The \LaTeX\ 2ε Sources

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## W  Itfilehook.dtx

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   2.9 High-level interfaces for \LaTeX{}  
   2.10 Internal commands needed elsewhere

3 A sample package for structuring the log output

4 Package emulations  
   4.1 Package atveryend emulation

## X  Itshipout.dtx

xv
1 \LaTeX{} System Dependent Initializations

This file implements the semi-automatic determination of various system dependent parts of the initialization. The actual definitions may be placed in a file \texttt{texsys.cfg}. Thus for operating systems for which the tests here do not result in acceptable settings, a ‘hand written’ \texttt{texsys.cfg} may be produced.

The macros that must be defined are:

\begin{verbatim}
@currdir \@currdir(filename)(space) should expand to a form of the filename that uniquely refers to the ‘current directory’ if this is possible. (The expansion should also end with a space.) on UNIX, this is \def\@currdir{./}. For more exotic operating systems you may want to make \@currdir a macro with arguments delimited by \ and/or \space. If the operating system has no concept of directory structure, this macro should be defined to be empty.
\end{verbatim}

\begin{verbatim}
\input@path If the primitive \openin searches the same directories as the primitive \input, then it is possible to tell (using \ifeof) whether a file exists before trying to input it. For systems like this, \input@path should be left undefined.
\end{verbatim}

\begin{verbatim}
\filename@parse After a call of the form: \filename@parse{(filename)}, the three macros \filename@area, \filename@base and \filename@ext should be defined to be the ‘area’ (or directory), basename and extension respectively. If there was no extension specified in \filename, \filename@ext should be \let to \relax (so this case may be tested with \@ifundefined{filename@ext} and, perhaps a default extension substituted).
\end{verbatim}

\begin{verbatim}
\@TeXversion \@TeXversion is now set automatically by the initialization tests in this file. You should not need to set it in \texttt{texsys.cfg}, however the following documentation is left for information. \LaTeX{} does not set this variable exactly, the automatic tests set it to:
2 for any version, \( v, v < 3.0 \)
3 for any version, \( v, 3.0 \leq v \leq 3.14 \)
\end{verbatim}
\textit{undefined}) otherwise. However these values are accurate enough for \LaTeX\ to take appropriate action for these old \TeX\s.

If your \TeX\ is older than version 3.141, then you should define $\textbackslash \@TeXversion$ (using \texttt{\def}) to be the version number. If you do not do this\footnote{Actually if your \TeX\ is really old, version 2, \LaTeX\ can detect this, and sets $\textbackslash \@TeXversion$ to 2 if it is not set in the \texttt{cfg} file.}, \LaTeX\ will not work around a bug in old \TeX\ versions, and so error messages will appear in a very strange format, with "\^^J appearing instead of line breaks:

\begin{verbatim}
\LaTeX\ Error: \rubbish\ undefined.^^J^^JSee the \LaTeX\ manual or \LaTeX=\ Companion
for explanation.^^J\texttt{\textbackslash H <return> for immediate help.}
\ldots
\end{verbatim}

\begin{verbatim}
.3 \renewcommand{\rubbish}
  {}
\end{verbatim}

However if you put \texttt{\def\@TeXversion{3.14}} in \texttt{texsys.cfg} the following format will be used:

\begin{verbatim}
\LaTeX\ Error: \rubbish\ undefined.
\ldots
\end{verbatim}

\begin{verbatim}
.3 \renewcommand{\rubbish}
  {}
\end{verbatim}

Note that this has an extra line \footnote{Actually if your \TeX\ is really old, version 2, \LaTeX\ can detect this, and sets $\textbackslash \@TeXversion$ to 2 if it is not set in the \texttt{cfg} file.}, which does not appear in error messages that use the default settings with a current version of \TeX, but this should not cause any confusion we hope.

\section{Initialization}

As this file is read at a very early stage, some definitions that are normally considered to be part of the format must be made here.

Most such definitions are repeated later in the “right” place, usually (but not always) with different implementations. To be able to spot this more easily if you look into the file \texttt{latex.ltx} (which is stripped of comments) we add some comment lines to that effect that survive the stripping process by \texttt{docstrip}.

\begin{verbatim}
\%\% ---- START temporary definitions for bootstrapping; later overwritten ----
\%\%
\end{verbatim}
2.1 INITEX

\{dircheck\}
\{initex\}\ifnum\catcode\{}=1
\errmessage{\LaTeX\ must be made using an initex with no format preloaded}\fi
\catcode\{}=2
\ifx\directlua\undefined
\else
\ifx\luatexversion\undefined
\directlua{tex.enableprimitives('',%}
\text.extraprimitives('etex', 'pdftex', 'umath'))}
\EndIncludeInRelease
\IncludeInRelease{0000/00/00}{\luatexluafunction}{LuaTeX (prefixed names)}%
\directlua{\text.enableprimitives('luatex', \text.extraprimitives('core', 'omega', 'aleph', 'luatex'))}
\local i
\local t = { }
\for _,i in pairs(\text.extraprimitives('luatex')) do
\if not string.match(i, "U") then
\if not string.match(i, "luatex") then
\table.insert(t,i)
\end
\if string.match(i,"Uchar$") then
\table.insert(t,i)
\end
\end
\for _,i in pairs(t) do
\text.print("
\noexpand\let\noexpand\" .. i

File a: ltdirchk.dtx
A test can now be made for e\TeX.

\ifx\eTeXversion\undefined
  \errmessage{LaTeX requires e-\TeX}
  \expandafter\endinput
\fi

That distraction over, back to the basics of a format.

\catcode'\#=6
\catcode'\^=7
\chardef\active=13
\catcode'\@=11
\countdef\count@=255
\let\bgroup=\let\egroup=
\ifx\@@input\@undefined\let\@@input\input\fi
\ifx\@@end\@undefined\let\@@end\end\fi
\chardef\@inputcheck0
\chardef\sixt@@n=16
\newlinechar'\^^J
\def\typeout{\immediate\write17}
\def\dospecials{\do\ \do\\\do\{\do\}\do\$\do\&\%
\do\#\do\^\do\_\do\%
\do\~}
\def\@makeother#1{\catcode'#1=12\relax}
\def\space{ }
\def\@tempswafalse{\let\if@tempswa\iffalse}
\def\@tempswatrue{\let\if@tempswa\iftrue}
\let\if@tempswa\iffalse
\def\loop#1\repeat{\def\iterate{#1\relax\expandafter\iterate\fi}\
\iterate \let\iterate\relax}
\let\repeat\fi

\ProvidesFile{\string\filespecials} for initex use.
\def\ProvidesFile#1{\
  \begingroup\
\catcode'\ =10 \%
\ifnum \endlinechar<256 \%
\file{a:\ ltdirchk.dtx}
\catcode'\+=7
%
As mentioned above, any site specific definitions required to describe the filename handling must be entered into a file `texsys.cfg`. If `texsys.cfg` can not be located by `\openin`, we write a default version out. The default version only contains comments, so we do not actually input the file in that case. The automatic tests later will, hopefully, correctly define the required macros.

The tricky code below checks to see if `texsys.cfg` exists. If it does not, all the text in this file between `START` and `END` is copied verbatim to a new file `texsys.cfg`. If `texsys.cfg` is found, then it is simply input. This is only done when this file is being used unstripped.

\section*{texsys.cfg}

As mentioned above, any site specific definitions required to describe the filename handling must be entered into a file `texsys.cfg`. If `texsys.cfg` can not be located by `\openin`, we write a default version out. The default version only contains comments, so we do not actually input the file in that case. The automatic tests later will, hopefully, correctly define the required macros.

The tricky code below checks to see if `texsys.cfg` exists. If it does not, all the text in this file between `START` and `END` is copied verbatim to a new file `texsys.cfg`. If `texsys.cfg` is found, then it is simply input. This is only done when this file is being used unstripped.

\section*{texsys.cfg}

As mentioned above, any site specific definitions required to describe the filename handling must be entered into a file `texsys.cfg`. If `texsys.cfg` can not be located by `\openin`, we write a default version out. The default version only contains comments, so we do not actually input the file in that case. The automatic tests later will, hopefully, correctly define the required macros.

The tricky code below checks to see if `texsys.cfg` exists. If it does not, all the text in this file between `START` and `END` is copied verbatim to a new file `texsys.cfg`. If `texsys.cfg` is found, then it is simply input. This is only done when this file is being used unstripped.
3.1 texsys.cfg

This file contains the site specific definitions of the four macros
\@currdir, \input@path, \filename@parse and \@TeXversion.

As distributed it only contains comments, however this ‘empty’ file will work on
many systems because of the automatic tests built into ltdirchk.dtx. You are allowed
to edit this file to add definitions of these macros appropriate to your system.

The macros that must be defined are:
\@currdir   \@currdir\(\text{filename}\)\(\text{space}\) should expand to a form of the filename that uniquely
refers to the ‘current directory’ if this is possible. (The expansion should also end with
a space.) on UNIX, this is  \texttt{\def\@currdir{./}}. For more exotic operating systems you
may want to make \@currdir a macro with arguments delimited by . and/or (space).
If the operating system has no concept of directory structure, this macro should be defined
to be empty.
\input@path   If the primitive \texttt{\openin} searches the same directories as the primitive \texttt{\input}, then it is possible to tell (using \texttt{\ifeof}) whether a file exists before trying to input it. For systems like this, \texttt{\input@path} should be left undefined.

If \texttt{\openin} does not ‘follow’ \texttt{\input} then \texttt{\input@path} must be defined to be a list
of directories to search for input files. The format for each directory is as for \@currdir,
normally just a prefix is required, but it may be a macro with space-delimited argument.
That is, if \(\langle\text{dir}\rangle\) is an entry in the input path, \TeX will try to load the expansion of
\(\langle\text{dir}\rangle\langle\text{filename}\rangle\langle\text{space}\rangle\)
So either \(\langle\text{dir}\rangle\) should be defined as a macro with argument delimited by space, or it
should just expand to a directory name, including the final directory separator, so that
it may be concatenated with the \(\langle\text{filename}\rangle\). This means that for UNIX-like syntax, each
\(\langle\text{dir}\rangle\) should end with a slash, /, One exception to this rule is that the input path should
always contain the empty directory \{\} as this will allow ‘full pathnames’ to be used, and
the ‘current directory’ to be searched.
\input@path should expand to a list of such directories, each in a {} group.
\filename@parse   After a call of the form: \texttt{\filename@parse(\langle\text{filename}\rangle)}, the three macros
\filename@area, \filename@base, \filename@ext should be defined to be the ‘area’ (or directory), basename and extension respectively. If there was no extension specified in \langle\text{filename}\rangle, \filename@ext should be \texttt{\let} to \texttt{\relax} (so this case may be tested with
\texttt{\@ifundefined{filename@ext}} and, perhaps a default extension substituted).

Normally one would not need to define this macro in texsys.cfg as the automatic
tests can supply parsers that work with UNIX and VMS syntax, as well as a basic parser
that will cover many other cases. However some operating systems may need a ‘hand
produced’ parser in which case it should be defined in this file.

The UNIX parser also works for most MSDOS \TeX versions. Currently if the UNIX
or VMS parser is not used, \texttt{\filename@parse} is defined to always return an empty area,
and to split the argument into basename and extension at the first ‘.’ that occurs in the
name. Parsers for other formats may be defined in texsys.cfg, in which case they will
be used in preference to the default definitions.
\@TeXversion   You should not need to set this macro in texsys.cfg. \TeX tests to set this automatically. See the comments in the opening section of ltdirchk.dtx.

The following sections give examples of definitions which might work on various
systems. These are currently mainly untested as I only have access to a few systems, all
of which do not need this file as the automatic tests work. All the code is commented out.

3.2 UNIX (web2c)

This implementation does make `\openin` and `\input` look in the same places. Acceptable settings are made by `ltdirchk.dtx`, and so this file may be empty. The definitions below are therefore just for information.

```latex
% \def\@currdir{./}
% \let\input@path\@undefined
```

3.3 UNIX (other)

Apparently some commercial UNIX implementations have different paths for `\openin` and `\input`. For these one could use definitions like the following (with whatever directories are used at your site): note that the directory names should end with `/`.

```latex
% \def\@currdir{./}
% \def\input@path{%
% {/usr/local/lib/tex/inputs/distrib/}%
% {/usr/local/lib/tex/inputs/contrib/}%
% {/usr/local/lib/tex/inputs/local/}%
% }
```

3.4 MSDOS (emtex)

This implementation does make `\openin` and `\input` look in the same places. Acceptable settings are made by `ltdirchk.dtx`, and so this file may be empty. The definitions below are therefore just for information.

```latex
% \def\@currdir{./}
% \let\input@path\@undefined
```

3.5 MSDOS (other)

Some PC implementations have different paths for `\openin` and `\input`. For these one could use definitions like the following (with whatever directories are used at your site): note that the directory names should end with `/`. This assumes the implementation uses UNIX style `/` as the directory separator.

```latex
% \def\@currdir{./}
% \def\input@path{%
% {c:/tex/inputs/distrib/}%
% {c:/tex/inputs/contrib/}%
% {c:/tex/inputs/local/}%
% }
```

3.6 VMS (DECUS TeX, PD VMS 3.6)

This implementation does make `\openin` and `\input` look in the same places. Acceptable settings are made by `ltdirchk.dtx`, and so this file may be empty. The definitions below are therefore just for information.

```latex
% \def\@currdir{}\%
% \let\input@path\@undefined
```
3.7 VMS (???)

Some VMS implementations have different paths for \openin and \input. For these one could use definitions like the following:

\begin{verbatim}
% \def\@currdir{}% % \def\input@path{% % \{tex_inputs:}% % \{SOMEDISK:[SOME.TEX.DIRECTORY]}% % }
\end{verbatim}

3.8 MACINTOSH (OzTeX 1.6)

This implementation does make \openin and \input look in the same places. Acceptable settings are made by ltdirchk.dtx, and so this file may be empty. The definitions below are therefore just for information.

\begin{verbatim}
% \def\@currdir:{% \let\input@path@undefined
\end{verbatim}

3.9 MACINTOSH (other)

Some Macintosh implementations have different paths for \openin and \input. For these one could use definitions like the following (with whatever folders are used on your machine): note that the directory names should end with ;, and they should contain no spaces.

\begin{verbatim}
% \def\@currdir:{% \def\input@path{% % \{Hard-Disk:Applications:TeX:TeX-inputs:}% % \{Hard-Disk:Applications:TeX:My-inputs:}% % }
\end{verbatim}

3.10 FAKE EXAMPLE

This example is for an operating system that has filenames of the form <area>name For maximum compatibility with macro sets, you want name.ext to be mapped to <ext>name, and <area>name.ext to be mapped to <area.ext>name. \input does this mapping automatically, but \openin does not, and does not look in the same places as \input. <>name is the desired ‘current directory’ syntax.

the following code would possibly work:

\begin{verbatim}
% \def\@dir#1#2 {,% \@d@r{#1}#2..@nil}% % \def\@d@r#1#2.#3.#4@nil{% % \{ifx\@dir#1\@dir\else#1\ifx\@dir#3\@dir\else.\fi\fi#3>#2 }% % % % \def\@currdir{\@dir{}% % \def\input@path{% % \{\@dir(area.one)% % % \{\@dir(area.two)% % % }
\end{verbatim}

END

\begin{verbatim}
\immediate\closeout15
\end{verbatim}

File a: ltdirchk.dtx
If `texsys.cfg` did exist, then input it.

```latex
\begin{verbatim}
   \else
   \typeout{** Using the existing texsys.cfg}
   \closein15
   \input texsys.cfg
   \fi
\end{verbatim}
```

If the stripped version of this file is being used (in `latex2e.ltx`) then `texsys.cfg` should be there, so just input it.

```latex
\begin{verbatim}
   \dircheck\input texsys.cfg
\end{verbatim}
```

\section{Setting `\@currdir`}

`\@currdir` is a local definition of `\IfFileExists`. It tries to relocate `texsys.aux`. If it succeeds, then the `\@currdir` syntax has been determined. If all the tests fail then `\@currdir` will be set to `\@empty`, and `ltxcheck` will warn of this when it checks the format.

```latex
\begin{verbatim}
\begingroup
\count@\time
\divide\count@ 60
\count2=-\count@
\multiply\count2 60
\advance\count2 \time
\edef\today{\the\year/\two@digits{\the\month}/\two@digits{\the\day}:%\two@digits{\the\count@}:\two@digits{\the\count2}}
\end{verbatim}
```

The current date and time stamp.

```latex
\begin{verbatim}
\edef\today{\the\year/\two@digits{\the\month}/\two@digits{\the\day}:%\two@digits{\the\count@}:\two@digits{\the\count2}}
\immediate\openout15=texsys.aux
\immediate\write15{\today^^J}
\immediate\closeout15 %
\def\IfFileExists#1#2#3{\openin\@inputcheck#1 %
\ifeof\@inputcheck
\else
\read\@inputcheck to \reserved@a
\if\reserved@a\today\relax
\else
\typeout{BAD: old file \reserved@a (should be \today)}\relax
\fi
\fi
\closein\@inputcheck}
```

Create a file `texsys.aux` (hopefully in the current directory), then try to locate it again.

```latex
\begin{verbatim}
\def\IfFileExists#1#2#3{%
\openin\@inputcheck#1 %
\ifeof\@inputcheck
\#3\relax
\else
\read\@inputcheck to \reserved@a
\if\reserved@a\today
\else
\typeout{BAD: old file \reserved@a (should be \today)}\relax
\fi
\fi
\closein\@inputcheck}
```

File a: `ltdirchk.dtx`
If \@currdir has not been pre-defined in texsys.cfg then test for UNIX, VMS and Oz-\TeX-Mac syntax.

\begin{verbatim}
\ifx\@currdir\@undefined
  \IfFileExists{./texsys.aux}{\gdef\@currdir{./}}%
  {\IfFileExists{[]\@currdir}{\gdef\@currdir{[]}}%
    \IfFileExists{:\@currdir}{\gdef\@currdir{}}{}}
\fi
\end{verbatim}

If it is still undefined at this point, all the above tests failed. Earlier versions interactively prompted for a definition at this point, but it seems impossible to reliably obtain information from users at this point in the installation. This version of the file produces a format with no user-interaction. Later if the format is not suitable for the system, texsys.cfg may be edited and the format re-made.

\begin{verbatim}
\ifx\@currdir\@undefined
  \global\let\@currdir\@empty
  \typeout{^^J%%
  ! No syntax for the current directory could be found^^J%
  }%
\fi
\end{verbatim}

Otherwise \@currdir was defined in texsys.cfg. In this case check that the syntax specified works on this system. (In case a complete \LaTeX system has been copied from one system to another.) If the test fails, give up. The installer should remove or correct the offending texsys.cfg and try again.

\begin{verbatim}
\else
  \IfFileExists{\@currdir texsys.aux}{}{%
    \edef\reserved@a{\errhelp{\texsys.cfg specifies the current directory syntax to be^^J%
      \meaning\@currdir^^J%
      but this does not work on this system.^^J%
      Remove texsys.cfg and restart.}}\reserved@a
  \errmessage{Bad texsys.cfg file: \noexpand\@currdir}
\end{verbatim}

The version of \@currdir in texsys.cfg looks OK.

\begin{verbatim}
\fi
\end{verbatim}

\begin{verbatim}
\immediate\closeout15 %
\endgroup
\end{verbatim}

\begin{verbatim}
\typeout{^^J\@currdir set to:
\expandafter\strip@prefix\meaning\@currdir.^^J%}
\end{verbatim}

(End definition for \@currdir, IfFileExists, and \today.)

Stop here if the file is being used unstripped.

\begin{verbatim}
⟨∗docstrip⟩
\relax\endinput
⟨/docstrip⟩
\end{verbatim}
5 Setting \input@path

Earlier versions of this file attempted to automatically test whether \input@path was required, and interactively prompt for a path if necessary. This was not found to be very reliable. The first-time installer of \LaTeX{} can not be expected to have enough information to supply the correct information to the prompts. Now the interaction is omitted. After the format is made the installer can attempt to run the test document ltxcheck.tex through \LaTeX{}. This will check, among other things, whether texsys.cfg will need to be edited and the format remade.

\input@path

Now set up the \input@path.

\input@path should either be undefined, or a list of directories as described in the introduction.

\input@path has not been pre-defined.

\input@path has been defined in texsys.cfg.

\latex{} will use the path specified by \input@path:

\end (End definition for \input@path.)

6 Filename Parsing

\filename@parse

Split a filename into its components.

\filename@parse was not specified in texsys.cfg, but \@currdir looks like UNIX...

Search for the last /.

File a: ldtirchk.dtx
\filename@parse was not specified in texsys.cfg, but \@currdir looks like VMS...

\typeout{^^JDefining VMS style filename parser.^^J}
def\filename@parse#1{%  
    \let\filename@area\@empty
    \expandafter\filename@path#1\\}

Search for the last ].
def\filename@path#1]\#2\{\%
    \ifx\#2\%
        \def\reserved@a{\filename@simple#1.\}
    \else
        \edef\filename@area{\filename@area#1]}
        \def\reserved@a{\filename@path#2\\}
    \fi
\reserved@a}
\else\def\reserved@a{\}\ifx\@currdir\reserved@a
\filename@parse was not specified in texsys.cfg, but \@currdir looks like Macintosh...

\typeout{^^JDefining Mac style filename parser.^^J}
def\filename@parse#1{%  
    \let\filename@area\@empty
    \expandafter\filename@path#1:\}

Search for the last :.
def\filename@path#1:#2\{\%
    \ifx\#2\%
        \def\reserved@a{\filename@simple#1.\\}
    \else
        \edef\filename@area{\filename@area#1:}
        \def\reserved@a{\filename@path#2\\}
    \fi
\reserved@a}
\else

\filename@parse was not specified in texsys.cfg. So just make a simple parser that always sets \filename@area to empty.
\typeout{^^JDefining generic filename parser.^^J}
def\filename@parse#1{%  
    \let\filename@area\@empty
    \expandafter\filename@simple#1.\\}
\fi\fi

\filename@simple is used by all three versions. Finally we can split off the extension.
⟨/dircheck⟩
⟨/dircheck, latexrelease⟩
⟨latexrelease⟩\IncludeInRelease{2019/10/01}{\filename@simple}{Final dot for extension}⟨latexrelease⟩{Final dot for extension}
def\filename@simple#1.#2\{\%
    \ifx\#2\%
        \let\filename@ext\relax
        \edef\filename@base{#1}\
    \else

File a: ltdirchk.dtx
\filename@dots{#1}\#2\%
\fi}
def\filename@dots#1#2.#3\%
  \ifx\#3\%
  \def\filename@ext{#2}\%
  \edef\filename@base{#1}\%
  \else
  \filename@dots{#1.#2}#3\%
  \fi}
⟨latexrelease\rangle\EndIncludeInRelease
⟨latexrelease\rangle\IncludeInRelease{0000/00/00}{\filename@simple}
⟨latexrelease\rangle{Final dot for extension}\%
⟨latexrelease\rangle\EndIncludeInRelease
⟨dircheck,latexrelease\rangle
  Remove a final dot, added earlier.
  \def\filename@dot#1.\{#1}
  \else
  Otherwise, \filename@parse was specified in texsys.cfg.
  \typeout{^^J\noexpand\filename@parse was defined in texsys.cfg:^^J\expandafter\strip@prefix\meaning\filename@parse.^^J}
  \fi
(End definition for \filename@parse.)

7 \TeX Versions

\@TeXversion \TeX versions older than 3.141 require \@TeXversion to be set. This can be determined automatically due to a trick suggested by Bernd Raichle. (Actually this will not always get the correct version number, eg \TeX3.14 would be detected as \TeX3, but \TeX only needs to take account of \TeX's older than 3, or between 3 and 3.14.
\ifx\@TeXversion\@undefined
  \def\@TeXversion{2}
\else
  \catcode`\^^J=\active
  \def\reserved@a{\string\@TeXversion{2}}
  \def\reserved@a{\string\@TeXversion{3}\@TeXversion{2}}
  \if\reserved@a\@empty\else\gdef\@TeXversion{3}\fi
 \else
  \catcode`\^^J=\active
  \def\reserved@a{\string\@TeXversion{2}}
  \def\reserved@a{\string\@TeXversion{3}\@TeXversion{2}}
  \if\reserved@a\@empty\else\gdef\@TeXversion{3}\fi
 \fi

File a: ltxdirchk.dtx 13
(End definition for \TeXversion.)

\%\%  END temporary definitions for bootstrapping  ----
\%\%  (/dircheck)

8  ltxcheck.tex

After the format has been made, and article.cls moved with the other files to the ‘standard input directory’ as specified in install.txt, the format may be checked by running the file ltxcheck.tex.
1 Plain \TeX

\LaTeX includes almost all of the functionality of Knuth’s original ‘Basic Macros’ That is, the plain \TeX format described in Appendix B of the \TeXBook. However, some of the user commands are not much use so, in order to save memory, we may remove them from the kernel into a package. Here is a list of the commands that may be removed (PROBABLY NOT COMPLETE).

\begin{verbatim}
\magstep \magstephalf
\mathhexbox
\vglue \vgl@\n\hglue \hgl@
\end{verbatim}

This file is by now very small as most of it has been moved to more appropriate kernel files: it may disappear completely one day.

\LaTeX font definitions are done using NFSS2 so none of PLAIN’s font definitions are in \LaTeX.

\LaTeX has its own tabbing environment, so PLAIN’s is disabled.

\LaTeX uses its own output routine, so most of the plain one was removed.

\begin{verbatim}
\langle
\end{verbatim}

\begin{verbatim}
\catcode'\{=1 % left brace is begin-group character
\catcode'\}=2 % right brace is end-group character
\catcode'\$=3 % dollar sign is math shift
\catcode'\&=4 % ampersand is alignment tab
\catcode'\#=6 % hash mark is macro parameter character
\catcode'\^=7 % circumflex and uparrow are for superscripts
\catcode'\_=8 % underline and downarrow are for subscripts
\catcode'\^^I=10 % ascii tab is a blank space
\chardef\active=13 \catcode'\~\=\active % tilde is active
\catcode'\^^L\=\active \def\^^L{\par}% ascii form-feed is \par
\message{catcodes,}
\end{verbatim}

We had to define the \catcodes right away, before the message line, since \message uses the \{ and \} characters. When INITEX (the \TeX initializer) starts up, it has defined the following \catcode values:

\begin{verbatim}
\catcode'\^^@=9 % ascii null is ignored
\catcode'\^^M=5 % ascii return is end-line
\catcode'\%=14 % percent sign is comment character
\catcode'\_=10 % ascii space is blank space
\catcode'\^^?=15 % ascii delete is invalid
\catcode'A=11 ... \catcode'Z=11 \% uppercase letters
\catcode'a=11 ... \catcode'z=11 \% lowercase letters
all others are type 12 (other)
\end{verbatim}

\begin{verbatim}
\def\dospert\{do\ \do\\do\{do\}\do\$\do\% \
\do\#\do\ \do\%\do\}
\end{verbatim}

File b: \texttt{1tplain.dtx} Date: 2022/01/25 Version v2.3h
Each symbol in the list is preceded by , which can be defined if you want to do something to every item in the list.

We make @ signs act like letters, temporarily, to avoid conflict between user names and internal control sequences of plain format.
\catcode`@=11

To make the plain macros more efficient in time and space, several constant values are declared here as control sequences. If they were changed, anything could happen; so they are private symbols.
\@ne \tw@ \thr@@ \sixt@@n \@cclv

Small constants are defined using \chardef.
\chardef\@ne=1
\chardef\tw@=2
\chardef\thr@@=3
\chardef\sixt@@n=16
\chardef\@cclv=255

Constants above 255 defined using \mathchardef.
\mathchardef\@cclvi=256
\mathchardef\@m=1000
\mathchardef\@M=10000
\mathchardef\@MM=20000

Allocation of registers
Here are macros for the automatic allocation of \count, \box, \dimen, \skip, \muskip, and \toks registers, as well as \read and \write stream numbers, \fam codes, \language codes, and \insert numbers.
\message{registers,}

When a register is used only temporarily, it need not be allocated; grouping can be used, making the value previously in the register return after the close of the group. The main use of these macros is for registers that are defined by one macro and used by others, possibly at different nesting levels. All such registers should be defined through these macros; otherwise conflicts may occur, especially when two or more macro packages are being used at the same time.

Historical \LaTeX\ 2.09 comments (not necessarily accurate any more):

The following counters are reserved:
  0 to 9  page numbering
  10  count allocation
  11  dimen allocation
  12  skip allocation
  13  muskip allocation
  14  box allocation
  15  toks allocation
  16  read file allocation
  17  write file allocation
  18  math family allocation
  19  language allocation
  20  insert allocation
  21  the most recently allocated number
New counters are allocated starting with 23, 24, etc. Other registers are allocated starting with 10. This leaves 0 through 9 for the user to play with safely, except that counts 0 to 9 are considered to be the page and subpage numbers (since they are displayed during output). In this scheme, \count 10 always contains the number of the highest-numbered counter that has been allocated, \count 14 the highest-numbered box, etc. Inserts are given numbers 254, 253, etc., since they require a \count, \dimen, \skip, and \box all with the same number; \count 20 contains the lowest-numbered insert that has been allocated. Of course, \box255 is reserved for \output; \count255, \dimen255, and \skip255 can be used freely.

It is recommended that macro designers always use \global assignments with respect to registers numbered 1, 3, 5, 7, 9, and always non-\global assignments with respect to registers 0, 2, 4, 6, 8, 255. This will prevent “save stack buildup” that might otherwise occur.

\count10=22 \% allocates \count registers 23, 24, ...
\count11=9 \% allocates \dimen registers 10, 11, ...
\count12=9 \% allocates \skip registers 10, 11, ...
\count13=9 \% allocates \muskip registers 10, 11, ...
\count14=9 \% allocates \box registers 10, 11, ...
\count15=9 \% allocates \toks registers 10, 11, ...
\count16=-1 \% allocates input streams 0, 1, ...
\count17=-1 \% allocates output streams 0, 1, ...
\count18=3 \% allocates math families 4, 5, ...
\count19=0 \% allocates \language codes 1, 2, ...
\count20=255 \% allocates insertions 254, 253, ...

\countdef\insc@unt=20
\countdef\allocationnumber=21

(End definition for \insc@unt and \allocationnumber.)

\m@ne The constant \(-1\).
\countdef\m@ne=22 \m@ne=-1

(End definition for \m@ne.)

\wlog Write on log file (only)
\def\wlog{\immediate\write\m@ne}

(End definition for \wlog.)

\count@ Here are abbreviations for the names of scratch registers that don’t need to be allocated.
\dimen@ \countdef\count@=255
\dimen@i \dimendef\dimen@=0
\dimen@ii \dimendef\dimen@i=1 \% global only
\skip@ \dimendef\skip@=2
\toks@ \toksdef\toks@=0

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Now, we define \newcount, \newbox, etc. so that you can say \newcount\foo and \foo will be defined (with \countdef) to be the next counter. To find out which counter \foo is, you can look at \allocationnumber.

Since there's no \bboxdef command, \chardef is used to define a \newbox, \newinsert, \newfam, and so on.

\LaTeXX change: remove \outer from \newcount and \newdimen \textit{FMi} This is necessary to use \newcount inside \if... later on. Also remove from \newskip, \newbox \newwrite and \newfam \textit{DPC} to save later redefinition.

For compatibility use \chardef in the classical range.

\Skip\write18 due to its traditional use as a shell-escape.
\newcount{\newcount}
\newdimen{\newdimen}
\newskip{\newskip}
\newmuskip{\newmuskip}
\newbox{\newbox}
\newtoks{\newtoks}
\newread{\newread}
\newwrite{\newwrite}
\new@mathgroup{\new@mathgroup}
\newlanguage{\newlanguage}
\let\newfam\new@mathgroup

The upper limit of extended registers, which leaves this number (eg \texttt{\newdimen32767}) always unallocated by these macros. cf traditional \texttt{\newdimen255}.

\let\newchardef\chardef

classic \TeX{} has \texttt{2^5} registers.

etex and xetex have \texttt{2^{15}} registers.

luatex has \texttt{2^{16}} registers.

(End definition for \texttt{\newcount} and others.)
The upper limit of extended math groups (\fam) 16 in classic \TeX{} and e-\TeX{}, but 256 in Unicode \TeX{} variants.

\begin{verbatim}
124 ⟨∗2ekernel|latexrelease⟩
125 ⟨latexrelease⟩\IncludeInRelease{2015/01/01}{\e@mathgroup@top}{Extended Allocation}%
126 \ifx\Umathcode\@undefined
128 \chardef\e@mathgroup@top=16
129 \else
130 \chardef\e@mathgroup@top=256
131 \fi
132 ⟨∗2ekernel|latexrelease⟩
133 ⟨latexrelease⟩\EndIncludeInRelease
134 ⟨latexrelease⟩\IncludeInRelease{0000/00/00}{\e@mathgroup@top}{Extended Allocation}%
135 \let\e@mathgroup@top\@undefined
136 ⟨latexrelease⟩\EndIncludeInRelease
\end{verbatim}

\begin{verbatim}
(End definition for \e@mathgroup@top.)
\end{verbatim}

\e@alloc A modified version of \alloc@ that takes the count register rather than just the final digit of its number (assuming \count1x). It also has an extra argument to give the top of the extended range.

\begin{verbatim}
#1 #2 #3 #4 #5 #6
\e@alloc type defcmd current top extended-top newname
\end{verbatim}

Note that if just a single allocation range is required (not omitting a range up to 255 for inserts) then \texttt{−1} should be used for the first upper bound argument, \texttt{#4}.

\begin{verbatim}
138 ⟨∗2ekernel|latexrelease⟩
139 ⟨latexrelease⟩\IncludeInRelease{2015/01/01}{\e@alloc}{Extended Allocation}%
140 \def\e@alloc#1#2#3#4#5#6{%
141 \global\advance#3\@ne
142 \e@ch@ck{#3}{#4}{#5}#1%
143 \allocationnumber#3\relax
144 \global#2#6\allocationnumber
145 \wlog{\string#6=\string#1\the\allocationnumber}}%
146 ⟨∗2ekernel|latexrelease⟩
147 ⟨latexrelease⟩\EndIncludeInRelease
148 ⟨latexrelease⟩\IncludeInRelease{0000/00/00}{\e@alloc}{Extended Allocation}%
149 ⟨latexrelease⟩\let\e@alloc\@undefined
150 ⟨latexrelease⟩\EndIncludeInRelease
151 ⟨∗2kernel⟩
\end{verbatim}

(End definition for \e@alloc.)

\e@ch@ck Extended check command. If the first range is exceeded, bump to 256 (or 266 for counts) and try again, testing the extended range.
Allocate matching registers from the top of the extended range and add to \@freelist.

\begin{verbatim}
152 \new kernel \freelist
153 \new kernel \latexrelease
154 \latexrelease \IncludeInRelease{2015/10/01}
155 \latexrelease \{\e@ch@ck{Extended Allocation (checking)}\%
156 \let\@check\freelist
157 \ifnum\@check\#2\else
158 If we’ve reached the classical top limit, bump to 256 or 266 for counts (count 256–265
159 are reserved by the allocation system).
160 \fi
161 \fi
162 \EndIncludeInRelease
163 \latexrelease \IncludeInRelease{2015/01/01}
164 \latexrelease \{\e@ch@ck{Extended Allocation (checking)}\%
165 \let\e@ch@ck\@undefined
166 \EndIncludeInRelease
167 \latexrelease \IncludeInRelease{0000/00/00}
168 \latexrelease \{\e@ch@ck{Extended Allocation (checking)}\%
169 \extrafloats \extrafloats
170 In classic \TeX{} use \texttt{newinsert} to allocate float boxes.
171 \extrafloats
\end{verbatim}
In e-tex take float boxes from the top of the extended range.

\def\extrafloats#1{\
  \ifnum#1>\z@
  \count@\numexpr\float@count-1\relax
  \ch@ck0\count@\count
  \ch@ck1\count@\dimen
  \ch@ck2\count@\skip
  \ch@ck4\count@\box
  \global\e@alloc@chardef\float@count\count@
  \global\expandafter\e@alloc@chardef\csname bx@\the\float@count\endcsname\float@count
  \@cons\@freelist{\csname bx@\the\float@count\endcsname}\
  \expandafter\extrafloats\expandafter{\numexpr#1-1\relax}\
  \fi\
}\fi\

(End definition for \e@ch@ck, \extrafloats, and \extrafloats.)

\alloc@ Since \e@alloc was added in 2015, \alloc@ has not been used, but was left as some legacy code calls it. However the original definition gives spurious errors once the "classic" registers run out, so it is now defined to call \e@alloc internally.
If e-\TeX{} is not available use the original plain \TeX{} definition of \texttt{\newinsert}.

```latex
\def\newinsert#1{\global\advance\insc@unt \m@ne
\ch@ck0\insc@unt\count
\ch@ck1\insc@unt\dimen
\ch@ck2\insc@unt\skip
\ch@ck4\insc@unt\box
\allocationnumber\insc@unt
\global\chardef#1\allocationnumber
\wlog{\string#1=\string\insert\the\allocationnumber}}
```

If the classic registers are exhausted, take an insert from the free float list and use \texttt{\extrafloats} to add a new float to that list.

```latex
\def\newinsert#1{%
\if\tempswafalse
\global\advance\insc@unt \m@ne
\ifnum\count10<\insc@unt
\ifnum\count11<\insc@unt
\ifnum\count12<\insc@unt
\ifnum\count14<\insc@unt
\tempswatrue
\fi\fi\fi\fi
\if\tempswa
\fi
\fi\fi%}
\if\tempswa
\global\advance\insc@unt \m@ne
\extrafloats\m@ne
\m@ne\@next\@currbox\@freelist
{\ifnum\@currbox<\e@insert@top
\allocationnumber\@currbox
\else
\ch@ck0\m@ne\insert
\fi}%
{\ch@ck0\m@ne\insert}%
\fi%}
```

\tex]{\texttt{End definition for \texttt{\newinsert}.}}\par
\begin{verbatim}
\ch@ck
\gdef\ch@ck#1#2#3{\ifnum\count1#1<#2\else\errmessage{No room for a new #3}\fi}
\end{verbatim}
\begin{flushright}(End definition for \texttt{\ch@ck}.)\end{flushright}
\begin{verbatim}
\newhelp
\def\newhelp#1#2{\newtoks#1#1\expandafter{\csname#2\endcsname}}
\end{verbatim}
\begin{flushright}(End definition for \texttt{\newhelp}.)\end{flushright}
\begin{verbatim}
\@inputcheck \@unused
\newread\@inputcheck \newwrite\@unused
\end{verbatim}
\begin{flushright}(End definition for \texttt{@inputcheck} and \texttt{@unused}.)\end{flushright}
\begin{verbatim}
\maxdimen \hideskip
\newdimen\maxdimen \maxdimen=16383.99999pt % the largest legal <dimen>
\newskip\hideskip \hideskip=-1000pt plus 1fill % negative but can grow
\end{verbatim}
\begin{flushright}(End definition for \texttt{\maxdimen} and \texttt{\hideskip}.)\end{flushright}
\begin{verbatim}
\p@ \z@ \z@skip \voidb@x
\newdimen\p@ \p@=1pt % this saves macro space and time
\newdimen\z@ \z@=0pt % can be used both for Opt and 0
\newskip\z@skip \z@skip=0pt plus0pt minus0pt
\newbox\voidb@x % permanently void box register
\end{verbatim}
Assign initial values to \TeX’s parameters

\message{parameters,}

All of \TeX’s numeric parameters are listed here, but the code is commented out if no special value needs to be set. INITEX makes all parameters zero except where noted.

Historical \BT\TeX\ 2.09 comments (not necessarily accurate any more):

\pretolerance=100
\tolerance=200 \% INITEX sets this to 10000
\hbadness=1000
\vbadness=1000
\linepenalty=10
\hyphenpenalty=50
\exhyphenpenalty=50
\binoppenalty=700
\relpenalty=500
\clubpenalty=150
\widowpenalty=150
\displaywidowpenalty=50
\brokenpenalty=100
\predisplaypenalty=10000
\postdisplaypenalty=0
\interlinepenalty=0
\floatingpenalty=0, set during \insert
\outputpenalty=0, set before \TeX enters \output
\doublehyphendemerits=10000
\finalhyphendemerits=5000
\adjdemerits=10000
% \looseness=0, cleared by \TeX after each paragraph
% \pausing=0
% \holdinginserts=0
% \tracingonline=0
% \tracingmacros=0
% \tracingstats=0
% \tracingparagraphs=0
% \tracingpages=0
% \tracingoutput=0

In the past \LaTeX{} used the default value of \texttt{1} for \cs{tracinglostchars} because this was the best it could do. This way one would at least get a warning in the \texttt{.log} file. e-\TeX{} improved on that and supported a value of \texttt{2} to show the warning on the terminal, so we could have changed the default when we made the e-\TeX{} extensions required—however, we overlooked that opportunity.

In 2021 this parameter was improved on again and now also accepts the value \texttt{3} (error on the terminal). This made us realize that we should change the default. Using \texttt{3} would really be the best, but for compatibility reasons we only use \texttt{2}.

\changes{v2.3g}{2021/07/16}{Use 2 as default value for \cs{tracinglostchars}}

\tracinglostchars=2
\begin{macro}{\tracingstacklevels}
For \LaTeX, the \texttt{\cs{tracingstacklevels}} functionality was implemented as a callback, so here we just define the count register to hold the value of the parameter.
\end{macro}

\begin{Verbatim}
\begin{verbatim}
\begin{macro}{\tracingstacklevels}
\makeatletter
\ifx\directlua\@undefined
\else
\newcount\tracingstacklevels
\fi
\end{macro}
\end{verbatim}
\end{Verbatim}
\time=now \% TeX does this at beginning of job
\day=now \% TeX does this at beginning of job
\month=now \% TeX does this at beginning of job
\year=now \% TeX does this at beginning of job

End of historical \LaTeX\ 2.09 comments.

In \LaTeX\ we don’t want box information in the transcript unless we do a full tracing.

\showboxbreadth=-1
\showboxdepth=-1
\errorcontextlines=-1
\hfilz=0.1pt
\vfilz=0.1pt
\overfullrule=5pt
\maxdepth=4pt
\splitmaxdepth=\maxdimen
\boxmaxdepth=\maxdimen

Historical \LaTeX\ 2.09 comments (not necessarily accurate any more):
\lineskiplimit=0pt, changed by \normalbaselines
\delimitershortfall=5pt
\nulldelimiterspace=1.2pt
\scriptspace=0.5pt
\mathsurround=0pt
\predisplaysize=0pt, set before TeX enters \$\$
\displaywidth=0pt, set before TeX enters \$\$
\displayindent=0pt, set before TeX enters \$\$
\parindent=20pt
\hangindent=0pt, zeroed by TeX after each paragraph
\hoffset=0pt
\voffset=0pt
\baselineskip=0pt, changed by \normalbaselines
\lineskip=0pt, changed by \normalbaselines
\parskip=0pt plus 1pt
\abovedisplayskip=12pt plus 3pt minus 9pt
\belowdisplayskip=12pt plus 3pt minus 9pt
\belowdisplayshortskip=7pt plus 3pt minus 4pt
\leftskip=0pt
\parfillskip=0pt plus 1fil
\topskip=10pt
\abovedisplayshortskip=0pt plus 3pt
\belowdisplayshortskip=0pt
\tabskip=0pt
\spaceskip=0pt
\xspaceskip=0pt
\parfillskip=0pt plus 1fil

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End of historical \TeX\ 2.09 comments.

\normalbaselineskip
\normallineskip
\normallineskiplimit

We also define special registers that function like parameters:
\newskip\normalbaselineskip \normalbaselineskip=12pt
\newskip\normallineskip \normallineskip=1pt
\newdimen\normallineskiplimit \normallineskiplimit=0pt
(End definition for \normalbaselineskip, \normallineskip, and \normallineskiplimit.)

\interfootlinepenalty

\newcount\interfootnotelinepenalty \interfootnotelinepenalty=100
(End definition for \interfootlinepenalty.)

Definitions for preloaded fonts
\magstephalf
\magstep

\def\magstephalf{1095}
\def\magstep#1{\ifcase#1 @m\or 1200\or 1440\or 1728\or
2074\or 2488\fi\relax}
(End definition for \magstephalf and \magstep.)

Macros for setting ordinary text
\frenchspacing
\nonfrenchspacing

\def\frenchspacing{\sfcode\.'@m \sfcode\?'@m \sfcode\!'@m
\sfcode\:'@m \sfcode\;'@m \sfcode\,'1250}
\def\nonfrenchspacing{\sfcode\.'3000\sfcode\?'3000\sfcode\!'3000%
\sfcode\:'2000\sfcode\;'1500\sfcode\,'1250}
(End definition for \frenchspacing and \nonfrenchspacing.)

\normalbaselines
\def\normalbaselines{\lineskip\normallineskip
\baselineskip\normalbaselineskip \lineskiplimit\normallineskiplimit}
(End definition for \normalbaselines.)

\M
\lbrack
\rbrack

Save a bit of space by using \let here.
\I
\def\``M{\ } % control <return> = control <space>
\def\``I``M % same for <tab>
(End definition for \M and \I.)

\lq
\rq
\def\lq{'}
\def\rq{'}
(End definition for \lq and \rq.)

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These are not from plain.tex but they are similar to other commands found here and nowhere else, being alternate input forms for characters.

\def \aa {\r a}
\def \AA {\r A}

(End definition for \aa and \AA.)

\begin{verbatim}
def \space{ }
(End definition for \space.)
def \empty{\hbox{}}
(End definition for \empty.)
def \null{\hbox{}}
(End definition for \null.)
def \bgroup{{}
def \egroup{}}
(End definition for \bgroup and \egroup.)
\end{verbatim}

In \obeylines, we say \let^^M=\obeyedline instead of \def^^M{\obeyedline} since this allows, for example, \let\obeyedline=\cr \obeylines \halign{....
This is essentially a plain \TeX trick and in its original version where you had to use \let\par=\cr not really a safe idea in \LaTeX. If anybody used this trick this now breaks (and one needs to use \obeyedline instead).

If the active ^^M escapes, e.g. into a \write (which is effectively in a different context) we don’t want the definition from \obeylines but rather a simple \par (in fact even the primitive one, not the \LaTeX version \para_end: which is only defined later.

\begin{verbatim}
\catcode'\^^M=\active
\let\obeyedline=\halign
\end{verbatim}
The next line ending the definition is rather curious and it took me awhile to understand why rollback fails. The problem is the following: if \latexrelease is used, then blocks of \IncludeInRelease ... \EndIncludeInRelease are bypassed at high speed by grabbing each as a delimited argument. However, in that case \^^M is seen not as code but as line ending characters and in that mode \TeX discards everything from that point onwards to the real end of the line so it works like a comment — pretty strange really (and I think due to the fact the the original pascal compiler could have some garbage showing up after the normal line ending character. Thus we really have to make sure that any closing braces is not one the same line as an \^^M, because otherwise it would get dropped and we end with unbalanced braces and never see the \EndIncludeInRelease — weird. In other places it doesn't matter because we aren't using the incomplete result.

The \obeyline expands by default to \par with whatever definition \par has when it is executed. It can, however, be redefined (before calling \obeylines!) to achieve some special effects. If you want to alter is definition when already in the scope of \obeylines, it has no effect (because \let is used above). In that case simply make another call to \obeylines immediately. As you are in a restricted scope all that happens is that your redefinition is applied.

For the default definition we have to use \def not \let because the meaning of \par can change and we want to use the one that is current when \obeylines act.

There is a small subtlety here: in an \edef the active \^^M stayed put (because it was equal to to the primitive \par), now \obeyline expands and you get what it contains, i.e., in that case \par, into the \edef or \mark unless we use \protected on it.

The definition of \obeyspaces is changed in the same way and now executes \obeyedspace for each active space.

An active space elsewhere generates \space by default (for example in a \write).

From 2019 onwards the commands are made robust (somewhat later in the kernel sources). So if we roll back they are robust, so when redefining them we have get rid of the robust payload first. Otherwise that is seen by the later rollback below, which then installs a fragile version of the new definition on top of the one we roll back to here, sigh. \kernel@make@fragile also changes its definition (later own) so this is done directly.
Another pitfall: if we do a rollback \par is no longer the primitive, so the roll back definition needs \let to what is new the primitive.

\let\obeyedline@undefined
\let\obeyedspace@undefined
\EndIncludeInRelease

(End definition for \obeylines and others.)

\loop
\iterate
\repeat

This setting of \repeat is needed to make \loop...\if...\repeat skippable within another \if...

\let\repeat=\fi

(End definition for \loop, \iterate, and \repeat.)

\loop We use Kabelschacht’s method of doing loops, see TUB 8#2 (1987). (unless that breaks something :-). It turned out to need an extra \relax: see pr/642 (\loop could do one iteration too much in certain cases).

\long\def\loop #1\repeat{%
\def\iterate(#1)\relax % Extra \relax
\expandafter\iterate\fi
%}
\iterate
\let\iterate\relax
\repeat

(End definition for \loop, \iterate, and \repeat.)

\nointerlineskip \offinterlineskip

(End definition for \nointerlineskip and \offinterlineskip.)

\vglue \hglue

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\LaTeX defines \texttt{\~} in \texttt{ltdefns.dtx}.

\texttt{\slash} This generates a / acting a bit like - but still allows hyphenation in the word part preceding it (but not after).
\begin{verbatim}
\def\slash{/\penalty\exhyphenpenalty}
\end{verbatim}

(End definition for \texttt{\slash}.)

\texttt{\break}\texttt{\nobreak}\texttt{\allowbreak}
\begin{verbatim}
\def\break{\penalty-\@M}
\def\nobreak{\penalty \@M}
\def\allowbreak{\penalty \z@}
\end{verbatim}

(End definition for \texttt{\break}, \texttt{\nobreak}, and \texttt{\allowbreak}.)

\texttt{\filbreak}\texttt{\goodbreak}
\begin{verbatim}
\def\filbreak{\par\vfil\penalty-200\vfilneg}
\def\goodbreak{\par\penalty-500 }
\end{verbatim}

(End definition for \texttt{\filbreak} and \texttt{\goodbreak}.)

\texttt{\eject}
Define \texttt{\eject} as in plain \TeX{} but define \texttt{\supereject} only in the compatibility file.
\begin{verbatim}
\def\eject{\par\break}
\end{verbatim}

(End definition for \texttt{\eject}.)

\texttt{\removelastskip}
\begin{verbatim}
\def\removelastskip{\ifdim\lastskip=\z@\else\vskip-\lastskip\fi}
\end{verbatim}

(End definition for \texttt{\removelastskip}.)

\texttt{\smallbreak}\texttt{\medbreak}\texttt{\bigbreak}
\begin{verbatim}
\def\smallbreak{\par\ifdim\lastskip<\smallskipamount
\removelastskip\penalty-50\smallskip\fi}
\def\medbreak{\par\ifdim\lastskip<\medskipamount
\removelastskip\penalty-100\medskip\fi}
\def\bigbreak{\par\ifdim\lastskip<\bigskipamount
\removelastskip\penalty-200\bigskip\fi}
\end{verbatim}

(End definition for \texttt{\smallbreak}, \texttt{\medbreak}, and \texttt{\bigbreak}.)

\texttt{\m@th}
\begin{verbatim}
\def\m@th{\mathsurround\z@}
\end{verbatim}

(End definition for \texttt{\m@th}.)

\texttt{\underline}
Due to \LaTeX{}'s redefinition of \texttt{\underline} plain \TeX{}'s \texttt{\underline} can be done in a simpler fashion (but do we need it at all?).
\begin{verbatim}
\def\underline#1{\underline{\sbox\tw@{#1}\dp\tw@\z@\box\tw@}}
\end{verbatim}

(End definition for \texttt{\underline}.)

\texttt{\strutbox}\texttt{\strut}
\LaTeX{} sets \texttt{\strutbox} in \texttt{\set@fontsize}.
\begin{verbatim}
\newbox\strutbox
\def\strut{\relax\ifmmode\copy\strutbox\else\unhcopy\strutbox\fi}
\end{verbatim}

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\hidewidth
For alignment entries that can stick out.
\def\hidewidth{\hskip\hideskip}
(End definition for \hidewidth.)

\narrower
\def\narrower{%\advance\leftskip\parindent \advance\rightskip\parindent}
(End definition for \narrower.)

\leavevmode
begins a paragraph, if necessary
\def\leavevmode{\unhbox\voidb@x}
(End definition for \leavevmode.)

\mathhexbox
\def\mathhexbox#1#2#3{\mbox{$\m@th \mathchar"#1#2#3$}}
(End definition for \mathhexbox.)

\ialign
\def\ialign{\everycr{}\tabskip\z@skip\halign} % initialized \halign
(End definition for \ialign.)

\oalign \o@align \ooalign
\def\oalign#1{\leavevmode\vtop{\baselineskip\z@skip \lineskip.25ex% \ialign{##
\crcr#1\crcr}}}
\def\o@align{\lineskiplimit\z@ \oalign}
\def\ooalign{\lineskiplimit-\maxdimen \oalign}
(End definition for \oalign, \o@align, and \ooalign.)

\sh@ft
The definition of this macro in plain.tex was improved in about 1997; but as a result its usage was changed and its new definition is not appropriate for \LaTeX.

Since the version given here has been in use by \LaTeX{} for many years it does not seem prudent to remove it now. As far as we can tell it has only been used to define \b and \d but this cannot be certain.
\def\sh@ft#1{\dimen@.00#1ex\multiply\dimen@\fontdimen1\font \kern-.0156\dimen@ } % compensate for slant in lowered accents
(End definition for \sh@ft.)
This is the \LaTeX{} version of the second incarnation of the plain macro \texttt{\sf@ft}, which takes a dimension as its argument. It shifts a pseudo-accent horizontally by an amount proportional to the product of its argument and the slant-per-point (fontdimen 1).

\begin{verbatim}
def\ltx@sh@ft #1{\dimen@ #1\kern \strip@pt\fontdimen1\font \dimen@} % kern by #1 times the current slant
\end{verbatim}

(End definition for \texttt{\ltx@sh@ft}.)

\LaTeX{} change: the text commands such as \texttt{\textbackslash d}, \texttt{\textbackslash b}, \texttt{\textbackslash c}, \texttt{\copyright}, \texttt{\TeX} are now defined elsewhere.

\LaTeX{} change: Make \texttt{\textbackslash t} work in a moving argument. Now defined elsewhere.

\hrulefill, \dotfill

\texttt{\hrulefill} \LaTeX{} change: \texttt{\kern\z@} added to end of \texttt{\hrulefill} and \texttt{\dotfill} to make them work in ‘tabular’ and ‘array’ environments. (Change made 24 July 1987). \LaTeX{} change: \texttt{\leavevmode} added at beginning of \texttt{\dotfill} and \texttt{\hrulefill} so that they work as expected in vertical mode.

\begin{verbatim}
def\hrulefill{\leavevmode\leaders\hrule\hfill\kern\z@}
\end{verbatim}

(The box in \texttt{\dotfill} originally contained (in plain.tex):
\texttt{\mkern 1.5mu .\mkern 1.5mu}; the width of .44em differs from this by .04pt which is probably an acceptable difference within leaders.

\begin{verbatim}
def\dotfill{\leavevmode\cleaders \hb@xt@ .44em{\hss.\hss}\hfill\kern\z@}
\end{verbatim}

(End definition for \texttt{\hrulefill} and \texttt{\dotfill}.)

\texttt{\leavevmode} added at beginning of \texttt{\dotfill} and \texttt{\hrulefill} so that they work as expected in vertical mode.

\begin{verbatim}
def\dotfill{\leavevmode\cleaders \hb@xt@ .44em{\hss.\hss}\hfill\kern\z@}
\end{verbatim}

(The box in \texttt{\dotfill} originally contained (in plain.tex):
\texttt{\mkern 1.5mu .\mkern 1.5mu}; the width of .44em differs from this by .04pt which is probably an acceptable difference within leaders.

\LaTeX{} change: \texttt{\leavevmode} added at beginning of \texttt{\dotfill} and \texttt{\hrulefill} so that they work as expected in vertical mode.

\begin{verbatim}
def\dotfill{\leavevmode\cleaders \hb@xt@ .44em{\hss.\hss}\hfill\kern\z@}
\end{verbatim}

(End definition for \texttt{\hrulefill} and \texttt{\dotfill}.)

INITEX sets \texttt{\sfcode} x=1000 for all x, except that \texttt{\sfcode}'X=999 for uppercase letters. The following changes are needed:

\begin{verbatim}
\sfcode\)=0 \sfcode'\'=0 \sfcode\}]=0
\end{verbatim}

The \texttt{\nonfrenchspacing} macro will make further changes to \texttt{\sfcode} values.

Definitions related to output

\texttt{\magnification} doesn’t work in \LaTeX{}.

\begin{verbatim}
def\magnification{\afterassignment\m@g\count@}
def\m@g{\mag\count@
\hsize6.5truein\vsize8.9truein\dimen\footins8truein}
\end{verbatim}

\texttt{\showoverfull} The following commands are used in debugging:

\begin{verbatim}
def\showoverfull{\tracingonline\@ne}
\end{verbatim}

(End definition for \texttt{\showoverfull}.)

\texttt{\showoutput, \loggingoutput}

\begin{verbatim}
gdef\loggingoutput{\tracingoutput\@ne
\showboxbreadth\maxdimen\showboxdepth\maxdimen\errorstopmode}
gdef\showoutput{\loggingoutput\showoverfull}
(\texttt{\@kernel})
\end{verbatim}

(End definition for \texttt{\showoutput} and \texttt{\loggingoutput}.)
\tracingall
\loggingall
\IncludeInRelease{2021/06/01}{\loggingall}{\tracingstacklevels and \tracinglostchars=3}%
\edef\loggingall{%
\tracingstats\tw@\n\tracingpages\@ne\n\tracinglostchars\thr@@\n\tracingparagraphs\@ne\n\tracinggroups\@ne\n\tracingifs\@ne\n\tracingscantokens\@ne\n\tracingnesting\@ne\n\errorcontextlines\maxdimen\n\ifdefined\tracingstacklevels \tracingstacklevels\maxdimen \fi\n\noexpand \loggingoutput\n\tracingmacros\tw@\n\tracingcommands\thr@@\n\tracingrestores\@ne\n\tracingassigns\@ne\n}%
\def\tracingall{\showoverfull\loggingall}\n\EndIncludeInRelease\n\IncludeInRelease{2015/01/01}{\loggingall}{etex tracing}%
\if\tracingscantokens\@undefined\else\gdef\loggingall{%\tracingstats\tw@\n\tracingpages\@ne\n\tracinglostchars\tw@\n\tracingparagraphs\@ne\n\tracinggroups\@ne\n\tracingifs\@ne\n\tracingscantokens\@ne\n\tracingnesting\@ne\n\errorcontextlines\maxdimen\n\loggingoutput\n\tracingmacros\tw@\n\tracingcommands\thr@@\n\tracingrestores\@ne\n\tracingassigns\@ne\n}%\fi
\texttt{(End definition for \texttt{\textbackslash tracingall} and \texttt{\textbackslash loggingall}.)}

\texttt{\textbackslash tracingnone}

\texttt{(End definition for \texttt{\textbackslash tracingall} and \texttt{\textbackslash loggingall}.)}

\texttt{(End definition for \texttt{\textbackslash tracingall} and \texttt{\textbackslash loggingall}.)}
\hideoutput

\showhyphens Defined later.

\LaTeX change: \showhyphens

File b: 1tplain.dtx Date: 2022/01/25 Version v2.3h
Punctuation affects the spacing.
1 Version Identification

First we identify the date and version number of this release of \LaTeX, and set `\everyjob` so that it is printed at the start of every \LaTeX run.

A `\patch@level` of 0 or higher denotes an official public release. A negative value indicates a candidate release that is not distributed.

If we put code updates into the kernel that are supposed to go into the next release we set the `\patch@level` to -1 and the `\fmtversion` / `\latexreleaseversion` to the dated of the next release (guessed, the real value is not so important and will get corrected when we make the release official).

If the `\patch@level` is already at -1 we do nothing here and use the `\fmtversion` date for any new `\IncludeInRelease` line when we add further code.

Finally, if we do make a public release we either just set the `\patch@level` to zero (if our initial guess was good) or we also change the date and then have to additionally change to that date on all the `\IncludeInRelease` statements that used the “guessed” date.

\begin{verbatim}
\def\fmtname{LaTeX2e}
\edef\fmtversion{2ekernel}\latexreleaseversion\{2022-06-01\}\latexrelease\{2022-06-01\}\latexrelease\{2022-06-01\}
\def\patch@level{3}
\end{verbatim}

For more fine grain control there is the possibility to name the current development branch. This is only used when the `\patch@level` is negative (i.e., a pre-release format) and is intended to help us internally when we locally install a format out of some development branch.

\begin{verbatim}
\def\development@branch@name{}
\end{verbatim}

(End definition for `\fmtname` and others.)

Check that the format being made is not too old. The error message complains about ‘more than 5 years’ but in fact the error is not triggered until 65 months.

This code is currently not activated as we don’t know if we already got to the last official 2e version (due to staff shortage or due to a successor (think positive:-)).
\count@ is now the age of this file in months. Take a generous definition of 'year' so this message is not generated too often.

\ifnum\count@>65
\typeout{\^^J
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!\^^J
! You are attempting to make a LaTeX format from a source file\^^J
! That is more than five years old.\^^J
\^^J
! If you enter <return> to scroll past this message then the format\^^J
! will be built, but please consider obtaining newer source files\^^J
! before continuing to build LaTeX.\^^J
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!\^^J
}\errhelp{To avoid this error message, obtain new LaTeX sources.}
\errmessage{LaTeX source files more than 5 years old!}
\fi
\let\reserved@a\relax
\fi
\ifnum0\ifnum\patch@level=0 \ifx\development@branch@name\@empty 1\fi\fi>0
\everyjob\expandafter{\the\everyjob
\typeout{\fmtname\space <\fmtversion>}}
\immediate
\write16{\fmtname\space <\fmtversion>}
\else\ifnum\patch@level>0
\everyjob\expandafter{\the\everyjob
\typeout{\fmtname\space <\fmtversion> patch level \patch@level}}
\immediate
\write16{\fmtname\space <\fmtversion> patch level \patch@level}
\else
\everyjob\expandafter{\the\everyjob
\typeout{\fmtname\space <\fmtversion> pre-release-\number-\patch@level\space
\ifx\development@branch@name\@undefined \else
  \ifx\development@branch@name\@empty \else
    \space (\development@branch@name\space branch)\fi
\fi}
\fi
\fi
}\immediate
\write16{\fmtname\space <\fmtversion> pre-release-\number-\patch@level\space
\ifx\development@branch@name\@undefined \else
  \ifx\development@branch@name\@empty \else
    \space (\development@branch@name\space branch)\fi
\fi}
\fi
}\fi
(/2ekernel)

\IncludeInRelease
\EndIncludeInRelease
@IncludeInRelease
@IncludeInRelease
@gobble@IncludeInRelease
@gobble@IncludeInRelease
@check@IncludeInRelease
File c: l1vers.dtx Date: 2022/02/28 Version v1.1i
40
If a specific date has not been specified in \texttt{latexrelease} use \texttt{'#1'}:

\begin{verbatim}
\def\IncludeInRelease#1\[#2\]{% 
  \ifnum0% 
  \ifx\new@moduledate\@empty\else 1\fi 
  \ifnum \expandafter\@parse@version#1//00\@nil=0 1\fi 
  =11 
  \expandafter\@firstoftwo 
\else 
  \expandafter\@secondoftwo 
\fi 
  \finish@module@release{#1} 
  \kernel@ifnextchar[ 
  \IncludeInRelease{#1} 
  \IncludeInRelease{#1}[#1]} }
\end{verbatim}

If we roll back and the first patch already matches then applying that is actually reapplying what is already in the format, i.e., it is useless and possibly allocating new registers. However, it makes the logic simpler so this is the way it is for now. In theory we could always jump over the first patch because that is only really needed for rolling forward. So maybe one day ...


1.1 Declaring an all-new module

When we have a whole new module, we can’t roll back to a date where such module exists, otherwise hundreds of “command already defined” errors will pop up. But we can’t skip it altogether either, because the module might have changes we still want applied, so a more detailed cherry-picking of code chunks have to be done.

\let\if@skipping@module\iffalse
\def\if@skipping@moduletrue{\let\if@skipping@module\iftrue}
\def\if@skipping@modulefalse{\let\if@skipping@module\iffalse}
\let\new@modulename\@empty
\let\new@moduledate\@empty
\def\NewModuleRelease#1#2#3{%
\if\new@modulename\@empty
\@latex@error{Nested \noexpand\NewModuleRelease forbidden.}\@ehd \fi
\enddef\gobble@includeInRelease#1\EndIncludeInRelease{%
\if@includeinrelease
@includeinreleasetrue
\else
\PackageError{latexrelease}{mis-matched EndIncludeInRelease}{%}
\fi
\if@skipping@module
\expandafter\new@module@skip
\fi
\long\def\gobble@includeInRelease#1\EndIncludeInRelease{%
@includeinreleasetrue
@includeinreleasefalse
\else
\PackageError{latexrelease}{skipped IncludeInRelease for tag \string#1}{}%
\fi
\if@skipping@module
\expandafter\new@module@skip
\fi
\long\def\check@includeInRelease#1\IncludeInRelease{#2#3}{%}
\if\check@includeInRelease#2\endcheck@includeInRelease{else
\PackageError{latexrelease}{skipped IncludeInRelease for tag \string#3}{}%
\fi
\if@skipping@module
\expandafter\new@module@skip
\fi
\iffalse
(End definition for \IncludeInRelease and others.)

When we have a whole new module, we can’t roll back to a date where such module exists, otherwise hundreds of “command already defined” errors will pop up. But we can’t skip it altogether either, because the module might have changes we still want applied, so a more detailed cherry-picking of code chunks have to be done.
\edef\new@moduledate{#1}\
\edef\new@modulename{#2}\
\GenericInfo{}{BEGIN module: \new@modulename \space \new@moduledate}\n\GenericInfo{}{ @spaces @spaces @spaces \space \new@modulename}\n\ifnum\sourceLaTeXdate<\n\expandafter\@parse@version\new@moduledate//00\@nil\relax\n\expandafter\@parse@version\fmtversion//00\@nil<\n\expandafter\@parse@version\new@moduledate//00\@nil\relax\n\GenericInfo{}{Skipping module \new@modulename}\n\expandafter\expandafter\n\expandafter\gobble@finish@module@release\n\else\n\GenericInfo{}{Applying module \new@modulename}\n\@skipping@modulefalse\n\fi\n\long\def\new@module@skip#1\IncludeInRelease{\n\long\def\reserved@a##1\EndModuleRelease{}\n\if\relax\detokenize\expandafter{\reserved@a#1{}{}\EndModuleRelease}\relax\n\else\n\@latex@error{Missing mandatory \string\IncludeInRelease{0000/00/00}}\@ehc\n\expandafter\@secondoftwo\n\fi\n\@gobble\n{\@expandtwoargs\IncludeInRelease\n {0000/00/00}{\new@modulename}{ERROR! Emergency recovery}\n #1}\n\IncludeInRelease\n\def\EndModuleRelease{\n\if\new@modulename\empty\n\@latex@error{Extra \string\EndModuleRelease.}@eha\n\else\n\GenericInfo{}{END module: \new@modulename \space \new@moduledate}\n \let\new@modulename@empty\n \let\new@moduledate@empty\n \@skipping@modulefalse\n \fi}\n(End definition for \if@skipping@module and others.)
\(//2ekernel\ | latexrelease)
1 Overview

Lua\TeX{} adds a number of engine-specific functions to \TeX{}. Several of these require set up that is best done in the kernel or need related support functions. This file provides basic support for Lua\TeX{} at the \E\TeX{}2\TeX{} kernel level plus as a loadable file which can be used with plain \TeX{} and \L\TeX{}.

This file contains code for both \TeX{} (to be stored as part of the format) and Lua (to be loaded at the start of each job). In the Lua code, the kernel uses the namespace luatexbase.

The following \texttt{\count} registers are used here for register allocation:

\begin{itemize}
  \item \texttt{\e@alloc@attribute@count} Attributes (default 258)
  \item \texttt{\e@alloc@ccodetable@count} Category code tables (default 259)
  \item \texttt{\e@alloc@luafunction@count} Lua functions (default 260)
  \item \texttt{\e@alloc@whatsit@count} User whatsits (default 261)
  \item \texttt{\e@alloc@bytecode@count} Lua bytecodes (default 262)
  \item \texttt{\e@alloc@luachunk@count} Lua chunks (default 263)
\end{itemize}

\texttt{\count} 256 is used for \texttt{\newmarks} allocation and \texttt{\count} 257 is used for \texttt{\newXeTeXintercharclass} with Xe\TeX{}, with code defined in \texttt{ltfinal.dtx}. With any \E\TeX{}2\TeX{} kernel from 2015 onward these registers are part of the block in the extended area reserved by the kernel (prior to 2015 the \E\TeX{}2\TeX{} kernel did not provide any functionality for the extended allocation area).

2 Core \TeX{} functionality

The commands defined here are defined for possible inclusion in a future \L\TeX{} format, however also extracted to the file \texttt{ltlatex.tex} which may be used with older \L\TeX{} formats, and with plain \TeX{}.

\texttt{\newattribute{\texttt{\textbackslash attribute}}} defines a named \texttt{\textbackslash attribute}, indexed from 1 (\textit{i.e.} \texttt{\textbackslash attribute0} is never defined). Attributes initially have the marker value \texttt{-7FFFFFFF} ("unset") set by the engine.

\texttt{\newcatcodetable{\texttt{\textbackslash catcodetable}}} defines a named \texttt{\textbackslash catcodetable}, indexed from 1 (\texttt{\textbackslash catcodetable0} is never assigned). A new catcode table will be populated with exactly those values assigned by Ini\TeX{} (as described in the Lua\TeX{} manual).

\texttt{\newluafunction{\texttt{\textbackslash luafunction}}} defines a named \texttt{\textbackslash luafunction}, indexed from 1. (Lua indexes tables from 1 so \texttt{\textbackslash luafunction0} is not available).

\texttt{\newluacmd{\texttt{\textbackslash luacmd}}} like \texttt{\textbackslash luafunction}, but defines the command using \texttt{\textbackslash luadef} instead of just assigning an integer.
Like \newluacommand, but the defined command is not expandable.
\newcommand\newwhatsit{⟨whatsit⟩}
Defines a custom \whatsit, indexed from 1.
\newcommand\newluabytecode{⟨bytecode⟩}
Allocates a number for Lua bytecode register, indexed from 1.
\newcommand\newluachunkname{⟨chunkname⟩}
Allocates a number for Lua chunk register, indexed from 1. Also enters the name of the register (without backslash) into the lua.name table to be used in stack traces.
\setattribute{⟨attribute⟩}{⟨value⟩}
Set and unset attributes in a manner analogous to \setlength. Note that attributes take a marker value when unset so this operation is distinct from setting the value to zero.

3 Plain \TeX\ interface

The \ltluatex interface may be used with plain \TeX using \input{ltluatex}. This inputs \ltluatex.tex which inputs etex.src (or etex.sty if used with \ETEX) if it is not already input, and then defines some internal commands to allow the \ltluatex interface to be defined.

The luatexbase package interface may also be used in plain \TeX, as before, by inputting the package \input\luatexbase.sty. The new version of \luatexbase is based on this \ltluatex code but implements a compatibility layer providing the interface of the original package.

4 Lua functionality

4.1 Allocators in Lua

\newcommand\new_attribute\\ltexbase.new_attribute{⟨attribute⟩}
Returns an allocation number for the ⟨attribute⟩, indexed from 1. The attribute will be initialised with the marker value −7FFFFFFF (‘unset’). The attribute allocation sequence is shared with the \TeX code but this function does not define a token using \attributedef. The attribute name is recorded in the attributes table. A metatable is provided so that the table syntax can be used consistently for attributes declared in \TeX or Lua.

\newcommand\new_whatsit\\ltexbase.new_whatsit{⟨whatsit⟩}
Returns an allocation number for the custom ⟨whatsit⟩, indexed from 1.

\newcommand\new_bytecode\\ltexbase.new.Bytecode{⟨bytecode⟩}
Returns an allocation number for a bytecode register, indexed from 1. The optional ⟨name⟩ argument is just used for logging.

\newcommand\new_chunkname\\ltexbase.new_chunkname{⟨chunkname⟩}
Returns an allocation number for a Lua chunk name for use with \directlua and \latelua, indexed from 1. The number is returned and also ⟨name⟩ argument is added to the lua.name array at that index.

\newcommand\new_luafunction\\ltexbase.new_luafunction{⟨functionname⟩}
Returns an allocation number for a lua function for use with \luafunction, \latexluafunction, and \luadef, indexed from 1. The optional \langle functionname \rangle argument is just used for logging.

These functions all require access to a named TeX count register to manage their allocations. The standard names are those defined above for access from TeX, e.g. \c@alloc@attribute@count, but these can be adjusted by defining the variable \langle type \rangle_count_name before loading \texttt{ltluatex.lua}, for example

```latex
local attribute_count_name = "attributetracker"
require("ltluatex")
```

would use a TeX \count (\countdef’d token) called attributetracker in place of \c@alloc@attribute@count.

4.2 Lua access to TeX register numbers

\texttt{\luatexbase.registernumber(\langle name \rangle)}

Sometimes (notably in the case of Lua attributes) it is necessary to access a register by number that has been allocated by TeX. This package provides a function to look up the relevant number using LuaTeX’s internal tables. After for example

\texttt{\newattribute\myattrib, \myattrib would be defined by (say) \myattrib=\attribute15.}

\texttt{\luatexbase.registernumber("myattrib") would then return the register number, 15 in this case. If the string passed as argument does not correspond to a token defined by \attributedef, \countdef or similar commands, the Lua value \texttt{false} is returned.}

As an example, consider the input:

```latex
\newcommand\test[1]{%
\typeout{#1: \expandafter\meaning\csname#1\endcsname^^J
\space\space\space\space
\directlua{tex.write(luatexbase.registernumber(#1) or "bad input")}% }
}
\test{undefinedrubbish}
\test{space}
\test{hbox}
\test{@MM}
\test{@tempdima}
\test{@tempdimb}
\test{strutbox}
\test{sixt@@n}
\attributedef\myattr=12
\myattr=200
\test{myattr}
```

File d: ltluatex.dtx
If the demonstration code is processed with LuaLaTeX then the following would be produced in the log and terminal output.

```
undefinedrubbish: \relax
  bad input
space: macro:->
  bad input
hbox: \hbox
  bad input
@MM: \mathchar"4E20
    20000
@tempdima: \dimen14
    14
@tempdimb: \dimen15
    15
strutbox: \char"B
    11
sixt@@n: \char"10
    16
myattr: \attribute12
    12
```

Notice how undefined commands, or commands unrelated to registers do not produce an error, just return `false` and so print `bad input` here. Note also that commands defined by `\newbox` work and return the number of the box register even though the actual command holding this number is a `\chardef` defined token (there is no `\boxdef`).

### 4.3 Module utilities

**provides_module** luatexbase.provides_module((⟨info⟩))

This function is used by modules to identify themselves; the `info` should be a table containing information about the module. The required field `name` must contain the name of the module. It is recommended to provide a field `date` in the usual LaTeX format `yyyy/mm/dd`. Optional fields `version` (a string) and `description` may be used if present. This information will be recorded in the log. Other fields are ignored.

**module_info** luatexbase.module_info((⟨module⟩), (⟨text⟩))

**module_warning** luatexbase.module_warning((⟨module⟩), (⟨text⟩))

**module_error** luatexbase.module_error((⟨module⟩), (⟨text⟩))

These functions are similar to LaTeX’s `\PackageError`, `\PackageWarning` and `\PackageInfo` in the way they format the output. No automatic line breaking is done, you may still use `\n` as usual for that, and the name of the package will be prepended to each output line.

Note that `luatexbase.module_error` raises an actual Lua error with `error()`, which currently means a call stack will be dumped. While this may not look pretty, at least it provides useful information for tracking the error down.

### 4.4 Callback management

**add_to_callback** luatexbase.add_to_callback((⟨callback⟩), (⟨function⟩), (⟨description⟩)) Registers the `⟨function⟩` into the `⟨callback⟩` with a textual `⟨description⟩` of the function. Functions are inserted into the callback in the order loaded.

**remove_from_callback** luatexbase.remove_from_callback((⟨callback⟩), (⟨description⟩)) Removes the callback
function with \langle description \rangle from the \langle callback \rangle. The removed function and its description are returned as the results of this function.

\texttt{in\_callback} \texttt{luatexbase\_in\_callback(\langle callback \rangle, \langle description \rangle)} Checks if the \langle description \rangle matches one of the functions added to the list for the \langle callback \rangle, returning a boolean value.

\texttt{disable\_callback} \texttt{luatexbase\_disable\_callback(\langle callback \rangle)} Sets the \langle callback \rangle to false as described in the \LaTeX{}\TeX{} manual for the underlying \texttt{callback.register} built-in. Callbacks will only be set to false (and thus be skipped entirely) if there are no functions registered using the callback.

\texttt{callback\_descriptions} A list of the descriptions of functions registered to the specified callback is returned. \{} is returned if there are no functions registered.

\texttt{create\_callback} \texttt{luatexbase\_create\_callback(\langle name \rangle, \texttt{metatype}, \langle default \rangle)} Defines a user defined callback. The last argument is a default function or \texttt{false}.

\texttt{call\_callback} \texttt{luatexbase\_call\_callback(\langle name \rangle, \ldots)} Calls a user defined callback with the supplied arguments.

5 Implementation

\begin{verbatim}
\include{ltdefns}
\end{verbatim}

5.1 Minimum Lua\TeX{} version

Lua\TeX{} has changed a lot over time. In the kernel support for ancient versions is not provided: trying to build a format with a very old binary therefore gives some information in the log and loading stops. The cut-off selected here relates to the tree-searching behaviour of \texttt{require()}: from version 0.60, Lua\TeX{} will correctly find \LaTeX{} files in the \texttt{texmf} tree without ‘help’.

5.2 Older \LaTeX/Plain \TeX{} setup

Older \LaTeX{} formats don’t have the primitives with ‘native’ names: sort that out. If they already exist this will still be safe.

In pre-2014 \LaTeX, or plain \TeX, load \texttt{etex.\{sty,src\}}.

\begin{verbatim}
\include{ltdefns}
\end{verbatim}
18 \input{etex.src}\
19 \fi
20 \catcode`\@=11 %
21 \outer\expandafter\def\csname newfam\endcsname
22 {\alloc@8\fam\chardef\et@xmaxfam}
23 \else
24 \RequirePackage{etex}
25 \expandafter\def\csname newfam\endcsname
26 {\alloc@8\fam\chardef\et@xmaxfam}
27 \expandafter\let\expandafter\new@mathgroup\csname newfam\endcsname
28 \fi

5.2.1 Fixes to etex.src/etex.sty

These could and probably should be made directly in an update to etex.src which already has some LuaTeX-specific code, but does not define the correct range for LuaTeX. 2015-07-13 higher range in luatex.

\edef \et@xmaxregs {\ifx\directlua\@undefined 32768\else 65536\fi}
\edef \et@xmaxfam {\ifx\Umathcode\@undefined\sixt@@n\else\@cclvi\fi}
\count 270=\et@xmaxregs % locally allocates \count registers
\count 271=\et@xmaxregs % ditto for \dimen registers
\count 272=\et@xmaxregs % ditto for \skip registers
\count 273=\et@xmaxregs % ditto for \muskip registers
\count 274=\et@xmaxregs % ditto for \box registers
\count 275=\et@xmaxregs % ditto for \toks registers
\count 276=\et@xmaxregs % ditto for \marks classes

and 256 or 16 fam. (Done above due to plain/LaTeX differences in l4luatex.)
\% \outer\def\newfam{\alloc@8\fam\chardef\et@xmaxfam}

End of proposed changes to etex.src

5.2.2 luatex specific settings

Switch to global cf luatex.sty to leave room for inserts not really needed for luatex but possibly most compatible with existing use.

\edef \et@xmarkregs {\ifx\directlua\@undefined 32768\else 65536\fi}
\edef \et@xmarkfam {\ifx\Umathcode\@undefined\sixt@@n\else\@cclvi\fi}
\count 270=\et@xmarkregs % locally allocates \count registers
\count 271=\et@xmarkregs % ditto for \dimen registers
\count 272=\et@xmarkregs % ditto for \skip registers
\count 273=\et@xmarkregs % ditto for \muskip registers
\count 274=\et@xmarkregs % ditto for \box registers
\count 275=\et@xmarkregs % ditto for \toks registers
\count 276=\et@xmarkregs % ditto for \marks classes

and 256 or 16 fam. (Done above due to plain/LaTeX differences in l4luatex.)
\% \outer\def\newfam{\alloc@8\fam\chardef\et@xmaxfam}

End of proposed changes to etex.src

Define \e@alloc as in latex (the existing macros in etex.src hard to extend to further register types as they assume specific 26x and 27x count range. For compatibility the existing register allocation is not changed.
\chardef\e@alloc@top=65535
\let\e@alloc@chardef\chardef

File d: l4luatex.dtx
Fix up allocations not to clash with `etex.src`.

\expandafter\csname newcount\endcsname\e@alloc@attribute@count
\expandafter\csname newcount\endcsname\e@alloc@codelatetable@count
\expandafter\csname newcount\endcsname\e@alloc@luafunction@count
\expandafter\csname newcount\endcsname\e@alloc@whatsit@count
\expandafter\csname newcount\endcsname\e@alloc@bytecode@count
\expandafter\csname newcount\endcsname\e@alloc@luachunk@count

\newattribute
As is generally the case for the Lua\LaTeX{} registers we start here from 1. Notably, some
code assumes that \texttt{\attribute0} is never used so this is important in this case.

\def\newattribute#1{%
  \ifx\e@alloc@attribute@count\@undefined
  \countdef\e@alloc@attribute@count=258
  \e@alloc@attribute@count=\z@
  \fi
  \def\newattribute#1{%
  \e@alloc\attribute\attributedef
  \e@alloc@attribute@count=\m@ne\e@alloc@top#1%
  }

\setattribute\unsetattribute
Handy utilities.

\def\setattribute#1#2{#1=#2\relax}
\def\unsetattribute#1{#1=-"7FFFFFFF\relax}

(End definition for \texttt{\newattribute}.)

\newattribute
\setattribute\unsetattribute
(End definition for \texttt{\setattribute} and \texttt{\unsetattribute}.)
5.4 Category code tables

Category code tables are allocated with a limit half of that used by LuaTeX for everything else. At the end of allocation there needs to be an initialization step. Table 0 is already taken (it’s the global one for current use) so the allocation starts at 1.

\newcatcodetable

\catcodetable@initex
\catcodetable@string
\catcodetable@latex
\catcodetable@atletter

\catcodetable@initex
\catcodetable@string
\catcodetable@latex
\catcodetable@atletter

(End definition for \newcatcodetable.)

Save a small set of standard tables. The Unicode data is read here in using a parser simplified from that in load-unicode-data: only the nature of letters needs to be detected.

\newcatcodetable\catcodetable@initex
\newcatcodetable\catcodetable@string
\begin{group}
\def\setrangecatcode#1#2#3{\%\ifnum#1>#2 \%\else\expandafter\@firstofone\fi{\catcode#1=#3 \%\expandafter\setrangecatcode\expandafter\number\numexpr#1+1\relax\{#2\{#3\}}}\%\}\@firstofone{\catcodetable\catcodetable@initex
\catcode0=12 \%\catcode13=12 \%\catcode37=12 \%\setrangecatcode{65}{90}{12}\%\setrangecatcode{97}{122}{12}\%\catcode92=12 \%\catcode127=12 \%\savecatcodetable\catcodetable@string\endgroup\}%\\begin{group}
\def\parseunicodedataI#1;#2;#3;#4\relax{\%\parseunicodedataII#1;#3;#2 First>\relax\}%\\def\parseunicodedataII#1;#3;#2 First>#4\relax{%\%\relax#4\relax

File d: ltluatex.dtx 51
5.5 Named Lua functions

\newluafunction

Much the same story for allocating Lua\TeX{} functions except here they are just numbers so they are allocated in the same way as boxes. Lua indexes from 1 so once again slot 0 is skipped.

\ifx\e@alloc@luafunction@count\@undefined
5.6 Custom whatsits
\newwhatsit These are only settable from Lua but for consistency are definable here.
\ifx\e@alloc@whatsit@count\@undefined
\countdef\e@alloc@whatsit@count=261
\e@alloc@whatsit@count=\z@
\fi
\def\newwhatsit#1{\e@alloc\whatsit\e@alloc@chardef
\e@alloc@whatsit@count\m@ne\e@alloc@top#1}%
(End definition for \newwhatsit.)

5.7 Lua bytecode registers
\newluabytecode These are only settable from Lua but for consistency are definable here.
\ifx\e@alloc@bytecode@count\@undefined
\countdef\e@alloc@bytecode@count=262
\e@alloc@bytecode@count=\z@
\fi
\def\newluabytecode#1{\e@alloc\luabytecode\e@alloc@chardef
\e@alloc@bytecode@count\m@ne\e@alloc@top#1}%
(End definition for \newluabytecode.)
5.8 Lua chunk registers

\newluachunkname

As for bytecode registers, but in addition we need to add a string to the \texttt{lua.name} table to use in stack tracing. We use the name of the command passed to the allocator, with no backslash.

\begin{verbatim}
\ifx\e@alloc@luachunk@count\@undefined
\countdef\e@alloc@luachunk@count=263
\e@alloc@luachunk@count=\z@
\fi
\def\newluachunkname#1{%
\e@alloc\luachunk\e@alloc@chardef
\e@alloc@luachunk@count\m@ne\e@alloc@top#1%
{"\escapechar\m@ne
\directlua{lua.name[\the\allocationnumber]="\string#1"}}%
}
\end{verbatim}

(End definition for \texttt{\newluachunkname}.)

5.9 Lua loader

Lua code loaded in the format often has to be loaded again at the beginning of every job, so we define a helper which allows us to avoid duplicated code:

\begin{verbatim}
\def\now@and@everyjob#1{%
\everyjob\expandafter{\the\everyjob
#1%}
#1%}
\end{verbatim}

Load the Lua code at the start of every job. For the conversion of \TeX into numbers at the Lua side we need some known registers: for convenience we use a set of systematic names, which means using a group around the Lua loader.

\begin{verbatim}
(2ekernel) \now@and@everyjob{%
\begingroup
\attributedef\attributezero=0 %
\chardef \charzero =0 %
\countdef \CountZero =0 %
\dimendef \dimenzero =0 %
\mathchardef \mathcharzero =0 %
\muskipdef \muskipzero =0 %
\skipdef \skipzero =0 %
\toksdef \tokszero =0 %
\directlua{require("ltluatex")}
\endgroup
(2ekernel);}
\EndIncludeInRelease
\IncludeInRelease{0000/00/00}{\newluafunction}{LuaTeX}%
\let\e@alloc@attribute@count\@undefined
\let\newattribute\@undefined
\let\setattribute\@undefined
\end{verbatim}

File d: ltluatex.dtx
In \everyjob, if luaotfload is available, load it and switch to TU.

\IncludeInRelease{2017/01/01}{\fontencoding}{TU in everyjob}
\fontencoding{TU}\let\encodingdefault\f@encoding
\ifx\directlua\@undefined\else
  \Everyjob\expandafter{%}
  \directlua{if xpcall(function ()
          require('luaotfload-main')
         end,texio.write_nl) then %
    local _void = luaotfload.main ()% 
  else %
    texio.write_nl('Error in luaotfload: reverting to OT1')%
    tex.print('\string\def\string\encodingdefault{OT1}')%
  end %
}%
\let\f@encoding\encodingdefault
\expandafter\let\csname ver@luaotfload.sty\endcsname\fmtversion
\EndIncludeInRelease
\IncludeInRelease{0000/00/00}{\fontencoding}{TU in everyjob}
\fontencoding{OT1}\let\encodingdefault\f@encoding
\EndIncludeInRelease

5.10 Lua module preliminaries

(*lua)
Some set up for the Lua module which is needed for all of the Lua functionality added here.

```
luatexbase
```

Set up the table for the returned functions. This is used to expose all of the public functions.

```
luatexbase = luatexbase or { }
local luatexbase = luatexbase
```

(End definition for luatexbase.)

Some Lua best practice: use local versions of functions where possible.

```
local string_gsub = string.gsub
local tex_count = tex.count
local tex_setattribute = tex.setattribute
local tex_setcount = tex.setcount
local texio_write_nl = texio.write_nl
local flush_list = node.flush_list
```

5.11 Lua module utilities

5.11.1 Module tracking

```
modules
```

To allow tracking of module usage, a structure is provided to store information and to return it.

```
local modules = modules or { }
```

(End definition for modules.)

```
provides_module
```

Local function to write to the log.

```
local function luatexbase_log(text)
texio_write_nl("log", text)
end
```

Modelled on \ProvidesPackage, we store much the same information but with a little more structure.

```
local function provides_module(info)
if not (info and info.name) then
    luatexbase_error("Missing module name for provides_module")
end
local function spaced(text)
    return text and (" ".text) or ""
end
luatexbase_log(  "Lua module: " .. info.name  .. spaced(info.date)  .. spaced(info.version)  .. spaced(info.description)  )  modules[info.name] = info
end
luatexbase.provides_module = provides_module
```

(End definition for provides_module.)
5.11.2 Module messages

There are various warnings and errors that need to be given. For warnings we can get
exactly the same formatting as from \TeX. For errors we have to make some changes.
Here we give the text of the error in the \TeX format then force an error from Lua
to halt the run. Splitting the message text is done using \\
which takes the place of \MessageBreak.

First an auxiliary for the formatting: this measures up the message leader so we
always get the correct indent.

```lua
local function msg_format(mod, msg_type, text)
    local leader = ""
    local cont
    local first_head
    if mod == "LaTeX" then
        cont = string.gsub(leader, ".", " ")
        first_head = leader .. "LaTeX: "
    else
        first_head = leader .. "Module " .. msg_type
        cont = "(" .. mod .. ")"
        .. string.gsub(first_head, ".", " ")
        first_head = leader .. "Module " .. mod .. ") " .. msg_type .. ":"
    end
    if msg_type == "Error" then
        first_head = "\n" .. first_head
    end
    if string.sub(text, -1) ~= "\n" then
        text = text .. " "
    end
    return first_head .. " \\
    .. string.gsub(
        .. "on input line "
        .. tex.inputlineno, "\n", "\n" .. cont .. " \\
    )
    .. "\n"
end
```

```lua
module_info = Write messages.
module_warning = local function module_info(mod, text)
    texio.write_nl("log", msg_format(mod, "Info", text))
end
luatexbase.module_info = module_info
local function module_warning(mod, text)
    texio.write_nl("term and log",msg_format(mod, "Warning", text))
end
luatexbase.module_warning = module_warning
local function module_error(mod, text)
    error(msg_format(mod, "Error", text))
end
luatexbase.module_error = module_error
(End definition for module_info, module_warning, and module_error.)
```

Dedicated versions for the rest of the code here.
5.12 Accessing register numbers from Lua

Collect up the data from the \TeX{} level into a Lua table: from version 0.80, \LaTeX{} makes that easy.

```lua
local luaregisterbasetable = {}
local registermap = {
    attributezero = "assign_attr",
    charzero = "char_given",
    CountZero = "assign_int",
    dimenzero = "assign_dimen",
    mathcharzero = "math_given",
    muskipzero = "assign_mu_skip",
    skipzero = "assign_skip",
    tokszero = "assign_toks",
}
local createtoken
if tex.latexversion > 81 then
    createtoken = token.create
elseif tex.latexversion > 79 then
    createtoken = newtoken.create
end
local hashtokens = tex.hashtokens()
local luatexversion = tex.latexversion
for i,j in pairs (registermap) do
    if luatexversion < 80 then
        luaregisterbasetable[hashtokens[i][1]] = hashtokens[i][2]
    else
        luaregisterbasetable[j] = createtoken(i).mode
    end
end

registernumber Working out the correct return value can be done in two ways. For older \LaTeX{} releases it has to be extracted from the hashtokens. On the other hand, newer \LaTeX{}'s have newtoken, and whilst .mode isn't currently documented, Hans Hagen pointed to this approach so we should be OK.

local registernumber
if luatexversion < 80 then
    function registernumber(name)
        local nt = hashtokens[name]
        if(nt and luaregisterbasetable[nt[1]]) then
            return nt[2] - luaregisterbasetable[nt[1]]
        else
            return false
        end
    end
end
```
else
   function registernumber(name)
      local nt = createtoken(name)
      if(luaregisterbasetable[nt.cmdname]) then
         return nt.mode - luaregisterbasetable[nt.cmdname]
      else
         return false
      end
   end
end
luatexbaseregisternumber = registernumber
(End definition for registernumber.)

5.13 Attribute allocation
new_attribute As attributes are used for Lua manipulations its useful to be able to assign from this end.
   local attributes=setmetatable(
      {},
      {
         __index = function(t,key)
            return registernumber(key) or nil
         end}
   )
luatexbase.attributes = attributes
local attribute_count_name =
   attribute_count_name or "e@alloc@attribute@count"
local function new_attribute(name)
   tex_setcount("global", attribute_count_name,
      tex_count[attribute_count_name] + 1)
   if tex_count[attribute_count_name] > 65534 then
      luatexbase_error("No room for a new \attribute")
   end
   attributes[name]= tex_count[attribute_count_name]
   luatexbase_log("Lua-only attribute " .. name .. " = " ..
      tex_count[attribute_count_name])
   return tex_count[attribute_count_name]
end
luatexbase.new_attribute = new_attribute
(End definition for new_attribute.)

5.14 Custom whatsit allocation
new_whatsit Much the same as for attribute allocation in Lua.
   local whatsit_count_name = whatsit_count_name or "e@alloc@whatsit@count"
   local function new_whatsit(name)
      tex_setcount("global", whatsit_count_name,
         tex_count[whatisit_count_name] + 1)
      if tex_count[whatisit_count_name] > 65534 then
         luatexbase_error("No room for a new custom whatsit")
      end
   end
   luatexbase_log("Custom whatsit " .. (name or ")")}
5.15 Bytecode register allocation

```lua
local bytecode_count_name = bytecode_count_name or "e@alloc@bytecode@count"
local function new_bytecode(name)
    tex_setcount("global", bytecode_count_name, tex_count[bytecode_count_name] + 1)
    if tex_count[bytecode_count_name] > 65534 then
        luatexbase_error("No room for a new bytecode register")
    end
    luatexbase_log("Lua bytecode ". .. (name or ")" .. " = " .. tex_count[bytecode_count_name])
    return tex_count[bytecode_count_name]
end
luatexbase.new_bytecode = new_bytecode
```

(End definition for new_bytecode.)

5.16 Lua chunk name allocation

```lua
local chunkname_count_name = chunkname_count_name or "e@alloc@luachunk@count"
local function new_chunkname(name)
    local chunkname_count = tex_count[chunkname_count_name]
    chunkname_count = chunkname_count + 1
    if chunkname_count > 65534 then
        luatexbase_error("No room for a new chunkname")
    end
    lua.name[chunkname_count]=name
    luatexbase_log("Lua chunkname ". .. (name or ")" .. " = " .. chunkname_count .. "\n")
    return chunkname_count
end
luatexbase.new_chunkname = new_chunkname
```

(End definition for new_chunkname.)
5.17 Lua function allocation

**new_luafunction**

Much the same as for attribute allocation in Lua. The optional \( \text{name} \) argument is used in the log if given.

```latex
local luafunction_count_name = luafunction_count_name or "e@alloc@luafunction@count"
local function new_luafunction(name)
    tex_setcount("global", luafunction_count_name, tex_count[luafunction_count_name] + 1)
    if tex_count[luafunction_count_name] > 65534 then
        luatexbase_error("No room for a new luafunction register")
    end
    luatexbase_log("Lua function " .. (name or "") .. " = " .. tex_count[luafunction_count_name])
    return tex_count[luafunction_count_name]
end
luatexbase.new_luafunction = new_luafunction
```

(End definition for new_luafunction.)

5.18 Lua callback management

The native mechanism for callbacks in LuaTeX allows only one per function. That is extremely restrictive and so a mechanism is needed to add and remove callbacks from the appropriate hooks.

5.18.1 Housekeeping

The main table: keys are callback names, and values are the associated lists of functions. More precisely, the entries in the list are tables holding the actual function as \textit{func} and the identifying description as \textit{description}. Only callbacks with a non-empty list of functions have an entry in this list.

```latex
local callbacklist = callbacklist or { }

Numerical codes for callback types, and name-to-value association (the table keys are strings, the values are numbers).

```latex
local list, data, exclusive, simple, reverselist = 1, 2, 3, 4, 5
local types = {
    list = list,
data = data,
exclusive = exclusive,
simple = simple,
reverselist = reverselist,
}
```

Now, list all predefined callbacks with their current type, based on the LuaTeX manual version 1.01. A full list of the currently-available callbacks can be obtained using

```latex\directlua{
    for i, _ in pairs(callback.list()) do
        texio.write_nl("- " .. i)
    end
}\bye
```

File d: ltluatex.dtx
in plain LuaTeX. (Some undocumented callbacks are omitted as they are to be removed.)

```lua
local callbacktypes = callbacktypes or {

Section 8.2: file discovery callbacks.

- find_read_file = exclusive,
- find_write_file = exclusive,
- find_font_file = data,
- find_output_file = data,
- find_format_file = data,
- find_vf_file = data,
- find_map_file = data,
- find_enc_file = data,
- find_pk_file = data,
- find_data_file = data,
- find_opentype_file = data,
- find_truetype_file = data,
- find_type1_file = data,
- find_image_file = data,
- open_read_file = exclusive,
- read_font_file = exclusive,
- read_vf_file = exclusive,
- read_map_file = exclusive,
- read_enc_file = exclusive,
- read_pk_file = exclusive,
- read_data_file = exclusive,
- read_truetype_file = exclusive,
- read_opentype_file = exclusive,
- find_cidmap_file = data,
- read_cidmap_file = exclusive,

Section 8.3: data processing callbacks.

- process_input_buffer = data,
- process_output_buffer = data,
- process_jobname = data,

Section 8.4: node list processing callbacks.

- contribute_filter = simple,
- buildpage_filter = simple,
- build_page_insert = exclusive,
- pre_linebreak_filter = list,
- linebreak_filter = exclusive,
- append_to_vlist_filter = exclusive,
- post_linebreak_filter = reverselist,
- hpack_filter = list,
- vpack_filter = list,
- hpack_quality = exclusive,
- vpack_quality = exclusive,
- pre_output_filter = list,
- process_rule = exclusive,
- hyphenate = simple,
```

File d: ltluatex.dtx
ligaturing = simple,
kerning = simple,
insert_local_par = simple,
pre_mlist_to_hlist_filter = list,
mlist_to_hlist = exclusive,
post_mlist_to_hlist_filter = reverse_list,
new_graf = exclusive,

Section 8.5: information reporting callbacks.

pre_dump = simple,
start_run = simple,
stop_run = simple,
start_page_number = simple,
stop_page_number = simple,
show_error_hook = simple,
show_warning_message = simple,
show_error_message = simple,
show_lua_error_hook = simple,
start_file = simple,
stop_file = simple,
call_edit = simple,
finish_synctex = simple,
wrapup_run = simple,

Section 8.6: PDF-related callbacks.

finish_pdf_file = data,
finish_pdf_page = data,
page_objnum_provider = data,
page_order_index = data,
process_pdf_image_content = data,

Section 8.7: font-related callbacks.

define_font = exclusive,
glyph_info = exclusive,
glyph_not_found = exclusive,
glyph_stream_provider = exclusive,
make_extensible = exclusive,
font_descriptor_objnum_provider = exclusive,
input_level_string = exclusive,
provide_charproc_data = exclusive,

}
luatexbase.callbacktypes=callbacktypes

callback.register  Save the original function for registering callbacks and prevent the original being used.
The original is saved in a place that remains available so other more sophisticated code
can override the approach taken by the kernel if desired.

local callback_register = callback_register or callback.register
function callback.register()
  luatexbase_error("Attempt to use callback.register() directly\n")
end

(End definition for callback.register.)
5.18.2 Handlers

The handler function is registered into the callback when the first function is added to this callback’s list. Then, when the callback is called, the handler takes care of running all functions in the list. When the last function is removed from the callback’s list, the handler is unregistered.

More precisely, the functions below are used to generate a specialized function (closure) for a given callback, which is the actual handler.

The way the functions are combined together depends on the type of the callback. There are currently 4 types of callback, depending on the calling convention of the functions the callback can hold:

**simple** is for functions that don’t return anything: they are called in order, all with the same argument;

**data** is for functions receiving a piece of data of any type except node list head (and possibly other arguments) and returning it (possibly modified): the functions are called in order, and each is passed the return value of the previous (and the other arguments untouched, if any). The return value is that of the last function;

**list** is a specialized variant of **data** for functions filtering node lists. Such functions may return either the head of a modified node list, or the boolean values `true` or `false`. The functions are chained the same way as for **data** except that for the following. If one function returns `false`, then `false` is immediately returned and the following functions are not called. If one function returns `true`, then the same head is passed to the next function. If all functions return `true`, then `true` is returned, otherwise the return value of the last function not returning `true` is used.

**reverselist** is a specialized variant of **list** which executes functions in inverse order.

**exclusive** is for functions with more complex signatures; functions in this type of callback are not combined: An error is raised if a second callback is registered.

```lua
local function data_handler(name)
  return function(data, ...)
    for _,i in ipairs(callbacklist[name]) do
      data = i.func(data,...)
    end
    return data
  end
end

local function data_handler_default(value)
  return value
end

local function exclusive_handler(name)
  return function(...)
    return callbacklist[name][1].func(...)
  end
end
```

Default for user-defined **data** callbacks without explicit default.

Handler for **exclusive** callbacks. We can assume `callbacklist[name]` is not empty: otherwise, the function wouldn’t be registered in the callback any more.

```lua
local function exclusive_handler(name)
  return function(...) end
  return callbacklist[name][1].func(...) end
```

File d: ltluatex.dtx
Handler for list callbacks.

```lua
local function list_handler(name)
    return function(head, ...)
        local ret
        for _,i in ipairs(callbacklist[name]) do
            ret = i.func(head, ...)  
            if ret == false then
                return false
            end  
            if ret ~= true then
                head = ret
            end
        end
        return head
    end
end
```

Default for user-defined list and reverselist callbacks without explicit default.

```lua
local function list_handler_default(head)
    return head
end
```

Handler for reverselist callbacks.

```lua
local function reverselist_handler(name)
    return function(head, ...)
        local callbacks = callbacklist[name]
        for i = #callbacks, 1, -1 do
            local cb = callbacks[i]
            ret = cb.func(head, ...)  
            if ret == false then
                return false
            end  
            if ret ~= true then
                head = ret
            end
        end
        return head
    end
end
```

Handler for simple callbacks.

```lua
local function simple_handler(name)
    return function(...)  
        for _,i in ipairs(callbacklist[name]) do
            i.func(...)  
        end
    end
end
```

File d: ltluatex.dtx
Default for user-defined simple callbacks without explicit default.

```lua
local function simple_handler_default()
end
```

Keep a handlers table for indexed access and a table with the corresponding default functions.

```lua
local handlers = {
    [data] = data_handler,
    [exclusive] = exclusive_handler,
    [list] = list_handler,
    [reverselist] = reverselist_handler,
    [simple] = simple_handler,
}
local defaults = {
    [data] = data_handler_default,
    [exclusive] = nil,
    [list] = list_handler_default,
    [reverselist] = list_handler_default,
    [simple] = simple_handler_default,
}
```

### 5.18.3 Public functions for callback management

Defining user callbacks perhaps should be in package code, but impacts on `add_to_callback`. If a default function is not required, it may be declared as `false`. First we need a list of user callbacks.

```lua
local user_callbacks_defaults = {
    pre_mlist_to_hlist_filter = list_handler_default,
    mlist_to_hlist = node.mlist_to_hlist,
    post_mlist_to_hlist_filter = list_handler_default,
}
```

```lua
local function create_callback(name, ctype, default)
local ctype_id = types[ctype]
if not name or name == "" or not ctype_id then
    luatexbase_error("Unable to create callback:
" ..
   "valid callback name and type required")
end
if callbacktypes[name] then
    luatexbase_error("Unable to create callback ‘" .. name ..
   "’:\ncallback is already defined")
end
default = default or defaults[ctype_id]
if not default then
    luatexbase_error("Unable to create callback ‘" .. name ..
   "’:\ndefault is required for ‘" .. ctype ..
   "’ callbacks")
elseif type (default) ~= "function" then
```

File d: ltluatex.dtx
luatexbase_error("Unable to create callback '\" .. name .. ":\ndefault is not a function")
end
user_callbacks_defaults[name] = default
callbacktypes[name] = ctype_id
end
luatexbase.create_callback = create_callback
(End definition for create_callback.)

call_callback Call a user defined callback. First check arguments.
local function call_callback(name,...)
  if not name or name == "" then
    luatexbase_error("Unable to create callback:\n.. "valid callback name required")
  end
  if user_callbacks_defaults[name] == nil then
    luatexbase_error("Unable to call callback '\" .. name
.. ":\nunknown or empty")
  end
  local l = callbacklist[name]
  local f
  if not l then
    f = user_callbacks_defaults[name]
  else
    f = handlers[callbacktypes[name]](name)
  end
  return f(...)
end
luatexbase.call_callback=call_callback
(End definition for call_callback.)

add_to_callback Add a function to a callback. First check arguments.
local function add_to_callback(name, func, description)
  if not name or name == "" then
    luatexbase_error("Unable to register callback:\n.. "valid callback name required")
  end
  if not callbacktypes[name] or
    type(func) ~= "function" or
    not description or
    description == "" then
    luatexbase_error(
      "Unable to register callback:\n\n.. "Correct usage:\n
.. "add_to_callback(<callback>, <function>, <description>)"
    )
  end
Then test if this callback is already in use. If not, initialise its list and register the proper handler.
local l = callbacklist[name]
if l == nil then
  l = { }
callbacklist[name] = l
If it is not a user defined callback use the primitive callback register.

```lua
if user_callbacks_defaults[name] == nil then
    callback_register(name, handlers[callbactypes[name]](name))
end
end
```

Actually register the function and give an error if more than one exclusive one is registered.

```lua
local f = {
    func = func,
    description = description,
}
local priority = #l + 1
if callbacktypes[name] == exclusive then
    if #l == 1 then
        luatexbase_error(
            "Cannot add second callback to exclusive function\n'" ..
            name .. "'
        )
    end
end
table.insert(l, priority, f)
```

Keep user informed.

```lua
luatexbase_log(
    "Inserting " .. description .. " at position " ..
    priority .. " in " .. name .. ","
)
end
luatexbase.add_to_callback = add_to_callback
```

**remove_from_callback** Remove a function from a callback. First check arguments.

```lua
local function remove_from_callback(name, description)
    if not name or name == "" then
        luatexbase_error("Unable to remove function from callback:\n" ..
            "valid callback name required")
    end
    if not callbacktypes[name] or
        not description or
        description == "" then
        luatexbase_error(
            "Unable to remove function from callback.\n\n.. "Correct usage:\n\n.. "remove_from_callback(<callback>, <description>)"
        )
    end
    local l = callbacklist[name]
    if not l then
        luatexbase_error(
            "No callback list for " .. name .. ","
        )
    end
    loop over the callback's function list until we find a matching entry. Remove it and check if the list is empty: if so, unregister the callback handler.
```
local index = false
for i,j in ipairs(l) do
    if j.description == description then
        index = i
        break
    end
end
if not index then
    luatexbase_error("No callback \".. description .. \\n\", name .. \\n\"");
end
local cb = l[index]
luatexbase_log(\n\"Removing \".. description .. \" from \".. name .. \\n\"");
if #l == 0 then
    callbacklist[name] = nil
    if user_callbacks_defaults[name] == nil then
        callback_register(name, nil)
    end
end
return cb.func, cb.description
end
luatexbase.remove_from_callback = remove_from_callback

in_callback Look for a function description in a callback.
local function in_callback(name, description)
    if not name
        or name == 
        or not callbacklist[name]
        or not callbacktypes[name]
        or not description then
        return false
    end
    for _, i in pairs(callbacklist[name]) do
        if i.description == description then
            return true
        end
    end
    return false
end
luatexbase.in_callback = in_callback

(End definition for remove_from_callback.)

disable_callback As we subvert the engine interface we need to provide a way to access this functionality.
local function disable_callback(name)
    if(callbacklist[name] == nil) then
        callback_register(name, false)
    else
        luatexbase_error("Callback list for " .. name .. "; not empty")
    end
end
luatexbase.in_callback = in_callback

(End definition for in_callback.)
luatexbase.disable_callback = disable_callback

(End definition for disable_callback.)

callback_descriptions List the descriptions of functions registered for the given callback.

callback_register (name)
callback_descriptions (name)
local d = {}
if not name
  or name == ""
  or not callbacklist[name]
  or not callbacktypes[name]
  then
  return d
else
  for k, i in pairs(callbacklist[name]) do
    d[k] = i.description
  end
  return d
end
luatexbase.callback_descriptions = callback_descriptions

(End definition for callback_descriptions.)

uninstall Unlike at the \TeX{} level, we have to provide a back-out mechanism here at the same time as the rest of the code. This is not meant for use by anything other than \texttt{latexrelease}; as such this is deliberately not documented for users!

local function uninstall()
module_info(
  "luatexbase",
  "Uninstalling kernel luatexbase code"
)
callback.register = callback_register
luatexbase = nil
end
luatexbase.uninstall = uninstall

(End definition for uninstall.)

mlist_to_hlist To emulate these callbacks, the “real” \texttt{mlist_to_hlist} is replaced by a wrapper calling the wrappers before and after.

callback_register("mlist_to_hlist", function(head, display_type, need_penalties)
local current = call_callback("pre_mlist_to_hlist_filter", head, display_type, need_penalties)
if current == false then
  flush_list(head)
  return nil
end

current = call_callback("mlist_to_hlist", current, display_type, need_penalties)
local post = call_callback("post_mlist_to_hlist_filter", current, display_type, need_penalties)
if post == false then
  flush_list(current)
  return nil
end
return post
end)

(End definition for mlist_to_hlist.)
(/lua)

Reset the catcode of $@$.
(tex)\catcode'@=\etcatcode\relax
File e
ltexpl.dtx

1 expl3-dependent code

1.1 Loader

These two kernel hooks are used by the shipout code. They are defined earlier here because the lthooks code adds material to them.

We only initialize these kernel hooks if they are not already existing. Otherwise they would be set to \@empty on rollback which would be wrong because code that has been added to them may still have to be executed in the rollback situation. Instead code that writes to them needs to handle the rollback as needed. It is likely that we have to change that approach in the future, but for now it should do. (It is enough to test only for the existence of one hook, as all got added at the same time.)

For the similar reasons we also define those that are used in \document because they too get material added to in early modules.

First define some blank commands, so that in case something goes wrong while loading expl3, we won’t get strange Undefined control sequence errors.
Create a hook for last-minute expl3 material.

\def\expl@finalise@setup@@{}

Now define some basics to support loading expl3. These macros can be defined here safely, because they are redefined later on by the kernel, so we define simpler versions just to suit our needs.

\long\def\@gobble#1{}
\long\def\@firstofone#1{#1}
\long\def\@firstoftwo#1#2{#1}
\long\def\@secondoftwo#1#2{#2}
\long\def\IfFileExists#1{\openin\@inputcheck"#1" %}
\@ifnextchar#1#2#3{\let\reserved@d=#1\%\def\reserved@a{#2}\def\reserved@b{#3}\futurelet\@let@token\@ifnch}
\@ifnch{\ifx\@let@token\reserved@d\expandafter\reserved@a\else\expandafter\reserved@b\fi}

If we are doing a rollback with a format containing expl3 we aren’t reloading it as that creates havoc. This may need a refined version!

\executeatendinput\IfFileExists{expl3.ltx}{\ifnum0\ifdefined\pdffilesize 1\fi\ifdefined\filesize 1\fi\ifdefined\luatexversion\ifnum\luatexversion>94 1\fi\fi\fi\futurelet\@let@token\@ifnch}{\IfFileExists{expl3.ltx}{\futurelet\@let@token\@ifnch}{\ifx\@let@token\reserved@d\expandafter\reserved@a\else\expandafter\reserved@b\fi}}

Check for the required primitive/engine support and the existence of a loader.

\IfFileExists{expl3.ltx}{\ifnum0\ifdefined\pdffilesize 1\fi\ifdefined\filesize 1\fi\ifdefined\luatexversion\ifnum\luatexversion>94 1\fi\fi\fi\futurelet\@let@token\@ifnch}{\ifx\@let@token\reserved@d\expandafter\reserved@a\else\expandafter\reserved@b\fi}
In \texttt{2ekernel} mode, an error is fatal and building the format is aborted. Use \texttt{\batchmode \read -1 to \tokenlist}, which errors with

```latex
! Emergency stop. (cannot \read from terminal in nonstop modes)
```

and aborts the \TeX{} run. In \texttt{latexrelease} mode, raise an error and do nothing. Both ways, the error message shows the minimum \texttt{expl3} engine requirements.

```latex
\texttt{2ekernel}
\def{-} \def{\MessageBreak{\^^J------------------------}}
\texttt{latexrelease}
\texttt{\latexerror{LaTeX requires expl3}}
\texttt{\batchmode \read -1 to \reserved@a}
\texttt{\endinput}
```

We do not support a roll forward across 2019. You need to start with 2019 if you want to get to 2020 or beyond.

```latex
\texttt{latexrelease}
\latexerror{You need a format that already contains a recent expl3 as part of the kernel, e.g. at least a kernel from 2019 to roll forward to that date! I'm giving up! Note that manually loading the expl3 package from your distribution is not enough!}
\texttt{\batchmode \read -1 to \reserved@a}
\texttt{\endinput}
```

To support roll-forward for the case where \texttt{xparse} is fully integrated into the kernel, we do not need to repeat the complex test above as we can simply look for the marker command.

```latex
\texttt{latexrelease}\IncludeInRelease{2020/02/02}{\texttt{\expandafter\@firstofone \else \fi}}
\texttt{\latexerror{Pre-load expl3}}
\texttt{\expandafter\@firstofone \else \fi}
```
Now in \latexrelease{} mode, redefine a few commands to avoid "already defined" errors.

1.2 Using expl3 code

In order to ease the implementation of some new features in \LaTeX{} 2ε we may (temporarily) use some coding based on the expl3-code. Such macros will eventually vanish and may be changed unannounced. They are there for internal use in the \LaTeX{} 2ε kernel and are not meant to be used in third-party packages. These macros will always have the \@expl@ prefix in their name.

The rest of the name matches the expl3 name but with all underscores replaced by @ and the : replaced by @@, e.g.,

\cs_new_eq:NN \@expl@tl@trim@spaces@apply@@nN \tl_trim_spaces_apply:nN

if that expl3 command is needed in places that are others coded in \LaTeX{} 2ε conventions.

In this file, each release of \LaTeX{} adds an \IncludeInRelease{} block, in which the macros copied for that release were defined. In case a rollback is requested, the entire block is changed.

Each macro copied has a \changes{} entry to explain when and why it was copied, so that further to that may spot it easily.

Here \cs_gset_eq:NN is used, instead of the new variant because if different releases use that same name for different purposes, each can copy the macro without worrying about redefinitions.

The expl3 activation needs to be inside the release guards as otherwise rolling forward is broken in old kernels that do not have expl3 loaded.
Here we can’t assume that expl3 is available. It will be if we roll back but if this
code is executed rolling forward it needs to be pure 2e.

The expandable command \fpeval takes as its argument a floating point expression and
produces a result using the normal rules of mathematics. As this command
is expandable it can be used where Te\TeX{} requires a number and for example within a
low-level \edef operation to give a purely numerical result. See usrguide3 for further explanation.

The expandable command \inteval takes as its argument an integer expression and
produces a result using the normal rules of mathematics. The operations recognised are
\(+\), \(-\), \(*\) and \(/\) plus parentheses. Division occurs with \textit{rounding}, and ties are rounded away
from zero. As this command is expandable it can be used where Te\TeX{} requires a number and
for example within a low-level \edef operation to give a purely numerical result. See usrguide3 for further explanation. \dimeval and \skipeval are similar, but generate
fixed and rubber length values, respectively.

A document level wrapper around the code level function for floating point calculations.

And a few more, this time wrappers around the e\TeX{} primitives.

2 Document-level command names for expl3 functions

Current home for L3 programing layer functions that we make directly available at the
document level. This section may need to be moved later (after \NewDocumentCommand
is defined in case we want to use that in the setup).
\cs_new_eq:NN \dimeval \dim_eval:n
\cs_new_eq:NN \skipeval \skip_eval:n
\ExplSyntaxOff

(End definition for \fpeval and others.)

\⟨/2ekernel|\latexrelease⟩
\langle\latexrelease⟩\EndIncludeInRelease
\langle\latexrelease⟩\IncludeInRelease{0000/00/00}%
\langle\latexrelease⟩ \{\fpeval\} {fp and int calculations}%
\langle\latexrelease⟩
\langle\latexrelease⟩\let\fpeval\@undefined
\langle\latexrelease⟩\let\inteval\@undefined
\langle\latexrelease⟩\let\dimeval\@undefined
\langle\latexrelease⟩\EndIncludeInRelease
\langle\latexrelease⟩\IncludeInRelease{2022/06/01}%
\langle\latexrelease⟩ \{\ExpandArgs\} {Some pre-expansion commands}%
\langle\latexrelease⟩ \ExplSyntaxOn
\cs_new_eq:NN \UseName \use:c
\cs_new:Npn \ExpandArgs #1
{\cs_if_exist_use:cF { exp_args:N #1 }{ \msg_expandable_error:nnn { kernel } { unknown-arg-expansion } {#1} } }
\msg_new:nnn { kernel } { unknown-arg-expansion }{ Unknown-arg-expansion-"#1" }
\ExplSyntaxOff

(End definition for \UseName and \ExpandArgs.)

\langle/2ekernel|\latexrelease⟩
\langle\latexrelease⟩\EndIncludeInRelease
\langle\latexrelease⟩\IncludeInRelease{0000/00/00}%
\langle\latexrelease⟩ \{\ExpandArgs\} {Some pre-expansion commands}%
\langle\latexrelease⟩
\langle\latexrelease⟩\let\UseName\@undefined
\langle\latexrelease⟩\let\ExpandArgs\@undefined
\langle\latexrelease⟩\EndIncludeInRelease
\langle/2ekernel|\latexrelease⟩
\langle\latexrelease⟩\EndIncludeInRelease
\langle\latexrelease⟩\IncludeInRelease{2022/02/28}%
File *ltdefns.dtx*

1 Definitions

This section contains commands used in defining other macros.

(*2ekernel*)

1.1 Initex initializations

\two@digits  Prefix a number less than 10 with ‘0’.
\begin{verbatim}
def	wo@digits#1{\ifnum#1<10 0\fi\number#1}
\end{verbatim}

(End definition for \two@digits.)

\typeout  Display something on the terminal.
\begin{verbatim}
def\typeout#1{\begingroup\set@display@protect
\def\par{\hfill\\}\immediate\write\@unused{#1}\endgroup}
\end{verbatim}

(End definition for \typeout.)

\newlinechar  A char to be used as new-line in output to files.
\begin{verbatim}
\newlinechar'\^^J
\end{verbatim}

(End definition for \newlinechar.)

1.2 Saved versions of \TeX{} primitives

The \TeX{} primitive \texttt{\foo} is saved as \texttt{\@@foo}. The following primitives are handled in this way:

\begin{verbatim}
def\@@par{\let\@@par=\par}
def\@@input{\input} \let\@@end=\end
\end{verbatim}

(End definition for \@@par.)
\@hyph \ Save original \ primitive \ definition.
\let\@hyph=\-
(End \ definition \ for \ \@hyph.)

\@italiccorr\ Save the original \ italic \ correction.
\let\@italiccorr=/
(End \ definition \ for \ \@italiccorr.)

\@height\ The following \ definitions \ save \ token \ space. \ E.g., \ using \ \@height \ instead \ of \ height \ saves
\@depth\ 5 \ tokens \ at \ the \ cost \ in \ time \ of \ one \ macro \ expansion.
\@width\ \@minus\ \@plus\ The \ next \ one \ is \ another \ 100 \ tokens \ worth.
\def\@height{height} \def\@depth{depth} \def\@width{width} \def\@minus{minus} \def\@plus{plus}
(End \ definition \ for \ \@height \ and \ others.)
\message{hacks,}

1.3 Command definitions

This \ section \ defines \ the \ following \ commands:
\namedef\{\(NAME\)}\ Expands \ to \ \def\{\(NAME\)}, except \ name \ can \ contain \ any \ characters.
\nameuse\{\(NAME\)}\ Expands \ to \ \{\(NAME\)}.
\ifnextchar\ X\{\(YES\}\}{\(NO\)}\ Expands \ to \ \{\(YES\)} \ if \ next \ character \ is \ an \ ‘X’, \ and \ to \ \{\(NO\)} \ otherwise. \ (Uses \ \reserved@a-\reserved@c.) \ NOTE: \ GOBBLES \ ANY \ SPACE \ FOLLOWING \ IT.
\ifstar\ \{\(YES\)}\{\(NO\)}\ Gobbles \ following \ spaces \ and \ then \ tests \ if \ next \ the \ character \ is \ a \ ‘*’. \ If \ it \ is, \ then \ it \ gobbles \ the \ ‘*’ \ and \ expands \ to \ \{\(YES\)}, \ otherwise \ it \ expands \ to \ \{\(NO\)}.
\dblarg\ \{\(CMD\)}\{\{\ARG\}\} \{\ARG\}\ Expands \ to \ \{\(CMD\)}\{\{\ARG\}\} \{\ARG\}. \ Use \ \dblarg\CS \ when \ \CS \ takes \ arguments \ [\ARG1\{\ARG2}], \ where \ default \ is \ ARG1 = ARG2.
\ifundefined\{\(NAME\)}\{\{\YES\}\}{\{\NO\}\}\ : \ If \ \NAME\ is \ undefined \ then \ it \ executes \ \{\YES\}, \ otherwise \ it \ executes \ \{\NO\}. \ More \ precisely, \ true \ if \ \NAME\ either \ undefined \ or = \ \relax.
\ifdefinable\ \NAME\{\YES\}\ Executes \ \YES\ \ if \ the \ user \ is \ allowed \ to \ define \ \NAME, \ otherwise \ it \ gives \ an \ error. \ The \ user \ can \ define \ \NAME\ if \ \ifdefinable\{\NAME\} \ is \ true, \ ‘NAME’ \ ≠ \ ‘relax’ \ and \ the \ first \ three \ letters \ of \ ‘NAME’ \ are \ not \ ‘end’, \ and \ if \ \endNAME\ is \ not \ defined.
\newcommand\ \star\{\(\FOO\)}\{\(\i\)}\{\TEXT\}\ User \ command \ to \ define \ \FOO\ \ to \ be \ a \ macro \ with \ i \ arguments \ (i = 0 \ if \ missing) \ having \ the \ definition \ \{\TEXT\}. \ Produces \ an \ error \ if \ \FOO\ \ already \ defined.
\renewcommand\ \star\{\(\FOO\)}\{\(\i\)}\{\TEXT\}\ Normally \ the \ command \ is \ defined \ to \ be \ \long \ (ie \ it \ may \ take \ multiple \ paragraphs \ in \ its \ argument). \ In \ the \ star-form, \ the \ command \ is \ not \ defined \ as \ \long \ and \ a \ blank \ line \ in \ any \ argument \ to \ the \ command \ would \ generate \ an \ error.

File: \ltdefns.dtx \ Date: 2022/05/13 \ Version \ v1.5q
Same as \newcommand, except it checks if \FOO already defined.

\newenvironment \texttt*{(FOO)} \texttt*[i]{(DEF1)}{(DEF2)}
equivalent to:
\newcommand \FOO \texttt*[i]{DEF1} \def \texttt{endFOO}{DEF2}
(or the appropriate star forms).

\renewenvironment
Obvious companion to \newenvironment.

\@cons
\@car T1 T2 ... Tn\@nil == T1 (unexpanded)
\@cdr T1 T2 ... Tn\@nil == T2 ... Tn (unexpanded)
\texttt{typeout}
{(message)}
Produces a warning message on the terminal.
\texttt{typein}
{(message)}
Types message, asks the user to type in a command, then executes it
\texttt{typein}
{(\CS)}{(MSG)}
Same as above, except defines \CS to be the input instead of executing it.

The \texttt{typein} command is defined as follows:

\begin{verbatim}
def\typein{%
let\@typein=relax
@testopt\@xtypein\@typein%\ifx\directlua\@undefined
@xtypein[#1]#2{%
typeout{#2}%
advance\endlinechar\@M
read\@inputcheck to#1%
advance\endlinechar-\@M
@typein%
}else
@xtypein[#1]#2{%
typeout(#2)%
begin\endlinechar=m@ne
begin\endlinechar=\@M
read\@inputcheck to#1%
expandafter\endgroup
expandafter\def\expandafter{#1}expandafter{%
@typein%
}fi%
(End definition for \typein.)
\end{verbatim}

\@namedef
\def\@namedef#1\expandafter{\expandafter{\csname #1\endcsname}%(End definition for \@namedef.)

\@nameuse
\def\@nameuse#1\csname #1\endcsname%(End definition for \@nameuse.)

File f: ltdefs.dtx Date: 2022/05/13 Version v1.5q
\def\@cons#1#2\@nil{\begingroup\let\@elt\relax\xdef#1{#1\@elt#2}\endgroup}
(End definition for \@cons.)
\def\@car#1#2\@nil{#1}
\def\@cdr#1#2\@nil{#2}
(End definition for \@car and \@cdr.)
\def\@carcube\@carcube \ldots \ Tn\@nil = T1 T2 T3 , n > 3
\endinput
\long\def\@carcube#1#2#3#4\@nil{#1#2#3}
(End definition for \@carcube.)
\def\@preamblecmds{}
\def\@onlypreamble#1{\expandafter\gdef\expandafter\@preamblecmds\expandafter{\@preamblecmds\do#1}}
(End definition for \@onlypreamble and \@preamblecmds.)
\def\@starorlong#1{%  \@ifstar{\let\l@ngrel@x\relax#1}{}{\let\l@ngrel@x\long#1}}
(End definition for \@starorlong.)
\newcommand User level \newcommand.
\def\newcommand{\@starorlong\new\@command}
(End definition for \newcommand.)
This macro adds its argument to the list of commands stored in \@preamblecmds
This macro adds its argument to the list of commands stored in \@preamblecmds
to be disabled after \begin{document}. These commands are redefined to generate
\notprerr at this point.
\newcommand User level \newcommand.
\def\newcommand{\@starorlong\new\@command}
\newcommand{\new@command}{%}
\@testopt{%new@command%0}

(End definition for \newcommand and \new@command.)

\@newcommand{\@argdef}{\@xargdef}

Handling arguments for \newcommand.

\def\@newcommand#1[#2]{%}
\kernel@ifnextchar {[\@xargdef#1[#2]]%}
\{\@argdef#1[#2]}

Define #1 if it is definable.

Both here and in \@xargdef the replacement text is absorbed as an argument because if we are not allowed to make the definition we have to get rid of it completely.

\long\def\@argdef[#2]{%}
\@ifdefinable #1{\@yargdef#1@{\@ne{#2}}}

Handle the second optional argument.

\long\def\@xargdef[#2][#3]{%}
\@ifdefinable#1{Define the actual command to be:
\def\foo{\@protected@testopt\foo\foo{default}}
where \foo is a csname generated from applying \csname and \string to \foo, ie the actual name contains a backslash and therefore can't clash easily with existing command names. “Default” is the contents of the second optional argument of (re)newcommand.

\expandafter\def\expandafter#1\expandafter{%}
\expandafter\@protected@testopt
\expandafter\expandafter#1%}
\csname\string#1\endcsname{#3}}%

Now we define the internal macro ie \foo which is supposed to pick up all arguments (optional and mandatory).

\expandafter\@yargdef
\csname\string#1\endcsname{tw@}{#2}{#4}}}

(End definition for \@newcommand, \@argdef, and \@xargdef.)

\@testopt

This macro encapsulates the most common call to \@ifnextchar, saving several tokens each time it is used in the definition of a command with an optional argument. #1 The code to execute in the case that there is a [ need not be a single token but can be any sequence of commands that ‘expects’ to be followed by[]. If this command were only used in \newcommand definitions then #1 would be a single token and the braces could be omitted from {#1} in the definition below, saving a bit of memory.

\long\def\@testopt[#2]{%}
\kernel@ifnextchar {[\@ifnextchar[{{#1}{#1[{{#2}}]}}]

(End definition for \@testopt.)
Robust version of \testopt. The extra argument (#1) must be a single token. If protection is needed the call expands to \protect applied to this token, and the 2nd and 3rd arguments are discarded (by \xprotect). Otherwise \testopt is called on the 2nd and 3rd arguments.

This method of making commands robust avoids the need for using up two csnames per command, the price is the extra expansion time for the \ifx test.

\begin{lstlisting}[language=TeX]
def\protected@testopt#1{%
  \ifx\protect\@typeset@protect
    \expandafter\@testopt
  \else
    \@x@protect#1%
  \fi}
\end{lstlisting}

(End definition for \protected@testopt.)

These generate a primitive argument specification, from a \TeX \[(digit)\] form; in fact \langle digit \rangle can be anything such that \number \langle digit \rangle is single digit.

Reorganised slightly so that \renewcommand\reserved@a[1]{\@tempa}{foo} works. I am not sure this is worth it, as a following \newcommand would over-write the definition of \reserved@a.

Recall that \TeX2.09 goes into an infinite loop with \renewcommand[1]\{@tempa}{foo} (DPC 6 October 93).

Reorganised again (DPC 1999). Rather than make a loop to construct the argument spec by counting, just extract the required argument spec by using a delimited argument (delimited by the digit). This is faster and uses less tokens. The coding is slightly odd to preserve the old interface (using \#2 = \tw@ as the flag to surround the first argument with \[\]). But the new method did not allow for the number of arguments \#3 not being given as an explicit digit; hence (further expansion of this argument and use of) \number was added later in 1999.

It is not clear why these are still \long.

\begin{lstlisting}[language=TeX]
long \def \yargdef #1#2#3{%
  \ifx#2\tw@
    \def\reserved@b##11{[####1]}%
  \else
    \let\reserved@b\@gobble
  \fi
  \expandafter 114  \@yargd@f \expandafter{\number #3}#1%
}
\end{lstlisting}

(End definition for \yargdef and \yargd@f.)

\begin{lstlisting}[language=TeX]
long \def \reargdef#1[#2]{%
  \@yargdef#1#@ne{#2}}
\end{lstlisting}

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\renewcommand
Check the command name is already used. If not give an error message. Then temporarily disable \@ifdefinable then call \newcommand. (Previous version \let#1=\relax but this does not work too well if #1 is \@tempa–e.)
\def\renewcommand{\@star@or@long\renew@command}
\renew@command
\def\renew@command#1{%
\begingroup \escapechar\m@ne\xdef\@gtempa{{\string#1}}\endgroup
\expandafter\@ifundefined\@gtempa
{\@latex@error{Command \string#1 undefined}\@ehc}%
\relax
\let\@ifdefinable\@rc@ifdefinable
\new@command#1}
\renew@command
\renew@command
\renew@command
\let\@@ifdefinable\@ifdefinable
\long\def\@ifdefinable #1#2{%
\edef\reserved@a{\expandafter\@gobble\string #1}%
\@ifundefined\reserved@a
{\edef\reserved@b{\expandafter\@carcube \reserved@a xxx\@nil}%
\ifx \reserved@b\@qend \@notdefinable\else
\@ifundefined\reserved@a\@@ifdefinable \@notdefinable\else
#2%
\fi
\fi}%
\let\@ifdefinable\@@ifdefinable
\@rc@ifdefinable#1#2}
\newenvironment
Define a new user environment. #1 is the environment name. #2# grabs all the tokens up to the first {. These will be any optional arguments. They are not parsed at this point, but are just passed to \one newenv which will eventually call \newcommand. Any optional arguments will then be parsed by \newcommand as it defines the command that executes the ‘begin code’ of the environment.
This #2# trick removed with version 1.2i as it fails if a { occurs in the optional argument. Now use \ifnextchar directly.
\def\newenvironment{\@star@or@long\new@environment}
\new@environment
\def\new@environment#1{%
\testopt{\newenva#1}0}
\newenvironment{#1}{% \kernel@ifnextchar [{{\newenvb#1[#2][#3]}}}{{\newenv{#1}{[#2]}}} }

\newenvironmentb{#1}[#2][#3]{{\newenv{#1}{[#2][#3]}}}

(End definition for \newenvironment and others.)

\renewenvironment Redefine an environment. For \renewenvironment disable \@ifdefinable and then call \newenvironment. It is OK to \let the argument to \relax here as there should not be a @temp... environment.

\def\renewenvironment{\@star@or@long\renew@environment}

\renew@environment
\def\renew@environment#1{\@ifundefined{#1}\relax{\expandafter\let\csname#1\endcsname\relax\expandafter\let\csname end#1\endcsname\relax\new@environment{#1}}}

(End definition for \renewenvironment and \renew@environment.)

\@newenv
The internal version of \newenvironment.

Call \newcommand to define the \langle begin-code \rangle for the environment. \def is used for the \langle end-code \rangle as it does not take arguments. (but may contain \par)s

Make sure that an attempt to define a ‘graf’ or ‘group’ environment fails.

\def\@newenv#1#2#3#4{\@ifundefined{#1}\relax{\expandafter\let\csname#1\endcsname\csname end#1\endcsname}\relax\expandafter\new@command\csname #1\endcsname#2{#3}\longrelx\expandafter\def\csname end#1\endcsname{#4}}

(End definition for \@newenv.)

\newif And here’s a different sort of allocation: For example, \newif\iffoo creates \footrue, \foofalse to go with \iffoo.

\def\newif#1{% \count@\escapechar \escapechar\m@ne \let#1\iffalse \let\if#1\iftrue \iffalse \fi#1\iffalse \escapechar\count@}
\providecommand
\providecommand takes the same arguments as \newcommand, but discards them if #1 is already defined. Otherwise it just acts like \newcommand. This implementation currently leaves any discarded definition in \reserved@a (and possibly \reserved@a) this wastes a bit of space, but it will be reclaimed as soon as these scratch macros are redefined.

\def\providecommand{\@star@or@long\provide@command}

\provide@command
\provide@command#1{%
\begingroup
\escapechar\m@ne\xdef\@gtempa{{\string#1}}%
\endgroup
\expandafter\@ifundefined\@gtempa
{\def\reserved@a{\new@command#1}}%
{\def\reserved@a{\renew@command\reserved@a}}%
\reserved@a}%
\CheckCommand
\CheckCommand takes the same arguments as \newcommand. If the command already exists, with the same definition, then nothing happens, otherwise a warning is issued. Useful for checking the current state before a macro package starts redefining things. Currently two macros are considered to have the same definition if they are the same except for different default arguments. That is, if the old definition was: \newcommand\xxx[2][a]{(#1)(#2)} then \CheckCommand\xxx[2][b]{(#1)(#2)} would not generate a warning, but, for instance \CheckCommand\xxx[2]{(#1)(#2)} would.
\def\CheckCommand{\@star@or@long\check@command}
\CheckCommand is only available in the preamble part of the document.
\@onlypreamble\CheckCommand

\check@command
\check@command#1#2#{\@check@c#1{#2}}
\@onlypreamble\check@command
\@check@c
\check@command itself just grabs all the arguments we need, without actually looking for [ optional argument forms. Now define \reserved@a. If \reserved@a is then defined, compare it with the “#1’ otherwise compare \reserved@a with #1.
\long\def\@check@c#1#2#3{%
\expandafter\let\csname string\reserved@a\endcsname\relax
\renew@command\reserved@a#2{#3}%
@ifundefined{\string\reserved@a}%
{\@check@c#1\reserved@a}%
{\@check@c#1\reserved@a}
\endgroup
\expandafter\@check@c
\@check@c
\@check@c
\@onlypreamble\@check@c

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Complain if #1 and #2 are not \texttt{ifx} equal.

\def\check@eq#1#2{\ifx#1#2\else\latex@warning@no@line{Command \noexpand#1 has
changed.\MessageBreakCheck if current package is valid}\fi}
\@onlypreamble\check@eq
(The End definition for \check@eq.)

The \texttt{\gobble} macro is used to get rid of its argument.

\long\def \gobble #1{}\gobbletwo #1#2{}\gobblethree #1#2#3{}\gobblefour #1#2#3#4{}
(End definition for \gobble and others.)

Some argument-grabbers.

\long\def\firstofone#1{#1}\long\def\firstoftwo#1#2{#1}\long\def\secondoftwo#1#2{#2}
\let\iden@firstofone\iden
(End definition for \firstofone and others.)

Another grabber now used in the encoding specific section.

\long\def\thirdofthree#1#2#3{#3}
(End definition for \thirdofthree.)

A macro to totally expand two arguments to another macro
\def\expandtwoargs#1#2#3{%\edef\reserved@a{\noexpand#1{#2}{#3}}\reserved@a}
(End definition for \expandtwoargs.)

A category code 12 backslash.
\edef\backslashchar{\expandafter\@gobble\string\}\}
(End definition for \backslashchar.)
1.4 Robust commands and protect

Fragile and robust commands are one of the thornier issues in \LaTeX’s commands. Whilst typesetting documents, \LaTeX makes use of many of \TeX’s features, such as arithmetic, defining macros, and setting variables. However, there are (at least) three different occasions when these commands are not safe. These are called ‘moving arguments’ by \LaTeX, and consist of:

- writing information to a file, such as indexes or tables of contents.
- writing information to the screen.
- inside an \texttt{\edef}, \texttt{\message}, \texttt{\mark}, or other command which evaluates its argument fully.

The method \LaTeX uses for making fragile commands robust is to precede them with \texttt{\protect}. This can have one of four possible values:

- \texttt{\relax}, for normal typesetting. So \texttt{\protect\foo} will execute \texttt{\foo}.
- \texttt{\string}, for writing to the screen. So \texttt{\protect\foo} will write \texttt{\foo}.
- \texttt{\noexpand}, for writing to a file. So \texttt{\protect\foo} will write \texttt{\foo} followed by a space.
- \texttt{@unexpandable@protect}, for writing a moving argument to a file. So \texttt{\protect\foo} will write \texttt{\protect\foo} followed by a space. This value is also used inside \texttt{\edef}, \texttt{\marks} and other commands which evaluate their arguments fully. More precisely, whenever the content of an \texttt{\edef} or \texttt{\xdef} etc. can contain arbitrary user input not under the direct control of the programmer, one should use \texttt{\protect\edef} instead of \texttt{\edef}, etc., so that \texttt{\protect} has a suitable definition and the user input will not break if it contains fragile commands.

\texttt{@unexpandable@protect}

\begin{verbatim}
def@unexpandable@protect{\noexpand\protect\noexpand}
(End definition for \texttt{@unexpandable@protect}.)
\end{verbatim}

\texttt{\DeclareRobustCommand \declare@robustcommand}
This is a package-writers command, which has the same syntax as \texttt{\newcommand}, but which declares a protected command. It does this by having
\texttt{\DeclareRobustCommand\foo}
define \texttt{\foo} to be \texttt{\protect\foo<space>},
and then use \texttt{\newcommand\foo<space>}. Since the internal command is \texttt{\foo<space>}, when it is written to an auxiliary file, it will appear as \texttt{\foo}.

We have to be a bit cleverer if we’re defining a short command, such as \texttt{\_}, in order to make sure that the auxiliary file does not include a space after the command, since \texttt{\_a} and \texttt{\_a} aren’t the same. In this case we define \texttt{\_} to be:

\texttt{\x@protect\_\protect\_<space>}

which expands to:
Then if \texttt{\protect} is \texttt{\@typeset@protect} (normally \texttt{\relax}) then we just perform \texttt{\_<space>}, and otherwise \texttt{\@x@protect@_} gobbles everything up and expands to \texttt{\protect\_<space>}.  

Note: setting \texttt{\protect} to any value other than \texttt{\relax} whilst in ‘typesetting’ mode will cause commands to go into an infinite loop! In particular, setting \texttt{\protect} to \texttt{\@empty} will cause \texttt{\_<space>} to loop forever. It will also break lots of other things, such as protected \texttt{\ifmmode} inside \texttt{\halign}s. If you really have to do such a thing, then please set \texttt{\@typeset@protect} to be \texttt{\@empty} as well. (This is what the code for \texttt{\patterns} does, for example.)

More fun with \texttt{\expandafter} and \texttt{\csname}.

\begin{verbatim}
\def\DeclareRobustCommand{\@star@or@long\declare@robustcommand}
\def\declare@robustcommand#1{%
  \ifx#1\@undefined\else\ifx#1\relax\else
    \latex@info{Redefining \string#1}%
  \fi\fi
  \edef\reserved@a{\string#1}%
  \def\reserved@b{#1}%
  \edef\reserved@b{\expandafter\strip@prefix\meaning\reserved@b}%
  \edef#1{%
    \ifx\reserved@a\reserved@b
      \noexpand\x@protect
      \noexpand#1%
    \fi
    \noexpand\protect
    \expandafter\noexpand\csname
    \expandafter\@gobble\string#1 \endcsname
  }%
  \let\@ifdefinable\@rc@ifdefinable
  \expandafter\new@command\csname
  \expandafter\@gobble\string#1 \endcsname
}%
(End definition for \DeclareRobustCommand and \declare@robustcommand.)
\end{verbatim}

\begin{verbatim}
\@protect
\@protect
\def\@protect#1{%
  \ifx\protect\@typeset@protect\else
    \@x@protect#1\fi
  \fi
  \@protect\expandafter\noexpand\protect
  \noexpand\@protect
  \noexpand\@protect
  \noexpand\expandafter\noexpand\csname
  \expandafter\@gobble\string#1 \endcsname
}%
(End definition for \@protect and \@protect.)
\end{verbatim}

\texttt{\@typeset@protect} We set \texttt{\@typeset@protect} to \texttt{\relax} rather than \texttt{\@empty} to make sure that the protection mechanism stops the look-ahead and expansion performed at the start of \texttt{\halign} cells.

\begin{verbatim}
\let\@typeset@protect\relax
\end{verbatim}

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These macros set \protect appropriately for typesetting or displaying.

\set\display\protect
\set\typeset\protect

The commands \protected\edef and \protected\xdef perform ‘safe’ \edefs and \xdefs, saving and restoring \protect appropriately. For cases where restoring \protect doesn’t matter, there’s an ‘unsafe’ \unrestored\protected\xdef, useful if you know what you’re doing!

\protected\edef{%
\let\@@protect\protect
\let\protect\@unexpandable\protect
\afterassignment\restore\protect
\edef%
}
def\protected\xdef{%
\let\@@protect\protect
\let\protect\@unexpandable\protect
\afterassignment\restore\protect
\xdef%
}

def\unrestored\protected\xdef{%
\let\protect\@unexpandable\protect
\xdef%
}
\def\restore\protect{\let\protect\@@protect}

The normal meaning of \protect

\set\typeset\protect

This macro makes an existing fragile macro robust, but only if it hasn’t been robust in the past, i.e., it checks for the existence of the macro \<name\> and if that exists it assumes that \<name\> is already robust. In that case either undefine the inner macro first or use \DeclareRobustCommand to define it in a robust way directly. We could probably test the top-level definition to have the right kind of structure, but this is somewhat problematical as we then have to distinguish between \long macros and others and also take into account that sometimes the top-level is deliberately done manually (like with \begin).

The macro firstly checks if the control sequence in question exists at all.

\Zekernel\latexrelease\IncludeInRelease{2020/10/01}{\MakeRobust}{\MakeRobust}%%
(+Zekernel | \latexrelease)
\def\MakeRobust#1{%
\count\count0=\escapechar
\escapechar='\\'
@ifundefined{\expandafter\@gobble\string#1}{%}
   \latexerror{Command '\string#1' undefined.}
}
Then we check if the macro is already robust. We do this by testing if the internal name for a robust macro is defined, namely \texttt{\textbackslash foo}. If it is already defined do nothing, otherwise set \texttt{\textbackslash foo} equal to \texttt{\textbackslash foo} and redefine \texttt{\textbackslash foo} so that it acts like a macro defined with \texttt{\textbackslash DeclareRobustCommand}. We use \texttt{\textbackslash kernel@rename@newcommand} to copy \texttt{\textbackslash foo} over to \texttt{\textbackslash foo}, including a possible default optional argument.

\begin{verbatim}
\%\MessageBreak There is nothing here to make robust)\%
\\@eha
\}
\%

This macro renames a command, possibly with an optional argument (defined with \texttt{\textbackslash newcommand}) from \#2 to \#1, by renaming the internal macro \texttt{\\#2} to \texttt{\\#1} and defining \texttt{\\#1} appropriately, then undefining \texttt{\textbackslash \#2} and \texttt{\\#2}. The \texttt{\afterassignment} trick is to make both definitions in \texttt{\@copy@newcommand} global (which are local by default).

In case the macro was defined with \texttt{\textbackslash newcommand} and an optional argument, to replicate exactly the behaviour of \texttt{\textbackslash DeclareRobustCommand} we have to move also the internal \texttt{\textbackslash foo} to \texttt{\textbackslash foo}. In that case, \#1 will be a parameterless macro (\texttt{\robust@command@chk@safe} checks that), and \texttt{\@if@newcommand} will return true (both defined below in this file). If so, we can use \texttt{\@copy@newcommand} rather than plain \texttt{\let} to copy the command over. \texttt{\@kernel@rename@newcommand} does this test and carries out the renaming.

\begin{verbatim}
\def\@kernel@rename@newcommand#1#2{\%
  \robust@command@chk@safe#2\%
  {\@if@newcommand#2\%
    \afterassignment\global
    \global\@copy@newcommand#1#2\%
    \global\let#2\@undefined
    \global\expandafter\let\csname\string#2\endcsname\@undefined\%
    {\global\let#1=\#2}\%
  \}}\%
\}
\escapechar=\count@\%
\end{verbatim}

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\kernel@make@fragile \texttt{The opposite of} \MakeRobust \texttt{except that it doesn't do many checks as it is internal to the kernel. Why does one want such a thing? Only for compatibility reasons if } \latexrelease \texttt{requests a rollback of the kernel. For this reason we pretend that this command existed in all earlier versions of \LaTeX i.e., we are not rolling it back since we need it precisely then. But we have to get it into the } \latexrelease \texttt{file so that a roll forward is possible too.}

\begin{verbatim}
\end{verbatim}
1.5 Acting on robust commands

With most document level commands being robust now there is more of a requirement to have a standard way of aliasing (or copying) a command to a new name, for example to save an original definition before changing a command. \DeclareCommandCopy is analogous to \TeX’s \let, except that it copes with the different types of robust commands defined by \LaTeX’s mechanisms.

A couple of “types of robustness” are defined by the \LaTeX2ε kernel, namely robust commands defined with \DeclareRobustCommand and commands with optional arguments defined with \newcommand. However there are other types of robust commands that are frequently used, which are not defined in the \LaTeX2ε kernel, like commands defined with \preamble’s \NewDocumentCommand and \etoolbox’s \newrobustcmd.

In this section we will define a generic extensible machinery to act on robust commands. This code will then be used to test if a command is robust, considered the different types of robustness, and then either copy that definition, if \DeclareCommandCopy (or similar) is used, or show the definition of the command, if \ShowCommand is used.

The looping machinery is generic and knows nothing about what is to be done for each case. The syntax of the main macro \robust@command@act is:

\begin{verbatim}
\robust@command@act⟨action-list⟩⟨robust-cmd⟩⟨fallback-action⟩⟨act-arg⟩
\end{verbatim}

⟨action-list⟩ is a token list of the form:

\begin{verbatim}
\{⟨if-type-1⟩⟨act-type-1⟩\}
\{⟨if-type-2⟩⟨act-type-2⟩\}
\ldots
\end{verbatim}

\robust@command@act will iterate over the ⟨action-list⟩, evaluating each ⟨if-type-n⟩ ⟨robust-cmd⟩ ⟨⟨true⟩⟩\{⟨act-type-n⟩\}⟨⟨false⟩⟩. If the ⟨if-type-n⟩ conditional returns ⟨true⟩, then ⟨act-type-n⟩⟨act-arg⟩ is executed, and the loop ends. If the conditional returns ⟨false⟩, then ⟨if-type-n + 1⟩ is executed in the same way, until either one of the conditionals return ⟨true⟩, or the end of the ⟨action-list⟩ is reached. If the end is reached, then ⟨fallback-action⟩⟨act-arg⟩ is executed before \robust@command@act exits.

\robust@command@act will start by using \robust@command@act@chk@args to check if the ⟨robust-cmd⟩ (#2) is a parameterless (possibly \protected) macro. If it is not, the command is not a robust command: these always start with a parameterless user-level macro; in that case, \robust@command@act@end is used to short-circuit the process and do the ⟨fallback-action⟩ (#3). This first test is necessary because later on we need to be able to expand the ⟨robust-cmd⟩ without the risk of it Breaking Badly, and as a bonus, this speeds up the process in case we used \NewCommandCopy in a “normal” macro.
If \texttt{\robust@command@act@chk@args} branched to false, then \texttt{\robust@command@act@loop} will loop over the list of items in the \texttt{(action-list)} (#1), and process each item as described earlier. If the \texttt{(if-type-n)} command expands to \texttt{(true)} then \texttt{\robust@command@act@do} is used to execute \texttt{(act-type-n)} on the \texttt{(act-arg)}, otherwise the loop resumes with the next item.

If the end is reached and no action was taken, then do \texttt{(fallback-action)(act-arg)}.
1.5.1 Copying robust commands

\NewCommandCopy \NewCommandCopy \RenewCommandCopy \DeclareCommandCopy

\NewCommandCopy starts by checking if \#1 is already defined, and raises an error if so, otherwise the definition is carried out. \RenewCommandCopy does (almost) the opposite. If the command is not defined, then an error is raised. But the definition is carried out anyhow, so the behaviour is consistent with \renewcommand.

A \ProvideCommandCopy isn’t defined because it’s not reasonably useful. \provide... commands mean “define this if there’s no other definition”, but copying a command (usually) implies that the command being copied is defined, so \ProvideCommandCopy doesn’t make a lot of sense. But more importantly, the most common use case of copying a command is to redefine it later, while preserving the old definition, as in:

\ProvideCommandCopy \A \B
\renewcommand \B \{ ... \A ... \}

then, if \A is already defined the first line is skipped, an in this case \B won’t work as expected.

The three versions call the internal \declare@commandcopy with the proper action. \@firstofone will carry out the copy. The only case when the copy is not made is the \langle false\rangle case for \NewCommandCopy, in which the command already exists and the definition is aborted.

Start by checking if the command is already defined. The proper action is taken by each specific command above. If all’s good, then \robust@command@act is called with the proper arguments as described earlier, with \@declarecommandcopylisthook as the \langle action-list\rangle and \@declarecommandcopy@let as the \langle fallback-action\rangle.

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The initial definition of \@declarecommandcopylisthook contains the tests for the two types of robust command in the kernel.

\def\@declarecommandcopylisthook{%
{\@if@DeclareRobustCommand \@copy@DeclareRobustCommand}%
{\@if@newcommand \@copy@newcommand}}

The initial definition of \@declarecommandcopylisthook contains the same tests as used for copying, but \@show@... commands instead of \@copy@.... Same as before, it is initialized to cope with \DeclareRobustCommand and \newcommand with optional arguments.

\def\@showcommandlisthook{%
{\@if@DeclareRobustCommand \@show@DeclareRobustCommand}%
{\@if@newcommand \@show@newcommand}}

\@showcommandlisthook

Now the rollback code.

\long\def\declare@commandcopy@let#1#2{\let#1=#2\relax}

1.5.2 Showing robust commands

\ShowCommand

Most of the machinery defined for \NewCommandCopy can be used to show the definition of a robust command, in a similar fashion to texdef. The difference is that after the command’s is detected to have a given type of robustness, rather than making a copy, we use a separate routine to show its definition.

With all the machinery in place, \ShowCommand itself is quite simple: use \robust@command@act to iterate through the \@showcommandlisthook list, and if nothing is found, fallback to \show.

\long\def\ShowCommand#1{%
\robust@command@act
\@showcommandlisthook#1
\show#1}
Now the rollback code.

\begin{verbatim}
\/2ekernel\end{verbatim}
\begin{verbatim}
\{latexrelease\} \EndIncludeInRelease
\{latexrelease\} \IncludeInRelease{0000-00-00}{\ShowCommand}\%
\{latexrelease\} \let\ShowCommand\@undefined
\EndIncludeInRelease
\end{verbatim}

(End definition for \ShowCommand and \@showcommandlistbook.)

\begin{verbatim}
\/2ekernel\end{verbatim}
\begin{verbatim}
\{latexrelease\} \IncludeInRelease{2020-10-01}{\@if@DeclareRobustCommand}
\{latexrelease\} \{Add \@if@DeclareRobustCommand, \@if@newcommand,
\{latexrelease\} \{\@copy@DeclareRobustCommand, \@copy@newcommand,
\{latexrelease\} \{\@show@DeclareRobustCommand, \@show@newcommand\%
\{latexrelease\} \let\ShowCommand\@undefined
\\{latexrelease\} \let\@showcommandlisthook\@undefined
\EndIncludeInRelease

1.5.3 Commands defined with \texttt{\DeclareRobustCommand}
\texttt{\@if@DeclareRobustCommand}

Now that we provided a generic way to copy one macro to another, we need to define a way to check if a command is one of \LaTeX{}'s robust types. These tests are heavily based on Heiko's \texttt{\LetLtxMacro}, but chopped into separate macros. \texttt{\@if@DeclareRobustCommand} checks if a command \texttt{\cmd} was defined by \texttt{\DeclareRobustCommand}. The test returns true if the expansion of \texttt{\cmd} is exactly \texttt{\protect\cmd}.

\begin{verbatim}
\long\def\@if@DeclareRobustCommand\#1{\%
\begingroup\escapechar='\%\\edef\reserved@a{\string\#1}\%
\edef\reserved@b{\detokenize{\#1}}\%
\edef\@gtempa{\ifx\reserved@a\reserved@b
\noexpand\protect\noexpand\#1\fi
\noexpand\protect\expandafter\noexpand\csname\@expl@cs@to@str@@N\#1 \endcsname}\%
\endgroup
\ifx\@gtempa\#1\relax
\expandafter\@firstoftwo\else\expandafter\@secondoftwo\fi}
\end{verbatim}

If a command was defined by \texttt{\DeclareRobustCommand} (that is, \texttt{\@if@DeclareRobustCommand} returns true), then to make a copy of \texttt{\cmd} into \texttt{\foo} we define the latter such that it expands to \texttt{\protect\foo\cmd}, then make \texttt{\foo\cmd} equal to \texttt{\cmd}. There is one detail we need to take care of: if a command was defined with \texttt{\DeclareRobustCommand} it may still have an optional argument, in which case there is one more macro layer before the actual definition of the command. We use \texttt{\@if@newcommand} to check that and \texttt{\@copy@newcommand} to do the copying.

\begin{verbatim}
\long\def\@copy@DeclareRobustCommand\#1#2{\%
\end{verbatim}

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Showing the command is pretty simple. This command prints the top-level expansion as \TeX’s `\show` would, but with `robust macro:` rather than just `macro:`; then a blank line and then `\show` the inner command. For a macro defined with, say, \DeclareRobustCommand`\foo[1]{bar}`, it will print:

> `\foo=robust macro:  
->`\protect `\foo` .

> `\foo =`\long macro: 
#1->bar.

If the inner command is defined with an optional argument, then `\ShowCommand` is also used.

The value of `\escapechar` is deliberately not enforced, so `\ShowCommand` behaves more like `\show`.

(End definition for `\DeclareRobustCommand` and others.)
1.5.4 Commands defined with \newcommand (with optional argument)

A command \cmd (or \cmd_{opt}), if it was defined with \DeclareRobustCommand with an
optional argument will expand to \@protected@testopt\cmd\cmd\{<opt>\}. To check
that we look at the first three tokens in the expansion of \cmd, and return true or false
accordingly.

This test requires that the command be a parameterless macro, otherwise it will not
work (and probably break). This is ensured with \robust@command@chk@safe before
calling \@if@newcommand.

578 \long\def\@if@newcommand#1{%
579 \edef\reserved@a{%
580 \noexpand\@protected@testopt
581 \noexpand#1%
582 \expandafter\noexpand\csname\@backslashchar\@expl@cs@to@str@@N#1\endcsname}%
583 \edef\reserved@b{%
584 \unexpanded\expandafter\expandafter\expandafter
585 \expandafter\@carcube#1{}{}{}\@nil}}%
586 \ifx\reserved@a\reserved@b
587 \expandafter\@firstoftwo
588 \else
589 \expandafter\@secondoftwo
590 \fi

Then, if a command \cmd takes an optional argument, we copy it to \foo by defining
the latter to expand to \@protected@testopt\foo\foo\{<opt>\}.

591 \long\def\@copy@newcommand#1#2{%
592 \edef#1{\noexpand\@protected@testopt
593 \noexpand#1%
594 \expandafter\noexpand\csname\@backslashchar\@expl@cs@to@str@@N#1\endcsname
595 \unexpanded\expandafter\expandafter\expandafter
596 \expandafter\@gobblethree#2}}%
597 \let\csname\@backslashchar\@expl@cs@to@str@@N#1\expandafter\endcsname
598 \csname\@backslashchar\@expl@cs@to@str@@N#2\endcsname}

A command being \shown here is guaranteed to have an optional argument. Start by
showing the top-level expansion of the command (using \typeout to avoid TeX asking for
interaction and extra context lines), then call \show@newcommand@aux with the internal
command, which contains the actual definition, and with the expansion of the command
to extract the default value of the optional argument.

599 \long\def\shownewcommand#1{%
600 \typeout{\string#1=robust macro:}%
601 \typeout{\string#1=\string-\string replacement@spec\string-\string opt\string-\string opt=}\%\%
602 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
603 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
604 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
605 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
606 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
607 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
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617 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
618 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
619 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
620 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
621 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
622 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
623 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
624 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
625 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=}\%\%
626 \typeout{\string-\string opt=\string-\string opt=\string-\string opt=\string-\string opt=}\%\%

For a macro defined with, say, \newcommand\foo[1][opt]{bar}, it will print:

\> \foo=robust macro:
\> \@protected@testopt \foo \foo {opt}.
\> \foo=long macro:

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If the command was defined with `\DeclareRobustCommand`, then another pair of lines show the top-level expansion `\protect\foo␣␣`. The extra gymnastics with `\showtokens` ensures that `\showtokens` itself, and the internals of this macro aren’t showed in the context lines.

Now the rollback code.

```
⟨\2ekernel |\latexrelease⟩
\IncludeInRelease{2018-04-01}{\ifundefined}
⟨\latexrelease⟩{Leave commands undefined in \ifundefined}⟨∗\2ekernel |\latexrelease⟩
\EndIncludeInRelease
⟨∗\2ekernel⟩
```

(End definition for `\ifnewcommand` and others.)

### 1.6 Internal defining commands

These commands are used internally to define other \LaTeX{} commands.

`\ifundefined` Check if first arg is undefined or `\relax` and execute second or third arg depending.

```
⟨\2ekernel⟩
\IncludeInRelease{2018-04-01}{\ifdefined}
⟨\latexrelease⟩{Leave commands undefined in \ifdefined}⟨∗\2ekernel |\latexrelease⟩
\EndIncludeInRelease
⟨\2ekernel⟩
```

Version using `\ifcsname` to avoid defining undefined tokens to `\relax`. Defined here to simplify using unmatched `\fi`.

```
def\ifundefined#1{%
    \ifcsname#1\endcsname\ifundef\relax\else\ifundef\relax\fi\fi{#1}{}
}
```

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Now test of engine.

Classic version (should not be needed as etex is assumed).

Use the \ifcsname defined above.

Optimised version for Lua\TeX, using \lastnamedcs

(The end definition for \ifundefined.)

The following define \end and \relax to be the strings 'end' and 'relax' with the characters \catcode 12.

(End definition for \end and \relax.)

\ifnextchar \ifnextchar peeks at the following character and compares it with its first argument. If both are the same it executes its second argument, otherwise its third.
This macro is the kernel version of \ifnextchar which is used in a couple of places to prevent the AMS variant from being used since in some places this produced chaos (for example if an fd file is loaded in a random place then the optional argument to \ProvidesFile could get printed there instead of being written only in the log file. This happened when there was a space or a newline between the mandatory and optional arguments! It should really be fixed in the amsmath package one day, but...

Note that there may be other places in the kernel where this version should be used rather than the original, but variable, version.

\let\kernel@ifnextchar\@ifnextchar

\ifnch \ifnch is a tricky macro to skip any space tokens that may appear before the character in question. If it encounters a space token, it calls xifnch.

\def\ifnch{% 
\ifx\@let@token\@sptoken 
\let\reserved@c\@xifnch 
\else 
\ifx\@let@token\reserved@d 
\let\reserved@c\reserved@a 
\else 
\let\reserved@c\reserved@b 
\fi 
\fi 
\reserved@c}

\@sptoken The following code makes \@sptoken a space token. It is important here that the control sequence \: consists of a non-letter only, so that the following whitespace is significant. Together with the fact that the equal sign in a \let may be followed by only one optional space the desired effect is achieved. NOTE: the following hacking must precede the definition of \: as math medium space.

\def\:}{\let\@sptoken= } \: % this makes \@sptoken a space token

\@xifnch In the following definition of \@xifnch, \: is again used to get a space token as delimiter into the definition.

\def\\@xifnch}{\expandafter\def\:\{\futurelet\@let@token\@ifnch

\@ifstar The new implementation below avoids passing the \texttt{\langle true code\rangle} Through one more \def than the \texttt{\langle false code\rangle}, which previously meant that \# had to be written as \texttt{###} in one argument, but \#\# in the other. The * is gobbled by \@firstoftwo.

\def\@ifstar#1\@ifnextchar*{\@firstoftwo{#1}}
The command `\@sanitize` changes the catcode of all special characters except for braces to ‘other’. It can be used for commands like `\index` that want to write their arguments verbatim. Needless to say, this command should only be executed within a group, or chaos will ensue.

This makes the whole “meaning” of #1 (its one-level expansion) into catcode 12 tokens: it could be used in `\DeclareRobustCommand`. If it is to be used on default float specifiers, this should be done when they are defined.

The macro uses expl3’s `\expl@str@map@function@@NN` to iterate on the string (without losing spaces) and applies `\string@makeletter` on each character. The latter checks if character is between a–z or A–Z, and uses `\@alph` or `\@Alph` to get the corresponding catcode-11 token. Other tokens are passed through unchanged.
2 Discretionary Hyphenation

The primitive \texttt{\-} command adds a discretionary hyphen using the current font’s \texttt{hyphenchar}. Monospace fonts are usually declared with \texttt{hyphenchar} set to \texttt{−1} to suppress hyphenation. \LaTeX{}, from \LaTeX{}2.09 in 1986 defined \texttt{\-} by

\begin{verbatim}
def\-\{\discretionary{\-}{\{}{}\}
\end{verbatim}

The following comment was added when these commands were first set up, 19 April 1986:

\begin{quote}
the \texttt{\-} command is redefined to allow it to work in the \texttt{ttfamily} type style, where automatic hyphenation is suppressed by setting \texttt{hyphenchar} to \texttt{−1}. The original primitive \TeX{} definition is saved as \texttt{\@@hyph} just in case anyone needs it.
\end{quote}

\TeX{}2ε, between 1993 and 2017, had a comment at this point saying that the definition “would probably change” because the definition always uses \texttt{\-}. The definition used below was given in comments at this point during time.

In 2017 we finally enabled this definition by default, with the older \TeX{} definition accessible via \texttt{latexrelease} as usual.

In \LuaLaTeX{} the primitive definition of \texttt{\-} is used directly because it’s use of extended hyphenation parameters means that \texttt{\-} works correctly even with \texttt{hyphenchar} set to \texttt{−1}. This change makes \texttt{\-} under Lua\TeX{} compatible with language specific hyphenation characters.

Temporary definition of \texttt{\��latex\＠info}, final definition is later.

\begin{verbatim}
def\��latex\＠info\#1{}
\end{verbatim}
\def\defaulthyphenchar{
  \else
  \hyphenchar\font
  \fi
}
}
}\else
\let\-=\@hyphenchar
\fi
⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{2017/04/15}{\-}{Use \hyphenchar in \-}⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\DeclareRobustCommand{\-}{%
\MakeRobust\strut
\MakeRobust\underbar
\texttt{(2ekernel|latexrelease)}
\texttt{\EndIncludeInRelease}
\texttt{(latexrelease)}\IncludeInRelease{0000/00/00}%
\texttt{(latexrelease)}\allowbreak\{Make various commands robust\}%
\texttt{(latexrelease)}
\texttt{(latexrelease)}\kernel@make@fragile\allowbreak
\texttt{(latexrelease)}\kernel@make@fragile\bigbreak
\texttt{(latexrelease)}\kernel@make@fragile\break
\texttt{(latexrelease)}\kernel@make@fragile\dotfill
\texttt{(latexrelease)}\kernel@make@fragile\frenchspacing
\texttt{(latexrelease)}\kernel@make@fragile\goodbreak
\texttt{(latexrelease)}\kernel@make@fragile\hrulefill
\texttt{(latexrelease)}\kernel@make@fragile\medbreak
\texttt{(latexrelease)}\kernel@make@fragile\nobreak
\texttt{(latexrelease)}\kernel@make@fragile\obeylines
\texttt{(latexrelease)}\kernel@make@fragile\obeyspaces
\texttt{(latexrelease)}\kernel@make@fragile\slash
\texttt{(latexrelease)}\kernel@make@fragile\smallbreak
\texttt{(latexrelease)}\kernel@make@fragile\strut
\texttt{(latexrelease)}\kernel@make@fragile\underbar
\texttt{(latexrelease)}\texttt{(latexrelease)}\EndIncludeInRelease
\texttt{(latexrelease)}\texttt{(latexrelease)}(2ekernel)

\g@addto@macro\texttt{Globally add to the end of a macro. This macro is used by the kernel to add to its internal hooks.}
\texttt{\long\def\g@addto@macro#1#2{%}
\texttt{\begingroup}
\texttt{\toks0\expandafter{#1#2}}%
\texttt{\xdef\the\toks0\{#1\}}%
\texttt{\endgroup}}

\texttt{(End definition for \g@addto@macro.)}
\texttt{(/2ekernel)}
1 Creating document commands

Document commands should be created using the tools provided by this module: \NewDocumentCommand, etc., in almost all cases. This allows clean separation of document-level syntax from code-level interfaces. Users have a need to create new document commands, and as such a significant amount of documentation for \texttt{ltcmd} is provided as part of \texttt{usrguide3}. Here, additional material aimed at programmers is provided

\begin{verbatim}
\lstinputlisting{ltcmd.dtx}
\end{verbatim}

1.1 Variables and constants

\begin{verbatim}
\tl_new:N \l__cmd_arg_spec_tl \\
\tl_new:N \l__cmd_args_tl \\
\tl_new:N \l__cmd_args_i_tl \\
\tl_new:N \l__cmd_args_ii_tl \\
\int_new:N \l__cmd_current_arg_int
\end{verbatim}

\l__cmd_arg_spec_tl Holds the argument specification after normalization of shorthands.
\l__cmd_args_tl Token list variable for grabbed arguments.
\l__cmd_args_i_tl \l__cmd_args_ii_tl Hold the modified arguments when dealing with default values or processors.
\l__cmd_current_arg_int The number of the current argument being set up: this is used to make sure there are at most 9 arguments, then for creating the expandable auxiliary functions and knowing how many arguments the code function should take.
The boolean indicates whether there are any argument with default value other than -NoValue-; the token list holds the code to determine these default values in terms of other arguments.

\bool_new:N \l__cmd_defaults_bool
\tl_new:N \l__cmd_defaults_tl

Generating environments uses the same mechanism as generating functions. However, full processing of arguments is always needed for environments, and so the function-generating code needs to know this. This variable is also used at run time to give correct error messages.

\bool_new:N \l__cmd_environment_bool
\str_new:N \l__cmd_environment_str

Used to indicate if an expandable command is begin generated, as this affects both the acceptable argument types and how they are implemented.

\bool_new:N \l__cmd_expandable_bool
\tl_new:N \l__cmd_expandable_aux_name_tl
\tl_set:Nn \l__cmd_expandable_aux_name_tl { \l__cmd_function_tl \c_space_tl ( arg~ \int_use:N \l__cmd_current_arg_int ) }

Used to create pretty-printing names for the auxiliaries: although the immediate definition does not vary, the full expansion does and so it does not count as a constant.

\tl_new:N \l__cmd_fn_tl
\tl_new:N \l__cmd_fn_code_tl
\l__cmd_function_tl  Holds the control sequence name of the function currently being defined: used to avoid passing this as an argument and to avoid repeated use of \cs_to_str:N.
30  \tl_new:N \l__cmd_function_tl

\l__cmd_grab_expandably_bool
When defining a non-expandable command, indicates whether the arguments can all safely be grabbed by expandable grabbers. This is to support abuses of xparse that use protected functions inside csname constructions.
31  \bool_new:N \l__cmd_grab_expandably_bool

\l__cmd_obey_spaces_bool
For trailing optionals.
32  \bool_new:N \l__cmd_obey_spaces_bool

\l__cmd_last_delimiters_tl
Holds the delimiters (first tokens) of all optional arguments since the previous mandatory argument, to warn about cases where it would be impossible to omit optional arguments completely because the following mandatory argument has the same delimiter as one of the optional arguments.
33  \tl_new:N \l__cmd_last_delimiters_tl

\l__cmd_long_bool
Used to indicate that an argument is long, on a per-argument basis.
34  \bool_new:N \l__cmd_long_bool

\l__cmd_m_args_int
The number of m arguments: if this is the same as the total number of arguments, then a short-cut can be taken in the creation of the grabber code.
35  \int_new:N \l__cmd_m_args_int

\l__cmd_prefixed_bool
When preparing the signature of non-expandable commands, indicates that the current argument is affected by a processor or by + (namely is long).
36  \bool_new:N \l__cmd_prefixed_bool

\l__cmd_process_all_tl
\l__cmd_process_one_tl
\l__cmd_process_some_bool
When preparing the signature, the processors that will be applied to a given argument are collected in \l__cmd_process_one_tl, while \l__cmd_process_all_tl contains processors for all arguments. The boolean indicates whether there are any processors (to bypass the whole endeavour otherwise).
37  \tl_new:N \l__cmd_process_all_tl
38  \tl_new:N \l__cmd_process_one_tl
39  \bool_new:N \l__cmd_process_some_bool
\__cmd_saved_args_tl
Stores \__cmd_args_tl to deal with space-trimming of b-type arguments.
\tl_new:N \__cmd_saved_args_tl

\__cmd_signature_tl
Used when constructing the signature (code for argument grabbing) to hold what will become the implementation of the main function. When arguments are grabbed (at point of use of the command/environment), it also stores the code for grabbing the remaining arguments.
\tl_new:N \__cmd_signature_tl

\__cmd_some_obey_spaces_bool
\__cmd_some_long_bool
\__cmd_some_short_bool
These flags are set while normalizing the argument specification. The obey_spaces one is used to detect when ! is used on an argument that is not a trailing optional argument. The other two are used to check whether all short arguments appear before long arguments: this is needed to grab arguments expandably. As soon as the first long argument is seen (other than t-type, whose long status is ignored) the some_long flag is set. The some_short flag is used for expandable commands, to know whether to define a short auxiliary too.
\bool_new:N \__cmd_some_obey_spaces_bool
\bool_new:N \__cmd_some_long_bool
\bool_new:N \__cmd_some_short_bool

\__cmd_tmp_prop
\__cmd_tmpa_tl
\__cmd_tmpb_tl
Scratch space.
\prop_new:Nnn \g_msg_module_type_prop { cmd } { LaTeX }

1.2 Declaring commands and environments
The main functions for creating commands set the appropriate flag then use the same internal code to do the definition.
\cs_new_protected:Npn \__cmd_declare_cmd:Nnn
The first stage is to log information, both for the user in the log and for programmatic use in a property list of all declared commands.

At definition time, the variable \l__cmd_fn_tl is only used for error messages. The real business of defining a document command starts with setting up the appropriate name, then normalizing the argument specification to get rid of shorthands.

(End definition for \__cmd_declare_cmd:Nnn and others.)

A marker used to escape from creating a definition if necessary.

(End definition for \__cmd_break_point:n.)
The appropriate auxiliary is called.

Standard functions call `\__cmd_start:nNNnnn`, which receives the argument specification, an auxiliary used for grabbing arguments, an auxiliary containing the code, and then the signature, default arguments, and processors.

Expandable functions and functions whose arguments can be grabbed expandably call `\__cmd_start_expandable:nNNNNnn`, which receives the argument specification, four auxiliaries (two for grabbing arguments, one for the code, and one for default arguments), and finally the signature. Non-expandable functions that take this branch should nevertheless be protected, as well as their code function. They will only be expanded in contexts such as constructing a csname. The two grabbers (named after the function with one or two spaces) are needed when there are both short and long arguments; otherwise the same grabber is included twice in the definition. If all arguments are long or all are short the (only) grabber is defined correspondingly to be long/short. Otherwise two grabbers are defined, one long, one short.
The lead-off to creating an environment is much the same as that for creating a command: issue the appropriate message, store the argument specification then hand off to an internal function.

\cs_new_protected:Npn \_\_cmd_declare_env:nnnn \_\_cmd_environment_str
\_\_cmd_environment_str
\_\_cmd_function_tl \_\_cmd_environment_str
\_\_cmd_start_expansible:n
\_\_cmd_start_expansible:n
\_\_cmd_start_expansible:n\n
(End definition for \_\_cmd_declare_cmd_code:Nnn, \_\_cmd_declare_cmd_code_aux:Nnn, and \_\_cmd_declare_cmd_code_expansible:Nnn.)
Creating a document environment requires a few more steps than creating a single command. In order to pass the arguments of the command to the end of the function, it is necessary to store the grabbed arguments. To do that, the function used at the end of the environment has to be redefined to contain the appropriate information. To minimize the amount of expansion at point of use, the code here is expanded now as well as when used. The last argument of \_\_\_cmd_declare_env_internal:NNnn is only run if the definition succeeded. In package mode this ensures that the original definition of the environment is not changed if the definition fails for any reason. This also avoids an error when defining the end\_aux function when the user asks for more than 9 arguments.

(End definition for \_\_\_cmd_declare_env:nnnn and \_\_\_cmd_declare_env_internal:nnnn.)

1.3 Structure of xparse commands

For error messages that occur during run-time when getting arguments of environments it is necessary to keep track of the environment name. We begin non-expandable commands with a token equal to \scan_stop:, whose name gives a reasonable error message
if the command is used inside a csname and protects against f-expansion. This is useless for environments since \begin is already not expandable. Both the command and environment codes start with \group_align_safe_begin; then \__cmd_run_code: (used by both) does \group_align_safe_end:, so that delimited arguments may be grabbed in alignments if they contain and alignment tab token (see latex3/latex3/issues/839).

\cs_new_protected:Npn \__cmd_start_env:nnnnn #1#2
\begin{conditionally@traceoff}
\group_align_safe_begin:
\str_set:Nn \l__cmd_environment_str {#2}
\bool_set_true:N \l__cmd_environment_bool
\__cmd_start_aux:ccnnnn
\{ environment- \l__cmd_environment_str \c_space_tl \}
\{ environment- \l__cmd_environment_str \c_space_tl code \}
\{#1\}
\end{conditionally@traceoff}
\__cmd_start_aux:ccnnnn
\cs_new_protected:Npx \__cmd_start:nNNnnn #1#2#3
\begin{conditionally@traceoff}
\exp_not:c { xparse~function~is~not~expandable }
\exp_not:N \conditionally@traceoff
\exp_not:N \group_align_safe_begin:
\exp_not:n { \bool_set_false:N \l__cmd_environment_bool }
\exp_not:N \__cmd_start_aux:NNnnnn
\#2 \#3 \{#1\}
\end{conditionally@traceoff}
\__cmd_start_aux:NNnnnn
\end{definition}

\__cmd_start_aux:NNnnnn
This sets up a few variables to minimize the boilerplate code included in all xparse-defined commands. It then runs the grabbers \#4. Again, the argument specification \#1 is only for diagnostics.

\cs_new_protected:Npn \__cmd_start_aux:NNnnnn #1#2#3#4#5#6
\begin{tl_clear:N \l__cmd_args_tl
\tl_set:Nn \l__cmd_fn_tl {#1}
\tl_set:Nn \l__cmd_fn_code_tl {#2}
\tl_set:Nn \l__cmd_defaults_tl {#5}
\tl_set:Nn \l__cmd_process_all_tl {#6}
\#4
\__cmd_run_code:
\end{tl_clear:N}
\cs_generate_variant:Nn \__cmd_start_aux:NNnnnn { cc }
\end{definition}

\__cmd_run_code:
After arguments are grabbed, this function is responsible for inserting default values, running processors, and finally doing \group_align_safe_end: as promised, and running the code.

\cs_new_protected:Npn \__cmd_run_code:
\begin{tl_if_empty:NF \l__cmd_defaults_tl { \__cmd_defaults: }
\tl_if_empty:NF \l__cmd_process_all_tl { \__cmd_process_all_tl }
\bool_if:NT \l__cmd_environment_bool
\{ \exp_args:No \__cmd_set_environment_end:n \l__cmd_environment_str \}
\end{tl_if_empty:NF}
First construct \texttt{\_cmd_tmp:w} (see below) that will receive the arguments found so far and determine default values for any missing argument. Then call it repeatedly until the set of arguments stabilizes. Since that could lead to an infinite loop we only call it up to nine times, the maximal number needed for stabilization if there is a chain of arguments that depend on each other. If that fails to stabilize raise an error.

To construct \texttt{\_cmd_tmp:w}, first go through the arguments found and the corresponding defaults, building a token list with \texttt{\{#⟨arg number⟩\}} for arguments found in the input (whose default will not be used) and otherwise \texttt{\{\exp_not:n{⟨default⟩}\}} for arguments whose default will be used.
\exp_args:NV \__cmd_defaults_def:nnn \l__cmd_current_arg_int
\cs_new_protected:Npn \__cmd_defaults_def:nnn #1#2#3
{\tl_put_right:Nx \l__cmd_tmpa_tl
{\exp_not:N \exp_not:n
{\tl_if_novalue:nTF {#2}
{\exp_not:o {#3}}
{\exp_not:n { ## #1}}
}
}
}
(End definition for \__cmd_defaults: and others.)
\__cmd_args_process:
\__cmd_args_process_loop:nn
\__cmd_args_process_aux:n
Loop through arguments (stored in \l__cmd_args_tl) and the corresponding processors (in \l__cmd_process_all_tl) simultaneously, apply all processors for each argument and store the result back into \l__cmd_args_tl. To allow processors to depend on other arguments, for every processor define a temporary auxiliary that receives all arguments \l__cmd_args_tl.
\cs_new_protected:Npn \__cmd_args_process:
{\tl_clear:N \l__cmd_args_ii_tl\__cmd_tl_mapthread_function:NNN \l__cmd_args_tl \l__cmd_process_all_tl \__cmd_args_process_loop:nn
\tl_set_eq:NN \l__cmd_args_tl \l__cmd_args_ii_tl}
\cs_new_protected:Npn \__cmd_args_process_loop:nn #1#2
{\tl_set:Nn \ProcessedArgument {#1}\tl_if_novalue:nF {#1}{\tl_map_function:nN {#2} \__cmd_args_process_aux:n }\tl_put_right:No \l__cmd_args_ii_tl {\exp_after:wN \ProcessedArgument}
}
\cs_new_protected:Npn \__cmd_args_process_aux:n #1
{\cs_generate_from_arg_count:NNnn \__cmd_tmp:w \cs_set:Npn {\tl_count:N \l__cmd_args_tl} {#1}\exp_args:NNNo \exp_after:wN \__cmd_tmp:w \l__cmd_args_tl {\ProcessedArgument}
}
(End definition for \__cmd_args_process:, \__cmd_args_process_loop:nn, and \__cmd_args_process_aux:n.)
This is called for all expandable commands. #6 is the signature, responsible for grabbing arguments. #5 is used to determine default values (or is ? if there are none). #4 is
the code to run. #2 and #3 are functions (named after the command) that grab a single argument in the input stream (#3 is short). The argument specification #1 is only used by diagnostic functions. Same as for the non-expandable version, this starts with \texttt{\_\_cmd_start_redefine:nNNNNn}:

\begin{verbatim}
\cs_new:Npn \_\_cmd_start_redefine:nNNNNn \#1\#2\#3\#4\#5\#6
{ \group_align_safe_begin:
  \_\_cmd_end_redefine:nw \#5 \#4 \q_{\_\_cmd} \#2\#3
}
\end{verbatim}

(End definition for \_\_cmd_start_redefine:nNNNNn.)

Followed by a function #1 to determine default values (or \texttt{?} if there are no defaults), the code #2, arguments that have been grabbed, then \texttt{\q_{\_\_cmd}} and two generic grabbers. The idea to find default values is similar to the non-expandable case but we cannot define an auxiliary function, so at every step in the loop we need to go through all arguments searching for which ones started out as \texttt{-NoValue-} and replacing these by the newly computed values. In fact we need to keep track of three versions of all arguments: the original version, the previous version with default values, and the currently built version (first argument of \_\_cmd_end_redefine_defaults:nnnNNn).

\begin{verbatim}
\cs_new:Npn \_\_cmd_end_redefine_defaults:nnnNNn \#1\#2\#3\#4\#5\#6
{ \str_if_eq:nTF {\#1} \#2 { \exp_args:No \_\_cmd_end_redefine_defaults:nnw \#1\#2\#3\#4\#5\#6 } { \exp_args:No \_\_cmd_end_redefine_defaults:nnNn \#1\#2\#3\#4\#5 } }
\end{verbatim}

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1.4 Normalizing the argument specifications

The goal here is to expand aliases and check that the argument specification is valid before the main parsing run. If it is not valid the entire setup is abandoned to avoid any strange internal errors. A function is provided for each argument type that will grab any extra data items and call the loop function after performing the following checks and tasks.

- Check that each argument has the correct number of data items associated with it, and that where a single character is required, one has actually been supplied.
- Check that processors and the markers \texttt{+} and \texttt{!} are followed by an argument for which they make sense, and are not redundant.
- Check the absence of forbidden types for expandable commands, namely \texttt{G/v} always, and \texttt{1/u} after optional arguments (\texttt{xparse} may have inserted braces due to a failed search for an optional argument).
- Check that no optional argument is followed by a mandatory argument with the same delimiter, as otherwise the optional argument could never be omitted.
- Keep track in \texttt{\l__cmd_some_long_bool} and \texttt{\l__cmd_some_short_bool} of whether the command has some long/short arguments.
- Keep track in \texttt{\l__cmd_grab_expandably_bool} of whether all arguments are \texttt{m/l/u} type and short arguments appear before long ones, in which case they can be grabbed expandably just as safely as they could be grabbed nonexpandably. Regardless of that, arguments of expandable commands will be grabbed expandably and arguments of environments will not (because the list of arguments built by non-expandable grabbing is used to pass them to the end-environment code).

Further checks happen at the end of the loop:

- that there are at most 9 arguments;
- that an expandable command does not end with an optional argument (this case is detected by using the fact that \texttt{\l__cmd_last_delimiters_tl} is cleared by every mandatory argument and filled by every optional argument).
\bool_set_true:N \l__cmd_grab_expandably_bool
\bool_set_false:N \l__cmd_obey_spaces_bool
\bool_set_false:N \l__cmd_long_bool
\bool_set_false:N \l__cmd_some_obey_spaces_bool
\bool_set_false:N \l__cmd_some_long_bool
\bool_set_false:N \l__cmd_some_short_bool
\__cmd_normalize_arg_spec_loop:n #1
\q_recursion_tail \q_recursion_tail \q_recursion_stop
\int_compare:nNnT \l__cmd_current_arg_int > 9
{\msg_error:nnxx { cmd } { too-many-args }
 \{ \_cmd_environment_or_command: \{ \tl_to_str:n \#1 \} \}
 \_cmd_bad_def:wn
}
\bool_if:NT \l__cmd_expandable_bool
{ \tl_if_empty:NF \l__cmd_last_delimiters_tl
 \{ \msg_error:nnxx { cmd } { expandable-ending-optional }
 \{ \low_char:N \ \l__cmd_function_tl \} \tl_to_str:n \#1 \}
 \_cmd_bad_def:wn
}
\bool_if:NT \l__cmd_expandable_bool
{ \bool_set_true:N \l__cmd_grab_expandably_bool }
\bool_if:NT \l__cmd_environment_bool
{ \bool_set_false:N \l__cmd_grab_expandably_bool }
\cs_new_protected:Npn \__cmd_normalize_arg_spec_loop:n #1
{ \quark_if_recursion_tail_stop:n \#1
 \int_incr:N \l__cmd_current_arg_int
 \cs_if_exist_use:cF { __cmd_normalize_type_ \tl_to_str:n \#1 \:w }
 { \bool_lazy_any:nTF
 { \str_if_eq_p:nn \#1 \ { G }
 } \str_if_eq_p:nn \#1 \ { g }
 { \str_if_eq_p:nn \#1 \ { l }
 } \str_if_eq_p:nn \#1 \ { u }
 }
{ \msg_error:nnxx { cmd } { xparse-arg-type }
 \{ \_cmd_environment_or_command: \{ \tl_to_str:n \#1 \} \}
 }
 { \msg_error:nnxx { cmd } { unknown-argument-type }
 \{ \_cmd_environment_or_command: \{ \tl_to_str:n \#1 \} \}
 }
 \_cmd_bad_def:wn
}
(End definition for \__cmd_normalize_arg_spec:n and \__cmd_normalize_arg_spec_loop:n.)
These argument types are aliases of more general ones, for example with the default argument `-NoValue-`. To easily insert that marker expanded in the definitions we call \__cmd_tmp:w with the argument `-NoValue-`. For argument types that need additional data, check that the data is present (not \q_recursion_tail) before proceeding.

\cs_set_protected:Npn \__cmd_tmp:w #1
\{
  \cs_new_protected:Npn \__cmd_normalize_type_d:w ##1##2
  \{
    \quark_if_recursion_tail_stop_do:nn {##2} { \__cmd_bad_arg_spec:wn }
    \__cmd_normalize_type_D:w {##1} {##2} {#1}
  \}
\}
\cs_new_protected:Npn \__cmd_normalize_type_e:w ##1
\{
  \quark_if_recursion_tail_stop_do:nn {##1} { \__cmd_bad_arg_spec:wn }
  \__cmd_normalize_type_E:w {##1} { }
\}
\cs_new_protected:Npn \__cmd_normalize_type_o:w
\{
  \__cmd_normalize_type_D:w \[ \] {#1}
\}
\cs_new_protected:Npn \__cmd_normalize_type_O:w
\{
  \__cmd_normalize_type_D:w \[ \]
\}
\cs_new_protected:Npn \__cmd_normalize_type_r:w ##1##2
\{
  \quark_if_recursion_tail_stop_do:nn {##2} { \__cmd_bad_arg_spec:wn }
  \__cmd_normalize_type_R:w {##1} {##2} {#1}
\}
\cs_new_protected:Npn \__cmd_normalize_type_s:w
\{
  \__cmd_normalize_type_t:w * 
\}
\exp_args:No \__cmd_tmp:w { \c_novalue_tl }
\}
\)

(End definition for \__cmd_normalize_type_d:w and others.)

Check that these prefixes have arguments, namely that the next token is not \q_recursion_tail, and remember to leave it after the looping macro. Processors are forbidden in expandable commands. If all is good, store the prefix in the cleaned up \l__cmd_arg_spec_tl, and decrement the argument number as prefixes do not correspond to arguments.

\cs_new_protected:cpn { __cmd_normalize_type_>:w } #1#2
\{
  \quark_if_recursion_tail_stop_do:nn {#2} { \__cmd_bad_arg_spec:wn }
  \bool_if:NT \l__cmd_expandable_bool
  \{
    \msg_error:nnxx { cmd } { processor-in-expandable }
    \{ \iow_char:N \l__cmd_function_tl \} { \tl_to_str:n {#1} }
    \__cmd_bad_def:wn
  \}
  \tl_put_right:Nx \l__cmd_arg_spec_tl { > { \tl_trim_spaces:n {#1} } }
  \int_decr:N \l__cmd_current_arg_int
  \bool_set_false:N \l__cmd_grab_expandably_bool
  \__cmd_normalize_arg_spec_loop:n {#2}
\}
\cs_new_protected:cpn { __cmd_normalize_type_+:w } #1
\{

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Optional argument types. Check that all required data is present (and consists of single characters if applicable) and check for forbidden types for expandable commands. For E-type require that there is at least one embellishment, that each one is a single character, and that there aren’t more optional arguments than embellishments; also remember that each embellishment counts as one argument for \l__cmd_current_arg_int. Then in each case store the data in \l__cmd_arg_spec_tl, and for later checks store in \l__cmd_last_delimiters_tl the tokens whose presence determines whether there is an optional argument (for braces store {}, seen later as an empty delimiter).

\cs_new_protected:Npn \__cmd_normalize_type_D:w #1#2#3
\quark_if_recursion_tail_stop_do:nn {#3} { \__cmd_bad_arg_spec:wn }
\__cmd_single_token_check:n {#1} \__cmd_allowed_token_check:N #1
\__cmd_single_token_check:n {#2}
\__cmd_add_arg_spec:n { D #1 #2 {#3} }
\tl_if_blank:nT {#1} { \__cmd_bad_arg_spec:wn }
\tl_map_function:nN {#1} \__cmd_single_token_check:n
\tl_map_function:nN {#1} \__cmd_allowed_token_check:N
\__cmd_normalize_arg_spec_loop:n {#1}
\tl_put_right:Nn \l__cmd_last_delimiters_tl {#1}
\bool_set_false:N \l__cmd_grab_expandably_bool
\__cmd_normalize_arg_spec_loop:n

\cs_new_protected:Npn \__cmd_normalize_type_E:w #1#2
\quark_if_recursion_tail_stop_do:nn {#2} { \__cmd_bad_arg_spec:wn }
\tl_if_blank:nT {#1} { \__cmd_bad_arg_spec:wn }
\tl_map_function:nN {#1} \__cmd_single_token_check:n
\tl_map_function:nN {#1} \__cmd_allowed_token_check:N
\__cmd_normalize_E_unique_check:w #1 \q_nil \q_stop
Mandatory arguments. First check the required data is present, consists of single characters where applicable, and that the argument type is allowed for expandable commands if applicable. For the m and R argument types check that they do not follow some optional argument with that delimiter as otherwise the optional argument could not be omitted. Then save data in \l__cmd_arg_spec_tl, count the mandatory argument, and empty the list of last delimiters.
\__cmd_normalize_arg_spec_loop:n
}\cs_new_protected:Npn \__cmd_normalize_type_v:w
{\__cmd_normalize_check_gv:N v
\__cmd_add_arg_spec_mandatory:n { v }
\__cmd_normalize_arg_spec_loop:n
}

(End definition for \__cmd_normalize_type_m:w, \__cmd_normalize_type_R:w, and \__cmd_normalize_type_v:w.)
\__cmd_normalize_type_b:w
This argument type is not allowed for commands. This is only allowed at the end of the argument specification, hence we check that #1 is the end.
\cs_new_protected:Npn \__cmd_normalize_type_b:w #1
{\bool_if:NF \l__cmd_environment_bool
{\msg_error:nnxx { cmd } { invalid-command-arg }
{ \__cmd_environment_or_command: } { b }
\__cmd_bad_def:wn
}
\tl_clear:N \l__cmd_last_delimiters_tl
\__cmd_add_arg_spec:n { b }
\quark_if_recursion_tail_stop:n {#1}
\msg_error:nnxx { cmd } { arg-after-body }
{ \__cmd_environment_or_command: }
{ \tl_to_str:n {#1} }
\__cmd_bad_def:wn
}

(End definition for \__cmd_normalize_type_b:w.)
\__cmd_single_token_check:n
Checks that the argument is a single (non-space) token (possibly surrounded by spaces), and aborts the definition otherwise.
\cs_new_protected:Npn \__cmd_single_token_check:n #1
{\tl_trim_spaces_apply:nN {#1} \tl_if_single_token:nF
{\msg_error:nnxx { cmd } { not-single-token }
{ \__cmd_environment_or_command: }
{ \tl_to_str:n {#1} }
\__cmd_bad_def:wn
}
}

(End definition for \__cmd_single_token_check:n.)
\__cmd_allowed_token_check:N
Some tokens are now allowed as delimiters for some argument types, notably implicit begin/end-group tokens (\bgroup/\egroup). The major problem with these tokens is that for \peek_... functions, a literal \{1. is virtually indistinguishable from a \bgroup or other token which was \let to a \{1, and the same goes for \}2. All other tokens can be easily distinguished from their implicit counterparts by grabbing them and looking at the string length (see \__cmd_token_if_cs:NTF), but for begin/end group tokens
that is not possible without the risk of mistakenly grabbing the entire brace group (potentially leading to a `Runaway argument` error) or trying to grab a `}`, leading to an `Argument of \dots has an extra }` error.

```latex
\cs_new_protected:Npn \__cmd_allowed_token_check:N #1
\token_if_eq_meaning:NNTF #1 \c_group_begin_token
{ \use:n }
\token_if_eq_meaning:NNTF #1 \c_group_end_token
{ \use:n }
{ \use_none:n }
{ \msg_error:nnxxx { cmd } { forbidden-group-token }
\__cmd_environment_or_command: } { \tl_to_str:n {#1} }
\token_if_eq_meaning:NNTF #1 \c_group_begin_token
{ begin } { end }
\__cmd_bad_def:wn
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```
```
```latex
\__cmd_normalize_check_gv:N
\__cmd_normalize_check_lu:N
\__cmd_delimiter_check:nnn
\end{definition}
```
\cs_new_protected:Npn \_cmd_delimiter_check:nnn \#1\#2\#3
\{ 
\tl_map_inline:Nn \_cmd_last_delimiters_tl
\{ 
\tl_if_eq:nnT {##1} {#1}
\{ 
\msg_warning:nxxx \{ cmd \} \{ optional-mandatory \}
\{#2} \{#3\}
\}
\}
\}

(End definition for \_cmd_delimiter_check:nnn.)

\_cmd_bad_arg_spec:wn
\_cmd_bad_def:wn
If the argument specification is wrong, this provides an escape from the entire definition process.
\cs_new_protected:Npn \_cmd_bad_arg_spec:wn \#1 \_cmd_break_point:n \#2
\{ 
\msg_error:nxxx \{ cmd \} \{ bad-arg-spec \}
\{ \_cmd_environment_or_command: \} \{ \tl_to_str:n \{#2\} \}
\}
\cs_new_protected:Npn \_cmd_bad_def:wn \#1 \_cmd_break_point:n \#2 \{ \}

(End definition for \_cmd_bad_arg_spec:wn and \_cmd_bad_def:wn.)

\_cmd_add_arg_spec:n
\_cmd_add_arg_spec_mandatory:n
When adding an argument to the argument specification, set the some_long or some_short booleans as appropriate and clear the booleans keeping track of + and ! markers. Before that, test for a short argument following some long arguments: this is forbidden for expandable commands and prevents grabbing arguments expandably.

For mandatory arguments do some more work, in particular complain if they were preceeded by !.
\cs_new_protected:Npn \_cmd_add_arg_spec:n \#1
\{ 
\bool_lazy_and:nnT
\{ ! \_cmd_long_bool \}
\{ \_cmd_some_long_bool \}
\{ 
\bool_if:NT \_cmd_expandable_bool
\{ 
\msg_error:nx \{ cmd \} \{ long-short-mix \}
\{ \iow_char:N \\_cmd_function_tl \}
\_cmd_bad_def:wn
\}
\bool_set_false:N \_cmd_grab_expandably_bool
\}
\bool_if:NTF \_cmd_long_bool
\{ \bool_set_true:N \_cmd_long_bool \}
\{ \bool_set_true:N \_cmd_some_long_bool \}
\tl_put_right:Nx \_cmd_arg_spec_tl
\{ 
\bool_if:NTF \_cmd_long_bool \{ + \}
\bool_if:NTF \_cmd_obey_spaces_bool \{ ! \}
\exp_not:n \{#1\}
\}

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1.5 Preparing the signature: general mechanism

Actually creating the signature uses the same loop approach as normalizing the signature. There are first a number of variables which need to be set to track what is going on. Many of these variables are unused when defining expandable commands.

The main looping function does not take an argument, but carries out the reset on the processor boolean. This is split off from the rest of the process so that when actually setting up processors the flag-reset can be bypassed.

For each known argument type there is an appropriate function to actually do the addition to the signature. These are separate for expandable and standard functions, as the approaches are different.

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\begin{quote}
\begin{verbatim}
\cs_new_protected:Npn \__cmd_prepare_signature:n #1 \q_recursion_tail \q_recursion_stop
\bool_if:NF \l\_cmd_expandable_bool { \__cmd_flush_m_args: }
\end{verbatim}
\end{quote}

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For each known argument type there is an appropriate function to actually do the addition to the signature. These are separate for expandable and standard functions, as the approaches are different.

\begin{quote}
\begin{verbatim}
\cs_new_protected:Npn \__cmd_prepare_signature:N #1 \q_recursion_tail \q_recursion_stop
\bool_if:NF \l\_cmd_expandable_bool { \__cmd_flush_m_args: }
\end{verbatim}
\end{quote}

The main looping function does not take an argument, but carries out the reset on the processor boolean. This is split off from the rest of the process so that when actually setting up processors the flag-reset can be bypassed.

For each known argument type there is an appropriate function to actually do the addition to the signature. These are separate for expandable and standard functions, as the approaches are different.

\begin{quote}
\begin{verbatim}
\cs_new_protected:Npn \__cmd_prepare_signature_bypass:N #1 \q_recursion_tail \q_recursion_stop
\end{verbatim}
\end{quote}
1.6 Setting up a standard signature

Each argument-adding function appends to the signature a grabber (and for some types, the delimiters or default value), except the one for m arguments. These are collected and added to the signature all at once by \_\_cmd_flush_m_args, called for every other argument type. All of the functions then call the loop function \_\_cmd_prepare_signature:N. Default values of arguments are collected by \_\_cmd_add_default:n rather than being stored with the argument; this function and \_\_cmd_add_default: are also responsible for keeping track of \l__cmd_current_arg_int.

\_\_cmd_add_type_+:+w Making the next argument long means setting the flag. The m arguments are recorded here as this has to be done for every case where there is then a long argument.

\_\_cmd_add_type_!:+w Much the same for controlling trailing optional arguments.

\_\_cmd_add_type_>:w When a processor is found, the processor code is stored. It will be used by \_\_cmd_args_process: once arguments are all found. Here too the loop calls \_\_cmd_prepare_signature_bypass:N rather than \_\_cmd_prepare_signature:N so that the flag is not reset.
The E-type argument needs a special handling of default values. Since each embellishment is a separate argument, it also needs to replicate the argument processors for each embellishment argument so that the numbers of arguments and processors remain in sync.

In the command’s argument processor signature (the final argument of \_\_cmd_\_start:nNNnnn) there is one braced item for each formal argument (up to nine), and in each of these items there is one braced item for each processor (as many as there were processors declared for a given argument). Something like this:

\{ % argument processors
  \{ % argument 1
    \{ processor 1 \} \{ processor 2 \} \ldots \{ processor n \}
The function \__cmd_add_grabber:N adds one single grabber for an argument, and adds the braced item for that one argument. However, in an E-type argument each embellishment requires its own formal argument, so we need to break out of one layer of braces in \l__cmd_process_one_tl, add copies of the processor as necessary, and then return the removed brace. The function below does just that: it defines \l__cmd_process_one_tl starting with a }2 and ending with a {1, so that it adds as many processors as needed when x-expanded.

\cs_new_protected:Npn \__cmd_replicate_processor:nn #1 #2
\int_compare:nNnF {#1} > {1} \{ \use_none:nnn \}
\tl_set:Nx \l__cmd_process_one_tl
\{ \exp_not:n \{ \exp_not:n \{#2\} \if_false: \{ \fi: \} \}
\prg_replicate:nn {#1 - 2}
\{ \exp_not:n \{ \exp_not:n \{#2\} \} \}
\exp_not:n \{ \{ \if_false: \} \fi: \exp_not:n \{#2\} \}
\}
(End definition for \__cmd_replicate_processor:nn.)

\__cmd_add_type_m:w  The m type is special as short arguments which are not post-processed are simply counted at this stage. Thus there is a check to see if either of these cases apply. If so, a one-argument grabber is added to the signature. On the other hand, if a standard short argument is required it is simply counted at this stage, to be added later using \__cmd_flush_m_args:

\cs_new_protected:Npn \__cmd_add_type_m:w #1#2#3
\__cmd_flush_m_args:
\__cmd_add_default:n {#3}
\__cmd_add_grabber:N R
\tl_put_right:Nn \l__cmd_signature_tl \{ #1 #2 \}
\__cmd_prepare_signature:N
(End definition for \__cmd_add_type_m:w.)

\__cmd_add_type_R:w  The R-type argument is very similar to the D-type.

\cs_new_protected:Npn \__cmd_add_type_R:w #1#2#3
\__cmd_flush_m_args:
\__cmd_add_default:n \{#3\}
\__cmd_add_grabber:N R
\tl_put_right:Nn \l__cmd_signature_tl \{ #1 #2 \}
\__cmd_prepare_signature:N
}
Setting up a \texttt{t} argument means collecting one token for the test, and adding it along with the grabber to the signature.

\begin{verbatim}
\cs_new_protected:Npn \_\_\_cmd_add_type_t:w #1
  {\_\_\_cmd_flush_m_args:
   \_\_\_cmd_add_default:
   \_\_\_cmd_add_grabber:N t
   \tl_put_right:Nn \l__cmd_signature_tl {#1}
   \_\_\_cmd_prepare_signature:N}
\end{verbatim}

At this stage, the \texttt{v} argument is identical to \texttt{l} except that since the grabber may fail to read a verbatim argument we need a default value.

\begin{verbatim}
\cs_new_protected:Npn \_\_\_cmd_add_type_v:w
  {\_\_\_cmd_flush_m_args:
   \exp_args:No \_\_\_cmd_add_default:n \c_novalue_tl
   \_\_\_cmd_add_grabber:N v
   \_\_\_cmd_prepare_signature:N}
\end{verbatim}

As \texttt{m} arguments are simply counted, there is a need to add them to the token register in a block. As this function can only be called if something other than \texttt{m} turns up, the flag can be switched here.

\begin{verbatim}
\cs_new_protected:Npn \_\_\_cmd_flush_m_args:
  {\int_compare:nNnT \l__cmd_m_args_int > 0
   {\tl_put_right:Nx \l__cmd_signature_tl
    { \exp_not:c { \_\_\_cmd_grab_m \int_use:N \l__cmd_m_args_int :w } }
    \tl_put_right:Nx \l__cmd_process_all_tl
    { \prg_replicate:nn { \l__cmd_m_args_int } { { } } }
   }
   \int_zero:N \l__cmd_m_args_int}
\end{verbatim}

To keep the various checks needed in one place, adding the grabber to the signature is done here. The only questions are whether the grabber should be long or not, and whether to obey spaces. The \texttt{\_\_\_cmd_obeySpacesBool} boolean can only be \texttt{true} for trailing optional arguments. In that case spaces will not be ignored when looking for that optional argument.

\begin{verbatim}
\cs_new_protected:Npn \_\_\_cmd_add_grabber:N
  {\tl_put_right:Nx \l__cmd_signature_tl}
\end{verbatim}
\__cmd_add_default:n \__cmd_add_default: \__cmd_add_default_E:nn

Store the default value of an argument, or rather code that gives that default value (it may involve other arguments). This is \c_novalue_tl for arguments with no actual default or with default -NoValue--; and (in a brace group) \prg_do_nothing: followed by a default value for others. For E-type arguments, pad the defaults \c_novalue_tl until there are as many as embellishments \#1. These functions are also used when defining expandable commands.

\cs_new_protected:Npn \__cmd_add_default:n #1
\{ \tl_if_novalue:nTF {#1} \{ \__cmd_add_default: \} \}
\cs_new_protected:Npn \__cmd_add_default: \{ \int_incr:N \l__cmd_current_arg_int
\bool_set_true:N \l__cmd_defaults_bool
\tl_put_right:Nx \l__cmd_process_all_tl \{ \prg_do_nothing: \}
\}
\tl_clear:N \l__cmd_process_one_tl
\}
\cs_new_protected:Npn \__cmd_add_default_E:nn #1#2
\{ \tl_map_function:nN {#2} \__cmd_add_default:n
\prg_replicate:nn \tl_count:n {#1} - \tl_count:n {#2} \{
\__cmd_add_default: \}
\}

(End definition for \__cmd_add_grabber:N.)
### 1.7 Setting up expandable types

The approach here is not dissimilar to that for standard types, but fewer types are supported. There is also a need to define the per-function auxiliaries: this is done here, while the general grabbers are dealt with later.

We have already checked that short arguments are before long arguments, so \texttt{\textbackslash l\_\textbackslash cmd\_long\_bool} only changes from \texttt{false} to \texttt{true} once (and there is no need to reset it after each argument). Continue the loop.

```latex
\cs_new_protected:cpn { __cmd_add_expandable_type_+:w }
{ \bool_set_true:N \l__cmd_long_bool \__cmd_prepare_signature:N }
```

(End definition for \texttt{\_\_cmd_add_expandable_type_+:w}.)

The set up for D-type arguments involves constructing a rather complex auxiliary which is used repeatedly when grabbing. There is an auxiliary here so that the R-type can share code readily: \#1 is D or R. The \texttt{\_aux:NN} auxiliary is needed if the two delimiting tokens are identical: in contrast to the non-expandable route, the grabber here has to act differently for this case.

```latex
\cs_new_protected:Npn \__cmd_add_expandable_type_D:w { \__cmd_add_expandable_type_D_aux:NNNn D }
\cs_new_protected:Npn \__cmd_add_expandable_type_D_aux:NNNn #1#2#3#4
{ \__cmd_add_default:n {#4} \tl_if_eq:nnTF {#2} {#3}
{ \__cmd_add_expandable_type_D_aux:NN #1 #2 }
{ \__cmd_add_expandable_type_D_aux:NNN #1 #2 #3 }
\__cmd_prepare_signature:N }
\cs_new_protected:Npn \__cmd_add_expandable_type_D_aux:NNN #1#2#3
{ \bool_if:NTF \l__cmd_long_bool
{ \cs_set:cpx }
{ \cs_set_nopar:cpx }
{ \l__cmd_expandable_aux_name_tl } ##1 ##2 #2 ##3 \q__cmd ##4 #3
{ ##1 {##2} {##3} {##4} }
\__cmd_add_expandable_grabber:nn {#1} }
\cs_new_protected:Npn \__cmd_add_expandable_type_D_aux:NN #1#2
{ \bool_if:NTF \l__cmd_long_bool
{ \cs_set:cpx }
{ \cs_set_nopar:cpx }
{ \l__cmd_expandable_type_D_aux:NN #1#2#3#4 \q__cmd #4 #3 }
{ \l__cmd_expandable_type_D_aux:NNN #1#2 #2 }
\exp_not:c { \l__cmd_expandable_aux_name_tl } \exp_not:n { #2 #3 }
}
\cs_new_protected:Npn \__cmd_add_expandable_type_D_aux:NNN #1#2 #2
{ \bool_if:NTF \l__cmd_long_bool
{ \cs_set:cpx }
{ \cs_set_nopar:cpx }
{ \l__cmd_expandable_type_D_aux:NN #1#2#3#4 \q__cmd #4 #3 }
{ \l__cmd_expandable_type_D_aux:NNN #1#2 #2 }
\exp_not:c { \l__cmd_expandable_aux_name_tl } \exp_not:n { #2 #3 }
}
```

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For each embellishment, use `\__cmd_get_grabber:NN` to obtain an auxiliary delimited by that token and store a pair constituted of the auxiliary and the token in `\l__cmd__cmd_add_expandable_type_E:w`, before appending the whole set of these pairs to the signature, and an equal number of `-NoValue-` markers (regardless of the default values of arguments). Set the current argument appropriately.

\cs_new_protected:Npn \__cmd_add_expandable_type_E:w #1#2
\__cmd_add_default_E:nn {#1} {#2}
\tl_clear:N \l__cmd_tmpb_tl
\tl_map_function:nN {#1} \__cmd_add_expandable_type_E_aux:n
\__cmd_add_expandable_grabber:nn
{ E \bool_if:NT \l__cmd_long_bool { _long } }
\exp_not:o \l__cmd_tmpb_tl
\prg_replicate:nn { \tl_count:n {#1} }
{ \c_novalue_tl }
\__cmd_prepare_signature:N
\endinput

\cs_new_protected:Npn \__cmd_add_expandable_type_m:w
\__cmd_add_default:
\__cmd_add_expandable_grabber:nn
\tl_put_right:Nx \l__cmd_tmpa_tl \exp_not:o \l__cmd_tmpb_tl \exp_not:N #1
\__cmd_prepare_signature:N
\endinput

\cs_new_protected:Npn \__cmd_add_expandable_type_R:w
\__cmd_add_expandable_type_D_aux:NNNn R
\endinput

Unlike the standard case, when working expandably each argument is always grabbed separately:

\cs_new_protected:Npn \__cmd_add_expandable_type_m:w
\__cmd_add_default:
\__cmd_add_expandable_grabber:nn
{ m \bool_if:NT \l__cmd_long_bool { _long } }
\__cmd_prepare_signature:N
\endinput

The R-type is very similar to the D-type argument, and so the same internals are used.

\cs_new_protected:Npn \__cmd_add_expandable_type_R:w
\__cmd_add_expandable_type_D_aux:NNNn R
\endinput

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An auxiliary delimited by \texttt{#1} is built now. It will be used to test for the presence of that token.

\begin{verbatim}
\cs_new_protected:Npn \_\_cmd_add_expandable_type_t:w \#1
{\_\_cmd_add_default:
 \_\_cmd_get_grabber:NN \#1 \l__cmd_tmpa_tl
 \_\_cmd_add_expandable_grabber:nn { t }
 {\exp_not:o \l__cmd_tmpa_tl
 \exp_not:N \#1
}
 \_\_cmd_prepare_signature:N
}
\end{verbatim}

(End definition for \_\_cmd_add_expandable_type_t:w.)

This is called for all arguments to place the right grabber in the signature.

\begin{verbatim}
\cs_new_protected:Npn \_\_cmd_add_expandable_grabber:nn #1#2
{\tl_put_right:Nx \l__cmd_signature_tl
 { \exp_not:c { __cmd_expandable_grab_ #1 :w } #2 }
}
\end{verbatim}

(End definition for \_\_cmd_add_expandable_grabber:nn.)

Given a token \#1, defines an expandable function delimited by that token and stores it in the token list \#2. The function is named after the token, unless that function name is already taken by some other grabber (this can happen in the rare case where delimiters with different category codes are used in the same document): in that case use a global counter to get a unique name. Since the grabbers are not named after \texttt{xparse} commands they should not be used to get material from the input stream.

\begin{verbatim}
\cs_new_protected:Npn \_\_cmd_get_grabber:NN #1#2
{\cs_set:Npn \_\_cmd_tmp:w ##1 #1 {##1}
\exp_args:Nc \_\_cmd_get_grabber_auxi:NN
 { __cmd_grabber_ \token_to_str:N #1 :w } #2
}
\end{verbatim}

\begin{verbatim}
\cs_new_protected:Npn \_\_cmd_get_grabber_auxi:NN #1#2
{\cs_if_eq:NNTF \_\_cmd_tmp:w #1
 { \tl_set:Nn #2 {#1} }
 { \cs_if_exist:NTF #1
 { \int_gincr:N \g__cmd_grabber_int
 \exp_args:Nc \_\_cmd_get_grabber_auxi:NN
 { __cmd_grabber_ \token_to_str:N #1 :w } #2
 } { \_\_cmd_get_grabber_auxii:NN #1 #2 }
}
\end{verbatim}

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1.7.1 Copying a command and its internal structure

Since the 2020-10-01 \LaTeX{} release, support for copying, and showing the definition of, robust commands has been available, but the specifics of each command are implemented separately. Here we’ll add support for copying and showing \texttt{ltcmd} definitions.

To fully support copying, we need two commands: a conditional to test if a command is in fact a \texttt{ltcmd} command, and another command to actually copy the command. The conditional is defined later as \texttt{\_kernel\_cmd\_if\_xparse:NTF}, so now to the copying: This macro just branches to the proper copying command by using \texttt{\_cmd\_cmd\_type\_cases:NnnnnF}. The copying command takes the names of the commands to be copied to and from, and the actual commands as its four arguments.

An utility macro similar to \texttt{\_cmd\_bad\_def:wn} to abort a command copy. Contrary to \texttt{\_cmd\_bad\_def:wn} though, when this happens the issue is most likely internal, because the command was already (supposedly) correctly defined so it should be copyable. Hopefully this macro will never be used ever, but if it does, apologise and give the reason for the failure so the user can report.
\{ Error-while-copying-command-\iow_char:N\\#2:\\\n\str_case:nn \#1
\{
{ non-ltcmd } \{ Command-is-not-a-valid-ltcmd-command. \}
{ unknown-type } \{ Found-an-unknown-argument-type. \}
{ invalid-end }
{ Target-command-is-not-named-\iow_char:N \end<name>. }
\}

And, of course, add \_\_kernel_cmd_if_xparse:NTF and \_\_cmd_copy:NN to \@declarecommandcopylisthook:
\tl_gput_right:Nn \@declarecommandcopylisthook
\{ \_\_kernel_cmd_if_xparse:NTF \_\_cmd_copy:NN \}

(End definition for \_\_cmd_copy:NN, \_\_cmd_set_eq_if_exist:NN, and \_\_cmd_cant_copy:nw.)

\_\_cmd_copy_command:nnNN
\_\_cmd_copy_command:NNnnnn

A normal (non-expandable) command has a pretty straightforward structure. Its definition is stored in \langle cmd \rangle code, its defaults (if any) are stored in \langle cmd \rangle defaults, and its top-level definition contains its signature, which can just be copied over. \_\_cmd_copy_command:nnNN copies the command code and defaults, and then defines the top-level command using the auxiliary \_\_cmd_copy_command:NNnnn. This macro takes the signature of the command being copied from its top-level definition, and replaces the named bits with the new name.

\cs_new_protected:Npn \_\_cmd_copy_command:nnNN #1 #2 #3 #4
\{ \cs_set_eq:cc { #1 ~ code } { #2 ~ code }
\_\_cmd_set_eq_if_exist:cc { #1 ~ defaults } { #2 ~ defaults }
\cs_set_protected_nopar:Npx #3
\{ \exp_after:wN \_\_cmd_copy_command:NNnnn \#4 \#1 \}
\}
\cs_new:Npn \_\_cmd_copy_command:NNnnnn #1 #2 #3 #4 #5 #6 #7 #8
\{ #1 \exp_not:n \{ \#2 \}
\exp_not:c \{ \#8 - \} \exp_not:c \{ \#8 - code \}
\exp_not:n \{ \#5 \#6 \#7 \}
\}

(End definition for \_\_cmd_copy_command:nnNN and \_\_cmd_copy_command:NNnnnn.)

\_\_cmd_copy_expandable:nnNN
\_\_cmd_copy_expandable:NNnnnn

An expandable command is slightly more complicated. Besides the \langle cmd \rangle code, and \langle cmd \rangle defaults, it also has an auxiliary \langle cmd \rangle for grabbing delimited arguments, and possibly another auxiliary \langle cmd \rangle if the command has both long and short arguments.

Then, its signature also has several specific bits that are unique to that command; this is in contrast to non-expandable commands, which use a common set of parsing functions.

We start by copying the basics, then call \_\_cmd_copy_expandable_signature:NNnnnn to parse the signature of the command and build up the modified copy in a temporary token list, then we call \_\_cmd_copy_expandable:NNnnnn that will copy the top-level definition of the command, with the proper internal renames.

\cs_new_protected:Npn \_\_cmd_copy_expandable:nnNN #1 #2 #3 #4
\{ \cs_set_eq:cc { #1 - code } { #2 - code }

\__cmd_set_eq_if_exist:cc { #1 \ } { #2 \ }
\__cmd_set_eq_if_exist:cc { #1 \ _c_space_tl } { #2 \ _c_space_tl }
\__cmd_set_eq_if_exist:cc { #1 \ defaults } { #2 \ defaults }
\exp_after:wN \__cmd_copy_expandable_signature:NnNNNNnnn #4 {#1} {#2}
\cs_set_nopar:Npx #3
{ \exp_after:wN \__cmd_copy_expandable:NnNNNNnnn #4 {#1} {#2} }
\cs_new:Npn \__cmd_copy_expandable:NnNNNNnnn #1 #2 #3 #4 #5 #6 #7 #8 #9
{ \exp_not:N #1 \exp_not:n { {#2} } \exp_not:c { #8 \ _c_space_tl }
\str_if_eq:eeT { \exp_not:c { #9 \ _c_space_tl } } { \exp_not:N #4 }
{ \exp_not:c { #8 \ code } } \str_if_eq:eeTF { \exp_not:N #6 } { ? }
{ ? }
{ \exp_not:c { #8 \ defaults } }
{ \exp_not:V \l__cmd_tmpa_tl }
}

A signature for an expandable command contains as many \expandable_grab_(type):w as there are arguments, and what follows this macro depends on the \langle type \rangle. We’ll start a loop through the signature, and at each argument grabber, we’ll step the argument count, and look for the \langle type \rangle with \__cmd_copy_parse_grabber:w so that we know which \__cmd_copy_grabber_(type):w to call next.

\cs_new_protected:Npn \__cmd_copy_expandable_signature:NnNNNNnnn
{ \int_zero:N \l__cmd_current_arg_int \tl_clear:N \l__cmd_tmpa_tl
\__cmd_copy_expandable:nnN {#8} {#9} #7 \q_recursion_tail \q_recursion_stop }
\cs_new_protected:Npn \__cmd_copy_expandable:nnN #1 #2 #3
{ \quark_if_recursion_tail_stop:n {#3} \int_incr:N \l__cmd_current_arg_int \exp_after:wN \__cmd_copy_parse_grabber:w \token_to_str:N #3 {#1} {#2} }
\use:x
\cs_new_protected:Npn \exp_not:N \__cmd_copy_parse_grabber:w \langle type \rangle:w
{ \int_zero:N \l__cmd_current_arg_int \tl_clear:N \l__cmd_tmpa_tl
\__cmd_copy_expandable:nnN \langle type \rangle:w {#8} {#9} #7 \q_recursion_tail \q_recursion_stop }
\cs_new_protected:Npn \exp_not:N \__cmd_copy_grabber:w \langle type \rangle:w
{ \exp_not:N \exp_not:c { \__cmd_expandable_grab_##2:w } }
\exp_not:N \cs_if_exist_use:cF { \__cmd_copy_grabber_##2:w }
{ \__cmd_cant_copy:nwn { unknown-type } }

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The most complicated is the Delimited argument: each argument has a dedicated grabbing function named after the command that has to be copied over (of the form `\langle cmd\rangle\langle arg\rangle\langle num\rangle`).

\cs_new_protected:Npn \__cmd_copy_grabber_D:w #1 #2 #3 #4 #5
{\tl_put_right:Nx \l__cmd_tmpa_tl
  \exp_not:c { \int_use:N \l__cmd_current_arg_int ~ (arg ~ #1 ~ (arg ~ \int_use:N \l__cmd_current_arg_int ) ) }
  \exp_not:n { #4 #5 }
}
\cs_set_eq:cc { \int_use:N \l__cmd_current_arg_int ~ (arg ~ \int_use:N \l__cmd_current_arg_int ) } { #2 ~ (arg ~ \int_use:N \l__cmd_current_arg_int ) }
\__cmd_copy_expandable:nnN {#1} {#2}

\__cmd_copy_grabber_D_alt:w #1 #2 #3 #4 #5 #6
{ \__cmd_copy_grabber_D:w {#1} {#2} {#3} {#4} { } }
\cs_set_eq:cc { \int_use:N \l__cmd_current_arg_int } { (arg ~ \int_use:N \l__cmd_current_arg_int ) }
\__cmd_copy_expandable:nnN {#1} {#2}

\__cmd_copy_grabber_R:w #1 #2 #3 #4
\cs_new_eq:NN \__cmd_copy_grabber_R:w \__cmd_copy_grabber_D:w
\cs_new_eq:NN \__cmd_copy_grabber_R_alt:w \__cmd_copy_grabber_D_alt:w

\__cmd_copy_grabber_E:w #1 #2 #3 #4
\cs_new_protected:Npn \__cmd_copy_grabber_E:w #1 #2 #3 #4 #5
{\tl_put_right:Nn \l__cmd_tmpa_tl { #3 #4 }
  \int_add:Nn \l__cmd_current_arg_int { \tl_count:n {#4} - 1 }
  \__cmd_copy_expandable:nnN {#1} {#2}
}
\cs_set_eq:cc { \int_use:N \l__cmd_current_arg_int } { (arg ~ \int_use:N \l__cmd_current_arg_int ) }
\__cmd_copy_expandable:nnN {#1} {#2}

\__cmd_copy_grabber_E_long:w #1 #2 #3 #4
\cs_new_protected:Npn \__cmd_copy_grabber_E_long:w #1 #2 #3 #4
{ \__cmd_copy_grabber_E:w {#1} {#2} {#3} {#4} }

\__cmd_copy_grabber_t:w #1 #2 #3 #4
\cs_new_protected:Npn \__cmd_copy_grabber_t:w #1 #2 #3 #4
{ \tl_put_right:Nn \l__cmd_tmpa_tl { #3 #4 }
  \__cmd_copy_expandable:nnN {#1} {#2}
}
\__cmd_copy_grabber_m:w #1 #2 #3 #4
\cs_new_protected:Npn \__cmd_copy_grabber_m:w { \__cmd_copy_expandable:_grab_m:w }
\cs_new_eq:NN \__cmd_copy_grabber_m_long:w \__cmd_copy_grabber_m:w

(End definition for \__cmd_copy_expandable:nnNN and others.)

Copying an environment’s \begin part is pretty much like copying a command, except it has a longer name, and at the end we have to copy \environment \langle name\rangle into \langle name\rangle.

\cs_new_protected:Npn \__cmd_copy_environment:nnNN #1 #2 #3 #4
{\tl_put_right:Nn \l__cmd_tmpa_tl }
\int_add:Nn \l__cmd_current_arg_int { \tl_count:n {#4} - 1 }
\__cmd_copy_expandable:nnN {#1} {#2}

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Copying an environment’s \texttt{end} part is a bit trickier. We first have to make sure that both parts are named \texttt{end}(name) (that’s actually not a hard requirement, but an environment \texttt{end} command makes no sense without the \texttt{end} in its name), and strip the leading \texttt{end} from the strings. After that, copying is straightforward.

To check whether an \texttt{end} command is valid, we look for the string \texttt{end} at the beginning of the command name, and if not found, raise an error:

```
\cs_new_protected:Npn \_\_\_cmd_copy_environment_end:nnNN #1 #2
{
  \_\_\_cmd_check_end:NN \tl_ttmpa_tl {#1}
  \_\_\_cmd_check_end:NN \tl_ttmpb_tl {#2}
  \exp_args:Noo \_\_\_cmd_copy_environment_end_aux:nnNN
  \{ \tl_ttmpa_tl \} \{ \tl_ttmpb_tl \}
}
```

```latex
\begin{verbatim}
\_\_\_cmd_copy_environment_end:nnNN
\_\_\_cmd_copy_environment_end_aux:nnNN
\__cmd_check_end:nnNN
\__cmd_check_end:n
\__cmd_check_end:w
\end{verbatim}
```

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Not much to do regarding \texttt{latexrelease}: we could remove the entries from \texttt{\@declarecommandcopylist} and others.

1.7.2 Showing the definition of a command

To show the definition of a command we need more or less the same building blocks as for copying, except that instead of making a copy, we'll just print stuff to the terminal. This macro just branches to the proper showing command by using \texttt{\__cmd_cmd_type_cases:F}. The showing command takes the command to be shown as argument.

\begin{verbatim}
\cs_new_protected:Npn \__cmd_show:N #1
{ \use:x
{ \int_set:Nn \tex_escapechar:D { 92 }
\exp_not:N \__cmd_cmd_type_cases:NnnnnF \exp_not:N #1
{ \__cmd_show_command:N }
{ \__cmd_show_expandable:N }
{ \__cmd_show_environment:N }
{ \__cmd_show_environment_end:N }
{ \__cmd_cant_copy:nwn { non-ltcmd } }
\exp_not:N #1
\exp_not:N \__cmd_break_point:n { \cs_to_str:N #1 }
\int_set:Nn \tex_escapechar:D { \int_use:N \tex_escapechar:D }
}
\end{verbatim}

These commands just expand the command once to reveal its innards, then pass the type of command, the control sequence, the signature, and the code macro to \texttt{\__cmd_show_command_aux:nNnN}.

\begin{verbatim}
\cs_new_protected:Npn \__cmd_show_command:N #1
{ \exp_after:wN \__cmd_show_command:NnNNwN #1 \q__cmd #1 }
\cs_new_protected:Npn \__cmd_show_command:NnNNwN #1 #2 #3 #4 #5 \q__cmd #6
{ \__cmd_show_command_aux:nNNn { document-command } \#6 \#4 \#2 }
\cs_new_protected:Npn \__cmd_show_command:NnNNn { \__cmd_show_command_aux:nNNn\#1 \#2 \#3 \#4 \#5 \#6 \#7 \#8 }
\end{verbatim}

Now just print everything in the required format. The auxiliary \texttt{\__cmd_split_signature:n} stores a ready-to-print token list in \texttt{l__cmd_tmpa_tl}, so we ust use that here:

\begin{verbatim}
\cs_new_protected:Npn \__cmd_show_command_aux:nNNn\#1 \#2 \#3 \#4
{ \exp_after:wN \__cmd_show_expandable:nNNn\#1 \#2 \#3 \#4 \#5 \#6 \#7 \#8 }
\cs_new_protected:Npn \__cmd_show_command_aux:nNNn\#1 \#2 \#3 \#4
{ \__cmd_show_command_aux:nnNn\#1 \#2 \#3 \#4 \#5 \#6 \#7 \#8 }
\cs_new_protected:Npn \__cmd_split_signature:n\#4
{ \exp_after:wN \__cmd_split_signature:n \l__cmd_tmpa_tl \#4 }
\end{verbatim}
We can reuse most of the above to show an environment, except that we need to ensure that the proper \texttt{\texttt{environment ...}} are passed to \texttt{\texttt{\_\_cmd_show_command\_aux:nNNn}}. Additionally, when \texttt{\texttt{ShowCommand\textbackslash foo}} is used (if \texttt{foo} is an environment), we show \texttt{\textbackslash endfoo} as well, and when \texttt{\texttt{ShowCommand\textbackslash endfoo}} is used, change that to \texttt{\texttt{ShowCommand\textbackslash foo}} and do the same.

\begin{verbatim}
\cs_new_protected:Npn \__cmd_show_environment:N #1
{ \exp_after:wN \__cmd_show_environment:Nnnw #1 \q__cmd
  \tl_show:x
  { \token_to_str:N \end { \cs_to_str:N #1 } : \iow_newline:
    -> \exp_args:Nc \cs_replacement_spec:N
      { \texttt{environment-} \cs_to_str:N #1 \texttt{-end-aux-} }
  }
}
\cs_new_protected:Npn \__cmd_show_environment:Nnnw #1 #2 #3 #4 \q__cmd
{ \use:x
  { \__cmd_show_command_aux:nNNn \l__cmd_tmpb_tl \cs_to_str:N #1 \texttt{-code}
    \exp_not:N \begin {#3} \\
      \exp_not:c { \texttt{environment-} \cs_to_str:N #3 \texttt{-code} }
    {\#2}
  }
}
\cs_new_protected:Npn \__cmd_show_environment_end:N #1
{ \exp_args:NNx \__cmd_check_end:Nn \l__cmd_tmpa_tl \cs_to_str:N #1 \texttt{-aux}
  \exp_args:Nc \__cmd_show_environment:N { \l__cmd_tmpa_tl }
}
\end{verbatim}

And, of course, add \texttt{\_\_kernel_cmd_if_xparse:NTF} and \texttt{\_\_cmd_show:N} to \texttt{\_\_showcommandlisthook}:

\begin{verbatim}
\tl_gput_right:Nn \_\_showcommandlisthook
{ \{ \_\_kernel_cmd_if_xparse:NTF \_\_cmd_show:N \_\_cmd_split_signature:n \} }
\end{verbatim}

(End definition for \texttt{\_\_cmd_show_command:N} and others.)

\_\_cmd_split_signature:n

Now we'll try a least-effort adventure into splitting the symbolic user-provided signature for a command into individual parameters for pretty-printing. A counter is used to keep track of the current argument number, and two token lists are used: \texttt{\_\_cmd_tmpa_tl} holds the final token list to be printed, and \texttt{\_\_cmd_tmpb_tl} holds just the current item, so that we can make changes to an individual item without having to dissect the whole thing (this is used for \texttt{e-} and \texttt{E-types}).

\begin{verbatim}
\cs_new_protected:Npn \_\_cmd_split_signature:n #1
{ \int_set:Nn \_\_cmd_current_arg_int { 1 }
  \_\_cmd_tmpb_tl
  \_\_cmd_tmpa_tl
}
\end{verbatim}
This is the main chunk of the loop: it starts an item with \cmd{__cmd_split_start_item}: (this adds indentation and the argument number to \lcmd{cmd_tmpb_tl}), then checks if a special token list \cmd{c__cmd_show_type_{type}_tl} exists. If it doesn’t, the current argument is a “simple” type which needs no extra processing. Otherwise, call a specific function depending on the value of said token list.

The token lists \cmd{c__cmd_show_type_{type}_tl} exist for nontrivial (for printing) (types) that require special parsing (like delimiters or optional arguments). Values from 0 to 7 are assigned to each type:

1. a single delimiter token;
2. two delimiter tokens;
3. two delimiter tokens plus a default value;
4. a default value;
5. a list of embellishments (exclusive for e-type);
6. embellishments plus defaults (exclusive for E-type);
7. simple prefixes;
8. prefixes with arguments (argument processors);

The token lists \cmd{c__cmd_show_type_{type}_tl} exist for nontrivial (for printing) (types) that require special parsing (like delimiters or optional arguments). Values from 0 to 7 are assigned to each type:
Now, based on each type we know how to act. In most cases it is just a matter of feeding
in the grabbed arguments and resuming the loop. The embellishments require a bit more
attention: the e-type loops through the list of embellishments and adds each to the token
list as a separate argument. The E-type does more or less the same, but uses \texttt{tl_mapthread_function:nnN} to map over two lists simultaneously, adding each token
and default to the token list for printing.

\begin{verbatim}
\cs_new_protected:Npn \__cmd_show_delim:Nw #1 #2
\{ \__cmd_split_end_item:n { #1 #2 } \__cmd_split_signature_loop:Nw \}
\cs_new_protected:Npn \__cmd_show_delims:Nw #1 #2 #3
\{ \__cmd_split_end_item:n { #1 #2 #3 } \__cmd_split_signature_loop:Nw \}
\cs_new_protected:Npn \__cmd_show_delims_opt:Nw #1 #2 #3 #4
\{ \__cmd_split_end_item:n { #1 #2 #3 {#4} } \__cmd_split_signature_loop:Nw \}
\cs_new_protected:Npn \__cmd_show_opt:Nw #1 #2
\{ \__cmd_split_end_item:n { #1 {#2} } \__cmd_split_signature_loop:Nw \}
\cs_new_protected:Npn \__cmd_show_e:Nw #1 #2
\{ \tl_map_inline:nn {#2} \__cmd_split_start_item:\__cmd_split_end_item:n { #1 ##1 } \__cmd_split_signature_loop:Nw \}
\cs_new_protected:Npn \__cmd_show_prefix:Nw #1
\{ \__cmd_split_add_item:n {#1} \__cmd_split_signature_loop:Nw \}
\cs_new_protected:Npn \__cmd_show_processor:Nw #1 #2
\{ \__cmd_split_add_item:n { #1 {#2} } \__cmd_split_signature_loop:Nw \}
\end{verbatim}

Minor wrinkle with the prefixes: they use \texttt{\__cmd_split_add_item:n} instead of
\texttt{\__cmd_split_end_item:n} (add vs. end) because they are followed by an argument, so
they can’t end the item.

\begin{verbatim}
\cs_new_protected:Npn \__cmd_show_prefix:Nw #1
\{ \__cmd_split_add_item:n {#1} \__cmd_split_signature_loop:Nw \}
\cs_new_protected:Npn \__cmd_show_processor:Nw #1 #2
\{ \__cmd_split_add_item:n { #1 {#2} } \__cmd_split_signature_loop:Nw \}
\end{verbatim}

And now the auxiliaries that store the strings to be printed. \texttt{\__cmd_split_start_item:}
starts an item from scratch, \texttt{\__cmd_split_add_item:n} adds tokens to an item without
adding a newline, and \texttt{\__cmd_split_end_item:n} adds tokens, terminates the item with
a newline, and steps the argument count.

\begin{verbatim}
\cs_new_protected:Npn \__cmd_split_start_item:
\end{verbatim}
1.8 Grabbing arguments

All of the grabbers follow the same basic pattern. The initial function stores in \l__cmd_signature_tl the code to grab further arguments, defines (the function in) \l__cmd_fn_tl that will grab the argument, and calls it.

Defining \l__cmd_fn_tl means determining whether to use \cs_set:Npn or \cs_set_nopar:Npn, and for optional arguments whether to skip spaces. Once the argument is found, \l__cmd_fn_tl calls \__cmd_add_arg:n, responsible for calling processors and grabbing further arguments.

This uses the well-tested code of D-type arguments, skipping the peeking step because the b-type argument is always present, and adding a cleanup stage at the end by hijacking the signature. The clean-up consists of properly dealing with \l__cmd_args_tl and also putting back the \end that served as an end-delimiter: this \end receives the environment name as its argument and is run normally. The D-type code stores the argument found (body of the environment) as a brace group in \l__cmd_args_tl and depending on the presence of a prefix we trim spaces or not before adding this braced argument into the saved \l__cmd_args_tl. The strange \begin control sequence is there for display purposes only: it has to look like \begin in the terminal but not to delimited arguments.
The generic delimited argument grabber. The auxiliary function does a peek test before calling \texttt{\_\_\_cmd\_grab\_D\_call:Nw}, so that the optional nature of the argument works as expected.

This is a bit complicated. The idea is that, in order to check for nested optional argument tokens (\texttt{[[...]]} and so on) the argument needs to be grabbed without removing any braces at all. If this is not done, then cases like \texttt{[{	extbackslash{[}]}]} fail. So after testing for an optional argument, it is collected piece-wise. Inserting a quark prevents loss of braces, and there is then a test to see if there are nested delimiters to handle.
Inside the “standard” grabber, there is a test to see if the grabbed argument is entirely enclosed by braces. There are a couple of extra factors to allow for: the argument might be entirely empty, and spaces at the start and end of the input must be retained around a brace group. Also notice that a blank argument might still contain spaces.

\cs_new_protected:Npn \__cmd_grab_D_aux:NNnN #1#2#3#4
\tl_set:Nn \l__cmd_signature_tl {#3}
\exp_after:wN #4 \l__cmd_fn_tl ##1 #2
\tl_if_in:nnTF {##1} {#1}
{ \__cmd_grab_D_nested:NNnN #1 #2 {##1} #4 }
\tl_if_blank:oTF { \use_none:n ##1 }
{ \__cmd_add_arg:o { \use_none:n #1 } }
{ \str_if_eq:eeTF { \exp_not:o { \use_none:n ##1 } } { { \exp_not:o { \use_ii:nnn ##1 \q_nil } } } { \__cmd_add_arg:o { \use_ii:nn ##1 } } { \__cmd_add_arg:o { \use_none:n #1 } } }
\tl_if_in:nnTF {##2} {#1}

(End definition for \__cmd_grab_D:w and others.)

\__cmd_grab_D_nested:NNnN \__cmd_grab_D_nested:w \l__cmd_nesting_a_tl \l__cmd_nesting_b_tl \q__cmd

Catching nested optional arguments means more work. The aim here is to collect up each pair of optional tokens without \TeX helping out, and without counting anything. The code above will already have removed the leading opening token and a closing token, but the wrong one. The aim is then to work through the material grabbed so far and divide it up on each opening token, grabbing a closing token to match (thus working in pairs). Once there are no opening tokens, then there is a second check to see if there are any opening tokens in the second part of the argument (for things like \[\] \[\]). Once everything has been found, the entire collected material is added to the output as a single argument. The only tricky part here is ensuring that any grabbing function that might run away is named after the function currently being parsed and not after \texttt{xparse}. That leads to some rather complex nesting! There is also a need to prevent the loss of any braces, hence the insertion and removal of quarks along the way.

\tl_new:N \l__cmd_nesting_a_tl
\tl_new:N \l__cmd_nesting_b_tl
\quark_new:N \q__cmd
\cs_new_protected:Npn \__cmd_grab_D_nested:NNnN #1#2#3#4
{ \tl_clear:N \l__cmd_nesting_a_tl \tl_clear:N \l__cmd_nesting_b_tl \exp_after:wN #4 \l__cmd_fn_tl ##1 #1 \#2 \q__cmd \#3 \#2
{ \tl_put_right:No \l__cmd_nesting_a_tl { \use_none:n \#1 \#1 } \tl_put_right:No \l__cmd_nesting_b_tl { \use_i:nn \#2 \#3 }
{ \tl_if_in:nnTF {\#2} {#1} }
\__cmd_grab_D_nested:NNnN

For D and R-type arguments, to avoid losing any braces, a token needs to be inserted before the argument to be grabbed. If the argument runs away because the closing token is missing then this inserted token shows up in the terminal. Ideally, \#1 would therefore be used directly, but that is no good as it will mess up the rest of the grabber. Instead, a copy of \#1 with an altered category code is used, as this will look right in the terminal but will not mess up the grabber. The only issue then is that the category code of \#1 is unknown. So there is a quick test to ensure that the inserted token can never be matched by the grabber. (This assumes that the open and close delimiters are not the same character with different category codes, but that really should not happen in any sensible document-level syntax.) An exception is when \#1 is a control sequence token, in which case the character-token treatment is no good because if hit with \token_to_str:N it would add spitious tokens to the argument. In this case a different branch is taken. The token inserted is then the same \langle \textit{csname} \rangle as \#1, but with a space appended, so that the grabber don’t see it as another of the same delimiter.

\__cmd_grab_D_call:Nw

(End definition for \__cmd_grab_D_nested:NNnN and others.)
A loop is needed here to allow a random ordering of keys. These are searched for one at a time, with any not found needing to be tracked: they can appear later. The grabbed values are held in a property list which is then turned into an ordered list to be passed back to the user.
Collecting a single mandatory argument is quite easy.

Grabbing 1–8 mandatory arguments is done by giving 8–1 known arguments to a 9-argument function that stores them in \l__cmd_args_tl. For simplicity, grabbing 9 mandatory arguments is done by grabbing 5 then 4 arguments.
The grabber for R-type arguments is basically the same as that for D-type ones, but always skips spaces (as it is mandatory) and has a hard-coded error message.
Dealing with a token is quite easy. Check the match, remove the token if needed and add a flag to the output.

The opening delimiter is the first non-space token, and is never read verbatim. This is required by consistency with the case where the preceding argument was optional and absent: then TeX has already read and tokenized that token when looking for the optional argument. The first thing is thus to check is that this delimiter is a character, and to distinguish the case of a left brace (in that case, \_\_cmd_align_safe_end: is needed to compensate for the begin-group character that was just seen). Then set verbatim catcodes with \_\_cmd_align_safe_catcodes:.

The group keep catcode changes local, and \_\_cmd_align_safe_begin/end: allow to use a character with category code 4 (normally \& as the delimiter (all commands do \_\_cmd_align_safe_begin/end:), so there's no need to do that again here). It is
ended by \__cmd_grab_v_group_end:, which smuggles the collected argument out of the group.

\cs_new_protected:Npn \__cmd_grab_v:w
  \{\bool_set_false:N \l__cmd_long_bool \__cmd_grab_v_aux:w \}
\cs_new_protected:Npn \__cmd_grab_v_long:w
  \{\bool_set_true:N \l__cmd_long_bool \__cmd_grab_v_aux:w \}
\cs_new_protected:Npn \__cmd_grab_v_aux:w #1 \__cmd_run_code:
  \tl_set:Nn \l__cmd_signature_tl {#1}
  \group_begin:
  \tex_escapechar:D = 92 \scan_stop:
  \tl_clear:N \l__cmd_v_arg_tl
  \peek_remove_spaces:n
    \peek_meaning_remove:NTF \c_group_begin_token
      \{ \__cmd_grab_v_bgroup: \}
    \group_align_safe_end:
    \__cmd_grab_v_vgroup:
    \__cmd_grab_v_aux_test:N \__cmd_grab_v_aux_loop:N \__cmd_grab_v_aux_loop:NN \__cmd_grab_v_aux_loop_end:
  \group_end:
  \tl_set:Nn \l__cmd_v_arg_tl { \l__cmd_v_arg_tl }
\cs_new_protected:Npn \__cmd_grab_v_group_end:
  \exp_args:NNNo \group_end:
  \tl_set:Nn \l__cmd_v_arg_tl { \l__cmd_v_arg_tl }
\cs_new_protected:Npn \__cmd_grab_v_w #1 \__cmd_run_code:
\__cmd_grab_v_aux_test:N
\__cmd_grab_v_aux_loop:N
\__cmd_grab_v_aux_loop:NN
\__cmd_grab_v_aux_loop_end:

Check that the opening delimiter is a character, setup category codes, then start reading tokens one by one, keeping the delimiter as an argument. If the verbatim was not nested, we will be grabbing one character at each step. Unfortunately, it can happen that what follows the verbatim argument is already tokenized. Thus, we check at each step that the next token is indeed a “nice” character, i.e., is not a character with category code 1 (begin-group), 2 (end-group) or 6 (macro parameter), nor the space character, with category code 10 and character code 32, nor a control sequence. The partially built argument is stored in \l__cmd_v_arg_tl. If we ever meet a token which we cannot grab (non-N-type), or which is not a character according to \__cmd_grab_v_token_if_character:NTF, then we bail out with \__cmd_grab_v_aux_abort:n. Otherwise, we stop at the first character matching the delimiter.

(End definition for \__cmd_grab_v:w and others.)
If the opening delimiter is a left brace, we keep track of how many left and right braces were encountered so far in \l__cmd_v_nesting_int (the methods used for optional arguments cannot apply here), and stop as soon as it reaches 0.

Some care was needed when removing the opening delimiter, which has already been assigned category code 1: using \peek_meaning_remove:NTF in the \_cmd_grab_v_aux:w function would break within alignments. Instead, we first convert that token to a string, and remove the result as a normal undelimited argument.
The approach for short verbatim arguments is to make the end-line character a macro parameter character: this is forbidden by the rest of the code. Then the error branch can check what caused the bail out and give the appropriate error message.
\_\_cmd\_grab\_v\_aux\_put:N

Storing one token in the collected argument. Most tokens are converted to category code 12, with the exception of active characters, and spaces (not sure what should be done for those).

\cs\_new\_protected:Npn \_\_cmd\_grab\_v\_aux\_put:N \#1
  { \tl\_put\_right:Nx \l__cmd\_v\_arg\_tl
    { \token\_if\_active:NTF \#1
      { \exp\_not:N \#1 } { \token\_to\_str:N \#1 } } }

(End definition for \_\_cmd\_grab\_v\_aux\_put:N.)

\_\_cmd\_grab\_v\_token\_if\_char:NTF

This function assumes that the escape character is printable. Then the string representation of control sequences is at least two characters, and \str\_tail:n only removes the escape character. Macro parameter characters are doubled by \tl\_to\_str:n, and will also yield a non-empty result, hence are not considered as characters.

\cs\_new\_protected:Npn \_\_cmd\_grab\_v\_token\_if\_char:NTF \#1
  { \str\_if\_eq:eeTF { } { \str\_tail:n \#1 } }

(End definition for \_\_cmd\_grab\_v\_token\_if\_char:NTF.)

\_\_cmd\_add\_arg:n \_\_cmd\_add\_arg:V \_\_cmd\_add\_arg:o \_\_cmd\_add\_arg:x

When an argument is found it is stored, then further arguments are grabbed by calling \_\_cmd\_signature\_tl.

\cs\_new\_protected:Npn \_\_cmd\_add\_arg:n \#1
  { \tl\_put\_right:Nn \l__cmd\_args\_tl \{ \#1 } } \l__cmd\_signature\_tl \_\_cmd\_run\_code:

\cs\_generate\_variant:Nn \_\_cmd\_add\_arg:n \{ V , o , x \}

(End definition for \_\_cmd\_add\_arg:n.)
1.9 Grabbing arguments expandably

The first step is to grab the first token or group. The generic grabbers \( \langle \text{function} \rangle \) and \( \langle \text{function} \rangle \) are just after \( \text{q}_{-}\text{cmd} \), we go and find them (and use the long one).

\[
c_\text{new}:Npn \ \_\_\_\text{cmd}\_\text{expandable}\_\text{grab}:D:w \ #1 \ \text{q}_{-}\text{cmd} \ #2\#3
\]

We then wish to test whether \#7, which we just grabbed, is exactly \#2. A preliminary test is whether their string representations coincide, then expand the only grabber function we have, \#1, once: the two strings below are equal if and only if \#7 matches \#2 exactly.\(^2\) The preliminary test is needed as \#7 could validly contain \( \text{par} \) (because a later mandatory argument could be long) and our grabber may be short. If \#7 does not match \#2, then the optional argument is missing, we use the default \( \text{-NoValue-} \), and put back the argument \#7 in the input stream.

If it does match, then interesting things need to be done. We will grab the argument piece by piece, with the following pattern:

\[
\{ \langle \text{grabber} \rangle \} \{ \langle \text{tokens} \rangle \} \n\_\text{q}_{-}\text{nil} \{ \langle \text{piece 1} \rangle \} \{ \langle \text{piece 2} \rangle \} \text{ERROR} \n\_\text{q}_{-}\text{cmd} \n\_\text{q}_{-}\text{nil} \{ \langle \text{input stream} \rangle \}
\]

The \( \langle \text{grabber} \rangle \) will find an opening delimiter in \( \langle \text{piece 2} \rangle \), take the \( \text{q}_{-}\text{cmd} \) as a second delimiter, and find more material delimited by the closing delimiter in the \( \langle \text{input stream} \rangle \). We then move the part before the opening delimiter from \( \langle \text{piece 2} \rangle \) to \( \langle \text{piece 1} \rangle \), and the material taken from the \( \langle \text{input stream} \rangle \) to the \( \langle \text{piece 2} \rangle \). Thus, the argument moves gradually from the \( \langle \text{input stream} \rangle \) to the \( \langle \text{piece 2} \rangle \), then to the \( \langle \text{piece 1} \rangle \) when we have made sure to find all opening and closing delimiters. This two-step process ensures that nesting works: the number of opening delimiters minus closing delimiters in \( \langle \text{piece 2} \rangle \) is always equal to the number of closing delimiters in \( \langle \text{piece 1} \rangle \). We stop grabbing arguments once the \( \langle \text{piece 2} \rangle \) contains no opening delimiter any more, hence the balance is reached, and the final argument is \( \langle \text{piece 1} \rangle \langle \text{piece 2} \rangle \). The indirection via \( \_\_\text{cmd}\_\text{tmp}:w \) allows to insert \( \text{-NoValue-} \) expanded.

\[
c_\text{set}\_\text{protected}:Npn \ \_\_\text{cmd}\_\text{tmp}:w \ #1
\]

\[
c_\text{new}:Npn \ \_\_\text{cmd}\_\text{expandable}\_\text{grab}:D:NNwNNn \ #1#2#3#4 \ \text{q}_{-}\text{cmd} \ #5#6#7
\]

\[
\{ \text{str}\_\text{if}\_\text{eq}:NNnT \ #2 \ #7
\]

\[
\{ \text{str}\_\text{if}\_\text{eq}:onT
\]

\[
\{ \#1 \} \{ \} \ #7 \ #2 \ \text{q}_{-}\text{cmd} \ #3
\]

\[
\{ \} \{ \#2 \} \{ \}
\]

\[
\} \{ \text{use}_i\_i:nn 
\]

\[
\}
\]

\[
\#1
\]

\[
\{ \ \_\_\text{cmd}\_\text{expandable}\_\text{grab}:D:NNwNNnnn \ #1#2#3#4 \ \text{q}_{-}\text{cmd} \ #5#6 \}
\]

\(^2\)It is obvious that if \#7 matches \#2 then the strings are equal. We must check the converse. The right-hand-side of \text{str}\_\text{if}\_\text{eq}:onT does not end with \#3, implying that the grabber function took everything as its arguments. The first brace group can only be empty if \#7 starts with \#2, otherwise the brace group preceding \#7 would not vanish. The third brace group is empty, thus the \text{q}_{-}\text{cmd} that was used by our grabber \#1 must be the one that we inserted (not some token in \#7), hence the second brace group contains the end of \#7 followed by \#2. Since this is \#2 on the right-hand-side, and no brace can be lost there, \#7 must contain nothing else than its leading \#2.
At this stage, \texttt{\q_nil \{ \langle \text{piece 1} \rangle \langle \text{more for piece 1} \rangle \}}, and we want to concatenate all that, removing \texttt{\q_nil}, and keeping the opening delimiter \texttt{#2}. Simply use \texttt{\use_ii:nn}. Also, \texttt{#3} is \texttt{\langle \text{remainder of piece 2} \rangle \ERROR}, and \texttt{#9} is \texttt{\ERROR \langle \text{more for piece 2} \rangle}. We concatenate those, replacing the two \ERROR by the closing delimiter \texttt{#3}.

\begin{verbatim}
\cs_new:Npn \__cmd_expandable_grab_D:NNNwNNnnn #1#2#3#4 \q__cmd #5#6#7#8#9 
{ \exp_args:Nof \__cmd_expandable_grab_D:nnNNNwNN 
\{ \use_ii:nn \#7 \#2 \} \__cmd_expandable_grab_D:Nw \#3 \exp_stop_f: \#8 \#9 \}
\cs_new:Npn \__cmd_expandable_grab_D:Nw #1#2 \ERROR \ERROR { #2 #1 }
\end{verbatim}

Armed with our two new \texttt{\langle pieces \rangle}, we are ready to loop. However, we must first see if \texttt{\langle piece 2 \rangle} (here \texttt{#2}) contains any opening delimiter \texttt{#4}. Again, we expand \texttt{#3}, this time removing its whole output with \texttt{\use_none:nnn}. The test is similar to \texttt{\tl_if_in:nnTF}. The token list is empty if and only if \texttt{#2} does not contain the opening delimiter. In that case, we are done, and put the argument (from which we remove a spurious pair of delimiters coming from how we started the loop). Otherwise, we go back to looping with \texttt{\__cmd_expandable_grab_D:NNNwNNnnn}. The code to deal with brace stripping is much the same as for the non-expandable case.

\begin{verbatim}
\cs_new:Npn \__cmd_expandable_grab_D:nnNNNwNN #1#2#3#4 \q__cmd #5#6#7#8 #9 
{ \exp_args:No \tl_if_empty:oTF 
\{ \use_none:nn \#2 \q__cmd \#5 \q__cmd \#5 \}
\tl_if_blank:oTF { \use_none:nn \#1\#2 } \__cmd_put_arg_expandable:ow { \use_none:nn \#1\#2 } \str_if_eq:eeTF 
\{ \exp_not:o { \use_none:nn \#1\#2 } \} \__cmd_put_arg_expandable:ow { \use_iii:nnnn #1#2 \q_nil } 
\__cmd_put_arg_expandable:ow { \use_iii:nnnn #1#2 } 
\__cmd_put_arg_expandable:ow { \use_none:nn \#1\#2 } \__cmd_put_arg_expandable:ow { \use_none:nn \#1\#2 } 
#6 \q__cmd \#7 \#8 
}
\end{verbatim}

\begin{verbatim}
\end{verbatim}

(End definition for \texttt{\__cmd_expandable_grab_D:w} and others.)
When the delimiters are identical, nesting is not possible and a simplified approach is used. The test concept here is the same as for the case where the delimiters are different but there cannot be any nesting.

\begin{verbatim}
\cs_new:Npn \__cmd_expandable_grab_D_alt:w #1 \q__cmd #2#3
\{ #2 { \__cmd_expandable_grab_D_alt:NNwNNn #1 \q__cmd #2 #3 } \}
\cs_set_protected:Npn \__cmd_tmp:w #1
{ \cs_new:Npn \__cmd_expandable_grab_D_alt:NNwNNn ##1##2##3 \q__cmd ##4##5##6
\str_if_eq:nnTF {##6} {##2}
{ \str_if_eq:onTF
{ ##1 { } ##6 ##2 ##2 }
{ { } ##2 }
}{ \use_ii:nn }
{ #1
\{ \__cmd_expandable_grab_D_alt:NNwn ##4 ##5 ##3 \q__cmd }
##6 \ERROR
}{ ##3 {#1} \q__cmd ##4 ##5 {##6} }
}
\exp_args:No \__cmd_tmp:w { \c_novalue_tl }
\cs_new:Npn \__cmd_expandable_grab_D_alt:NNwn #1#2#3 \q__cmd #4
\str_if_eq:nnTF {\exp_not:o { \use_ii:nnn #4 \q_nil } } { \__cmd_put_arg_expandable:ow { \use_ii:nn #4 } } { \__cmd_put_arg_expandable:ow { \use_none:n #4 } } #3 \q__cmd #1 #2
\end{verbatim}

We keep track of long/short by placing the appropriate grabber as the third token after \q__cmd; it is eventually removed by the end:nnw auxiliary. The aux:w auxiliary will be called repeatedly with two arguments: the set of pairs \langle parser ⟩ ⟨token⟩, and the set of arguments found so far (initially all \{-NoValue-\}). At each step, grab what follows in the input stream then call the loop:nnnNNw auxiliary to compare it with each possible embellishment in turn. This auxiliary’s #1 is what was found in the input, #2 collects \langle parser ⟩ ⟨token⟩ pairs that did not match, #3 collects the corresponding arguments found previously, #4 and #5 is the current pair, #6 is the remaining pairs, #7 is empty or two \q_nil, and #8 is the current argument. If none of the pairs matched (determined by \quark_if_nil:NTF) then call the end auxiliary to stop looking for embellishments, remembering to put what was grabbed in the input back where it belongs, and storing
the arguments found just before \q__cmd. If the current argument #8 is not -NoValue- or if the input #1 does not match #5 (see t-type arguments below for a similar \str_if_-eq:onTF test) then carry on the loop. Otherwise, we found a new embellishment: grab the corresponding argument in the input using the find:w auxiliary. To avoid losing braces around that auxiliary's argument we include a space, which will be eliminated in the next loop through embellishments.

\cs_new:Npn \__cmd_expandable_grab_E:w #1 \q__cmd #2#3
\begin{verbatim}
{ \__cmd_expandable_grab_E_aux:w #1 \q__cmd #2 #3 #3 }
\end{verbatim}
\cs_new:Npn \__cmd_expandable_grab_E_long:w #1 \q__cmd #2#3
\begin{verbatim}
{ #2 \{ \__cmd_expandable_grab_E_test:nw #1 \q__cmd #2 #3 #4 \} }
\end{verbatim}
\cs_new:Npn \__cmd_expandable_grab_E_test:nnw #1#2#3 \q__cmd #4#5#6#7
\begin{verbatim}
{ \__cmd_expandable_grab_E_loop:nnnNNw {#7} { } { } #1 \q_nil \q_nil \q_nil \q_mark #2 \q_nil #3 \q__cmd #4 #5 #6 }
\end{verbatim}
\cs_new:Npn \__cmd_expandable_grab_E_find:w #1 \q__cmd #2#3#4
\begin{verbatim}
{ \__cmd_expandable_grab_E_find:nnw #1 \q__cmd #2 #3 #4 }
\end{verbatim}
\cs_new:Npn \__cmd_expandable_grab_E_aux:wNn #1 \q__cmd #2#3#4#5#6#7
\begin{verbatim}
{ #1 \q_nil \q_nil \q_nil \q_mark \q_nil \q_nil #3 \q__cmd #4 #5 #6 }
\end{verbatim}
\cs_new:Npn \__cmd_expandable_grab_E_end:nnw #1#2#3 \q__cmd #4#5#6
\begin{verbatim}
{ #3 #2 \q__cmd #4 #5 {#1} }
\end{verbatim}
\begin{verbatim}
\__cmd_expandable_grab_m:w #1 \q__cmd #2#3#4
\{ \str_if_eq:ontF \{ \#4 \{ \} \#1 \#5 \} \#5 \}
\__cmd_expandable_grab_m_long:w #1 \q__cmd #2#3#4
\{ \#2 \{ \__cmd_expandable_grab_m_test:nw \{ \#7\} {#1} \q__cmd \#2 \#3 \} \#4 \q__cmd \#5 \#6 \#7 \}
\__cmd_expandable_grab_m_aux:wNn #1 \q__cmd #2#3#4
\{ \#1 \{ \#4 \{ \} \#1 \}
\end{verbatim}
(End definition for \__cmd_expandable_grab_E:w and others.)

The mandatory case is easy: find the auxiliary after the \q__cmd, and use it directly to grab the argument, then correctly position the argument before \q__cmd.

\cs_new:Npn \__cmd_expandable_grab_m:w \q__cmd \__cmd_expandable_grab_m_long:w \q__cmd \__cmd_expandable_grab_m_aux:wNn
\begin{verbatim}
{ #1 \{ \__cmd_expandable_grab_m_aux:wn \#1 \q__cmd \#2 \#3 \} }
\end{verbatim}
\cs_new:Npn \__cmd_expandable_grab_m_long:w \q__cmd \__cmd_expandable_grab_m_aux:wn \#1 \q__cmd \#2 \#3
\begin{verbatim}
{ \__cmd_expandable_grab_m_test:nw \{ \#7\} {#1} \q__cmd \#2 \#3 \} \#4 \q__cmd \#5 \#6 \#7 }
\end{verbatim}
\cs_new:Npn \__cmd_expandable_grab_m_aux:wn \#1 \q__cmd \#2\#3#4
\begin{verbatim}
{ \#1 \{ \#4 \{ \} \#1 \}
\end{verbatim}
(End definition for \__cmd_expandable_grab_m:w, \__cmd_expandable_grab_m_long:w, and \__cmd_expandable_grab_m_aux:wn.)

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Much the same as for the D-type argument, with only the lead-off function varying.

```
\cs_new:Npn \__cmd_expandable_grab_R:w #1 \q__cmd #2#3
\cs_set_protected:Npn \__cmd_tmp:w #1
\cs_new:Npn \__cmd_expandable_grab_R_aux:NNNwNNn #1#2#3#4 \q__cmd #5#6#7
{\str_if_eq:nnTF {#7} {#2}
  {\str_if_eq:onTF
    {##1 { } { } #2 \q__cmd #3}
    {{ } {#2} { }}
  }
  {\use_ii:nn}
  {##1}
  { { \__cmd_expandable_grab_D:NNNwNNnnn #4##5##6 \q__cmd #7 #2 \ERROR \q__cmd \ERROR}
  }
}{\msg_expandable_error:nnff {cmd} {missing-required}
  {\exp_args:Nf \tl_trim_spaces:n {\token_to_str:N ##5}
      {\tl_to_str:n {##2}}
      {##4 #1 \q__cmd #5 #6 {##7}}}

\exp_args:No \__cmd_tmp:w {\c_novalue_tl}
```

(End definition for \__cmd_expandable_grab_R:w and \__cmd_expandable_grab_R_aux:NNNwNNn.)

When the delimiters are identical, nesting is not possible and a simplified approach is used. The test concept here is the same as for the case where the delimiters are different.

```
\cs_new:Npn \__cmd_expandable_grab_R_alt:w #1 \q__cmd #2#3
\cs_set_protected:Npn \__cmd_tmp:w #1
\cs_new:Npn \__cmd_expandable_grab_R_alt_aux:NNwNNn #1#2#3#4 \q__cmd #5#6#7
{\msg_expandable_error:nnff {cmd} {missing-required}
  {\exp_args:Nf \tl_trim_spaces:n {\token_to_str:N #5}
    {\tl_to_str:n (###2)}
    {##4 (##4) \ERROR}
  }
}{\msg_expandable_error:nnff {cmd} {missing-required}
  {\exp_args:Nf \tl_trim_spaces:n {\token_to_str:N #4}
    {\tl_to_str:n {##2}}
    {##4 #1 \q__cmd #5 #6 {##7}}}

\exp_args:No \__cmd_tmp:w {\c_novalue_tl}
```

(End definition for \__cmd_expandable_grab_R_alt:w and \__cmd_expandable_grab_R_alt_aux:NNwNNn.)
As for a D-type argument, here we compare the grabbed tokens using the only parser we have in order to work out if \#2 is exactly equal to the output of the grabber.

\begin{verbatim}
\cs_new:Npn \__cmd_expandable_grab_t:w \__cmd #2\#3
{ \__cmd_expandable_grab_t_aux:w \__cmd #2 \#3 \#1 \q__cmd #2 \#3 }
\cs_new:Npn \__cmd_expandable_grab_t_aux:NNwn #1#2#3 \q__cmd #4#5#6
{ \str_if_eq:onTF { \#1 \q\cmd #6 \#2 } {\#2} { \__cmd #3 \#1 \q\cmd \str_if_eq:onTF { \#3 \q\cmd \#5 } {\#6} }
(End definition for \__cmd_expandable_grab_t:w and \__cmd_expandable_grab_t_aux:NNwn.)
\end{verbatim}

A useful helper, to store arguments when they are ready.

\begin{verbatim}
\cs_new:Npn \__cmd_put_arg_expandable:ow \__cmd #1\#2 \q\cmd \#2 \#1 \q\cmd \str_if_eq:onTF { \#1 \q\cmd } {\#2} { \__cmd \#3 \#4 \#5 \#6 }
\cs_new:Npn \__cmd_put_arg_expandable:ow \__cmd #1\#2 \q\cmd \str_if_eq:onTF { \#1 \q\cmd } {\#2}
\cs_generate_variant:Nn \__cmd_put_arg_expandable:ow { o } \cs_new:NNn \__cmd_put_arg_expandable:nw \__cmd #1
(End definition for \__cmd_put_arg_expandable:ow.)
\end{verbatim}

### 1.10 Argument processors

\begin{verbatim}
\cs_new_protected:Npn \__cmd_bool_reverse:N #1
\str_if_eq:onTF \#1 \c\true \cmd \{ \tl_set:Nn \ProcessedArgument { \c\false } \}
\str_if_eq:onTF \#1 \c\false \cmd \{ \tl_set:Nn \ProcessedArgument { \c\true } \}
(End definition for \__cmd_bool_reverse:N.)
\end{verbatim}
Splitting can take place either at a single token or at a longer identifier. To deal with single active tokens, a two-part procedure is needed.

```latex
\texttt{\__cmd_split_list:nn \\__cmd_split_list_seq} \texttt{\__cmd_split_list_mon} \texttt{\__cmd_split_list_single:NN}
```

Splitting to a known number of items is a special version of splitting a list, in which the limit is hard-coded and where there will always be exactly the correct number of output items. An auxiliary function is used to save on working out the token list length several times.

```latex
\texttt{\__cmd_split_list:nn} \texttt{\__cmd_split_list_seq} \texttt{\__cmd_split_list_mon} \texttt{\__cmd_split_list_single:NN}
```

(End definition for \texttt{\__cmd_split_list:nn}, \texttt{\__cmd_split_list_mon}, and \texttt{\__cmd_split_list_single:NN}.)
Auxiliaries to leave exactly the correct number of arguments in $\texttt{ProcessedArgument}$.

This one is almost trivial.

1.11 Access to the argument specification

Provide an informative error when trying to get the argument specification of a non-xparse command or environment.
\_\_cmd_get_arg_spec_error:n \#1
}\cs_new_protected:Npn \__cmd_get_arg_spec_error:n \#1
{ \bool_set_true:N \l__cmd_environment_bool
 \str_set:Nx \l__cmd_environment_str {#1}
\__cmd_get_arg_spec_error_aux:n
{ \cs_if_exist:cTF { \l__cmd_environment_str } }
}\cs_new_protected:Npn \__cmd_get_arg_spec_error_aux:n #1
{ #1
{ \msg_error:nnx { cmd } { non-xparse }
{ \_\_cmd_environment_or_command: }
}
{ \msg_error:nnx { cmd } { unknown }
{ \_\_cmd_environment_or_command: }
}
}

(End definition for \_\_cmd_get_arg_spec_error:N, \_\_cmd_get_arg_spec_error:n, and
\_\_cmd_get_arg_spec_error_aux:n.)

\__cmd_get_arg_spec:NTF If the command is not an \texttt{xparse} command, complain. If it is, its second “item” is the argument specification.
\cs_new_protected:Npn \_\_cmd_get_arg_spec:NTF #1#2#3
{ \__kernel_cmd_if_xparse:NTF #1
{ \tl_set:Nx \ArgumentSpecification { \tl_item:Nn #1 { 2 } }
 #2
 }
{ #3 }
}

(End definition for \_\_cmd_get_arg_spec:NTF.)

Rolling forward from 2020-10-01 is tricky because the entire \texttt{ltcmd} module is new, but the user-level commands have the same name, so only these will clash. To work around that, in \texttt{latexrelease} mode we will (temporarily) disable \_\_kernel_chk_if_free_cs:N for this final part of the code, then restore at the end.
\langle latexrelease \rangle \cs_new_eq:NN \__cmd_get_arg_spec:NTF \__kernel_chk_if_free_cs:N \langle latexrelease \rangle \cs_gset_eq:NN \__kernel_chk_if_free_cs:N \use_none:n

\texttt{ArgumentSpecification} \tl_new:N \ArgumentSpecification
\_\_cmd_get_arg_spec:N \_\_cmd_get_arg_spec:n Recovering the argument specification is now trivial.
\cs_new_protected:Npn \_\_cmd_get_arg_spec:N \#1
{ \_\_cmd_get_arg_spec:NTF \#1 \{ \}

2071 \{ \__cmd_get_arg_spec_error:N #1 \}
2072 \}
2073 \cs_new_protected:Npn \__cmd_get_arg_spec:n #1
2074 \{\exp_args:Nc \__cmd_get_arg_spec:NTF
2075 \{ \__cmd_get_arg_spec_error:n \}
2076 \}
2077 \}
2078 \}
2079 \exp_args:Nc \__cmd_get_arg_spec:NTF
2080 \{ \tl_to_str:n \}
2081 \}
2082 \}
2083 \__cmd_get_arg_spec_error:n \}
2084 \}
2085 \exp_args:Nc \__cmd_get_arg_spec:NTF
2086 \{ \__cmd_get_arg_spec_error:n \}
2087 \}
2088 \exp_args:Nc \__cmd_get_arg_spec:NTF
2089 \{ \__cmd_get_arg_spec_error:n \}
2090 \}
2091 \}
2092 \}
2093 \}
2094 \}
2095 \}
2096 \}
2097 \}
2098 \}
2099 \}
2100 \}
2101 \}
2102 \}

(End definition for \__cmd_get_arg_spec:N and \__cmd_get_arg_spec:n.)

\__cmd_show_arg_spec:N
\__cmd_show_arg_spec:n

Showing the argument specification simply means finding it and then calling the \tl_-_show:N function.

2103 \cs_new_protected:Npn \__cmd_show_arg_spec:N #1
2104 \{ \__cmd_get_arg_spec:NTF #1
2105 \{ \__cmd_get_arg_spec_error:N \}
2106 \}
2107 \cs_new_protected:Npn \__cmd_show_arg_spec:n #1
2108 \{\exp_args:Nc \__cmd_get_arg_spec:NTF
2109 \{ \__cmd_get_arg_spec_error:n \}
2110 \}
2111 \exp_args:Nc \__cmd_get_arg_spec:NTF
2112 \{ \__cmd_get_arg_spec_error:n \}
2113 \}
2114 \}
2115 \exp_args:Nc \__cmd_get_arg_spec:NTF
2116 \{ \__cmd_get_arg_spec_error:n \}
2117 \}
2118 \}
2119 \}
2120 \}
2121 \}
2122 \}
2123 \}
2124 \}
2125 \}
2126 \}
2127 \}
2128 \}
2129 \}
2130 \}
2131 \}
2132 \}
2133 \}
2134 \}
2135 \}
2136 \}
2137 \}
2138 \}
2139 \}
2140 \}
2141 \}
2142 \}
2143 \}
2144 \}
2145 \}
2146 \}
2147 \}
2148 \}
2149 \}
2150 \}
2151 \}
2152 \}

(End definition for \__cmd_show_arg_spec:N and \__cmd_show_arg_spec:n.)

\__cmd_check_definable:nNT
\__cmd_check_definable_aux:nN

Check that a token list is appropriate as a first argument of \NewDocumentCommand and similar functions and otherwise produce an error. First trim whitespace to allow for spaces around the actual command to be defined. If the result has multiple tokens, it is not a valid argument. The single token is a control sequence exactly if its string representation has more than one character (using \token_to_str:N rather than \tl_to_str:n to avoid problems with macro parameter characters, and setting \tex_escapechar:D to prevent it from being non-printable). Finally, check for an active character: this is done by lowercasing the token to fix its character code (arbitrarily to that of ?) and comparing the result to an active ?. Both control sequences and active characters are valid arguments, and non-active character tokens are not. In all cases, the group opened to keep assignments local must be closed.

2153 \cs_new_protected:Npn \__cmd_check_definable:nNT #1
2154 \{ \tl_trim_spaces_apply:nN \}
2155 \}
2156 \cs_new_protected:Npn \__cmd_check_definable_aux:nN #1#2
2157 \{ \tl_if_single_token:nTF \}
2158 \}
2159 \}
2160 \}
2161 \}
2162 \}
2163 \}
2164 \}
2165 \}
2166 \}
2167 \}
2168 \}
2169 \}
2170 \}
2171 \}
2172 \}
2173 \}
2174 \}
2175 \}
2176 \}
2177 \}
2178 \}
2179 \}
2180 \}
2181 \}
2182 \}
2183 \}
2184 \}
2185 \}
2186 \}
2187 \}
2188 \}
2189 \}
2190 \}
2191 \}
2192 \}

\tl_if_single_token:nTF
\int_set:Nn \tex_escapechar:D { 92 }

1.12 Utilities

Check that a token list is appropriate as a first argument of \NewDocumentCommand and similar functions and otherwise produce an error. First trim whitespace to allow for spaces around the actual command to be defined. If the result has multiple tokens, it is not a valid argument. The single token is a control sequence exactly if its string representation has more than one character (using \token_to_str:N rather than \tl_to_str:n to avoid problems with macro parameter characters, and setting \tex_escapechar:D to prevent it from being non-printable). Finally, check for an active character: this is done by lowercasing the token to fix its character code (arbitrarily to that of ?) and comparing the result to an active ?. Both control sequences and active characters are valid arguments, and non-active character tokens are not. In all cases, the group opened to keep assignments local must be closed.
Based on the definition of \__cmd_check_definable_aux:nN above, but only checks for an actual control sequence (i.e., \langle \text{anything} \rangle). \tex_escapechar:D is temporarily changed to a known value and then it checks if \string#1 contains more than one character: if it does, it’s a control sequence. This test differs from \token_if_cs:NTF for example in \token_if_cs:NTF \c_group_begin_token {T}{F}, where \token_if_cs:NTF returns false.

\__cmd_token_if_cs:NTF Analogue of \seq_mapthread_function:NNN for token lists.

\__cmd_tl_mapthread_function:NNN\__cmd_tl_mapthread_loop:w Analogue of \seq_mapthread_function:NNN for token lists.
\texttt{\textbackslash q\_recursion\_tail}\texttt{\textbackslash q\_recursion\_stop}

\texttt{\textbackslash cs\_new: \textbackslash Npn \_\_cmd\_tl\_mapthread\_function:nnN #1\#2\#3}

\{\texttt{\textbackslash \_cmd\_tl\_mapthread\_loop:w #3\textbackslash q\_recursion\_tail \textbackslash q\_mark}
\texttt{\#1 \textbackslash q\_recursion\_tail \textbackslash q\_recursion\_stop}
\texttt{\textbackslash \_cmd\_tl\_mapthread\_loop:w #1\#2\#3 \textbackslash q\_recursion\_stop}
\}

\texttt{\textbackslash cs\_new: \textbackslash Npn \_\_cmd\_tl\_mapthread\_function:nnN #1\#2\#3 \textbackslash q\_mark #4}

\{\texttt{\textbackslash quark\_if\_recursion\_tail\_stop:n (#2)}
\texttt{\textbackslash quark\_if\_recursion\_tail\_stop:n (#4)}
\texttt{\#1 (#2) (#4)}
\texttt{\_\_cmd\_tl\_mapthread\_loop:w #1\#3 \textbackslash q\_mark}
\}

(End definition for \_\_cmd\_tl\_mapthread\_function:NNN, \_\_cmd\_tl\_mapthread\_function:nnN, and \_\_cmd\_tl\_mapthread\_loop:w.)

To determine whether the command is an \texttt{xparse} command check that its \texttt{arg\_spec} is empty (this also excludes non-macros) and that its \texttt{replacement\_spec} starts with either \_\_cmd\_start:nNNnnn (non-expandable command) or \_\_cmd\_start\_expandable:nNNNNn (expandable command) or \_\_cmd\_start\_env:nnnnn (environment) or \texttt{environment \#1 end aux} (environment end).

This conditional is needed in several kernel modules and is therefore has a kernel-
internal name.

\texttt{\textbackslash cs\_new\_protected: \textbackslash Npn \_\_cmd\_cmd\_type\_cases:NNnnnF #1 #2 #3 #4 #5 #6}

\{\texttt{\exp\_args:Ne \texttt{str\_case\_e:nnF}}
\texttt{\{\exp\_args:Nf \texttt{tl\_if\_empty:nT \{ \texttt{cs\_argument\_spec:N #1}}}
\texttt{\{ \exp\_not:N \texttt{exp\_not:n} \{ \exp\_not:e \{ \texttt{tl\_head:N #1} \} \}}
\}
\}

\texttt{\{\exp\_not:N \_\_cmd\_start:nNNnnn \} (#2)}
\texttt{\{\exp\_not:N \_\_cmd\_start\_expandable:nNNNNn \} (#3)}
\texttt{\{\exp\_not:N \_\_cmd\_start\_env:nnnnn \} (#4)}
\texttt{\{\exp\after:wN \texttt{exp\_not:N} \texttt{\cs:w environment-}}
\texttt{\texttt{\exp\_last\_unbraced:Ne \texttt{use\_none:nnn}}
\texttt{\{ \texttt{cs\_to\_str:N #1} \} -end-aux \texttt{\cs\_end:}}
\}
\)
\}
\)

\texttt{\textbackslash cs\_new\_protected: \textbackslash Npn \_\_kernel\_cmd\_if\_xparse:NTF #1}

\{\texttt{\_\_cmd\_cmd\_type\_cases:NNnnnF #1}
\} { } { } { } { \texttt{\use\_iii:nnn}}
\texttt{\textbackslash use\_i:nnn}
Collect spaces in a loop, and put the collected spaces back in the false branch of a call to \peek_meaning:NTF or \peek_meaning_remove:NTF.

\cs_new_protected:Npn \__cmd_peek_nonspace:NTF\{ \__cmd_peek_nonspace_aux:nNNTF { } \__cmd_peek_meaning:NTF \}
\cs_new_protected:Npn \__cmd_peek_nonspace_remove:NTF\{ \__cmd_peek_nonspace_aux:nNNTF { } \__cmd_peek_meaning_remove:NTF \}
\cs_new_protected:Npn \__cmd_peek_nonspace_aux:nNNTF #1#2#3#4#5
{ \peek_meaning_remove:NTF \c_space_token
{ \__cmd_peek_nonspace_aux:nNNTF { #1 ~ } #2 #3 {#4} {#5} }
{ #2 #3 { #4 } { #5 #1 } }
}

Peek ahead for a token with a given meaning. In case the search token is a control sequence, also check that the ⟨csname⟩ is the same as the control sequence peeked at. This extra verification is necessary when the command is delimited by control sequence tokens (as opposed to character tokens), and we want the exact same control sequence to match.

\cs_new_protected:Npn \__cmd_peek_meaning:NTF\{ \__cmd_peek_meaning_aux:NNTF \c_false_bool \}
\cs_new_protected:Npn \__cmd_peek_meaning_remove:NTF\{ \__cmd_peek_meaning_aux:NNTF \c_true_bool \}
\cs_new_protected:Npn \__cmd_peek_meaning_aux:NNTF #1#2#3#4#5
{ \tl_set:Nn \l__cmd_tmpa_tl {#3}
\tl_set:Nn \l__cmd_tmpb_tl {#4}
\peek_meaning:NTF \c_group_begin_token
{ \__cmd_token_if_cs:NTF #2 #1 #2 \__cmd_peek_cs_check_equal:NNN #1 #2 }
{ \__cmd_peek_true_remove:Nw #1 }
}

\cs_new_protected:Npn \__cmd_peek_cs_check_equal:NNN #1#2#3
{ \str_if_eq:nnTF {#2} {#3}
{ \__cmd_peek_true_remove:Nw #1 }
{ \c_space_token }
#3
}

\cs_new_protected:Npn \__cmd_peek_true_remove:Nw #1
{ \bool_if:NTF \c_space_token #1
}
\c__cmd_ignore_def_tl
\tl_const:Nn \c__cmd_ignore_def_tl
\{ \\\\\ LaTeX\ will\ ignore\ this\ entire\ definition. \} 
\__cmd_environment_or_command: 
Two texts used in several messages.
\cs_new:Npn \__cmd_environment_or_command:
{ \bool_if:NTF \l__cmd_environment_bool
\{ \c__cmd_environment_str \}
\{ command ~ ' \exp_args:Nf \tl_trim_spaces:n
\{ \exp_after:wN \token_to_str:N \l__cmd_fn_tl \}
\} }
\msg_new:nnnn { cmd } { arg-after-body }
{ Argument\-type\-‘b’\-must\-be\-last\-in\-#1. \}
{ The\-‘b’\-argument\-type\-must\-come\-last\-but\-it\-is\-followed\-
by\-‘#2’\-in\-the\-argument\-specification.\-This\-is\-not\-allowed. }
\msg_new:nnnn { cmd } { bad-arg-spec }
{ Bad\-argument\-specification\-‘#2’\-for\-#1. }
{ The\-argument\-specification\-provided\-is\-not\-valid:\-
one\-or\-more\-mandatory\-parts\-are\-missing. }
\msg_new:nnnn { cmd } { already-defined }
{ Command\-‘#1’\-already\-defined. }
{ You\-have\-used\-‘#2’\-
with\-a\-command\-that\-already\-has\-a\-definition. \\\\\
The\-existing\-definition\-of\-‘#1’\-will\-not\-be\-altered. }
\msg_new:nnnn { cmd } { undefined }

1.13 Messages

(End definition for \__cmd_peek_meaning:NTF and others.)
{ Command -'#1'-undefined. }
{ You-have-used-#2-
  with-a-command-that-was-never-defined. \_\_\_\_\_\_\_\_\_\_cmd_ignore_def_tl
 }
\msg_new:nnnn { cmd } { env-already-defined }
{ Environment-'#1'-already-defined. }
{ You-have-used-\NewDocumentEnvironment
  with-an-environment-that-already-has-a-definition. \_\_\_\_\_\_\_\_\_\_cmd_ignore_def_tl
 The-existing-definition-of-'#1'-will-not-be-altered. }
\msg_new:nnnn { cmd } { env-end-already-defined }
{ End-of-environment-'#1'-already-defined. }
{ You-have-used-\NewDocumentEnvironment
  with-an-environment-that-already-has-a-definition-for-`end#1'. \_\_\_\_\_\_\_\_\_\_cmd_ignore_def_tl
 The-existing-definition-of-'#1'-will-not-be-altered. }
\msg_new:nnnn { cmd } { env-undefined }
{ Environment-'#1'-undefined. }
{ You-have-used-\RenewDocumentEnvironment
  with-an-environment-that-was-never-defined. \_\_\_\_\_\_\_\_\_\_cmd_ignore_def_tl
 }
\msg_new:nnnn { cmd } { expandable-ending-optional }
{ Bad-argument-specification-'#2'-for-'#1'. }
{ Expandable-commands-must-have-a-final-mandatory-argument-
  (or-no-arguments-at-all).-You-cannot-have-a-terminal-optional-
  argument-with-expandable-commands. }
\msg_new:nnnn { cmd } { long-short-mix }
{ Invalid-argument-prefix-'+'-in-command-'#1'. }
{ The-arguments-for-an-expandable-command-must-not-involve-short-
  arguments-after-long-arguments.-You-have-tried-to-mix-the-two-types-
  when-defining-`#1'. }
\msg_new:nnnn { cmd } { invalid-command-arg }
{ Invalid-argument-type-'#2'-in-`#1'. }
{ The-letter-`#2'-can-only-be-used-in-environment-argument-
  specifications,-but-not-for-commands. \_\_\_\_\_\_\_\_\_\_cmd_ignore_def_tl
 LaTeX-will-ignore-the-entire-definition. }
\msg_new:nnnn { cmd } { invalid-expandable-arg }
{ Invalid-argument-type-'#2'-in-`#1'. }
{ The-letter-`#2'-specifies-an-argument-type-which-cannot-be-used-
  in-an-expandable-command. }
\__cmd_ignore_def_tl

\msg_new:nnnn { cmd } { invalid-after-optional-expandably }
{ Argument-~'#2'~invalid-after-optional-arg-in-#1. }
{ The~letter~'#2'~specifies~an~argument-type~which~cannot~be~used~in~an~expandable-command~after~an~optional-argument.
 \__cmd_ignore_def_tl }

\msg_new:nnnn { cmd } { invalid-bang }
{ Invalid-argument-prefix-!'~-in-#1. }
{ The-prefix~!'!'~is~only~allowed~for~trailing-optional-arguments.-You~tried~to~apply~it~to~'#2'.
 \__cmd_ignore_def_tl }

\msg_new:nnnn { cmd } { not-definable }
{ First-argument-of~'#2'~must~be~a~command. }
{ The-first-argument-of~'#2'~should~be~the~document-command~that~will~be~defined.-The~provided-argument~'#1'~is~a~character.-Perhaps~a-backslash~is~missing?
 \__cmd_ignore_def_tl }

\msg_new:nnnn { cmd } { not-one-token }
{ First-argument-of~'#2'~must~be~a~command. }
{ The-first-argument-of~'#2'~should~be~the~document-command~that~will~be~defined.-The~provided-argument~'#1'~contains~more~than~one-token.-Perhaps~a-backslash~is~missing?
 \__cmd_ignore_def_tl }

\msg_new:nnnn { cmd } { not-single-token }
{ Argument-delimiter~'#2'~invalid-in-#1. }
{ The-argument-specification~contains-
 \tl_if_empty:nTF{#2}{nothing}{'#2'}~in~a~place~where~a~single~token~is~required.
 \__cmd_ignore_def_tl }

\msg_new:nnnn { cmd } { forbidden-group-token }
{ Argument-delimiter~'#2'~invalid-in-#1. }
{ The-argument-specification~contains~the~implicit-
 #3-group-token~'#2'~which~is~not~allowed~as~an~argument-delimiter.
 \__cmd_ignore_def_tl }

\msg_new:nnnn { cmd } { processor-in-expandable }
{ Invalid-argument-prefix->'~in-command~'#1'. }
{ The-argument-specification~for~'#1'~contains~the~processor-function~'>(#2)'~This~is~only~supported~for~robust-commands,-but~not~for~expandable-ones.
 \__cmd_ignore_def_tl }
\msg_new:nnn { cmd } { too-many-args }
{ Too-many-arguments-for-\#1. }
{ The-argument-specification-‘\#2’-asks-for-more-than-9-arguments.-
  This-cannot-be-implemented. }
\c__cmd_ignore_def_tl
\msg_new:nnnn { cmd } { two-markers }
{ Invalid-argument-prefix-‘\#2’-in-\#1. }
{ The-argument-specification-provided-for-\#1-has-two-‘\#2’-markers-applied-
  to-the-same-argument;-one-is-redundant. }
\msg_new:nnnn { cmd } { unknown-argument-type } % should be unkown-arg-type but dep in xparse
{ Invalid-argument-type-‘\#2’-in-\#1. }
{ The-letter-‘\#2’-does-not-specify-a-known-argument-type. }
\c__cmd_ignore_def_tl
\msg_new:nnn { cmd } { xparse-arg-type }
{ Invalid-argument-type-‘\#2’-in-\#1-(requires-xparse). }
{ The-letter-‘\#2’-specifies-a-known-but-deprecated-argument-type.-
  If-you-really-need-it-you-have-to-load-the-xparse-package. }
\c__cmd_ignore_def_tl
\msg_new:nnnn { cmd } { if-boolean }
{ Invalid-argument-\{\#1\}-to-\io_char:N\IfBoolean... }
\msg_new:nnnn { cmd } { default-loop }
{ Circular-dependency-in-defaults-of-\#1. }
{ The-default-values-of-two-or-more-arguments-of-the-\#1-
  depend-on-each-other-in-a-way-that-cannot-be-resolved. }
\msg_new:nnnn { cmd } { missing-required }
{ Required-argument-missing-for-\#1. }
{ The-\#1-expects-one-of-its-arguments-to-start-with-‘\#2’.-
  \LaTeX-did-not-find-this-argument-and-will-insert-a-default-value-
  for-further-processing. }
\msg_new:nnnn { cmd } { non-xparse }
{ \str_uppercase:n \#1-not-defined-using-xparse. }
{ You-have-asked-for-the-argument-specification-for-the-\#1,-
  but-this-was-not-defined-using-xparse. }
\msg_new:nnnn { cmd } { arg-split }
{ Too-many-‘\#1’-separators-in-argument. }

Errors when using commands/environments. The if-boolean message is always
used in expandable errors. The default-loop and missing-required messages can be
expandable or not expandable.
LaTeX was asked to split the input '#3' at each occurrence of the separator '#1' into #2 parts.
Too many separators were found.

\msg_new:nnnn { cmd } { unknown } { Unknown-document-#1. }
\{ You-have-asked-for-the-argument-specification-for-the-#1,- but-it-is-not-defined. \}
\msg_new:nnnn { cmd } { verbatim-nl } { Verbatim-like #1 ended by end-of-line. }
\{ The-verbatim-argument-of-the-#1-cannot-contain-more-than-one-line,- but-the-end-of-the-current-line-has-been-reached.-You-may-have-forgotten-the-closing-delimiter. \\
LaTeX-will-ignore-#2'and-you-may-get-some-additional-(low-level)-errors. \}
\msg_new:nnnn { cmd } { verbatim-tokenized } { Verbatim-like #1 illegal in argument. }
\{ The-#1-takes-a-verbatim-argument-and-should-therefore-normally-not-be-used-in-arguments-of-other-commands-or-environments.-LaTeX-found-an-illegal-token- \tl_if_empty:nF \{#3\} \{ (#3) \} \after-'#2'-and-will-drop-everything-up-to-this-point. \\
Expect-further-(low-level)-errors. \}

Intended more for information.
\msg_new:nnnn { cmd } { define-command } \% should be just "define" but dep in xparse
\{ Defining-command-#1- with-sig.-'#2'-\msg_line_context:. \}
\msg_new:nnnn { cmd } { define-env }
\{ Defining-environment-#1- with-sig.-'#2'-\msg_line_context:. \}
\msg_new:nnnn { cmd } { redefine }
\{ Redefining-command-#1- with-sig.-'#2'-\msg_line_context:. \}
\msg_new:nnnn { cmd } { redefine-env }
\{ Redefining-environment-#1- with-sig.-'#2'-\msg_line_context:. \}
\msg_new:nnnn { cmd } { optional-mandatory }
Optional-and-mandatory-argument-with-same-delimiter-#2'.
\ \ \ The-mandatory-argument-specified-with-
'str_case:nnF(#1){(R/r){r’-or-R}{#1}’-has-the-
same-delimiter-#2'-as-an-earlier-optional-argument.-
It-will-therefore-not-be-possible-to-omit-all-the-earlier-
optional-arguments-when-calling-this-command.
\ \ \ This-may-be-intentional,-but-then-it-might-be-a-mistake.
\msg_new:nnn { cmd } { unsupported-let }
\ The-command-‘#1’-was-undefined-but-not-the-associated-commands-
’#1-code’-and/or-’#1-defaults’.-Maybe-you-tried-using-
\low_char:N\let.-This-may-lead-to-an-infinite-loop.

1.14 User functions

The user functions are more or less just the internal functions renamed.

\BooleanFalse \BooleanTrue

Design-space names for the Boolean values.
\cs_new_eq:NN \BooleanFalse \c_false_bool
\cs_new_eq:NN \BooleanTrue \c_true_bool

(End definition for \BooleanFalse and \BooleanTrue.)

\NewDocumentCommand \RenewDocumentCommand \ProvideDocumentCommand \DeclareDocumentCommand

The user macros are pretty simple wrappers around the internal ones. There is however
a check that the first argument is a single token, possibly surrounded by spaces (hence
the strange \use:nnn), and is definable.
\cs_new_protected:Npn \NewDocumentCommand #1\#2\#3
\{ \__cmd_check_definable:nNT {#1} \NewDocumentCommand
\{ \cs_if_exist:NTF {#1} \NewDocumentCommand
\{ \msg_error:nxxx { cmd } { already-defined }
\{ \use:nnn \token_to_str:N #1 { } \}
\{ \token_to_str:N \NewDocumentCommand \}
\{ \__cmd_declare_cmd:Nnn #1 \{#2\} \{#3\} \}
\}
\}
\cs_new_protected:Npn \RenewDocumentCommand #1\#2\#3
\{ \__cmd_check_definable:nNT {#1} \RenewDocumentCommand
\{ \cs_if_exist:NTF {#1} \RenewDocumentCommand
\{ \__cmd_declare_cmd:Nnn #1 \{#2\} \{#3\} \}
\{ \msg_error:nxxx { cmd } { undefined }
\{ \use:nnn \token_to_str:N #1 { } \}
\{ \token_to_str:N \RenewDocumentCommand \}

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\cs_new_protected:Npn \ProvideDocumentCommand #1#2#3
{ \__cmd_check_definable:nNT {#1} \ProvideDocumentCommand
  \cs_if_exist:NF #1 \__cmd_declare_cmd:Nnn #1 {#2} {#3} }
\cs_new_protected:Npn \DeclareDocumentCommand #1#2#3
{ \__cmd_check_definable:nNT {#1} \DeclareDocumentCommand
  \cs_if_exist:NF #1 \__cmd_declare_cmd:Nnn #1 {#2} {#3} }

\NewDocumentEnvironment {\NewDocumentCommand and others.}
\RenewDocumentEnvironment
\ProvideDocumentEnvironment
\DeclareDocumentEnvironment
Very similar for environments.
\cs_new_protected:Npn \NewDocumentEnvironment #1#2#3#4
{ \cs_if_exist:cTF {#1}
  \cs_if_exist:CTF {#1}
  \msg_error:nxx { cmd } { env-already-defined } {#1}
  \cs_if_exist:CTF { end #1}
  \msg_error:nxx { cmd } { env-end-already-defined } {#1}
  \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4}
}
\cs_new_protected:Npn \RenewDocumentEnvironment #1#2#3#4
{ \cs_if_exist:cTF {#1}
  \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4}
  \msg_error:nxx { cmd } { env-undefined } {#1}
}
\cs_new_protected:Npn \ProvideDocumentEnvironment #1#2#3#4
{ \cs_if_exist:cF {#1}
  \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4}
}
\cs_new_protected:Npn \DeclareDocumentEnvironment #1#2#3#4
{ \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4} }

(End definition for \NewDocumentCommand and others.)
\NewExpandableDocumentCommand
\RenewExpandableDocumentCommand
\ProvideExpandableDocumentCommand
\DeclareExpandableDocumentCommand
The expandable versions are essentially the same as the basic functions. The strange \use:nnn is there in case \#1 is surrounded with spaces, as can happen with usual document catcodes in \RenewExpandableDocumentCommand { \! } ...
\cs_new_protected:Npn \NewExpandableDocumentCommand #1#2#3
{ \__cmd_check_definable:nNT {#1} \NewExpandableDocumentCommand
  \cs_if_exist:NTF #1
  \msg_error:nxx { cmd } { already-defined } {#1}
  \use:nnn \token_to_str:N #1
  \__cmd_declare_expandable_cmd:Nnn {#1} {#2} {#3} }

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\IfBooleanT
\IfBooleanF
\IfBooleanTF

The logical \texttt{⟨true⟩} and \texttt{⟨false⟩} statements are just the normal \texttt{\c_{true\_bool}} and \texttt{\c_{false\_bool}} so \texttt{\bool_if:NTF} is almost enough. However, this code-level function blows up badly when passed invalid input. We want \texttt{\IfBooleanTF} to accept a single (non-space) token equal to \texttt{\c_{true\_bool}} or \texttt{\c_{false\_bool}}, possibly surrounded by spaces. If the input is blank or multiple items, jump to the error and pick the false branch. If the input, ignoring spaces (we do this by omitting braces in the \texttt{\tl_if_single_token:nF} test), is not a single token then jump to the error as well. It is then safe to compare the token to the two booleans, picking the appropriate branch. If neither matches, we jump to the error as well.

\cs_new:Npn \IfBooleanTF \#1

\end{definition}
\use_{ii}:nn

\cs_new:Npn \IfBooleanT #1#2 { \IfBooleanTF {#1} {#2} { } }
\cs_new:Npn \IfBooleanF #1 { \IfBooleanTF {#1} { } }

(End definition for \IfBooleanT, \IfBooleanF, and \IfBooleanTF.)

\IfNoValueT Simple re-naming.
\IfNoValueF \cs_new_eq:NN \IfNoValueF \tl_if_novalue:nF
\IfNoValueTF \cs_new_eq:NN \IfNoValueTF \tl_if_novalue:nTF

(End definition for \IfNoValueT, \IfNoValueF, and \IfNoValueTF.)

\IfValueT Inverted logic.
\IfValueF \cs_new:Npn \IfValueF { \tl_if_novalue:nT }
\IfValueTF \cs_new:Npn \IfValueTF #1#2#3 { \tl_if_novalue:nTF {#1} {#3} {#2} }

(End definition for \IfValueT, \IfValueF, and \IfValueTF.)

\IfBlankT Another simple re-naming.
\IfBlankF \cs_new_eq:NN \IfBlankF \tl_if_blank:nF
\IfBlankTF \cs_new_eq:NN \IfBlankTF \tl_if_blank:nTF

(End definition for \IfBlankT, \IfBlankF, and \IfBlankTF.)

\ProcessedArgument Processed arguments are returned using this name, which is reserved here although the definition will change.
\tl_new:N \ProcessedArgument

(End definition for \ProcessedArgument.)

\ReverseBoolean Simple copies.
\SplitArgument \cs_new_eq:NN \ReverseBoolean \__cmd_bool_reverse:N
\SplitList \cs_new_eq:NN \SplitArgument \__cmd_split_argument:nnn
\TrimSpaces \cs_new_eq:NN \SplitList \__cmd_split_list:nn
\cs_new_eq:NN \TrimSpaces \__cmd_trim_spaces:n

(End definition for \ReverseBoolean and others.)

\ProcessList To support \SplitList.
\cs_new_eq:NN \ProcessList \tl_map_function:nN

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More simple mappings, with a check that the argument is a single control sequence or active character.

```latex
\cs_new_protected:Npn \GetDocumentCommandArgSpec #1
\{ \__cmd_check_definable:nNT {#1} \GetDocumentCommandArgSpec
\{ \__cmd_get_arg_spec:N #1 \}
\}
\cs_new_eq:NN \GetDocumentEnvironmentArgSpec \__cmd_get_arg_spec:n
\cs_new_protected:Npn \ShowDocumentCommandArgSpec #1
\{ \__cmd_check_definable:nNT {#1} \ShowDocumentCommandArgSpec
\{ \__cmd_show_arg_spec:N #1 \}
\}
\cs_new_eq:NN \ShowDocumentEnvironmentArgSpec \__cmd_show_arg_spec:n

(End definition for \ProcessList.)
```

Finally as promised, restore \__kernel_chk_if_free_cs:N:

```latex
\ExplSyntaxOff
```

Now in \texttt{latexrelease} mode, redefine \texttt{\NewDocumentCommand} to not complain on commands already defined.

```latex
\ExplSyntaxOff
```

We need to stop DocStrip treating \texttt{@@} in a special way at this point.

```latex
\ExplSyntaxOff
```

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1 Introduction

Hooks are points in the code of commands or environments where it is possible to add processing code into existing commands. This can be done by different packages that do not know about each other and to allow for hopefully safe processing it is necessary to sort different chunks of code added by different packages into a suitable processing order.

This is done by the packages adding chunks of code (via \AddToHook) and labeling their code with some label by default using the package name as a label.

At \begin{document} all code for a hook is then sorted according to some rules (given by \DeclareHookRule) for fast execution without processing overhead. If the hook code is modified afterwards (or the rules are changed), a new version for fast processing is generated.

Some hooks are used already in the preamble of the document. If that happens then the hook is prepared for execution (and sorted) already at that point.

2 Package writer interface

The hook management system is offered as a set of CamelCase commands for traditional \LaTeX\ packages (and for use in the document preamble if needed) as well as expl3 commands for modern packages, that use the L3 programming layer of \LaTeX. Behind the scenes, a single set of data structures is accessed so that packages from both worlds can coexist and access hooks in other packages.

2.1 \LaTeX\ 2ε interfaces

2.1.1 Declaring hooks

With a few exceptions, hooks have to be declared before they can be used. The exceptions are the generic hooks for commands and environments (executed at \begin and \end), and the hooks run when loading files (see section 3.1).

\NewHook \NewHook {\langle hook\rangle}

Creates a new \langle hook\rangle. If this hook is declared within a package it is suggested that its name is always structured as follows: (package-name)/\langle hook-name\rangle. If necessary you can further subdivide the name by adding more / parts. If a hook name is already taken, an error is raised and the hook is not created.

The \langle hook\rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

\NewReversedHook \NewReversedHook {\langle hook\rangle}

Like \NewHook declares a new \langle hook\rangle. the difference is that the code chunks for this hook are in reverse order by default (those added last are executed first). Any rules for the hook are applied after the default ordering. See sections 2.3 and 2.4 for further details.

The \langle hook\rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

The $\langle\textit{hooks}\rangle$ can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

### 2.1.2 Special declarations for generic hooks

The declarations here should normally not be used. They are available to provide support for special use cases mainly involving generic command hooks.

After this declaration\(^3\) the $\langle\texttt{hook}\rangle$ is no longer usable: Any attempt to add further code to it will result in an error and any use, e.g., via $\texttt{\textbackslash UseHook}$, will simply do nothing.

This is intended to be used with generic command hooks (see $\texttt{lcmdhooks-doc}$) as depending on the definition of the command such generic hooks may be unusable. If that is known, a package developer can disable such hooks up front.

The $\langle\texttt{hook}\rangle$ can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

This declaration activates a generic hook provided by a package/class (e.g., one used in code with $\texttt{\textbackslash UseHook}$ or $\texttt{\textbackslash UseOneTimeHook}$) without it being explicitly declared with $\texttt{\textbackslash NewHook}$. This command undoes the effect of $\texttt{\textbackslash DisableGenericHook}$. If the hook is already activated, this command does nothing.

See section 2.6 for a discussion of when this declaration is appropriate.

### 2.1.3 Using hooks in code

Execute the hook code inside a command or environment.

Before $\texttt{\textbackslash begin\{document\}}$ the fast execution code for a hook is not set up, so in order to use a hook there it is explicitly initialized first. As that involves assignments using a hook at those times is not 100\% the same as using it after $\texttt{\textbackslash begin\{document\}}$.

The $\langle\texttt{hook}\rangle$ cannot be specified using the dot-syntax. A leading $.\text{ is treated literally.}

\(^3\)In the 2020/06 release this command was called $\texttt{\textbackslash DisableHook}$, but that name was misleading as it shouldn’t be used to disable non-generic hooks.
Some hooks are only used (and can be only used) in one place, for example, those in \begin{document} or \end{document}. Once we have passed that point adding to the hook through a defined \addtocmd command (e.g., \AddToHook or \AtBeginDocument, etc.) would have no effect (as would the use of such a command inside the hook code itself). It is therefore customary to redefine \addtocmd to simply process its argument, i.e., essentially make it behave like \@firstofone.

\UseOneTimeHook \UseOneTimeHook \{\langle hook\rangle\}

The \langle hook\rangle cannot be specified using the dot-syntax. A leading . is treated literally.

See section 2.1.5 for details.

Using \UseOneTimeHook several times with the same \{\langle hook\rangle\} means that it only executes the first time it is used. For example, if it is used in a command that can be called several times then the hook executes during only the first invocation of that command; this allows its use as an “initialization hook”.

Mixing \UseHook and \UseOneTimeHook for the same \{\langle hook\rangle\} should be avoided, but if this is done then neither will execute after the first \UseOneTimeHook.

2.1.4 Updating code for hooks

\AddToHook \AddToHook \{\langle hook\rangle\}\{\langle label\rangle\}\{\langle code\rangle\}

Adds \langle code\rangle to the \langle hook\rangle labeled by \langle label\rangle. When the optional argument \langle label\rangle is not provided, the \langle default label\rangle is used (see section 2.1.5). If \AddToHook is used in a package/class, the \langle default label\rangle is the package/class name, otherwise it is top-level (the top-level label is treated differently: see section 2.1.6).

If there already exists code under the \langle label\rangle then the new \langle code\rangle is appended to the existing one (even if this is a reversed hook). If you want to replace existing code under the \langle label\rangle, first apply \RemoveFromHook.

The hook doesn’t have to exist for code to be added to it. However, if it is not declared, then obviously the added \langle code\rangle will never be executed. This allows for hooks to work regardless of package loading order and enables packages to add to hooks from other packages without worrying whether they are actually used in the current document. See section 2.1.8.

The \langle hook\rangle and \langle label\rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
\RemoveFromHook \RemoveFromHook \{\langle hook\rangle\}\{\langle label\rangle\}

Removes any code labeled by \langle label\rangle from the \langle hook\rangle. When the optional argument \langle label\rangle is not provided, the \langle default label\rangle is used (see section 2.1.5).

If there is no code under the \langle label\rangle in the \langle hook\rangle, or if the \langle hook\rangle does not exist, a warning is issued when you attempt to \RemoveFromHook, and the command is ignored. \RemoveFromHook should be used only when you know exactly what labels are in a hook. Typically this will be when some code gets added to a hook by a package, then later this code is removed by that same package. If you want to prevent the execution of code from another package, use the \voids rule instead (see section 2.1.7).

If the optional \langle label\rangle argument is *, then all code chunks are removed. This is rather dangerous as it may well drop code from other packages (that one may not know about); it should therefore not be used in packages but only in document preambles!

The \langle hook\rangle and \langle label\rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

In contrast to the \voids relationship between two labels in a \DeclareHookRule this is a destructive operation as the labeled code is removed from the hook data structure, whereas the relationship setting can be undone by providing a different relationship later.

A useful application for this declaration inside the document body is when one wants to temporarily add code to hooks and later remove it again, e.g.,

\AddToHook{env/quote/before}{\small}
\begin{quote}
  A quote set in a smaller typeface
\end{quote}
...
\RemoveFromHook{env/quote/before}
... now back to normal for further quotes

Note that you can’t cancel the setting with

\AddToHook{env/quote/before}{}

because that only “adds” a further empty chunk of code to the hook. Adding \\normalsize would work but that means the hook then contained \small\\normalsize which means two font size changes for no good reason.

The above is only needed if one wants to typeset several quotes in a smaller typeface. If the hook is only needed once then \AddToHookNext is simpler, because it resets itself after one use.
\AddToHookNext \AddToHookNext \langle \textit{hook} \rangle \{ \langle \textit{code} \rangle \}

Adds \langle \textit{code} \rangle to the next invocation of the \langle \textit{hook} \rangle. The code is executed after the normal hook code has finished and it is executed only once, i.e. it is deleted after it was used.

Using this declaration is a global operation, i.e., the code is not lost even if the declaration is used inside a group and the next invocation of the hook happens after the end of that group. If the declaration is used several times before the hook is executed then all code is executed in the order in which it was declared.\textsuperscript{4}

If this declaration is used with a one-time hook then the code is only ever used if the declaration comes before the hook’s invocation. This is because, in contrast to \AddToHook, the code in this declaration is not executed immediately in the case when the invocation of the hook has already happened—in other words, this code will truly execute only on the next invocation of the hook (and in the case of a one-time hook there is no such “next invocation”). This gives you a choice: should my code execute always, or should it execute only at the point where the one-time hook is used (and not at all if this is impossible)? For both of these possibilities there are use cases.

It is possible to nest this declaration using the same hook (or different hooks): e.g.,

\AddToHookNext{\langle \textit{hook} \rangle}{\langle \textit{code-1} \rangle}\AddToHookNext{\langle \textit{hook} \rangle}{\langle \textit{code-2} \rangle}

will execute \langle \textit{code-1} \rangle next time the \langle \textit{hook} \rangle is used and at that point puts \langle \textit{code-2} \rangle into the \langle \textit{hook} \rangle so that it gets executed on following time the hook is run.

A hook doesn’t have to exist for code to be added to it. This allows for hooks to work regardless of package loading order. See section 2.1.8.

The \langle \textit{hook} \rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

\ClearHookNext \ClearHookNext \langle \textit{hook} \rangle

Normally \AddToHookNext is only used when you know precisely where it will apply and why you want some extra code at that point. However, there are a few use cases in which such a declaration needs to be canceled, for example, when discarding a page with \DiscardShipoutBox (but even then not always), and in such situations \ClearHookNext can be used.

### 2.1.5 Hook names and default labels

It is best practice to use \AddToHook in packages or classes without specifying a \langle \textit{label} \rangle because then the package or class name is automatically used, which is helpful if rules are needed, and avoids mistyping the \langle \textit{label} \rangle.

Using an explicit \langle \textit{label} \rangle is only necessary in very specific situations, e.g., if you want to add several chunks of code into a single hook and have them placed in different parts of the hook (by providing some rules).

The other case is when you develop a larger package with several sub-packages. In that case you may want to use the same \langle \textit{label} \rangle throughout the sub-packages in order to avoid that the labels change if you internally reorganize your code.

Except for \UseHook, \UseOneTimeHook and \IfHookEmptyTF (and their expl3 interfaces \hook_use:n, \hook_use_once:n and \hook_if_empty:nTF), all \langle \textit{hook} \rangle and \langle \textit{label} \rangle arguments are processed in the same way: first, spaces are trimmed around the argument, then it is fully expanded until only character tokens remain. If the full expansion

\textsuperscript{4}There is no mechanism to reorder such code chunks (or delete them).
of the ⟨hook⟩ or ⟨label⟩ contains a non-expandable non-character token, a low-level \TeX error is raised (namely, the ⟨hook⟩ is expanded using \TeX’s \verb|\csname ...\endcsname|, as such, Unicode characters are allowed in ⟨hook⟩ and ⟨label⟩ arguments). The arguments of \verb|\UseHook|, \verb|\UseOneTimeHook|, and \verb|\IfHookEmptyTF| are processed much in the same way except that spaces are not trimmed around the argument, for better performance.

It is not enforced, but highly recommended that the hooks defined by a package, and the ⟨labels⟩ used to add code to other hooks contain the package name to easily identify the source of the code chunk and to prevent clashes. This should be the standard practice, so this hook management code provides a shortcut to refer to the current package in the name of a ⟨hook⟩ and in a ⟨label⟩. If the ⟨hook⟩ name or the ⟨label⟩ consist just of a single dot (.), or starts with a dot followed by a slash (./) then the dot denotes the ⟨default label⟩ (usually the current package or class name—see \verb|\SetDefaultHookLabel|). A “.” or “./” anywhere else in a ⟨hook⟩ or in ⟨label⟩ is treated literally and is not replaced.

For example, inside the package \verb|mypackage.sty|, the default label is \verb|mypackage|, so the instructions:

\begin{verbatim}
\NewHook {./hook}
\AddToHook {./hook}[]{code}  % Same as \AddToHook{./hook}{code}
\AddToHook {./hook}[]/.{code}
\DeclareHookRule{begindocument}{.}{before}{babel}
\AddToHook {file/foo.tex/after}{code}
\end{verbatim}

are equivalent to:

\begin{verbatim}
\NewHook {mypackage/hook}
\AddToHook {mypackage/hook}[]{mypackage}{code}
\AddToHook {mypackage/hook}[]/.{mypackage}{code}
\DeclareHookRule{begindocument}{mypackage}{before}{babel}
\AddToHook {file/foo.tex/after}{code}  % unchanged
\end{verbatim}

The ⟨default label⟩ is automatically set equal to the name of the current package or class at the time the package is loaded. If the hook command is used outside of a package, or the current file wasn’t loaded with \verb|\usepackage| or \verb|\documentclass|, then the top-level is used as the ⟨default label⟩. This may have exceptions—see \verb|\PushDefaultHookLabel|.

This syntax is available in all ⟨label⟩ arguments and most ⟨hook⟩ arguments, both in the \TeX{}2ε interface, and the \TeX{}3 interface described in section 2.2.

Note, however, that the replacement of . by the ⟨default label⟩ takes place when the hook command is executed, so actions that are somehow executed after the package ends will have the wrong ⟨default label⟩ if the dot-syntax is used. For that reason, this syntax is not available in \verb|\UseHook| (and \verb|\hook_use:n|) because the hook is most of the time used outside of the package file in which it was defined. This syntax is also not available in the hook conditionals \verb|\IfHookEmptyTF| (and \verb|\hook_if_empty:nTF|), because these conditionals are used in some performance-critical parts of the hook management code, and because they are usually used to refer to other package’s hooks, so the dot-syntax doesn’t make much sense.

In some cases, for example in large packages, one may want to separate it in logical parts, but still use the main package name as ⟨label⟩, then the ⟨default label⟩ can be set using \verb|\SetDefaultHookLabel| or \verb|\PushDefaultHookLabel(...)|...\verb|\PopDefaultHookLabel|.
\PushDefaultHookLabel \PushDefaultHookLabel \{(default label)\}
\PopDefaultHookLabel
\PopDefaultHookLabel
\PushDefaultHookLabel
\PopDefaultHookLabel
\PopDefaultHookLabel

\PushDefaultHookLabel sets the current \langle default label \rangle to be used in \langle label \rangle arguments, or when replacing a leading "." (see above). \PopDefaultHookLabel reverts the \langle default label \rangle to its previous value.

Inside a package or class, the \langle default label \rangle is equal to the package or class name, unless explicitly changed. Everywhere else, the \langle default label \rangle is top-level (see section 2.1.6) unless explicitly changed.

The effect of \PushDefaultHookLabel holds until the next \PopDefaultHookLabel.
\usepackage (and \RequirePackage and \documentclass) internally use \PushDefaultHookLabel\langle package name \rangle \langle package code \rangle \PopDefaultHookLabel to set the \langle default label \rangle for the package or class file. Inside the \langle package code \rangle the \langle default label \rangle can also be changed with \SetDefaultHookLabel. \input and other file input-related commands from the \LaTeX kernel do not use \PushDefaultHookLabel, so code within files loaded by these commands does not get a dedicated \langle label \rangle! (that is, the \langle default label \rangle is the current active one when the file was loaded.)

Packages that provide their own package-like interfaces (\LaTeX's \texttt{\usetikzlibrary}, for example) can use \PushDefaultHookLabel and \PopDefaultHookLabel to set dedicated labels and to emulate \texttt{\usepackage}-like hook behavior within those contexts.

The top-level label is treated differently, and is reserved to the user document, so it is not allowed to change the \langle default label \rangle to top-level.

\PopDefaultHookLabel
\PopDefaultHookLabel
\PopDefaultHookLabel
\SetDefaultHookLabel \SetDefaultHookLabel \{(default label)\}
\PopDefaultHookLabel

Similarly to \PushDefaultHookLabel, sets the current \langle default label \rangle to be used in \langle label \rangle arguments, or when replacing a leading ".". The effect holds until the label is changed again or until the next \PopDefaultHookLabel. The difference between \PushDefaultHookLabel and \SetDefaultHookLabel is that the latter does not save the current \langle default label \rangle.

This command is useful when a large package is composed of several smaller packages, but all should have the same \langle label \rangle, so \SetDefaultHookLabel can be used at the beginning of each package file to set the correct label.

\SetDefaultHookLabel is not allowed in the main document, where the \langle default label \rangle is top-level and there is no \PopDefaultHookLabel to end its effect. It is also not allowed to change the \langle default label \rangle to top-level.

2.1.6 The top-level label

The top-level label, assigned to code added from the main document, is different from other labels. Code added to hooks (usually \texttt{\AtBeginDocument}) in the preamble is almost always to change something defined by a package, so it should go at the very end of the hook.

Therefore, code added in the top-level is always executed at the end of the hook, regardless of where it was declared. If the hook is reversed (see \texttt{\NewReversedHook}), the top-level chunk is executed at the very beginning instead.
Rules regarding top-level have no effect: if a user wants to have a specific set of rules for a code chunk, they should use a different label to said code chunk, and provide a rule for that label instead.

The top-level label is exclusive for the user, so trying to add code with that label from a package results in an error.

2.1.7 Defining relations between hook code

The default assumption is that code added to hooks by different packages are independent and the order in which they are executed is irrelevant. While this is true in many cases it is obviously false in others.

Before the hook management system was introduced packages had to take elaborate precaution to determine of some other package got loaded as well (before or after) and find some ways to alter its behavior accordingly. In addition is was often the user’s responsibility to load packages in the right order so that code added to hooks got added in the right order and some cases even altering the loading order wouldn’t resolve the conflicts.

With the new hook management system it is now possible to define rules (i.e., relationships) between code chunks added by different packages and explicitly describe in which order they should be processed.

\DeclareHookRule \DeclareHookRule {⟨hook⟩}{⟨label1⟩}{⟨relation⟩}{⟨label2⟩}

Defines a relation between ⟨label1⟩ and ⟨label2⟩ for a given ⟨hook⟩. If ⟨hook⟩ is ?? this defines a default relation for all hooks that use the two labels, i.e., that have chunks of code labeled with ⟨label1⟩ and ⟨label2⟩. Rules specific to a given hook take precedence over default rules that use ?? as the ⟨hook⟩.

Currently, the supported relations are the following:

- **before** or < Code for ⟨label1⟩ comes before code for ⟨label2⟩.
- **after** or > Code for ⟨label1⟩ comes after code for ⟨label2⟩.
- **incompatible-warning** Only code for either ⟨label1⟩ or ⟨label2⟩ can appear for that hook (a way to say that two packages—or parts of them—are incompatible). A warning is raised if both labels appear in the same hook.
- **incompatible-error** Like incompatible-error but instead of a warning a L\TeX{} error is raised, and the code for both labels are dropped from that hook until the conflict is resolved.
- **voids** Code for ⟨label1⟩ overwrites code for ⟨label2⟩. More precisely, code for ⟨label2⟩ is dropped for that hook. This can be used, for example if one package is a superset in functionality of another one and therefore wants to undo code in some hook and replace it with its own version.
- **unrelated** The order of code for ⟨label1⟩ and ⟨label2⟩ is irrelevant. This rule is there to undo an incorrect rule specified earlier.

There can only be a single relation between two labels for a given hook, i.e., a later \DeclareHookRule overwrites any previous declaration.

The ⟨hook⟩ and ⟨label⟩ can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
Syntactic sugar for saying that \langle label1 \rangle and \langle label2 \rangle are unrelated for the given \langle hook \rangle.

This sets up a relation between \langle label1 \rangle and \langle label2 \rangle for all hooks unless overwritten by a specific rule for a hook. Useful for cases where one package has a specific relation to some other package, e.g., is incompatible or always needs a special ordering before or after. (Technically it is just a shorthand for using \DeclareHookRule with ?? as the hook name.)

Declaring default rules is only supported in the document preamble.\footnote{Trying to do so, e.g., via \DeclareHookRule with ?? has bad side-effects and is not supported (though not explicitly caught for performance reasons).}

The \langle label \rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

2.1.8 Querying hooks

Simpler data types, like token lists, have three possible states; they can:

- exist and be empty;
- exist and be non-empty; and
- not exist (in which case emptiness doesn’t apply);

Hooks are a bit more complicated: a hook may exist or not, and independently it may or may not be empty. This means that even a hook that doesn’t exist may be non-empty and it can also be disabled.

This seemingly strange state may happen when, for example, package A defines hook A/foo, and package B adds some code to that hook. However, a document may load package B before package A, or may not load package A at all. In both cases some code is added to hook A/foo without that hook being defined yet, thus that hook is said to be non-empty, whereas it doesn’t exist. Therefore, querying the existence of a hook doesn’t imply its emptiness, neither does the other way around.

Given that code or rules can be added to a hook even if it doesn’t physically exist yet, means that a querying its existence has no real use case (in contrast to other variables that can only be update if they have already been declared). For that reason only the test for emptiness has a public interface.

A hook is said to be empty when no code was added to it, either to its permanent code pool, or to its “next” token list. The hook doesn’t need to be declared to have code added to its code pool. A hook is said to exist when it was declared with \NewHook or some variant thereof. Generic hooks such as file and env hooks are automatically declared when code is added to them.

Tests if the \langle hook \rangle is empty (i.e., no code was added to it using either \AddToHook or \AddToHookNext) or such code was removed again (via \RemoveFromHook), and branches to either \langle true code \rangle or \langle false code \rangle depending on the result.

The \langle hook \rangle cannot be specified using the dot-syntax. A leading . is treated literally.

\footnote{Trying to do so, e.g., via \DeclareHookRule with ?? has bad side-effects and is not supported (though not explicitly caught for performance reasons).}
2.1.9 Displaying hook code

If one has to adjust the code execution in a hook using a hook rule it is helpful to get some information about the code associated with a hook, its current order and the existing rules.

\ShowHook \ShowHook \{\hook\}
\LogHook \LogHook \{\hook\}

Displays information about the \(\hook\) such as

- the code chunks (and their labels) added to it,
- any rules set up to order them,
- the computed order in which the chunks are executed,
- any code executed on the next invocation only.

\LogHook prints the information to the \log file, and \ShowHook prints them to the terminal/command window and starts \TeX's prompt (only in \errorstopmode) to wait for user action.

The \(\hook\) can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

Suppose a hook \examplehook whose output of \ShowHook{\examplehook} is:

\begin{verbatim}
\rightarrow The hook \examplehook:

\rightarrow Code chunks:
\rightarrow foo -> [code from package 'foo']
\rightarrow bar -> [from package 'bar']
\rightarrow baz -> [package 'baz' is here]
\rightarrow Document-level (top-level) code (executed last):
\rightarrow -> [code from 'top-level']
\rightarrow Extra code for next invocation:
\rightarrow -> [one-time code]
\rightarrow Rules:
\rightarrow foo|baz with relation >
\rightarrow baz|bar with default relation <
\rightarrow Execution order (after applying rules):
\rightarrow baz, foo, bar.
\end{verbatim}

In the listing above, lines 3 to 5 show the three code chunks added to the hook and their respective labels in the format

\(\langle\text{label}\rangle \rightarrow \langle\text{code}\rangle\)

Line 7 shows the code chunk added by the user in the main document (labeled \toplevel) in the format

Document-level (top-level) code (executed \textit{first/last}):
\rightarrow \langle\text{top-level code}\rangle
This code will be either the first or last code executed by the hook (last if the hook is normal, first if it is reversed). This chunk is not affected by rules and does not take part in sorting.

Line 9 shows the code chunk for the next execution of the hook in the format

\[ \text{-> } \langle \text{next-code} \rangle \]

This code will be used and disappear at the next \UseHook{example-hook}, in contrast to the chunks mentioned earlier, which can only be removed from that hook by doing \RemoveFromHook{⟨label⟩}{example-hook}.

Lines 11 and 12 show the rules declared that affect this hook in the format

\[ ⟨\text{label-1}⟩|⟨\text{label-2}⟩ \text{ with } (\text{default?}) \text{ relation } ⟨\text{relation}⟩ \]

which means that the (relation) applies to ⟨label-1⟩ and ⟨label-2⟩, in that order, as detailed in \DeclareHookRule. If the relation is default it means that this rule applies to ⟨label-1⟩ and ⟨label-2⟩ in all hooks, (unless overridden by a non-default relation).

Finally, line 14 lists the labels in the hook after sorting; that is, in the order they will be executed when the hook is used.

### 2.1.10 Debugging hook code

\DebugHooksOn  
\DebugHooksOff

Turn the debugging of hook code on or off. This displays most changes made to the hook data structures. The output is rather coarse and not really intended for normal use.

### 2.2 L3 programming layer (expl3) interfaces

This is a quick summary of the \LaTeX3 programming interfaces for use with packages written in expl3. In contrast to the \LaTeX2ε interfaces they always use mandatory arguments only, e.g., you always have to specify the ⟨label⟩ for a code chunk. We therefore suggest to use the declarations discussed in the previous section even in expl3 packages, but the choice is yours.

\hook_new:n {⟨hook⟩}  
\hook_new_reversed:n {⟨hook⟩}  
\hook_new_pair:nn {⟨hook-1⟩} {⟨hook-2⟩}

Creates a new ⟨hook⟩ with normal or reverse ordering of code chunks. \hook_new_pair:nn creates a pair of such hooks with {⟨hook-2⟩} being a reversed hook. If a hook name is already taken, an error is raised and the hook is not created.

The ⟨hook⟩ can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

\hook_disable_generic:n {⟨hook⟩}

Marks {⟨hook⟩} as disabled. Any further attempt to add code to it or declare it, will result in an error and any call to \hook_use:n will simply do nothing.

This declaration is intended for use with generic hooks that are known not to work (see \lthcmdhooks--doc) if they receive code.

The ⟨hook⟩ can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
This is like \texttt{\textbackslash hook\_new:n} but it does nothing if the hook was previously declared with \texttt{\textbackslash hook\_new:n}. This declaration should be used only in special situations, e.g., when a command from another package needs to be altered and it is not clear whether a generic \texttt{cmd} hook (for that command) has been previously explicitly declared.

Normally \texttt{\textbackslash hook\_new:n} should be used instead of this.

\texttt{\textbackslash hook\_activate\_generic:n \{\textbackslash hook\}\}}

This is like \texttt{\textbackslash hook\_new:n} but it does nothing if the hook was previously declared with \texttt{\textbackslash hook\_new:n}. This declaration should be used only in special situations, e.g., when a command from another package needs to be altered and it is not clear whether a generic \texttt{cmd} hook (for that command) has been previously explicitly declared.

Normally \texttt{\textbackslash hook\_new:n} should be used instead of this.

\texttt{\textbackslash hook\_use:n \{\textbackslash hook\}\}}

Executes the \{\textbackslash hook\}\code code followed (if set up) by the code for next invocation only, then empties that next invocation code.

The \{\textbackslash hook\}\ cannot be specified using the dot-syntax. A leading . is treated literally.

\texttt{\textbackslash hook\_use\_once:n \{\textbackslash hook\}\}}

Changes the \{\textbackslash hook\}\ status so that from now on any addition to the hook code is executed immediately. Then execute any \{\textbackslash hook\}\code already set up.

The \{\textbackslash hook\}\ cannot be specified using the dot-syntax. A leading . is treated literally.

\texttt{\textbackslash hook\_gput\_code:nnn \{\textbackslash hook\}\} \{\textbackslash label\}\} \{\textbackslash code\}\}

Adds a chunk of \texttt{\textbackslash code} to the \texttt{\textbackslash hook} labeled \texttt{\textbackslash label}. If the label already exists the \texttt{\textbackslash code} is appended to the already existing code.

If code is added to an external \texttt{\textbackslash hook} (of the kernel or another package) then the convention is to use the package name as the \texttt{\textbackslash label} not some internal module name or some other arbitrary string.

The \texttt{\textbackslash hook} and \texttt{\textbackslash label} can be specified using the dot-syntax to denote the current package name. See section \texttt{2.1.5}.

\texttt{\textbackslash hook\_gput\_next\_code:nnn \{\textbackslash hook\}\} \{\textbackslash code\}\}

Adds a chunk of \texttt{\textbackslash code} for use only in the next invocation of the \texttt{\textbackslash hook}. Once used it is gone.

This is simpler than \texttt{\textbackslash hook\_gput\_code:nnn}, the code is simply appended to the hook in the order of declaration at the very end, i.e., after all standard code for the hook got executed.

Thus if one needs to undo what the standard does one has to do that as part of \texttt{\textbackslash code}.

The \texttt{\textbackslash hook} can be specified using the dot-syntax to denote the current package name. See section \texttt{2.1.5}.

\texttt{\textbackslash hook\_gclear\_next\_code:n \{\textbackslash hook\}\}}

Undo any earlier \texttt{\textbackslash hook\_gput\_next\_code:nn}. 

File h: lthooks.dtx 192
\hook_gremove_code:nn \hook_gremove_code:nn \{\langle hook\rangle\} \{\langle label\rangle\}

Removes any code for \langle hook\rangle labeled \langle label\rangle.

If there is no code under the \langle label\rangle in the \langle hook\rangle, or if the \langle hook\rangle does not exist, a warning is issued when you attempt to use \hook_gremove_code:nn, and the command is ignored.

If the second argument is \*, then all code chunks are removed. This is rather dangerous as it drops code from other packages one may not know about, so think twice before using that!

The \langle hook\rangle and \langle label\rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

\hook_gset_rule:nnnn \hook_gset_rule:nnnn \{\langle hook\rangle\} \{\langle label1\rangle\} \{\langle relation\rangle\} \{\langle label2\rangle\}

Relate \langle label1\rangle with \langle label2\rangle when used in \langle hook\rangle. See \DeclareHookRule for the allowed \langle relation\rangles. If \langle hook\rangle is ?? a default rule is specified.

The \langle hook\rangle and \langle label\rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5. The dot-syntax is parsed in both \langle label\rangle arguments, but it usually makes sense to be used in only one of them.

\hook_if_empty:nTF \hook_if_empty:nTF \{\langle hook\rangle\} \{\langle true code\rangle\} \{\langle false code\rangle\}

Tests if the \langle hook\rangle is empty (i.e., no code was added to it using either \AddToHook or \AddToHookNext), and branches to either \langle true code\rangle or \langle false code\rangle depending on the result.

The \langle hook\rangle cannot be specified using the dot-syntax. A leading . is treated literally.

\hook_show:n \hook_show:n \{\langle hook\rangle\}
\hook_log:n \hook_log:n \{\langle hook\rangle\}

Displays information about the \langle hook\rangle such as

- the code chunks (and their labels) added to it,
- any rules set up to order them,
- the computed order in which the chunks are executed,
- any code executed on the next invocation only.

\hook_log:n prints the information to the .log file, and \hook_show:n prints them to the terminal/command window and starts \TeX’s prompt (only if \errorstopmode) to wait for user action.

The \langle hook\rangle can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

\hook_debug_on: \hook_debug_on:
\hook_debug_off: \hook_debug_off:

 Turns the debugging of hook code on or off. This displays changes to the hook data.

2.3 On the order of hook code execution

Chunks of code for a \langle hook\rangle under different labels are supposed to be independent if there are no special rules set up that define a relation between the chunks. This means that you can’t make assumptions about the order of execution!
Suppose you have the following declarations:

\NewHook{myhook}
\AddToHook{myhook}[packageA]{\typeout{A}}
\AddToHook{myhook}[packageB]{\typeout{B}}
\AddToHook{myhook}[packageC]{\typeout{C}}

then executing the hook with \UseHook will produce the typeout \texttt{A B C} in that order. In other words, the execution order is computed to be \texttt{packageA, packageB, packageC} which you can verify with \ShowHook{myhook}:

\begin{verbatim}
-> The hook 'myhook':
  > Code chunks:
  >    packageA -> \typeout {A}
  >    packageB -> \typeout {B}
  >    packageC -> \typeout {C}
  > Document-level (top-level) code (executed last):
  >     ---
  > Extra code for next invocation:
  >     ---
  > Rules:
  >     ---
  > Execution order:
  >     packageA, packageB, packageC.
\end{verbatim}

The reason is that the code chunks are internally saved in a property list and the initial order of such a property list is the order in which key-value pairs got added. However, that is only true if nothing other than adding happens!

Suppose, for example, you want to replace the code chunk for \texttt{packageA}, e.g.,

\begin{verbatim}
\RemoveFromHook{myhook}[packageA]
\AddToHook{myhook}[packageA]{\typeout{A alt}}
\end{verbatim}

then your order becomes \texttt{packageB, packageC, packageA} because the label got removed from the property list and then re-added (at its end).

While that may not be too surprising, the execution order is also sometimes altered if you add a redundant rule, e.g. if you specify

\begin{verbatim}
\DeclareHookRule{myhook}{packageA}{before}{packageB}
\end{verbatim}

instead of the previous lines we get

\begin{verbatim}
-> The hook 'myhook':
  > Code chunks:
  >    packageA -> \typeout {A}
  >    packageB -> \typeout {B}
  >    packageC -> \typeout {C}
  > Document-level (top-level) code (executed last):
  >     ---
  > Extra code for next invocation:
  >     ---
  > Rules:
  >     ---
  > Execution order (after applying rules):
  >     packageA, packageC, packageB.
\end{verbatim}
As you can see the code chunks are still in the same order, but in the execution order for the labels packageB and packageC have swapped places. The reason is that, with the rule there are two orders that satisfy it, and the algorithm for sorting happened to pick a different one compared to the case without rules (where it doesn’t run at all as there is nothing to resolve). Incidentally, if we had instead specified the redundant rule

\DeclareHookRule{myhook}{packageB}{before}{packageC}

the execution order would not have changed.

In summary: it is not possible to rely on the order of execution unless there are rules that partially or fully define the order (in which you can rely on them being fulfilled).

2.4 The use of “reversed” hooks

You may have wondered why you can declare a “reversed” hook with \NewReversedHook and what that does exactly.

In short: the execution order of a reversed hook (without any rules!) is exactly reversed to the order you would have gotten for a hook declared with \NewHook.

This is helpful if you have a pair of hooks where you expect to see code added that involves grouping, e.g., starting an environment in the first and closing that environment in the second hook. To give a somewhat contrived example\footnote{there are simpler ways to achieve the same effect.}, suppose there is a package adding the following:

\AddToHook{env/quote/before}[package-1]{\begin{itshape}}
\AddToHook{env/quote/after} [package-1]{\end{itshape}}

As a result, all quotes will be in italics. Now suppose further that another package-too makes the quotes also in blue and therefore adds:

\usepackage{color}
\AddToHook{env/quote/before}{package-too}{\begin{color}{blue}}
\AddToHook{env/quote/after} [package-too]{\end{color}}

Now if the env/quote/after hook would be a normal hook we would get the same execution order in both hooks, namely:

package-1, package-too

(or vice versa) and as a result, would get:

\begin{itshape}\begin{color}{blue} ...
\end{itshape}\end{color}

and an error message that \begin{color} ended by \end{itshape}. With env/quote/after declared as a reversed hook the execution order is reversed and so all environments are closed in the correct sequence and \ShowHook would give us the following output:

- The hook 'env/quote/after':
  > Code chunks:
  > package-1 -> \end {itshape}
  > package-too -> \end {color}
  > Document-level (top-level) code (executed first):
Extra code for next invocation:

Rules:

Execution order (after reversal):

package-too, package-1.

The reversal of the execution order happens before applying any rules, so if you alter the order you will probably have to alter it in both hooks, not just in one, but that depends on the use case.

2.5 Difference between “normal” and “one-time” hooks

When executing a hook a developer has the choice of using either \UseHook or \UseOneTimeHook (or their expl3 equivalents \hook_use:n and \hook_use_once:n). This choice affects how \AddToHook is handled after the hook has been executed for the first time.

With normal hooks adding code via \AddToHook means that the code chunk is added to the hook data structure and then used each time \UseHook is called.

With one-time hooks it this is handled slightly differently: After \UseOneTimeHook has been called, any further attempts to add code to the hook via \AddToHook will simply execute the \textlangle code\textrangle immediately.

This has some consequences one needs to be aware of:

- If \textlangle code\textrangle is added to a normal hook after the hook was executed and it is never executed again for one or the other reason, then this new \textlangle code\textrangle will never be executed.

- In contrast if that happens with a one-time hook the \textlangle code\textrangle is executed immediately.

In particular this means that construct such as

\AddToHook{myhook}
\AddToHook{myhook}{\textlangle code-1\textrangle}
\AddToHook{myhook}{\textlangle code-2\textrangle}
\AddToHook{myhook}{\textlangle code-3\textrangle}

works for one-time hooks\footnote{This is sometimes used with \AtBeginDocument which is why it is supported.} (all three code chunks are executed one after another), but it makes little sense with a normal hook, because with a normal hook the first time \UseHook{myhook} is executed it would

- execute \textlangle code-1\textrangle,

- then execute \AddToHook{myhook}{\textlangle code-2\textrangle} which adds the code chunk \textlangle code-2\textrangle to the hook for use on the next invocation,

- and finally execute \textlangle code-3\textrangle.

The second time \UseHook is called it would execute the above and in addition \textlangle code-2\textrangle as that was added as a code chunk to the hook in the meantime. So each time the hook is used another copy of \textlangle code-2\textrangle is added and so that code chunk is executed \textlangle # of invocations\textrangle − 1 times.

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2.6 Generic hooks provided by packages

The hook management system also implements a category of hooks that are called “Generic Hooks”. Normally a hook has to be explicitly declared before it can be used in code. This ensures that different packages are not using the same hook name for unrelated purposes—something that would result in absolute chaos. However, there are a number of “standard” hooks where it is unreasonable to declare them beforehand, e.g., each and every command has (in theory) an associated before and after hook. In such cases, i.e., for command, environment or file hooks, they can be used simply by adding code to them with \AddToHook. For more specialized generic hooks, e.g., those provided by babel, you have to additionally enable them with \ActivateGenericHook as explained below.

The generic hooks provided by \LaTeX{} are those for cmd, env, file, include package, and class, and all these are available out of the box: you only have to use \AddToHook to add code to them, but you don’t have to add \UseHook or \UseOneTimeHook to your code, because this is already done for you (or, in the case of cmd hooks, the command’s code is patched at \begin{document}, if necessary).

However, if you want to provide further generic hooks in your own code, the situation is slightly different. To do this you should use \UseHook or \UseOneTimeHook, but without declaring the hook with \NewHook. As mentioned earlier, a call to \UseHook with an undeclared hook name does nothing. So as an additional setup step, you need to explicitly activate your generic hook. Note that a generic hook produced in this way is always a normal hook.

For a truly generic hook, with a variable part in the hook name, such upfront activation would be difficult or impossible, because you typically do not know what kind of variable parts may come up in real documents.

For example, babel may want to provide hooks such as babel/⟨language⟩/afterextras. Language support in babel is often done through external language packages. Thus doing the activation for all languages inside the core babel code is not a viable approach. Instead it needs to be done by each language package (or by the user who wants to use a particular hook).

Because the hooks are not declared with \NewHook their names should be carefully chosen to ensure that they are (likely to be) unique. Best practice is to include the package or command name, as was done in the babel example above.

Generic hooks defined in this way are always normal hooks (i.e., you can’t implement reversed hooks this way). This is a deliberate limitation, because it speeds up the processing considerably.

2.7 Private \LaTeX{} kernel hooks

There are a few places where it is absolutely essential for \LaTeX{} to function correctly that code is executed in a precisely defined order. Even that could have been implemented with the hook management (by adding various rules to ensure the appropriate ordering with respect to other code added by packages). However, this makes every document unnecessarily slow, because there has to be sorting even though the result is predetermined. Furthermore it forces package writers to unnecessarily add such rules if they add further code to the hook (or break \LaTeX{}).

For that reason such code is not using the hook management, but instead private kernel commands directly before or after a public hook with the following naming convention:
\@kernel@before@⟨hook⟩ or \@kernel@after@⟨hook⟩. For example, in \enddocument
you find
\UseHook{enddocument}%
\@kernel@after@enddocument
which means first the user/package-accessible enddocument hook is executed and then
the internal kernel hook. As their name indicates these kernel commands should not be
altered by third-party packages, so please refrain from that in the interest of stability
and instead use the public hook next to it.8

2.8 Legacy \TeX{} 2ε interfaces

\TeX{} 2ε offered a small number of hooks together with commands to add to them. They
are listed here and are retained for backwards compatibility.

With the new hook management, several additional hooks have been added to \TeX{} and
more will follow. See the next section for what is already available.

\AtBeginDocument \AtBeginDocument ⟨⟨label⟩⟩ {⟨code⟩}

If used without the optional argument ⟨label⟩, it works essentially like before, i.e., it is
adding ⟨code⟩ to the hook begindocument (which is executed inside \begin{document}).
However, all code added this way is labeled with the label top-level (see section 2.1.6)
if done outside of a package or class or with the package/class name if called inside such
a file (see section 2.1.5).

This way one can add further code to the hook using \AddToHook or \AtBeginDocument
using a different label and explicitly order the code chunks as necessary, e.g., run some
code before or after another package’s code. When using the optional argument the call
is equivalent to running \AddToHook {begindocument} ⟨⟨label⟩⟩ {⟨code⟩}.

\AtBeginDocument is a wrapper around the begindocument hook (see section 3.2),
which is a one-time hook. As such, after the begindocument hook is executed at
\begin{document} any attempt to add ⟨code⟩ to this hook with \AtBeginDocument or
with \AddToHook will cause that ⟨code⟩ to execute immediately instead. See section 2.5
for more on one-time hooks.

For important packages with known order requirement we may over time add rules
to the kernel (or to those packages) so that they work regardless of the loading-order in
the document.

\AtEndDocument \AtEndDocument ⟨⟨label⟩⟩ {⟨code⟩}

Like \AtBeginDocument but for the enddocument hook.

The few hooks that existed previously in \TeX{} 2ε used internally commands such as
\@begindocumenthook and packages sometimes augmented them directly rather than
working through \AtBeginDocument. For that reason there is currently support for this,
that is, if the system detects that such an internal legacy hook command contains code
it adds it to the new hook system under the label legacy so that it doesn’t get lost.

However, over time the remaining cases of direct usage need updating because in one
of the future release of \TeX{} we will turn this legacy support off, as it does unnecessary
slow down the processing.

8As with everything in \TeX{} there is not enforcement of this rule, and by looking at the code it is
easy to find out how the kernel adds to them. The main reason of this section is therefore to say “please
don’t do that, this is unconfigurable code!”

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3 \LaTeX{} 2\epsilon commands and environments augmented by hooks

In this section we describe the standard hooks that are now offered by \LaTeX{}, or give pointers to other documents in which they are described. This section will grow over time (and perhaps eventually move to usrguide3).

3.1 Generic hooks

As stated earlier, with the exception of generic hooks, all hooks must be declared with \texttt{\sf \newhook} before they can be used. All generic hooks have names of the form "\texttt{⟨type⟩/⟨name⟩/⟨position⟩}"}, where \texttt{⟨type⟩} is from the predefined list shown below, and \texttt{⟨name⟩} is the variable part whose meaning will depend on the \texttt{⟨type⟩}. The last component, \texttt{⟨position⟩}, has more complex possibilities: it can always be \texttt{before} or \texttt{after}; for \texttt{env} hooks, it can also be \texttt{begin} or \texttt{end}; and for \texttt{include} hooks it can also be \texttt{end}. Each specific hook is documented below, or in \texttt{ltcmdhooks-doc.pdf} or \texttt{ltfilehook-doc.pdf}.

The generic hooks provided by \LaTeX{} belong to one of the six types:

- \texttt{env} Hooks executed before and after environments – \texttt{⟨name⟩} is the name of the environment, and available values for \texttt{⟨position⟩} are \texttt{before}, \texttt{begin}, \texttt{end}, and \texttt{after};
- \texttt{cmd} Hooks added to and executed before and after commands – \texttt{⟨name⟩} is the name of the command, and available values for \texttt{⟨position⟩} are \texttt{before} and \texttt{after};
- \texttt{file} Hooks executed before and after reading a file – \texttt{⟨name⟩} is the name of the file (with extension), and available values for \texttt{⟨position⟩} are \texttt{before} and \texttt{after};
- \texttt{package} Hooks executed before and after loading packages – \texttt{⟨name⟩} is the name of the package, and available values for \texttt{⟨position⟩} are \texttt{before} and \texttt{after};
- \texttt{class} Hooks executed before and after loading classes – \texttt{⟨name⟩} is the name of the class, and available values for \texttt{⟨position⟩} are \texttt{before} and \texttt{after};
- \texttt{include} Hooks executed before and after \texttt{\include} files – \texttt{⟨name⟩} is the name of the included file (without the \texttt{.tex} extension), and available values for \texttt{⟨position⟩} are \texttt{before}, \texttt{end}, and \texttt{after}.

Each of the hooks above are detailed in the following sections and in linked documentation.

3.1.1 Generic hooks for all environments

Every environment \texttt{⟨env⟩} has now four associated hooks coming with it:

- \texttt{env/⟨env⟩/before} This hook is executed as part of \texttt{\begin} as the very first action, in particular prior to starting the environment group. Its scope is therefore not restricted by the environment.
- \texttt{env/⟨env⟩/begin} This hook is executed as part of \texttt{\begin} directly in front of the code specific to the environment start (e.g., the second argument of \texttt{\newenvironment}). Its scope is the environment body.
- \texttt{env/⟨env⟩/end} This hook is executed as part of \texttt{\end} directly in front of the code specific to the end of the environment (e.g., the third argument of \texttt{\newenvironment}).
env/⟨env⟩/after This hook is executed as part of \end after the code specific to the environment end and after the environment group has ended. Its scope is therefore not restricted by the environment.

The hook is implemented as a reversed hook so if two packages add code to env/⟨env⟩/before and to env/⟨env⟩/after they can add surrounding environments and the order of closing them happens in the right sequence.

Generic environment hooks are never one-time hooks even with environments that are supposed to appear only once in a document. In contrast to other hooks there is also no need to declare them using \NewHook.

The hooks are only executed if \begin{⟨env⟩} and \end{⟨env⟩} is used. If the environment code is executed via low-level calls to \⟨env⟩ and \end{⟨env⟩} (e.g., to avoid the environment grouping) they are not available. If you want them available in code using this method, you would need to add them yourself, i.e., write something like

\UseHook{env/quote/before}\quote...
\endquote\UseHook{env/quote/after}

to add the outer hooks, etc.

Largely for compatibility with existing packages, the following four commands are also available to set the environment hooks; but for new packages we recommend directly using the hook names and \AddToHook.

\BeforeBeginEnvironment \BeforeBeginEnvironment [[⟨label⟩]] {⟨env⟩} {⟨code⟩}
This declaration adds to the env/⟨env⟩/before hook using the ⟨label⟩. If ⟨label⟩ is not given, the ⟨default label⟩ is used (see section 2.1.5).

\AtBeginEnvironment \AtBeginEnvironment [[⟨label⟩]] {⟨env⟩} {⟨code⟩}
This is like \BeforeBeginEnvironment but it adds to the env/⟨env⟩/begin hook.

\AtEndEnvironment \AtEndEnvironment [[⟨label⟩]] {⟨env⟩} {⟨code⟩}
This is like \BeforeBeginEnvironment but it adds to the env/⟨env⟩/end hook.

\AfterEndEnvironment \AfterEndEnvironment [[⟨label⟩]] {⟨env⟩} {⟨code⟩}
This is like \BeforeBeginEnvironment but it adds to the env/⟨env⟩/after hook.

3.1.2 Generic hooks for commands

Similar to environments there are now (at least in theory) two generic hooks available for any \LaTeX command. These are

cmd/⟨name⟩/before This hook is executed at the very start of the command execution.

cmd/⟨name⟩/after This hook is executed at the very end of the command body. It is implemented as a reversed hook.

In practice there are restrictions and especially the after hook works only with a subset of commands. Details about these restrictions are documented in \lcmdhooks-doc.pdf or with code in \lcmdhooks-code.pdf.

9Thus if one adds code to such hooks after the environment has been processed, it will only be executed if the environment appears again and if that doesn’t happen the code will never get executed.
3.1.3 Generic hooks provided by file loading operations

There are several hooks added to \LaTeX’s process of loading file via its high-level interfaces such as \texttt{\input}, \texttt{\include}, \texttt{\usepackage}, \texttt{\RequirePackage}, etc. These are documented in \texttt{ltfilehook-doc.pdf} or with code in \texttt{ltfilehook-code.pdf}.

3.2 Hooks provided by \texttt{\begin{document}}

Until 2020 \texttt{\begin{document}} offered exactly one hook that one could add to using \texttt{\AtBeginDocument}. Experiences over the years have shown that this single hook in one place was not enough and as part of adding the general hook management system a number of additional hooks have been added at this point. The places for these hooks have been chosen to provide the same support as offered by external packages, such as \texttt{etoolbox} and others that augmented \texttt{\document} to gain better control.

Supported are now the following hooks (all of them one-time hooks):

\begin{description}
  \item[begindocument/before] This hook is executed at the very start of \texttt{\document}, one can think of it as a hook for code at the end of the preamble section and this is how it is used by \texttt{etoolbox}'s \texttt{\AtEndPreamble}.
  \begin{itemize}
    \item This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).
  \end{itemize}

  \item[begindocument] This hook is added to when using \texttt{\AtBeginDocument} and it is executed after the .aux file as be read in and most initialization are done, so they can be altered and inspected by the hook code. It is followed by a small number of further initializations that shouldn’t be altered and are therefore coming later.
  \begin{itemize}
    \item The hook should not be used to add material for typesetting as we are still in \LaTeX’s initialization phase and not in the document body. If such material needs to be added to the document body use the next hook instead.
    \item This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).
  \end{itemize}

  \item[begindocument/end] This hook is executed at the end of the \texttt{\document} code in other words at the beginning of the document body. The only command that follows it is \texttt{\ignorespaces}.
  \begin{itemize}
    \item This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).
  \end{itemize}
\end{description}

The generic hooks executed by \texttt{\begin} also exist, i.e., \texttt{env/document/before} and \texttt{env/document/begin}, but with this special environment it is better use the dedicated one-time hooks above.

3.3 Hooks provided by \texttt{\end{document}}

\LaTeX{} always provided \texttt{\AtEndDocument} to add code to the execution of \texttt{\end{document}} just in front of the code that is normally executed there. While this was a big improvement over the situation in 2.09 it was not flexible enough for a number of use cases and so packages, such as \texttt{etoolbox}, \texttt{atveryend} and others patched \texttt{\enddocument} to add additional points where code could be hooked into.

Patching using packages is always problematical as leads to conflicts (code availability, ordering of patches, incompatible patches, etc.). For this reason a number of
additional hooks have been added to the \enddocument code to allow packages to add code in various places in a controlled way without the need for overwriting or patching the core code.

Supported are now the following hooks (all of them one-time hooks):

\begin{description}
\item[\enddocument] The hook associated with \AtEndDocument. It is immediately called at the beginning of \enddocument.

When this hook is executed there may be still unprocessed material (e.g., floats on the deferlist) and the hook may add further material to be typeset. After it, \clearpage is called to ensure that all such material gets typeset. If there is nothing waiting the \clearpage has no effect.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

\item[\enddocument/afterlastpage] As the name indicates this hook should not receive code that generates material for further pages. It is the right place to do some final housekeeping and possibly write out some information to the .aux file (which is still open at this point to receive data, but since there will be no more pages you need to write to it using \immediate\write). It is also the correct place to set up any testing code to be run when the .aux file is re-read in the next step.

After this hook has been executed the .aux file is closed for writing and then read back in to do some tests (e.g., looking for missing references or duplicated labels, etc.).

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

\item[\enddocument/afteraux] At this point, the .aux file has been reprocessed and so this is a possible place for final checks and display of information to the user. However, for the latter you might prefer the next hook, so that your information is displayed after the (possibly longish) list of files if that got requested via \listfiles.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

\item[\enddocument/info] This hook is meant to receive code that write final information messages to the terminal. It follows immediately after the previous hook (so both could have been combined, but then packages adding further code would always need to also supply an explicit rule to specify where it should go.

This hook already contains some code added by the kernel (under the labels kernel/filelist and kernel/warnings), namely the list of files when \listfiles has been used and the warnings for duplicate labels, missing references, font substitutions etc.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

\item[\enddocument/end] Finally, this hook is executed just in front of the final call to \@@end.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5). is it even possible to add code after this one?
\end{description}
There is also the hook `shipout/lastpage`. This hook is executed as part of the last `\shipout` in the document to allow package to add final `\special`s to that page. Where this hook is executed in relation to those from the above list can vary from document to document. Furthermore to determine correctly which of the `\shipouts` is the last one, \LaTeX{} needs to be run several times, so initially it might get executed on the wrong page. See section 3.4 for where to find the details.

It is in also possible to use the generic `env/document/end` hook which is executed by `\end`, i.e., just in front of the first hook above. Note however that the other generic `\end` environment hook, i.e., `env/document/after` will never get executed, because by that time \LaTeX{} has finished the document processing.

### 3.4 Hooks provided by `\shipout` operations

There are several hooks and mechanisms added to \LaTeX{}’s process of generating pages. These are documented in `ltshipout-doc.pdf` or with code in `ltshipout-code.pdf`.

### 3.5 Hooks provided for paragraphs

The paragraph processing has been augmented to include a number of internal and public hooks. These are documented in `ltpara-doc.pdf` or with code in `ltpara-code.pdf`.

### 3.6 Hooks provided in NFSS commands

In languages that need to support for more than one script in parallel (and thus several sets of fonts, e.g., supporting both Latin and Japanese fonts), NFSS font commands such as `\sffamily` need to switch both the Latin family to “Sans Serif” and in addition alter a second set of fonts.

To support this, several NFSS commands have hooks to which such support can be added.

- **rmfamily** After `\rmfamily` has done its initial checks and prepared a font series update, this hook is executed before `\selectfont`.
- **sffamily** This is like the `rmfamily` hook, but for the `\sffamily` command.
- **ttfamily** This is like the `rmfamily` hook, but for the `\ttfamily` command.
- **normalfont** The `\normalfont` command resets the font encoding, family, series and shape to their document defaults. It then executes this hook and finally calls `\selectfont`.
- **expand@font@defaults** The internal `\expand@font@defaults` command expands and saves the current defaults for the meta families (`rm/sf/tt`) and the meta series (`bf/md`). If the NFSS machinery has been augmented, e.g., for Chinese or Japanese fonts, then further defaults may need to be set at this point. This can be done in this hook which is executed at the end of this macro.
- **bfseries/defaults, bffamily** If the `\bfdefault` was explicitly changed by the user, its new value is used to set the bf series defaults for the meta families (`rm/sf/tt`) when `\bfseries` is called. The `bfseries/defaults` hook allows further adjustments to be made in this case. This hook is only executed if such a change is detected. In contrast, the `bffamily` hook is always executed just before `\selectfont` is called to change to the new series.
mdseries/defaults, mdseries  These two hooks are like the previous ones but they are in the \mdseries command.

selectfont  This hook is executed inside \selectfont, after the current values for encoding, family, series, shape, and size are evaluated and the new font is selected (and if necessary loaded). After the hook has executed, NFSS will still do any updates necessary for a new size (such as changing the size of \strut) and any updates necessary to a change in encoding.

This hook is intended for use cases where, in parallel to a change in the main font, some other fonts need to be altered (e.g., in CJK processing where you may need to deal with several different alphabets).

3.7 Hook provided by the mark mechanism

See ltmarks-doc.pdf for details.

insertmark  This hook allows for a special setup while \InsertMark inserts a mark. It is executed in group so local changes only apply to the mark being inserted.

4 The Implementation

4.1 Debugging

\g__hook_debug_bool

Holds the current debugging state.

\bool_new:N \g__hook_debug_bool

(End definition for \g__hook_debug_bool.)

\hook_debug_on:

\hook_debug_off:

\__hook_debug:n

\__hook_debug_gset:

Turns debugging on and off by redefining \__hook_debug:n.

\cs_new_eq:NN \__hook_debug:n \use_none:n

\cs_new_protected:Npn \hook_debug_on:

{ \bool_gset_true:N \g__hook_debug_bool \__hook_debug_gset: }

\cs_new_protected:Npn \hook_debug_off:

{ \bool_gset_false:N \g__hook_debug_bool \__hook_debug_gset: }

\cs_new_protected:Npn \__hook_debug_gset:

{ \cs_gset_protected:Npx \__hook_debug:n { \bool_if:NT \g__hook_debug_bool {##1} } }

(End definition for \hook_debug_on: and others. These functions are documented on page 193.)
4.2 Borrowing from internals of other kernel modules

\cs_new_eq:NN \__hook_str_compare:nn \__str_if_eq:nn
\end{verbatim}

\__hook_str_compare:nn Private copy of \__str_if_eq:nn

\cs_new_eq:NN \__hook_str_compare:nn \__str_if_eq:nn
\end{verbatim}

(End definition for \__hook_str_compare:nn.)

4.3 Declarations

\bool_new:N \l__hook_tmpa_bool

\tl_new:N \l__hook_return_tl \tl_new:N \l__hook_tmpa_tl \tl_new:N \l__hook_tmpb_tl

(End definition for \l__hook_return_tl, \l__hook_tmpa_tl, and \l__hook_tmpb_tl.)

\g__hook_all_seq In a few places we need a list of all hook names ever defined so we keep track if them in
this sequence.

\seq_new:N \g__hook_all_seq

(End definition for \g__hook_all_seq.)

\tl_new:N \g__hook_hook_curr_name_tl

\seq_new:N \g__hook_name_stack_seq

(End definition for \g__hook_hook_curr_name_tl and \g__hook_name_stack_seq.)

\__hook_tmp:w Temporary macro for generic usage.

\cs_new_eq:NN \__hook_tmp:w ?

(End definition for \__hook_tmp:w.)

\tl_gremove_once:Nx \tl_show:x \tl_log:x Some variants of expl3 functions.

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FMi: should probably be moved to expl3

\cs_generate_variant:Nn \tl_gremove_once:Nn \{ Nx \}
\cs_generate_variant:Nn \tl_show:n \{ x \}
\cs_generate_variant:Nn \tl_log:n \{ x \}

(End definition for \tl_gremove_once:Nx, \tl_show:x, and \tl_log:x.)

\s__hook_mark
Scan mark used for delimited arguments.
\scan_new:N \s__hook_mark
(End definition for \s__hook_mark.)
\__hook_clean_to_scan:w
Removes tokens until the next \s__hook_mark.
\cs_new:Npn \__hook_clean_to_scan:w #1 \s__hook_mark { }
(End definition for \__hook_clean_to_scan:w.)
\__hook_tl_set:Nn \__hook_tl_set:Nx \__hook_tl_set:cn \__hook_tl_set:co \__hook_tl_set:cx
Private copies of a few expl3 functions. l3debug will only add debugging to the public names, not to these copies, so we don’t have to use \debug_suspend: and \debug_resume: everywhere.
Functions like \__hook_tl_set:Nn have to be redefined, rather than copied because in expl3 they use \__kernel_tl_(g)set:Nx, which is also patched by l3debug.
\cs_new_protected:Npn \__hook_tl_set:Nn #1#2 { \cs_set_nopar:Npx #1 \{ \__kernel_exp_not:w {#2} \} }
\cs_new_protected:Npn \__hook_tl_set:Nx #1#2 { \cs_gset_nopar:Npx #1 \{ \__kernel_exp_not:w \exp_after:wN {#2} \} }
\cs_new_protected:Npn \__hook_tl_set:cn #1#2 { \cs_gset_nopar:Npx #1 \{#2\} }
\cs_generate_variant:Nn \__hook_tl_set:Nn { c }
\cs_generate_variant:Nn \__hook_tl_set:Nx { c }
\cs_generate_variant:Nn \__hook_tl_set:cn { c }
\cs_generate_variant:Nn \__hook_tl_set:co { c }
\cs_generate_variant:Nn \__hook_tl_set:cx { c }
(End definition for \__hook_tl_set:Nn.)
\__hook_tl_gset:Nn \__hook_tl_gset:No \__hook_tl_gset:cn \__hook_tl_gset:co \__hook_tl_gset:cx
Same as above.
\cs_new_protected:Npn \__hook_tl_gset:Nn \__hook_tl_gset:No \__hook_tl_gset:cn \__hook_tl_gset:co \__hook_tl_gset:cx
{ \cs_set_nopar:Npx \__hook_tl_gset:Nn \{ \__kernel_exp_not:w \exp_after:wN \}\{#2\} }
\cs_new_protected:Npn \__hook_tl_gset:No \__hook_tl_gset:cn \__hook_tl_gset:co \__hook_tl_gset:cx
{ \cs_gset_nopar:Npx \__hook_tl_gset:Nn \{ \__kernel_exp_not:w \exp_after:wN \}\{#2\} }
\cs_new_protected:Npn \__hook_tl_gset:cn \__hook_tl_gset:co \__hook_tl_gset:cx
{ \cs_gset_nopar:Npx \__hook_tl_gset:Nn \{#2\} }
\cs_generate_variant:Nn \__hook_tl_gset:Nn \{ c \}
\cs_generate_variant:Nn \__hook_tl_gset:No \{ c \}
\cs_generate_variant:Nn \__hook_tl_gset:cn \{ c \}
(End definition for \__hook_tl_gset:Nn.)
\__hook_tl_gput_right:Nn \__hook_tl_gput_right:No \__hook_tl_gput_right:cn
Same as above.
\cs_new_protected:Npn \__hook_tl_gput_right:Nn \__hook_tl_gput_right:No \__hook_tl_gput_right:cn
{ \__hook_tl_gset:Nn \{ \__kernel_exp_not:w \exp_after:wN \}\{ #1 #2 \} }
\cs_generate_variant:Nn \__hook_tl_gset:Nn \{ #1 \}
\cs_generate_variant:Nn \__hook_tl_gput_right:Nn \{ No, cn \}
(End definition for \__hook_tl_gput_right:Nn.)

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\__hook_tl_gput_left:Nn \__hook_tl_gput_left:No
Same as above.
\cs_new_protected:Npn \__hook_tl_gput_left:Nn #1#2
\{\__kernel_exp_not:w {#2} \__kernel_exp_not:w \exp_after:wN {#1}\}
\cs_generate_variant:Nn \__hook_tl_gput_left:Nn { No }
(End definition for \__hook_tl_gput_left:Nn.)

\__hook_tl_gset_eq:NN \__hook_tl_gset_eq:NN \tl_gset_eq:NN
Same as above.
\cs_new_eq:NN \__hook_tl_gset_eq:NN \tl_gset_eq:NN
(End definition for \__hook_tl_gset_eq:NN.)

\__hook_tl_gclear:N \__hook_tl_gclear:c
Same as above.
\cs_new_protected:Npn \__hook_tl_gclear:N #1
\{ \__hook_tl_gset_eq:NN #1 \c_empty_tl \}
\cs_generate_variant:Nn \__hook_tl_gclear:N { c }
(End definition for \__hook_tl_gclear:N.)

4.4 Providing new hooks
4.4.1 The data structures of a hook
\g@@_(hook)_code_prop \g@@_(hook)
\g@@_next_(hook)
\g@@_(hook)_code_prop A property list holding the code for the hook in separate
chunks. The keys are by default the package names that add code to the hook, but
it is possible for packages to define other keys.
\g@@_(hook)_rule_(label1)\|\label2\_tl A token list holding the relation be-
tween (label1) and (label2) in the (hook). The (labels) are lexically (reverse) sorted
to ensure that two labels always point to the same token list. For global rules, the
(hook) name is ??.
\g@@_(hook) The code that is actually executed when the hook is called in the doc-
ument is stored in this token list. It is constructed from the code chunks applying
the information. This token list is named like that so that in case of an error inside
the hook, the reported token list in the error is shorter, and to make it simpler to
normalize hook names in \__hook_make_name:n.
\g@@_(hook)_reversed_tl Some hooks are “reversed”. This token list stores a - for
such hook so that it can be identified. The - character is used because (reversed)1
is +1 for normal hooks and -1 for reversed ones.
\g@@_(hook)_declared_tl This token list serves as marker for the hook being offi-
cially declared. Its existence is tested to raise an error in case another declaration
is attempted.
This token list stores the code inserted in the hook from the user’s document, in the top-level label. This label is special, and doesn’t participate in sorting. Instead, all code is appended to it and executed after (or before, if the hook is reversed) the normal hook code, but before the next code chunk.

Finally there is extra code (normally empty) that is used on the next invocation of the hook (and then deleted). This can be used to define some special behavior for a single occasion from within the document. This token list follows the same naming scheme than the main __hook⟨hook⟩ token list. It is called __hook_next⟨hook⟩ rather than __hook⟨hook⟩ because otherwise a hook whose name is next⟨hook⟩ would clash with the next code-token list of the hook called ⟨hook⟩.

### 4.4.2 On the existence of hooks

A hook may be in different states of existence. Here we give an overview of the internal commands to set up hooks and explain how the different states are distinguished. The actual implementation then follows in subsequent sections.

One problem we have to solve is that we need to be able to add code to hooks (e.g., with \AddToHook) even if that code has not yet been declared. For example, one package needs to write into a hook of another package, but that package may not get loaded, or is loaded only later. Another problem is that most hooks, but not the generic hooks, require a declaration.

We therefore distinguish the following states for a hook, which are managed by four different tests: structure existence (__hook_if_structure_exist:nTF), creation (__hook_if_usable:nTF), declaration (__hook_if_declared:nTF) and disabled or not (__hook_if_disabled:nTF)

**not existing** Nothing is known about the hook so far. This state can be detected with __hook_if_structure_exist:nTF (which uses the false branch).

In this state the hook can be declared, disabled, rules can be defined or code could be added to it, but it is not possible to use the hook (with \UseHook).

**basic data structure set up** A hook is this state when its basic data structure has been set up (using __hook_init_structure:n). The data structure setup happens automatically when commands such as \AddToHook are used and the hook is at that point in state “not existing”.

In this state the four tests give the following results:

\_\_hook\_if\_structure\_exist:nTF returns true.
\_\_hook\_if\_usable:nTF returns false.
\_\_hook\_if\_declared:nTF returns false.
\_\_hook\_if\_disabled:nTF returns false.

The allowed actions are the same as in the “not existing” state.

**declared** A hook is in this state it is not disabled and was explicitly declared (e.g., with \NewHook). In this case the four tests give the following results:

\_\_hook\_if\_structure\_exist:nTF returns true.
usable A hook is in this state if it is not disabled, was not explicitly declared but nevertheless is allowed to be used (with \UseHook or \hook_use:n). This state is only possible for generic hooks as they do not need to be declared. Therefore such hooks move directly from state “not existing” to “usable” the moment a declaration such as \AddToHook wants to add to the hook data structure. In this state the tests give the following results:

\__hook_if_structure_exist:nTF returns true.
\__hook_if_usable:nTF returns true.
\__hook_if_declared:nTF returns false.
\__hook_if_disabled:nTF returns false.

disabled A generic hook in any state is moved to this state when \DisableGenericHook is used. This changes the tests to give the following results:

\__hook_if_structure_exist:nTF unchanged.
\__hook_if_usable:nTF returns false.
\__hook_if_declared:nTF returns true.
\__hook_if_disabled:nTF returns true.

The structure test is unchanged (if the hook was unknown before it is false, otherwise true). The usable test returns false so that any \UseHook will bypass the hook from now on. The declared test returns true so that any further \NewHook generates an error and the disabled test returns true so that \AddToHook can return an error.

_FMi: maybe it should do this only after begin document?

4.4.3 Setting hooks up

\hook_new:n The \hook_new:n declaration declares a new hook and expects the hook ⟨name⟩ as its argument, e.g., \begindocument.

\cs_new_protected:Npn \hook_new:n #1
\__hook_new:n #1
\__hook_normalize_hook_args:Nn \__hook_new:n {#1} }
\cs_new_protected:Npn \__hook_new:n #1
\__hook_make_usable:n {#1} }

We check if the hook was already explicitly declared with \hook_new:n, and if it already exists we complain, otherwise set the “created” flag for the hook so that it errors next time \hook_new:n is used.

\__hook_if_declared:nTF {#1}
{ \msg_error:nnn { hooks } { exists } {#1} }
{ \tl_new:c { g__hook_#1_declared_tl }
\__hook_make_usable:n {#1} }

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\_\_hook_make_usable:n
This initializes all hook data structures for the hook but if used on its own doesn’t mark
the hook as declared (as \hook_new:n does, so a later \hook_new:n on that hook will
not result in an error. This command is internally used by \hook_gput_code:n when
adding code to a generic hook.

\cs_new_protected:Npn \_\_hook_make_usable:n #1
\{
\tl_if_exist:cF { __hook~#1 }
    { \seq_gput_right:Nn \g__hook_all_seq {#1} }
This is only used by the actual code of the current hook, so declare it normally:
\tl_new:c { __hook~#1 }
Now ensure that the base data structure for the hook exists:
\_\_hook_init_structure:n {#1}
The \g__hook_{hook}_labels_clist holds the sorted list of labels (once it got sorted).
This is used only for debugging.
\clist_new:c { g__hook_#1_labels_clist }
Some hooks should reverse the default order of code chunks. To signal this we have a
token list which is empty for normal hooks and contains a - for reversed hooks.
\tl_new:c { g__hook_#1_reversed_tl }
The above is all in L3 convention, but we also provide an interface to legacy L\TeX2ε
hooks of the form \@...hook, e.g., \@begindocumenthook. There have been a few of
them and they have been added to using \g@addto@macro. If there exists such a macro
matching the name of the new hook, i.e., \@\langle\hook-name\ranglehook and it is not empty then
we add its contents as a code chunk under the label legacy.

Warning: this support will vanish in future releases!
\_\_hook_include_legacy_code_chunk:n {#1}
\}
(End definition for \_\_hook_make_usable:n.)

\_\_hook_init_structure:n
This function declares the basic data structures for a hook without explicit declaring
the hook itself. This is needed to allow adding to undeclared hooks. Here it is unnecessary
to check whether all variables exist, since all three are declared at the same time (either
all of them exist, or none).
It creates the hook code pool (\g__hook_{hook}_code_prop) and the top-level
and next token lists. A hook is initialized with \_\_hook_init_structure:n the first
time anything is added to it. Initializing a hook just with \_\_hook_init_structure:n
will not make it usable with \hook_use:n.
\cs_new_protected:Npn \_\_hook_init_structure:n #1
\{ \_\_hook_if_structure_exist:nF {#1} \}

(End definition for \_\_hook_make_usable:n.)
\prop_new:c { g__hook_#1_code_prop }
\tl_new:c { __hook_toplevel-#1 }
\tl_new:c { __hook_next-#1 }
}

(End definition for \__hook_init_structure:n)

\hook_new_reversed:n
\__hook_new_reversed:n

Declare a new hook. The default ordering of code chunks is reversed, signaled by setting the token list to a minus sign.
\cs_new_protected:Npn \hook_new_reversed:n #1
{ \__hook_normalize_hook_args:Nn \__hook_new_reversed:n {#1} }
\cs_new_protected:Npn \__hook_new_reversed:n #1
{ \__hook_new:n {#1} }

If the hook already exists the above will generate an error message, so the next line should be executed (but it is — too bad).
\tl_gset:cn { g__hook_#1_reversed_tl } { - }

(End definition for \hook_new_reversed:n and \__hook_new_reversed:n. This function is documented on page 191.)

\hook_new_pair:nn

A shorthand for declaring a normal and a (matching) reversed hook in one go.
\cs_new_protected:Npn \hook_new_pair:nn #1#2
{ \hook_new:n {#1} \hook_new_reversed:n {#2} }

(End definition for \hook_new_pair:nn. This function is documented on page 191.)

\__hook_include_legacy_code_chunk:n

The \LaTeX{} legacy concept for hooks uses with hooks the following naming scheme in the code: \@...hook.

If this macro is not empty we add it under the label legacy to the current hook and then empty it globally. This way packages or classes directly manipulating commands such as \@begindocumenthook still get their hook data added.

Warning: this support will vanish in future releases!
\cs_new_protected:Npn \__hook_include_legacy_code_chunk:n #1
{\tl_if_exist:cT { @#1hook }\tl_if_empty:cF { @#1hook }\exp_args:Nnnv \__hook_hook_gput_code_do:nnn {#1} { legacy } { @#1hook }Once added to the hook, we need to clear it otherwise it might get added again later if the hook data gets updated.
\__hook_tl_gclear:c { @#1hook }

(End definition for \__hook_include_legacy_code_chunk:n.)

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4.4.4 Disabling and providing hooks

Disables a hook by creating its \__hook\_\{hook\}_declared_tl so that the hook errors when used with \hook\_new:n, then it undefines \__hook\_\{hook\} so that it may not be executed.

This does not clear any code that may be already stored in the hook's structure, but doesn't allow adding more code. \__hook\_\{if\}_\{disabled\}_\{n\}_TF uses that specific combination to check if the hook is disabled.

\cs_new_protected:Npn \hook\_disable\_generic:n \#1
\{ \__hook\_normalize\_hook\_args:Nn \__hook\_\{if\}_\{disabled\}\_\{n\}_\{TF\} \{#1\} \}
\cs_new_protected:Npn \__hook\_\{if\}_\{disabled\}\_\{n\}_\{TF\} \#1
\{ \bool_lazy_and:nnTF
\{ \tl_if_exist_p:c \{ g\_\{hook\}\_\#1\}_\{declared\}_\{tl\} \}
\{ \prg_return_true: \}
\{ \prg_return_false: \}
\}

\cs_new_protected:Npn \hook\_activate\_generic:n \#1 \{ \__hook\_normalize\_hook\_args:Nn \__hook\_\{if\}_\{disabled\}\_\{n\}_\{TF\} \{ \bool_lazy_and:nnTF
\{ \tl_if_exist_p:c \{ g\_\{hook\}\_\#1\}_\{declared\}_\{tl\} \}
\{ \prg_return_true: \}
\{ \prg_return_false: \}
\}

The \hook\_\{activate\}_\{generic\}:\{n\} declaration declares a new hook if it wasn’t declared already, in which case it only checks that the already existing hook is not a reversed hook.

\cs_new_protected:Npn \hook\_\{activate\}_\{generic\}:\{n\} \#1 \{ \__hook\_\{if\}_\{disabled\}\_\{n\}_\{TF\} \#1 \{ \bool_lazy_and:nnTF
\{ \tl_if_exist_p:c \{ g\_\{hook\}\_\#1\}_\{declared\}_\{tl\} \}
\{ \prg_return_true: \}
\{ \prg_return_false: \}
\}

If the hook to be activated was disabled we warn (for now — this may change).

\__hook\_\{if\}_\{disabled\}\_\{n\}_\{TF\} \#1
\{ \msg\_warning:nnn \{ hooks \} \{ activate\_disabled \} \{#1\} \}

Otherwise we check if the hook is not declared, and if it isn’t, figure out if it’s reversed or not, then declare it accordingly.

\__hook\_\{if\}_\{disabled\}\_\{n\}_\{TF\} \#1

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\begin{verbatim}
\tl_new:c { g__hook_#1_declared_tl }
\_hook_make_usable:n {#1} \tl_gset:cx { g__hook_#1_reversed_tl }
{ \_hook_if_generic_reversed:nT {#1} { - } }
\end{verbatim}

Reflect that we have activated the generic hook and set its execution code.

\begin{verbatim}
\__hook_update_hook_code:n {#1}
\end{verbatim}

(End definition for \hook_activate_generic:n and \_hook_activate_generic:n. This function is
documented on page 192.)

\end{verbatim}

\section*{4.5 Parsing a label}

This macro checks if a label was given (not \c_novalue_tl), and if so, tries to parse the
label looking for a leading . to replace by \_hook_currname_or_default:. Start by checking if the label is empty, which raises an error, and uses the fallback value.
If not, split the label at a ./, if any, and check if no tokens are before the ./, or if the
only character is a .. If these requirements are fulfilled, the leading . is replaced with
\_hook_currname_or_default:. Otherwise the label is returned unchanged.

\begin{verbatim}
\cs_new:Npn \__hook_parse_label_default:n #1
{ \tl_if_novalue:nTF {#1} { \_hook_currname_or_default: } { \tl_trim_spaces_apply:nN {#1} \__hook_parse_dot_label:n } }
\end{verbatim}

(End definition for \_hook_parse_label_default:n.)
{\tl_if_empty:nTF {#1}
  { \__hook_parse_dot_label_aux:w #2 \s__hook_mark }
  \\
  {\tl_if_empty:nTF {#2}
    { \__hook_make_name:n {#1} }
    { \__hook_parse_dot_label_cleanup:w #1 ./ #2 \s__hook_mark }
  }
\}
}
\cs_new:Npn \__hook_parse_dot_label_cleanup:w #1 ./ \s__hook_mark {#1}
\cs_new:Npn \__hook_parse_dot_label_aux:w #1 ./ \s__hook_mark
  { \__hook_currname_or_default: / \__hook_make_name:n {#1} }

(End definition for \__hook_parse_dot_label:n and others.)

\__hook_currname_or_default:
This uses \g__hook_hook_curr_name_tl if it is set, otherwise it tries \@currrname. If neither is set, it raises an error and uses the fallback value label-missing.
\cs_new:Npn \__hook_currname_or_default:
  {\tl_if_empty:NTF \g__hook_hook_curr_name_tl
    {\tl_if_empty:NTF \@currname
      {\msg_expandable_error:nnn {latex2e} {should-not-happen}
        {Empty-default-label.}
        {\__hook_make_name:n {label-missing}}
      }
    }
  }
  {\g__hook_hook_curr_name_tl}

(End definition for \__hook_currname_or_default:.)

\__hook_make_name:n
\__hook_make_name:w
This provides a standard sanitzation of a hook’s name. It uses \cs:w to build a control sequence out of the hook name, then uses \cs_to_str:N to get the string representation of that, without the escape character. \cs:w-based expansion is used instead of e-based because Unicode characters don’t behave well inside \expanded. The macro adds the \__hook_prefix to the hook name to reuse the hook’s code token list to build the csname and avoid leaving “public” control sequences defined (as \relax) in TeX’s memory.
\cs_new:Npn \__hook_make_name:n #1
  {\exp_after:wN \exp_after:wN \exp_after:wN \__hook_make_name:w
    \exp_after:wN \token_to_str:N \cs:w __hook- #1 \cs_end:}
\exp_last_unbraced:NNNN
\cs_new:Npn \__hook_make_name:w #1 \tl_to_str:n { __hook- } \{ }

(End definition for \__hook_make_name:n and \__hook_make_name:w.)

\__hook_normalize_hook_args:N
\__hook_normalize_hook_args:Nnn
\__hook_normalize_hook_rule_args:Nnnnn
\__hook_normalize_hook_args_aux:N
This is the standard route for normalizing hook and label arguments. The main macro does the entire operation within a group so that csnames made by \__hook_make_-name:n are wiped off before continuing. This means that this function cannot be used for \hook_use:n!

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The token list \g__hook_hook_curr_name_tl stores the name of the current package/file to be used as the default label in hooks. Providing a consistent interface is tricky because packages can be loaded within packages, and some packages may not use \SetDefaultHookLabel to change the default label (in which case \@currname is used).

To pull that one off, we keep a stack that contains the default label for each level of input. The bottom of the stack contains the default label for the top-level (this stack should never go empty). If we're building the format, set the default label to be top-level:

\tl_set:Nn \g__hook_hook_curr_name_tl \{ top-level \}

Then, in case we're in \texttt{latexrelease} we push something on the stack to support roll forward. But in some rare cases, \texttt{latexrelease} may be loaded inside another package (notably \texttt{platexrelease}), so we'll first push the top-level entry:

\latexrelease\seq_if_empty:NT \g__hook_name_stack_seq (\latexrelease) \{ \seq_put_right:Nn \g__hook_name_stack_seq \{ top-level \} \}

then we dissect the \@currnamework, adding \@currname to the stack:

\latexrelease\cs_set_protected:Npn \__hook_tmp:w \#1 \#2 \#3

(End definition for \__hook_normalize_hook_args:Nn and others.)
and finally set the default label to be the \@currrname:

\tl_gset:Nx \g__hook_hook_curr_name_tl { \@currrname }
\seq_gpop_right:NN \g__hook_name_stack_seq \l__hook_tmpa_tl

Two commands keep track of the stack: when a file is input, \_\_hook_curr_name-_push:n pushes the current default label onto the stack and sets the new default label (all in one go):

\cs_new_protected:Npn \_\_hook_curr_name_push:n #1
{ \exp_args:Nx \_\_hook_curr_name_push_aux:n { \_\_hook_make_name:n {#1} } }
\cs_new_protected:Npn \_\_hook_curr_name_push_aux:n #1
{ \tl_if_blank:nTF {#1}
{ \msg_error:nn { hooks } { no-default-label } }
{\str_if_eq:nnTF {#1} { top-level }
{ \msg_error:nmmnn { hooks } { set-top-level }
{ to } { PushDefaultHookLabel } (#1)}
}
\seq_gpush:NV \g__hook_name_stack_seq \g__hook_hook_curr_name_tl
\tl_gset:Nn \g__hook_hook_curr_name_tl {#1}
}

and when an input is over, the topmost item of the stack is popped, since that label will not be used again, and \_\_hook_hook_curr_name_tl is updated to equal the now topmost item of the stack:

\cs_new_protected:Npn \_\_hook_curr_name_pop:
{ \seq_gpop:NNT \_\_hook_name_stack_seq \l__hook_return_tl
{ \tl_gset_eq:NN \g__hook_hook_curr_name_tl \l__hook_return_tl }
{ \msg_error:nn { hooks } { extra-pop-label } }
}

At the end of the document we want to check if there was no \_\_hook_curr_name-_push:n without a matching \_\_hook_curr_name_pop: (not a critical error, but it might indicate that something else is not quite right):

\tl_gput_right:Nn \@kernel@after@enddocument@afterlastpage
{ \_\_hook_end_document_label_check: }
\cs_new_protected:Npn \_\_hook_end_document_label_check:
{ \seq_gpop:NNT \_\_hook_name_stack_seq \l__hook_return_tl
{ \msg_error:nxx { hooks } { missing-pop-label }
{ \_\_hook_hook_curr_name_tl }

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The token list \texttt{\textbackslash g\_hook\_hook\_curr\_name\_tl} is but a mirror of the top of the stack.

Now define a wrapper that replaces the top of the stack with the argument, and updates \texttt{\textbackslash g\_hook\_hook\_curr\_name\_tl} accordingly.

```latex
\cs_new_protected:Npn \__hook_set_default_hook_label:n #1
\begin{Verbatim}
\{ \seq_if_empty:NTF \g__hook_name_stack_seq
\end{Verbatim}
\begin{Verbatim}
\{ \msg_error:nnnnn \{ hooks \} \{ set-top-level \}
\end{Verbatim}
\begin{Verbatim}
\{ for \} \{ SetDefaultHookLabel \} \{#1\}
\end{Verbatim}
\begin{Verbatim}
\} \{ \exp_args:Nx \__hook_set_default_label:n \{ \__hook_make_name:n \{#1\} \} \}
\end{Verbatim}
\begin{Verbatim}
\}
\end{Verbatim}
\begin{Verbatim}
\cs_new_protected:Npn \__hook_set_default_label:n #1
\begin{Verbatim}
\{ \str_if_eq:nnTF \{#1\} \{ top-level \}
\end{Verbatim}
\begin{Verbatim}
\{ \msg_error:nnnnn \{ hooks \} \{ set-top-level \}
\end{Verbatim}
\begin{Verbatim}
\{ to \} \{ SetDefaultHookLabel \} \{#1\}
\end{Verbatim}
\begin{Verbatim}
\} \{ \tl_gset:Nn \g__hook_hook_curr_name_tl \{#1\} \}
\end{Verbatim}
\begin{Verbatim}
\}
\end{Verbatim}
```

4.6 Adding or removing hook code

With \texttt{\textbackslash hook\_gput\_code:nnn\{\textbackslash hook\}\{\textbackslash label\}\{\textbackslash code\}} a chunk of \textbackslash code is added to an existing \textbackslash hook labeled with \textbackslash \textbackslash label.

```latex
\cs_new_protected:Npn \__hook_gput_code:nnn #1 #2
\begin{Verbatim}
\{ \__hook_normalize_hook_args:Nnn \__hook_gput_code:nnn \{#1\} \{#2\} \}
\end{Verbatim}
\begin{Verbatim}
\cs_new_protected:Npn \__hook_gput_code:nnn #1 #2 #3
\begin{Verbatim}
\{ \__hook_if_execute_immediately:nTF \{#1\}
\end{Verbatim}
\begin{Verbatim}
\{#3\}
\end{Verbatim}
\begin{Verbatim}
\}
\end{Verbatim}
```

First check if the code should be executed immediately, rather than stored:

```latex
\__hook_if_usable:nTF \{#1\}
```

Then check if the hook is usable.

```latex
\__hook_if_usable:nTF \{#1\}
```

If so we simply add (or append) the new code to the property list holding different chunks for the hook. At \texttt{\begin{document}} this is then sorted into a token list for fast execution.

```latex
\__hook_gput_code:nnn \{#1\} \{#2\} \{#3\}
```

However, if there is an update within the document we need to alter this execution code which is done by \texttt{\__hook\_update\_hook\_code:n}. In the preamble this does nothing.

```latex
\__hook_update_hook_code:n \{#1\}
```

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If the hook is not usable, before giving up, check if it’s not disabled and otherwise try to declare it as a generic hook, if its name matches one of the valid patterns.

```latex
\__hook_if_disabled:nTF {#1} \msg_error:nnn { hooks } { hook-disabled } {#1} \__hook_trydeclaring_generic_hook:nnn {#1} {#2} {#3}
```

This macro will unconditionally add a chunk of code to the given hook.

```latex\cs_new_protected:Npn \__hook_gput_code_do:nnn #1 #2 #3
\__hook_debug:n{\iow_term:x{****~ Add~ to~ \__hook_if_usable:nF {#1} { undeclared~ hook~ #1~ (#2) \on@line\space <-- \tl_to_str:n{#3}}} }
```

Then try to get the code chunk labeled #2 from the hook. If there’s code already there, then append #3 to that, otherwise just put #3. If the current label is top-level, the code is added to a dedicated token list \__hook_toplevel⟨hook⟩ that goes at the end of the hook (or at the beginning, for a reversed hook), just before \__hook_next⟨hook⟩.

```latex\str_if_eq:nnTF {#2} { top-level }\str_if_eq:eeTF { top-level } { \__hook_currname_or_default: } \prop_get:cnNTF { g__hook_#1_code_prop } {#2} \l__hook_return_tl\prop_gput:cno { g__hook_#1_code_prop } {#2} { \l__hook_return_tl #3 }\prop_gput:cn { g__hook_#1_code_prop } {#2} {#3}
```

If the hook’s basic structure does not exist, we need to declare it with \__hook_init_structure:n.

```latex\__hook_init_structure:n {#1} \__hook_toplevel⟨hook⟩ \msg_error:nnn { hooks } { misused-top-level } {#1} \l__hook_return_tl \prop_get:cnNTF { g__hook_#1_code_prop } {#2} \prop_gput:right:cn { __hook_toplevel-#1 } {#3} \l__hook_return_tl \prop_gput:cn { g__hook_#1_code_prop } {#2} { \l__hook_return_tl #3 }\prop_gput:cn { g__hook_#1_code_prop } {#2} {#3}
```

```latex\__hook_gput_undeclared_hook:nnn \cs_new_protected:Npn \__hook_gput_undeclared_hook:nnn #1 #2 #3 \__hook_init_structure:n {#1}
```

Often it may happen that a package A defines a hook foo, but package B, that adds code to that hook, is loaded before A. In such case we need to add code to the hook before its declared.

```latex\__hook_gput_undeclared_hook:nnn
```

(End definition for \hook_gput_code:nnn, \__hook_gput_code:nnn, and \__hook_gput_code_do:nnn. This function is documented on page 192.)
These entry-level macros just pass the arguments along to the common \_\_hook_try_declaring_generic_hook:nNNnn with the right functions to execute when some action is to be taken.

The wrapper \_\_hook_try_declaring_generic_hook:nNNnn then defers \hook_gput_code:nnn if the generic hook was declared, or to \_\_hook_gput_undeclared_hook:nnn otherwise (the hook was tested for existence before, so at this point if it isn’t generic, it doesn’t exist).

The wrapper \_\_hook_try_declaring_generic_next_hook:nn for next-execution hooks does the same: it defers the code to \hook_gput_next_code:nn if the generic hook was declared, or to \_\_hook_gput_next_do:nn otherwise.

\_\_hook_try_declaring_generic_hook:nNNnn now splits the hook name at the first / (if any) and first checks if it is a file-specific hook (they require some normalization) using \__hook_if_file_hook:wTF. If not then check it is one of a predefined set for generic names. We also split off the second component to see if we have to make a reversed hook. In either case the function returns (true) for a generic hook and (false) in other cases.
If the hook doesn’t exist yet we check if it is a cmd hook and if so we attempt patching the command in addition to declaring the hook. For some commands this will not be possible, in which case \_\_hook_patch_cmd:_or_delay:Nnn (defined in ltcmdhooks) will generate an appropriate error message.

\str_if_eq:nnT {#1} { cmd } \{ \_\_hook_try_put_cmd_hook:n {#5} \}

\str_if_eq:nnT {#1} { \_\_hook_patch_cmd:_or_delay:Nnn \_\_hook_make_usable:n {#5} \}

Declare the hook always even if it can’t really be used (error message generated elsewhere).

Here we use \_\_hook_make_usable:n, so that a \_\_hook_new:n is still possible later.

\_\_hook_make_usable:n {#5} \}
\_\_hook_if_generic_reversed:nT {#5} \{ tl_gset:cn { g__hook_#5_reversed_tl } { - } \}
\prg_return_true:
}

Generic hooks are all named ⟨type⟩/⟨name⟩/⟨place⟩, where ⟨type⟩ and ⟨place⟩ are predefined (\_\_hook_generic ⟨type⟩/. ⟨place⟩_tl), and ⟨name⟩ is the variable component. Older releases had some hooks with the ⟨name⟩ in the third part, so the code below supports that syntax for a while, with a warning.

File h: lthooks.dtx
The \texttt{\exp_after:wN \ldots \exp:w} trick is there to remove the conditional structure inserted by \texttt{\__hook_try_declarng_generic_hook:wnTF} and thus allow access to the tokens that follow it, as is needed to keep things going.

When the deprecation cycle ends, the lines below should all be replaced by \texttt{\prg_return_false}.  

\begin{verbatim}
\__hook_if_deprecated_generic:nTF {#5}
  {
    \__hook_deprecated_generic_warn:n {#5}
    \exp_after:wN \__hook_declare_deprecated_generic:Nn\n    \exp:w % \exp_end:
  }
  \{ \prg_return_false: \}
\}
\end{verbatim}

\texttt{\__hook_deprecated_generic_warn:n} will issue a deprecation warning for a given hook, and mark that hook such that the warning will not be issued again (multiple warnings can be issued, but only once per hook).

\begin{verbatim}
\cs_new_protected:Npn \__hook_deprecated_generic_warn:n #1
  { \__hook_deprecated_generic_warn:w #1 \s__hook_mark }
\cs_new_protected:Npn \__hook_deprecated_generic_warn:w
  #1 / #2 / #3 \s__hook_mark
  {
    \ifcs_exist:w __hook~#1/#2/#3 \cs_end: \else:
      \msg_warning:nnnnn { hooks } { generic-deprecated } {#1} {#2} {#3}
    \fi:
    \cs_gset_eq:cN { __hook~#1/#2/#3 } \scan_stop:
  }
\end{verbatim}

Now that the user has been told about the deprecation, we proceed by swapping \texttt{\langle name \rangle} and \texttt{\langle place \rangle} and adding the code to the correct hook.

\begin{verbatim}
\cs_new_protected:Npn \__hook_do_deprecated_generic:Nn #1 #2
  { \__hook_do_deprecated_generic:Nw #1 #2 \s__hook_mark
    \cs_gset_eq:cN { __hook~#1/#2/#3 } \scan_stop:
  }
\cs_new_protected:Npn \__hook_do_deprecated_generic:Nw #1
  #2 / #3 / #4 \s__hook_mark
  { #1 { #2 / #4 / #3 } }
\cs_new_protected:Npn \__hook_declare_deprecated_generic:Nn #1 #2 #3
  \cs_gset_eq:cN { __hook~#1/#2/#3 } \scan_stop:
\end{verbatim}

\begin{verbatim}
\__hook_try_declarng_generic_hook:wnTF \#3 / \#5 / \#4 / \scan_stop:
  \{ \#3 / \#5 / \#4 \}
  \#1 \#2 \{ \#3 / \#5 / \#4 \}
\end{verbatim}

\begin{verbatim}
\EndIncludeInRelease\IncludeInRelease{2021/06/01}{\__hook_try_declarng_generic_hook:wn}
\IncludeInRelease{2021/06/01}{\Support-cmd-hooks}
\IncludeInRelease{2021/06/01}{\__hook_try_declarng_generic_hook:wnTF}
\IncludeInRelease{2021/06/01}{\tl_if_empty:nTF {#2}}
\end{verbatim}
\begin{verbatim}
\__hook_file_hook:TF \__hook_file_hook:wTF checks if the argument is a valid file-specific hook (not, for example, file/before, but file/foo.tex/before). If it is a file-specific hook, then it executes the \texttt{true} branch, otherwise \texttt{false}.
\end{verbatim}

File h: lthooks.dtx
When a file-specific hook is found, before being declared it is lightly normalized by \_\_hook_file_hook_normalize:n. The current implementation just replaces two consecutive slashes (//) by a single one, to cope with simple cases where the user did something like \def\input@path{{./mypath/}}, in which case a hook would have to be \AddToHook{file/./mypath/file.tex/after}.

This function is always called after testing if the argument is a file hook with \_\_hook_if_file_hook:wTF, so we can assume it has three parts (it is either file/.../before
or file/.../after), so we use #1/#2/#3 // instead of just #1 // to prevent losing a slash if the file name is empty.

\cs_new:Npn \__hook_strip_double_slash:w #1/#2/#3 // #4 \s__hook_mark
\tl_if_empty:nTF {#4}
\{ #1/#2/#3 \}
\{ \__hook_strip_double_slash:w #1/#2/#3 / #4 \s__hook_mark \}
\EndIncludeInRelease

Token lists defining the possible generic hooks. We don’t provide any user interface to this as this is meant to be static.

cmd The generic hooks used for commands.

env The generic hooks used in \begin and \end.

file, package, class, include The generic hooks used when loading a file

\clist_map_inline:nn { cmd , env , file , package , class , include }
\{ \tl_const:cn { c__hook_generic_#1/./before_tl } { + } \}
\{ \tl_const:cn { c__hook_generic_#1/./after_tl } { - } \}
\{ \tl_const:cn { c__hook_generic_env/./begin_tl } { + } \}
\{ \tl_const:cn { c__hook_generic_env/./end_tl } { + } \}
\{ \tl_const:cn { c__hook_generic_include/./end_tl } { - } \}
\{ \tl_const:cn { c__hook_generic_deprecated/./before_tl } { + } \}
\{ \tl_const:cn { c__hook_generic_deprecated/./after_tl } { - } \}
\EndIncludeInRelease

|\c__hook_generation_prop
\EndIncludeInRelease

\clist_map_inline:nn { file , package , class , include }
\{ \tl_const:cn { c__hook_deprecated_#1/./before_tl } { } \}
\{ \tl_const:cn { c__hook_deprecated_#1/./after_tl } { } \}
\{ \tl_const:cn { c__hook_deprecated_deprecated/./before_tl } { } \}
\{ \tl_const:cn { c__hook_deprecated_deprecated/./after_tl } { } \}
\{ \tl_const:cn { c__hook_deprecated_deprecated/./end_tl } { } \}
\{ \tl_const:cn { c__hook_deprecated_deprecated_deprecated/./before_tl } { } \}
\{ \tl_const:cn { c__hook_deprecated_deprecated_deprecated/./after_tl } { } \}
\{ \tl_const:cn { c__hook_deprecated_deprecated_deprecated/./end_tl } { } \}
\EndIncludeInRelease

|\c__hook_generics_reversed_ii_prop
\c__hook_generics_reversed_iii_prop
\c__hook_generics_file_prop
\EndIncludeInRelease

The following generic hooks are supposed to use reverse ordering (the ii and iii names are kept for the deprecation cycle):

\EndIncludeInRelease

File h: lthooks.dtx
With `\hook_gremove_code:nn{⟨hook⟩}{⟨label⟩}` any code for ⟨hook⟩ stored under ⟨label⟩ is removed.

\begin{Verbatim}
\cs_new_protected:Npn \hook_gremove_code:nn #1 #2 { \__hook_normalize_hook_args:Nnn \__hook_gremove_code:nn {#1} {#2} }
\cs_new_protected:Npn \__hook_gremove_code:nn #1 #2 {
  \str_if_eq:nnTF {#2} {*} {
    \prop_gclear:c {g__hook_#1_code_prop}
    \__hook_tl_gclear:c {__hook_toplevel~#1}
    \__hook_tl_gclear:c {__hook_next~#1}
  } {
    \str_if_eq:nnTF {#2} {top-level} {
      \__hook_tl_gclear:c {__hook_toplevel~#1}
    } {
      \prop_gpop:cnNF {g__hook_#1_code_prop} {#2} \l__hook_return_tl
      \msg_warning:nnnn {hooks} {cannot-remove} {#1} {#2}
    }
  }
  \__hook_if_usable:nTF {#1} {
    \__hook_update_hook_code:n {#1}
  }
}
\end{Verbatim}

If the label is `top-level` then clear the token list, as all code there is under the same label.

\begin{Verbatim}
\str_if_eq:nnTF {#2} {top-level} {
  \__hook_tl_gclear:c {__hook_toplevel~#1}
  \prop_gpop:cnNF {g__hook_#1_code_prop} {#2} \l__hook_return_tl
  \msg_warning:nnnn {hooks} {cannot-remove} {#1} {#2}
}
\end{Verbatim}

Finally update the code, if the hook exists.

\begin{Verbatim}
\__hook_if_usable:nT {#1} {
  \__hook_update_hook_code:n {#1}
}
\end{Verbatim}

If the code pool for this hook doesn’t exist, show a warning:

\begin{Verbatim}
\__hook_if_deprecated_generic:nTF {#1} {
  \__hook_deprecated_generic_warn:n {#1}
}
\end{Verbatim
Initially these variables simply used an empty “label” name (not two question marks). This was a bit unfortunate, because then \l3doc\ complains about \_\_ in the middle of a command name when trying to typeset the documentation. However using a “normal” name such as \texttt{default} has the disadvantage of that being not really distinguishable from a real hook name. I now have settled for \__ which needs some gymnastics to get it into the csname, but since this is used a lot, the code should be fast, so this is not done with \cexp\ expansion in the code later on.

\__\_ isn’t used, but it has to be defined to trick the code into thinking that \__ is actually a hook.

\prop_new:c {g\__\_\_code\_prop}
\prop_new:c {\__\_\_??}

Default rules are always given in normal ordering (never in reversed ordering). If such a rule is applied to a reversed hook it behaves as if the rule is reversed (e.g., \texttt{after} becomes \texttt{before}) because those rules are applied first and then the order is reversed.

\tl_new:c {g\__\_\_reversed\_tl}

4.7 Setting rules for hooks code

With \texttt{\hook_gset_rule:nnnn}{\langle hook\rangle}{\langle label1\rangle}{\langle relation\rangle}{\langle label2\rangle} a relation is defined between the two code labels for the given \langle hook\rangle. The special hook \__ stands for any hook, which sets a default rule (to be used if no other relation between the two hooks exist).

\cs_new_protected:Npn \hook_gset_rule:nnnn #1#2#3#4
{}
First we ensure the basic data structure of the hook exists:
\__hook_init_structure:n {#1}

Then we clear any previous relationship between both labels.
\__hook_rule_gclear:nnn {#1} {#2} {#4}

Then we call the function to handle the given rule. Throw an error if the rule is invalid.
\cs_if_exist_use:cTF { __hook_rule_#3_gset:nnn }
\{ {#1} {#2} {#4} \}
\__hook_update_hook_code:n {#1}
\}
\msg_error:nnnn { hooks } { unknown-rule }
\{ {#1} {#2} {#3} {#4} \}
\}
\s__hook_mark

Then we add the new rule. We need to normalize the rules here to allow for faster processing later. Given a pair of labels $l_A$ and $l_B$, the rule $l_A > l_B$ is the same as $l_B < l_A$ only presented differently. But by normalizing the forms of the rule to a single representation, say, $l_B < l_A$, reduces the time spent looking for the rules later considerably.

End definition for \hook_gset_rule:nnnn and \__hook_gset_rule:nnnn. This function is documented on page 193.)
\__hook_rule_before_gset:nnn
\__hook_rule_after_gset:nnn
\__hook_rule_<_gset:nnn
\__hook_rule>_gset:nnn

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Here we do that normalization by using \texttt{\texttt{pdf}strcmp} to lexically sort labels \( l_A \) and \( l_B \) to a fixed order. This order is then enforced every time these two labels are used together.

Here we use \texttt{\_\_hook\_label\_pair:nn} \{\{\texttt{hook}\}\} \{\{\texttt{\_\_hook\_label\_ordered:nnTF}\}\} to build a string \( l_B \| l_A \) with a fixed order, and use \texttt{\_\_hook\_label\_ordered:nnTF} to apply the correct rule to the pair of labels, depending if it was sorted or not.

\begin{verbatim}
\cs_new_protected:Npn \__hook_rule_before_gset:nnn #1#2#3
  { \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
    \__hook_label_ordered:nnTF {#2} {#3} { < } { > } }
\end{verbatim}

\begin{verbatim}
\cs_new_protected:Npn \__hook_rule_after_gset:nnn #1#2#3
  { \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#3} {#2} _tl }
    \__hook_label_ordered:nnTF {#3} {#2} { < } { > } }
\end{verbatim}

\begin{verbatim}
\cs_new_protected:Npn \__hook_rule_voids_gset:nnn #1#2#3
  { \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
    \__hook_label_ordered:nnTF {#2} {#3} { -> } { <- } }
\end{verbatim}

\begin{verbatim}
\cs_new_protected:cpn { \__hook_rule_incompatible-error_gset:nnn } #1#2#3
  { \__hook_tl_gset:cn { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl } \xE }
\end{verbatim}

\begin{verbatim}
\cs_new_protected:cpn { \__hook_rule_incompatible-warning_gset:nnn } #1#2#3
  { \__hook_tl_gset:cn { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl } \xW }
\end{verbatim}

\begin{verbatim}
\cs_new_protected:Npn \__hook_rule_unrelated_gset:nnn #1#2#3 { }
\end{verbatim}

\begin{verbatim}
\cs_new_protected:Npn \__hook_rule_gclear:nnn #1#2#3
  { \cs_undefine:c { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl } }
\end{verbatim}

\begin{verbatim}
\cs_new:Npn \__hook_label_pair:nn #1#2
  { \if_case:w \__hook_str_compare:nn {#1} {#2} \exp_stop_f: 
    #1 | #1 \% 0 }
\end{verbatim}
or: \#1 | \#2 \% +1
\else: \#2 | \#1 \% -1
\fi:
}

(End definition for \__hook_label_pair:nn.)

\__hook_label_ordered_p:nn\__hook_label_ordered:nn TF
Check that labels \#1 and \#2 are in the correct order (as returned by \__hook_label_pair:nn) and if so return true, else return false.

\prg_new_conditional:Npnn \__hook_label_ordered:nn #1#2 { TF }
{ \if_int_compare:w \__hook_str_compare:nn {#1} {#2} > 0 \exp_stop_f:
  \prg_return_true:
\else:
  \prg_return_false:
\fi:
}

(End definition for \__hook_label_ordered:nnTF.)

\__hook_if_label_case:nnnnn
To avoid doing the string comparison twice in \__hook_initialize_single:NNn (once with \str_if_eq:nn and again with \__hook_label_ordered:nn), we use a three-way branching macro that will compare \#1 and \#2 and expand to \use_i:nnn if they are equal, \use_ii:nn if \#1 is lexically greater, and \use_iii:nn otherwise.
\cs_new:Npn \__hook_if_label_case:nnnnn #1#2
{ \cs:w use_ \if_case:w \__hook_str_compare:nn {#1} {#2}
i \or: ii \else: iii \fi: :nnn \cs_end: }

(End definition for \__hook_if_label_case:nnnnn.)

\__hook_update_hook_code:n
Before \begin{document} this does nothing, in the body it reinitializes the hook code using the altered data.
\cs_new:NN \__hook_update_hook_code:n \use_none:n

(End definition for \__hook_update_hook_code:n.)

\__hook_initialize_all:
Initialize all known hooks (at \begin{document}), i.e., update the fast execution token lists to hold the necessary code in the right order.
\cs_new_protected:NN \__hook_initialize_all: 
First we change \__hook_update_hook_code:n which so far was a no-op to now initialize one hook. This way any later updates to the hook will run that code and also update the execution token list.
\cs_gset_eq:NN \__hook_update_hook_code:n \__hook_initialize_hook_code:n
Now we loop over all hooks that have been defined and update each of them.
\__hook_debug:n \prop_gclear:N \g__hook_used_prop \seq_map_inline:Nn \g__hook_all_seq
{ \__hook_update_hook_code:n {##1} }

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If we are debugging we show results hook by hook for all hooks that have data.

```latex
\__hook_debug:n
  \{ \io_term:x{^^JAll~initialized~(non-empty)~hooks:}
  \prop_map_inline:Nn \g__hook_used_prop
    \{ \io_term:x{^^J~##1~->~}
      \exp_not:v {__hook~##1}~\}
  \}
```

After all hooks are initialized we change the “use” to just call the hook code and not initialize it (as it was done in the preamble.

```latex
\cs_gset_eq:NN \hook_use:n \__hook_use_initialized:n
\cs_gset_eq:NN \__hook_preamble_hook:n \use_none:n
```

(End definition for \__hook_initialize_all:) 

\__hook_initialize_hook_code:n

Initializing or reinitializing the fast execution hook code. In the preamble this is selectively done in case a hook gets used and at \begin{document} this is done for all hooks and afterwards only if the hook code changes.

```latex
\cs_new_protected:Npn \__hook_initialize_hook_code:n #1
  \{ \__hook_debug:n
    \io_term:x{^^J~Update~code~for~hook~'#1' \on@line:^^J}
  \}
```

This does the sorting and the updates. First thing we do is to check if a legacy hook macro exists and if so we add it to the hook under the label legacy. This might make the hook non-empty so we have to do this before the then following test.

```latex
\__hook_include_legacy_code_chunk:n {#1}
```

If there aren’t any code chunks for the current hook, there is no point in even starting the sorting routine so we make a quick test for that and in that case just update \__-hook\hook\hook to hold the top-level and next code chunks. If there are code chunks we call \__hook_initialize_single:NNn and pass to it ready made csnames as they are needed several times inside. This way we save a bit on processing time if we do that up front.

```latex
\__hook_if_usable:nT {#1}
  \{ \prop_if_empty:cTF {\g__hook_#1_code_prop}
    \{ \__hook_tl_gset:co {__hook~#1} \exp_after:wN \cs_end:
      \cs:w __hook_toplevel~#1 \exp_after:wN \cs_end:
      \cs:w __hook_next~#1 \cs_end:
    \}
  ```

By default the algorithm sorts the code chunks and then saves the result in a token list for fast execution; this is done by adding the code chunks one after another, using \tl_gput_right:NV. When we sort code for a reversed hook, all we have to do is to add the code chunks in the opposite order into the token list. So all we have to do in preparation is to change two definitions that are used later on.

```latex
\__hook_if_reversed:nTF {#1}
```

File h: lthooks.dtx
When sorting, some relations (namely voids) need to act destructively on the code property lists to remove code that shouldn’t appear in the sorted hook token list, so we make a copy of the code property list that we can safely work on without changing the main one.

\prop_set_eq:Nc \l__hook_work_prop { g__hook_#1_code_prop }
\__hook_initialize_single:ccn { __hook~#1 } { g__hook_#1_labels_clist } {#1}

For debug display we want to keep track of those hooks that actually got code added to them, so we record that in plst. We use a plist to ensure that we record each hook name only once, i.e., we are only interested in storing the keys and the value is arbitrary.

\__hook_debug:n { \exp_args:NNx \prop_gput:Nnn \g__hook_used_prop {#1} { } }
}

(End definition for \__hook_initialize_hook_code:n.)
\__hook_tl_csname:n It is faster to pass a single token and expand it when necessary than to pass a bunch of character tokens around.
\__hook_seq_csname:n

\cs_new:Npn \__hook_tl_csname:n #1 { l__hook_label_#1_tl }
\cs_new:Npn \__hook_seq_csname:n #1 { l__hook_label_#1_seq }

(End definition for \__hook_tl_csname:n and \__hook_seq_csname:n.)

\l__hook_labels_seq \l__hook_labels_int \l__hook_front_tl \l__hook_rear_tl \l__hook_label_0_tl

For the sorting I am basically implementing Knuth’s algorithm for topological sorting as given in TAOCP volume 1 pages 263–266. For this algorithm we need a number of local variables:

• List of labels used in the current hook to label code chunks:

\seq_new:N \l__hook_labels_seq

• Number of labels used in the current hook. In Knuth’s algorithm this is called \( N \):

\int_new:N \l__hook_labels_int

• The sorted code list to be build is managed using two pointers one to the front of the queue and one to the rear. We model this using token list pointers. Knuth calls them \( F \) and \( R \):

\tl_new:N \l__hook_front_tl
\tl_new:N \l__hook_rear_tl

File h: 1thooks.dtx
The data for the start of the queue is kept in this token list, it corresponds to what Don calls QLINK[0] but since we aren’t manipulating individual words in memory it is slightly differently done:

\tl_new:c { \_\_hook_tl_csname:n { 0 } }

(End definition for \l__hook_labels_seq and others.)

\_\_hook_initialize_single:NNN \_\_hook_initialize_single:ccn \_\_hook_initialize_single:NNn implements the sorting of the code chunks for a hook and saves the result in the token list for fast execution (#4). The arguments are \langle hook-code-plist \rangle, \langle hook-code-tl \rangle, \langle hook-top-level-code-tl \rangle, \langle hook-next-code-tl \rangle, \langle hook-ordered-labels-clist \rangle and \langle hook-name \rangle (the latter is only used for debugging—the \langle hook-rule-plist \rangle is accessed using the \langle hook-name \rangle).

The additional complexity compared to Don’s algorithm is that we do not use simple positive integers but have arbitrary alphanumeric labels. As usual Don’s data structures are chosen in a way that one can omit a lot of tests and I have mimicked that as far as possible. The result is a restriction I do not test for at the moment: a label can’t be equal to the number 0!

FMi: Needs checking for, just in case ... maybe

\cs_new_protected:Npn \_\_hook_initialize_single:NNn \_\_hook_initialize_single:CCn \_\_hook_initialize_single:ccn

Step T1: Initialize the data structure ...

\seq_clear:N \l__hook_labels_seq
\int_zero:N \l__hook_labels_int

Store the name of the hook:

\tl_set:Nn \l__hook_cur_hook_tl {#3}

We loop over the property list holding the code and record all the labels listed there. Only the rules for those labels are of interest to us. While we are at it we count them (which gives us the \textit{N} in Knuth’s algorithm). The prefix \texttt{label} is added to the variables to ensure that labels named \texttt{front}, \texttt{rear}, \texttt{labels}, or \texttt{return} don’t interact with our code.

\prop_map_inline:Nn \l__hook_work_prop

Steps T2 and T3: Here we sort the relevant rules into the data structure...

This loop constitutes a square matrix of the labels in \langle hook-rule-plist \rangle in the vertical and the horizontal directions. However, since the rule \textit{t}_A(\textit{rel})\textit{t}_B is the same as \textit{t}_B(\textit{rel})^{-1}\textit{t}_A we can cut the loop short at the diagonal of the matrix (\textit{i.e.}, when both labels are equal), saving a good amount of time. The way the rules were set up (see the implementation of \_\_hook_rule_before_gset:nnn above) ensures that we have no rule in the ignored side of the matrix, and all rules are seen. The rules are applied in \_\_hook_apply_label_pair:nnn, which takes the properly-ordered pair of labels as argument.
\prop_map_inline:Nn \l__hook_work_prop
{
    \__hook_if_label_case:nnnn {##1} {####1}
    { \prop_map_break: }
    { \__hook_apply_label_pair:nnn {##1} {####1} }
    { \__hook_apply_label_pair:nnn {####1} {##1} }
    {#3}
}

Now take a breath, and look at the data structures that have been set up:

\__hook_debug:n { \__hook_debug_label_data:N \l__hook_work_prop }

Step T4:

\tl_set:Nn \l__hook_rear_tl { 0 }
\tl_set:cn { \__hook_tl_csname:n { 0 } } { 0 }
\seq_map_inline:Nn \l__hook_labels_seq
{
    \int_compare:nNnT { \cs:w \__hook_tl_csname:n {##1} \cs_end: } = 0
    {
        \tl_set:cn { \__hook_tl_csname:n { \l__hook_rear_tl } }{##1}
        \tl_set:Nn \l__hook_rear_tl {##1}
    }
}
\tl_set_eq:Nc \l__hook_front_tl { \__hook_tl_csname:n { 0 } }
\__hook_tl_gclear:N #1
\clist_gclear:N #2

The whole loop gets combined in steps T5–T7:

\bool_while_do:nn { ! \str_if_eq_p:Vn \l__hook_front_tl { 0 } }
{
    \int_decr:N \l__hook_labels_int
    \prop_get:NVN \l__hook_work_prop \l__hook_front_tl \l__hook_return_tl
    \exp_args:NNV \__hook_tl_gput:Nn #1 \l__hook_return_tl
    \__hook_clist_gput:NV #2 \l__hook_front_tl
    \__hook_debug:n { \iow_term:x{Handed- code- for- \l__hook_front_tl} }
}

This part is step T5:

\int_decr:N \l__hook_labels_int
\prop_get:NVN \l__hook_work_prop \l__hook_front_tl \l__hook_return_tl
\exp_args:NNV \__hook_tl_gput:Nn #1 \l__hook_return_tl
\__hook_clist_gput:NV #2 \l__hook_front_tl
\__hook_debug:n { \iow_term:x{Handed- code- for- \l__hook_front_tl} }

This is step T6, except that we don’t use a pointer \textit{P} to move through the successors, but instead use \texttt{##1} of the mapping function.

\seq_map_inline:cn { \__hook_seq_csname:n { \l__hook_front_tl } }
{
    \tl_set:cx { \__hook_tl_csname:n {##1} }
    { \int_eval:n
        \cs:w \__hook_tl_csname:n {##1} \cs_end: - 1 }
    \int_compare:nNnT
    { \cs:w \__hook_tl_csname:n {##1} \cs_end: } = 0
    {
        \tl_set:cn { \__hook_tl_csname:n { \l__hook_rear_tl } }{##1}
        \tl_set:Nn \l__hook_rear_tl {##1}
    }
}

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and here is step T7:

\tl_set_eq:Nc \l__hook_front_tl
 { \__hook_tl_csname:n { \l__hook_front_tl } }

This is step T8: If we haven’t moved the code for all labels (i.e., if \l__hook_labels_int is still greater than zero) we have a loop and our partial order can’t be flattened out.

\int_compare:nNnF \l__hook_labels_int = 0
 {
 \iow_term:x{====================}
 \iow_term:x{Error: label rules are incompatible:}
 This is not really the information one needs in the error case but it will do for now ...

 FMi: improve output on a rainy day

After we have added all hook code to \#1, we finish it off by adding extra code for the top-level (\#2) and for one time execution (\#3). These should normally be empty. The top-level code is added with \__hook_tl_gput:Nn as that might change for a reversed hook (then top-level is the very first code chunk added). The next code is always added last.

\exp_args:NNo \__hook_tl_gput:Nn \#1 { \cs:w __hook_toplevel~\#3 \cs_end: }
 \__hook_tl_gput_right:No \#1 { \cs:w __hook_next~\#3 \cs_end: }

\cs_generate_variant:Nn \__hook_initialize_single:NNn { cc }
 (End definition for \__hook_initialize_single:NNn.)

\__hook_tl_gput:Nn
 \__hook_clist_gput:NV
These append either on the right (normal hook) or on the left (reversed hook). This is setup up in \__hook_initialize_hook_code:n, elsewhere their behavior is undefined.

\cs_new:Npn \__hook_tl_gput:Nn \#1 \#2 \#3 \{ \ERROR \}
 \cs_new:Npn \__hook_clist_gput:NV \#1 \#2 \{ \ERROR \}
 (End definition for \__hook_tl_gput:Nn and \__hook_clist_gput:NV.)

\__hook_apply_label_pair:nnn
 \__hook_label_if_exist_apply:nnnF
This is the payload of steps T2 and T3 executed in the loop described above. This macro assumes \#1 and \#2 are ordered, which means that any rule pertaining the pair \#1 and \#2 is \g__hook_\langle hook\rangle_rule_\#1_\#2_tl and not \g__hook_\langle hook\rangle_rule_\#2_\#1_tl. This also saves a great deal of time since we only need to check the order of the labels once.

The arguments here are \langle label1\rangle, \langle label2\rangle, \langle hook\rangle, and \langle hook-code-plist\rangle. We are about to apply the next rule and enter it into the data structure. \__hook_apply_label_pair:nnn will just call \__hook_label_if_exist_apply:nnnF for the \langle hook\rangle, and if no rule is found, also try the \langle hook\rangle name ?? denoting a default hook rule.

\__hook_label_if_exist_apply:nnnF will check if the rule exists for the given hook, and if so call \__hook_apply_rule:nnn.

\cs_new_protected:Npn \__hook_apply_label_pair:nnn \#1 \#2 \#3
 {
Extra complication: as we use default rules and local hook specific rules we first have to check if there is a local rule and if that exist use it. Otherwise check if there is a default rule and use that.

\__hook_label_if_exist_apply:nnnF \{#1\} \{#2\} \{#3\}

If there is no hook-specific rule we check for a default one and use that if it exists.

\__hook_label_if_exist_apply:nnnF \{#1\} \{#2\} \{ ?? \} \{ \}

\cs_new_protected:Npn \__hook_label_if_exist_apply:nnnF #1#2#3
\if_cs_exist:w g__hook_ #3 _rule_ #1 | #2 _tl \cs_end:
What to do precisely depends on the type of rule we have encountered. If it is a before rule it will be handled by the algorithm but other types need to be managed differently.

All this is done in \__hook_apply_rule:nnn.

\__hook_apply_rule:nnn

This is the code executed in steps T2 and T3 while looping through the matrix. This is part of step T3. We are about to apply the next rule and enter it into the data structure. The arguments are \langle label1 \rangle, \langle label2 \rangle, \langle hook-name \rangle, and \langle hook-code-plist \rangle.

\cs_new_protected:Npn \__hook_apply_rule:nnn #1#2#3
{\cs:w __hook_apply_rule : nnn \cs:w g__hook_ #3_reversed_tl \cs_end: rule_ \cs:w g__hook_ #3_rule_ #1 | #2 _tl \cs_end: : nnn \cs_end:
{(#1) (#2) (#3)}
}

(End definition for \__hook_label_pair:nnn and \__hook_label_if_exist_apply:nnnF.)

\__hook_apply_rule_:nnn
\__hook_apply_rule_>:nnn

The most common cases are < and > so we handle that first. They are relations \textless{} and \textgreater{} in TAOCP, and they dictate sorting.

\cs_new_protected:cpn \{ __hook_apply_rule_<:nnn \} #1#2#3
{\__hook_debug:n { __hook_msg_pair_found:nnn {#1} {#2} {#3} }
 \tl_set:cx { __hook_tl_csname:n {#2} }
 \{ \int_eval:n{ \cs:w __hook_tl_csname:n {#2} \cs_end: + 1 } \}
 \seq_put_right:cn{ __hook_seq_csname:n {#1} }{#2}
 }

\cs_new_protected:cpn \{ __hook_apply_rule_>:nnn \} #1#2#3
{\__hook_debug:n { __hook_msg_pair_found:nnn {#1} {#2} {#3} }
 \tl_set:cx { __hook_tl_csname:n {#1} }
 \{ \int_eval:n{ \cs:w __hook_tl_csname:n {#1} \cs_end: + 1 } \}
 \seq_put_right:cn{ __hook_seq_csname:n {#2} }{#1}
}

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These relations make two labels incompatible within a hook. \texttt{xE} makes raises an error if the labels are found in the same hook, and \texttt{xW} makes it a warning.

\begin{verbatim}
\cs_new_protected:cpn { __hook_apply_rule_xE:nnn } #1#2#3
{ \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
\msg_error:nnnnn { hooks } { labels-incompatible }
{#1} {#2} {#3} { 1 }
\use:c { __hook_apply_rule_->:nnn } {#1} {#2} {#3}
\use:c { __hook_apply_rule_<-:nnn } {#1} {#2} {#3} }
\cs_new_protected:cpn { __hook_apply_rule_xW:nnn } #1#2#3
{ \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
\msg_warning:nnnnnn { hooks } { labels-incompatible }
{#1} {#2} {#3} { 0 }
}
\end{verbatim}

If we see \texttt{->} we have to drop code for label \texttt{#3} and carry on. We could do a little better and drop everything for that label since it doesn’t matter where we put such empty code. However that would complicate the algorithm a lot with little gain.\footnote{This also has the advantage that the result of the sorting doesn’t change, as it might otherwise do (for unrelated chunks) if we aren’t careful.} So we still unnecessarily try to sort it in and depending on the rules that might result in a loop that is otherwise resolved. If that turns out to be a real issue, we can improve the code.

Here the code is removed from \texttt{\l__hook_cur_hook_tl} rather than \texttt{#3} because the latter may be ?, and the default hook doesn’t store any code. Removing it instead from \texttt{\l__hook_cur_hook_tl} makes the default rules \texttt{->} and \texttt{<-} work properly.

\begin{verbatim}
\cs_new_protected:cpn { __hook_apply_rule_->:nnn } #1#2#3
{ \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
\msg_term:x{--->~ Drop~ '#2'~ code~ from~ \iow_char:N \g__hook_ \l__hook_cur_hook_tl_code_prop~ because~ of~ '#1' }
\prop_put:Nnn \l__hook_work_prop {#2} { } }
\cs_new_protected:cpn { __hook_apply_rule_<-:nnn } #1#2#3
{ \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
\msg_term:x{--->~ Drop~ '#1'~ code~ from~ \iow_char:N \g__hook_ \l__hook_cur_hook_tl_code_prop~ because~ of~ '#2' }
\prop_put:Nnn \l__hook_work_prop {#1} { } }
\end{verbatim}
Reversed rules.
\cs_new_eq:cc { __hook_apply_rule_<:nnn } { __hook_apply_rule_:nnn }
\cs_new_eq:cc { __hook_apply_rule_:nnn } { __hook_apply_rule_<:nnn }
\cs_new_eq:cc { __hook_apply_rule_<-:nnn } { __hook_apply_rule_<:nnn }
\cs_new_eq:cc { __hook_apply_rule_->:nnn } { __hook_apply_rule_<-:nnn }

\cs_new_eq:cc { __hook_apply_rule_xW:nnn } { __hook_apply_rule_xE:nnn }
\cs_new_eq:cc { __hook_apply_rule_xE:nnn } { __hook_apply_rule_xW:nnn }

\__hook_msg_pair_found:nnn
A macro to avoid moving this many tokens around.
\cs_new_protected:Npn \__hook_msg_pair_found:nnn #1#2#3
\iow_term:x{~ \str_if_eq:nnTF {#3} {??} {default} {-normal} ~
rule~ __hook_label_pair:nn {#1} {#2}:
\use:c { g__hook_#3_rule_ __hook_label_pair:nn {#1} {#2} _tl } -
found}

\__hook_debug_label_data:N
\cs_new_protected:Npn \__hook_debug_label_data:N #1
\iow_term:x{Code~ labels~ for~ sorting:}
\iow_term:x{\seq_use:Nnnn\l__hook_labels_seq {and}{,and} }
\iow_term:x{\^J Data~ structure~ for~ label~ rules:}
\prop_map_inline:Nn #1
\iow_term:x{~ ##1~ =~ \tl_use:c{\__hook_tl_csname:n {##1} }~ ->~
\seq_use:cnnn{\__hook_seq_csname:n {##1} }{->}{->}{->}}
\iow_term:x{}

This writes out information about the hook given in its argument onto the .log file and
the terminal, if \show_hook:n is used. Internally both share the same structure, except
that at the end, \hook_show:n triggers \TeX{}'s prompt.
\cs_new_protected:Npn \hook_log:n #1
\cs_set_eq:NN \__hook_log_cmd:x \iow_log:x
\__hook_normalize_hook_args:Nn \__hook_log:nN {#1} \tl_log:x
\cs_new_protected:Npn \hook_show:n #1
\cs_set_eq:NN \__hook_log_cmd:x \iow_term:x
\__hook_normalize_hook_args:Nn \__hook_show:nN {#1} \tl_show:x
\cs_new_protected:Npn \__hook_log_line:x #1
\cs_set_eq:NN \__hook_log_line:x \iow_term:x
\__hook_normalize_hook_args:Nn \__hook_log_line:n #1 \tl_log:x
\cs_new_protected:Npn \__hook_log_line:n #1
\cs_set_eq:NN \__hook_log_line:x \iow_term:x
\__hook_normalize_hook_args:Nn \__hook_log_line:n #1 \tl_show:x
\cs_new_protected:Npn \__hook_log_line_indent:x #1
\cs_set_eq:NN \__hook_log_line:x { \tl_spaces }
\cs_new_protected:Npn \__hook_log:nN #1 #2
{
  \__hook_if_deprecated_generic:nT (#1)
  {
    \__hook_deprecated_generic_warn:n {#1}
  \__hook_do_deprecated_generic:Nn \__hook_log:nN {#1} #2
  \exp_after:wN \use_none:nnnnnnnnn \use_none:nnnn}
\__hook_preamble_hook:n {#1}
\__hook_log_cmd:x
{ ^\j \rightarrow The \__hook_if_generic:nT {#1} { generic } hook-#1: }
\__hook_if_usable:nF {#1}
{ \__hook_log_line:x { The hook is not declared. } }
\__hook_if_disabled:nT {#1}
{ \__hook_log_line:x { The hook is disabled. } }
\hook_if_empty:nTF {#1}
{ #2 { The hook is empty } }
{
  \__hook_log_line:x { Code-chunks: }
  \prop_if_empty:cTF { g__hook_#1_code_prop }
  { \__hook_log_line_indent:x { --- } }
  {
    \prop_map_inline:cn { g__hook_#1_code_prop }
    { \__hook_log_line_indent:x { #1->\tl_to_str:n {#2} } }
  }
}\__hook_log_line:x { Document-level (top-level) code }
\__hook_if_usable:nT {#1}
{ -(executed-\__hook_if_reversed:nTF {#1} {first} {last}) }:
\__hook_log_line:x { Extra code for next invocation: }
\__hook_log_line_indent:x
{ \tl_if_empty:cTF { __hook_toplevel-#1 } 
  { --- }
  { \exp_args:Nv \tl_to_str:n { __hook_toplevel-#1 } }
}\__hook_log_line:x { Rules: }
\__hook_log_line:x
{
  \tl_if_empty:cTF { __hook_next-#1 } 
  { --- }
\tl_if_empty:cTF { __hook_log_next_code:n { __hook_next-#1 } }
}
\__hook_log_line:x { Rules: }
\_hook_log_line:x

If there is code in the top-level token list, print it:
\__hook_log_line:x
{
  Document-level-(top-level)-code 
  \__hook_if_usable:nT {#1}
  { -(executed-\__hook_if_reversed:nTF {#1} {first} {last}) }:
\__hook_log_line:x 
  { \tl_if_empty:cTF { __hook_toplevel-#1 } 
    { --- }
    { \exp_args:Nv \tl_to_str:n { __hook_toplevel-#1 } }
  }
\__hook_log_line:x { Extra code for next invocation: }
\__hook_log_line_indent:x
{ \tl_if_empty:cTF { __hook_next-#1 } 
  { --- }
\tl_if_empty:cTF { __hook_log_next_code:n { __hook_next-#1 } }
}

If the token list is not empty we want to display it but without the first tokens (the
code to clear itself) so we call a helper command to get rid of them.
\__hook_log_line:x { Rules: }
\_hook_log_line:x

If the token list is not empty we want to display it but without the first tokens (the
code to clear itself) so we call a helper command to get rid of them.

Loop through the rules in a hook and for every rule found, print it. If no rule is
there, print ---. The boolean \l__hook_tmpa_bool here indicates if the hook has no
rules.
\_hook_log_line:x { Rules: }
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When the hook is declared (that is, the sorting algorithm is applied to that hook) and not empty

\bool_lazy_and:nnTF
{ \__hook_if_usable_p:n {#1} }
{ ! \hook_if_empty_p:n {#1} }
{ \__hook_log_line:x
{ Execution-order:
\bool_if:NTF \l__hook_tmpa_bool
{ \__hook_if_reversed:nT {#1} { ~(after-reversal) } }
{ ~(after-
\__hook_if_reversed:nT {#1} { reversal-and~ }
applying-rules)
} :
}
#2 \% \tl_show:n
{ \@spaces
\clist_if_empty:cTF { g__hook_#1_labels_clist }
{ --- }
\clist_use:cn {g__hook_#1_labels_clist} { ,~ }
}
}
{ \__hook_log_line:x { Execution-order: }
#2
{ \@spaces Not-set-because-the-hook- \__hook_if_usable:nTF {#1}
{ code-pool-is-empty }
{ is-\__hook_if_disabled:nTF {#1} {disabled} {undeclared} }
}
}
}

To display the code for next invocation only (i.e., from \AddToHookNext we have to remove the first two tokens at the front which are \tl_gclear:N and the token list to clear.
\cs_new:Npn \__hook_log_next_code:n #1
\__hook_log_next_code:n

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This macro takes a ⟨hook⟩ and an ⟨inline function⟩ and loops through each pair of ⟨labels⟩ in the ⟨hook⟩, and if there is a relation between this pair of ⟨labels⟩, the ⟨inline function⟩ is executed with #1 = ⟨relation⟩, #2 = ⟨label1⟩ | ⟨label2⟩, and #3 = ⟨hook⟩ (the latter may be the argument #1 to \__hook_list_rules:nn, or ?? if it is a default rule).

\lhook_print_rules:n
A shorthand for debugging that prints similar to \prop_show:N.
\lhook_debug_print_rules:n
\exp_args:No \tl_to_str:n { \use_none:n #1 } )

(End definition for \hook_show:n and others. These functions are documented on page 193.)

\lhook_debug_print_rules:n
\__hook_list_rules:nn\__hook_list_one_rule:nnn\__hook_list_if_rule_exists:nnnF

These two are quite similar to \lhook_apply_label_pair:nnn and \lhook_label_if_exists_apply:nnnF, respectively, but rather than applying the rule, they pass it to the ⟨inline function⟩.

\lhook_debug_print_rules:n
\exp_args:No \tl_to_str:n { \use_none:n #1 } )

(End definition for \lhook_list_rules:nn, \lhook_list_one_rule:nnn, and \lhook_list_if_rule_exists:nnnF.)

\lhook_debug_print_rules:n
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\begin{verbatim}
\cs_new_protected:Npn \hook_gput_next_code:nn #1 #2
{ \tl_if_empty:cT { __hook~#2 } { \__hook_update_hook_code:n (#2) } \tl_if_empty:NT #1 { \__hook_tl_gset:Nn #1 { \__hook_clear_next:n (#2) } } \__hook_tl_gput_right:Nn #1 }
\end{verbatim}

First check if the “next code” token list is empty: if so we need to add a \texttt{\tl_gclear:c} to clear it, so the code lasts for one usage only. The token list is cleared early so that nested usages don’t get lost. \texttt{\tl_gclear:c} is used instead of \texttt{\tl_gclear:N} in case the hook is used in an expansion-only context, so the token list doesn’t expand before \texttt{\tl_gclear:N}: that would make an infinite loop. Also in case the main code token list is empty, the hook code has to be updated to add the next execution token list.

\begin{verbatim}
\cs_new_protected:Npn \__hook_gput_next_code:nn #1 { \__hook_normalize_hook_args:Nn \__hook_gput_next_code:nn (#1) } \exp_args:No \__hook_tmp:w \{ \use:nn \{ - \} \{ - \} \}
\end{verbatim}

(End definition for \texttt{\__hook_debug_print_rules:n}.)

\section*{4.8 Specifying code for next invocation}

\begin{verbatim}
\cs_new_protected:Npn \hook_gput_next_code:nn #1
{ \__hook_if_disabled:nTF {#1} { \msg_error:nnn { hooks } { hook-disabled } {#1} } { \__hook_if_structure_exist:nTF {#1} { \__hook_gput_next_do:nn {#1} {#2} } { \__hook_try_declaring_generic_next_hook:nn {#1} {#2} } } }
\end{verbatim}

\begin{verbatim}
\exp_args:Nc \__hook_gput_next_do:Nnn { __hook_next~#1 } {#1}
\end{verbatim}

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Discard anything set up for next invocation of the hook.

\cs_new_protected:Npn \Hook_gclear_next_code:n #1
{ \__hook_normalize_hook_args:Nn \__Hook_clear_next:n { #1 } }
\cs_new_protected:Npn \__Hook_clear_next:n #1
{ \cs_gset_eq:cN { __hook_next~#1 } \c_empty_tl }

(End definition for \Hook_gclear_next_code:n and \__Hook_clear_next:n. This function is documented on page 192.)

4.9 Using the hook

\Hook_use:n as defined here is used in the preamble, where hooks aren’t initialized by default. \__Hook_use_initialized:n is also defined, which is the non-\protected version for use within the document. Their definition is identical, except for the \__Hook_preamble_hook:n (which wouldn’t hurt in the expandable version, but it would be an unnecessary extra expansion).

\__Hook_use_initialized:n holds the expandable definition while in the preamble. \__Hook_preamble_hook:n initializes the hook in the preamble, and is redefined to \use_none:n at \begin{document}.

Both versions do the same thing internally: they check that the hook exists as given, and if so they use it as quickly as possible.

At \begin{document}, all hooks are initialized, and any change in them causes an update, so \Hook_use:n can be made expandable. This one is better not protected so that it can expand into nothing if containing no code. Also important in case of generic hooks that we do not generate a \relax as a side effect of checking for a csname. In contrast to the \TeX low-level \csname ...\endcsname construct \tl_if_exist:c is careful to avoid this.
\__hook_preamble_hook:n \__hook_use_initialized:n \__hook_use:wn \__hook_try_file_hook:n \__hook_if_usable_use:n

\__hook_use:wn does a quick check to test if the current hook is a file hook: those need a special treatment. If it is not, the hook does not exist. If it is, then \__hook_try_file_hook:n is called, and checks that the current hook is a file-specific hook using \__hook_if_file_hook:wTF. If it’s not, then it’s a generic file/hook and is used if it exist.

If it is a file-specific hook, it passes through the same normalization as during declaration, and then it is used if defined. \__hook_if_usable_use:n checks if the hook exist, and calls \__hook_preamble_hook:n if so, then uses the hook.

(End definition for \hook_use:n and others. This function is documented on page 192.)
For hooks that can and should be used only once we have a special use command that further inhibits the hook from getting more code added to it. This has the effect that any further code added to the hook is executed immediately rather than stored in the hook.

The code needs some gymnastics to prevent space trimming from the hook name, since \hook_use:n and \hook_use_once:n are documented to not trim spaces.

\cs_new_protected:Npn \hook_use_once:n #1
\begin{verbatim}
\__hook_if_execute_immediately:nF {#1}
{ \__hook_normalize_hook_args:Nn \__hook_use_once:n { \use:n {#1} } }
\end{verbatim}
\cs_new_protected:Npn \__hook_use_once_set:n #1
\begin{verbatim}
\__hook_preamble_hook:n {#1}
\__hook_use_once_set:n {#1}
\__hook_use_initialized:n {#1}
\__hook_use_once_clear:n {#1}
\end{verbatim}
\cs_new_protected:Npn \__hook_use_once_clear:n #1
\begin{verbatim}
\__hook_tl_gclear:c { __hook~#1 }
\__hook_tl_gclear:c { __hook_next~#1 }
\__hook_tl_gclear:c { __hook_toplevel~#1 }
\prop_gclear_new:c { g__hook_#1_code_prop }
\end{verbatim}
\end{verbatim}

\__hook_use_once_set:n is used before the actual hook code is executed so that any usage of \AddToHook inside the hook causes the code to execute immediately. Setting \g__hook⟨hook⟩_reversed_tl to I prevents further code from being added to the hook. \__hook_use_once_clear:n then clears the hook so that any further call to \hook_use:n or \hook_use_once:n will expand to nothing.

\cs_new_protected:Npn \__hook_use_once_set:n #1
\begin{verbatim}
{ \__hook_tl_gset:cn { g__hook_#1_reversed_tl } { I } }
\end{verbatim}
\cs_new_protected:Npn \__hook_use_once_clear:n #1
\begin{verbatim}
\__hook_tl_gclear:c { __hook~#1 }
\__hook_tl_gclear:c { __hook_next~#1 }
\__hook_tl_gclear:c { __hook_toplevel~#1 }
\prop_gclear_new:c { g__hook_#1_code_prop }
\end{verbatim}

To check whether the code being added should be executed immediately (that is, if the hook is a one-time hook), we check if it’s usable (it can’t be one-time if it was not already usable), then we check that \g__hook⟨hook⟩_reversed_tl is I. The gymnastics around \if:w is there to allow the reversed token list to be empty.

\prg_new_conditional:Npnn \__hook_if_execute_immediately:n #1 { T, F, TF }
\begin{verbatim}
\EndIncludeInRelease
\end{verbatim}

(End definition for \__hook_use:wn, \__hook.TryFileHook:n, and \__hook_if_usable_use:n.)
4.10 Querying a hook

Simpler data types, like token lists, have three possible states; they can exist and be empty, exist and be non-empty, and they may not exist, in which case emptiness doesn’t apply (though \texttt{\tl_if_empty:N} returns false in this case).

Hooks are a bit more complicated: they have several other states as discussed in 4.4.2. A hook may exist or not, and either way it may or may not be empty (even a hook that doesn’t exist may be non-empty) or may be disabled.

A hook is said to be empty when no code was added to it, either to its permanent code pool, or to its “next” token list. The hook doesn’t need to be declared to have code added to its code pool (it may happen that a package A defines a hook \texttt{foo}, but it’s loaded after package B, which adds some code to that hook. In this case it is important that the code added by package B is remembered until package A is loaded).

All other states can only be queried with internal tests as the different states are irrelevant for package code.

\texttt{\hook_if_empty_p:n} Test if a hook is empty (that is, no code was added to that hook). A (\texttt{hook}) being empty means that all three of its \texttt{\g__hook_{\texttt{hook}}\_code_prop}, its \texttt{\__hook_toplevel_\texttt{hook}} and its \texttt{\__hook_next_\texttt{hook}} are empty.

\begin{verbatim}
\prg_new_conditional:Npnn \hook_if_empty:n #1 { p , T , F , TF } 1253 \{ 1254 \__hook_if_structure_exist:nTF {#1} 1255 \{ 1256 \bool_lazy_and:nnTF 1257 { \prop_if_empty_p:c { \g__hook_{#1}\_code_prop } } 1258 { \bool_lazy_and_p:nn 1259 { \tl_if_empty_p:c { \__hook_toplevel_{#1} } } 1260 { \tl_if_empty_p:c { \__hook_next_{#1} } } 1261 \} 1262 \} 1263 \prg_return_true: \} 1264 \} 1265 \prg_return_false: \}
\end{verbatim}

(End definition for \texttt{\hook_if_empty:nTF}. This function is documented on page 193.)
A hook is usable if the token list that stores the sorted code for that hook, \__hook (hook), exists. The property list \g__hook⟨hook⟩_code_prop cannot be used here because often it is necessary to add code to a hook without knowing if such hook was already declared, or even if it will ever be (for example, in case the package that defines it isn’t loaded).

\prg_new_conditional:Npnn \__hook_if_usable:n #1 { p , T , F , TF }
\begin{verbatim}
\tl_if_exist:cTF { \__hook~#1 }
{ \prg_return_true: }
{ \prg_return_false: }
\end{verbatim}

(End definition for \__hook_if_usable:nTF.)

An internal check if the hook has already its basic internal structure set up with \__hook_init_structure:n. This means that the hook was already used somehow (a code chunk or rule was added to it), but it still wasn’t declared with \hook_new:n.

\prg_new_conditional:Npnn \__hook_if_structure_exist:n #1 { p , T , F , TF }
\begin{verbatim}
\prop_if_exist:cTF { g__hook_#1_code_prop }
{ \prg_return_true: }
{ \prg_return_false: }
\end{verbatim}

(End definition for \__hook_if_structure_exist:nTF.)

Internal test to check if the hook was officially declared with \hook_new:n or a variant.

\prg_new_conditional:Npnn \__hook_if_declared:n #1 { p, T, F, TF }
\begin{verbatim}
\tl_if_exist:cTF { g__hook_#1_declared_tl }
{ \prg_return_true: }
{ \prg_return_false: }
\end{verbatim}

(End definition for \__hook_if_declared:nTF.)

An internal conditional that checks if a hook is reversed.

\prg_new_conditional:Npnn \__hook_if_reversed:n #1 { p , T , F , TF }
\begin{verbatim}
\exp_after:wN \__hook_clean_to_scan:w
\if:w - \cs:w g__hook_#1_reversed_tl \cs_end:
\s__hook_mark \prg_return_true:
\else:
\s__hook_mark \prg_return_false:
\fi:
\end{verbatim}

(End definition for \__hook_if_reversed:nTF.)

An internal conditional that checks if a name belongs to a generic hook. The deprecated version needs to check if #3 is empty to avoid returning true on file/before, for example.

\prg_new_conditional:Npnn \__hook_if_deprecated_generic:n #1 { T, TF }
\begin{verbatim}
{ \__hook_if_deprecated_generic:w #1 / / \s__hook_mark }
\cs_new:Npn \__hook_if_deprecated_generic:w #1 / #2 / #3 / #4 \s__hook_mark
\end{verbatim}

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An internal conditional that checks if a name belongs to a generic reversed hook.

\__hook_if_generic_reversed_p:n
\__hook_if_generic_reversed:nTF

4.11 Messages

Hook errors are LaTeX kernel errors:

\prop_gput:Nnn \g_msg_module_type_prop { hooks } { LaTeX } { LaTeX }
And so are kernel errors (this should move elsewhere eventually).

\prop_gput:Nnn \g_msg_module_type_prop { latex2e } { LaTeX } { LaTeX }
\prop_gput:Nnn \g_msg_module_name_prop { latex2e } { kernel } { kernel }
\msg_new:nnnn { hooks } { labels-incompatible }

{ Labels~'#1'~and~'#2'~are-incompatible
  \str_if_eq:nnF {#3} {??} { -in-hook~'#3' } .-
  \int_compare:nNnTF {#4} = { 1 ]
  { The~ code~ for both~ labels~ will~ be~ dropped. }
  { You~ may~ see~ errors~ later. }
}
{ LaTeX-found-two-incompatible-labels-in-the-same-hook.-
  This-indicates-an-incompatibility-between-packages. }
Hook '#1' has already been declared.
There already exists a hook declaration with this name. Please use a different name for your hook.

Cannot add code to disabled hook '#1'.
The hook '#1' you tried to add code to was previously disabled with \hook_disable_generic:n or \DisableGenericHook, so it cannot have code added to it.

Empty code label \msg_line_context:. Using \__hook_currname_or_default: instead.

Missing (empty) default label \msg_line_context:. This command was ignored.

Unknown relationship '#3' between labels '#2' and '#4' in hook '#1'. Perhaps a misspelling?
The relation used not known to the system. Allowed values are 'before' or '<', 'after' or '>', 'incompatible-warning', 'incompatible-error', 'voids' or 'unrelated'.

Sorting rule for '#1' hook applied too late. Try setting this rule earlier.
You tried to set the ordering of hook '#1' using \DeclareHookRule{#1}{#2}{#3}{#4} but hook '#1' was already used as a one-time hook, thus sorting is no longer possible. Declare the rule before the hook is used.
\msg_new:nnn { hooks } { set-top-level }
\msg_new:nnn { hooks } { extra-pop-label }
\msg_new:nnn { hooks } { missing-pop-label }
\msg_new:nnn { hooks } { activate-disabled }
\msg_new:nnn { hooks } { cannot-remove }
\msg_new:nnn { hooks } { generic-deprecated }

4.12 \LaTeX\ 2\epsilon\ package interface commands

Declaring new hooks...
\NewDocumentCommand \NewHook { m }{ \hook_new:n {#1} }
\NewDocumentCommand \NewReversedHook { m }{ \hook_new_reversed:n {#1} }
\NewDocumentCommand \NewMirroredHookPair { mm }{ \hook_new_pair:nn {#1}{#2} }

(End definition for \NewHook, \NewReversedHook, and \NewMirroredHookPair. These functions are documented on page 181.)

\IncludeInRelease{2021/06/01}{\hook_activate_generic:n}{Providing hooks}
\NewDocumentCommand \ActivateGenericHook { m }{ \hook_activate_generic:n {#1} }

(End definition for \ActivateGenericHook. This function is documented on page 182.)

\IncludeInRelease{2020/10/01}{\hook_activate_generic:n}{Providing hooks}
\NewDocumentCommand \DisableGenericHook { m }{ \hook_disable_generic:n {#1} }

(End definition for \DisableGenericHook. This function is documented on page 182.)

\EndIncludeInRelease
\AddToHook
\NewDocumentCommand \AddToHook { m o +m }{ \hook_gput_code:nnn {#1} {#2} {#3} }

(End definition for \AddToHook. This function is documented on page 183.)

\AddToHookNext
\NewDocumentCommand \AddToHookNext { m +m }{ \hook_gput_next_code:nn {#1} {#2} }

(End definition for \AddToHookNext. This function is documented on page 185.)

\ClearHookNext
\NewDocumentCommand \ClearHookNext { m }{ \hook_gclear_next_code:n {#1} }

(End definition for \ClearHookNext. This function is documented on page 185.)

\RemoveFromHook
\NewDocumentCommand \RemoveFromHook { m o }{ \hook_gremove_code:nn {#1} {#2} }

(End definition for \RemoveFromHook. This function is documented on page 184.)
Now define a wrapper that replaces the top of the stack with the argument, and updates \_g__hook_hook_curr_name_tl accordingly.

\begin{verbatim}
\NewDocumentCommand \SetDefaultHookLabel { m } \__hook_set_default_hook_label:n {#1}
\EndDocumentCommand
\% The label is only automatically updated with \cs{@onefilewithoptions}
\% \cs{usepackage} and \cs{documentclass}, but some packages, like
\% Ti\emph{k}Z, define package-like interfaces, like
\% \cs{usetikzlibrary} that are wrappers around \cs{input}, so they
\% inherit the default label currently in force (usually |top-level|,
\% but it may change if loaded in another package). To provide a
\% package-like behavior also for hooks in these files, we provide
\% high-level access to the default label stack.
\% \begin{macrocode}
\NewDocumentCommand \PushDefaultHookLabel { m } \__hook_curr_name_push:n {#1}
\NewDocumentCommand \PopDefaultHookLabel { } \__hook_curr_name_pop: 
\(\text{The current label stack holds the labels for all files but the current one (more or less like} \@currnamestack), and the current label token list, \_g__hook_hook_curr_name_tl, holds the label for the current file. However \@pushfilename happens before \currname is set, so we need to look ahead to get the \currname for the label. expl3 also requires the current file in \@pushfilename, so here we abuse \@expl@push@filename@@ to do \_\_hook_curr_name_push:n.}
\EndDocumentCommand
\cs_gset_protected:Npn \@expl@push@filename@@ #1#2#3
\{ \__hook_curr_name_push:n {#3} \str_gset:Nx \g_file_curr_name_str {#3} #1 #2 {#3} \}
\EndDocumentCommand
\NewDocumentCommand \PopDefaultHookLabel { m } \_\_hook_curr_name_pop: 
\NewDocumentCommand \PopDefaultHookLabel { } \_\_hook_curr_name_pop: 
\(\text{Avoid the overhead of \texttt{xparse} and its protection that we don’t want here (since the hook should vanish without trace if empty)!}
\cs_new:Npn \UseHook { \hook_use:n }
\cs_new:Npn \UseOneTimeHook { \hook_use_once:n }
\EndDocumentCommand
\NewDocumentCommand \ShowHook { m } \hook_show:n }
\cs_new_protected:Npn \LogHook { \hook_log:n }
\EndDocumentCommand
\cs_new_protected:Npn \DebugHooksOn { \hook_debug_on: }
\cs_new_protected:Npn \DebugHooksOff { \hook_debug_off: }
\EndDocumentCommand
\end{verbatim}

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**DeclareHookRule**

\NewDocumentCommand \DeclareHookRule { m m m } \hook_gset_rule:nnnn {#1}{#2}{#3}{#4}

*(End definition for \DeclareHookRule. This function is documented on page 188.)*

**DeclareDefaultHookRule**

This declaration is only supported before \begin{document}.

\NewDocumentCommand \DeclareDefaultHookRule { m m m } \hook_gset_rule:nnnn {??}{#1}{#2}{#3}

\@onlypreamble\DeclareDefaultHookRule

*(End definition for \DeclareDefaultHookRule. This function is documented on page 189.)*

**ClearHookRule**

A special setup rule that removes an existing relation. Basically @@_rule_gclear:nnn plus fixing the property list for debugging.

*FMi: Needs perhaps an L3 interface, or maybe it should get dropped?*

\NewDocumentCommand \ClearHookRule { m m m } \hook_gset_rule:nnnn {#1}{#2}{unrelated}{#3}

*(End definition for \ClearHookRule. This function is documented on page 189.)*

**IfHookEmptyTF**

Here we avoid the overhead of xparse, since \IfHookEmptyTF is used in \end (that is, every \LaTeX{} environment). As a further optimization, use \let rather than \def to avoid one expansion step.

\cs_new_eq:NN \IfHookEmptyTF \hook_if_empty:nTF

*(End definition for \IfHookEmptyTF. This function is documented on page 189.)*

**IfHookExistsTF**

Marked for removal and no longer documented in the doc section!

*PhO: \IfHookExistsTF is used in jlreq.cls, pxatbegshi.sty, pxeverysel.sty, pxeveryshi.sty, so the public name may be an alias of the internal conditional for a while. Regardless, those packages’ use for \IfHookExistsTF is not really correct and can be changed.*

\cs_new_eq:NN \IfHookExistsTF \__hook_if_usable:nTF

*(End definition for \IfHookExistsTF.)*

### 4.13 Deprecated that needs cleanup at some point

**hook_disable:n**

**hook_provide:n**

**hook_provide_reversed:n**

**hook_provide_pair:nn**

**__hook_activate_generic_reversed:n**

**__hook_activate_generic_pair:nn**

Deprecation.

\cs_new_protected:Npn \hook_disable:n

\{ \__hook_deprecated_warn:nn \hook_disable:n \}

\cs_new_protected:Npn \hook_provide:n

\{ \__hook_deprecated_warn:nn \hook_provide:n \}

\cs_new_protected:Npn \hook_activate_generic:n

\{ \__hook_deprecated_warn:nn \hook_activate_generic:n \}

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\cs_new_protected:Npn \hook_provide_reversed:n
  { \__hook_deprecated_warn:nn
    { \hook_provide_reversed:n } { \hook_activate_generic:n }\__hook_activate_generic_reversed:n
  }
\cs_new_protected:Npn \hook_provide_pair:nn
  { \__hook_deprecated_warn:nn
    { \hook_provide_pair:nn } { \hook_activate_generic:n } \__hook_activate_generic_pair:nn
  }
\cs_new_protected:Npn \__hook_activate_generic_reversed:n #1
  { \__hook_normalize_hook_args:Nn \__hook_activate_generic:nn {#1} { - } }
\cs_new_protected:Npn \__hook_activate_generic_pair:nn #1#2
  { \hook_activate_generic:n {#1} \__hook_activate_generic_reversed:n {#2} }
(End definition for \hook_disable:n and others.)
\__hook_deprecated_warn:nn Warns about a deprecation, telling what should be used instead.

\DisableHook Deprecated.
\ProvideHook
\ProvideReversedHook
\ProvideMirroredHookPair
\cs_new_protected:Npn \DisableHook
  { \__hook_deprecated_warn:nn
    { DisableHook } { DisableGenericHook } \hook_disable_generic:n
  }
\cs_new_protected:Npn \ProvideHook
  { \__hook_deprecated_warn:nn
    { ProvideHook } { ActivateGenericHook } \hook_activate_generic:n
  }
\cs_new_protected:Npn \ProvideReversedHook
  { \__hook_deprecated_warn:nn
    { ProvideReversedHook } { ActivateGenericHook } \__hook_activate_generic_reversed:n
  }
\cs_new_protected:Npn \ProvideMirroredHookPair
  { \__hook_deprecated_warn:nn
    { ProvideMirroredHookPair } { ActivateGenericHook } \__hook_activate_generic_pair:nn
  }
(End definition for \DisableHook and others.)

\__hook_deprecated_warn:nn Warns about a deprecation, telling what should be used instead.
4.14 Internal commands needed elsewhere

Here we set up a few horrible (but consistent) B\TeX\ epsilon names to allow for internal commands to be used outside this module. We have to unset the @@ since we want double “at” sign in place of double underscores.

\begin{verbatim}
\exp@initialize@all\exp@hook@curr@name@pop\exp@customize
\cs_new_eq:NN \exp@initialize@all
\__hook_initialize_all:
\cs_new_eq:NN \exp@hook@curr@name@pop
\__hook_curr_name_pop:
\end{verbatim}

Rolling back here doesn’t undefine the interface commands as they may be used in packages without rollback functionality. So we just make them do nothing which may or may not work depending on the code usage.

\begin{verbatim}
\latexrelease\IncludeInRelease{0000/00/00}{lthooks}{The hook management}\latexrelease\def\NewHook#1{}
\latexrelease\def\NewReversedHook#1{}
\latexrelease\def\NewMirroredHookPair#1#2{}
\latexrelease\def\DisableGenericHook #1{}
\latexrelease\long\def\AddToHookNext#1#2{}
\latexrelease\def\AddToHook#1{\@gobble\AddToHook@args}
\latexrelease\providecommand\@gobble\AddToHook@args[2][]{}
\latexrelease\def\RemoveFromHook#1{\@gobble\RemoveFromHook@arg}
\latexrelease\providecommand\@gobble\RemoveFromHook@arg[1][]{}
\latexrelease\def\UseHook #1{}
\latexrelease\long\def\UseOneTimeHook #1{}
\latexrelease\def\ShowHook #1{}
\latexrelease\let\DebugHooksOn\@empty
\latexrelease\let\DebugHooksOff\@empty
\latexrelease\def\DeclareHookRule #1#2#3#4{}
\end{verbatim}
If the hook management is not provided we make the test for existence false and the test for empty true in the hope that this is most of the time reasonable. If not a package would need to guard against running in an old kernel.
1 Introduction

This file implements generic hooks for (arbitrary) commands. In theory every command \(\langle\text{name}\rangle\) offers now two associated hooks to which code can be added using \AddToHook or \AddToHookNext.\(^{11}\) These are

\texttt{cmd/\langle\text{name}\rangle/before} This hook is executed at the very start of the command execution after its arguments (if any) are parsed. The hook \(\langle\text{code}\rangle\) is wrapped in the command inside a call to \UseHook{cmd/\langle\text{name}\rangle/before}, so the arguments passed to the command are not available in the hook \(\langle\text{code}\rangle\).

\texttt{cmd/\langle\text{name}\rangle/after} This hook is similar to \texttt{cmd/\langle\text{name}\rangle/before}, but it is executed at the very end of the command body. This hook is implemented as a reversed hook.

The hooks are not physically present before \begin{document} (i.e., using a command in the preamble will never execute them) and if nobody has declared any code for them, then they are not added to the command code ever. For example, if we have the following definition

\begin{verbatim}
\newcommand\foo[2]{Code #1 for #2!}
\end{verbatim}

then executing \texttt{\foo{A}{B}} will simply run \texttt{Code A for B!} as it was always the case. However, if somebody, somewhere (e.g., in a package) adds

\begin{verbatim}
\AddToHook{cmd/foo/before}{\langle\text{before code}\rangle}
\end{verbatim}

then, after \begin{document} the definition of \texttt{\foo} will be:

\begin{verbatim}
\renewcommand\foo[2]{\UseHook{cmd/foo/before}Code #1 for #2!}
\end{verbatim}

and similarly \AddToHook{cmd/foo/after}{\langle\text{after code}\rangle} alters the definition to

\begin{verbatim}
\renewcommand\foo[2]{\langle\text{before code}\rangle\UseHook{cmd/foo/after}Code #1 for #2!}
\end{verbatim}

In other words, the mechanism is similar to what \texttt{etoolbox} offers with \texttt{pretocmd} and \texttt{apptocmd} with the important differences

- that code can be prepended or appended (i.e., added to the hooks) even if the command itself is not defined, because the defining package has not yet been loaded
- and that by using the hook management interface it is now possible to define how the code chunks added in these places are ordered, if different packages want to add code at these points.

2 Restrictions and Operational details

Adding arbitrary material to commands is tricky because most of the time we do not know what the macro expects as arguments when expanding and \TeX{} doesn’t have a reliable way to see that, so some guesswork has to be employed.

\(^{11}\)In practice this is not supported for all types of commands, see section 2.2 for the restrictions that apply and what happens if one tries to use this with commands for which this is not supported.
2.1 Patching

The code here tries to find out if a command was defined with `\newcommand` or `\DeclareRobustCommand` or `\NewDocumentCommand`, and if so it assumes that the argument specification of the command is as expected (which is not fail-proof, if someone redefines the internals of these commands in devious ways, but is a reasonable assumption).

If the command is one of the defined types, the code here does a sandboxed expansion of the command such that it can be redefined again exactly as before, but with the hook code added.

If however the command is not a known type (it was defined with `\def`, for example), then the code uses an approach similar to `etoolbox`’s `patchcmd` to retokenize the command with the hook code in place. This procedure, however, is more likely to fail if the catcode settings are not the same as the ones at the time of command’s definition, so not always adding a hook to a command will work.

2.1.1 Timing

When `\AddToHook` (or its `expl3` equivalent) is called with a generic `cmd` hook, say, `cmd/foo/before`, for the first time (that is, no code was added to that same hook before), in the preamble of a document, it will store a patch instruction for that command until `\begin{document}`, and only then all the commands which had hooks added will be patched in one go. That means that no command in the preamble will have hooks patched into them.

At `\begin{document}` all the delayed patches will be executed, and if the command doesn’t exist the code is still added to the hook, but it will not be executed. After `\begin{document}`, when `\AddToHook` is called with a generic `cmd` hook the first time, the command will be immediately patched to include the hook, and if it doesn’t exist or if it can’t be patched for any reason, an error is thrown; if `\AddToHook` was already used in the preamble no new patching is attempted.

This has the consequence that a command defined or redefined after `\begin{document}` only uses generic `cmd` hook code if `\AddToHook` is called for the first time after the definition is made, or if the command explicitly uses the generic hook in its definition by declaring it with `\NewHookPair` adding `\UseHook` as part of the code.\footnote{We might change this behavior in the main document slightly after gaining some usage experience.}

2.2 Commands that look ahead

Some commands are defined in different “steps” and they look ahead in the input stream to find more arguments. If you try to add some code to the `cmd/⟨name⟩/after` hook of such command, it will not work, and it is not possible to detect that programmatically, so the user has to know (or find out) which commands can or cannot have hooks attached to them.

One good example is the \texttt{\section} command. You can add something to the `cmd/section/before` hook, but if you try to add something to the `cmd/section/after` hook, \texttt{\section} will no longer work. That happens because the \texttt{\section} macro takes no argument, but instead calls a few internal \LaTeX{} macros to look for the optional and mandatory arguments. By adding code to the `cmd/section/after` hook, you get in the way of that scanning.
3 Package Author Interface

The cmd hooks are, by default, available for all commands that can be patched to add the hooks. For some commands, however, the very beginning or the very end of the code is not the best place to put the hooks, for example, if the command looks ahead for arguments (see section 2.2).

If you are a package author and you want to add the hooks to your own commands in the proper position you can define the command and manually add the \UseHook calls inside the command in the proper positions, and manually define the hooks with \NewHook or \NewReversedHook. When the hooks are explicitly defined, patching is not attempted so you can make sure your command works properly. For example, an (admittedly not really useful) command that typesets its contents in a framed box with width optionally given in parentheses:

\newcommand\fancybox\{\@ifnextchar\{\@fancybox\{\@fancybox(5cm)\}\}\def\@fancybox\(#1)#2\{\fbox{\parbox\#1\{\#2\}}\}

If you try that definition, then add some code after it with

\AddToHook\{cmd/fancybox/after\}{\langle\text{code}\rangle}

and then use the \fancybox command you will see that it will be completely broken, because the hook will get executed in the middle of parsing for optional (...) argument.

If, on the other hand, you want to add hooks to your command you can do something like:

\newcommand\fancybox\{\@ifnextchar\{\@fancybox\{\@fancybox(5cm)\}\}\def\@fancybox\(#1)#2\{\fbox{\%\UseHook\{cmd/fancybox/before\}\%\parbox\#1\{\#2\}\%\UseHook\{cmd/fancybox/after\}}\%

\NewHook\{cmd/fancybox/before\}
\NewReversedHook\{cmd/fancybox/after\}

then the hooks will be executed where they should and no patching will be attempted. It is important that the hooks are declared with \NewHook or \NewReversedHook, otherwise the command hook code will try to patch the command. Note also that the call to \UseHook\{cmd/fancybox/before\} does not need to be in the definition of \fancybox, but anywhere it makes sense to insert it (in this case in the internal \@fancybox).

Alternatively, if for whatever reason your command does not support the generic hooks provided here, you can disable a hook with \DisableHook\footnote{Please use \DisableHook if at all, only on hooks that you “own”, i.e., for commands that your package or class defines and not second guess whether or not hooks of other packages should get disabled!}, so that when someone tries to add code to it they will get an error. Or if you don’t want the error, you can simply declare the hook with \NewHook and never use it.

The above approach is useful for really complex commands where for one or the other reason the hooks can’t be placed at the very beginning and end of the command body and some hand-crafting is needed. However, in the example above the real (and in fact only) issue is the cascading argument parsing in the style developed long ago in \LaTeX\ 2.09. Thus, a much simpler solution for this case is to replace it with the modern \NewDocumentCommand syntax and define the command as follows:

\DeclareDocumentCommand\fancybox\{D(){5cm}m\}{\fbox{\parbox\#1\{\#2\}}}

If you do that then both hooks automatically work and are patched into the right places.
4 The Implementation

4.1 Execution plan

To add before and after hooks to a command we will need to peek into the definition of a command, which is always a tricky thing to do. Some cases are easy because we know how the command was defined, so we can assume how its \langle parameter text \rangle looks like (for example a command defined with \newcommand may have an optional argument followed by a run of mandatory arguments), so we can just expand that command and make it grab #1, #2, etc. as arguments and define it all back with the hooks added.

Life’s usually not that easy, so with some commands we can’t do that (a #1 might as well be #1212 instead of the expected #612, for example) so we need to resort to “patching” the command: read its \meaning, and tokenize it again with \scantokens and hope for the best.

So the overall plan is:

1. Check if a command is of a known type (that is, defined with \newcommand\textsuperscript{14}, \DeclareRobustCommand, or \New(Expandable)DocumentCommand), and if is, take appropriate action.

2. If the command is not a known type, we’ll check if the command can be patched.
   Two things will prevent a command from being patched: if it was defined in a nonstandard catcode setting, or if it is an internal expl3 command with \_\langle module \rangle in its name, in which case we refuse to patch.

3. If the command was defined in nonstandard catcode settings, we will try a few standard ones to try our best to carry out the patching. If this doesn’t help either, the code will give up and throw an error.

\begin{verbatim}
\@@=hook
\end{verbatim}

4.2 Variables

Pairs of \if<cmd>..\patch<cmd> to be used with \robust@command@act when looking for a known patching rule. This token list is exposed because we see some future applications (with very specialized packages, such as etoolbox that may want to extend the pairs processed. It is not meant for general use which is why it is not documented in the interface documentation above.

\begin{verbatim}
\tl_new:N \g_hook_patch_action_list_tl
\end{verbatim}

\begin{verbatim}
\l__hook_patch_num_args_int
\end{verbatim}

The number of arguments in a macro being patched.

\begin{verbatim}
\l__hook_patch_num_args_int
\end{verbatim}

\textsuperscript{14}It’s not always possible to reliably detect this case because a command defined with no optional argument is indistinguishable from a \texttt{defed} command.
\__hook_patch_prefixes_tl The prefixes and parameters of the definition for the macro being patched.
\__hook_param_text_tl
\__hook_replace_text_tl

(End definition for \__hook_patch_prefixes_tl, \__hook_param_text_tl, and \__hook_replace_text_tl.)

\__hook_replace_text_tl

\c__hook_hash_tl A constant token list that contains two parameter tokens.
\__hook_param_text_tl

(End definition for \c__hook_hash_tl.)

\__hook_hash_tl

\__hook_exp_not:NN Two temporary macros that change depending on the macro being patched.
\__hook_def_cmd:w

(End definition for \__hook_exp_not:NN and \__hook_def_cmd:w.)

\__hook_def_cmd:w

\__hook_recursion_tail Internal quarks for recursion: they can't appear in any macro being patched.
\__hook_recursion_stop

(End definition for \__hook_recursion_tail and \__hook_recursion_stop.)

\__hook_recursion_stop

\g__hook_delayed_patches_prop A list containing the patches delayed to \begin{document}, so that patching is not attempted twice.
\__hook_patch_prefixes_tl

(End definition for \g__hook_delayed_patches_prop.)

\__hook_patch_debug:x A helper for patching debug info.
\__hook_patch_prefixes_tl

(End definition for \__hook_patch_debug:x.)

\__hook_patch_debug:x

4.3 Variants

\tl_rescan:nV expl3 function variants used throughout the code.
\__hook_patch_prefixes_tl

(End definition for \tl_rescan:nV.)
4.4 Patching or delaying

Before \begin{document} all patching is delayed.

This function is called from within \AddToHook, when code is first added to a generic cmd hook. If it is called within the preamble, it delays the action until \begin{document}; otherwise it tries to update the hook.

\begin{verbatim}
\cs_new_protected:Npn \__hook_patch_cmd_or_delay:Nnn #1 #2 #3
\__hook_cmd_begindocument_code:
\end{verbatim}

In the preamble, \__hook_patch_cmd_or_delay:Nnn just adds the patch instruction to a property list to be executed later.

\begin{verbatim}
\cs_new_protected:Npn \__hook_patch_cmd_or_delay:Nnn #1 #2 #3
\__hook_cmd_begindocument_code:
\end{verbatim}

The delayed patches are added to a property list to prevent duplication, and the code stored in the property list for each key is executed. The function \__hook_patch_cmd_or_delay:Nnn is also redefined to be \__hook_patch_command:Nnn so that no further delaying is attempted.

\begin{verbatim}
\cs_new_protected:Npn \__hook_patch_cmd_or_delay:Nnn \__hook_patch_command:Nnn
\__hook_cmd_begindocument_code:
\end{verbatim}

File: ltcmdhooks.dtx
\_\_hook_cmd_try_patch:nn

At \begin{document} tries patching the command if the hook was not manually created in the meantime. If the document does not exist, no error is raised here as it may hook into a package that wasn’t loaded. Hooks added to commands in the document body still raise an error if the command is not defined.

\cs_new_protected:Npn \__hook_cmd_try_patch:nn #1 #2

\__hook_patch_command:NNnn \__hook_patch_check:NNnn \__hook_if_public_command:NTF \__hook_if_public_command:w

\__hook_patch_command:NNnn will do some sanity checks on the argument to detect if it is possible to add hooks to the command, and raises an error otherwise. If the command can contain hooks, then it uses \robust@command@act to find out what type is the command, and patch it accordingly.

\cs_new_protected:Npn \__hook_patch_command:NNnn #1 #2 #3

4.5 Patching commands
And here's the auxiliary used above:
\cs_new_protected:Npn \__hook_patch_check:NNnn #1 #2 #3 #4
{ #1 #2 {#4}
{ \msg_error:nnxx { hooks } { cant-patch }
  \{ \token_to_str:N #2 \}#3
}
}

and a conditional \__hook_if_public_command:N to check if a command has \__ in its name (no other checking is performed). Primitives with :D in their name could be included here, but they are already discarded in the \token_if_macro:NTF test above.

\use:x
{ \prg_new_protected_conditional:Npnn \exp_not:N \__hook_if_public_command:N ##1 { TF }
{ \exp_not:N \exp_last_unbraced:Nf \exp_not:N \__hook_if_public_command:w { \exp_not:N \cs_to_str:N ##1 }
 \tl_to_str:n { _ _ } \s__hook_mark
}
}
\exp_last_unbraced:NNNNo \cs_new_protected:Npn \__hook_if_public_command:w #1 \tl_to_str:n { _ _ } #2 \s__hook_mark

(End definition for \__hook_patch_command:Nnn and others.)

4.5.1 Patching by expansion and redefinition
\g_hook_patch_action_list_tl
This is the list of known command types and the function that patches the command hooks into them. The conditionals are taken from \ShowCommand, \NewCommandCopy and \__kernel_cmd_if_xparse:NTF defined in ltcmd.
\tl_gset:Nn \g_hook_patch_action_list_tl
{ \0ifDeclareRobustCommand \__hook_patchDeclareRobustCommand:Nnn }
{ \0ifNewcommand \__hook_patchNewcommand:Nnn }
{ \__kernel_cmd_if_xparse:NTF \__hook_patchCommand_xparse:Nnn }

(End definition for \g_hook_patch_action_list_tl.)

\__hook_patch_DeclareRobustCommand:Nnn
At this point we know that the commands can be patched by expanding then redefining. These are the cases of commands defined with \newcommand with an optional argument or with \DeclareRobustCommand.
With \__hook_patch_DeclareRobustCommand:Nnn we check if the command has an optional argument (with a test counter-intuitively called \@if@newcommand; also make sure the command doesn’t take args by calling \robust@command@chk@safe). If so, we pass the patching action to \__hook_patch_newcommand:Nnn, otherwise we call the patching engine \__hook_patch_expand redefine:NNnn with a \c_false_bool to indicate that there is no optional argument.

\cs_new_protected:Npn \__hook_patch_DeclareRobustCommand:Nnn #1
\exp_args:Nc \__hook_patch_DeclareRobustCommand_aux:Nnn
\cs_to_str:N #1 ~

\cs_new_protected:Npn \__hook_patch_DeclareRobustCommand_aux:Nnn #1
\robust@command@chk@safe #1
\@if@newcommand #1
\use_ii:nn
\__hook_patch_newcommand:Nnn
\__hook_patch_expand redefine:NNnn \c_false_bool
#1

(End definition for \__hook_patch_DeclareRobustCommand:Nnn.)

\__hook_patch_newcommand:Nnn
If the command was defined with \newcommand and an optional argument, call the patching engine with a \c_true_bool to flag the presence of an optional argument, and with \command to patch the actual code for \command.

\cs_new_protected:Npn \__hook_patch_newcommand:Nnn #1
\exp_args:NNc \__hook_patch_expand redefine:NNnn \c_true_bool
\cs_to_str:N #1 ~ code

(End definition for \__hook_patch_newcommand:Nnn.)

\__hook_cmd_patch_xparse:Nnn
And for commands defined by the xparse commands use this for patching:

\cs_new_protected:Npn \__hook_cmd_patch_xparse:Nnn #1
\exp_args:NNc \__hook_patch_expand redefine:NNnn \c_false_bool
\cs_to_str:N #1 ~ code

(End definition for \__hook_cmd_patch_xparse:Nnn.)

\__hook_patch_expand redefine:NNnn
\__hook_redefine with hooks:NNnn
\__hook_make prefixes:w

Now the real action begins. Here we have in \#1 a boolean indicating if the command has a leading [...] delimited argument, in \#2 the command control sequence, in \#3 the name of the command (note that \#1 \neq \csname#2\endcsname at this point!), and in \#4 the hook position, either before or after.

Patching with expansion+redefinition is trickier than it looks like at first glance. Suppose the simple definition:

\def\foo#1{#1##2}

When defined, its (replacement text) will be a token list containing:

File i: ltcmdhooks.dtx
out_param 1, mac_param #, character 2

Then, after expanding \foo{##1} (here ## denotes a single #) we end up with a token list with out_param 1 replaced:

mac_param #, character 1, mac_param #, character 2

that is, the definition would be:

\def\foo#1{#1#2}

which obviously fails, because the original input in the definition was ## but \TeX\ reduced that to a single parameter token # when carrying out the definition. That leaves no room for a clever solution with (say) \unexpanded, because anything that would double the second # would also (incorrectly) double the first, so there’s not much to do other than a manual solution.

There are three cases we can distinguish to make things hopefully faster on simpler cases:

1. a macro with no parameters;
2. a macro with no parameter tokens in its definition;
3. a macro with parameters and parameter tokens.

The first case is trivial: if the macro has no parameters, we can just use \unexpanded around it, and if there is a parameter token in it, it is handled correctly (the macro can be treated as a \texttt{tl} variable).

The second case requires looking at the \texttt{replacement text} of the macro to see if it has a parameter token in there. If it does not, then there is no worry, and the macro can be redefined normally (without \unexpanded).

The third case, as usual, is the devious one. Here we’ll have to loop through the definition token by token, and double every parameter token, so that this case can be handled like the previous one.

We’ll start by counting the number of arguments in the command by counting the number of characters in the \texttt{cs_argument_spec:N} of the macro, divided by two, and subtracting one if the command has an optional argument (that is, an extra \texttt{[]} in its \texttt{parameter text}).

Now build two token lists:

\l__hook_param_text_tl will contain the \texttt{parameter text} to be used when redefining the macro. It should be identical to the \texttt{parameter text} used when originally defining that macro.

\l__hook_replace_text_tl will contain braced pairs of \texttt{c__hook_hash_tl(num)} to feed to the macro when expanded. This token list as well as the previous will have the first item surrounded by \texttt{[...]} in the case of an optional argument.
The use of \c__hook_hash_tl here is to differentiate actual parameters in the macro from parameter tokens in the original definition of the macro. Later on, \c__hook_hash_tl is either replaced by actual parameter tokens, or expanded into them.

\begin{verbatim}
\int_compare:nNnTF { \l__hook_patch_num_args_int } > { \c_zero_int }
{ We'll first check if the command has any parameter token in its definition (feeding it empty arguments), and set \__hook_exp_not:n accordingly. \__hook_exp_not:n will be used later to either leave \c__hook_hash_tl or expand it, and also to remember the result of \__hook_if_has_hash:nTF to avoid testing twice (the test can be rather slow).

\tl_set:Nx \l__hook_tempa_tl { \bool_if:NTF #1 { [ ] } { { } } }
\int_step_inline:nnn { 2 } { \l__hook_patch_num_args_int }
{ \tl_put_right:Nn \l__hook_tempa_tl { { } } }
\exp_args:NNo \exp_args:No \__hook_if_has_hash:nTF
{ \exp_after:wN #2 \l__hook_tempa_tl }
{ \cs_set_eq:NN \__hook_exp_not:n \exp_not:n }
{ \cs_set_eq:NN \__hook_exp_not:n \use:n }
\cs_set_protected:Npn \__hook_tmp:w ##1 ##2
{ \exp_after:wN \exp_not:N \exp_not:V \l__hook_replace_text_tl }
\token_if_eq_meaning:NNTF \__hook_exp_not:n \exp_not:n
{ \exp_args:NNV \exp_args:No \__hook_double_hashes:n to double them, and replace every \c__hook_hash_tl by #:
\tl_set:Nx \l__hook_replace_text_tl
{ \exp_not:N #2 \exp_not:V \l__hook_replace_text_tl }
\tl_set:Nx \l__hook_replace_text_tl
{ \exp_not:N \exp_not:V \l__hook_replace_text_tl }
{ \exp_args:NNV \exp_args:No \__hook_double_hashes:n }
{ \exp_args:NV \exp_not:o }
\l__hook_replace_text_tl }

Now, if the command has any parameter token in its definition (then \__hook_exp_not:n is \exp_not:n), call \__hook_double_hashes:n to double them, and replace every \c__hook_hash_tl by #:
\tl_set:Nx \l__hook_replace_text_tl
\token_if_eq_meaning:NNTF \__hook_exp_not:n \exp_not:n
{ \exp_args:NNV \exp_args:No \__hook_double_hashes:n }
{ \exp_args:NV \exp_not:o }
\l__hook_replace_text_tl }

And now, set a few auxiliaries for the case that the macro has parameters, so it won’t be passed through \unexpanded (twice):
\cs_set_eq:NN \__hook_def_cmd:w \tex_gdef:D
\cs_set_eq:NN \__hook_exp_not:NN \prg_do_nothing:

In the case the macro has no parameters, we’ll treat it as a token list and things are much simpler (expansion control looks a bit complicated, but it’s just a pair of \exp_not:N preventing another \exp_not:n from expanding):
\end{verbatim}
Before redefining, we need to also get the prefixes used when defining the command. Here we ensure that the \texttt{\escapechar} is printable, otherwise a macro defined with prefixes \texttt{\protected \long} will have it \texttt{\meaning} printed as \texttt{protectedlong}, making life unnecessarily complicated. Here the \texttt{\escapechar} is changed to /, then we loop between pairs of /.../ extracting the prefixes.

Finally, call \texttt{\__hook_redefine_with_hooks:Nnnn} with the macro being redefined in \texttt{#1}, then \texttt{\UseHook{cmd/<name>/before}} in \texttt{#2} or \texttt{\UseHook{cmd/<name>/after}} in \texttt{#3} (one is always empty), and in \texttt{#4} the \texttt{(replacement text)} of the macro.

Now that all the needed tools are ready, without further ado we'll redefine the command. The definition uses the prefixes gathered in \texttt{\l__hook_patch_prefixes_tl}, a primitive \texttt{\__hook_def_cmd:w} (which is \texttt{\tex_gdef:D} or \texttt{\tex_xdef:D}) to avoid adding extra prefixes, and the \texttt{(parameter text)} from \texttt{\l__hook_param_text_tl}.

Then finally, in the body of the definition, we insert \texttt{#2}, which is \texttt{cmd/#1/before} or empty, \texttt{#3} which is the \texttt{(replacement text)}, and \texttt{#4} which is \texttt{cmd/#1/after} or empty.

Here's the auxiliary that makes the prefix control sequences for the redefinition. Each item has to be \texttt{\tl_trim_spaces:n'd} because the last item (and not any other) has a trailing space.
\if_empty:nF {#1}
  \exp_not:c { tex_ \tl_trim_spaces:n {#1} :D }
  \__hook_make_prefixes:w /
\end{condition}

(End definition for \__hook_patch.expand redefine:NnNn, \__hook redefine with hooks:NnNn, and \__hook_make_prefixes:w.)

Here are some auxiliaries for the contraption above.

\__hook_if_has_hash:nTF searches the token list #1 for a catcode 6 token, and if any is found, it returns true, and false otherwise. The searching doesn't care about preserving groups or spaces: we can ignore those safely (braces are removed) so that searching is as fast as possible.

\prg_new_conditional:Npnn \__hook_if_has_hash:n #1 { TF }
  { \__hook_if_has_hash:w #1 ## \s__hook_mark }
\cs_new:Npn \__hook_if_has_hash:w #1
  { \tl_if_single_token:nTF {#1}
    { \token_if_eq_catcode:NNTF ## #1
      { \__hook_if_has_hash_check:w }
      { \__hook_if_has_hash:w }
    }
    { \__hook_if_has_hash:w #1 }
  }
\cs_new:Npn \__hook_if_has_hash_check:w #1 \s__hook_mark
  { \tl_if_empty:nTF {#1} { \prg_return_false: } { \prg_return_true: } }

(End definition for \__hook_if_has_hash:nTF, \__hook_if_has_hash:w, and \__hook_if_has_hash_check:w.)

\__hook_double_hashes:n loops through the token list #1 and duplicates any catcode 6 token, and expands tokens \ifx-equal to \__hook_hash_tl, and leaves all other tokens \notexpanded with \exp_not:N. Unfortunately pairs of explicit catcode 1 and catcode 2 character tokens are normalised to \{ and } because it’s not feasible to expandably detect the character code (maybe it could be done using something along the lines of \url{https://tex.stackexchange.com/a/527538}, but it’s far too much work for close to zero benefit).

\__hook_double_hashes:w is the tail-recursive loop macro, that tests which of the three types of item is in the head of the token list.

\cs_new:Npn \__hook_double_hashes:n #1
  { \__hook_double_hashes:w #1 \q__hook_recursion_tail \q__hook_recursion_stop }
\cs_new:Npn \__hook_double_hashes:w #1 \q__hook_recursion_stop
  { \tl_if_head_is_N_type:nTF {#1}
    { \__hook_double_hashes_output:N }
    { \tl_if_head_is_group:nTF {#1}
      { \__hook_double_hashes_group:n }
      { \__hook_double_hashes_space:w }
    }
  #1 \q__hook_recursion_stop

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\__hook_double_hashes_output:N checks for the end of the token list, then checks if the token is \c__hook_hash_tl, and if so just leaves it.
\cs_new:Npn \__hook_double_hashes_output:N #1
{\__hook_double_hashes_stop:w}
\if_meaning:w \q__hook_recursion_tail #1 \__hook_double_hashes_stop:w \fi:
\if_meaning:w \c__hook_hash_tl #1
(this \use_i:nnnn uses \fi: and consumes \use:n, the whole \if_catcode:w block, and the \exp_not:N, leaving just #1 which is \c__hook_hash_tl.)
\use_i:nnnn \fi:
\use:n
{ \exp_not:n { #1 #1 } }
}\if_catcode:w ## \exp_not:N #1 \exp_after:wN \use_ii:nnnn \fi:
\use_none:n
If #1 is not \c__hook_hash_tl, then check if its catcode is 6, and if so, leave it doubled in \exp_not:n and consume the following \exp_not:N #1.
\if_catcode:w ## \exp_not:N #1 \exp_after:wN \use_i:nnnn \fi:
\use_none:n
\use:n
If both previous tests returned false, then leave the token unexpanded and resume the loop.
\exp_not:N #1
\__hook_double_hashes:w}
\cs_new:Npn \__hook_double_hashes_stop:w \q__hook_recursion_stop \{ \fi: \}
\cs_new:Npn \__hook_double_hashes_group:n #1
{ { \__hook_double_hashes:n {#1} } \__hook_double_hashes:w }
\exp_last_unbraced:NNo \cs_new:Npn \__hook_double_hashes_group:n \c_space_tl
{ - \__hook_double_hashes:w }
(End definition for \__hook_double_hashes:n and others.)

4.5.2 Patching by retokenization
At this point we’ve drained the possibilities of patching a command by expansion-and-redefinition, so we have to resort to patching by retokenizing the command. Patching by retokenization is done by getting the \meaning of the command, doing the necessary manipulations on the generated string, and the retokenizing that again by using \scantokens.

Patching by retokenization is definitely a riskier business, because it relies that the tokens printed by \meaning produce the exact same tokens as the ones in the original definition. That is, the catcode régime must be exactly(ish) the same, and there is no way of telling except by trial and error.
This is the macro that will control the whole process. First we’ll try out one final, rather
trivial case, of a command with no arguments; that is, a token list. This case can be
patched with the expand-and-redefine routine but it has to be the very last case tested for,
because most (all?) robust commands start with a top-level macro with no arguments,
so testing this first would short-circuit \robust@command@act and the top-level macros
would be incorrectly patched. In that case, we just check if the \cs_argument_spec:N
is empty, and call \__hook_patch_expand_redefine:NNNn.

284 \cs_new_protected:Npn \__hook_retokenize_patch:Nnn #1 #2 #3
285 { \__hook_patch_debug:x { ..~command~can~only~be~patched~by~rescanning }
286 \str_if_eq:eeTF { \cs_argument_spec:N #1 } { } { \__hook_patch_expand_redefine:NNnn \c_false_bool #1 {#2} {#3} }
289 {

Otherwise, we start the actual patching by retokenization job. The code calls
\__hook_try_patch_with_catcodes:Nnnww with a different catcode setting:

• The current catcode setting;
• Switching the catcode of $\$;
• Switching the expl3 syntax on or off;
• Both of the above.

If patching succeeds, \__hook_try_patch_with_catcodes:Nnnww has the side-effect
of patching the macro #1 (which may be an internal from the command whose name is #2).

\tl_set:Nx \l__hook_tmpa_tl
\tl_set:Nx \l__hook_tmpb_tl
\use:x
\exp_not:N \__hook_try_patch_with_catcodes:Nnnww
\exp_not:n { #1 {#2} {#3} }
\exp_not:V \l__hook_tmpa_tl % $ \
\exp_not:V \l__hook_tmpb_tl % _:
\q_recursion_tail \q_recursion_stop

If no catcode setting succeeds, give up and raise an error. The command isn’t
changed in any way in that case.
This function is a simple wrapper around \_\_hook_cmd_if_scannable:NnTF and \_\_hook_patch_retokenize:Nnnn if the former returns \langle true \rangle, plus some debug messages.

\cs_new_protected:Npn \_\_hook_try_patch_with_catcodes:Nnnnw \#1 \#2 \#3 \#4
\{
\quark_if_recursion_tail_stop_do:nn \{\#4\} \{ \use:n \}
\_\_hook_patch_debug:x \{ ++trying-to-patch-by-retokenization \}
\_\_hook_cmd_if_scannable:NnTF \{\#1\} \{\#4\}
\{
\_\_hook_patch_debug:x \{ ++macro-can-be-retokenized-cleanly \}
\_\_hook_patch_debug:x \{ ==retokenizing-macro-now \}
\_\_hook_patch_retokenize:Nnnn \#1 \{\#2\} \{\#3\} \{\#4\}
\use_i_delimit_by_q_recursion_stop:nw \use_none:n
\}
\{
\_\_hook_patch_debug:x \{ ---macro-cannot-be-retokenized-cleanly \}
\_\_hook_patch_with_catcodes:Nnnwn \#1 \{\#2\} \{\#3\}
\}
\}

(End definition for \_\_hook_try_patch_with_catcodes:Nnnnw.)

\kerneltmpDoNotUse
This is an oddity required to be safe (as safe as reasonably possible) when patching the command. The entirety of

\langle prefixes \rangle \def \langle cs \rangle \langle parameter text \rangle \langle replacement text \rangle\}

will go through \csantokens. The \langle parameter text \rangle and \langle replacement text \rangle are what we are trying to retokenize, so not much worry there. The other items, however, should “just work”, so some care is needed to not use too fancy catcode settings. Therefore we can’t use an \expl3-named macro for \langle cs \rangle, nor the \expl3 versions of \def or the \langle prefixes \rangle. That is why the definitions that will eventually go into \csantokens will use the oddly (but hopefully clearly)-named \kerneltmpDoNotUse:

\cs_new_eq:NN \kerneltmpDoNotUse !

\PhO: Maybe this can be avoided by running the \langle parameter text \rangle and the \langle replacement text \rangle separately through \csantokens and then putting everything together at the end.

(End definition for \kerneltmpDoNotUse.)

\_\_hook_patch_required_catcodes:
Here are the catcode settings that are mandatory when retokenizing commands. These are the minimum necessary settings to perform the definitions: they identify control sequences, which must be escaped with \textbackslash, delimit the definition with \{ and \}, and mark parameters with \#. Everything else may be changed, but not these.

\cs_new_protected:Npn \_\_hook_patch_required_catcodes:
\{
\char_set_catcode_escape:N \textbackslash
\char_set_catcode_group_begin:N \{
\char_set_catcode_group_end:N \}
\}

File: 1tcmdhooks.dtx 271
PhO: etoolbox sets the \endlinechar and \newlinechar when patching, but as far as I tested these didn’t make much of a difference, so I left them out for now. Maybe \newlinechar=-1 avoids a space token being added after the definition.

PhO: If the patching is split by ⟨parameter text⟩ and ⟨replacement text⟩, then only # will have to stay in that list.

PhO: Actually now that we patch \UseHook{cmd/foo/before}, all the tokens there need to have the right catcodes, so this list now includes all lowercase letters, U and H, the slash, and whatever characters in the command name... sigh...

(End definition for \__hook_patch_required_catcodes:.)

\__hook_cmd_if_scanable:NnTF
Here we’ll do a quick test if the command being patched can in fact be retokenized with the specific catcode setting without changing in meaning. The test is straightforward:

1. apply \meaning to the command;
2. split the ⟨prefixes⟩, ⟨parameter text⟩ and ⟨replacement text⟩ and arrange them as
   ⟨prefixes⟩\def\kerneltmpDoNotUse⟨parameter text⟩⟨replacement text⟩
3. rescan that with the given catcode settings, and do the definition; then finally
4. compare \kerneltmpDoNotUse with the original command.

If both are \ifx-equal, the command can be safely patched.

\__hook_patch_retokenize:Nnnn
Then, if \__hook_cmd_if_scanable:NnTF returned true, we can go on and patch the command.

File i: ltcmdhooks.dtx
Start off by making some things \relax to avoid lots of \noexpand below.

\cs_set_eq:NN \kerneltmpDoNotUse \scan_stop:
\cs_set_eq:NN \__hook_tmp:w \scan_stop:
\use:x
{

Now we’ll define \__hook_tmp:w such that it splits the \meaning of the macro (#1) into its three parts:

####1. ⟨prefixes⟩

####2. ⟨parameter text⟩

####3. ⟨replacement text⟩

and arrange that a complete definition, then place the before or after hooks around the ⟨replacement text⟩: accordingly.

\cs_set:Npn \__hook_tmp:w
####1 \tl_to_str:n { macro: } ####2 -> ####3 \s__hook_mark
{
####1 \def \kerneltmpDoNotUse ####2
{
####1 \str_if_eq:nnT {#3} { before } { \token_to_str:N \UseHook { cmd / #2 / #3 } }
####3 \str_if_eq:nnT {#3} { after } { \token_to_str:N \UseHook { cmd / #2 / #3 } }

}
}

Now we just have to get the \meaning of the command being patched and pass it through the meat grinder above.

\tl_set:Nx \exp_not:N \l__hook_tmpa_tl
{ \exp_not:N \__hook_tmp:w \token_to_meaning:N #1 \s__hook_mark }

Now rescan with the given catcode settings (overridden by the \__hook_patch_required_catcodes:), and implicitly (by using the rescanned token list) carry out the definition from above.

\tl_rescan:nV { #4 \__hook_patch_required_catcodes: } \l__hook_tmpa_tl

And to close, copy the newly-defined command into the old name and the patching is finally completed:

\cs_gset_eq:NN #1 \kerneltmpDoNotUse

(End definition for \__hook_patch_retokenize:Nnnn.)

4.6 Messages

\latexrelease\IncludeInRelease{2021/11/15}{wrong-cmd-hook}\
\latexrelease \{Standardise-generic-hook-names\}
\latexrelease\EndIncludeInRelease
\latexrelease\IncludeInRelease{2021/11/15}{wrong-cmd-hook}\
\latexrelease \{Standardise-generic-hook-names\}
\latexrelease \msg_new:nnnn { hooks } { wrong-cmd-hook }

File: ltcmdhooks.dtx 273
Generic hook ‘cmd/#1/#2’ is invalid.

The hook should be ‘cmd/#1/before’ or ‘cmd/#1/after’.

You tried to add a generic hook to command \iow_char:N \#1, but ‘#2’ is an invalid component. Only ‘before’ or ‘after’ are allowed.

You tried to add a generic hook to command \iow_char:N \#1, but ‘#2’ is an invalid component. Only ‘before’ or ‘after’ are allowed.

The command \__hook_cmd_begindocument_code: is used in an internal hook, so we need to make sure it has a harmless definition after rollback as that will not remove it from the kernel hook.

\cs_set_eq:NN \__hook_cmd_begindocument_code: \prg_do_nothing:
\ExplSyntaxOff

\message{hooks}{cant-patch}{Generic hooks cannot be added to '#1'.}
\message{hooks}{cant-patch}{You tried to add a hook to '#1', but LaTeX was unable to patch the command because it \__hook_unpatchable_cases:n (#2).
\cs_new:Npn \__hook_unpatchable_cases:n #1 \{ \str_case:nn {#1} {\{ undef \} { doesn’t exist } \{ macro \} { is not a macro } \{ expl3 \} { is a private expl3 macro } \{ retok \} { can’t be retokenized cleanly } \} }
The hook management system for commands

File i: ltcmdhooks.dtx
1 Counters

This section deals with counter and other variable allocation.

\langle \astekernel \rangle

The following are from plain TeX:

\z@ A zero dimen or number. It’s more efficient to write \parindent\z@ than \parindent 0pt.

\@one The number 1.
\@mone The number \(-1\).
\@two The number 2.
\@six@@n The number 16.
\@m The number 1000.
\@MM The number 20000.

\@xxxii The constant 32.
\chardef\@xxxii=32

(End definition for \@xxxii.)

\@Mi \@Mii \@Miii \@Miv Constants 10001–10004.
\mathchardef\@Mi=10001
\mathchardef\@Mii=10002
\mathchardef\@Miii=10003
\mathchardef\@Miv=10004

(End definition for \@Mi and others.)

\@tempcnta \@tempcntb Scratch count registers used by \LaTeX{} kernel commands.
\newcount\@tempcnta
\newcount\@tempcntb

(End definition for \@tempcnta and \@tempcntb.)

\if@tempswa General boolean switch used by \LaTeX{} kernel commands.
\newif\if@tempswa

(End definition for \if@tempswa.)

\@tempdimaa \@tempdimmb \@tempdimmc Scratch dimen registers used by \LaTeX{} kernel commands.
\newdimen\@tempdimaa
\newdimen\@tempdimmb
\newdimen\@tempdimmc

(End definition for \@tempdimaa, \@tempdimmb, and \@tempdimmc.)
\@tempboxa Scratch box register used by \LaTeX{} kernel commands.
\newbox\@tempboxa
(End definition for \@tempboxa.)
\@tempskipa \@tempskipb
Scratch skip registers used by \LaTeX{} kernel commands.
\newskip\@tempskipa
\newskip\@tempskipb
(End definition for \@tempskipa and \@tempskipb.)
\@temptokena
Scratch token register used by \LaTeX{} kernel commands.
\newtoks\@temptokena
(End definition for \@temptokena.)
\@flushglue Glue used for \rightskip \& \leftskip = 0pt plus 1fil
\newskip\@flushglue \@flushglue = 0pt plus 1fil
(End definition for \@flushglue.)
File k
ltcntrl.dtx

1 Program control structure

This section defines a number of control structure macros, such as while-loops and for-loops.

Historical \LaTeX2.09 comments (not necessarily accurate any more):

1 \texttt{⟨∗2ekernel⟩}
2 \texttt{\message{control,}}

\texttt{\@whilenum TEST \do {BODY}}
\texttt{\@whiledim TEST \do {BODY}} : These implement the loop
while TEST do BODY od
where TEST is a \TeX \texttt{\ifnum} or \texttt{\ifdim} test, respectively.
They are optimized for the normal case of TEST initially false.

\texttt{\@whilesw SWITCH \fi {BODY}} : Implements the loop
while SWITCH do BODY od
Optimized for normal case of SWITCH initially false.

\texttt{\@for NAME := LIST \do {BODY}} : Assumes that LIST expands to A1,A2,
... ,An .
Executes BODY \texttt{n} times, with \texttt{NAME} = Ai on the i-th iteration.
Optimized for the normal case of \texttt{n} = 1. Works for \texttt{n}=0.

\texttt{\@tfor NAME := LIST \do {BODY}}
if, before expansion, LIST = \texttt{T1 ... Tn} where each Ti is a
token or \{...\}, then executes BODY \texttt{n} times, with \texttt{NAME} = Ti
on the i-th iteration. Works for \texttt{n}=0.

NOTES: 1. These macros use no \texttt{\@temp} sequences.
   2. These macros do not work if the body contains anything that
looks syntactically to \TeX like an improperly balanced \texttt{\if}
\texttt{\else \fi}.

\texttt{\@whilenum TEST \do {BODY} ==
BEGIN
 if TEST
 then BODY
 \texttt{\@iwhilenum\{TEST \relax BODY\}}
END}

\texttt{\@iwhilenum \{TEST BODY\} ==
BEGIN
 if TEST
 then BODY

NOTES: 1. These macros use no \texttt{\@temp} sequences.
   2. These macros do not work if the body contains anything that
looks syntactically to \TeX like an improperly balanced \texttt{\if}
\texttt{\else \fi}.
\@nextwhile = def(\@iwhilenum)
else \@nextwhile = def(\@whilenoop)
fi
\@nextwhile {TEST BODY}
END

\@whilesw SWITCH \fi \{BODY\} ==
BEGIN
if SWITCH
then BODY
\@iwhilesw {SWITCH BODY}\fi
fi
END
\@iwhilesw {SWITCH BODY} \fi ==
BEGIN
if SWITCH
then BODY
\@nextwhile = def(\@iwhilesw)
else \@nextwhile = def(\@whileswnoop)
fi
\@nextwhile {SWITCH BODY} \fi
END

End of historical \LaTeX{} 2.09 comments.

\@whilenoop
\@whilenum
\@iwhilenum
\long\def\@whilenum#1\do #2{\ifnum #1\relax #2\relax\@iwhilenum{#1}\relax #2\relax}\fi}
\long\def\@iwhilenum#1{\ifnum #1\expandafter\@iwhilenum\else\expandafter\@gobble\fi{#1}}

(End definition for \@whilenoop, \@whilenum, and \@iwhilenum.)

\@whiledim
\@iwhiledim
\long\def\@whiledim#1\do #2{\ifidim #1\relax#2\relax\@iwhiledim{#1}\relax#2\relax}\fi}
\long\def\@iwhiledim#1{\ifidim #1\expandafter\@iwhiledim\else\expandafter\@gobble\fi{#1}}

(End definition for \@whiledim and \@iwhiledim.)

\@whileswnoop
\@whilesw
\@iwhilesw
\long\def\@whilesw#1\do #2{#1#2\@iwhilesw(#1#2)\fi\fi}
\long\def\@iwhilesw#1\do #1\expandafter\@iwhilesw\else\gobbletwo\fi{#1}\fi

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Historical \LaTeX2e comments (not necessarily accurate any more):

\begin{verbatim}
\@for NAME := LIST \do {BODY} ==
    BEGIN \@forloop expand(LIST),\@nil,\@nil \@@ NAME \do {BODY} END
\end{verbatim}

\begin{verbatim}
\@forloop CAR, CARCDR, CDRCDR \@@ NAME \do {BODY} ==
    BEGIN
        NAME = CAR
        if def(NAME) = def(\@nnil)
            else BODY;
            NAME = CARCDR
            if def(NAME) = def(\@nnil)
                else BODY
                \@iforloop CDRCDR \@@ NAME \do {BODY}
            fi
        fi
    fi
END
\end{verbatim}

\begin{verbatim}
\@iforloop CAR, CDR \@@ NAME \do {BODY} =
    NAME = CAR
    if def(NAME) = def(\@nnil)
        then \@nextwhile = def(\@fornoop)
        else BODY;
        \@nextwhile = def(\@iforloop)
    fi
\@nextwhile name cdr \{body\}
\end{verbatim}

\begin{verbatim}
\@tfor NAME := LIST \do {BODY} ==
    \@tforloop LIST \@nil \@@ NAME \do {BODY} END
\end{verbatim}

\begin{verbatim}
\@tforloop car cdr \@@ name \{body\} ==
    name = car
    if def(name) = def(\@nnil)
        then \@nextwhile == \@fornoop
        else body ;
        \@nextwhile == \@forloop
    fi
\@nextwhile name cdr \{body\}
\end{verbatim}

End of historical \LaTeX2e comments.

\@nnil
\def\@nnil{\@nil}
(End definition for \@nnil.)

\@empty
\def\@empty{}
(End definition for \@empty.)

File k: ltcntrl.dtx Date: 2020/12/04 Version v1.0h
\@fornoop
15 \long\def\@fornoop#1\@@#2#3{}
(End definition for \@fornoop.)
\@for
16 \long\def\@for#1:=#2\do#3{%
17 \expandafter\def\expandafter\@fortmp\expandafter{#2}%
18 \ifx\@fortmp\empty\else
19 \expandafter\@forloop#2,\@nil,\@nil\@@#1{#3}\fi}
(End definition for \@for.)
\@forloop
20 \long\def\@forloop#1,#2,#3\@@#4#5{%
21 \ifx\@fortmp\@empty\else
22 \expandafter\@forloop#2,\@nil,\@nil\@@#1{#3}\fi}
(End definition for \@forloop.)
\@iforloop
23 \long\def\@iforloop#1,#2\@@#3#4{
24 \def#3{#1}\ifx#3\@nnil
25 \expandafter\@fornoop\else
26 #4\relax\expandafter\@iforloop\fi#2\@@#3{#4}}
(End definition for \@iforloop.)
\@tfor
27 \def\@tfor#1:={\@tf@r#1 }
28 \long\def\@tf@r#1#2\do#3{
29 \def\@fortmp{#2}\ifx\@fortmp\space
30 \@tforloop#2\@nil\@nil\@@#1{#3}\fi}
31 \long\def\@tforloop#1#2\@@#3#4{
32 \def#3{#1}\ifx#3\@nnil
33 \expandafter\@tforloop\else
34 \@break@tfor#2\@@#3{\fi\fi}
(End definition for \@tfor.)
\@break@tfor
35 Break out of a \@tfor loop. This should be called inside the scope of an \if. See \@iffileonpath for an example.
36 \long\def\@break@tfor#1\@@#2#3{\fi\fi}
(End definition for \@break@tfor.)
\@removeelement
37 Removes an element from a comma-separated list and puts it into a control sequence, called as \@removeelement{⟨element⟩}{⟨list⟩}{⟨cs⟩}. Due to the implementation method the ⟨element⟩ is not allowed to contain braces.
38 \def\@removeelement#1#2#3{%
39 \def\reserved@a##1,#1,##2\reserved@a{##1,##2\reserved@b}%
40 \def\reserved@b##1,\reserved@b##2\reserved@b{%
41 \ifx,##1\@empty\else##1\fi}%
42 \edef#3{%
43 \expandafter\reserved@b\reserved@a,#2,\reserved@b,#1,\reserved@a}}
(End definition for \@removeelement.)
1 Error handling and tracing

This section defines \LaTeX’s error commands.

The ‘2ekernel’ code ensures that a \usepackage{autoerr} is essentially ignored if a ‘full’ format is being used that has the error messages already in the format.

These days we don’t support autoloading approach any longer, but this part bit is kept in case it is used in old documents.

\let\MessageBreak\relax

\GenericInfo
This takes two arguments: a continuation and a message, and sends the result to the log file.

\GenericWarning
This takes two arguments: a continuation and a message, and sends the result to the screen.
This macro takes four arguments: a continuation, an error message, where to go for further information, and the help information. It displays the error message, and sets the error help (the result of typing \texttt{h} to the prompt), and does a horrible hack to turn the last context line (which by default is the only context line) into just three dots. This could be made more efficient.

Unfortunately \TeX{} versions older than 3.141 have a bug which means that \texttt{^^J} does not force a linebreak in \texttt{message} and \texttt{errmessage} commands. So for these old \TeX{}'s we use \texttt{typeout} to produce the message, and then have an empty \texttt{errmessage} command. This causes an extra line of the form .

To appear on the terminal, but if you do not like it, you can always upgrade your \TeX{}! In order for your format to use this version, you must define the macro \texttt{@TeXversion} to be the version number, e.g., 3.14 of the underlying \TeX{}. See the comments in ltdircheck.dtx.

First the ‘standard case’:

\begin{verbatim}
\DeclareRobustCommand{\GenericError}[4]{% 
\begingroup% 
\immediate\write\@unused{}% 
\def\MessageBreak{^^J}% 
\set@display@protect% 
\edef% % %<-------------------do not delete this space!------------------>% 
\@err@ % 
{#4}% 
\errhelp% % %<-------------------do not delete this space!------------------>% 
\@err@ % 
\let% %<-------------------do not delete this space!------------------>% 
\@err@ % 
\@empty% 
\def\MessageBreak{^^J#1}% 
\def~{errmessage{% 
#2.^^J^^J% 
#3^^J% 
Type H <return> for immediate help% % %<-------------------do not delete this space!------------------>% 
\@err@ % 
\endgroup% 
\end{verbatim}
These commands are intended for use by package and class writers, to give information to authors. The syntax is:

\PackageError{⟨package⟩}{⟨error⟩}{⟨help⟩}
\PackageWarning{⟨package⟩}{⟨warning⟩}
\PackageWarningNoLine{⟨package⟩}{⟨warning⟩}
\PackageInfo{⟨package⟩}{⟨info⟩}

and similarly for classes. The Error commands print the ⟨error⟩ message, and present the interactive prompt; if the author types h, then the ⟨help⟩ information is displayed. The Warning commands produce a warning but do not present the interactive prompt. The WarningNoLine commands do the same, but don’t print the input line number. The Info commands write the message to the log file. Within the messages, the command \MessageBreak can be used to break a line, \protect can be used to protect command names, and \space is a space, for example:

File: lterror.dtx  Date: 2021/08/20  Version v1.2t
\newcommand{\foo}{FOO}
\PackageWarning{ethel}{% Your hovercraft is full of eels,\MessageBreak and \protect\foo\space is \foo} produces:

Package ethel warning: Your hovercraft is full of eels, \(\text{(ethel)}\) and \(\foo\) is FOO on input line 54.

File l: 1terror.dtx Date: 2021/08/20 Version v1.2t
We don’t roll back, because if this code is used by packages then most often they will not have rollback code implemented, so they would immediately break even if they otherwise would work fine.

Errors and other info, for use in the \LaTeX{} core.

File: lterror.dtx  Date: 2021/08/20  Version v1.2t
See the LaTeX manual or LaTeX Companion for explanation.\%
\{(2)\%
\}

\def\@latex@warning#1{%
  \GenericWarning{\space\space\space\@spaces\@spaces\@spaces}{%\LaTeX Warning: #1\}%
}\%

\def\@latex@warning@no@line#1{%
  \@latex@warning{#1\@gobble}}%

\def\@latex@info#1{%
  \GenericInfo{\space\@spaces\@spaces}{%\LaTeX Info: #1\}%
}\%

\def\@latex@info@no@line#1{%
  \@latex@info{#1\@gobble}}%

\@font@warning and \@font@info are defined later since they have to be redefined
by the \tracefnt{} package.

\def\@font@warning#1{%
  \GenericWarning{\@spaces\@spaces}{Font Warning: #1\}%
}\%

\def\@font@info#1{%
  \GenericInfo{\space\@spaces}{Font Info: #1\}%
}\%

(End definition for \latexerror{} and others.)

These are “info” messages that display on the terminal not just in the transcript.
We don’t make them undefined but rather point to \@latex@info because that’s what they replace. This way we can change \@latex@info elsewhere without the need to further rollback sections.

\begin{verbatim}
⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}{\@latex@note}{Display notes}⟨latexrelease⟩
⟨latexrelease⟩\let\@latex@note\@latex@info
⟨latexrelease⟩\let\@latex@note@no@line\@latex@info@no@line
⟨latexrelease⟩\EndIncludeInRelease

⟨∗2ekernel⟩
\end{verbatim}

(End definition for \@latex@note and \@latex@note@no@line.)

\c@errorcontextlines \errorcontextlines as a \TeX{} counter, so that it may be manipulated with \setcounter (once it is defined :-)
\let\c@errorcontextlines\errorcontextlines
\c@errorcontextlines=-1
(End definition for \c@errorcontextlines.)

\on@line The message ‘ on input line \n’.
\def\on@line{ on input line \the\inputlineno}
(End definition for \on@line.)

\@warning Older \LaTeX{} messages. For the moment, these \let to the new message commands. They may be changed later, once only obsolete packages and classes contain them.
\let\@warning\@latex@warning
\let\@@warning\@latex@warning@no@line
\global\let\@latexerr\@latex@error
(End definition for \@warning, \@@warning, and \@latexerr.)

\@spaces Four spaces.
\def\@spaces{\space\space\space\space}
(End definition for \@spaces.)

### 1.2 Specific errors

\@eha The more common error help messages.
\gdef\@eha{%
  Your command was ignored.\MessageBreak
  \space I <command> <return> \space to replace it \%
  with another command,\MessageBreak
  or \space <return> \space to continue without it.}%
\gdef\@ehb{%
  You’ve lost some text. \space \@ehc}%
\gdef\@ehc{%
  Try typing \space <return> %
\end{verbatim}

File l: lterror.dtx Date: 2021/08/20 Version v1.2t
\space to proceed.\MessageBreak
If that doesn’t work, type \space X <return> \space to quit.}
\gdef\@ehd{\%
\ifnum\count\textwidth>26\relax
You’re in trouble here. \space@ehc
(End definition for \@eha and others.)
\notdefinable Error message generated in \@ifdefinable from calls to one of the commands \newcommand, \newlength or \newtheorem specifying an already-defined command name or one that begins \end….  
\gdef\@notdefinable{\%
\latexerror{Command \reserved@name already defined.\MessageBreak
Or name \reserved@name @end… illegal, see p.192 of the manual}@eha}
(End definition for \@notdefinable.)
\nolnerr Generated by \newline and \ when called in vertical mode.
\gdef\@nolnerr{\%
\latexerror{There’s no line here to end}@eha}
(End definition for \@nolnerr.)
\nocounterr Generated by \setcounter, \addtocounter or \newcounter if applied to an undefined counter (cnt).
Obsolete error message generated in \LaTeX2.09 by \setcounter, \addtocounter or \newcounter for undefined counter. DO NOT use for \LaTeX\,2ε it MIGHT vanish! Use \nocounterr{cnt} instead.
\gdef\@nocounterr{\%
\latexerror{No counter '1' defined}@eha}
\gdef\@nocnterr{\@nocounterr?}
(End definition for \@nocouterr and \@nocnterr.)
\ctrerr Called when trying to print the value of a counter numbered by letters that’s greater than 26.
\gdef\@ctrerr{\%
\latexerror{Counter too large}@ehb}
(End definition for \@ctrerr.)
\nodocument Error produced if paragraphs are typeset in the preamble.
\gdef\@nodocument{\%
\latexerror{Missing \protect\begin{document}}@ehd}
(End definition for \@nodocument.)
\@badend Called by \end that doesn’t match its \begin. RmS 1992/08/24: added code to \@badend to display position of non-matching \begin. FMi 1993/01/14: missing space added.

The environment name has to literally match, i.e., what is stored in \@currenvir (after one expansion) must match what is passed to \end (without expansion). If not we complain. Not the absolute best solution but at least it avoids getting \begin{foo} ended by \end{foo} which was possible in the past.

\begin{alltt}
\gdef\@badend#1{% 
  \latexerror{\protect\begin\space ended by \protect\end{\detokenize{#1}}}}\@eha
\end{alltt}

(End definition for \@badend.)

\@badmath Called by \[, \], \( or \) when used in wrong mode.

\begin{alltt}
\gdef\@badmath{\latexerror{Bad math environment delimiter}}\@eha
\end{alltt}

(End definition for \@badmath.)

\@toodeep Called by a list environment nested more than six levels deep, or an enumerate or itemize nested more than four levels.

\begin{alltt}
\gdef\@toodeep{\latexerror{Too deeply nested}}\@ehd
\end{alltt}

(End definition for \@toodeep.)

\@badpoptabs Called by \endtabbing when not enough \poptabs have occurred, or by \poptabs when too many have occurred.

\begin{alltt}
\gdef\@badpoptabs{% 
  \latexerror{\pushtabs\space and \poptabs\space don’t match}}\@ehd
\end{alltt}

(End definition for \@badpoptabs.)

\@badtab Called by \>, \+, \- or \< when stepping to an undefined tab.

\begin{alltt}
\gdef\@badtab{\latexerror{Undefined tab position}}\@ehd
\end{alltt}

(End definition for \@badtab.)

\@preamerr This error is special: it appears in places where we normally have to \protect expansions. However, to prevent a protection of the error message itself (which would result in the message getting printed not issued on the terminal) we need to locally reset \protect to \relax.

\begin{alltt}
\gdef\@preamerr#1{% 
  \begingroup \let\protect\relax 
  \latexerror{\ifcase #1 Illegal character\or Missing \-exp\or Missing p-arg\fi\space in array arg}}\@ehd 
  \endgroup}
\end{alltt}

(End definition for \@preamerr.)

File l: lterror.dtx Date: 2021/08/20 Version v1.2t
\@badlinearg Occurs in \line and \vector command when a bad slope argument is encountered.
\gdef\@badlinearg{\@latexerror{Bad \protect\line\space or \protect\vector
\space argument}\@ehb}
(End definition for \@badlinearg.)

\@parmoderr Occurs in a float environment or a \marginpar when encountered in inner vertical mode.
\gdef\@parmoderr{\@latexerror{Not in outer par mode}\@ehb}
(End definition for \@parmoderr.)

\@fltovf Occurs in float environment or \marginpar when there are no more free boxes for storing floats.
\gdef\@fltovf{\@latexerror{Too many unprocessed floats}\@ehb}
(End definition for \@fltovf.)

\latexbug Occurs in output routine. This is bad news.
\gdef\latexbug{\@latexerror{This may be a \LaTeX\ bug}\textbackslash Call for help}
(End definition for \latexbug.)

\@badcrerr This error was removed and replaced by \@nolnerr.
\%\def\@badcrerr {\@latexerror{Bad use of \protect\\}
\@ehc}
(End definition for \@badcrerr.)

\@noitemerr \addvspace or \addpenalty was called when not in vmode. Probably caused by a missing \item.
\gdef\@noitemerr{\@latexerror{Something’s wrong—perhaps a missing \protect\item}\@ehc}
(End definition for \@noitemerr.)

\@notprerr A command that can be used only in the preamble appears after the command \begin{document}.
\gdef\@notprerr{\@latexerror{Can be used only in preamble}\@eha}
(End definition for \@notprerr.)

\@inmatherr Issued by commands that don’t work correctly within math (like \item). There is no real error recovery happening, e.g., the user might get additional errors afterwards.
\gdef\@inmatherr\#1\{%\relax\ifmmode\@latexerror{Command \protect\#1 invalid in math mode}\@ehc
\fi\}

File l: lterror.dtx Date: 2021/08/20 Version v1.2t
An error for use with invalid characters. This is commented out, since we decided to use catcode 15 instead.

\def\@invalidchar{\latex@error{Invalid character in input}\@ehc}

As well as the above error commands some error messages are directly coded to save space. The messages already present in \TeX\ 2.09 include:

- Environment --- undefined
  Issued by \begin for undefined environment.
- Tab overflow
  Occurs in $\backslash$= when maximum number of tabs exceeded.
- $\langle$ in mid line
  Occurs in $\langle$ when it appears in middle of line.
- Float(s) lost
  In output routine, caused by a float environment or \marginpar occurring in inner vertical mode.

### 1.3 Tracing

The \texttt{trace} package implements the commands \texttt{\traceon} and \texttt{\traceoff} that work similar to \texttt{\tracingall} but skip certain code blocks that produce a lot of tracing output being of no interest during debugging (for example loading a font). Code blocks that should be hidden during tracing need to be surrounded by the macros \texttt{\conditionally@traceoff} and \texttt{\conditionally@traceon}.

For the kernel code the \texttt{trace} package then redefines a number of macros to include this tracing support.

However, in order to allow any macro package to react to \texttt{\traceon} we also provide dummy definitions for the two commands in the kernel so that they can be used by external packages without the need to distinguish between \texttt{trace} being loaded or not.

\let\conditionally@traceon\@empty
\let\conditionally@traceoff\@empty

These are only dummy definitions. For details see the \texttt{trace} package.
1 Paragraphs

This section of the kernel declares the commands used to set \par and \everypar when ever their function needs to be changed for a long time.

This file here describes the interfaces that have been in the kernel forever, used to implement the scenarios described below. They remain valid but are now augmented in the next file (ltpara.dtx) to add hooks to paragraphs. At some point we will consolidate the two files further.

There are two situations in which \par may be changed:

- Long-term changes, in which the new value is to remain in effect until the current environment is left. The environments that change \par in this way are the following:
  - All list environments (itemize, quote, etc.)
  - Environments that turn \par into a noop: tabbing, array and tabular.

- Temporary changes, in which \par is restored to its previous value the next time it is executed. The following are all such uses.
  - \end when preceded by \@endparenv, which is called by \endtrivlist
  - The mechanism for avoiding page breaks and getting the spacing right after section heads.

1.1 Implementation

\@setpar To permit the proper interaction of these two situations, long-term changes are made by the \@setpar{(VAL)} command. It's function is:

To set \par. It \def's \par and \@par to (VAL).

\@restorepar Short-term changes are made by the usual \def\par commands. The original values are restored after a short-term change by the \@restorepar commands.

\@@par \@@par always is defined to be the original TEX \par.
\everypar \everypar is changed only for the short term. Whenever \everypar is set non-null, it should restore itself to null when executed.

The following commands change \everypar in this way:

- \item
- \end when preceded by \@endparenv, which is called by endtrivlist
- \minipage

When dealing with \par and \everypar remember the following two warnings:
1. Commands that make short-term changes to \texttt{par} and \texttt{everypar} must take account of the possibility that the new commands and the ones that do the restoration may be executed inside a group. In particular, \texttt{everypar} is executed inside a group whenever a new paragraph begins with a left brace. The \texttt{everypar} command that restores its definition should be local to the current group (in case the command is inside a minipage used inside someplace where \texttt{everypar} has been redefined). Thus, if \texttt{everypar} is redefined to do an \texttt{everypar\{}} it could take several executions of \texttt{everypar} before the restoration “holds”. This usually causes no problem. However, to prevent the extra executions from doing harm, use a global switch to keep anything harmful in the new \texttt{everypar} from being done twice.

2. Commands that change \texttt{everypar} should remember that \texttt{everypar} might be supposed to set the following switches false:

\begin{itemize}
  \item @nobreak
  \item @minipage
\end{itemize}

they should do the setting if necessary.

\begin{verbatim}
\@setpar
\@par
\message{par,}
\end{verbatim}

\texttt{\@setpar} Initiate a long-term change to \texttt{par}.
\texttt{\@par} The default definition of \texttt{\@par} will ensure that if \texttt{\@restorepar} defines \texttt{par} to execute \texttt{\@par} it will redefine itself to the primitive \texttt{@@par} after one iteration.
\begin{verbatim}
\def\@setpar#1{\def\par#1\def\par{#1}}\def\par{#1}
\end{verbatim}

(End definition for \texttt{\@setpar} and \texttt{\@par}.)

\begin{verbatim}
\@restorepar
\end{verbatim}

\texttt{\@restorepar} Restore from a short-term change to \texttt{par}.
\begin{verbatim}
\def\@restorepar{\def\par{\par}}
\end{verbatim}

(End definition for \texttt{\@restorepar}.)
Abstract

This code defines four special kernel hooks to support paragraph tagging as well as four public hooks which can be occasionally useful.

1 Introduction

The building of paragraphs in the \TeX engine(s) has a number of peculiarities that makes it on one hand fairly flexible but on the other hand somewhat awkward to control or reliably to extend. Thus to better understand the code below we start with a brief introduction of the mechanism; for more details refer to the \TeXbook [?, chap. 14] (for the full truth you may even have to study the program code).

1.1 The default processing done by the engine

\TeX automatically starts building a paragraph when it is currently in vertical mode and encounters anything that can only live in horizontal mode. Most often this is a character, but there are also many commands that can be used only in horizontal mode. If any of them is encountered, \TeX will immediately back up (i.e., the character or command is read later again), adds a \texttt{\parskip} glue to the current vertical list unless the list is empty, switches to horizontal mode, starts its special “start of paragraph processing” and only then rereads the character or command that caused the mode change.\footnote{Already not quite true: the command \texttt{\noindent} starts the paragraph but influences the special processing by suppressing the paragraph indentation box normally inserted by it.}

This “start of paragraph processing” first adds an empty box at the start of the horizontal list of width \texttt{\parindent} (which represents the paragraph indentation) unless the paragraph was started with \texttt{\noindent} in which case no such box is added\footnote{That’s a bit different from placing a zero-sized box!}. It then reads and processes all tokens stored in the special engine token register \texttt{\everypar}. After that it reads and processes whatever has caused the paragraph to start.

Thus out of the box, \TeX offers the possibility to put some special code into \texttt{\everypar} to gain control at (more or less) the start of the paragraph. For example, in \LaTeX and a number of packages, special code like the following is sometimes used:

\begin{quote}
\texttt{\everypar{{/setbox\z@\lastbox}\everypar\} \ldots}}\end{quote}

This removes the paragraph indentation box again (that was already placed by \TeX), then resets \texttt{\everypar} so that it doesn’t do anything on the next paragraph start and then does whatever it wants to do, e.g., in an \texttt{item} of a list it will typeset the label in front of the paragraph text. However, there is only one such \texttt{\everypar} token register and if different packages and/or the kernel all attempt to add their own code here, coordination is very difficult if not impossible.

The process when the paragraph ends has different mechanisms and interfaces. A paragraph ends when the engine primitive \texttt{\par} is called while \TeX is in unrestricted horizontal mode, i.e., is building a paragraph. At other times this primitive does nothing or generates as an error depending on the mode \TeX is in, e.g., the \texttt{\par in \hbox{a\par b}} is ignored, but \texttt{$a$\par $b$} would complain.
If this primitive ends the paragraph it does some special “end of horizontal list” processing, then calls \TeX’s paragraph builder; this breaks the horizontal list into lines and then these lines are added as boxes to the enclosing vertical list and \TeX returns to vertical mode.

This \texttt{\par} command can be given explicitly, but there are also situations in which \TeX is generating it on the fly. Most often this happens when \TeX encounters a blank line which is automatically changed to a \texttt{\par} command which is then executed. The other possibility is that \TeX encounters a command which is incompatible with horizontal processing, e.g., \texttt{\vskip} (a request for adding vertical space). In such cases it silently backs up, and inserts a \texttt{\par} in the hope that this gets it out of horizontal mode and makes the vertical command acceptable.

The important point to note here is that \TeX really inserts the command with the name \texttt{\par}, which can be redefined. Thus, it may not have its original “primitive” meaning and therefore may not end the horizontal list and call the paragraph builder. This approach offers some flexibility but also allows you to easily produce a \TeX document that loops forever, for example, the simple line

\begin{verbatim}
A \let\par\relax \vskip
\end{verbatim}

will start a horizontal list at \texttt{A}, redefines \texttt{\par}, then sees \texttt{\vskip} and inserts \texttt{\par} to end the paragraph. But this now only runs \texttt{\relax} so nothing changes and \texttt{\vskip} is read again, issues a \texttt{\par} which .... In short, it only takes a plain \TeX document with five tokens to run forever (since no memory is consumed and therefore eventually exhausted).

There is no way other than changing \texttt{\par} to gain control at the end of a paragraph, i.e., there is no token list like \texttt{\everypar} that is inserted. Hence the only way to change the default behavior is to modify the action that \texttt{\par} executes, with similar issues as outlined before: different processes need to ensure that they do not overwrite their modifications or worse, think that the \texttt{\par} in front of them is the engine primitive while in fact it has already been changed by other code.

To make matters slightly worse there are a few places where \TeX handles the situation differently (most likely for speed reasons back when computers were much slower). If \TeX finds itself in unrestricted horizontal mode at the end of building a vertical box (for an \texttt{\insert}, \texttt{\vadjust} or executing the output routine code), it will finish the horizontal list not by issuing a \texttt{\par} command (which would be consistent with all other places) but by simply executing the primitive meaning of \texttt{\par}, regardless of the actual definition that \texttt{\par} has at the time.

Thus, if you have carefully crafted a redefined \texttt{\par} to execute some special actions at the end of a paragraph and you write something like

\begin{verbatim}
\vbox{Some paragraph ... text.}
\end{verbatim}

you will find that your code does not get run for the last paragraph in that box. Is\TeX avoids this problem, by making sure that its boxes (such as \texttt{\parbox} or the \texttt{minipage} environment, etc.) all internally add an explicit \texttt{\par} at the end so that such code is run and \TeX finds itself in vertical mode already without the need to start up the paragraph builder internally. But, of course, this only works for boxes under direct control of the \TeX kernel; if some package uses low-level \texttt{\vbox}es without adding this precaution the \TeX optimization kicks in and no special \texttt{\par} code is executed.

And there is another optimization that is painful: if a paragraph is interrupted by a mathematical display, e.g., \texttt{\[...\]} in \TeX or $...$ in plain \TeX, then \TeX will resume horizontal mode afterward, i.e., it will start to build a new horizontal list.
without inserting an indentation box or \everypar at that point. However, if that list immediately ends with an explicit or implicit \par then \TeX{} will simply throw away this “null” paragraph and not do its usual “end of horizontal list” processing, so this special case also needs to be accounted for when introducing any extended processing.

## 2 The new mechanism implemented for \LaTeX{}

To improve the situation (and also to support automatic tagging of PDF documents) we now offer public as well as private hooks at the start and end of the paragraph processing. The public hooks can be used by packages (or by the user in the preamble or within the document) and using the hook mechanisms it is possible to reorder or arrange code from different packages in such a way that these can safely coexist.

To make that happen we have to make use of the basic functionality that is offered by \TeX{}, e.g., we install special code inside \everypar to provide hooks at the beginning and we redefine \par to do some special processing when appropriate to install hooks at the end of the paragraph.

In order to make this work, we have to ensure that package use of \everypar is not overwriting our code. This is done through a trick: we basically hide the real \everypar from the packages and offer them a new token register (with the same name). So if they install their own code it doesn’t overwrite ours. Our code then inserts the new \everypar at the right place inside the process so that it looks as if it was the primitive \everypar.\(^17\)

At the end of the paragraph it would be great if we could use a similar trick. However, due to the fact that \TeX{} inserts the token \par (that doesn’t have a defined meaning) we can’t hide “the real thing\(^TM\)” and offer the package an indistinguishable alternate.

Fortunately, \LaTeX{} has already redefined \par for its own purposes. As a result there aren’t many packages that attempt to change \par, because without a lot of extra care that would fail miserably. But the bottom line is that, if you load a package that alters \par then the end of paragraph hooks are most likely not executing while that redefinition is active.\(^18\)

\(^17\)Ideally, \everypar wouldn’t be used at all by packages and instead they would simply write their code into the hooks now offered by the kernel. However, while this is the longterm goal and clearly an improvement (because then the packages do no longer need to worry about getting their code overwritten or needing to account for already existing code in \everypar), this will not happen overnight. For that reason support for this legacy method is retained.

\(^18\)Similarly to the \everypar situation, the remedy is that such packages stop doing this and instead add their alterations into the paragraph hooks now provided.
2.1 The provided hooks

The following four public hooks are defined and executed for each paragraph:

- **para/before** This hook is executed after the kernel hook `\@kernel@before@para@before` (discussed below) in vertical mode immediately after TeX has contributed `\parskip` to the vertical list and before the actual paragraph processing in horizontal mode starts.

  This hook should either not produce any typeset material or add only vertical material. If it starts a paragraph an error is generated. The reason is that we are in the starting process of processing a paragraph and so this would lead to endless recursion.\(^19\)

- **para/begin** This hook is executed after the kernel hook `\@kernel@before@para@begin` (discussed below) in horizontal mode immediately before the indentation box is placed (if there is any, i.e., if the paragraph hasn’t been started with `\noindent`).

  The indentation box to be typeset is available to the hook as `\IndentBox` and its automatic placement (after the hook is executed) can be prevented through `\OmitIndent`. More precisely `\OmitIndent` voids the box.

  The indentation box is then typeset directly after the hook execution by something equivalent to `\box\IndentBox` followed by the current content of the token register `\everypar` that it is available to the kernel or to packages (that run some legacy code).

  One has to be careful not to add any code to the hook that starts its own paragraph (e.g., by adding a `\parbox` or a `\marginpar` inside) because that would call the hook inside again (as a new paragraph is started there) and thus lead to an endless recursion ending only after exhausting the available memory. This can only be done by making sure that is not executed for the inner paragraphs (or at least not recursively forever).

- **para/end** This hook is executed at the end of a paragraph when TeX is ready to return to vertical mode and after it has removed the last horizontal glue (but not any kerns) placed on the horizontal list. The code is still executed in horizontal mode so it is possible to add further horizontal material at this point, but it should not alter the mode (even a temporary exit from horizontal mode would create chaos—any attempt will cause an error message)! After the hook has ended the kernel hook `\@kernel@after@para@end` is executed and then TeX returns to vertical mode.

  The hook is offered as public hook, but because of the requirement to stay within horizontal mode one needs to be careful in what is placed into the hook.\(^20\)

  This hook is implemented as a reversed hook.

- **para/after** This hook is executed directly after TeX has returned to vertical mode and after any material that migrated out of the horizontal list (e.g., from a `\vadjust`) has processed.

\(^{20}\) Maybe we should guard against that, but it would be rather tricky to implement as mode changes can happen across group boundaries so one would need to keep a private stack just for that. Well, something to ponder.
This hook should either not produce any typeset material or add only vertical material. However, for this hook starting a new paragraph is not a disaster so that it isn’t prevented.

This hook is implemented as a reversed hook.

Once that hook code has been processed the kernel hook \texttt{\Kernel@after@para@after} is executed as the final action of the paragraph processing.

\texttt{\Kernel@before@para@before}
\texttt{\Kernel@after@para@after}
\texttt{\Kernel@before@para@begin}
\texttt{\Kernel@after@para@end}

As already mentioned above there are also four kernel hooks that are executed at the start and end of the processing.

\texttt{\Kernel@before@para@before} For future extensions, not currently used by the kernel.

\texttt{\Kernel@after@para@after} For future extensions, not currently used by the kernel.

\texttt{\Kernel@before@para@begin} Used by the kernel to implement tagging. This hook is executed at the very beginning of a paragraph after \TeX{} has switched to horizontal mode but before any indentation box got added or any \texttt{\everypar} was run.

It should not generate typeset material that could alter the position. Note that it should never leave imode, otherwise you will end with a loop! We could guard against this, but since it is an internal kernel hook that shouldn’t be touched this isn’t checked.

\texttt{\Kernel@after@para@end} Used by the kernel to implement tagging. It is executed directly after the public \texttt{para/end} hook. After it there is a quick check that we are still in horizontal mode, i.e., that the public hook has not mistakenly ended horizontal mode prematurely (this is an incomplete check just testing the mode and could perhaps be improved (at the cost of speed)).

2.2 Altered and newly provided commands

\texttt{\par\endgraf\para_end:}\hspace{1cm}

An explicit request for ending a paragraph is provided in plain \TeX{} under the name \texttt{\endgraf}, which simply uses the primitive meaning (regardless of what \texttt{\par} may have as its current definition). In \LaTeX{} \texttt{\endgraf} (with that behavior) was originally also available.

With the new paragraph handling in \LaTeX{}, ending a paragraph means a bit more than just calling the engine’s paragraph builder: the process also has to add any hook code for the end of a paragraph. Thus \texttt{\endgraf} was changed to provide this additional functionality (along with \texttt{\par} remaining subject to its current meaning).

The \texttt{expl3} name for this functionality is \texttt{\para_end:}.

\textbf{Note: The next two commands are still under discussion and may slightly change their semantics (as described in the document) and/or their names between now and the 2021 Spring release!}
Inside the `para/begin` hook one can use this command to suppress the indentation box at the start of the paragraph. (Technically it is possible to use this command outside the hook as well, but this should not be relied upon.) The box itself remains available for use.

The expl3 name for the function is `\para_omit_indent`.

The box register holding the indentation box for the paragraph is available for inspection (or changes) inside hooks. It remains available even if the `\OmitIndent` command was used; in that case it will just not be automatically placed.

The expl3 name for the box register is `\g_para_indent_box`.

The commands `\RawIndent` and `\RawNoindent` are not meant for normal paragraph building (where the result is a textual paragraph in the traditional meaning of the word), but for special cases where \TeX's low-level algorithm is used to achieve special effects, but where the result is not a "paragraph".

They are called "raw", because they bypass \TeX's hook mechanism for paragraphs and simply invoke the low-level \TeX algorithm. I.e., they are like the original \TeX primitives `\indent` and `\noindent` (that is they execute no hooks other than `\everypar`) except that they can only be used in vertical mode and generate an error if found elsewhere.

To avoid issues a paragraph started by them should always be ended by `\RawParEnd` and not by `\par` (or a blank line), because the latter will execute hooks which then have no counterpart at the beginning of the paragraph. It is the responsibility of the programmer to make sure that they are properly paired. This also means that one should not put arbitrary user content between these commands if that content could contain stray `\pars`.

The expl3 names for the functions are `\para_raw_indent`, `\para_raw_indent`, and `\para_raw_end`.

\section*{2.3 Examples}

None of the examples in this section are meant for real use as they are far too simple-minded but they should give some ideas of what could be possible if a bit more care is applied.

\subsection*{2.3.1 Testing the mechanism}

The idea is to output for each paragraph encountered some information: a paragraph sequence number, a level number in roman numerals, the environment in which this paragraph appears, and the line number where the start or end of the paragraph is, e.g., something like

```
PARA: 1-i start (document env. on input line 38)
PARA: 1-i end (document env. on input line 38)
PARA: 2-ii start (minipage env. on input line 40)
PARA: 3-ii start (minipage env. on input line 40)
```
As you can see paragraph 2 starts on line 40 and ends on 41 and inside a minipage started paragraph 3 (start and end on line 40). If you run this on some document you will find that \LaTeX{} considers more things “a paragraph” than you have probably thought.

This was generated by the following hook code:

\newcounter{paracnt} % sequence counter  
\newcounter{paralevel} % level counter

To support paragraph nesting we need to maintain a stack of the sequence numbers. This is most easily done using expl3 functions, so we switch over. This is not a very general implementation, just enough for what we need and a bit of \LaTeX{}2\epsilon{} thrown in as well. When popping, the result gets stored in \paracntvalue and the \ERROR{} should never happen because it means we have tried to pop from an empty stack.

ExplSyntaxOn
\seq_new:N \g_para_seq  
\cs_new:Npn \ParaPush {\seq_gpush:No \g_para_seq {\the\value{paracnt}}}  
\cs_new:Npn \ParaPop {\seq_gpop:NNF \g_para_seq \paracntvalue \ERROR}  
\ExplSyntaxOff

At the start of the paragraph increment both sequence counter and level and also save the then current sequence number on our stack.

\AddToHook{para/begin}{\% % stepcounter{paracnt}\stepcounter{paralevel}\% % ParaPush
\typeout{PARA: \arabic{paracnt}\roman{paralevel} start (% \@currenvir\space env.\on@line)}\%  
\llap{\color{red}\tiny\arabic{paracnt}\ }%  
}

At the end of the paragraph we display sequence number and level again. The level counter has the correct value but we need to retrieve the right sequence value by popping it off the stack after which it is available in \paracntvalue the way we have set this up above.

\AddToHook{para/end}{\% % ParaPop
\typeout{PARA: \paracntvalue\roman{paralevel} end \space\space
 (\@currenvir\space env.\on@line)}\%  
}

File n: ltpara.dtx
We also typeset again a tiny red number with that value, this time sticking out to the right.\footnote{Note that this can alter the document pagination, because a paragraph ending in a display (e.g., an equation) will get an extra line—in that case our tiny number has an effect even though it doesn’t take up any space, because it paragraph is no longer empty and thus isn’t dropped!} We also decrement the level counter since our level has finished.

\rlap{color(red)\tiny \paracntvalue}\
\addtocounter{paralevel}{-1}\
\makeatother

2.3.2 Mark the first paragraph of each \texttt{itemize}

The code for this is rather simple. We supply some code that is executed only once inside a hook at the start of each \texttt{itemize}. We explicitly change the color back and forth so that we don’t introduce grouping around the paragraph.

\begin{verbatim}
\AddToHook{env/itemize/begin}{%
  \AddToHookNext{para/begin}{\color{blue}}%
  \AddToHookNext{para/end}{\color{black}}%
}\end{verbatim}

As a result the first paragraph of each \texttt{itemize} will appear in blue.

2.4 Some technical notes

The code tries hard to be transparent for package code, but of course any change means that there is a potential for breaking other code. So in section we collect a few cases that may be of importance if low-level code is dealing with paragraphs that are now behaving slightly differently. The notes are from issues we observed and will probably grow over time.

2.4.1 Glue items between paragraphs (found with \texttt{fancypar})

In the past \LaTeX\ placed two glue items between two consecutive paragraphs, e.g.,

\texttt{text1 \par text2 \par}

would show something like

\texttt{\glue(\parskip) 0.0 plus 1.0 \\
  \glue(\baselineskip) 5.16669}

but now there is another \texttt{\parskip} glue (that is always 0pt):

\texttt{\glue(\parskip) 0.0 plus 1.0 \\
  \glue(\parskip) 0.0 \\
  \glue(\baselineskip) 5.16669}

The reason is that we generate a “fake” paragraph to gain control and safely add the early hooks, but this generates an additional glue item. That item doesn’t contribute anything vertically but if somebody writes code that unravels a constructed list using \texttt{\lastbox, \unskip and \unpenalty} then the code has to remove one additional glue item or else it will fail.
3 The Implementation

\ExplSyntaxOn
\NewModuleRelease{2021/06/01}{ltpara}
\ExplSyntaxOff

\newpage

\section{Providing hooks for paragraphs}

The public hooks. They are implemented as a paired set of hooks.

\begin{verbatim}
\hook_new_pair:nn{para/before}{para/after}
\hook_new_pair:nn{para/begin}{para/end}
\end{verbatim}

(End definition for \texttt{para/before} and others. These functions are documented on page \pageref{parabefore}.)

The corresponding kernel hooks (for tagging and future extensions).

\begin{verbatim}
\let\@kernel@before@para@before\@empty
\let\@kernel@before@para@begin\@empty
\let\@kernel@after@para@end\@empty
\let\@kernel@after@para@after\@empty
\end{verbatim}

(End definition for \texttt{@kernel@before@para@before} and others. These functions are documented on page \pageref{parabefore}.)

Whenever \texttt{\LaTeX} starts a paragraph it inserts first an indentation box and then executes the tokens stored in \texttt{\_\LaTeX\_everypar:D} (known to \texttt{\LaTeX} as \texttt{\everypar}). We alter this behavior slightly here, so that hooks are added into the right place. Otherwise the process change remains transparent to any legacy code for this space.

We keep the standard code to be used by \texttt{\_\LaTeX\_everypar:D} in a separate token list because we have to switch back and forth for error recovery and so altering \texttt{\_\LaTeX\_everypar:D} all the time should be a tiny bit faster.

Here is now its definition:

\begin{verbatim}
\tl_new:N \g__para_standard_everypar_tl
\tl_gset:Nn \g__para_standard_everypar_tl { }
\end{verbatim}

First we remove the indentation box and store it in \texttt{\g__para_indent_box}. If there was none because the paragraph was started by \texttt{\_\LaTeX\_noindent} the box register will be void.

\begin{verbatim}
\box_gset_to_last:N \g__para_indent_box
\end{verbatim}

This will make the newly started horizontal list empty, so if we stop it now and return to vertical mode it will be dropped by \texttt{\LaTeX}. We do that but inside a group so that any \texttt{\_\LaTeX\_parshape} settings will not get lost as we need them for later.

\begin{verbatim}
\group_begin:
\_\LaTeX\_par:D
\group_end:
\end{verbatim}

We then change \texttt{\_\LaTeX\_everypar:D} to generate an error so that we can detect and report if the \texttt{para/before} hook illegally changed out of vmode.

\begin{verbatim}
\_\LaTeX\_everypar:D { \msg_error:nnnn \_\LaTeX\_hooks \_\LaTeX\_mode \{before\} \{vertical\} }
\end{verbatim}

File n: ltpara.dtx
Assuming the hooks have been well behaved it is time to return to horizontal mode and start the paragraph in earnest. We already have the indentation box saved away so we now have to restart the paragraph with an empty \texttt{\everypar:D} and with \texttt{\noindent:D}. And we need to make sure not to get another \texttt{\parskip} or rather (since we can’t prevent that) that it is of zero size.

\everypar:D \noindent:D

That brings us back to the start of the horizontal list but we need to change \texttt{\everypar:D} back to its normal content in case there are nested paragraphs coming up.

\everypar:D{\g__para_standard_everypar_tl}

This is followed by executing the kernel and the public hook. The kernel hook is there to enable tagging.

\@kernel@before@para@begin
\hook_use:n {para/begin}

Finally we reinsert the indentation box (unless suppressed) and then call \everypar the way legacy \LaTeX{} code expects it. However, adding the public \everypar is a bit tricky (see below) so we add that later, and indirectly.

\__para_handle_indent:
\% \the \everypar \% <--- done differently below
}

(End definition for \g__para_standard_everypar_tl.)
\everypar
Tokens inserted at the beginning of the paragraph are placed into \everypar inside legacy \LaTeX{} code, e.g., by the list environments or by headings to handle \texttt{\clubpenalty}, etc. Now this isn’t any longer the primitive but simply a toks register used in the code above but to legacy \LaTeX{} code that is transparent.

There is, however, a problem: a handful packages use exactly the same trick and replace the primitive with a token register and call the token register inside the renamed primitive. That is they assume that \everypar is the primitive and that it will still be called at the start of the paragraph even if renamed.

But if we have already replaced it by a token register then all they do is to give that token register a new name. Thus our code in \texttt{\everypar:D} would call \everypar (which is now their token register) and the code that they added ends up in our token register which is then never used at all. A bit mind boggling I guess.

So what we have to do is not to call the token register \everypar by its name inside \texttt{\everypar:D} but by using its actual register number.

\newtoks \everypar

File n: ltpara.dtx
After we have allocated a new toks register with the name \everypar the actual register number is available (briefly) inside \allocationnumber. So instead of \the{\everypar} we have to put \the{\toks{\allocated number}} at the end of \tex\everypar:D.

So what remains doing is to append a few tokens to the token list \g___para_standard_everypar_tl which we do now. We use x expansion here to get the value of \allocationnumber in, all the other tokens should not be expanded at this point.

One important point here is to terminate the register allocation number with a real space. This space will get swallowed up when the number is read. Anything else, such as \scan_stop: would remain in the input and that would mean that it would interfere with \everypar code that attempts to scan ahead to see how the paragraph text starts.

\begin{verbatim}
\tl_gput_right:Nx \g___para_standard_everypar_tl { 
\exp_not:N \the
\exp_not:N \toks
\the \allocationnumber
\c_space_tl
}
\end{verbatim}

(End definition for \everypar.)

\g_para_indent_box

For managing the indentation we need to provide a public accessible box register

\begin{verbatim}
\box_new:N \g_para_indent_box
\end{verbatim}

(End definition for \g_para_indent_box. This function is documented on page 299.)

\_para_handle_indent:

Adding (typesetting) the indent box is straight forward. If it was emptied before it does nothing.

\begin{verbatim}
\cs_new:Npn \_para_handle_indent: { 
\box_use_drop:N \g_para_indent_box
}
\end{verbatim}

The declaration \para_omit_indent: (or \OmitIndent) changes that to do nothing.

\begin{verbatim}
\cs_new:Npn \para_omit_indent: { 
\box_gclear:N \g_para_indent_box
}
\end{verbatim}

(End definition for \_para_handle_indent:.)

\IndentBox \OmitIndent

The \LaTeX\ names for the indentation box and for suppressing it for use in the \para/begin hook.

\begin{verbatim}
\cs_set_eq:NN \IndentBox \g_para_indent_box
\cs_set_eq:NN \OmitIndent \para_omit_indent:
\end{verbatim}

(End definition for \IndentBox and \OmitIndent. These functions are documented on page 299.)

\para_end:

Adding hooks to the end of a paragraph is similar but here we need to alter the command that is used by \TeX to end horizontal mode and return to vertical mode, i.e., \par.

This is a bit more complicated as this command can appear anywhere either explicitly or implicitly added by \TeX in certain situations:

- when using \par in the code or the document
- when using a blank line (which is converted to \par)
- when \TeX finds any commands incompatible with horizontal mode it issues a \par and then rereads the command.
Unfortunately, \TeX{} has some (these days) unnecessary optimizations: if a \texttt{vbox} ends and \TeX{} is still in horizontal mode it simply exercises the paragraph builder instead of issuing a \texttt{par}. It is therefore necessary for \LaTeX{} to ensure that this case doesn’t happen and all boxes internally have a \texttt{par} command at their end.

This \texttt{par} may or may not run the “par primitive” (which is always available as \texttt{\relax par} in \texttt{expl3}); it is permissible to have a changed meaning and it is in fact changed by \LaTeX{} in various ways at various points inside \texttt{latex.ltx}. For this \LaTeX{} \TeX{} code has the following conventions: \texttt{@@par} and \texttt{endgraf} both refer to the default meaning (in the past this was the \texttt{initex} primitive) while \texttt{par} is the current meaning which maybe does something else.

We are now going to change this default meaning to instead run \texttt{\para_end:}, which ultimately executes the \texttt{initex} primitive but additionally adds our hooks when appropriate. This way the change is again transparent to the legacy \LaTeX{} \TeX{} code.

In most cases \texttt{\para_end:} should behave exactly like the primitive and we achieve this by simply expanding it to the primitive which is available to us as \texttt{\relax par:D}. This way we don’t have to care about whether \TeX{} just does nothing (e.g., if in vertical mode already) or generates an error, etc.

\texttt{\cs_new_protected:Npn \para_end: \{ CCC Maybe needs more explanation. TEMP NOTE: What should happen if in outer hmode with an empty hlist?

The only case we care about is when we are in horizontal mode (i.e., doing typesetting) and not also in inner mode (i.e., making paragraphs and not building an \texttt{hbox}.

\texttt{\bool_lazy_and:nnT \{ \mode_if_horizontal_p: \} \{ \bool_not_p:n \{ \mode_if_inner_p: \} \}} \{ ... 

Since this is executed for each and every paragraph in a document we try to stay as fast as possible, so we do not use the above construct but two conditionals instead. Using low-level \texttt{if_mode...} conditions would be even faster but has the danger to conflict with conditionals in the user hooks.

If \texttt{\para_end:} is executed while \TeX{} is currently doing a low-level assignment the test for horizontal mode may get executed as part of the assignment. That is normally not an issue but we just found one case where it is:

\texttt{\afterassignment\lst@vskip\@tempskipa \z@ \par}

If \TeX{} is in hmode while that assignment happens then the \texttt{par} is seen in hmode because in the above case the assignment may not be finished (one should have used \texttt{\z@skip} and the \texttt{\lst@vskip} will get inserted into the middle of the conditional. The \texttt{\lst@vskip} then changes to vmode and you get a surprising error about the \texttt{para/end} hook having changed modes even if you don’t have any hook code(!): it is the inserted \texttt{\lst@vskip} that is actually causing the change of mode. This is what happened when the output routines got started while a \texttt{lstlisting} environment (that redefines \texttt{\vskip} in this way) was active. This is really faulty coding, but we try to be proactive and guard the conditional so that any scanning is first stopped, thus:

\texttt{\scan_stop: \{ \mode_if_horizontal:TF { \{ \mode_if_inner:F { 

File n: \texttt{ltpara.dtx}
In that case the action of the primitive would be to remove the last glue (but no kerns) from the horizontal list (constructed to form a paragraph) and then to append a penalty of 10000 and the \texttt{parfillskip}: it then passes the whole list to the paragraph builder, which breaks it into lines and \TeX then returns to vertical mode.

What we want to do is to add this hook code at the end of the horizontal list before any of the above happens. If there was a glue item at the end of the list then it should get removed before the hook code gets added so we have to arrange for this removal.

As in other similar cases, it maybe best to add here a \texttt{nobreak} in case the hook itself adds glue and thus creates a non-explicit and unwanted potential breakpoint. On the other hand (as has been argued) the code in the hook should perhaps have the responsibility for adding such a guard penalty in this case. This needs further analysis and decisions (as in emails).

In either case, good documentation of these hooks is essential, covering what the hook may or should provide and all such related considerations concerning the content.

There is not much point in checking if there was really a glue item at the end of the horizontal list, instead we simply try to remove one using \texttt{tex_unskip:D}: if there wasn’t one this will do nothing.

\begin{verbatim}
  \tex_unskip:D
\end{verbatim}

We then execute the public hook (which may add some final typeset material) followed by the kernel hook that we need for adding tagging support. None of this is supposed to change the mode—at the moment we make only a very simple test for this, more devious changes go unnoticed, but too bad as they will then probably backfire badly.

\begin{verbatim}
\hook_use:n{para/end}
\@kernel@after@para@end
\mode_if_horizontal:TF {
  \tex_lastnodetype:D
\if_int_compare:w 11 = \tex_lastnodetype:D
  \tex_hskip:D \c_zero_dim
\fi:
\}
\end{verbatim}

The final action (before getting to the point where \texttt{tex_par:D} is called) is to add an extra glue item so that the primitive is prevented from removing intended glue (if there was some). If we don’t do this and the horizontal list ends in several glue items we would end up removing two glue items instead of just the last one, which would be wrong. We use glue (rather than a kern) as that will be removed by the primitive.

There is however one other \TeX optimization that hurts: in a sequence like this

\begin{verbatim}
$$ ... $$ \par
\end{verbatim}

(with \texttt{par} being the primitive) \TeX will be in horizontal mode after the display, ready to receive further paragraph text, but since the \texttt{par} follows immediately there is a “null” paragraph at the end and \TeX simply throws that away. The space between $$ and \par got already dropped during the display processing so the \texttt{par} is not removing any space and appending \texttt{parfillskip}, instead it simply goes silently to vmode.

Now if we would have added something (to prevent glue removal) that would look to \TeX like material after the display and so we would end up with an empty paragraph just containing a penalty and \texttt{parfillskip}.

We therefore check if the current hlist does end in glue (\texttt{tex_lastnodetype:D} has the value 11) and if so we add a zero-length guard skip which will be removed by the following \texttt{tex_par:D}.

\begin{verbatim}
  \if_int_compare:w 11 = \tex_lastnodetype:D
  \tex_haskip:D \c_zero_dim
  \fi:
\end{verbatim}

To run the \texttt{para/after} hook we first end the paragraph. This means that the \texttt{tex_{-}par:D} at the very end is unnecessary but executing it there unnecessarily is better than having code that tests for all the different mode possibilities.

File n: ltpara.dtx
If we were not horizontal mode (the F case from above) then the earlier hook `para/end' must have been at fault, so we report that.

\{ \msg_error:nnnn { hooks }{ para-mode }{end}{horizontal} \}

Finally close out the nested conditionals.

\}

And then we can use the primitive to truly end the paragraph.

\( \\text{End definition for \texttt{\paraa{end}}: This function is documented on page 298.} \)

The commands `\paraa{raw_indent}', `\paraa{raw_noindent}', and `\paraa{raw_end}' are like the primitives `\indent' and `\noindent' except that they can only be used in vertical mode.

To avoid issues a paragraph started by them should always be ended by `\paraa{raw_end}' and not by `\paraa{end}' or `\par' as the latter will execute hooks which then have no counterpart at the beginning of the paragraph. It is the responsibility of the programmer to make sure that they are properly paired.
\RawIndent \RawNoIndent \RawParEnd

The \LaTeX\ names for starting and ending a paragraph without adding any hooks.

\cs_set_eq:NN \RawIndent \para_raw_indent:\
\cs_set_eq:NN \RawNoindent \para_raw_noindent:\
\cs_set_eq:NN \RawParEnd \para_raw_end:\

(End definition for \RawIndent, \RawNoindent, and \RawParEnd. These functions are documented on page 299.)

This ends the para module code.

\par
\endgraf
\@@par

Having the new default definition for \par we also have to set it up so that it gets used.
This involves three commands: \par, \@@par (to which \TeX\ resets \par occasionally) and \endgraf, which is another name for the “default” action of \par.

\cs_set_eq:NN \par \para_end:\
\cs_set_eq:NN \@@par \para_end:\
\cs_set_eq:NN \endgraf \para_end:\

(End definition for \par, \endgraf, and \@@par. These functions are documented on page 298.)

While this is not integrated properly into the format we have to redo the \everypar setting from the kernel, otherwise that gets lost (as it happens before that file is loaded).
\everypar{\@nodocument} %% To get an error if text appears before the

3.2 The error messages

This one is used when we detect that some hook code has changed the mode where it shouldn't, e.g., by starting or ending a paragraph. The first argument is the hook name second the mode it should have stayed in but didn't.

\msg_new:nnnn { hooks } { para-mode }
{\verbatim
  Illegal mode change in hook 'para/#1'.\par
  Hook code did not remain in #2 mode.
}

And here is one used in the “raw” commands when they are used outside of vertical mode.

\msg_new:nnnn { latex2e } { raw-para }
{\verbatim
  Not in vertical mode.
}

File n: ltpara.dtx 308
We also need to clean up the primitive \texttt{everypar} as that should no longer execute any code by default. And, of course, make \texttt{everypar} become the primitive again.
Abstract

This code defines the \DocumentMetadata interface.

1 Introduction

In the past there was no dedicated location to declare settings concerning a document as a whole. Settings are placed somewhere in the preamble or with the class options or even with some package options. For some settings this can be too late, for example the pdf version can no longer be changed if a package has used code which already opened the PDF.

\DocumentMetadata as a new command unifies such settings in one place. It must be used before \documentclass but can be issued more than once there.

At the moment most of the code run by \DocumentMetadata is external to the format and subject to change. This includes the supported key/values.

For that reason all that happens right now in the format is to look for suitable support files and if found, to redirect the processing to them.

1.1 \DocumentMetadata

\DocumentMetadata{⟨key-value list⟩}

The keys defined for \DocumentMetadata currently allow to set the PDF version, to set the PDF /Lang, to uncompress a PDF, to set the language and to declare a few PDF standards and some color profiles.

\DocumentMetadata is also used to activate the new PDF management code and it loads a number of required files for the PDF management code. As this forces the loading of the backend files, a backend which can’t be detected automatically like dvipdfmx, must be set in the first \DocumentMetadata call (if there is more than one).

The full set of keys currently supported is documented in documentmetadata-support.pdf for now.

2 The Implementation

\documentmetadata-support.pdf

Not needed yet but ...

\ExplSyntaxOn
\NewModuleRelease{2022/06/01}{ltmeta}
\let \IfDocumentMetadataTF \@secondoftwo
\protected\def\DocumentMetadata{%
\InputIfFileExists{documentmetadata-support.ltx}%
}%
The above file is changing \DocumentMetadata to a suitable definition (or so we hope), so that we can try again — if not tough.

If the file can’t be found we say so and carry on without it.

\begin{verbatim}
\@latex@error{No support files for \noexpand\DocumentMetadata found}  
{Is the 'LaTeX-lab' bundle installed?\MessageBreak Without it, the declaration is ignored.}%
\end{verbatim}

No point in trying this more than once if there are several calls in the document.

\begin{verbatim}
\let\DocumentMetadata\@gobble
\let\IfDocumentMetadataTF\@firstoftwo
\DocumentMetadata
\end{verbatim}

To allow package and class author to support for document links we provide also the new interface commands of the hyperref package for the creation of targets.

\begin{verbatim}
\NewDocumentCommand\MakeLinkTarget{sO{}m}{\ifvmode\special\else\@savsf\spacefactor\smash\spacefactor\@savsf\fi}
\NewDocumentCommand\LinkTargetOn{\NewDocumentCommand\LinkTargetOff{\NewDocumentCommand\NextLinkTarget{m}{}}\NewDocumentCommand\LinkTargetOn{}}\NewDocumentCommand\LinkTargetOff{\NewDocumentCommand\NextLinkTarget{m}{}}
\end{verbatim}

(End definition for \MakeLinkTarget and others.)

We do not undo \MakeLinkTarget and friends if we roll back, in case they are used in packages that themselves do not offer rollback. This way a roll forward adds them, but the dummies remain if you roll back and you don’t get missing csname errors if they are used.

\begin{verbatim}
(latexrelease)\IncludeInRelease{0000/00/00}{ltmeta}\%
\end{verbatim}

Again for the future ...

\begin{verbatim}
\ExplSyntaxOff
\end{verbatim}

Restore module prefix (if any):

\begin{verbatim}
(@@=)
\end{verbatim}
1 Spacing

This section deals with spacing, and line- and page-breaking.

1.1 User Commands

\nopagebreak \(\langle i \rangle\) : \(\langle i \rangle = 0,...,4\).

  Default argument = 4. Puts a penalty into the vertical list output as follows:
  - 0: penalty = 0
  - 1: penalty = \@lowpenalty
  - 2: penalty = \@medpenalty
  - 3: penalty = \@highpenalty
  - 4: penalty = 10000

\pagebreak \(\langle i \rangle\) : same as except negatives of its penalty

\linebreak \(\langle i \rangle\) : analog of the above

\nolinebreak : inhibits page breaking most places by setting the following penalties to 10000:

- \interlinepenalty
- \postdisplaypenalty
- \interdisplaylinepenalty
- \@beginparpenalty
- \@endparpenalty
- \@itempenalty
- \@secpenalty
- \interfootnotelinepenalty

\newline

\vspace{\langle length \rangle} \newline

\noindent

Note: \* adds a \vadjust{\penalty 10000}

OBSOLETE COMMANDS (which never made it into the manual):

- \obeycr : defines <CR> == \relax
- \restorecr : restores <CR> to its usual meaning.

1.2 Chris’ comments

There are several aspects of the handling of space in horizontal mode that are inconsistent
or do not work well in some cases. These are largely concerned with ignoring the effect
of space tokens that would otherwise typeset an inter-word space.

Negating the effect of such space tokens is achieved by two mechanisms:

- \unskip is used to remove the glue just added by a space that has already had its
effect; it is sometimes invoked after an \ifdim test on \lastskip (see below);

- \ignorespaces is used to ignore space-tokens yet to come.
The test done on \texttt{\lastskip} is sometimes for equality with zero and sometimes for
being positive. Recall also that the test is only on the natural length of the glue and that
no glue cannot be distinguished from glue whose natural length is zero: to summarise, a
pretty awful test. It is not clear why these tests are not all the same; I think that they
should all be for equality. One place where \texttt{\unskip} is often used is just before a \texttt{\par}
(which itself internally does an \texttt{\unskip}) and one bit of code (in \texttt{@item}) even has two
\texttt{\unskips} before a \texttt{\par}. These uses may be fossil code but if they are necessary, maybe
\texttt{@killglue} would be even safer.

Such removal of glue by \texttt{\unskip} may sometimes have the wrong result, removing
not the glue from a space-token but other explicit glue; this is sometimes not what is
intended.

A common way to prevent such removal is to add an \texttt{\hskip\z@} after the glue that
should not be removed. This protects that glue against one \texttt{\unskip} with no test but
not against more than one. It does work for ‘tested \texttt{\unskips}’. This is used by \texttt{\hspace*}
but not by \texttt{\hspace}; this is inconsistent as the star is supposed to prevent removal only
at the beginning of a line, not at the end, or in a tabular, etc.

If this reason for removing glue were the only consideration then a tested-\texttt{\unskip}
and protection by \texttt{\hskip\z@} would suffice but would need to be consistently imple-
mented.

However, the class of invisibles, commands and environments tries to be even clev-
erer: one of these tries to leave only one inter-word space whenever there is one before it
and one after it; and it does this quite well.

But problems can arise when there is not a space-token on both sides of it; in
particular, when an invisible appears at the beginning or end of a piece of text the
method still leaves one space token whereas usually in these cases it should leave none.

Also, the current rules do not work well when more than one such command appears
consecutively, separated by space-tokens; it leaves glue between every other invisible.

There is also a question about what these commands should do when they occur next
to spaces that do not come from space tokens but, for example, from \texttt{\hspace}. Should
they still produce ‘just one space’? If so, which one? It is good to note that the manual
is sufficiently cautious about invisibles that we are not obliged to make anything work.

Another interesting side-road to explore is whether the space-tokens either side of
an \texttt{\hspace{...}} should be ignored.

One alternative to the current algorithm that is often suggested is that all glue
around the invisible should be consolidated into a space after it (usually without stating
how much glue should be put there). The command \texttt{\nolinebreak} is implemented this
way (and \texttt{\linebreak} should also be). This does not work correctly for the following
common case:

\begin{verbatim}
... some text
\index{some-word}

some-word and more text.
\end{verbatim}

This is optimal coding since it is normal to index a word that gets split across a page-
break on its starting page. This would, on the other hand, fix another common (and
documented) failure of the current system: when the invisible is the last thing in a
paragraph the space before it is not removed and, worse, it is also hidden from the
paragraph-ending mechanism so that an ‘empty’ line can be created at the end of the
paragraph.
Another deficiency (I think) of the current system is that the following is treated as
having the \index command between the paragraphs, which is probably not what the
author intended (since there is no empty line after it).

\index{beginnings}
Beginnings of paragraphs ...

I know of no algorithm that will handle satisfactorily even all the most common cases;
note that it could be that the best algorithm may be different for different invisibles
since, for example, the common uses and expected behaviour of \index, \marginpar,
\linebreak, \pagebreak and \vspace are somewhat different. [For example, is \vspace
ever used in the middle of a paragraph?]

One method that can (and is) used to make invisible commands produce no space
when used at the beginning of text is to put in some glue that is nearly enough the same
as no glue or glue of zero length in all respects except for the precise test for not being
exactly equal to zero; examples of such glue are \hskip 1sp and, possibly better but
more complex, \hskip -1sp \hskip 1sp. However, this only works when it is known
that user-supplied text is about to start.

Some similar concerns apply to the handling of space and penalties in vertical mode;
there is an extra hurdle here as \unskip does not work on the main vertical list. The
complexity of the tests done by \addvspace have never been explained.

The implementation of space hacks etc for vertical mode is another major area that
needs further attention; my earlier experiments did not produce much improvement over
the current unsatisfactory situation.

One particular problem is what happens when the following very natural coding is
used (part of the problem here is that this looks like an hmode problem, but it is not):

... end of text.

\begin{enumerate}
  \item \label{item:xxx} Item text.
\end{enumerate}

1.3 Some immediate actions

- Fix bug in \linebreak.
- Fix bug in \\*.
- Reimplement \, etc, removing extra \vadjust and getting better error trapping
  (this seems to involve a lot more tokens).
- Investigate whether \, etc need to be errors in vmode; I think that they could be
  noops (maybe with a warning).
- Make all(?) \unskips include test for zero skip (rather than other tests or no test).
- Consider replacing \hskip 1sp by something better (here called an ‘infinitesimal’
  skip).
- Look at all \hskip\z@ (or similar) to see if they should be changed to an ‘infinitesimal’
  skip.
• Resolve the inconsistency between \hspace and \hspace*.
• Remove unnecessary \unskip s.
• Investigate and rationalise the ‘newline’ code.
• Find better algorithms for all sorts of things or, easier(?), fix TeX itself.

1.4 The code

\message{spacing,}
\message{begin}
\pagebreak
\nopagebreak
\linebreak
\nolinebreak
\samepage
\DeclareRobustCommand\pagebreak{\@testopt\@no@pgbk-}4}
\DeclareRobustCommand\nopagebreak{\@testopt\@no@pgbk4}
\DeclareRobustCommand\linebreak{\@testopt\@no@lnbk-}4}
\DeclareRobustCommand\nolinebreak{\@testopt\@no@lnbk4}
\DeclareRobustCommand\samepage{
\interlinepenalty\@M
\postdisplaypenalty\@M
\interdisplaylinepenalty\@M
\@beginparpenalty\@M
\@endparpenalty\@M
\@itempenalty\@M
\@secpenalty\@M
\interfootnotelinepenalty\@M}
\endinput
The purpose of the new code is to fix a few bugs; however, it also attempts to optimize the following, in order of priority:

1. efficient execution of plain `\`; 
2. efficient execution of `\[...];`
3. memory use;
4. name-space use.

The changes should make no difference to the typeset output. It appears to be safe to use `\reserved@e` and `\reserved@f` here (other reserved macros are somewhat disastrous).

These changes made `\newline` even less robust than it had been, so now it is explicitly robust, like `\`.

The internal definition of the ‘normal’ definition of `\`. 

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\let\@normalcr

\endinput

\IncludeInRelease{0000/00/00}{\@normalcr}{Make robust}

\DeclareRobustCommand\{
\let \reserved@e \relax
\let \reserved@f \relax
\@ifstar{\let \reserved@e \vadjust \let \reserved@f \nobreak \@xnewline}{}
\@xnewline
\expandafter\let\expandafter\@normalcr
\csname\expandafter\@gobble\string\endcsname
\endinput

(End definition for \ and \@normalcr.)

\vspace@calcify Helper command to produce a \vskip that is first run through \setlength. This way the calc package can operate on the argument value.

\def\vspace@calcify#1{egingroup\setlength\skip@{#1}\vskip\skip@\endgroup}

(End definition for \vspace@calcify.)

\newline A simple form of the ‘normal’ definition of \.
\DeclareRobustCommand\newline{\@normalcr\relax}

(End definition for \newline.)

\xnewline
\def\xnewline{\ifnextchar[\ ] bracket matching
\newline
{\@newline}

(End definition for \xnewline.)

\newline
\endinput

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The \nobreak added to prevent null lines when ~ ends an overfull line. Change made 24 May 89 as suggested by Frank Mittelbach and Rainer Schöpf

\@gnewline Registers used to save the space factor and last skip.
\newdimen\@savsk
\newcount\@savsf

(End definition for \@savsk and \@savsf.)
\@bsphack \@bsphack and \@esphack used by macros such as \index and \begin{float} \end{float} that want to be invisible — i.e., not leave any extra space when used in the middle of text. Such a macro should begin with \@bsphack and end with \@esphack. The macro in question should not create any text, nor change the mode.

Before giving the current definition we give an extended definition that is currently not used (because it doesn’t work as advertised:-)

These are generalised hacks which attempt to do sensible things when ‘invisible commands’ appear in vmode too.

They need to cope with space in both hmode (plus spacefactor) and vmode, and also cope with breaks etc. In vmode this means ensuring that any following \addvspace, etc sees the correct glue in \lastskip.

In fact, these improved versions should be used for other cases of ‘whatsits, thingies etc’ which should be invisible. They are only for commands, not environments (see notes on \@Esphack).

BTW, anyone know why the standard hacks are surrounded by \ifmmode\else rather than simply \ifhmode?

And are there any cases where saving the spacefactor is essential? I have some extensions where it is, but it does not appear to be so in the standard uses.

\def \@bsphack{/% 
\relax \ifvmode 
\@savsk \lastskip 
\ifdim \lastskip=\z@ 
\else 
\vskip -\lastskip 
\fi 
\else 
\ifhmode 
\@savsk \lastskip 
\@savsf \spacefactor 
\fi 
\fi

I think that, in vmode, it is the safest to put in a \nobreak immediately after such things since writes, inserts etc followed by glue give valid breakpoints and, in general, it is possible to create breaks but impossible to destroy them.

\def \@esphack{% 
\relax \ifvmode 
\nobreak 
\ifdim \@savsk=\z@ 
\else 
\vskip\@savsk 
\fi 
\else 
\ifhmode 
\@savsk \lastskip 
\@savsf \spacefactor 
\else 
\ifhmode 
\spacefactor \@savsf 
\ifdim \@savsf>\z@ 
\ignorespaces 
\fi

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For the moment we are going to ignore the vertical versions until they are correct.

(End definition for \@bsphack.)

\@esphack Companion to \@bsphack. If this command is not properly paired with \@bsphack one might end up with a low-level \TeX error: “BAD spacefactor”. One possible cause is calling \@bsphack in vertical mode, then doing something that gets you (sometimes) into horizontal mode and finally calling \@esphack. Even if no error is generated that is wrong, because \@esphack will then use the saved values for \@savsk and \@savsf from some earlier invocation of \@bsphack which will have nothing to do with the current situation.
\@Esphack \A variant of \@esphack that sets the @ignore switch to true (as \@esphack used to do previously). This is currently used only for floats and similar environments. w
Another variant which is useful for invisible things which should not live in vmode (this is how some people feel about marginals).

If it occurs in vmode then it enters hmode and ensures that \@savsk is nonzero so that the \ignorespaces is put in later. It is not used at present.

\def \@vbsphack{ %
\relax \ifvmode
\leavevmode
\@savsk 1sp
\@savsf \spacefactor
\else
\ifhmode
\@savsk \lastskip
\@savsf \spacefactor
\fi
\fi
}

1.5 Vertical spacing

\LaTeX supports the plain \TeX commands \smallskip, \medskip and \bigskip. However, it redefines them using \vspace instead of \vskip.

Extra vertical space is added by the command \addvspace{⟨skip⟩}, which adds a vertical skip of ⟨skip⟩ to the document. The sequence \addvspace{⟨s1⟩} \addvspace{⟨s2⟩} is equivalent to \addvspace{⟨maximum of s1, s2⟩}.

\addvspace should be used only in vertical mode, and gives an error if it’s not. The \addvspace command does not add vertical space if \@minipage is true. The minipage environment uses this to inhibit the addition of extra vertical space at the beginning.

Penalties are put into the vertical list with the \addpenalty{⟨penalty⟩} command. It works properly when \advance and \addvspace commands are mixed.

The @nobreak switch is set true used when in vertical mode and no page break should occur. (Right now, it is used only by the section heading commands to inhibit page breaking after a heading.)

\addvspace{SKIP} ==
BEGIN
if vmode
then if @minipage
else if \lastskip =0
  then \vskip SKIP
else if \lastskip < SKIP
  then \vskip -\lastskip
  \vskip SKIP
else if SKIP < 0 and \lastskip >= 0
  then \vskip -\lastskip
  \vskip \lastskip + SKIP
fi fi fi fi fi
else useful error message (CAR).
fi
END

\@xaddvskip Internal macro for \vspace handling the case that space has previously been added.
\def\@xaddvskip{%
  \ifdim\lastskip<\@tempskipb
    \vskip-\lastskip
    \vskip\@tempskipb
  \else
    \ifdim\@tempskipb<\z@\z@\z@
      \ifdim\lastskip<\z@
        \else
        \advance\@tempskipb\lastskip
        \vskip-\lastskip
        \vskip\@tempskipb
      \fi
    \fi
  \fi
}

\addvspace Add vertical space taking into account space already added, as described above.
\def\addvspace#1{% #1\ifvmode\if@minipage\else\ifdim\lastskip=\z@
  \@vspace@calcify{#1}\i\fi\else\@noitemerr\fi}

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Fix provided by Donald (though the original fix was not good enough). In 2005 Plamen Tanovski discovered that this fix wasn’t good enough either as the \vskip kept getting bigger if several \addpenalty commands followed each other. Donald kindly send a new fix.

\def\addpenalty#1{\ifvmode\if@minipage\else\ifdim\lastskip=\z@\vskip\#1\relax\else\@tempskipb\lastskip\fi\else\@noitemerr\fi\fi\EndIncludeInRelease}

\begin{document}

We have to make sure the final \vskip seen by \TeX\ is the correct one, namely \@tempskipb. However we may have to adjust for \prevdepth when placing the penalty but that should not affect the skip we pass on to \TeX.

\begingroup
\@tempskipa\@tempskipb
\advance\@tempskipb\ifdim\prevdepth>\maxdepth\maxdepth\else\fi
\vskip-\@tempskipb
\penalty#1
\fi
\ifdim\@tempskipa=\@tempskipb
\penalty#1\else\vskip\@tempskipa\fi
\endgroup

\end{document}
Do nothing if the \texttt{prevdepth} check made no adjustment.
\begin{verbatim}
  \else
\fi
\endgroup
\fi}
\end{verbatim}

Combine the prevdepth adjustment into a single skip.
\begin{verbatim}
\advance\@tempskipb -\@tempskipa
\vskip \@tempskipb
\fi
\end{verbatim}

The final skip is always the specified length.
\begin{verbatim}
\vskip \@tempskipa
\end{verbatim}

The new code for these commands depends on the following facts:
- The value of prevdepth is changed only when a box or rule is created and added to a vertical list;
- The value of prevdepth is used only when a box is created and added to a vertical list;
- The value of prevdepth is always local to the building of one vertical list.
\begin{verbatim}
\DeclareRobustCommand\vspace{\@ifstar\@vspacer\@vspace}
\end{verbatim}
We support calc syntax in the argument and therefore use \setlength.

\def\vspace #1{\ifvmode\vskip #1\vskip\z@skip\else\@bsphack\vadjust{\@restorepar\vskip #1}\vskip\z@skip\@esphack\fi}
\def\vspacer#1{\ifvmode\dimen@\prevdepth\hrule \@height\z@\nobreak\@vspace@calcify{#1}\vskip\z@skip\prevdepth\dimen@\else\@bsphack\vadjust{\@restorepar\hrule \@height\z@\nobreak\@vspace@calcify{#1}\vskip\z@skip}\@esphack\fi}
1.6 Horizontal space (and breaks)

This idea is borrowed from the amsmath package but here we define a robust command. This command is a low-level command designed for use only before hyphens or dashes (such as -, --, or ---).

It could probably be better implemented: it may need its own private token register and temporary command.

Setting the hyphen in a box and then unboxing it means that the normal penalty will not be added after it—and if the penalty is not there a break will not be taken (unless an explicit penalty or glue follows, thus the final \nobreak).

Note that even if it is not followed by a ‘-’, it still leaves vmode and sets the space-factor; so use it carefully!

\nobreakdashes

\DeclareRobustCommand{\nobreakdashes}{%
\leavevmode
\toks@{}%
\def\reserved@a##1{\toks@\expandafter{\the\toks@-}%
\futurelet\@let@token \reserved@b}%
\def\reserved@b {\ifx\@let@token -%
\expandafter\reserved@a
\else%
\@bsphack
\vadjust{\@restorepar
\hrule \@height\z@}
\nobreak%
\vskip \z@skip}
\@esphack
\fi}%
\EndIncludeInRelease

\smallskipamount
\medskipamount
\bigskipamount

(End definition for \vspace , \@vspace , and \@vspacer.)

\smallskip
\medskip
\bigskip

(End definition for \smallskip, \medskip, and \bigskip.)

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\nobreakspace
This is a robust command that produces a horizontal space at which, in paragraph-mode, a line-break is not possible. We then define an active ~ to expand to it since this is the documented behaviour of ~. One reason for introducing this is that some 8-bit input encodings have a slot for such a space and we do not want to use active characters as the \TeX internal commands.

The braces in the definition of ~ are needed to ensure that a following space is preserved when reading to/from internal files.

We need to keep \@xobeysp as it is widely used; so here it is let to the non-robust command \nobreakspace.

\DeclareRobustCommand{\nobreakspace}{{%\leavevmode\nobreak}\ }
\catcode '\~\=13
\def~{\nobreakspace{}}
\expandafter\let\expandafter\@xobeysp\csname nobreakspace \endcsname
(End definition for \nobreakspace and \@xobeysp.)

\@ Placed before a ".", makes it a sentence-ending period. Does the right thing for other punctuation marks as well. Does this by setting spacefactor to 1000.
\DeclareRobustCommand\hspace{\@ifstar\@hspacer\@hspace}
(End definition for \hspace.)
\@hspace

\@hspacer

\fill

\stretch

\enspace

\leavevmode@ifvmode
(End definition for \leavevmode@ifvmode.)

\enskip \quad \qquad

\enskip \quad \qquad

(End definition for \enskip, \quad, and \qquad.)

For Unicode engines, make the Unicode soft hyphen an active character defined as \-. 

\ifx\Umathcode\@undefined\else
\catcode"AD=13
\def^^ad{\-}
\fi

\obeycr \restorecr

The following definitions will probably get deleted or moved to compatibility mode soon.

\enskip \quad \qquad

(End definition for \obeycr and \restorecr.)

(End definition for \leavevmode@ifvmode.)

\enskip \quad \qquad

\enskip \quad \qquad

(End definition for \enskip, \quad, and \qquad.)

\enskip \quad \qquad

(End definition for \enskip, \quad, and \qquad.)

\enskip \quad \qquad

(End definition for \enskip, \quad, and \qquad.)
File q
ltlogos.dtx

1 Logos

Various logos are defined here.

\TeX

The \TeX logo, adjusted so that a full stop after the logo counts as ending a sentence.
1 \langle∗2ekernel⟩
2 \DeclareRobustCommand\TeX{T\kern-.1667em\lower.5ex\hbox{E}\kern-.125emX\@}

(End definition for \TeX.)

\LaTeX

The \LaTeX logo.
3 \DeclareRobustCommand{\LaTeX}{L\kern-.36em%
4 \sbox\z@ T%
5 \vbox to\ht\z@{\hbox{\check@mathfonts
6 \fontsize\sf@size\z@
7 \math@fontsfalse\selectfont
8 A}%
9 \vss}
}
10 \kern-.15em
11 \TeX}

(End definition for \LaTeX.)

\LaTeXe

The \LaTeXe logo as proposed by A-W designers.
13 \DeclareRobustCommand{\LaTeXe}{\mbox{\m@th
14 \if b\expandafter\@car\f@series\@nil\boldmath\fi
15 \LaTeXe\kern.15em2\$_\textstyle\varepsilon$_}
16 ⟨/2ekernel⟩

(End definition for \LaTeXe.)
File r
ltfiles.dtx

1 File Handling

The following user commands are defined in this part:

\document (ie \begin{document})
Reads in the .AUX files and \catcode's @ to 12.
\nofiles
Suppresses all file output by setting \@files false.
\includeonly \{\NAME1, ... ,\NAMEn\}
Causes only parts \NAME1, ... ,\NAMEn to be read by their \include commands. Works by setting partsw true and setting \@partlist to \NAME1, ... ,\NAMEn.
\include \{(\NAME)\}
Does an \input \NAME unless \@partsw is true and \NAME is not in \@partlist. If \@files is true, then it directs .AUX output to \NAME.AUX, including a checkpoint at the end.
\input \{(\NAME)\}
The same as \TeX's \input, except it allows optional braces around the file name. In \BtX, it also avoids the primitive 'missing file' error, if the file can not be found.
\IfFileExists \{(\NAME)\}\{\{then\}\}\{\{else\}\}
If the file exists on the system, execute then otherwise execute else.
\InputIfFileExists \{(\NAME)\}\{\{then\}\}\{\{else\}\}
If the file exists on the system, execute then and input \NAME otherwise execute else.

Historical BtX comments (not necessarily accurate any more):

:\{\*2ekernel\}
:\message{files,}

VARIABLES, SWITCHES AND INTERNAL COMMANDS:
\@mainaux : Output file number for main .AUX file.
\@partaux : Output file number for current part's .AUX file.
\@auxout : Either \@mainout or \@partout, depending on which .AUX file output goes to.
\@input\{foo\} : If file foo exists, then \@input's it, otherwise types a warning message.
@files : Switch -- set false if no .AUX, .TOC, .IDX etc files are to be written
@partsw : Set true by a \includeonly command.
\@partlist : Set to the argument of the \includeonly command.
\cp@FOO : The checkpoint for \include'd file FOO.TEX, written by \@writeckpt at the end of file FOO.AUX

\includeonly\{FILELIST\} ==
BEGIN
\@partsw := T
\@partlist := FILELIST
END

\include{FILE} ==
BEGIN
\cleardoublepage
if \@filesw = T
then \immediate\write\@mainaux{\string\input{FILE.AUX}}
fi
if \@partsw = T
then \@tempswa := F
  \reserved@b == FILE
  for \reserved@a := \@partlist
do if eval(\reserved@a) = eval(\reserved@b)
    then \@tempswa := T fi
  od
fi
if \@tempswa = T
then \@auxout := \@partaux
  if \@filesw = T
    then \immediate\openout\@partaux{FILE.AUX}
        \immediate\write\@partaux{\relax}
  fi
  \@input{FILE.TEX}
  \cleardoublepage
  \@writeckpt{FILE}
if \@filesw then \closeout \@partaux fi
\@auxout := \@mainaux
else \cp@FILE
fi
END

\@writeckpt{FILE} ==
BEGIN
if \@filesw = T
  \immediate\write on file \@partaux:
    \@setckpt{FILE}{ }
  for \reserved@a := \cl@ckpt
do \immediate\write on file \@partaux:
    \global\string\setcounter{\eval(\reserved@a)}{\c@eval(\reserved@a)}
  od
  \immediate\write on file \@partaux: 
fi
END

\@setckpt{FILE}{LIST} ==
BEGIN

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G \cp@FILE := LIST
END

INITIALIZATION
\@tempswa := T

End of historical \TeX 2.09 comments.
\@mainaux
\@partaux
newwrite\@mainaux
newwrite\@partaux
(End definition for \@mainaux and \@partaux.)
\if@filesw
\if@partsw
newif\if@filesw \@filesut\false
newif\if@partsw \@partsw\false
(End definition for \if@filesw and \if@partsw.)
\@clubpenalty
This stores the current normal (non-infinite) value of \clubpenalty; it should therefore
be reset whenever the normal value is changed (as in the bibliography in the standard
styles).
newcount\@clubpenalty
\@clubpenalty \clubpenalty
(End definition for \@clubpenalty.)
\document
⟨/2ekernel⟩
(latexrelease)\IncludeInRelease{2020/10/01}%
(latexrelease) \{\document\}{Added hook to load l3backend code}%
(+2ekernel||latexrelease)
def\document{%
We do cancel the grouping as part of the \begin handling (this is now done inside
\begin instead) so that the env/{env}/begin hook is not hidden inside \begingroup
... \endgroup.
% \endgroup
\UseOneTimeHook{begindocument/before}%
\@kernel@after@begindocument@before
Added hook to load l3backend code:
\@expl@sys@load@backend@@
\ifx\@unusedoptionlist\@empty\else
\@latex@warning@no@line{Unused global option(s):^^J%
@spaces{\@unusedoptionlist}}%
\fi
\@colht\textheight
\@colroom\textheight \vsize\textheight
\columnwidth\textwidth
\@clubpenalty\clubpenalty
\if@twocolumn
\advance\columnwidth \columnsep
Dateline 1991/03/26: FMi added \process@table to support NFSS; This will also work with old lfonts if no other style defines \process@table. The following line forces the initialization of the math fonts.

\process@table
\let\glb@currsize\@empty % Force math initialization.
\normalsize
\everypar{}%

So that punctuation in headings is not disturbed by verbatim or other local changes to the space factor codes, save the document default here. This will be locally reset by the output routine. For special cases a class may want to define \normalsfcodes directly, in case that definition will be used. (This is an old bug, problem existed in L\TEX2.0x and plain \TeX.)

\if\normalsfcodes\@empty
  \ifnum\sfcode'.=\@m
    \let\normalsfcodes\frenchspacing
  \else
    \let\normalsfcodes\nonfrenchspacing
  \fi
\fi

For similar reasons also save the default language, this will be reset locally in the output routine. In particular it allows hyphenation in the page head even if the page break happens in verbatim. If this has already been set by a package, set to the value of \language at this point.

\if\document@default@language\m@ne
  \chardef\document@default@language\language
\fi

Way back in 1991 (08/26) FMi & RmS set the @noskipsec switch to true in the preamble and to false here. This was done to trap lists and related text in the preamble but it does not catch everything; hence Change 1.1g was introduced.

@noskipsecfalse
\let@refundefinedrelax

Just before disabling the preamble commands we execute the begin document hook which contains any code contributed by \AtBeginDocument. Also disable the gathering of the file list, if no \listfiles has been issued. \AtBeginDocument is redefined at this point so that and such commands that get into the hook do not chase their tail...
Most of the following assignments will be done globally in case the user adds something like `\begin{multicols}` to the document hook, i.e. starts are group in `\begin{document}`.

Since a value of exactly 0pt for `\topskip` causes `\twocolumn[]` to misbehave, we add this check, hoping that it will not cause any problems elsewhere.

\ifdim\topskip<1sp\global\topskip 1sp\relax\fi
\global\@maxdepth\maxdepth
\global\let\@begindocumenthook\@undefined
\ifx\@listfiles\@undefined
\global\let\@filelist\relax
\global\let\@addtofilelist\@gobble
\fi

At the very end we disable all preamble commands. This has to happen after the begin document hooks was executed so that this hook can still use such commands.

\gdef\do##1{\global\let##1\@notprerr}\
\@preamblecmds

The next line saves tokens and also allows `\@nodocument` to be used directly to trap preamble errors.

\global\let\@nodocument\relax

The next line is a pure safety measure in case a do list is ever expanded at the wrong place. In addition it will save a few tokens to get rid of the above definition.

\global\let\do\noexpand

Use of the hook might mean that we are already in horizontal mode, so ignore the space after `\begin{document}`.

\ignorespaces}

The `\begindocument` hook already existed in the kernel since 1994 under the name `\atbegindocumenthook` the additional ones are originally from the `etoolbox` package under the names `\@endpreamblehook \afterpreamble`.

\NewHook{begindocument}
\NewHook{begindocument/before}
\NewHook{begindocument/end}

Above we used two kernel only hooks to be run after the public `\begindocument/before` and after `\begindocument` hooks.

In `\@kernel@after@begindocument@before` we already place one action: drop the fast execution code for the `env/document/begin` hook. That hook marks the end of the preamble and should therefore only be run once. In a normal document that is anyway the case (so the code would just sit there taking up space afterwards, which these days is rather harmless), however, in more complicated scenarios where several full documents are combined to a single document it might get applied several times with harmful effects. We therefore explicitly drop it at this point. the coding is somewhat obscure due to the name of the macro which requires constructing.

\edef \@kernel@after@begindocument@before {%
\let\expandafter\noexpand\csname

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These internal hooks are already declared earlier (in \texttt{latex}) so that other modules could write to them.
The setting of \empty is just a flag. This command may be defined in a class or package file. If it is still \empty at \begin{document} it will be defined to be \frenchspacing or \nonfrenchspacing, depending on which of those appears to be in effect at that point.

\normalsfcodes

\nofiles Set \@filesfalse which suppresses the places where \LaTeX{} makes \texttt{immediate} writes. The \texttt{makeindex} and \texttt{makeglossary} are disabled. \texttt{protected@write} is redefined not to write to the file specified, but rather to write a blank line to the log file. This ensures that a \texttt{whatsit} node is still created, and so spacing is not affected by the \texttt{nofiles} command; to ensure this more generally, the \texttt{if@nobreak} test is needed.

\protected@write

This takes three arguments: an output stream, some initialization code, and some text to write. It then writes this, with appropriate handling of \texttt{protect} and \texttt{thepage}.
In the definition of \include, \def\reserved@b changed to \edef\reserved@b to be consistent with the \edef in \includeonly. (Suggested by Rainer Schöpf & Frank Mittelbach. Change made 20 Jul 88.)

Changed definition of \include to allow space at end of file name — otherwise, typing \include{foo } would cause \LaTeX{} to overwrite foo.tex. Change made 24 May 89, suggested by Rainer Schöpf and Frank Mittelbach

Made \include check for being used inside an \include'd file, as this will not work and cause surprising results.

Here the normalization will add .tex for all files, (it uses the same normalization as the hooks), so we need to remove that manually. \@strip@tex@ext does that.

For historical reasons \include expects an argument delimited by a space. This is kept (though unnecessary now) to avoid errors in other packages that use \include directly.

Here in \includeonly we also need to strip .tex after normalization:

Because the argument to \includeonly is a comma-separated list of filenames where there may be commas’s preceding some of the filenames or trailing them. Therefore we need to take the list apart, remove the unwanted spaces while leaving the spaces in the filenames intact.

(End definition for \protected@write.)
These macros take a \(\text{\texttt{detokenized}}\) file name and remove any .\texttt{tex} extension. Extra care is taken to not remove the string .\texttt{tex} from the middle of a file name: it is only removed if it’s the very last thing in the file name.

```latex
\def\reserved@a#1{\
\def\@strip@tex@ext##1{\expandafter\@strip@tex@ext@aux##1\@nil\@nil
#1\@nil\relax\@nnil}\
\def\@strip@tex@ext@aux##1#1\@nil##2\@nnil{\ifx\relax##2\@empty\expandafter\@cdr\expandafter\@empty\@cdr{}##1\%
\else##1\fi}}%\
\expandafter\reserved@a\expandafter{.\texttt{tex}}\langle/2ekernel\rangle\end{latex}
```

(End definition for \@strip@tex@ext and \@strip@tex@ext@aux.)

```latex
\end{IncludeInRelease}\
\IncludeInRelease{2019/10/01}%\{\includeonly\{Spaces in file names\}\}
```

```latex
\def\includeonly#1{\@partswtrue\edef\@partlist{\zap@space#1 \@empty}}
\def\include#1{\relax\ifnum\@auxout=\@partaux\@latex@error{\string\include\space cannot be nested}\@eha\else\set@curr@file{\zap@space}\let\@partlist\@curr@file\fi}
```

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\@include
\hfill
\sourcecode{}

\def\@include#1 {%
\ifx\@nodocument\relax
\clearpage
\if@filesw
\immediate\write\@mainaux{\string\@input{#1.aux}}%
\fi
\@tempswatrue
\if@partsw
\@tempswafalse
\edef\reserved@b{#1}%
\@for\reserved@a:=\@partlist\do
{\ifx\reserved@a\reserved@b\@tempswatrue\fi}%
\fi
\if@tempswa
\let\@auxout\@partaux
\if@filesw
\immediate\openout\@partaux "#1.aux"
\immediate\write\@partaux{\relax}%
\fi
\fi
\let\@auxout\@mainaux
\immediate\write\@auxout{\string\@include{#1}}%
\fi}

Now before going to the hooks we need to set \CurrentFile:

\sourcecode{\@filehook@set@CurrentFile}

Execute the before hooks just after we switched the .aux file ...
\sourcecode{\UseHook{include/before}}
\sourcecode{\UseOneTimeHook{include/#1/before}}
\sourcecode{\@input{#1.tex}}

... then end hooks ...
\sourcecode{\UseOneTimeHook{include/#1/end}}
\sourcecode{\UseHook{include/end}}
\sourcecode{\clearpage}

... and after the \clearpage the after hooks followed by another \clearpage just in case new material got added (after all we need to be in well defined state after the \include).
\sourcecode{\UseOneTimeHook{include/#1/after}}
\sourcecode{\UseHook{include/after}}
\sourcecode{\clearpage}
\sourcecode{\@writetoc{#1}}%
\if@filesw
\immediate\closeout\@partaux
\fi

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If the file is not included, reset `\deadcycles`, so that a long list of non-included files does not generate an 'Output loop' error.

```
\deadcycles\z@
\nameuse{cp@#1}%
```

We also execute a hook in this case, first a general used for every include file that is exclude and then a specific one that contains the name of the include file.

```
\UseHook{include/excluded}%
\UseOneTimeHook{include/#1/excluded}%
```

Now declare the non-generic `include` hooks used above:

```
\NewHook{include/before}
\NewReversedHook{include/end}
\NewReversedHook{include/after}
\NewHook{include/excluded}
⟨latexrelease⟩EndIncludeInRelease
⟨2ekernel⟩[latexrelease]
⟨latexrelease⟩\IncludeInRelease{2020/10/01}%
⟨latexrelease⟩\def\@include#1 {%
⟨latexrelease⟩\ifx\@nodocument\relax
⟨latexrelease⟩\clearpage
⟨latexrelease⟩\if@filesw
⟨latexrelease⟩\immediate\write\@mainaux{\string\@input{#1.aux}}%
⟨latexrelease⟩\fi
⟨latexrelease⟩\fi}
⟨latexrelease⟩\@latex@warning{\noexpand\include should only be used after \string\begin{document}}%
⟨latexrelease⟩\@input@{#1}%
⟨latexrelease⟩\fi}
```

```
\NewHook{include/before}
\NewReversedHook{include/end}
\NewReversedHook{include/after}
\NewHook{include/excluded}
⟨latexrelease⟩EndIncludeInRelease
⟨2ekernel⟩[latexrelease]
⟨latexrelease⟩\IncludeInRelease{2020/10/01}%
⟨latexrelease⟩\def\@include#1 {%
⟨latexrelease⟩\ifx\@nodocument\relax
⟨latexrelease⟩\clearpage
⟨latexrelease⟩\if@filesw
⟨latexrelease⟩\immediate\write\@mainaux{\string\@input{#1.aux}}%
⟨latexrelease⟩\fi
⟨latexrelease⟩\fi}
```

```
File r: ltfiles.dtx Date: 2022/05/27 Version v1.2r 343
```
\latexrelease \@input{#1.tex}\
\latexrelease \UseOneTimeHook{include/#1/end}\
\latexrelease \UseHook{include/end}\
\latexrelease \clearpage\
\latexrelease \UseOneTimeHook{include/#1/after}\
\latexrelease \UseHook{include/after}\
\latexrelease \clearpage\
\latexrelease \UseOneTimeHook{include/#1/after}\
\latexrelease \UseHook{include/after}\
\latexrelease \clearpage\
\latexrelease \@writeckpt{#1}\
\latexrelease \if@filesw\immediate\closeout\@partaux\fi\
\latexrelease \else\deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \let\@auxout\@mainaux\latexrelease \else\latexrelease \@latex@warning{\noexpand\include should only be used after \string\begin{document}}\latexrelease \@input{#1}\fi\latexrelease \NewHook{include/before}\latexrelease \NewReversedHook{include/end}\latexrelease \NewReversedHook{include/after}\latexrelease \IncludeInRelease{0000/00/00}\latexrelease \def\@include#1 {\latexrelease \clearpage\latexrelease \if@filesw\immediate\write\@mainaux{\string\@include{#1.aux}}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \let\@auxout\@mainaux\latexrelease \if@filesw\immediate\openout\@partaux #1.aux\immediate\write\@partaux{\relax}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \let\@auxout\@partaux\latexrelease \if@filesw\immediate\openout\@partaux #1.aux\immediate\write\@partaux{\relax}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \def\@include#1 {\latexrelease \clearpage\latexrelease \if@filesw\immediate\write\@mainaux{\string\@include{#1.aux}}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \let\@auxout\@mainaux\latexrelease \if@filesw\immediate\openout\@partaux #1.aux\immediate\write\@partaux{\relax}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \def\@include#1 {\latexrelease \clearpage\latexrelease \if@filesw\immediate\write\@mainaux{\string\@include{#1.aux}}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \let\@auxout\@mainaux\latexrelease \if@filesw\immediate\openout\@partaux #1.aux\immediate\write\@partaux{\relax}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \def\@include#1 {\latexrelease \clearpage\latexrelease \if@filesw\immediate\write\@mainaux{\string\@include{#1.aux}}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi\latexrelease \let\@auxout\@mainaux\latexrelease \if@filesw\immediate\openout\@partaux #1.aux\immediate\write\@partaux{\relax}\fi\latexrelease \else\latexrelease \deadcycles\z@\latexrelease \@nameuse{cp@#1}\fi
1.1 Safe Input Macros

File name handling is done by generating a csname from the provided file name (which means that UTF-8 octets gets turned into strings as this is what happens if they appear in a csname due to the code in utf8.def). By setting \escapchar to -1 we ensure that we don’t get a backslash in front. As a result we end up with all characters as catcode 12 (plus spaces). We then sometimes add quotes around the construct (removing any existing inner quotes. Sometimes we only remove the quotes if they have been supplied by the user. There is clearly some room for improvement.

A side effect of the new code is that we will see quotes around file name displays where there haven’t been any before.

For compatibility with existing code using \{abc\}.tex or \{one.two\}.png, an initial brace group is discarded before expansion and \string is applied. The content of the brace group is discarded. This means that a leading space will be lost unless protected (by \{ } or " " or \space) but filenames with a space are hopefully rare.
The definition below is from 2019 and only used during kernel bootstrapping, later on in ltfilehook.dtx it will get overwritten.

```
451 \def\set@curr@file#1{%
452 \begingroup
453 \escapechar\m@ne
454 \xdef\@curr@file{%
455 \expandafter\expandafter\expandafter\unquote@name
456 \expandafter\expandafter\expandafter{%
457 \expandafter\string\csname\@firstofone#1\@empty\endcsname}}%
458 \endgroup
459 }
```

*(End definition for \@curr@file and \set@curr@file.)*

```
\quote@name
\quote@@name
\unquote@name
```

Quoting spaces

\begin{quote}
\begin{itemize}
\item a b c \rightarrow "a b c"
\item "a b c" \rightarrow "a b c"
\item a" "b" "c \rightarrow "a b c"
\item \rightarrow ""
\end{itemize}
\end{quote}

*(End definition for \quote@name, \quote@@name, and \unquote@name.)*

```
\IfFileExists
\DeclareRobustCommand\IfFileExists[1]{%\set@curr@file{#1}%
469 \expandafter\IfFileExists@\expandafter{\@curr@file}}
```

*(End definition for \IfFileExists.)*

```
\IfFileExists[1]{\long\def \IfFileExists#1#2#3{%
481 \openin\@inputcheck#1 %
482 \ifeof\@inputcheck
483 \ifx\input@path\@undefined
484 \def\reserved@a{#3}%
485 \else
```

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Argument #1 is \@curr@file so catcode 12 string with no quotes.

The original definition picked up arguments #2 and #3 in a way that they couldn’t contain unbalanced conditionals. A better implementation would have been not to pick up the arguments at all but instead use the usual \@firstoftwo and \secondoftwo. However, that changes how # is interpreted and so we can’t do that nowadays without invalidating a lot of code. Therefore the somewhat curious construction near the end.

This is just there so that any # inside #2 or #3 needs doubling (as that was the case in the past).
\iffileonpath If the file is not found by \texttt{\openin}, and \texttt{\input@path} is defined, look in all the directories specified in \texttt{\input@path}.

(End definition for \texttt{\iffileonpath}.)
Now define \InputIfFileExists to input #1 if it seems to exist. Immediately prior to the input, #2 is executed. If the file #1 does not exist, execute ‘#3’.

This here is a temporary definition for the kernel. The real one comes somewhat later in the file ltfilehook.dtx.

\DeclareRobustCommand \InputIfFileExists[2]{
  \IfFileExists{#1}{}
  {\expandafter\@swaptwoargs\expandafter
   \@filef@und{#2\@addtofilelist{#1}\@@input}}}

(End definition for \InputIfFileExists.)

\@swaptwoargs Swap two arguments and return them unbraced (like \@firstoftwo etc).

\def\input{
  \@ifnextchar\bgroup\@iinput\@@input}

(End definition for \input.)

\@input Define \@input (i.e., \input) in terms of \InputIfFileExists. Changes to \@input: adapt to the changes to \@missingfileerror.

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Now here we have to use it. The file here is guaranteed to exist, because \@missingfileerror
ensures so, but we have to use \InputIfFileExists because it executes the file hooks.

\edef\reserved@a{\noexpand@iinput{%\@missingfile@area\@missingfile@base.\@missingfile@ext}}%
\reserved@a}

⟨/2ekernel|latexrelease⟩

\IncludeInRelease{2019/10/01}{\@input}{Quote file names}%
\IncludeInRelease{0000/00/00}{\@input@}{Version of \@input that does add the file to \@filelist.}

\IfFileExists{#1}{\@@input\@filef@und}{\typeout{No file #1.}}

(End definition for \@input.)

\@input Define \@input in terms of \IfFileExists. So this is a ‘safe input’ command, but the
files input are not listed by \listfiles.

We don’t want .aux, .toc files etc be listed by \listfiles. However, something
like .bbl probably should be listed and thus should be implemented not by \@input.
\def\@input#1{%\IfFileExists{#1}{\@@input\@filef@und}{\typeout{No file #1.}}}%

(End definition for \@input.)

\@input@ Version of \@input that does add the file to \@filelist.
\def\@input@#1{\IfFileExists{#1}{\@@input\@filef@und}{\typeout{No file #1.}}}

(End definition for \@input@.)

\@missingfileerror This ‘error’ command avoids \TeX’s primitive missing file loop.

Missing file error. Prompt for a new filename, offering a default extension.

Changes to \@missingfileerror: rather than trying to input the file by force, now
\@missingfileerror just returns three \@missingfile@part and the caller macro is
responsible for doing the right thing with it.

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If the user answers with \textit{return}, fallback to the .tex file (previously it did nothing).

Use \texttt{\textbackslash batchmode\textbackslash read-1} to \textit{return} to the \TeX{} run, same as expl3 does (it was \texttt{\textbackslash batchmode\textbackslash \@end} before).

\begin{verbatim}
def\reserved@a{\batchmode\read-1 to \reserved@a}
  \def\reserved@a{X}
  \filename@parse\@gtempa
  \edef\filename@ext{\ifx\filename@ext\relax#2\else\filename@ext\fi}
  \edef\reserved@a{\IfFileExists{\filename@area\filename@base.\filename@ext}{\def\reserved@a{\filename@area\filename@base.\filename@ext}}}
\end{verbatim}

Only check \texttt{\IfFileExists} (it was \texttt{\InputIfFileExists}).

\begin{verbatim}
\noexpand\IfFileExists{\filename@area\filename@base.\filename@ext}
\end{verbatim}

If the file exists, define \texttt{@missingfile@part}.

\begin{verbatim}
\def\reserved@a{\noexpand\IfFileExists{\filename@area\filename@base.\filename@ext}}
\end{verbatim}

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For compatibility with \texttt{\LaTeX} 2.09 document styles, we distribute files called \texttt{article.sty}, \texttt{book.sty}, \texttt{report.sty}, \texttt{slides.sty} and \texttt{letter.sty}. These use the command \texttt{@obsoletefile}, which produces a warning message.

\texttt{@obsoletefile} For compatibility with \texttt{\LaTeX} 2.09 document styles, we distribute files called \texttt{article.sty}, \texttt{book.sty}, \texttt{report.sty}, \texttt{slides.sty} and \texttt{letter.sty}. These use the command \texttt{\@obsoletefile}, which produces a warning message.

\begin{verbatim}
\def\@obsoletefile#1#2{\@latex@warning@no@line{inputting '#1' instead of obsolete '#2'}}
\end{verbatim}

1.2 Listing files
A list of files input so far. The initial value of \texttt{\@gobble} eats the comma before the first file name.

\texttt{@filelist} Add to the list of files input so far. This 'real' definition is only used for 'cfg' files during initex. An initial definition of \texttt{\@gobble} has already been set.

\begin{verbatim}
\def\@filelist\@gobble
\end{verbatim}

\texttt{@addtofilelist} A preamble command to cause \texttt{\end{document}} to list files input from the main file.

\begin{verbatim}
\def\listfiles{\let\listfiles\relax\def\@listfiles##1##2##3##4##5##6##7##8##9\@@{\def\reserved@d{\\}\@tfor\reserved@c:=##1##2##3##4##5##6##7##8\do{\ifx\reserved@c\reserved@d\edef\filename@area{ \filename@area}\fi}}}\def\@dofilelist{\typeout{\^{\textasciischeidel}} *File List*\@for\@currname:=\@filelist\do{\filename@parse\@currname\edef\reserved@a{\filename@base.\ifx\filename@ext\relax tex\else\filename@ext\fi}}\edef\reserved@a{\expandafter\let\expandafter\reserved@b\csname ver@\reserved@a\endcsname\filename@area\{ \filename@area\}}\@dofilelist\@missingfileerror}
\end{verbatim}

File r: \texttt{ltfiles.dtx} Date: 2022/05/27 Version v1.2r
Packages that \relax their \ver@... string to allow for multiple loading (e.g., fontenc) can use \ver@@... to store the version information instead.

\ifx\reserved@b\relax
   \expandafter\let\expandafter\reserved@b\csname ver@@\reserved@a\endcsname
\fi
\expandafter\expandafter\expandafter\@listfiles\expandafter
\filename@area\filename@base\\\\\\\\\\\@@
\typeout{\filename@area\reserved@a
\ifx\reserved@b\relax\else\@spaces\reserved@b\fi}}%
\typeout{ ***********^^J}}}

The \@filelist will be de-activated if \listfiles does not appear in the preamble. \begin{document} contains code equivalent to the following:

\AtBeginDocument{%
   \ifx\@listfiles@undefined
      \let\@filelist\relax
      \let\@addtofilelist\@gobble
   \fi}
\@onlypreamble\listfiles
\@dofilelist
\let\@dofilelist\relax

\(~/2ekernel\)

(End definition for \@obsoletefile and others.)
1 Font encodings

This section of the kernel contains commands for declaring encoding-specific commands, such as accents. It also contains the code for some of the encoding files, including omlenc.def, omsenc.def, tienc.def and otlenc.def files, which define the OML, OMS, T1 and OT1 encodings, and the fontenc package for selecting encodings.

The fontenc package has options for encodings, of which the last option is the default encoding. For example, to use the OT2, OT3 and T1 encodings, with T1 as the default, you say:

\usepackage[OT2,OT3,T1]{fontenc}

The standard kernel set-up loads font encoding files and selects an encoding as follows.

\input {omlenc.def}
\input {t1enc.def}
\input {ot1enc.def}
\input {omsenc.def}
\fontencoding{OT1}

Note that the files in the standard inputenc package depend on this behaviour of the kernel.

The syntax for declaring encoding-specific commands is:

\DeclareTextCommand{⟨command⟩}{⟨encoding⟩}{⟨number⟩}\[⟨default⟩]{⟨commands⟩}

This command is like \newcommand, except that it defines a command which is specific to one encoding. The resulting command is always robust, even if its definition is fragile. For example, the definition of \l in the OT1 encoding is:

\DeclareTextCommand{\l}{OT1}{\@xxxii l}

\DeclareTextCommand takes the same optional arguments as \newcommand.

\ProvideTextCommand{⟨command⟩}{⟨encoding⟩}{⟨number⟩}\[⟨default⟩]{⟨commands⟩}

This acts like \DeclareTextCommand, but does nothing if the command is already defined.

\DeclareTextSymbol{⟨command⟩}{⟨encoding⟩}{⟨slot⟩}

This command defines a text symbol, with a particular slot in that encoding. The commands:

\DeclareTextSymbol{\ss}{OT1}{25}
\DeclareTextCommand{\ss}{OT1}{\char25}

have the same effect, but the \DeclareTextSymbol is faster.

\DeclareTextAccent{⟨command⟩}{⟨encoding⟩}{⟨slot⟩}
This command declares a text accent. The commands:
\DeclareTextAccent{"}{OT1}{127}
\DeclareTextCommand{"}{OT1}{\add@accent {127}}

have the same effect.

\DeclareTextComposite{⟨command⟩}
{⟨encoding⟩}{⟨argument⟩}{⟨slot⟩}

This command declares a composite letter, for example in the T1 encoding \'{a} is slot 225, which is declared by:
\DeclareTextComposite{"}{T1}{a}{225}

The command will normally have been declared with \DeclareTextAccent, or as a one-argument \DeclareTextCommand.
\DeclareTextComposite is the most common example of using the more general declaration \DeclareTextCompositeCommand, which can define a composite to be an arbitrary piece of text.

\DeclareTextCompositeCommand{⟨command⟩}
{⟨encoding⟩}{⟨argument⟩}{⟨text⟩}

For example, in the OT1 encoding Å has a hand-crafted definition this is declared as follows
\DeclareTextCompositeCommand{\r}{OT1}{A}
\{\leavevmode\setbox\z@\hbox{!}\dimen@\ht\z@\advance\dimen@\textwidth\char23\rlap{\raise.67\dimen@\hbox{\char23}}A\}

The command will normally have been declared with \DeclareTextAccent, or as a one-argument \DeclareTextCommand.

The commands defined using the above declarations can be used in two ways. Normally they are used by just calling the command in the appropriate encoding, for example \ss. However, sometimes you may wish to use a command in an encoding where it is not defined. If the command has no arguments, then you can use it in another encoding by calling \UseTextSymbol:
\UseTextSymbol{⟨encoding⟩}{⟨command⟩}

For example, \UseTextSymbol{OT1}{\ss} has the same effect as:
\{\fontencoding{OT1}\selectfont\ss\}

If the command has one argument then you can use it in another encoding by calling \UseTextAccent:
\UseTextAccent{⟨encoding⟩}{⟨command⟩}{⟨text⟩}

For example, if the current encoding is OT2 then \UseTextAccent{OT1}{\'}{a} has the same effect as:
\{\fontencoding{OT1}\selectfont\'{\fontencoding{OT2}\selectfont a}\}
You can also declare a default definition for a text command, which will be used if the current encoding has no appropriate definition. Such use will also set the definition for this command in the current encoding to equal this default definition; this makes subsequent uses of the command much faster.

\DeclareTextCommandDefault{⟨command⟩}{⟨definition⟩}

For example, the default definition of the command \textonequarter (which produces the fraction \(\frac{1}{4}\)) could be built using math mode:

\DeclareTextCommandDefault{\textonequarter}{\ensuremath {\frac14}}

There is a matching \Provide command which will not override an existing default definition:

\ProvideTextCommandDefault{⟨command⟩}{⟨definition⟩}

The most common use for these commands is to use symbols from other encodings, so there are some optimizations provided:

\DeclareTextSymbolDefault{⟨command⟩}{⟨encoding⟩}
\DeclareTextAccentDefault{⟨command⟩}{⟨encoding⟩}

are short for:

\DeclareTextCommandDefault{⟨command⟩}{
   {\UseTextSymbol{⟨encoding⟩}{⟨command⟩}}}
\DeclareTextCommandDefault[1]{⟨command⟩}{
   {\UseTextAccent{⟨encoding⟩}{⟨command⟩}{#1}}}

For example, to make OT1 the default encoding for \ss and \’ you say:

\DeclareTextSymbolDefault{\ss}{OT1}
\DeclareTextAccentDefault{\'}{OT1}

Note that you can use these commands on any zero- or one-argument commands declared with \DeclareText* or \ProvideText*, not just those defined using \DeclareTextSymbol or \DeclareTextAccent.

1.1 Removing encoding-specific commands

In some cases encoding definitions are given to provide some limited support since nothing better is available, for example, the definition for \textdollar in OT1 is a hack since $ and £ actually share the same slot in this encoding. Thus if such a glyph becomes available in a different encoding (e.g., TS1) one would like to get rid of the flaky one and make the default definition point to the new encoding. In such a case defining

\DeclareTextSymbol{\textdollar}{TS1}{36}
\DeclareTextSymbolDefault{\textdollar}{TS1}

is not enough since if typesetting in OT1 \LaTeX will still find the encoding specific-definition for OT1 and therefore ignore the new default. Therefore to ensure that in this case the TS1 version is used we have to remove the OT1 declaration:

\UndeclareTextCommand{\textdollar}{OT1}
Since the $ sign is a proper glyph in the T1 encoding there is no point removing its
definition and forcing \LaTeX{} to pick up the TS1 version if typesetting in this encoding.
However, assume you want to use the variant dollar sign, i.e., $ for your dollars. In that
case you have to get rid of the T1 declaration as well, e.g., the following would do that
for you:

\UndeclareTextCommand{\textdollar}{OT1}
\UndeclareTextCommand{\textdollar} {T1}
\DeclareTextCommandDefault{\textdollar}{\UseTextSymbol{TS1}\textdollaroldstyle}

1.2 The order of declarations

If an encoding-specific command is defined for more than one encoding, then it will
execute fastest in the encoding in which it was defined last since its top-level definition
will be set up to execute in that encoding without any overhead.

For this reason the file fonttext.ltx currently first loads the definitions for the
T1 encoding and then those for the OT1 encoding so that typesetting in OT1 is op-
timized since that is (still) the default. However, when T1 is explicitly requested
(via \usepackage[T1]{fontenc}) the top-level definitions are automatically changed
to favour T1 since its declarations are reloaded in the process.

For the same reason default declarations should never come last since they are im-
plemented as a special encoding themselves (with the name ?). Specifying them last
would simply mean to make those encoding-specific commands equally inefficient in all
encodings. Therefore the textcomp package, for example, first sets up all defaults to
point to TS1 and then declares the commands in the TS1 encoding.

1.3 Docstrip modules

This .dtx file is be used to generate several related files containing font encoding defini-
tions. The mutually exclusive docstrip options are listed here.

T1 generates tienc.def for the Cork encoding.
TS1 generates ts1enc.def for the Text Companion encoding.
TS1sty generates textcomp.sty, package that sets up use of the Text
Companion encoding.
OT1 generates ot1enc.def for Knuth's CM encoding.
OMS generates omsenc.def for Knuth's math symbol encoding.
OML generates omlenc.def for Knuth's math letters encoding.
OT4 generates ot4enc.def for the Polish extension to the OT1 encoding,
created by B. Jackowski and M. Ryćko for use with the Polish
version of Computer Modern and Computer Concrete.
TU generates tuenc.def for Unicode font encoding.
package generates fontenc.sty for selecting encodings.
2ekernel for the kernel commands.
1.4 Definitions for the kernel

1.4.1 Declaration commands

This section contains definitions for commands such as accents which depend on the current encoding. These commands will usually be kept in `.def` files, for example `ot1enc.def` contains the definitions for the OT1 encoding.

If you say:

\DeclareTextCommand{\foo}{T1}...

then `\foo` is defined to be `\T1-cmd \foo \T1\foo`, where `\T1\foo` is one control sequence, not two! We then call `\newcommand` to define `\T1\foo`.

This command was introduced to fix a major bug in `\@dec@text@cmd` without changing that command itself. This was thought to be necessary because it is defined in more than one package. (Perhaps the more serious bug is to put complex low-level commands like this in packages?)

The declarations are only available before `\begin{document}`.

The sneaky bit in all this is what `\T1-cmd \foo \T1\foo` does. There are five possibilities, depending on the current values of `\protect`, `\cf@encoding` and `\ifmmode`:
• If \protect is \@typeset\protect and \cf@encoding is T1, then we execute \T1\foo. This should be the normal behaviour, and is optimized for speed.

• If \protect is \@typeset\protect, \cf@encoding is (say) OT1, and \OT1\foo is defined, then we execute \OT1\foo.

• If \protect is \@typeset\protect, \cf@encoding is (say) OT1, we’re in text mode, and \OT1\foo is undefined, then we define \OT1\foo to be the default value of \foo, and execute \OT1\foo.

• If \protect is \@typeset\protect, \cf@encoding is (say) OT1, we’re in math mode, and \OT1\foo is undefined, then we execute the default value of \foo. (This is necessary so that things like $X\copyright$ work properly.)

• If \protect is not \@typeset\protect then we execute \noexpand\foo. For example, if we are writing to a file, then this results in \foo being written. If we are in a \mark, then \foo will be put in the mark—since \foo is robust, it will then survive all the things which may happen to it whilst it’s a \mark.

So after all that, we will either execute the appropriate definition of \foo for the current encoding, or we will execute \noexpand\foo.

The default value of \foo is \textbackslash{}?\foo if it is defined, and an error message otherwise.

When the encoding is changed from T1 to OT1, \T1-cmd is defined to be \@changed@cmd and \OT1-cmd is defined to be \@current@cmd. This means that the test for what the current encoding is can be performed quickly.

25 \def\@current@cmd#1{% 26 \ifx\protect\@typeset\protect 27 \@inmathwarn#1% 28 \else 29 \noexpand#1\expandafter\@gobble 30 \fi}

31 \def\@changed@cmd#1#2{% 32 \ifx\protect\@typeset\protect 33 \@inmathwarn#1% 34 \expandafter\ifx\csname\cf@encoding\string#1\endcsname\relax 35 \expandafter\ifx\csname ?\string#1\endcsname\relax 36 \expandafter\def\csname ?\string#1\endcsname{% 37 \TextSymbolUnavailable#1% 38 }% 39 \fi 40 \global\expandafter\let 41 \csname cf@encoding \string#1\expandafter\endcsname 42 \csname \string#1\endcsname 43 \fi 44 \csname cf@encoding\string#1\endcsname 45 \expandafter\endcsname 46 \else 47 \noexpand#1% 48 \fi}

49 \gdef\TextSymbolUnavailable#1{% 50 \@latex@error{ 51 Command \protect#1 unavailable in encoding \cf@encoding% 52 }\@eha}
The command \texttt{@inmathwarn} produces a warning message if we are currently in math mode. Note that since this command is used inside text commands, it can't call \texttt{\relax} before \texttt{\ifmmode}. This means that it is possible for the warning to fail to be issued at the beginning of a row of a halign whose template enters math mode. This is probably a bad feature, but there's not much that can be done about it, since adding a \texttt{\relax} would break ligatures and kerning between text symbols.

A more efficient solution would be to make \texttt{@inmathwarn} and \texttt{@inmatherr} equal to \texttt{@empty} and \texttt{\relax} by default, and to have \texttt{everymath} reset them to their usual definitions. This is left for future investigation (for example it may break some third party code).

53 \def\@inmathwarn#1{\% 54 \ifmmode 55 %\latex@warning{Command \protect#1 invalid in math mode}\% 56 \fi}

(\textit{End definition for \texttt{\DeclareTextCommand} and others.})

\texttt{\DeclareTextCommandDefault} These define commands with encoding \texttt{?}.

Note that \texttt{\DeclareTextCommandDefault} can only be used in the preamble, but that the \texttt{\Provide} version is allowed in inputenc .def files, so is allowed anywhere.

57 \def\DeclareTextCommandDefault#1{\% 58 \DeclareTextCommand#1?}
59 \def\ProvideTextCommandDefault#1{\% 60 \ProvideTextCommand#1?}

\texttt{\onlypreamble\DeclareTextCommandDefault}\texttt{\onlypreamble\ProvideTextCommandDefault}

They require \texttt{\?-cmd} to be initialized as \texttt{@changed@cmd}.

63 \expandafter\let\csname?-cmd\endcsname\@changed@cmd

(\textit{End definition for \texttt{\DeclareTextCommandDefault} and \texttt{\ProvideTextCommandDefault}.})

\texttt{\DeclareTextAccent} This is just a disguise for defining a \LaTeX \texttt{\accent} command.

64 \def\DeclareTextAccent#1#2#3{\% 65 \DeclareTextCommand#1{#2}{\add@accent{#3}}}
66 \\onlypreamble\DeclareTextAccent

(\textit{End definition for \texttt{\DeclareTextAccent}.})

\texttt{\add@accent} To save space this code is shared between all text accents that are set using the \texttt{\accent} primitive. The argument is pre-set in a box so that any font loading that is needed is already done within the box. This is needed because font-loading involves grouping and that would prevent the accent mechanism from working so that the accent would not be positioned over the argument. Declarations that change the font should be allowed (only low-level ones are at present) inside the argument of an accent command, but not size changes, as they involve \texttt{\setbox} operations which also inhibit the mechanism of the \texttt{\accent} primitive.

Note that the whole process is within a group. For a detailed discussion of this reimplementation and its deficiencies, see pr/3160.

67 \def\add@accent#1#2{\hmode@bgroup

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Turn off the group in \UseTextSymbol in case this is used inside the argument of \add@accent.

When presetting the argument in a box we record its \spacefactor for later use after the accent got typeset. This way something like ‘A gets the spacefactor of A (i.e., 999) rather than the default value of 1000.

\global\mathchardef\accent@spacefactor\spacefactor

The accent primitive doesn’t allow things \begingroup to interfere between accent and base character. Therefore we need to avoid that (they are some hidden inside \maybe@load@fontshape). As we don’t have to load the fontshape in this case (as that happened in the box above if necessary, we simply disable that part of the code temporarily. We also ignore \ignorespaces which has the same issue and may show up as part of \normalfont if that is used.

\let\maybe@load@fontshape\relax
\let\ignorespaces\relax
\accent#1 #2\egroup\ifmmode\else\spacefactor\accent@spacefactor\fi}

Default definition for \accent@spacefactor prevents a horrible death of the above macro inside an unprotected \edef.

(End definition for \add@accent.)

\accent

\hmode\bgroup
\def\hmode@bgroup{\leavevmode\bgroup}
(End definition for \hmode@bgroup.)

Another amusing game to play with \expandafter, \csname, and \string. When you say \DeclareTextCompositeCommand{\T1\foo}{T1}{a}{bar}, we look to see if the expansion of \T1\foo begins with \text@composite, and if it doesn’t, we redefine \T1\foo to be:

\#1 -> \text@composite \T1\foo \#1\empty \text@composite {...}

where ... is the previous definition of \T1\foo. Finally, we define \T1\foo-a to expand to bar.

\text{...}

\DeclareTextCompositeCommand
\expandafter\DeclareTextCompositeCommand
\expandafter\@text@composite
\@strip@args
\expandafter\ifx
\expandafter\@car\reserved@a\relax\@nil \@text@composite
\expandafter\expandafter\expandafter\ifx
\expandafter\@car
\edef\reserved@b##1{...}

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\def\expandafter\noexpand\csname#2\string#1\endcsname{\noexpand\@text@composite\expandafter\noexpand\csname#2\string#1\endcsname\noexpand\@empty\noexpand\@text@composite\noexpand\@text@composite\noexpand\csname#2\string#1\endcsname\noexpand\@empty\noexpand\@text@composite\noexpand\csname#2\string#1\endcsname\noexpand\@empty\noexpand\@text@composite\noexpand\csname#2\string#1\endcsname\noexpand\@empty\noexpand\@text@composite\noexpand\csname#2\string#1\endcsname\noexpand\@empty\noexpand\@text@composite\fi}
\expandafter\reserved@b\expandafter{\reserved@a{##1}}\expandafter\reserved@b\expandafter{\reserved@a{##1}}
\expandafter\def\expandafter\string\expandafter{\csname#2\string#1\endcsname\string#1-\string#3\@empty\endcsname}{#4}

⟨/2ekernel | latexrelease⟩
⟨latexincludeinrelease⟩\EndIncludeInRelease
⟨latexincludeinrelease⟩\IncludeInRelease{0000/00/00}{\DeclareTextCompositeCommand}
⟨latexrelease⟩\{test for undeclared accent}%
⟨latexrelease⟩\def\DeclareTextCompositeCommand#1#2#3#4{%
⟨latexrelease⟩\expandafter\let\expandafter\reserved@a\csname#2\string#1\endcsname\expandafter\expandafter\expandafter\ifx\expandafter\@car\reserved@a\relax\relax\@nil\edef\reserved@b##1{%\def\expandafter\noexpand\csname#2\string#1\endcsname####1{\noexpand\@text@composite\expandafter\noexpand\csname#2\string#1\endcsname####1\noexpand\@empty\noexpand\@text@composite\noexpand\csname#2\string#1\endcsname\noexpand\@empty\noexpand\@text@composite\noexpand\csname#2\string#1\endcsname\noexpand\@empty\noexpand\@text@composite\fi\expandafter\def\expandafter\string\expandafter{\csname#2\endcsname\string#1-\string#3\@empty\endcsname}{#4}}

This all works because:
\@text@composite \T1\foo A\@empty \@text@composite {...} expands to \T1\foo-A if \T1\foo-A has been defined, and {...} otherwise.

Note that \@text@composite grabs the first token of the argument and puts just that in the csname. This is so that \'{\textit{e}} will work—it checks whether \T1\'{\textit{e}} is defined (which presumably it isn’t) and so expands to {\accent 1 \textit{e}}.

This trick won’t always work, for example \'{\{itshape e}} will expand to (with spaces added for clarity):
\csname \string \T1\'{ - \string \{itshape e} \@empty \endcsname
which will die pretty horribly. Unfortunately there’s not much can be done about this if we’re going to use \csname lookups as a fast way of accessing composites.

This has an unfortunate ‘misfeature’ though, which is that in the T1 encoding, \'{aa} produces á. This is not the expected behaviour, and should perhaps be fixed if the fix doesn’t affect performance too badly.
Finally, it’s worth noting that the \@empty is used in \text@composite so that accents will work even when the argument is empty. If you say \'{\empty} then this looks up \T1’-\@empty, which ought to be \relax, and so all is well. If we didn’t include the \@empty, then \'{\} would expand to:

\csname \string \T1\’ - \string \endcsname

so the \endcsname would be \string’ed and the whole of the rest of the document would be put inside the \csname. This would not be good.

126 \def\text@composite@x{\beginlnf\text@composite
127 \text@composite@x
128 \csname \string \T1\’ - \string \endcsname}

Originally the \text@composite@x macro had two arguments and if \#1 was not \relax it was executed, otherwise \#2 was executed. All this happened within the \ifx code so that neither \#1 nor \#2 could have picked up any additional arguments form the input stream. This has now being changed using the typical \ifstwo / \ifstwo coding. This way the final expansion will happen without any \else or \fi intervening in the case that we need to get a further token from the input stream.

129 \def\text@composite@x{\beginlnf\text@composite
130 \ifx\#1\relax
131 \expandafter\text@composite@x
132 \else
133 \expandafter\text@composite@x
134 \fi
135 \#1}

The command \DeclareTextComposite uses \DeclareTextCompositeCommand to declare a command which expands out to a single glyph.

136 \catcode\z@=11\relax
137 \def\DeclareTextComposite{\text@compositeCommand
138 \text@compositeCommand
139 \beginlnf\text@composite
140 \text@composite
141 \lccode\z@\#4%
142 \lowercase{%
143 \egroup
144 \reserved@a \^^@}}
145 \catcode\z@=15\relax
146 \onlypreamble\DeclareTextComposite

(End definition for \DeclareTextCompositeCommand and others.)

\UseTextAccent \UseTextSymbol \@use@text@encoding

These fragile commands access glyphs from different encodings. They use grotty low-level calls to the font selection scheme for speed, and in order to make sure that \UseTextSymbol doesn’t do anything which you’re not allowed to do between an \accent and its glyph.

For a detailed discussion of this reimplementation and its deficiencies, see pr/3160.

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\DeclareRobustCommand*{\UseTextAccent}[3]{%
  \hmode@start@before@group
  %
  \let\hmode@start@before@group\@firstofone
  \let\@curr@enc\cf@encoding
  \@use@text@encoding{#1}%
  #2{\@use@text@encoding\@curr@enc#3}%
}}

\DeclareRobustCommand*{\UseTextSymbol}[2]{%
  \hmode@start@before@group
  {%
    \def\@wrong@font@char{\MessageBreak
      for \noexpand\symbol'\string#2'}%
    \@use@text@encoding{#1}%
    #2%
  }%
}}

⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}%
⟨latexrelease⟩   {\UseTextAccent}{Make commands robust}%
⟨latexrelease⟩
⟨latexrelease⟩\kernel@make@fragile\UseTextAccent
⟨latexrelease⟩\kernel@make@fragile\UseTextSymbol
⟨latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨∗2ekernel⟩

Switch to a different text encoding without any grouping for use in \UseTextAccent
or \UseTextSymbol (and for \oldstylenums).
\def\@use@text@encoding#1{%
  \edef\f@encoding{#1}%
  \xdef\font@name{\csname\curr@fontshape/\f@size\endcsname}%
  \pickup\font
  \{\font@name
  \@@enc@update}%
}%

(End definition for \UseTextAccent, \UseTextSymbol, and \@use@text@encoding.)

The \hmode@start@before@group starts hmode and should be immediately followed by
an explicit {...}. Its purpose is to ensure that hmode is started before this group is
opened. Inside \add@accent and \UseTextAccent it is redefined to remove this group
so that it doesn’t conflict with the \accent primitive.

For a detailed discussion see pr/3160.
\let\hmode@start@before@group\leavevmode

(End definition for \hmode@start@before@group.)
Some syntactic sugar. Again, these should probably be optimized for speed.

\DeclareTextSymbolDefault\DeclareTextAccentDefault
(End definition for \DeclareTextSymbolDefault and \DeclareTextAccentDefault.)

\UndeclareTextCommand
This command safely removes an encoding specific declaration for a given encoding. It is helpful if one intends to use the default definition always and therefore wants to get rid of a declaration for some specific encoding.

\UndeclareTextCommand\UndeclareTextCommand
(End definition for \UndeclareTextCommand.)
1.4.2 Hyphenation

We redefine \patterns and \hyphenation to allow the use of commands declared with \DeclareText* to be used inside them.

\let\@@patterns\patterns
\let\@@hyphenation\hyphenation
\def\patterns{%
  \bgroup
  \let\protect\@empty
  \let\@typeset@protect\@empty
  \let\@changed@x\@changed@x@mouth
  \afterassignment\egroup
  \@@patterns
%}
\def\hyphenation{%
  \bgroup
  \let\protect\@empty
  \let\@typeset@protect\@empty
  \let\@changed@x\@changed@x@mouth
  \afterassignment\egroup
  \@@hyphenation
%}

(End definition for \patterns and others.)

1.4.3 Miscellania

The \a command is used to access the accent commands even when they have been redefined (for example by the tabbing environment). Its internal name is \@tabacckludge.

The \string within the \csname guards against something like ' being active at the point of use.

\def\@tabacckludge#1{\expandafter\@changed@cmd\csname\string#1\endcsname\relax}
\let\a=\@tabacckludge

(End definition for \a.)

1.4.4 Default encodings

We define the default encodings for most commands to be either OT1, OML or OMS. These defaults are in the kernel and therefore fonts with these encodings must be available unless these defaults are redefined elsewhere. Recall that the standard kernel loads the encoding files for these encodings, and also that for the T1 encoding.

The naming conventions in the kernel are not what we would use if we were starting from scratch... Those defined by DEK (like \ae and \ss) or by the TeX Users Group Technical Working Group on multi-lingual typesetting (like \th and \ng) have short names. Those which were added to the kernel in 1993 and early 1994 are named after their Adobe glyph names (like \guillemotleft and \quotedblbase). Unfortunately, this naming scheme won’t work for all glyphs, since some names (like \space) are already used, and some (like \endash) are very likely to be defined by users. So we’re now using the naming scheme of \text followed by the Adobe name, (like \textendash and \textsterling). Except that some glyphs don’t have Adobe names, so we’re using the names used by fontinst for those (like \textcompwordmark). Sigh.
Some accents from OT1:
\DeclareTextAccentDefault{"}{OT1}
\DeclareTextAccentDefault{\'}{OT1}
\DeclareTextAccentDefault{.}{OT1}
\DeclareTextAccentDefault{=} {OT1}
\DeclareTextAccentDefault{H} {OT1}
\DeclareTextAccentDefault{^} {OT1}
\DeclareTextAccentDefault{'}{OT1}
\DeclareTextAccentDefault{b}{OT1}
\DeclareTextAccentDefault{c}{OT1}
\DeclareTextAccentDefault{d}{OT1}
\DeclareTextAccentDefault{r}{OT1}
\DeclareTextAccentDefault{u}{OT1}
\DeclareTextAccentDefault{v}{OT1}
\DeclareTextAccentDefault{~}{OT1}

Some symbols from OT1:
\DeclareTextSymbolDefault{\AA}{OT1}
\DeclareTextSymbolDefault{\AE}{OT1}
\DeclareTextSymbolDefault{\L}{OT1}
\DeclareTextSymbolDefault{\OE}{OT1}
\DeclareTextSymbolDefault{\O}{OT1}
\DeclareTextSymbolDefault{\textdollar}{OT1}
\DeclareTextSymbolDefault{\textemdash}{OT1}
\DeclareTextSymbolDefault{\textendash}{OT1}
\DeclareTextSymbolDefault{\textexclamdown}{OT1}
\DeclareTextSymbolDefault{\textsterling}{OT1}
\DeclareTextSymbolDefault{\textasteriskcentered}{OMS}
\DeclareTextSymbolDefault{\textbackslash}{OMS}
\DeclareTextSymbolDefault{\textbar}{OMS}
\DeclareTextSymbolDefault{\textbardbl}{OMS}
\DeclareTextSymbolDefault{\textbraceleft}{OMS}
\DeclareTextSymbolDefault{\textbraceright}{OMS}
\DeclareTextSymbolDefault{\textbullet}{OMS}
\DeclareTextSymbolDefault{\textdollar}{OMS}
\DeclareTextSymbolDefault{\textemdash}{OMS}
\DeclareTextSymbolDefault{\textendash}{OMS}
\DeclareTextSymbolDefault{\textexclamdown}{OMS}
\DeclareTextSymbolDefault{\textquestiondown}{OMS}
\DeclareTextSymbolDefault{\textsterling}{OMS}
\DeclareTextSymbolDefault{\textasteriskcentered}{OMS}
\DeclareTextSymbolDefault{\textbackslash}{OMS}
\DeclareTextSymbolDefault{\textbar}{OMS}
\DeclareTextSymbolDefault{\textbardbl}{OMS}
\DeclareTextSymbolDefault{\textbraceleft}{OMS}
\DeclareTextSymbolDefault{\textbraceright}{OMS}
\DeclareTextSymbolDefault{\textbullet}{OMS}
\DeclareTextSymbolDefault{\textdaggerdbl}{OMS}
\DeclareTextSymbolDefault{\textdagger}{OMS}
\DeclareTextSymbolDefault{\textparagraph}{OMS}
\DeclareTextSymbolDefault{\textperiodcentered}{OMS}
\DeclareTextSymbolDefault{\textsection}{OMS}
\DeclareTextAccentDefault{\textcircled}{OMS}

Some symbols from OML:
\DeclareTextSymbolDefault{\textless}{OML}
\DeclareTextSymbolDefault{\textgreater}{OML}
\DeclareTextAccentDefault{\t}{OML}

Some defaults we can fake.
The interface for defining \copyright changed, it used to use \expandafter to add braces at the appropriate points.
\DeclareTextCommandDefault{\textcopyright}{\textcircled{c}}
\% \expandafter\def\expandafter\
\copyright\expandafter{\expandafter{\copyright}}
\DeclareTextCommandDefault{\textasciicircum}{\^{}}
\DeclareTextCommandDefault{\textasciitilde}{\~{}}
\DeclareTextCommandDefault{\textunderscore}{\leavevmode \kern.06em\vbox{\hrule\@width.3em}}
There is no good reason anymore to fake \textcompwordmark.
\DeclareTextCommandDefault{\textcompwordmark}{\leavevmode\kern\z@}
\DeclareTextCommandDefault{\textvisiblespace}{\mbox{\kern.06em\vrule \@height.3ex}\vbox{\hrule \@width.3em}\hbox{\vrule \@height.3ex}}
Using \fontdimen3 in the next definition is some sort of a kludge (since it is the interword stretch) but it makes the ellipsis come out right in mono-spaced fonts too (since there it is zero).
\DeclareTextCommandDefault{\textellipsis}{\dot{.}\kern\fontdimen3\font\dot{.}\kern\fontdimen3\font\dot{.}\kern\fontdimen3\font}
\%\DeclareTextCommandDefault{\textregistered}{\textcircled{%\check@mathfonts\fontsize{\sf@size}{\z@}\math@fontsfalse\selectfont R}}
\DeclareTextCommandDefault{\texttrademark}{\textsuperscript{TM}}
\DeclareTextCommandDefault{\SS}{SS}
\DeclareTextCommandDefault{\textordfeminine}{\textsuperscript{a}}
\DeclareTextCommandDefault{\textordmasculine}{\textsuperscript{o}}

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1.4.5 Math material

Some commands can be used in both text and math mode:

307 \DeclareRobustCommand\{$\$\}{\ifmmode\mathdollar\else\textdollar\fi}

We use protected not \DeclareRobustCommand so that \bigl\{ etc. works inside protected@edef.

310 \protect\def\{\ifmmode\lbrace\else\textbraceleft\fi

313 \DeclareRobustCommand\P\{$\$\}{\ifmmode\mathparagraph\else\textparagraph\fi}

316 \DeclareRobustCommand\S\{$\$\}{\ifmmode\mathsection\else\textsection\fi}

319 \DeclareRobustCommand\dag\{$\$\}{\ifmmode\dagger\else\textdagger\fi}

322 \DeclareRobustCommand\ddag\{$\$\}{\ifmmode\ddagger\else\textdaggerdbl\fi}

For historical reasons \copyright needs {} around the definition in maths.

331 \DeclareRobustCommand\copyright\{$\$\}{\ifmmode\nfss@text\textcopyright\else\textcopyright\fi}

334 \DeclareRobustCommand\pounds\{$\$\}{\ifmmode\mathsterling\else\textsterling\fi}

337 \DeclareRobustCommand\dots\{$\$\}{\ifmmode\mathellipsis\else\textellipsis\fi}

\let\ldots\dots

Default definition of the commabelow accent.

\textcommabelow\[1\]

\let\textcommabelow\@undefined

\let\csname\string\T1\string\c-G\endcsname\@undefined

\let\csname\string\T1\string\c-K\endcsname\@undefined

\let\csname\string\T1\string\c-k\endcsname\@undefined

\let\csname\string\T1\string\c-L\endcsname\@undefined

\let\csname\string\T1\string\c-l\endcsname\@undefined

\let\csname\string\T1\string\c-N\endcsname\@undefined

\let\csname\string\T1\string\c-n\endcsname\@undefined

\let\csname\string\T1\string\c-R\endcsname\@undefined

\let\csname\string\T1\string\c-r\endcsname\@undefined
1.5 Definitions for the OT1 encoding

The definitions for the ‘TeX text’ (OT1) encoding.

Declare the encoding.

\DeclareFontEncoding{OT1}{}{}

Declare the accents.

\DeclareTextAccent{"}{OT1}{127}
\DeclareTextAccent{'}{OT1}{19}
\DeclareTextAccent{.}{OT1}{95}
\DeclareTextAccent{=} {OT1}{22}
\DeclareTextAccent{^}{OT1}{94}
\DeclareTextAccent{\} {OT1}{18}
\DeclareTextAccent{\|}{OT1}{128}
\DeclareTextAccent{\|\}{OT1}{125}
\DeclareTextAccent{\u}{OT1}{21}
\DeclareTextAccent{\v}{OT1}{20}
\DeclareTextAccent{\r}{OT1}{23}

Some accents have to be built by hand: Note that \ooalign and \halign must be inside a group. In these definitions we no longer use the helper function \sh@ft from plain.tex since that now has two incompatible definitions.

\DeclareTextCommand{\b}{OT1}[1]
\hmode@bgroup \ooalign \hidewidth \relax #1 \crcr \hidewidth \ltx@sh@ft{-3ex} \%
Declare the text symbols.

\DeclareTextSymbol{\AE}{OT1}{29}
\DeclareTextSymbol{\OE}{OT1}{30}
\DeclareTextSymbol{\O}{OT1}{31}
\DeclareTextSymbol{\ae}{OT1}{26}
\DeclareTextSymbol{\i}{OT1}{16}
\DeclareTextSymbol{\j}{OT1}{17}
\DeclareTextSymbol{\oe}{OT1}{27}
\DeclareTextSymbol{\o}{OT1}{28}
\DeclareTextSymbol{\ss}{OT1}{25}
\DeclareTextSymbol{\textemdash}{OT1}{124}
\DeclareTextSymbol{\textendash}{OT1}{123}

The \textbackslashnobreak\textbackslashhskip\textbackslashz@ is there to prevent a break after the hyphen but allow later breaks in the remainder of the word.

\DeclareTextCommand{\textnonbreakinghyphen}{OT1}{\mbox{-}\nobreak\hskip\z@}
\DeclareTextCommand{\textfiguredash}{OT1}{\textendash}
\DeclareTextCommand{\texthorizontalbar}{OT1}{\textemdash}

Using the ligatures helps with OT1 fonts that have \textexclamdown and \textquestiondown in unusual positions.

\DeclareTextSymbol{\textexclamdown}{OT1}{60}
\DeclareTextSymbol{\textquestiondown}{OT1}{62}
\DeclareTextSymbol{\textexclamdown}{OT1}{!'}
\DeclareTextSymbol{\textquestiondown}{OT1}{?'}
\DeclareTextSymbol{\textquotesingle}{OT1}{'\''}
\DeclareTextSymbol{\textquoteleft}{OT1}{'\''}

Some symbols which are faked from others:

% \DeclareTextCommand{\aa}{OT1}
% \text{{\accent23a}}
\DeclareTextCommand{\AA}{OT1}
\leavevmode\setbox\z@\hbox{\ltx@sh@ft{-1ex}.\hidewidth}
\DeclareTextCommand{\textexclamdown}{OT1}{!'}
\DeclareTextCommand{\textquestiondown}{OT1}{?'}
\DeclareTextCommand{\textemdash}{OT1}{124}
\DeclareTextCommand{\textendash}{OT1}{123}

In the OT1 encoding Å has a hand-crafted definition, so we have here the first recorded explicit use of \DeclareTextCompositeCommand.

\DeclareTextCompositeCommand{\textexclamdown}{OT1}{!'}
\DeclareTextCommand{\AA}{OT1}
\leavevmode\setbox\z@\hbox{\ltx@sh@ft{-1ex}.\hidewidth}
\DeclareTextCommand{\textexclamdown}{OT1}{!'}
\DeclareTextCommand{\textquestiondown}{OT1}{?'}
\DeclareTextCommand{\textemdash}{OT1}{124}
\DeclareTextCommand{\textendash}{OT1}{123}

In the OT1 encoding Å has a hand-crafted definition, so we have here the first recorded explicit use of \DeclareTextCompositeCommand.
The Dutch language uses the letter ‘ij’. It is available in T1 encoded fonts, but not in the OT1 encoded fonts. Therefore we fake it for the OT1 encoding.

\DeclareTextCommand{\ij}{OT1}{% 
\nobreak\hskip\z@skip i\kern-0.02em\nobreak\hskip\z@skip j}

\DeclareTextCommand{\IJ}{OT1}{% 
\nobreak\hskip\z@skip I\kern-0.02em\nobreak\hskip\z@skip J}

In the OT1 encoding, £ and $ share a slot.

\DeclareTextCommand{\textdollar}{OT1}{\hmode@bgroup \ifdim \fontdimen\@ne\font >\z@ \slshape \else \upshape \fi \char'\$\egroup}

\DeclareTextCommand{\textsterling}{OT1}{\hmode@bgroup \ifdim \fontdimen\@ne\font >\z@ \itshape \else \fontshape{ui}\selectfont \fi \char'\$\egroup}

Here we are adding some more composite commands to the OT1 encoding. This makes the use of certain accents with i compatible with their use with the T1 encoding; this enables them to become true \LaTeX{} internal representations. However, it will make these accents work a little less fast since a check will always be made for the existence of a composite.

\DeclareTextComposite{.}{OT1}{i}{'\i}
\DeclareTextCompositeCommand{'}{OT1}{i}{\@tabacckludge'\i}
\DeclareTextCompositeCommand{"}{OT1}{i}{\textcommaabove{g}}
\DeclareTextCompositeCommand{\^}{OT1}{i}{\^i}
\DeclareTextCompositeCommand{\c}{OT1}{g}{\textcommaabove{g}}

T1 encoding is given more extensive set of overloads for \c But here we just adjust \c{g}.

\ifx\textcommaabove\@undefined\else \DeclareTextCompositeCommand{\c}{OT1}{g}{\textcommaabove{g}}\fi

\endinput

1.6 Definitions for the T1 encoding

The definitions for the ‘Extended T\hbox{\TeX} text’ (T1) encoding.

\DeclareFontEncoding{T1}{}

\DeclareTextAccent{\'}{T1}{0}
\DeclareTextAccent{\'}{T1}{1}
\DeclareTextAccent{\'}{T1}{2}
Some accents have to be built by hand. Note that `\ooalign` and `\o@lign` must be inside a group. In these definitions we no longer use the helper function `\sh@ft` from `plain.tex` since that now has two incompatible definitions.

Some symbols are constructed.

For Maltese, `\Hwithstroke` and `\hwithstroke` are needed.
\hmode{bgroup}
\phantom{h}\
\vphantom{h}\
\sbox{z}{h}\
\ooalign{\h\\
\kern0.075\wd{z}\\
\vrule
height \dimexpr 0.7\ht{z}+0.1ex\relax
depth -0.7\ht{z}\\
width 0.4\wd{z}\\
\hidewidth\cr
}%
\egroup
}

\DeclareTextSymbol{\AA}{T1}{197}
\DeclareTextSymbol{\AE}{T1}{198}
\DeclareTextSymbol{\DH}{T1}{208}
\DeclareTextSymbol{\DJ}{T1}{208}
\DeclareTextSymbol{\L}{T1}{138}
\DeclareTextSymbol{\NG}{T1}{141}
\DeclareTextSymbol{\OE}{T1}{215}
\DeclareTextSymbol{\O}{T1}{216}
\DeclareTextSymbol{\SS}{T1}{223}
\DeclareTextSymbol{\TH}{T1}{222}
\DeclareTextSymbol{\aa}{T1}{229}
\DeclareTextSymbol{\ae}{T1}{230}
\DeclareTextSymbol{\dh}{T1}{240}
\DeclareTextSymbol{\dj}{T1}{158}
\DeclareTextSymbol{\guillemetleft}{T1}{19}
\DeclareTextSymbol{\guillemetright}{T1}{20}
\DeclareTextSymbol{\guillemotleft}{T1}{19}
\DeclareTextSymbol{\guillemotright}{T1}{20}
\DeclareTextSymbol{\guilsinglleft}{T1}{14}
\DeclareTextSymbol{\guilsinglright}{T1}{15}
\DeclareTextSymbol{\i}{T1}{25}
\DeclareTextSymbol{\j}{T1}{26}
\DeclareTextSymbol{\ij}{T1}{188}
\DeclareTextSymbol{\IJ}{T1}{156}
\DeclareTextSymbol{\l}{T1}{170}
\DeclareTextSymbol{\ng}{T1}{173}
\DeclareTextSymbol{\oe}{T1}{247}
\DeclareTextSymbol{\o}{T1}{248}
\DeclareTextSymbol{\quotedblbase}{T1}{18}
\DeclareTextSymbol{\quotesinglbase}{T1}{13}
\DeclareTextSymbol{\textasciicircum}{T1}{255}
\DeclareTextSymbol{\textasciiquoteleft}{T1}{18}
\DeclareTextSymbol{\textasciitilde}{T1}{18}
\DeclareTextSymbol{\textbackslash}{T1}{18}
\DeclareTextSymbol{\textbar}{T1}{18}
\DeclareTextSymbol{\textbraceleft}{T1}{18}

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The \nobreak\hspace{0pt} is there to prevent a break after the hyphen but allow later breaks in the remainder of the word.

Declare the composites.

80 = 128

88 = 136

90 = 144
\DeclareTextComposite{\v}{T1}{T}{148}
\DeclareTextComposite{\c}{T1}{T}{149}
\DeclareTextComposite{\H}{T1}{U}{150}
\DeclareTextComposite{\r}{T1}{U}{151}
'98 = 152
\DeclareTextComposite{\^}{T1}{Y}{152}
\DeclareTextComposite{\'}{T1}{Z}{153}
\DeclareTextComposite{\v}{T1}{Z}{154}
\DeclareTextComposite{\,}{T1}{Z}{155}
\ DeclareTextComposite{\Y}{T1}{Y}{156}
\ DeclareTextComposite{\H}{T1}{U}{157}
'A0 = 160
\DeclareTextComposite{\u}{T1}{a}{160}
\DeclareTextComposite{\k}{T1}{a}{161}
\DeclareTextComposite{\'}{T1}{c}{162}
\DeclareTextComposite{\v}{T1}{c}{163}
\DeclareTextComposite{\v}{T1}{d}{164}
\DeclareTextComposite{\v}{T1}{e}{165}
\DeclareTextComposite{\u}{T1}{g}{166}
\ DeclareTextComposite{\l}{T1}{l}{167}
'A8 = 168
\DeclareTextComposite{\v}{T1}{l}{168}
\DeclareTextComposite{\v}{T1}{m}{169}
\DeclareTextComposite{\v}{T1}{n}{170}
\DeclareTextComposite{\v}{T1}{o}{171}
\DeclareTextComposite{\v}{T1}{e}{172}
\DeclareTextComposite{\u}{T1}{o}{173}
\ DeclareTextComposite{\r}{T1}{r}{174}
'B0 = 176
\DeclareTextComposite{\v}{T1}{r}{175}
\DeclareTextComposite{\v}{T1}{s}{176}
\DeclareTextComposite{\v}{T1}{t}{177}
\DeclareTextComposite{\v}{T1}{u}{178}
\DeclareTextComposite{\c}{T1}{t}{179}
\DeclareTextComposite{\c}{T1}{t}{180}
\DeclareTextComposite{\c}{T1}{t}{181}
\DeclareTextComposite{\c}{T1}{t}{182}
\DeclareTextComposite{\v}{T1}{u}{183}
'B8 = 184
\DeclareTextComposite{\v}{T1}{y}{184}
\DeclareTextComposite{\v}{T1}{z}{185}
\DeclareTextComposite{\v}{T1}{z}{186}
\DeclareTextComposite{\,}{T1}{z}{187}
'C0 = 192
\DeclareTextComposite{\v}{T1}{A}{192}
\DeclareTextComposite{\v}{T1}{A}{193}
\DeclareTextComposite{\v}{T1}{A}{194}
\DeclareTextComposite{\v}{T1}{A}{195}
\DeclareTextComposite{\v}{T1}{A}{196}
\DeclareTextComposite{\v}{T1}{A}{197}
\DeclareTextComposite{\c}{T1}{C}{198}
1.7 Definitions for the OMS encoding

The definitions for the ‘\TeX math symbol’ (OMS) encoding. Even though this is meant to be a math font, it includes some of the standard \LaTeX text symbols.

Declare the encoding.

\DeclareFontEncoding{OMS}{}{}

Declare the symbols. Note that slot 13 has in places been named \Orb: please root out and destroy this impolicy wherever you find it!

\DeclareTextSymbol{\textasteriskcentered}{OMS}{3} \texttt{"03}
\DeclareTextSymbol{\textbackslash}{OMS}{110} \texttt{"6E}
\DeclareTextSymbol{\textbar}{OMS}{106} \texttt{"6A}
\DeclareTextSymbol{\textbardbl}{OMS}{107} \texttt{"6B}
\DeclareTextSymbol{\textbraceleft}{OMS}{102} \texttt{"66}
\DeclareTextSymbol{\textbraceright}{OMS}{103} \texttt{"67}
\DeclareTextSymbol{\textbullet}{OMS}{15} \texttt{"0F}
\DeclareTextSymbol{\textdaggerdbl}{OMS}{122} \texttt{"7A}
\DeclareTextSymbol{\textdagger}{OMS}{121} \texttt{"79}
\DeclareTextSymbol{\textparagraph}{OMS}{123} \texttt{"7B}
\DeclareTextSymbol{\textsection}{OMS}{1} \texttt{"01}
\DeclareTextSymbol{\textbigcircle}{OMS}{13} \texttt{"OD}
\DeclareTextSymbol{\textcircled}{OMS}{11}\hbox{\char 13 \texttt{"OD

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1.8 Definitions for the OML encoding

The definitions for the ‘\textsc{TeX} math italic’ (OML) encoding. Even though this is meant to be a math font, it includes some of the standard \LaTeX\ text symbols.

Declare the encoding.
\begin{verbatim}
\DeclareFontEncoding{OML}{}{}
\end{verbatim}

Declare the symbols.
\begin{verbatim}
\DeclareTextSymbol{\textless}{OML}{'\<}
\DeclareTextSymbol{\textgreater}{OML}{'\>}
\end{verbatim}

1.9 Definitions for the OT4 encoding

These definitions are for the Polish extension to the ‘\textsc{TeX} text’ (OT1) encoding. This encoding was created by B. Jackowski and M. Ryćko for use with the Polish version of Computer Modern and Computer Concrete. In positions 0–127 it is identical to OT1 but it contains some additional characters in the upper half. The \LaTeX\ support was developed by Mariusz Olko.

The PL fonts that use it are available as follows:


\begin{verbatim}
\end{verbatim}

Declare the encoding.
\begin{verbatim}
\DeclareFontEncoding{OT4}{}{}
\\DeclareFontSubstitution{OT4}{cmr}{m}{n}
\end{verbatim}

Declare the accents.
\begin{verbatim}
\DeclareTextAccent{"}{OT4}{127}
\DeclareTextAccent{'}{OT4}{19}
\DeclareTextAccent{.}{OT4}{95}
\DeclareTextAccent{=}{}{22}
\DeclareTextAccent{^}{OT4}{94}
\DeclareTextAccent{'}{OT4}{18}
\DeclareTextAccent{\~}{OT4}{126}
\DeclareTextAccent{\H}{OT4}{125}
\DeclareTextAccent{\i}{OT4}{21}
\DeclareTextAccent{\v}{OT4}{20}
\DeclareTextAccent{\r}{OT4}{23}
\end{verbatim}

The ogonek accent is available only under a e A & E. But we have to provide some definition for k. Some other accents have to be built by hand as in OT1:
\begin{verbatim}
\\DeclareTextCommand{\k}{OT4}{1}{%}
\\\TextSymbolUnavailable{\k[#1]}#1
\end{verbatim}
In these definitions we no longer use the helper function \sh@ft from plain.tex since that now has two incompatible definitions.

\begin{verbatim}
\DeclareTextCommand{\b}{OT4}{1}
{\hmode@bgroup\o@lign{\relax#1\crcr\hidewidth\ltx@sh@ft{-3ex}\%}
 \vbox to.2ex{\hbox{\char22}\vss}\hidewidth}\egroup}
\DeclareTextCommand{\c}{OT4}{1}
{\leavevmode\setbox\z@hbox{#1}\ifdim\ht\z@=1ex\accent24 #1\else{\ooalign{\unhbox\z@\crcr\hidewidth\char24\hidewidth}}\fi}
\DeclareTextCommand{\d}{OT4}{1}
{\hmode@bgroup
 \o@lign{\relax#1\crcr\hidewidth\ltx@sh@ft{-1ex}.\hidewidth}\egroup}
\end{verbatim}

Declare the text symbols.

\begin{verbatim}
\DeclareTextSymbol{\AE}{OT4}{29}
\DeclareTextSymbol{\OE}{OT4}{30}
\DeclareTextSymbol{\O}{OT4}{31}
\DeclareTextSymbol{\L}{OT4}{138}
\DeclareTextSymbol{\ae}{OT4}{26}
\DeclareTextSymbol{\guillemetleft}{OT4}{174}
\DeclareTextSymbol{\guillemetright}{OT4}{175}
% old Adobe names
\DeclareTextSymbol{\guillemetleft}{OT4}{174}
\DeclareTextSymbol{\guillemetright}{OT4}{175}
\DeclareTextSymbol{\i}{OT4}{16}
\DeclareTextSymbol{\j}{OT4}{17}
\DeclareTextSymbol{\l}{OT4}{170}
\DeclareTextSymbol{\o}{OT4}{28}
\DeclareTextSymbol{\oe}{OT4}{27}
\DeclareTextSymbol{\quotedblbase}{OT4}{255}
\DeclareTextSymbol{\ss}{OT4}{25}
\DeclareTextSymbol{\textemdash}{OT4}{124}
\DeclareTextSymbol{\textendash}{OT4}{123}
\DeclareTextSymbol{\textexclamdown}{OT4}{60}
\DeclareTextSymbol{\texthyphenchar}{OT4}{'\-}
\DeclareTextSymbol{\texthyphen}{OT4}{'\-}
\DeclareTextSymbol{\textquestiondown}{OT4}{62}
\DeclareTextSymbol{\textquotedblleft}{OT4}{92}
\DeclareTextSymbol{\textquotedblright}{OT4}{92}
\DeclareTextSymbol{\textquoteleft}{OT4}{92}
\DeclareTextSymbol{\textquoteright}{OT4}{92}
\end{verbatim}

Definition for Å as in OT1:

\begin{verbatim}
\DeclareTextCompositeCommand{\r}{OT4}{1}
{\leavevmode\setbox\z@hbox{!}\dimen@\ht\z@\advance\dimen@-1ex\%}
 \rlap{\raise.67\dimen@\hbox{\char23}}A}
\end{verbatim}

In the OT4 encoding, £ and $ share a slot.

\begin{verbatim}
\DeclareTextCommand{\textdollar}{OT4}{1}
{\hmode@bgroup
 \ifdim \fontdimen\@ne\font >\z@\%}
 \rlap{\raise.67\dimen@\hbox{\char23}}A}
\end{verbatim}
Declare the composites.

\DeclareTextComposite{\k}{OT4}{A}{129}
\DeclareTextComposite{\'}{OT4}{C}{130}
\DeclareTextComposite{\k}{OT4}{E}{134}
\DeclareTextComposite{\'}{OT4}{N}{139}
\DeclareTextComposite{\'}{OT4}{S}{145}
\DeclareTextComposite{\'}{OT4}{Z}{153}
\DeclareTextComposite{\'\,}{OT4}{Z}{155}
\DeclareTextComposite{\k}{OT4}{a}{161}
\DeclareTextComposite{\'}{OT4}{c}{162}
\DeclareTextComposite{\k}{OT4}{e}{166}
\DeclareTextComposite{\'}{OT4}{n}{171}
\DeclareTextComposite{\'}{OT4}{s}{177}
\DeclareTextComposite{\'}{OT4}{z}{185}
\DeclareTextComposite{\'\,}{OT4}{z}{187}
\DeclareTextComposite{\'}{OT4}{0}{211}
\DeclareTextComposite{\'}{OT4}{a}{243}

1.10 Definitions for the TS1 encoding

⟨∗TS1⟩
\DeclareFontEncoding{TS1}{}{}
\DeclareFontSubstitution{TS1}{cmr}{m}{n}
Some accents have to be built by hand. Note that \ooalign and \o@lign must be inside a group.
\DeclareTextCommand{\capitalcedilla}{TS1}{1}
\DeclareTextCommand{\capitalogonek}{TS1}{1}
\DeclareTextAccent{\capitalgrave}{TS1}{0}
\DeclareTextAccent{\capitalacute}{TS1}{1}
\DeclareTextAccent{\capitalcircumflex}{TS1}{2}
\DeclareTextAccent{\capitaltilde}{TS1}{3}
\DeclareTextAccent{\capitaldieresis}{TS1}{4}
\DeclareTextAccent{\capitalhungarumlaut}{TS1}{5}
Tie accents.

The tie accent was borrowed from the \texttt{cmmi} font. The tc fonts now provide four tie accents, the first two are done in the classical way with asymmetric glyphs hanging out of their boxes; the new ties are centered in their boxes like all other accents. They need a name: please tell us if you know what to call them.

```
\DeclareTextAccent{\capitaltie}{TS1}{26}
\DeclareTextAccent{\capitalnewtie}{TS1}{29}
```

Compound word marks.

The text companion fonts contain two compound word marks of different heights, one has \texttt{cap_height}, the other \texttt{asc_height}.

```
\DeclareTextSymbol{\textcapitalcompwordmark}{TS1}{23}
\DeclareTextSymbol{\textascendercompwordmark}{TS1}{31}
```

The text companion symbols.

```
\DeclareTextSymbol{\textquotestraightbase}{TS1}{13}
'10 = 16
\DeclareTextSymbol{\textquotestraightdblbase}{TS1}{18}
\DeclareTextSymbol{\texttwelveudash}{TS1}{21}
\DeclareTextSymbol{\textthreequartersemdash}{TS1}{22}
'18 = 24
\DeclareTextSymbol{\textleftarrow}{TS1}{24}
\DeclareTextSymbol{\textrightarrow}{TS1}{25}
'20 = 32
\DeclareTextSymbol{\textblank}{TS1}{32}
\DeclareTextSymbol{\textdollar}{TS1}{36}
\DeclareTextSymbol{\textquotesingle}{TS1}{39}
'28 = 40
```

The symbol \texttt{\textasteriskcentered} “∗” is supposed to be always available in \texttt{TS1} and that is important as it is used in footnote symbols. However, in a few fonts it is missing even though they are otherwise fairly complete. We therefore use a rather elaborate method and check if the slot has a glyph and if not produce a poor man’s version by using a normal “∗” slightly enlarged and somewhat lowered. The main application for this symbol is in footnote symbols and there it should produce a comparable size and show a similar placement.

```
\DeclareTextSymbol{\textasteriskcentered}{TS1}{42} \% that’s wanted
\DeclareTextCommand{\textasteriskcentered}{TS1}{\% \ and that’s needed
  \iffontchar\font 42 \char42 \else
  \begingroup\fontencoding{T1}\
  \fontsize
  \begingroup\fontencoding{T1}\
  \endgroup
  \endgroup
\```
Note that '054 is a comma and '056 is a full stop: these make numbers using oldstyle digits easier to input.

```
\DeclareTextSymbol{\textdblhyphen}{TS1}{45}
\DeclareTextSymbol{\textfractionsolidus}{TS1}{47}

Oldstyle digits.
'30 = 48
\DeclareTextSymbol{\textzerooldstyle}{TS1}{48}
\DeclareTextSymbol{\textoneoldstyle}{TS1}{49}
\DeclareTextSymbol{\texttwooldstyle}{TS1}{50}
\DeclareTextSymbol{\textthreeoldstyle}{TS1}{51}
\DeclareTextSymbol{\textfouroldstyle}{TS1}{52}
\DeclareTextSymbol{\textfiveoldstyle}{TS1}{53}
\DeclareTextSymbol{\textsixoldstyle}{TS1}{54}
\DeclareTextSymbol{\textsevenoldstyle}{TS1}{55}
'38 = 56
\DeclareTextSymbol{\texteightoldstyle}{TS1}{56}
\DeclareTextSymbol{\textnineoldstyle}{TS1}{57}

More text companion symbols.
\DeclareTextSymbol{\textlangle}{TS1}{60}
\DeclareTextSymbol{\textminus}{TS1}{61}
\DeclareTextSymbol{\textrangle}{TS1}{62}
'48 = 72
\DeclareTextSymbol{\textmho}{TS1}{77}

The big circle is here to define the command \textcircled. Formerly it was taken from the cmsy font.
\DeclareTextSymbol{\textbigcircle}{TS1}{79}
\DeclareTextCommand{\textcircled}{TS1}[1]{\hmode@bgroup
  \ooalign{\hfil raise .07ex\hbox {\upshape#1}\hfil \crcr \char 79 % '117 = "4F
  }\egroup}

More text companion symbols.
'50 = 80
\DeclareTextSymbol{\textohm}{TS1}{87}
'58 = 88
\DeclareTextSymbol{\textlbrackdbl}{TS1}{91}
\DeclareTextSymbol{\textrbrackdbl}{TS1}{93}
\DeclareTextSymbol{\textuparrow}{TS1}{94}
\DeclareTextSymbol{\textdownarrow}{TS1}{95}
```
This next name may change. For the following sign we know only a German name, which is abzüglich. The meaning is something like “commercial minus”. An ASCII ersatz is ./.

The meaning of the circled-P is “sound recording copyright”.

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1.11 Definitions for the TU encoding

The TU encoding was originally introduced in the contributed package \texttt{fontspec} as a Unicode encoding for XeTeX and LuaTeX.

Normally for these engines, the input consists of Unicode characters encoded in UTF-8. There is therefore little need to use the traditional (ASCII) encoding-specific commands.

However, sometimes (e.g. for backwards compatibility) it can be useful to access these Unicode characters via such ASCII-based markup. The commands provided here cover the characters in the T1 and TS1 encodings, but specified in Unicode position. Almost all the command names have been mechanically extracted form the \texttt{inputenc} UTF-8 support, which is essentially doing a reverse mapping from UTF-8 data to \LaTeX\ LICR commands.

A few additional names for character which were supported in the original \texttt{fontspec} version of this file have also been added, even though they are not currently in the default \texttt{inputenc} UTF-8 declarations.

In the base interface the Unicode encoding is always known as TU. But we parameterize the encoding name to allow for modelling differences in Unicode support by different fonts.

\begin{verbatim}
\providecommand\UnicodeEncodingName{TU}
\end{verbatim}

As the Unicode encoding, TU, is only currently available with XeTeX or LuaTeX, we detect these engines first, and make adjustments for the differing font loading syntax. For other engines, we issue a warning then abort this file, switching back to T1 encoding.

\begin{verbatim}
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname XeTeXrevision\endcsname\relax
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname directlua\endcsname\relax
Not LuaTeX or XeTeX, abort with a warning.
\PackageWarningNoLine{fontenc}{TU encoding is only available with XeTeX and LuaTeX. Defaulting to T1 encoding}
\def\encodingdefault{T1}
\edef\reserved@c{\detokenize{+tlig;}}
\def\reserved@d{\@remove@tlig\@nil#1\@nil\relax}
\edef\reserved@e{\reserved@c}
\edef\reserved@f{\reserved@d{\reserved@e}}
\edef\reserved@g{\@remove@tlig@@#1\@nil#2\relax}
\endinput
\else
LuaTeX. For Lua\TeX\ 1.10+, define a Lua function to disable any handing by the font code. Otherwise we reload the font without TeX ligatures.
\def\UnicodeFontTeXLigatures{+tlig;}
\ifnum\luatexversion<110
\def\reserved@h{1}%
\def\reserved@i{0}{\remove@tlig\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@nil\@ni...
Now we can define the function. Mostly we just have to insert a protected glyph node, which is a glyph node with subtype 256. But we have to keep track of the current mode to avoid inserting the glyph into a vlist.

\begin{verbatim}
\now@and@everyjob{\directlua{
  local rawchar_func = token.create'@remove@tlig@@@'.index
  local forcehmode = tex.forcehmode
  local put_next = token.put_next
  local glyph_id = node.id'glyph'
  local rawchar_token = token.new(rawchar_func, token.command_id'lua_call')
  lua.get_functions_table()[rawchar_func] = function()
    local mode = tex.nest.top.mode
    if mode == 1 or mode == -1 then
      put_next(rawchar_token)
      return forcehmode(true)
    end
    local n = node.new(glyph_id, 256)
    n.font = font.current()
    n.char = token.scan_int()
    return node.write(n)
  end
}
\}
\def\remove@tlig#1{\@remove@tlig@@@#1\relax}
\fi
\else
XeTeX
\def\UnicodeFontTeXLigatures{mapping=tex-text;}
\def\remove@tlig#1{\XeTeXglyph\numexpr\XeTeXcharglyph#1\relax}
\fi
\def\UnicodeFontFile#1#2{"[#1]:#2"}
\def\UnicodeFontName#1#2{"#1:#2"}

Declare the encoding
\DeclareFontEncoding\UnicodeEncodingName{}{}

Declare accent command to use a postpended combining character rather than the\TeX \texttt{\accent} primitive
\def\addUnicodeAccent#1#2{%
  \if\relax\detokenize{#2}\relax^\texttt{a0}\else#2\fi\char#1\relax}
\end{verbatim}

Now \texttt{\remove@tlig} can be implemented almost as in XeTeX.
In its original implementation \texttt{\DeclareUnicodeAccent} was given 3 arguments (with second the “Unicode encoding” a.k.a., \texttt{\UnicodeEncodingName}) while in other places, e.g., \texttt{\DeclareUnicodeComposite}, we always made encoding implicit. So we now change it here to implicit too so that the interfaces become a bit more consistent. To avoid making that a breaking change (even though it only affects two packages on CTAN) we test for \texttt{#2} being \texttt{\UnicodeEncodingName}. This would not catch if somebody used \texttt{\DeclareUnicodeAccent}{\=}\texttt{TU-sub}{"0304} but that fortunately hasn’t happened. With the implicit argument you would need to change \texttt{\UnicodeEncodingName} instead, as you have to do anyway for the other interface commands.

```latex
\def\DeclareUnicodeAccent#1#2{\%  
  \edef\reserved@a{#2}\%  
  \edef\reserved@b{\unicodeencodingname}\%  
  \ifx\reserved@a\reserved@b\%  
    \def\reserved@a{\endcsname\textcommand{#1}{#2}}\%  
  \else\%  
    \def\reserved@a{\endcsname\textcommand{#1}{#2}\unicodeencodingname}\%  
  \fi\%  
  \reserved@a{#2}%}
\def\endcsname\textcommand{#1}{#2}\unicodeencodingname{\%}
```

Next two commands are simply syntactic sugar to go with the other \texttt{\DeclareUnicode...} declarations.
\def\DeclareUnicodeSymbol#1\{\DeclareTextSymbol#1\{\UnicodeEncodingName}\}
\def\DeclareUnicodeCommand#1\{\DeclareTextCommand#1\{\UnicodeEncodingName\}\}
\DeclareUnicodeCommand\textquotesingle\{\remove@tlig\{"0027\}\}
\DeclareUnicodeCommand\textasciigrave\{\remove@tlig\{"0060\}\}
\DeclareUnicodeCommand\textquotedbl\{\remove@tlig\{"0022\}\}
\DeclareUnicodeSymbol\textdollar\{"0024\}
\DeclareUnicodeSymbol\textless\{"003C\}
\DeclareUnicodeSymbol\textgreater\{"003E\}
\DeclareUnicodeSymbol\textbackslash\{"005C\}
\DeclareUnicodeSymbol\textasciicircum\{"005E\}
\DeclareUnicodeSymbol\textunderscore\{"005F\}
\DeclareUnicodeSymbol\textbraceleft\{"007B\}
\DeclareUnicodeSymbol\textbar\{"007C\}
\DeclareUnicodeSymbol\textbraceright\{"007D\}
\DeclareUnicodeSymbol\textasciitilde\{"007E\}
\DeclareUnicodeSymbol\textexclamdown\{"00A1\}
\DeclareUnicodeSymbol\textcent\{"00A2\}
\DeclareUnicodeSymbol\textsterling\{"00A3\}
\DeclareUnicodeSymbol\textcurrency\{"00A4\}
\DeclareUnicodeSymbol\textyen\{"00A5\}
\DeclareUnicodeSymbol\textbrokenbar\{"00A6\}
\DeclareUnicodeSymbol\textsection\{"00A7\}
\DeclareUnicodeSymbol\textasciidieresis\{"00A8\}
\DeclareUnicodeSymbol\textcopyright\{"00A9\}
\DeclareUnicodeSymbol\textordfeminine\{"00AA\}
\DeclareUnicodeSymbol\guillemetleft\{"00AB\}
% old Adobe name
\DeclareUnicodeSymbol\guillemotleft\{"00AB\}
\DeclareUnicodeSymbol\textlnot\{"00AC\}
\DeclareUnicodeSymbol\textregistered\{"00AE\}
\DeclareUnicodeSymbol\textasciimacron\{"00AF\}
\DeclareUnicodeSymbol\textdegree\{"00B0\}
\DeclareUnicodeSymbol\textpm\{"00B1\}
\DeclareUnicodeSymbol\texttimes\{"00B2\}
\DeclareUnicodeSymbol\texttwosuperior\{"00B3\}
\DeclareUnicodeSymbol\textthreesuperior\{"00B4\}
\DeclareUnicodeSymbol\textmu\{"00B5\}
\DeclareUnicodeSymbol\textparagraph\{"00B6\}
\DeclareUnicodeSymbol\textperiodcentered\{"00B7\}
\DeclareUnicodeSymbol\textonesuperior\{"00B9\}
\DeclareUnicodeSymbol\textordmasculine\{"00BA\}
\DeclareUnicodeSymbol\guillemetright\{"00BB\}
% old Adobe name
\DeclareUnicodeSymbol\guillemotright\{"00BB\}
\DeclareUnicodeSymbol\textonequarter\{"00BC\}
\DeclareUnicodeSymbol\textonehalf\{"00BD\}
\DeclareUnicodeSymbol\textthreequarters\{"00BE\}
\DeclareUnicodeSymbol\textquestiondown\{"00BF\}
\DeclareUnicodeSymbol\AE\{"00C6\}
\DeclareUnicodeSymbol\DH\{"00D0\}
\DeclareUnicodeSymbol\texttimes\{"00D7\}
Unfortunately some fonts do not implement "2011, "2012 and/or "2015 (including the $\text{E}$P$\text{X}$ default fonts for Unicode engines) so we provide some approximations if the glyph is missing, like we do for $\text{OT1}$ and $\text{T1}$.

The $\nobreak\hskip\z@$ is there to prevent a break after the hyphen but allow later breaks in the remainder of the word.
\DeclareUnicodeSymbol{\textdagger}{“2020}
\DeclareUnicodeSymbol{\textdaggerdbl}{“2021}
\DeclareUnicodeSymbol{\textbullet}{“2022}
\DeclareUnicodeSymbol{\textellipsis}{“2026}
\DeclareUnicodeSymbol{\textperthousand}{“2030}
\DeclareUnicodeSymbol{\textpertenthousand}{“2031}
\DeclareUnicodeSymbol{\guilsinglleft}{“2039}
\DeclareUnicodeSymbol{\guilsinglright}{“203A}
\DeclareUnicodeSymbol{\textreferencemark}{“203B}
\DeclareUnicodeSymbol{\textinterrobang}{“203D}
\DeclareUnicodeSymbol{\textfractionsolidus}{“2044}
\DeclareUnicodeSymbol{\textlquill}{“2045}
\DeclareUnicodeSymbol{\textrquill}{“2046}
\DeclareUnicodeSymbol{\textdiscount}{“2052}
\DeclareUnicodeSymbol{\textcolonmonetary}{“20A1}
\DeclareUnicodeSymbol{\textlira}{“20A4}
\DeclareUnicodeSymbol{\textnaira}{“20A6}
\DeclareUnicodeSymbol{\textwon}{“20A9}
\DeclareUnicodeSymbol{\textdong}{“20AB}
\DeclareUnicodeSymbol{\texteuro}{“20AC}
\DeclareUnicodeSymbol{\textpeso}{“20B1}
\DeclareUnicodeSymbol{\textcelsius}{“2103}
\DeclareUnicodeSymbol{\textnumero}{“2116}
\DeclareUnicodeSymbol{\textcircledP}{“2117}
\DeclareUnicodeSymbol{\textrecipe}{“211E}
\DeclareUnicodeSymbol{\textservicemark}{“2120}
\DeclareUnicodeSymbol{\texttrademark}{“2122}
\DeclareUnicodeSymbol{\textohm}{“2126}
\DeclareUnicodeSymbol{\textmho}{“2127}
\DeclareUnicodeSymbol{\Hwithstroke}{“0126}
\DeclareUnicodeSymbol{\hwithstroke}{“0127}

Not all fonts have U+2217 but using U+002A requires some adjustment.
\DeclareUnicodeCommand{\textasteriskcentered}{{“2217}\iffontchar\font#2217\char#2217\else\begingroup\fontsize{\the\dimexpr1.3\dimexpr\f@size pt\relax}{\f@baselineskip}\selectfont\raisebox{-0.7ex}\[\dimexpr\height-0.7ex\][0pt]\{*\}\endgroup\fi}\endgroup
\DeclareUnicodeSymbol{\textsurd}{“221A}
\DeclareUnicodeSymbol{\textangle}{“2329}

File s: loutenc.dtx Date: 2022/05/27 Version v2.0z 391
Accents must be declared before the composites that use them.

The odd one out:

```latex
\DeclareUnicodeCommand\textcommabelow[1] {
  \hmode@bgroup
  \ooalign{\null#1
cr
    \hidewidth
    \check@mathfonts
    \fontsize\ssf@size\z@
    \math@fontsfalse
    \selectfont,
    \hidewidth}
  \egroup
}
```

File s: ltoutenc.dtx Date: 2022/05/27 Version v2.0z
This file now also contains some packages that provide access to the more specialised encodings.

2.1 The fontenc package

This package allows authors to specify which encodings they will use. For each encoding FOO, the package looks to see if the encoding FOO has already been declared. If it has not, the file fooenc.def is loaded. The default encoding is set to be FOO.

In addition the package at the moment contains extra code to extend the \@uclclist (list of upper/lower case pairs) for encodings that involve cyrillic characters. THIS IS A TEMPORARY SOLUTION and will not stay this way forever (or so we hope) but right now we are missing a proper interface for this and didn’t wanted to rush it.

Here we define a macro that extends the \@uclclist if needed and afterwards turns itself in a noop.
Here we process each option:

\DeclareOption*{\let\encodingdefault\CurrentOption}

From 2020/02/02 release onward we only load the encoding files if they haven’t be loaded already. To check this we look if \texttt{T\encoding} is already defined. If not we load (indicated by setting the switch \texttt{@tempswa} to true and we always load if we run in an older format (or rather in a rollback situation).

\@tempswafalse
\@ifl@t@r\fmtversion{2020/02/02}{\expandafter\ifx\csname T\CurrentOption\endcsname\relax\@tempswatrue\fi}{\@tempswatrue}

Load if necessary:

\if@tempswa
\edef\reserved@f{%
\lowercase{\def\noexpand\reserved@f{\CurrentOption enc.def}}}%
\reserved@f
\InputIfFileExists\reserved@f
\PackageError{fontenc}{Encoding file ‘\reserved@f’ not found.}{Necessary code for this encoding was not loaded.\MessageBreak
Thus calling the encoding later on will produce further error messages.}\
\let\reserved@f\relax
\else
\update@uclclist@with@cyrillic\fi
\fi

In case the current encoding is one of a list of known cyrillic ones we extend the \texttt{@uclclist}:

\expandafter\in@\expandafter{\CurrentOption}{T2A,T2B,T2C,X2,LCY,OT2}\ifin@\else\update@uclclist@with@cyrillic\fi

But only if it hasn’t already been extended. This might happen if there are several calls to fontenc loading one of the above encodings. If we don’t do this check the \texttt{@uclclist} gets unnecessarily big, slowing down the processing at runtime.
We select the new font encoding default (i.e., the last encoding specified in the option list. But this encoding may not work with the current \f@shape, e.g., LY1 is not defined for cmr and therefore packages switching to LY1 usually also change \rmdefault. But that only applies at \begin{document} so we get a spurious warning if we use what \LaTeX previously used:

\%\fontencoding\encodingdefault\selectfont

So instead we do this here:

\usefont\encodingdefault\familydefault\seriesdefault\shapedefault

To save some space we get rid of the macro extending the \@uclclist (might have happened already).

\let\update@uclc@with@cyrillic\relax

Finally we pretend that the fontenc package wasn’t read in. This allows for using it several times, e.g., in a class file and in the preamble (at the cost of not getting any version info). That kind of hackery shows that using a general purpose package just for loading an encoding is not the right kind of interface for setting up encodings — it will get replaced at some point in the future.

\let\@elt\relax
\xdef\@fontenc@load@list{\@fontenc@load@list}\@elt{\csname opt@fontenc.sty\endcsname}
\global\expandafter\let\csname ver@fontenc.sty\endcsname\relax
\global\expandafter\let\csname opt@fontenc.sty\endcsname\relax
\global\let\@ifl@ter@@\@ifl@ter
\def\@ifl@ter#1#2#3#4#5{\global\let\@ifl@ter\@ifl@ter@@}
\langle
/package\rangle
1 Counters and Lengths

Commands for defining and using counters. This file defines:

- \newcounter To define a new counter.
- \setcounter To set the value of counters.
- \addtocounter Increase the counter #1 by the number #2.
- \stepcounter Increase a counter by one.
- \refstepcounter Increase a counter by one, also setting the value used by \label.

For accessing the value of the counter as a TeX number (as opposed to \the{counter} which expands to the printed representation of ⟨counter⟩):

- \arabic{⟨counter⟩}: 1, 2, 3, ...
- \roman{⟨counter⟩}: i, ii, iii, ...
- \Roman{⟨counter⟩}: I, II, III, ...
- \alph{⟨counter⟩}: a, b, c, ...
- \Alph{⟨counter⟩}: A, B, C, ...
- \fnsymbol{⟨counter⟩}: *, †, ‡, ...

\counterwithin[⟨format⟩]{⟨counter⟩}{⟨within-counter⟩}: Resets ⟨counter⟩ whenever ⟨within-counter⟩ is stepped. Also redefines \the{⟨counter⟩} command to produce \the{⟨within-counter⟩}.⟨⟨format⟩⟩{⟨counter⟩} with \arabic as the default for ⟨format⟩. Star form omits redefineing the print representation.

\counterwithout[⟨format⟩]{⟨counter⟩}{⟨within-counter⟩}: Removes ⟨counter⟩ from the reset list of ⟨within-counter⟩. Also redefines \the{⟨counter⟩} command to produce ⟨⟨format⟩⟩{⟨counter⟩} with \arabic as the default for ⟨format⟩. Star form omits redefineing the print representation.

1.1 Environment Counter Macros

An environment foo has an associated counter defined by the following control sequences:

- \c@foo Contains the counter’s numerical value. It is defined by \newcount{foocounter}.
- \thefoo Macro that expands to the printed value of \foocounter. For example, if sections are numbered within chapters, and section headings look like Section II-3. The Nature of Counters then \thesection might be defined by:
  \def\thesection
    {\@Roman{c@chapter}-\@arabic{c@section}}

- \p@foo Macro that expands to a printed ‘reference prefix’ of counter foo. Any \ref to a value created by counter foo will produce the expansion of \p@foo{thefoo} when the \label command is executed. See file ltxref.dtx for an extension of this mechanism.

- \cl@foo List of counters to be reset when foo stepped. Has format \@elt{countera}@\@elt{counterb}@\@elt{counterc}.
NOTE: \thefoo and \p@foo must be defined in such a way that \edef\bar{\thefoo} or \edef\bar{\p@foo} defines \bar so that it will evaluate to the counter value at the time of the \edef, even after \foocounter and any other counters have been changed. This will happen if you use the standard commands \@arabic, \@Roman, etc.

The following commands are used to define and modify counters.

\refstepcounter{⟨foo⟩}
Same as \stepcounter, but it also defines \@currentreference so that a subsequent \label{⟨bar⟩} command causes \ref{⟨bar⟩} to generate the current value of counter ⟨foo⟩.

\@definecounter{⟨foo⟩}
Initializes counter {⟨foo⟩} (with empty reset list), defines \p@foo and \thefoo to be null. Also adds ⟨foo⟩ to cl@ckpt – the reset list of a dummy counter @ckpt used for taking checkpoints for the \include system.

\@addtoreset{⟨foo⟩}{⟨bar⟩}
: Adds counter ⟨foo⟩ to the list of counters cl@bar to be reset when counter ⟨bar⟩ is stepped.

\@removetocounter{⟨foo⟩}{⟨bar⟩}
: Removes counter ⟨foo⟩ to the list of counters cl@bar to be reset when counter ⟨bar⟩ is stepped.

\setcounter{⟨foo⟩}{⟨val⟩}
Globally sets \foocounter equal to ⟨val⟩.

\addtocounter{⟨foo⟩}{⟨val⟩}
Globally increments \foocounter by ⟨val⟩.

\newcounter{⟨newctr⟩}[⟨oldctr⟩]
Defines ⟨newctr⟩ to be a counter, which is reset when counter ⟨oldctr⟩ is stepped. If ⟨newctr⟩ already defined produces 'c@newctr already defined' error.

\value{⟨ctr⟩}
produces the value of counter ⟨ctr⟩, for use with a \setcounter or \addtocounter command.

\newcommand{\newctr}{\newcounter{newctr}[oldctr]}
\stepcounter \stepcounter foo Globally increments counter \c@FOO and resets all subsidiary counters.

\def\stepcounter#1{% 
    \addtocounter{#1}\@ne 
    \begingroup 
        \let\@elt\@stpelt 
        \csname cl@#1\endcsname 
    \endgroup}

\@stpelt Rather than resetting the “within” counter to zero we set it to $-1$ and then run \stepcounter that moves it to $0$ and also initiates resetting the next level down.

\def\@stpelt#1{\global\csname c@#1\endcsname \m@ne\stepcounter{#1}}

\cl@@ckpt
\def\cl@@ckpt{\@elt{page}}

\@definecounter
\def\@definecounter#1{\expandafter\newcount\csname c@#1\endcsname 
    \setcounter{#1}\z@ 
    \global\expandafter\let\csname cl@#1\endcsname\@empty 
    \@addtoreset{#1}{@ckpt} 
    \global\expandafter\let\csname p@#1\endcsname\@empty 
    \expandafter 
    \gdef\csname the#1\expandafter\endcsname\expandafter {\expandafter\@arabic\csname c@#1\endcsname}}

\@addtoreset
\def\@addtoreset#1#2{\expandafter\@cons\csname cl@#2\endcsname {{#1}}}
Even through this is internal and the programmer should know what he/she is doing we test here if counter #2 is defined. If not, the execution would run into a tight loop.

```
\ifundefined{c@#2}\relax
{\begingroup
\expandafter\let\csname c@#1\endcsname\@removefromreset
\def\@elt##1{\
\expandafter\ifx\csname c@##1\endcsname\@removefromreset
\else
  \noexpand\@elt{##1}\
\fi}\
\expandafter\xdef\csname cl@#2\endcsname\
{\csname cl@#2\endcsname}\
\endgroup}
```

(End definition for \@removefromreset.)

```
\@ifbothcounters\Test if arg #1 and #2 are counters and if so execute #3.
\def\@ifbothcounters#1#2#3{\
\@ifundefined{c@#1}{\@nocounterr{#1}}{% else counter is defined
\@ifundefined{c@#2}{\@nocounterr{#2}}{% else both counter and within are defined
#3}}
```

(End definition for \@ifbothcounters.)

```
\counterwithout\counterwithin
\NewDocumentCommand \counterwithout {sO{\arabic}mm}{\
\@ifbothcounters{#3}{#4}{%\counterwithout{counter without/within}%
\@ifundefined{c@#1}{\@nocounterr{#1}}{\
\@ifundefined{c@#2}{\@nocounterr{#2}}{\@resetcounter{#3}{#4}}

\IfBooleanF #1%}{%\counterwithout{counter without/within}%
{\expandafter\ifx\csname c@##1\endcsname\@removefromreset
\gdef\csname the#3\endcsname {#2{#3}}
}
```

New implementation using xparse and supporting an optional format argument.

File t: ltcounts.dtx Date: 2021/07/08 Version v1.1m
Numbering commands for definitions of \texttt{\theCOUNTER} and \texttt{\list} arguments.
All commands can now be used in text and math mode.

File: \texttt{ltcounts.dtx}  Date: 2021/07/08  Version v1.1m
\arabic Representation of \emph{counter} as arabic numerals. Changed 29 Apr 86 to make it print the obvious thing it COUNTER not positive.
\begin{verbatim}
\def\arabic#1{\expandafter\@arabic\csname c@#1\endcsname}
\end{verbatim} (End definition for \arabic.)

\roman Representation of \emph{counter} as lower-case Roman numerals.
\begin{verbatim}
\def\roman#1{\expandafter\@roman\csname c@#1\endcsname}
\end{verbatim} (End definition for \roman.)

\Roman Representation of \emph{counter} as upper-case Roman numerals.
\begin{verbatim}
\def\Roman#1{\expandafter\@Roman\csname c@#1\endcsname}
\end{verbatim} (End definition for \Roman.)

\alph Representation of \emph{counter} as a lower-case letter: 1 = a, 2 = b, etc.
\begin{verbatim}
\def\alph#1{\expandafter\@alph\csname c@#1\endcsname}
\end{verbatim} (End definition for \alph.)

\Alph Representation of \emph{counter} as an upper-case letter: 1 = A, 2 = B, etc.
\begin{verbatim}
\def\Alph#1{\expandafter\@Alph\csname c@#1\endcsname}
\end{verbatim} (End definition for \Alph.)

\fnsymbol Representation of \emph{COUNTER} as a footnote symbol: 1 = *, 2 = †, etc.
\begin{verbatim}
\def\fnsymbol#1{\expandafter\@fnsymbol\csname c@#1\endcsname}
\end{verbatim} (End definition for \fnsymbol.)

\@arabic\FOOcounter Representation of \FOOcounter as arabic numerals.
\begin{verbatim}
\def\@arabic#1{\number #1} \% changed 29 Apr 86
\end{verbatim} (End definition for \@arabic.)

\@roman\FOOcounter Representation of \FOOcounter as lower-case Roman numerals.
\begin{verbatim}
\def\@roman#1{\romannumeral #1}
\end{verbatim} (End definition for \@roman.)

\@Roman\FOOcounter Representation of \FOOcounter as upper-case Roman numerals.
\begin{verbatim}
\def\@Roman#1{\expandafter\@slowromancap\romannumeral #1@}
\end{verbatim} (End definition for \@Roman.)

\@slowromancap Fully expandable macro to change a roman number to uppercase.
\begin{verbatim}
\def\@slowromancap#1{\ifx @#1% then terminate
  \else
  \if i#1I\else if v#1V\else if x#1X\else if l#1L\else if
    c#1C\else if d#1D\else if m#1M\else\fi\fi\fi\fi\fi\
  \expandafter\@slowromancap
  \fi
\end{verbatim} (End definition for \@slowromancap.)

File t: ltcounts.dtx Date: 2021/07/08 Version v1.1m 405
\@alph \@alph\FOOcounter Representation of \FOOcounter as a lower-case letter: 1 = a, 2 = b, etc.

\def\@alph#1{% 
  \ifcase#1\or a\or b\or c\or d\or e\or f\or g\or h\or i\or j\or k\or l\or m\or n\or o\or p\or q\or r\or s\or t\or u\or v\or w\or x\or y\or z\else\@ctrerr\fi
}(End definition for \@alph.)

\@Alph \@Alph\FOOcounter Representation of \FOOcounter as an upper-case letter: 1 = A, 2 = B, etc.

\def\@Alph#1{% 
  \ifcase#1\or A\or B\or C\or D\or E\or F\or G\or H\or I\or J\or K\or L\or M\or N\or O\or P\or Q\or R\or S\or T\or U\or V\or W\or X\or Y\or Z\else\@ctrerr\fi
}(End definition for \@Alph.)

\@fnsymbol Typesetting old fashioned footnote symbols. This can be done both in text or math mode now.

This macro is another example of an ever recurring problem in \TeX: Determining
if something is text-mode or math-mode. It is imperative for the decision between text and math to be delayed until the actual typesetting is done as the code in question may go through an \edef or \write where an \ifmmode test would be executed prematurely. Hence in the implementation below, \@fnsymbol is not robust in itself but the parts doing the actual typesetting are.

In the case of \@fnsymbol we make use of the robust command \TextOrMath which takes two arguments and typesets the first if in text-mode and the second if in math-mode. Note that in order for this command to make the correct decision, it must insert a \relax token if run under regular \TeX, which ruins any kerning between the preceding characters and whatever awaits typesetting. If you use e\TeX as engine for \ETeX (as recommended) this unfortunate side effect is not present.

%(2ekernel)
\def\@fnsymbol#1{% 
  \ifcase#1\or *\or \dagger\or \ddagger\or \mathsection\or \mathparagraph\or \|\or **\or \dagger\dagger\else\@ctrerr\fi
%(2ekernel | latexrelease)
\end{document}

File t: ltcounts.dtx Date: 2021/07/08 Version v1.1m
When using regular \TeX, we make this command robust so that it always selects the correct branch in an \texttt{ifmmode} switch with the usual disadvantage of ruining kerning. For the application we use it for here that shouldn’t matter. The alternative would be to mimic \texttt{\IeC} from \texttt{inputenc} but then it will have the disadvantage of choosing the wrong branch if appearing at the beginning of an alignment cell. However, users of \eTeX will be pleasantly surprised to get the best of both worlds and no bad side effects.

First some code for checking if we are running \eTeX but making sure not to permanently turn \texttt{\protect} into \texttt{\relax}.

\begin{verbatim}
In case of ordinary \TeX we define \texttt{\TextOrMath} as a robust command but make sure it always grabs its arguments. If we didn’t do this it might very well gobble spaces in the input stream.
\begin{verbatim}
\DeclareRobustCommand{\TextOrMath}{\ifmmode \expandafter\@secondoftwo \else \expandafter\@firstoftwo \fi}
\protected@edef{\TextOrMath}#1#2{\TextOrMath{#1}{#2}}
\end{verbatim}
\end{verbatim}

For \eTeX the situation is similar. The robust macro is a hidden one so that we again avoid problems of gobbling spaces in the input.

\begin{verbatim}
\protected\expandafter\def\csname TextOrMath\space\endcsname{\ifmmode \expandafter\@secondoftwo \else \expandafter\@firstoftwo \fi}
\edef{\TextOrMath}#1#2{\expandafter\noexpand\csname TextOrMath\space\endcsname{#1}{#2}}
\end{verbatim}

(End definition for \texttt{\TextOrMath}.)
\newlength \Declare #1 to be a new length command.
\setlength Set the length command, \#1, to the value \#2.
\addtolength Increase the value of the length command, \#1, by the value \#2.
\settowidth Set the length, \#1, to the width of a box containing \#2.
\settoheight Set the length, \#1, to the height of a box containing \#2.
\settodepth Set the length, \#1, to the depth of a box containing \#2.

\newlength
\def\newlength#1{\@ifdefinable#1{\newskip#1}}

(End definition for \newlength.)

\setlength
\DeclareRobustCommand\setlength{\@settodim\ht}
\DeclareRobustCommand\settodepth {\@settodim\dp}
\DeclareRobustCommand\settowidth {\@settodim\wd}

(End definition for \setlength and others.)

\addtolength added 24 Mar 86
\DeclareRobustCommand\addtolength{\@settodim\ht}

(End definition for \addtolength.)

\settowidth The obvious analogs of \settowidth.
\settoheight \settodepth \settowidth \@settodim
Clear the memory afterwards (which might be a lot).

(End definition for \settowidth and others.)
\settopoint This macro takes the contents of the skip register that is supplied as its argument and removes the fractional part to make it a whole number of points. This can be used in class files to avoid values like 345.4666666pt when calculating a dimension.
\begin{verbatim}
\def\settopoint#1{\divide#1\p@\multiply#1\p@}
\end{verbatim}
(End definition for \settopoint.)
File v
ltfssbas.dtx

This file contains the main implementation of the 'low level' font selection commands. See other parts of the L\TeX distribution, or The L\TeX Companion for higher level documentation of the L\TeX 'New' Font Selection Scheme.

Warning: The macro documentation is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

1 Preliminary macros

We define a number of macros that will be used later.

\@nomath
\@nomath is used by most macros that will have no effect in math mode. It issues a warning message.
\def\@nomath#1\relax{\ifmmode\@font@warning{Command \noexpand#1invalid in math mode}\fi}

\no@alphabet@error
The macro \no@alphabet@error is called whenever the user requests a math alphabet that is not available in the current version. In math mode an error message is produced otherwise the command keeps silent. The argument is the name of the control sequence that identifies the math alphabet. The \relax at the beginning is necessary to prevent \TeX from scanning too far in certain situations.
\gdef\no@alphabet@error#1\relax{\ifmmode\@latex@error{Math space alphabet identifier space undefined space in space math space version space \math@version}X}{Your requested math alphabet is undefined in the current math version. Check the spelling or use the \SetMathAlphabet command.\fi}

\new@mathgroup
\mathgroup
We also give a new name to \newfam and \fam to avoid verbal confusion (see the introduction).
\def\new@mathgroup\alloc@8\mathgroup\char\ sixt@@n
\let\mathgroup\fam
\let\newfam\new@mathgroup
\onlypreamble\new@mathgroup

(End definition for \nomath.)

(End definition for \no@alphabet@error.)

(End definition for \new@mathgroup and \mathgroup.)

\footnote{For the same reason it seems advisable to \let\fam and \newfam equal to \relax, but this is commented out to retain compatibility to existing style files.}
2 Macros for setting up the tables

The macro `\DeclareFontShape` takes 6 arguments:

```
\def\DeclareFontShape\{begingroup
\nfss@catcodes
\expandafter\endgroup
\enddef\endgroup
```

First we restore the catcodes of all characters used in the syntax.

We use `\expandafter \endgroup` to restore catcode in case something goes wrong with the argument parsing (suggested by Tim Van Zandt)

```
\expandafter\endgroup
\DeclareFontShape@}
```

(End definition for `\DeclareFontShape`.)

```
\enddef\endgroup
```

If the series value is incorrectly specified with an extra “m”, e.g., “mc” instead of just “c”, drop the surplus “m” but keep the “m” if it is by its own. In that case also issue a warning that the declaration needs correction.

For this we compare the given value `#3` with one where we may have dropped an “m”. If nothing has changed, fine. Otherwise there was a wrong value which is now corrected in \reservedb so we use that and also issue a warning.

```
\edef\reserved@b{#3}\
\series@maybe@drop@one@m\reserved@b\reserved@b
\ifx\reserved@b\reserved@b\else
\latex@note{Font shape \texttt{#1/#2/#3/#4} has incorrect series value \texttt{#3}.\MessageBreak It should not contain an \texttt{m}!\MessageBreak Please correct it.\MessageBreak Found}\
\fi
\expandafter
```

Most of the time `#6` is empty so using `\let` to `@empty` saves on space compared to using `\def`. That’s really one of the old space saving techniques and probably not necessary these days.

```
\def\reserved@b{#6}\global
\expandafter\let\csname5\expandafter\endcsname
```

File v: ltfssbas.dtx Date: 2021/06/09 Version v3.2j
\DeclareFixedFont
\def\DeclareFixedFont#1#2#3#4#5#6{\
\begingroup
\math@fontsfalse
\every@math@size{}
\fontsize{#6}\z@
\usefont{#2}{#3}{#4}{#5}
\global\expandafter\let\expandafter#1\the\font
\endgroup}
If we want fast checking for the encoding scheme we can just check for \T@.. being defined.

Now we have to define the macro \langle #1\rangle + \langle #2\rangle to contain #3. But since most of the time #3 will be empty we use \let in a tricky way rather than a simple \def since this will save internal memory. We store the argument #3 in a temporary macro \reserved@a.

We compare \reserved@a with \@empty if these two are the same we \let the ‘extra’ macro equal to \@empty which is not the same a doing a \let to \reserved@a — the latter would blow one extra memory location rather then reusing the one from \@empty.

We initialize the code page list to be empty.
First we start with ignoring all blanks and newlines since every surplus space in the second or third argument will come out in a weird place in the document.

\begingroup
\n\fss@catcodes
\expandafter\endgroup
\DeclareFontEncoding@}
\@onlypreamble\DeclareFontEncoding
\def\DeclareFontEncoding@#1#2#3{%
\expandafter
\ifx\csname T@#1\endcsname\relax
\def\cdp@elt\{\noexpand\cdp@elt\}%
\xdef\cdp@list\{\cdp@list\cdp@elt\#1\}%
{\default@family}{\default@series}%
{\default@shape}}%

To support encoding dependent commands (like accents) we initialise the command \encoding-cmd to be \changed@cmd. (See \texttt{ltoutenc.dtx} for details.)
\expandafter\let\csname#1-cmd\endcsname\@changed@cmd
\else
\latex@error{Encoding scheme \texttt{#1} unknown}\@eha
\fi
\global\@namedef{T@#1}{#2}%
\global\@namedef{M@#1}{\default@M#3}%
\xdef\LastDeclaredEncoding{#1}%
}\@onlypreamble\DeclareFontEncoding@)
\LastDeclaredEncoding The last encoding being declared by \DeclareFontEncoding.
\def\LastDeclaredEncoding{}
\@onlypreamble\DeclareFontEncoding@)
\DeclareFontSubstitution
\def\DeclareFontSubstitution@#1#2#3#4{%
\expandafter
\ifx\csname T@#1\endcsname\relax
\@latex@error{Encoding scheme \texttt{#1} unknown}\@eha
\else
\begingroup
\edef\reserved@a{#1}%
\toks@{}%
\def\cdp@elt##1##2##3##4{%
\def\reserved@b{##1}%
\ifx\reserved@a\reserved@b
File v: ltfssbas.dtx Date: 2021/06/09 Version v3.2j
Here we use the new defaults but we use \#1 (i.e., the encoding name already stored previously) since we know that it is expanded.

\addto\hook\toks@{\cdp@elt{\#1}{\#2}{\#3}{\#4}}%

\else

If \reserved@a and \reserved@b differ then we simply copy from the old list to the new.

\addto\hook\toks@{\cdp@elt{\#1}{\#2}{\#3}{\#4}}%
\fi%
\cdp@list
\xdef\cdp@list{\the\toks@%
\endgroup
\global
\@namedef{D@#1}{%
 \def\default@family{\#2}%
 \def\default@series{\#3}%
 \def\default@shape{\#4}%
}%
\fi%
\@onlypreamble\DeclareFontSubstitution

(End definition for \DeclareFontSubstitution.)

\DeclareFontEncodingDefaults
\def\DeclareFontEncodingDefaults#1#2{%
\ifx\relax#1\else
 \ifx\default@T@empty\else
   \@fontinfo{Overwriting encoding scheme text defaults}%
 \fi
 \gdef\default@T{#1}%
 \fi
\ifx\relax#2\else
 \ifx\default@M@empty\else
   \@fontinfo{Overwriting encoding scheme math defaults}%
 \fi
 \gdef\default@M{#2}%
 \fi
}%
\@onlypreamble\DeclareFontEncodingDefaults

(End definition for \DeclareFontEncodingDefaults.)

\DeclarePreloadSizes
\def\DeclarePreloadSizes#1#2#3#4#5{%
\@ifundefined{T@#1}{}
\ifx\latex\relax\latex@error{Encoding scheme ‘#1’ unknown}\@eha%
\%
Don’t know at the moment what this group here does!

\begingroup

We define a macro \reserved@f that grabs the next size and loads the corresponding font. This is done by delimiting \reserved@f’s only argument by the token , (comma).

\def\reserved@f##1,{%

The end of the list will be detected when there are no more elements, i.e. when \reserved@f’s argument is empty. The trick used here is explained in Appendix D of the \TeXbook: if the argument is empty the \if will select the first clause and \let \reserved@f equal to \relax. (We use the > character here since it cannot appear in font file names.)

\if>##1>%
\let\reserved@f\relax
\else

Otherwise, we define \font@name appropriately and call \pickup@font to do the work. Note that the requested \curr@fontshape combination must have been defined, or you will get an error. The definition of \font@name is carried out globally to be consistent with the rest of the code in this file.

\xdef\font@name{\csname#1/#2/#3/#4/##1\endcsname}%
\pickup@font

Now we forget the name of the font just loaded. More precisely, we set the corresponding control sequence to \relax. This means that later on, when the font is first used, the macro \define@newfont is called again to execute the ‘extra’ macro for this font.

\global\expandafter\let\font@name\relax
\fi

Finally we call \reserved@f again to process the next size. If \reserved@f was \let equal to \relax this will end the macro.

\reserved@f%

We finish with reinserting the list of sizes after the \reserved@f macro and appending an empty element so that the end of the list is recognized properly.

\reserved@f#5,,%
\endgroup
\@onlypreamble\DeclarePreloadSizes

(End definition for \DeclarePreloadSizes.)

\ifmath@fonts

We need a switch to decide if we have to switch math fonts. For this purpose we provide \ifmath@fonts that can be set to true or false by the \S@... macros depending on if math fonts are provided for this size or not. The default is of course to switch all fonts.

\newif\ifmath@fonts \math@fontstrue

(End definition for \ifmath@fonts.)

\@tempa since it is needed in \pickup@font.
\DeclareMathSizes \DeclareMathSizes*  
\DeclareMathSizes takes the text size, math text size, math script size, and math scriptscript size as arguments and defines the right \S@... macro.

\def\DeclareMathSizes{\@ifstar{\@DeclareMathSizes\math@fontsfalse}{}{\@DeclareMathSizes{}}}

\@onlypreamble\DeclareMathSizes

(End definition for \DeclareMathSizes and \DeclareMathSizes*.)

\@DeclareMathSizes  
This modification by Michael J. Downes on comp.text.tex on 2002/10/17 allows the user to have settings such as \DeclareMathSizes{9.5dd}{9.5dd}{7.4dd}{6.6dd}.

\@defaultunits\dimen@ #2pt\relax\@nnil
\if $#3$\else\expandafter\gdef\csname S@\strip@pt\dimen@\endcsname{\gdef\tf@size{#3}\gdef\sf@size{#4}\gdef\ssf@size{#5}}\the\toks@\fi

\@DeclareMathSizes{9.5dd}{9.5dd}{7.4dd}{6.6dd}.  
\@defaultunits\dimen@ii #3pt\relax\@nnil
\@defaultunits\@tempdima #4pt\relax\@nnil
\@defaultunits\@tempdimb #5pt\relax\@nnil
\toks@{#1}\expandafter\xdef\csname S@\strip@pt\dimen@\endcsname{\@defaultunits\dimen@ #2pt\relax\@nnil\@defaultunits\@tempdima #4pt\relax\@nnil\@defaultunits\@tempdimb #5pt\relax\@nnil}\toks@\expandafter\let\csname S@\strip@pt\dimen@\endcsname {\math@fontsfalse}

(End definition for \DeclareMathSizes and \DeclareMathSizes*.)
3 Selecting a new font

3.1 Macros for the user

As we said in the introduction a font is described by four parameters. We first define macros to specify the wanted family, series, or shape. These are simply recorded in internal macros \f@family, \f@series, and \f@shape, resp. We use \edef’s so that the arguments can also be macros.

\fontencoding\f@encoding

If the new encoding is the same as the old encoding we have nothing to do. However, in case we had a sequence of several encoding changes without a \selectfont in-between we can save processing by making sure that \enc@update is \relax.

\let\enc@update\relax

If current and new encoding differ we define the macro \enc@update to contain all updates necessary at \selectfont time.

\let\enc@update\@@enc@update

\expandafter\let\csname\cf@encoding-cmd\endcsname\@changed@cmd
\expandafter\let\csname\f@encoding-cmd\endcsname\@current@cmd

We execute the default settings \default@T, followed by the one for the new encoding.

\default@T
\csname T@\f@encoding\endcsname
Finally we change the default substitution values, disable \enc@update and make \f@encoding officially the current encoding.
\csname D@f@encoding\endcsname
\let\enc@update\relax
\let\cf@encoding\f@encoding
}

(End definition for \@enc@update.)

\enc@update The default action in \selectfont is to do nothing.
\let\enc@update\relax

(End definition for \enc@update.)

\fontfamily \f@family
\fontseries \f@series
\fontshape \f@shape
\DeclareRobustCommand\fontfamily[1]{\edef\f@family{#1}}
There are now defined later (and differently).
\DeclareRobustCommand\fontseries[1]{\edef\f@series{#1}}
\DeclareRobustCommand\fontshape[1]{\edef\f@shape{#1}}

(End definition for \fontfamily and others.)

\usefont Some handy abbreviation if you want to get some particular font in the current size. If also the size should change one has to issue a \fontsize command first.
\fontencoding needs to do some setup work so we call that, but instead of calling \fontfamily, \fontseries and \fontshape it earlier versions of this code did, we now set \f@family, etc. directly. If we would call \fontseries or \fontshape as it was done in the past, they would now interact with the existing series and shape which is not desired if we intend to use an explicit font shape!
\langle /2ekernel \langle *2ekernel | latexrelease \rangle \IncludeInRelease{2021/06/01}{\usefont}{Force font face}\% \DeclareRobustCommand\usefont[4]{\fontencoding[#1]}% \edef\f@family[#2] % \set@target@series[#3] % \edef\f@shape[#4] % Any earlier \fontseries, etc. should be canceled and we should switch unconditionally to the requested font face so we drop any code that may have been stored in \delayed@f@adjustment.
\let\delayed@f@adjustment\@empty \selectfont \ignorespaces\langle /2ekernel | latexrelease \rangle \EndIncludeInRelease \langle latexrelease \rangle\IncludeInRelease{2020/02/02}{\usefont}{Drop m in usefont}\% \langle latexrelease \rangle\DeclareRobustCommand\usefont[4]{\fontencoding[#1]}% \edef\f@family[#2] % \set@target@series[#3] % \edef\f@shape[#4] \selectfont

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\linespread The command \texttt{\linespread} changes the current \texttt{\baselinestretch} by calling \texttt{\set@fontsize}. The values for \texttt{\f@size} and \texttt{\f@baselineskip} will be left unchanged.

\linespread[1] \{\set@fontsize[1]\f@size\f@baselineskip\}

(End definition for \texttt{\linespread}.)

\fontsize We also define a macro that allows to specify a size. In this case, however, we also need the value of \texttt{\baselineskip}. As the first argument to \texttt{\set@fontsize} we pass the current value of \texttt{\baselinestretch}. This will either match the internal value (in which case nothing changes, or it will be an updated value due to a user change of that macro using \texttt{\renewcommand}. If we would pass the internal \texttt{\f@linespread} such a change would be effectively overwritten by a size change.

\fontsize[2] \{\set@fontsize[2]\baselinestretch[1][1][2]\}

(End definition for \texttt{\fontsize}.)

\f@linespread This macro holds the current internal value for \texttt{\baselinestretch}.

\f@linespread \{\set@fontsize[1]\f@baselineskip[1]\f@size[1]\f@series[1]\f@shape[1]\f@family[1]\f@encoding[1]\f@linespread[1]\empty\}

(End definition for \texttt{\f@linespread}.)

\cf@encoding

\cf@encoding \{\set@encoding[1]\cf@encoding[1]\empty\}

(End definition for \texttt{\cf@encoding}.)
\defaultunits The function \defaultunits when wrapped around a dimen or skip assignment supplies default units. Usage:
\defaultunits\dimen@=#1pt\relax\@nnil
Note: the \relax is *important*. Other units can be substituted for the ‘pt’ if desired.
We use \remove@to@nnil as an auxiliary macros for \defaultunits. It just has to gobble the supplied default unit ‘pt’ or whatever, if it wasn’t used in the assignment.
\def\defaultunits{\afterassignment\remove@to@nnil}
(End definition for \defaultunits.)

\strippt This macro strips the characters pt produced by using \the on a dimen register.
\begingroup
\catcode'P=12
\catcode'T=12
\lowercase{
\def\x{\def\rempt##1.##2PT{##1\ifnum##2>\z@.##2\fi}}}
\expandafter\endgroup\x
\def\strippt{\expandafter\rempt\the}
(End definition for \strippt and \rempt.)

\mathversion \math@version \mathversion takes the math version name as argument, defines \math@version appropriately and switches to the font selected forcing a call to \glb@settings if the version is known to the system.
\DeclareRobustCommand\mathversion[1]{\@nomath\mathversion
  \expandafter\ifx\csname mv@#1\endcsname\relax
  \@latex@error{Math version ‘#1’ is not defined}\@eha\else
  \edef\math@version{#1}\
  We need to force a math font setup both now and at the point where we return to the previous math version. Forcing a math font setup can simply be done by setting \glb@currsize to an invalid value since this will trigger the setup when the formula starts.
  \gdef\glb@currsize{}%
  When the scope of the current \mathversion ends we need to restore the old setup. However this time we need to force it directly at least if we are inside math, otherwise we could wait. Another way to enhance this code here is todo the setting only if the version really has changed after all. This might be interesting in case of amstext and boldsymbol.
  \aftergroup\glb@settings
  \fi}
(End definition for \mathversion and \math@version.)

If \TeX would support a hook just before the end of a formula (opposite of \everymath so to speak) the implementation of the algorithm would be much simpler because in that case we would set up the correct math fonts at this point without having to worry about incorrect settings due to nesting. The same would be true if in \TeX the use of $ (as the primitive \TeX command) would be impossible and instead only a higher-level interface would be available. Note that this does not mean that a $ couldn’t be the short-hand
for starting and stopping that higher-level interface, it only means that the direct \TeX function must be hidden.

Anyway, since we don’t have this and won’t have it in \iTeX we need to implement it in a somewhat slower way.

We test for the current math font setup on entry of a formula, i.e., on the hooks \everymath and \everydisplay. But since these hooks may contain user data we provide ourselves with an internal version of these hooks which stays frozen.

\verb|\everymath| \verb|\everydisplay| New internal names for \everymath and \everydisplay.

\verb|\frozen@everymath| \verb|\frozen@everydisplay| New internal names for \everymath and \everydisplay.

\verb|\everymath| \verb|\everydisplay| Now we provide now user hooks that will be called in the frozen internals.

\verb|\frozen@everymath| \verb|\frozen@everydisplay| Now we define the behaviour of the frozen hooks: first check the math setup then call the user hook.

\verb|\frozen@everymath| \verb|\frozen@everydisplay| Ditto for the display hook.

\verb|\curr@math@size| This holds locally the current math size.

\section{3.2 Macros for loading fonts}

\verb|\pickup@font| The macro \verb|\pickup@font| which is used in \verb|\selectfont| is very simple: if the font name is undefined (i.e. not known yet) it calls \verb|\define@newfont| to load it.

\verb|\def| \verb|\pickup@font| is a macro for loading fonts.
\split@name assumes that \font@name is set but it is sometimes called when \f@family, \f@series, \f@shape, or \f@size may have the wrong settings (see, e.g., the definition of \getanddefine@fonts). Therefore we need a macro to extract font family, series, shape, and size from the font name. To this end we define \split@name which takes the font name as a list of characters of \catcode 12 (without the backlash at the beginning) delimited by the special control sequence \@nil. This is not very complicated: we first ensure that / has the right \catcode
\newcommand\split@name#1/#2/#3/#4/#5\@nil{\def\f@encoding{#1}%
  \def\f@family{#2}%
  \def\f@series{#3}%
  \def\f@shape{#4}%
  \def\f@size{#5}}
\curr@fontshape Abbreviation which may get removed again for speed.
\newcommand\curr@fontshape{\f@encoding/\f@family/\f@series/\f@shape}
\define@newfont Now we can tackle the problem of defining a new font.
\newcommand\define@newfont{\let\typeout\@font@info\escapechar-1 Then we extract encoding scheme, family, series, shape, and size from the font name. Note the four \expandafter's so that \font@name is expanded first, then \string, and finally \split@name.
\newcommand\expandafter[1]{\expandafter#1}
\newcommand\expandafter[1]{\expandafter#1}
\newcommand\split@name{\expandafter\string\font@name\@nil
If the \curr@fontshape combination is not available, (i.e. undefined) we call the macro \wrong@fontshape to take care of this case. Otherwise \extract@font will load the external font for us.
To allow substitution we call the `curr@fontshape` macro which usually will expand to `\relax` but may hold code for substitution (see `\subst@fontshape` definition).

```latex
% \csname curr@fontshape\endcsname
\extract@font\fi
```

We are nearly finished and must only restore the `\escapechar` by closing the group.

```latex
\endgroup}
```

```latex
\def\try@load@fontshape{\
  \expandafter\ifx\csname \f@encoding+\f@family\endcsname\relax
  \@font@info{Trying to load font information for
   \f@encoding+\f@family}\%
  \fi}
```

We predefine this combination to be `\@empty` which means that next time we don’t try again unnecessary in case we don’t find a `.fd` file. If the file contains a `\DeclareFontFamily` command than this setting will be overwritten.

```latex
\global\expandafter\let\csname \f@encoding+\f@family\endcsname\@empty
```

Set the catcodes used in the syntax, but do it only once (this will be restored at the end of the font loading group).

```latex
\nfss@catcodes
\let\nfss@catcodes\relax
```

For increased portability make the external filename monocase, but look for the (old style) mixed case filename if the first attempt fails.

On any monocase system this means that the file is looked for twice which takes up time and string space, but at least for this release Check for both names to give people time to re-install their private fd files with lowercase names.

```latex
\edef\reserved@a{\lowercase{\noexpand\InputIfFileExists{\f@encoding\f@family.fd}}}\relax
```

```latex
\reserved@a\relax
```

```latex
\fi
```

(End definition for `\define@newfont`.)

\nfss@catcodes

This macro should contain the standard `\catcode` assignments to all characters which are used in the commands found in an `.fd` file and which might have special `\catcode` in the middle of a document. If necessary, this list can be extended in a package file using a suitable number of `\expandafter`, i.e.,

```latex
\expandafter\def\expandafter\nfss@catcodes\expandafter{\nfss@catcodes <additional settings>}
```

Note, that this macro might get executed several times since it is also called by `\DeclareFontShape`, thus it probably should not be misused as a general purpose hook.

```latex
\def\nfss@catcodes{\%
```

We start by making `@` a letter and ignoring all blanks and newlines.

```latex
\makeatletter
\catcode`\ 9%
\catcode`\^^I9%
\catcode`\^^M9%
```
Then we set up \, \{, \}, # and % in case an .fd file is loaded during a verbatim environment.

\catcode`\z@ \catcode`\@me \catcode`\tw@ \catcode`\#6% \catcode`\7% \catcode`\%14%

The we make sure that the important syntax parts have the right \catcode.

\@makeother\<% \@makeother\>% \@makeother\*% \@makeother\.% \@makeother\-% \@makeother\/% \@makeother\% \@makeother\-% \@makeother\/% \@makeother\% \@makeother\"% \@makeother\''% (End definition for \fss@catcodes.)

\LoadFontDefinitionFile Load and .fd files for some encoding and family (if it exists).

\LoadFontDefinitionFile\#1#2{%\begingroup \edef\f@encoding{#1} \edef\f@family{#2} \try@load@fontshape \endgroup}
(End definition for \LoadFontDefinitionFile.)

\DeclareFontFamilySubstitution
The idea for this macro is stolen from the \texttt{substitutefont} package by Günter Milde, with some modifications and a new name.

Its purpose is to provide characters in a special encoding that are not available in the current font family to be taken from a different family that is visually compatible (or not if you choose badly). For example, you can match the GFS Didot Greek characters with \TeX{} Gyre Pagella (Palatino) by specifying

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This way if you ask for the LGR encoding in for the qpl family you get the characters from the udidot family substituted.

We need to ensure that the macro is defined with \texttt{nfss@catcodes} in force (not quite sure why at the moment to be honest).

\begin{verbatim}
\DeclareFontFamilySubstitution{LGR}{qpl}{udidot}
\end{verbatim}

We only provide a set of silent substitutions. The package also (re)declared the family, but this is incorrect in my eyes and it is better to handle that differently.

Of course the families may still need loading at this point and so we arrange for this. Otherwise we might run into trouble because the necessary \texttt{DeclareFontFamily} has not been seen.

\begin{verbatim}
\begin{group}
\gdef\DeclareFontFamilySubstitution#1#2#3{\LoadFontDefinitionFile{#1}{#2}{#3}}
\end{group}
\end{verbatim}

These days a few more shapes might be around, so we declare those too. If they don’t exist then after the first substitution normal fallbacks will happen.

\begin{verbatim}
\LoadFontDefinitionFile{#1}{#2}{#3}
\end{verbatim}

Same game with b and bx, for other weights you are on your own:

\begin{verbatim}
\DeclareFontShape{#1}{#2}{b}{it}{<->ssub * #3/b/it}{}
\end{verbatim}

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\DeclareErrorFont

Declare the last resort shape! We assume that in this fontshape there is a 10pt font but it doesn’t really matter. We only loose one macro name if the assumption is false. But at least the font should be there!

\gdef\f@encoding{#1}%
\gdef\default@family{#2}%
\gdef\default@series{#3}%
\gdef\default@shape{#4}%
\global\let\f@family\default@family
\global\let\f@series\default@series
\global\let\f@shape\default@shape
\gdef\f@size{#5}%
\gdef\f@baselineskip{#5pt}%

Initialize all those internal variables which may or may not have values in the first seconds of NFSS’ bootstrapping process. Later on such values will be updated when an encoding is selected, etc.

We definitely don’t want to set \f@encoding; we can set all the others since if they are left “blank” any selection would grab “error default values” as well. However, this probably should go also—and now it did.

\include{ltfssbas.dtx}
Before we come to the macro \extract@font we have to take care of unknown \curr@fontshape combinations. The general strategy is to issue a warning and to try a default \shape, then a default \series, and finally a default \family. If this last one also fails \TeX will go into an infinite loop. But if the defaults are set incorrectly one deserves nothing else!

We remember the wanted \curr@fontshape combination which we will need in a moment.

Then we warn the user about the mess and set the shape to its default.

If the combination is not known, try the default \series.

If this is still undefined, try the default \family. Otherwise give up. We never try to change the encoding scheme!

If we change the font family and we are in the preamble then the corresponding .fd file may not been loaded yet. Therefore we try this now. Otherwise equating the requested font shape with the finally selected fontshape below will fail and can result in “NFSS tables corrupted”. After begin document that will not happen as all .fd files involved in substitution are loaded at \begin{document}.

At this point a valid \curr@fontshape combination must have been found. We inform the user about this fact.

The \texttt{\expandafter\string} here stops \TeX adding the space that it usually puts after command names in messages. The similar construction with \texttt{@undefined} just produces ‘undefined’, but saves a few tokens.

\texttt{@wrong@font@char} is locally redefined in \texttt{\UseTextSymbol} from its normal (empty) definition, to report the symbol generating the font switch.

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We change \texttt{@defaultsubs} to produce a warning at the end of the document. The macro \texttt{@defaultsubs} is initially \texttt{relax} but gets changed here if some default font substitution happens. It is then executed in \texttt{\enddocument}.

\begin{verbatim}
\gdef\@defaultsubs{%
  \@font@warning{Some font shapes were not available, defaults substituted.}\gobbletwo}%
\end{verbatim}

If we substitute a \texttt{\curr@fontshape} combination by the default one we don’t want the warning to be printed out whenever this (unknown) combination is used. Therefore we globally \texttt{\let} the macro corresponding to the wanted combination equal to its substitution. This requires the use of four \texttt{\expandafter}'s since \texttt{\csname ...\endcsname} has to be expanded before \texttt{\reserved@a} (i.e. the requested combination), and this must happen before the \texttt{\let} is executed.

\begin{verbatim}
\global\expandafter\expandafter\expandafter\let\reserved@a\csname\curr@fontshape\endcsname
\end{verbatim}

Now we can redefine \texttt{\font@name} accordingly. This \textit{must} be done globally since it might occur in the group opened by \texttt{\define@newfont}. If we would this definition were local the closing \texttt{\endgroup} there would restore the old meaning of \texttt{\font@name} and then switch to the wrong font at the end of \texttt{\selectfont} although the correct font was loaded.

\begin{verbatim}
\xdef\font@name{\csname\curr@fontshape/\f@size\endcsname}\
\end{verbatim}

The last thing this macro does is to call \texttt{\pickup@font} again to load the font if it is not defined yet. At this point this code will loop endlessly if the defaults are not well defined.

\begin{verbatim}
\pickup@font
\end{verbatim}

\texttt{⟨/2ekernel|latexrelease⟩}
\texttt{⟨latexrelease⟩}\EndIncludeInRelease
\texttt{⟨latexrelease⟩}\IncludeInRelease{0000/00/00}{\wrong@fontshape}\
\texttt{⟨latexrelease⟩}\def\wrong@fontshape{%
  \csname D@\f@encoding\endcsname\edef\reserved@a{\csname\curr@fontshape\endcsname}%,
  \ifx\last@fontshape\reserved@a\errmessage{Corrupted NFSS tables}\
  \else\let\f@shape\default@shape\expandafter\ifx\csname\curr@fontshape\endcsname\relax\let\f@series\default@series\expandafter\ifx\csname\curr@fontshape\endcsname\relax\let\f@family\default@family\fi\fi\fi
  \@font@warning{Font shape ‘\expandafter\string\reserved@a’ using ‘\curr@fontshape’ instead of \texttt{\wrong@font@char}}%
\texttt{⟨latexrelease⟩}\global\let\last@fontshape\reserved@a\gdef\@defaultsubs{%
\end{verbatim}
\@defaultsubs See above.
\@defaultsubs \let\@defaultsubs\relax
(End definition for \@defaultsubs and \@defaultsubs.)
\strip@prefix In \extract@font we will need a way to recover the replacement text of a macro. This is done by the primitive \meaning together with the macro \strip@prefix (for the details see appendix D of the \TeXbook, p. 382).
\def\strip@prefix#1>{}
(End definition for \strip@prefix.)

4 Assigning math fonts to versions
\install@mathalphabet This is just another name for \gdef but we can redefine it if necessary later on.
\let\install@mathalphabet\gdef
(End definition for \install@mathalphabet.)
\math@fonts \let\math@fonts\@empty
(End definition for \math@fonts.)
\select@group \select@group has four arguments: the new ⟨math alphabet identifier⟩ (a control sequence), the ⟨math group number⟩, the extra macro for math mode and the \curr@fontshape definition macro name. We first check if we are in math mode.
\def\select@group#1#2#3{(\relax\ifmmode
We do these things locally using \begingroup instead of \bgroup to avoid the appearance of an empty Ord atom on the math list.
% \begingroup
We set the math fonts for the *family* in question by calling `\getanddefine@fonts` in the correct environment.

591 \% \escapechar\m@ne
592 \% \getanddefine@fonts\csname c@mv@math@version\endcsname\#3\%

We globally select the math fonts...

593 \% \globaldefs\@ne \math@fonts
... and close the group to restore \globaldefs and \escapechar.

594 \% \endgroup

As long as no *size* or *version* change occurs the ⟨math alphabet identifier⟩ should simply switch to the installed *math group* instead of calling `\select@group` unnecessarily. So we globally redefine the first argument (the new ⟨math alphabet identifier⟩) to expand into a `\mathgroup` switch and then select this *alphabet*. Note that this redefinition will be overwritten by the next call to a *version* macro. The original code for the end of `\select@group` was

\[ \gdef#1{\noexpand\use@mathgroup\noexpand#2% \csname c@mv@math@version\endcsname}\% \stepcounter{mv@math@version}\% #1}\fi\]

i.e. first redefining the ⟨math alphabet identifier⟩ and then calling the new definition to switch to the wanted ⟨math group⟩. Now we define the ⟨math alphabet identifier⟩ as a call to the `\use@mathgroup` command.

595 \% \edef#1{\noexpand\use@mathgroup\noexpand#2% \csname c@mv@math@version\endcsname}\%
596 \% \number\csname c@mv@math@version\endcsname\% #1\%

But this is not sufficient, as we learned the hard way. The problem here is that the loading of the fonts that comprise the alphabet identifier #1, as well as the necessary math font assignments is deferred until it is used. This is OK so far, but if the fonts are switched within the current formula (which may happen if a sub-formula is a box that contains a math version switch) the font assignments for #1 are not restored unless #1 is used again. This is disastrous since TeX sees the wrong fonts at the end of the math formula, when it converts the math list into a horizontal list.

This is taken into account as follows: When a math alphabet identifier is used for the first time in a certain version it modifies the corresponding macro \mv@[version] so that it calls \getanddefine@fonts directly in future as well. We use the macro \extract@alph@from@version to do this. It takes the math alphabet identifier #1 and the math version macro as arguments.

597 \% \expandafter\extract@alph@from@version
598 \% \csname mv@[\math@version]\expandafter\endcsname
599 \% \expandafter{\number\csname c@mv@[\math@version]\endcsname}\%
600 \% \#1\%
601 \% \stepcounter{mv@[\math@version]}%

Finally, it is not possible to simply call the new definition since we have an argument (the third argument of `\use@mathgroup` or more exactly the argument of `\math@egroup` if the `marginid` option is in force) which would swallow our closing `\fi`. So we use the \expandafter technique to remove the `\fi` before the `\use@mathgroup` is expanded.

\%\expandafter #1\fi

(End definition for `\select@group`.)
We proceed to the definition of the macro \extract@alph@from@version. As stated above, it takes a math alphabet identifier and a math version macro (e.g. \mv@normal) as its arguments.

To extract and replace the definition of math alphabet identifier \#3 in macro \#1 we have to recall how this definition looks like: Somewhere in the replacement text of \#1 there is the sequence

\install@mathalphabet(math alphabet identifier) \#3{\langle Definitions for \#3\rangle}

Hence, the first thing we do is to extract the tokens preceding this definitions, the definition itself, and the tokens following it. To this end we define one auxiliary macro \reserved@a.

When \reserved@a is expanded, it will have the tokens preceding the definition in question in its first argument (##1), the following tokens in its third argument (##3), and the replacement text for the math alphabet identifier \#3 in its second argument. (##2). This is then recorded for later use in a temporary macro \reserved@b.

Additionally, we define a macro \reserved@c to reconstruct the definitions for the math version in question from the tokens that will remain unchanged (##1 and ##3) and the yet to build new definitions for the math alphabet identifier \#3.

Then we execute our auxiliary macro.

OK, so now we have to build the new definition for \#3. To do so, we first extract the interesting parts out of the old one. The old definition looks like:

\select@group(math alphabet identifier) \langle (math group number)(math extra part) \langle curr@fontshape definition \rangle \rangle

So we define a new temporary macro \reserved@a that extracts these parts.

This macro can now directly rebuild the math version definition by calling \reserved@c:

In addition it defines the alphabet the way it should be used from now on.

Finally, we only have to call this macro \reserved@a on the old definitions recorded in \reserved@b:

(End definition for \extract@alph@from@version.)

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Here are the default definitions for $\math@bgroup$ and $\math@egroup$. We use $\bgroup$ instead of $\begingroup$ to avoid ‘leaking out’ of style changes. This has the side effect of always producing mathord atoms.

\begin{verbatim}
\let\math@bgroup\bgroup
\def\math@egroup#1{#1\egroup}
\end{verbatim}

(End definition for $\math@bgroup$ and $\math@egroup$.)

Here is the default definition for $\calculate@math@sizes$ a more elaborate interface is under testing in mthscale.sty.

\begin{verbatim}
\gdef\calculate@math@sizes{\
\@font@info{Calculating\space math\space sizes\space for\space size\space <\f@size>}}\
\dimen0\f@size \p@\
\@tempdimb \defaultscriptratio \dimen0\
\dimen0 \defaultscriptscriptratio \dimen0\
\expandafter\xdef\csname S@f@size\endcsname{\gdef\noexpand\tf@size{\f@size}\
\gdef\noexpand\sf@size{\strip@pt\@tempdimb}\
\gdef\noexpand\ssf@size{\strip@pt\dimen0}\
\noexpand\math@fontstrue}}
\end{verbatim}

(End definition for $\calculate@math@sizes$.)

The default ratio for math sizes is: 1 to $\defaultscriptratio$ to $\defaultscriptscriptratio$.
By default this is 1 to .7 to .5.

\begin{verbatim}
\def\defaultscriptratio{.7}
\def\defaultscriptscriptratio{.5}
\end{verbatim}

(End definition for $\defaultscriptratio$ and $\defaultscriptscriptratio$.)

If we don’t have a definition for $\noaccents@$ we provide a dummy.

\begin{verbatim}
\ifx\noaccents@\@undefined
\let\noaccents@\@empty
\fi
\end{verbatim}

(End definition for $\noaccents@$.)

The $\showhyphens$ command must be redefined since the version in plain.tex uses \tenrm. We have also made some further adjustments for its use in \LaTeX.

\begin{verbatim}
\DeclareRobustCommand\showhyphens[1]{\setbox0\vbox{\
\color@begingroup\
\everypar{}\
\parfillskip\z@skip\hsize\maxdimen\
\normalfont\
\pretolerance\m@ne\tolerance\m@ne\hbadness\z@\showboxdepth\z@\#1\
\color@endgroup}}
\end{verbatim}

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\else

Xe\TeX\ version. When using system fonts Xe\TeX\ reports consecutive runs of characters as a single item in box logging, which means the standard \texttt{\showhyphens} does not work. This version typesets the text into a narrow box to force hyphenation and then reconstructs a horizontal list with explicit hyphens to generate the display. Note that the \texttt{lmr} OpenType font is forced, this works even if the characters are not in the font as hyphenation is attempted due to the width of the space and hyphen character. It may generate spurious Missing Character warnings in the log, these are however suppressed from the terminal output by ensuring that \texttt{\tracingonline} is locally zero.

\DeclareRobustCommand\showhyphens[1]{%
\setbox0\vbox{%
\usefont{TU}{lmr}{m}{n}%
\hsize 1sp%
\hbadness@M%
\hfuzz\maxdimen%
\tracingonline\z@
\everypar={}%
\leftskip\z@skip%
\rightskip\z@skip%
\parfillskip\z@skip%
\hyphenpenalty=-@M%
\pretolerance\m@ne%
\interlinepenalty\z@%
\clubpenalty\z@%
\widowpenalty\z@%
\brokenpenalty1127%
\setbox\z@\hbox{}}%
\noindent
#1%
\par
}

Note here we stop the loop if made no progress, non-removable items may mean that we can not process the whole list (which would be testable as \texttt{\lastnodetype=-1}).

\loop
\ifnum\lastnodetype=11\unskip\@tempswatrue\fi
\ifnum\lastnodetype=12\unkern\@tempswatrue\fi
\ifnum\lastnodetype=13%
\count@\lastpenalty%
\unpenalty\@tempswatrue
\fi
\ifnum\lastnodetype=\@ne
\setbox\tw@\lastbox\@tempswatrue
\setbox\hbox{\unhbox\tw@\unskip\unskip\unpenalty
\ifnum\count@=1127 \else\fi
\unhbox\z@}%
\count@\z@%
\fi
\if@tempswa
\repeat
\hbadness\z@%
\hsize\maxdimen

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\showboxdepth\z@ \tolerance\m@ne \hyphenpenalty\z@ \noindent\unhbox\z@ }}
fi

⟨/2ekernel | \latexrelease⟩
⟨\latexrelease⟩\EndIncludeInRelease
⟨\latexrelease⟩\IncludeInRelease{0000/00/00}{\showhyphens}\%
⟨\latexrelease⟩ \TeX support for \showhyphens\%
⟨\latexrelease⟩ gdef\showhyphens#1{%
⟨\latexrelease⟩ \setbox0\vbox{%
⟨\latexrelease⟩ \color@begingroup
⟨\latexrelease⟩ \everypar{}%
⟨\latexrelease⟩ \parfillskip\z@skip\hsize\maxdimen
⟨\latexrelease⟩ \normalfont
⟨\latexrelease⟩ \pretolerance\m@ne \tolerance\m@ne \hbadness\z@ \showboxdepth\z@ \#1%
⟨\latexrelease⟩ \color@endgroup}}
⟨\latexrelease⟩\EndIncludeInRelease
⟨∗2ekernel⟩

(End definition for \showhyphens.)

\addto@hook We need a macro to add tokens to a hook.
\long\def\addto@hook#1#2{#1\expandafter{\the#1#2}}
(End definition for \addto@hook.)

\@vpt
\def\@vpt{5}
(End definition for \@vpt.)

\@vipt
\def\@vipt{6}
(End definition for \@vipt.)

\@viipt
\def\@viipt{7}
(End definition for \@viipt.)

\@viiipt
\def\@viiipt{8}
(End definition for \@viiipt.)

\@ixpt
\def\@ixpt{9}
(End definition for \@ixpt.)

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\@xipt
\def\@xipt{10.95}
(End definition for \@xipt.)
\@xiipt
\def\@xiipt{12}
(End definition for \@xiipt.)
\@xivpt
\def\@xivpt{14.4}
(End definition for \@xivpt.)
\@xviipt
\def\@xviipt{17.28}
(End definition for \@xviipt.)
\@xxpt
\def\@xxpt{20.74}
(End definition for \@xxpt.)
\@xxvpt
\def\@xxvpt{24.88}
(End definition for \@xxvpt.)
This file contains the implementation for handling extra axes splitting the series and the values into sub-categories. selection commands. See other parts of the \LaTeX{} distribution, or The \LaTeX{} Companion for higher level documentation of the \LaTeX{} Font Selection Scheme.

Everything in this file got introduced 2020/02/02, so we use large rollback chunks, only interrupted if necessary.

1 \texttt{⟨∗2ekernel|latexrelease⟩}

2 \texttt{⟨latexrelease⟩}\texttt{\IncludeInRelease{2020/02/02}{}}

3 \texttt{⟨latexrelease⟩}{\DeclareFontSeriesChangeRule}{Series change rules}

1 Changing the font series

In the original NFSS implementation the series was a single attribute stored in \texttt{\f@series} and so one always had to specify both weight and width together. This means it was impossible to typeset a paragraph in a condensed font and inside have a few words in bold weight (but still condensed) without doing this manually by requesting \texttt{\fontseries{bc}\selectfont}.

The new implementation now works differently by looking both at the current value of \texttt{\f@series} and the requested new series and out of that combination selects a resulting series value. Thus, if the current series is c and we ask for b we now get bc.

This is done by consulting a simple lookup table. This table is configurable (though most likely that flexibility will seldom of ever be needed) Adding or changing entries in this table are done with \texttt{\DeclareFontSeriesChangeRule}.

1.1 The series lookup table

The \texttt{\DeclareFontSeriesChangeRule} defines entries in a simple database (implemented as a set of commands) that define mappings between from an existing series and requested new series and maps that to a result series (and additionally offers an alternative if the desired one is not existing):

\begin{verbatim}
#1 current \f@series
#2 requested new series
#3 result (if that exist for the given font family
#4 alternative result (if #3 does not exist)
\end{verbatim}

If an .fd file has its own substitution rules then \texttt{#3} exist and thus \texttt{#4} is not applied.

If there is no matching database entry or if neither the result nor the alternate result exist in the font family the requested new series is used (which then may trigger substitutions later on.

\begin{verbatim}
\def\DeclareFontSeriesChangeRule#1#2#3#4{%
\@namedef{series@#1@#2}{#3}{#4}}
\end{verbatim}

(End definition for \texttt{\DeclareFontSeriesChangeRule}.)

File w: \texttt{ltfssaxes.dtx} Date: 2021/03/18 Version v1.0i
1.2 Mapping rules for series changes

The rules set up use explicit series values not \..default indirections; my current feeling is that this is in fact better.

With 9 weights and 9 width classes this table is getting a bit large in the end (324 entries) but on the other hand it doesn’t change and accessing speed and it is fast this way.

We could alternatively split the axis and maintain weight and width separately, but that would take more processing time and would not allow for setting up explicit exceptions nicely (not sure that this would ever get used though).

Design considerations for mapping entries:

- We make \texttt{m} to reset both weight and width (as this is how it always worked). To reset just the width \texttt{?m} is provided and to reset just the weight \texttt{m}.

- We do support “\texttt{mwidth}” and “\texttt{weightm}”, e.g., \texttt{mec} to mean “go to medium weight and extra-condensed width”. At the end of the process we automatically drop any leftover \texttt{m} in the series name (unless it is just a single \texttt{m}).

- If there is no table entry then the target series is used unconditionally. This means that any request to set both weight and width (e.g. \texttt{bx} or \texttt{ulc}) needs no table entries. For that reason there are no entries which have a weight+width as request (i.e., second argument).

  In particular this is also true for cases involving \texttt{m}, e.g., \texttt{bm} (bold medium width) which automatically gets reduced result in \texttt{b} or \texttt{mc} (medium weight condensed) which becomes \texttt{c} as a result.

- Only a few entries have “alternative” values and perhaps most of them should get dropped. Or maybe not ... needs some thought perhaps.

  The idea is that you don’t want the normal substitution to kick in because that would reset the shape first and it may be better to stay with \texttt{b} when a change to \texttt{c} is requested and \texttt{bc} doesn’t exist, than to go to first change the shape to \texttt{n} and then find that \texttt{bc/n} doesn’t exist either and thus ending up with \texttt{m/n}.

- Also: while I did set up all nine standard weight values from \texttt{ul} to \texttt{ub} I only bothered to provide entries for \texttt{ec, sc, c} and \texttt{x}, because other levels of compression/expansion are not in any real fonts that I know.

  Could and perhaps should be eventually extended to cover the whole set.

\begin{verbatim}
6 \DeclareFontSeriesChangeRule {bc}{b}{bc}{}
7 \DeclareFontSeriesChangeRule {bc}{c}{bc}{}
8 \DeclareFontSeriesChangeRule {bc}{eb}{ebc}{}
9 \DeclareFontSeriesChangeRule {bc}{ec}{bec}{bc}
10 \DeclareFontSeriesChangeRule {bc}{el}{elc}{bc}
11 \DeclareFontSeriesChangeRule {bc}{l}{lc}{}
12 \DeclareFontSeriesChangeRule {bc}{sb}{sbc}{}
13 \ DeclareFontSeriesChangeRule {bc}{sc}{bsc}{bc}
14 \DeclareFontSeriesChangeRule {bc}{sl}{slc}{}
15 \DeclareFontSeriesChangeRule {bc}{ub}{ubc}{bc}
16 \DeclareFontSeriesChangeRule {bc}{ul}{ulc}{bc}
17 \DeclareFontSeriesChangeRule {bc}{x}{bx}{bc}
\end{verbatim}
\DeclareFontSeriesChangeRule {sc}{eb}{ebsc}{}
\DeclareFontSeriesChangeRule {sc}{el}{elsc}{}
\DeclareFontSeriesChangeRule {sc}{l}{lsc}{}
\DeclareFontSeriesChangeRule {sc}{sb}{sbsc}{}
\DeclareFontSeriesChangeRule {sc}{sl}{slsc}{}
\DeclareFontSeriesChangeRule {sc}{ub}{ubsc}{}
\DeclareFontSeriesChangeRule {sc}{ul}{ulsc}{}
\DeclareFontSeriesChangeRule {sc}{x}{x}{m} %<-----
\DeclareFontSeriesChangeRule {ebx}{b}{bx}{}
\DeclareFontSeriesChangeRule {ebx}{c}{ebc}{}
\DeclareFontSeriesChangeRule {ebx}{eb}{ebx}{}
\DeclareFontSeriesChangeRule {ebx}{ec}{ebec}{}
\DeclareFontSeriesChangeRule {ebx}{el}{elx}{}
\DeclareFontSeriesChangeRule {ebx}{l}{lx}{}
\DeclareFontSeriesChangeRule {ebx}{sb}{sbx}{}
\DeclareFontSeriesChangeRule {ebx}{sc}{ebsc}{}
\DeclareFontSeriesChangeRule {ebx}{sl}{slx}{}
\DeclareFontSeriesChangeRule {ebx}{ub}{ubx}{}
\DeclareFontSeriesChangeRule {ebx}{ul}{ulx}{}
\DeclareFontSeriesChangeRule {ebx}{x}{ebx}{}
\DeclareFontSeriesChangeRule {eb}{c}{ebc}{}
\DeclareFontSeriesChangeRule {eb}{ec}{ebec}{}
\DeclareFontSeriesChangeRule {eb}{sc}{ebsc}{}
\DeclareFontSeriesChangeRule {eb}{x}{ebx}{}
\DeclareFontSeriesChangeRule {elc}{b}{bc}{}
\DeclareFontSeriesChangeRule {elc}{c}{elc}{}
\DeclareFontSeriesChangeRule {elc}{eb}{ebc}{}
\DeclareFontSeriesChangeRule {elc}{ec}{elec}{}
\DeclareFontSeriesChangeRule {elc}{el}{elc}{}
\DeclareFontSeriesChangeRule {elc}{l}{lc}{}
\DeclareFontSeriesChangeRule {elc}{sb}{sbc}{}
\DeclareFontSeriesChangeRule {elc}{sc}{elsc}{}
\DeclareFontSeriesChangeRule {elc}{sl}{slc}{}
\DeclareFontSeriesChangeRule {elc}{ub}{ubc}{}
\DeclareFontSeriesChangeRule {elc}{ul}{ulc}{}
\DeclareFontSeriesChangeRule {elc}{x}{elx}{}
\DeclareFontSeriesChangeRule {el}{c}{elc}{}
\DeclareFontSeriesChangeRule {el}{ec}{elec}{}
\DeclareFontSeriesChangeRule {el}{sc}{elsc}{}
\DeclareFontSeriesChangeRule {el}{x}{elx}{}
\DeclareFontSeriesChangeRule {elx}{b}{bx}{}
\DeclareFontSeriesChangeRule {elx}{c}{elc}{}
\DeclareFontSeriesChangeRule {elx}{eb}{ebc}{}
\DeclareFontSeriesChangeRule {elx}{el}{elx}{}
\DeclareFontSeriesChangeRule {elx}{l}{lx}{}
\DeclareFontSeriesChangeRule {elx}{sb}{sbx}{}
\DeclareFontSeriesChangeRule {elx}{sc}{elsc}{}
\DeclareFontSeriesChangeRule {elx}{sl}{slc}{}
\DeclareFontSeriesChangeRule {elx}{ub}{ubx}{}
\DeclareFontSeriesChangeRule {elx}{ul}{ulx}{}
\DeclareFontSeriesChangeRule {elx}{x}{elx}{}
\DeclareFontSeriesChangeRule {el}{c}{elc}{}
\DeclareFontSeriesChangeRule {el}{ec}{elec}{}
\DeclareFontSeriesChangeRule {el}{sc}{elsc}{}
\DeclareFontSeriesChangeRule {el}{x}{elx}{}

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\DeclareFontSeriesChangeRule {lc}{b}{bc}{} 
\DeclareFontSeriesChangeRule {lc}{c}{lc}{} 
\DeclareFontSeriesChangeRule {lc}{eb}{ebc}{} 
\DeclareFontSeriesChangeRule {lc}{ec}{lec}{} 
\DeclareFontSeriesChangeRule {lc}{el}{elc}{} 
\DeclareFontSeriesChangeRule {lc}{l}{lc}{} 
\DeclareFontSeriesChangeRule {lc}{sb}{sbc}{} 
\DeclareFontSeriesChangeRule {lc}{sc}{lsc}{} 
\DeclareFontSeriesChangeRule {lc}{sl}{slc}{} 
\DeclareFontSeriesChangeRule {lc}{ub}{ubc}{} 
\DeclareFontSeriesChangeRule {lc}{ul}{ulc}{} 
\DeclareFontSeriesChangeRule {lc}{x}{lx}{} 
\DeclareFontSeriesChangeRule {lx}{b}{bx}{} 
\DeclareFontSeriesChangeRule {lx}{c}{lc}{} 
\DeclareFontSeriesChangeRule {lx}{eb}{ebx}{} 
\DeclareFontSeriesChangeRule {lx}{ec}{lec}{} 
\DeclareFontSeriesChangeRule {lx}{el}{elx}{} 
\DeclareFontSeriesChangeRule {lx}{l}{lx}{} 
\DeclareFontSeriesChangeRule {lx}{sb}{sbx}{} 
\DeclareFontSeriesChangeRule {lx}{sc}{lsc}{} 
\DeclareFontSeriesChangeRule {lx}{sl}{slx}{} 
\DeclareFontSeriesChangeRule {lx}{ub}{ubx}{} 
\DeclareFontSeriesChangeRule {lx}{ul}{ulx}{} 
\DeclareFontSeriesChangeRule {lx}{x}{lx}{} 
\DeclareFontSeriesChangeRule {l}{bx} {bx} {b} %<----- 
\DeclareFontSeriesChangeRule {l}{b} {b} {bx} %<----- 
\DeclareFontSeriesChangeRule {l}{c} {lc} {l} % ? %<----- 
\DeclareFontSeriesChangeRule {l}{ec} {lec} {l} % ? %<----- 
\DeclareFontSeriesChangeRule {l}{sb} {sbc} {b} % ? %<----- 
\DeclareFontSeriesChangeRule {l}{sc} {sbsc} {l} % ? %<----- 
\DeclareFontSeriesChangeRule {l}{x} {lx} {l} % ? %<----- 
\DeclareFontSeriesChangeRule {m}{bx} {bx} {b} %<------ 
\DeclareFontSeriesChangeRule {m}{b} {b} {bx} %<------ 
\DeclareFontSeriesChangeRule {m}{c} {m} %<------ 
\DeclareFontSeriesChangeRule {m}{ec} {ec} {m} %<------ 
\DeclareFontSeriesChangeRule {m}{l} {l} {m} %<------ 
\DeclareFontSeriesChangeRule {m}{sb} {sb} {b} %<------ 
\DeclareFontSeriesChangeRule {m}{sc} {sc} {m} %<------ 
\DeclareFontSeriesChangeRule {m}{x} {x} {m} %<------ 
\DeclareFontSeriesChangeRule {sbc}{b}{b}{bc}{} 
\DeclareFontSeriesChangeRule {sbc}{c}{sc}{} 
\DeclareFontSeriesChangeRule {sbc}{eb}{ebc}{} 
\DeclareFontSeriesChangeRule {sbc}{el}{elc}{} 
\DeclareFontSeriesChangeRule {sbc}{l}{sbc}{} 
\DeclareFontSeriesChangeRule {sbc}{sc}{sbc}{} 
\DeclareFontSeriesChangeRule {sbc}{sbc}{sbc}{} 
\DeclareFontSeriesChangeRule {sbc}{ub}{ubc}{} 
\DeclareFontSeriesChangeRule {sbc}{ul}{ulc}{} 
\DeclareFontSeriesChangeRule {sbc}{x}{sbc}{} 
\DeclareFontSeriesChangeRule {sbx}{b}{bx}{}
Special rules for \texttt{lm} etc. aren’t needed because if the target \texttt{lm} is request it will use if there is no rule and that id then reduced to \texttt{l} automatically. Same for \texttt{mc} and friends. Only \texttt{?m} and \texttt{m?} need rules.

So here are the special rules for \texttt{m?:}:

\begin{verbatim}
\DeclareFontSeriesChangeRule {bc}{m?}{c}{}
\DeclareFontSeriesChangeRule {bec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {bsc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {bx}{m?}{x}{}
\DeclareFontSeriesChangeRule {b}{m?}{m}{}
\DeclareFontSeriesChangeRule {c}{m?}{c}{}
\DeclareFontSeriesChangeRule {ebc}{m?}{c}{}
\DeclareFontSeriesChangeRule {ebec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {ebsc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {ebx}{m?}{x}{}
\DeclareFontSeriesChangeRule {eb}{m?}{m}{}
\DeclareFontSeriesChangeRule {ec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {elc}{m?}{c}{}
\DeclareFontSeriesChangeRule {elec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {elsc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {elx}{m?}{x}{}
\DeclareFontSeriesChangeRule {l}{m?}{m}{}
\DeclareFontSeriesChangeRule {sbc}{m?}{c}{}
\DeclareFontSeriesChangeRule {sbec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {sbsc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {sbx}{m?}{x}{}
\DeclareFontSeriesChangeRule {sb}{m?}{m}{}
\DeclareFontSeriesChangeRule {sc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {slc}{m?}{c}{}
\DeclareFontSeriesChangeRule {slec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {slsc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {slx}{m?}{x}{}
\DeclareFontSeriesChangeRule {sl}{m?}{m}{}
\DeclareFontSeriesChangeRule {ubc}{m?}{c}{}
\DeclareFontSeriesChangeRule {ubec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {ubsc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {ubx}{m?}{x}{}
\DeclareFontSeriesChangeRule {ub}{m?}{ub}{}
\DeclareFontSeriesChangeRule {ulc}{m?}{c}{}
\DeclareFontSeriesChangeRule {ulec}{m?}{ec}{}
\DeclareFontSeriesChangeRule {ulsc}{m?}{sc}{}
\DeclareFontSeriesChangeRule {ulx}{m?}{x}{}
\end{verbatim}

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And there the special rules for \texttt{?m}:

\begin{verbatim}
\DeclareFontSeriesChangeRule {ul}{m?}{m}{}
\DeclareFontSeriesChangeRule {x}{m?}{x}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {bc}{?m}{b}{}
\DeclareFontSeriesChangeRule {bec}{?m}{b}{}
\DeclareFontSeriesChangeRule {bsc}{?m}{b}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {bx}{?m}{b}{}
\DeclareFontSeriesChangeRule {b}{?m}{b}{}
\ DeclareFontSeriesChangeRule {c}{?m}{m}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {ebc}{?m}{eb}{}
\DeclareFontSeriesChangeRule {ebec}{?m}{eb}{}
\DeclareFontSeriesChangeRule {ebsc}{?m}{eb}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {ebx}{?m}{eb}{}
\DeclareFontSeriesChangeRule {eb}{?m}{eb}{}
\DeclareFontSeriesChangeRule {ec}{?m}{m}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {elc}{?m}{el}{}
\DeclareFontSeriesChangeRule {elec}{?m}{el}{}
\DeclareFontSeriesChangeRule {elsc}{?m}{el}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {lx}{?m}{l}{}
\DeclareFontSeriesChangeRule {l}{?m}{l}{}
\DeclareFontSeriesChangeRule {m}{?m}{m}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {sbc}{?m}{sb}{}
\DeclareFontSeriesChangeRule {sbec}{?m}{sb}{}
\DeclareFontSeriesChangeRule {sbsc}{?m}{sb}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {sbx}{?m}{sb}{}
\DeclareFontSeriesChangeRule {sb}{?m}{sb}{}
\DeclareFontSeriesChangeRule {sc}{?m}{m}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {slc}{?m}{sl}{}
\DeclareFontSeriesChangeRule {slec}{?m}{sl}{}
\DeclareFontSeriesChangeRule {slsc}{?m}{sl}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {slx}{?m}{sl}{}
\DeclareFontSeriesChangeRule {sl}{?m}{sl}{}
\DeclareFontSeriesChangeRule {ubc}{?m}{ub}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {ubc}{?m}{ub}{}
\DeclareFontSeriesChangeRule {ub}{?m}{ub}{}
\DeclareFontSeriesChangeRule {u1c}{?m}{u1}{}
\end{verbatim}

\begin{verbatim}
\DeclareFontSeriesChangeRule {u1sc}{?m}{u1}{}
\DeclareFontSeriesChangeRule {u1sc}{?m}{u1}{}
\end{verbatim}
1.3 Changing to a new series

\fontseries The \fontseries command takes one argument which is the requested new font series. In the original implementation it simply saved the expanded value in \f@series. Now we do a bit more processing and look up the final value in the font series data base. This is done by \merge@font@series. But the lookup should be done within the target family and call to \fontseries might be followed by a \fontfamily call. So we delay the processing to \selectfont and only record the necessary action in \delayed@f@adjustment.

\DeclareRobustCommand\fontseries[1]{\@forced@seriesfalse
  \expandafter\def\expandafter\delayed@f@adjustment\expandafter
  {\delayed@f@adjustment\delayed@merge@font@series{#1}}}

(End definition for \fontseries.)

\delayed@f@adjustment The macro holding the delayed action(s) for use in \selectfont.

(End definition for \delayed@f@adjustment.)

\fontseriesforce To change unconditionally to a new series you can use \fontseriesforce. Of course, if the series doesn’t exist for the current family substitution still happens, but there is not dependency on the current series.

\DeclareRobustCommand\fontseriesforce[1]{\@forced@seriestrue
  \expandafter\def\expandafter\delayed@f@adjustment\expandafter
  {\delayed@f@adjustment\edef\f@series{#1}}}

(End definition for \fontseriesforce.)

\if@forced@series If the series gets forced we need to know that fact later on.

(End definition for \if@forced@series.)
For a roll forward we may have to define \texttt{\if@forced@series} but this needs doing in a way that \TeX{} doesn’t see it when skipping over conditionals.

\begin{verbatim}
\DeclareRobustCommand\fontseries\[1\]{\def\f@series{#1}}
\let\fontseriesforce\@undefined\end{verbatim}

\begin{verbatim}
\def\merge@font@series#1{\expandafter\expandafter\expandafter
\merge@font@series@	he\f@series@#1\endcsname
{#1}\@nil\end{verbatim}

(End definition for \texttt{\merge@font@series}.)

\texttt{\merge@font@series@} This now defines the new \texttt{\f@series}:
\begin{verbatim}
\def\merge@font@series@#1#2#3\@nil{\ifcat\expandafter X\detokenize{#1}X
\reserved@a{#3}%=\reserved@a\@empty
\set@target@series{#2}\else}
\end{verbatim}

If the third argument is empty there is no database entry for the combination and the second argument holds the new series so we return that.

Originally the test was simply \texttt{\ifx!#3!} but that actually dies if \texttt{#3} starts with a conditional and in the definition of \texttt{\AmSfont} that is actually the case.

\begin{verbatim}
\def\reserved@a{#3}\% \ifx\reserved@a\@empty
 \set@target@series{#2}\% \else
\end{verbatim}

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Otherwise we check if the desired result for the series (#1) exists for the font family and the current shape. All this happens inside \selectfont which has already taken care to load the .fd file if necessary.

\edef\reserved@a{\f@encoding /\f@family /#1/\f@shape}\
\ifcsname \reserved@a \endcsname

If the desired result is available then we use that. However, we do need some post-processing because we need to drop surplus ms due to the way naming convention was designed in the '90s (sigh).

\set@target@series{#1}\

If not, then we try the alternate result (#2).

\else
\fi

\ifcsname \f@encoding /\f@family /#2/\f@shape \endcsname

If the alternate result exist we use that and also issue a warning (or rather a log entry) that we didn't managed to change to the desired font.

\set@target@series{#2}\
\@font@shape@subst@warning

If that doesn't exist either, then we use the requested series unmodified (again with a warning).

\else
\set@target@series{#3}\
\@font@shape@subst@warning
\fi
\fi
\}

It is possible that the previous font and the new one are actually identical (and the font was not found because it still needs loading) in which case a warning would look rather odd. So we make a quick check for that (which is the reason why we defined \@reserveda above instead of doing inline testing inside \ifcsname).

\def\@font@shape@subst@warning{%
\edef\reserved@b{\curr@fontshape}\
\ifx\reserved@a\reserved@b \else
\@font@warning{Font shape '\reserved@a' undefined\MessageBreak using '\reserved@b' instead}\
\fi
\fi
\}

(End definition for \merge@font@series@.)

\merge@font@series@without@substitution works like \merge@font@series, i.e., it looks up the combination in the rule base and if there exists an entry it uses it and if not it uses the new series value. However, it doesn't check if there is actually a font face with the new series value as \merge@font@series does. This simplified command is used in \selectfont at a point where other font attributes are not yet updated so that checking the font face might result incorrect in substitutions.

\def\merge@font@series@without@substitution{%
expandafter\expandafter\expandafter
\merge@font@series@without@substitution
\csname series@\f@series @#1\endcsname

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\def\merge@font@series@without@substitution@#1#2#3\@nil{%  
\def\reserved@a{#3}\%  
\ifx\reserved@a\@empty  
\set@target@series{#2}\%
\else  
\set@target@series{#1}\%  
\fi  
}\fi}

(End definition for \merge@font@series@without@substitution, \merge@font@series@without@substitution@, and \delayed@merge@font@series.)

\delayed@merge@font@series When we delay the merge action in \fontseries we first attempt to use merging without substitution. If that results in a non-existing font face the merge is redone in \selectfont using a version with substitution. See \selectfont for details.

\let\delayed@merge@font@series\merge@font@series@without@substitution

(End definition for \delayed@merge@font@series.)

\maybe@load@fontshape A small helper that we use a couple of times: try loading a fontshape (in a group because \try@load@fontshape normalizes catcodes and we also want to change \typeout so that it doesn’t report missing .fd files on the terminal).

\def\maybe@load@fontshape{%  \begingroup
  \let \typeout \@font@info
  \try@load@fontshape
  \endgroup}

(End definition for \maybe@load@fontshape.)

\set@target@series Finally the code for normalizing the \fseries value.

The combined series value determined by the mapping may still contain an m that we have to remove (as the .fd files use c not mc to denote a medium weight condensed series, etc.). We do this in all branches above because a user might have written

\DeclareFontSeriesChangeRule {m}{sc}{msc}{mc}

instead of using sc and c as needed in the .fd file.

\def\set@target@series#1{%  
We need to \edef the argument first in case it starts with a conditional. Then we check (and perhaps drop) an “m” from the value and assign the result to \fseries.

\edef\f@series{#1}\%
\series@maybe@drop@one@m\f@series\f@series
}

(End definition for \set@target@series.)
If the series value is in NFSS notation then it should not contain any “m” unless it is just an “m” by it own. So we need to drop surplus “m’s. But we better don’t do this for full names, such as “semibold” as used by autoinst, for example. So we test against the possible explicit values that should drop an “m”. After that we assign the result to \#2 for further use.

The code below is an inline version of the \in@ macro without the group, so that it works in \accent.

As a precaution we use a private toks register not \toks@ as that is no longer hidden inside the group.

Drop up to two ms but keep one if that makes the series value empty. Actually, with the current implementation we know that there is at least one in the series value itself and we added one after it, so all we have to do is now returning \#1\#2 and dropping the rest.

Supporting rollback ...
2 Changing the shape

Shapes are also split in two axes (though it could be more if that is desirable), essentially building in an “sc” axis).

The database for shapes is done in exactly the same way, only that it is much smaller and we usually have no alternative shape (or rather it is empty thus not used).

(End definition for \DeclareFontShapeChangeRule.)

There is kind of the same problem with returning back from sc to normal. It sort of needs its own letter. In fontspec this was solved by the first time \upshape changes it or sl back (so only sc remains) and second time it changes then sc back to normal. Maybe that’s not a bad way to handle it, but decided for a slightly different approach: n always returns to “normal”, ie resets everything and up changes italic or slanted to upright and ulc undoes small caps.

So we now offer \normalshape (using \shapedefault which is normally the same as calling both \ulcshape and \upshape, only more efficient.

(End definition for \ulcshape, \textulc, and \ulcdefault.)

New command to select a swash shape. The standard rules put this in the same category as italics or slanted, i.e., if you ask for it then italics are undone. One could provide more complicated rules so that it + sw becomes swit but given that there are only very few fonts that have swash letters that level of flexibility (these days) would be just resulting in a lot of combinations that do not exist.

(End definition for \ulcshape, \textulc, and \ulcdefault.)
New command to select spaced small capitals. This is only here because \texttt{fontaxes} offered it. There isn’t a single free font that supports it. However, some commercial ones do, so we offer it so that at some point \texttt{fontaxes} could be retired.

So far there aren’t any rules for it—probably there should be some putting it in the same category as \texttt{sc}.

\begin{verbatim}
\DeclareRobustCommand\sscshape
  {\not@math@alphabet\sscshape\relax
   \fontshape\sscdefault\selectfont}
\let\sscdefault\@undefined % for rollback
\newcommand\sscdefault{ssc}
\end{verbatim}

## 2.1 Mapping rules for shape combinations

Many of the entries are commented out as we will get that result without any entry.

\begin{verbatim}
\DeclareFontShapeChangeRule {n}{n} {n} {}
\DeclareFontShapeChangeRule {n}{it} {it} {sl}
\DeclareFontShapeChangeRule {n}{sl} {sl} {it}
\DeclareFontShapeChangeRule {n}{sw} {sw} {}
\DeclareFontShapeChangeRule {n}{sc} {sc} {}
\DeclareFontShapeChangeRule {n}{ulc} {n} {}
\DeclareFontShapeChangeRule {n}{up} {n} {}
\DeclareFontShapeChangeRule {it}{n} {n} {}
\DeclareFontShapeChangeRule {it}{it} {it} {}
\DeclareFontShapeChangeRule {it}{sl} {sl} {it}
\DeclareFontShapeChangeRule {it}{sw} {sw} {}
\DeclareFontShapeChangeRule {it}{sc} {sc} {it}
\DeclareFontShapeChangeRule {it}{ulc} {n} {}
\DeclareFontShapeChangeRule {it}{up} {n} {}
\DeclareFontShapeChangeRule {it}{sc} {sc} {it}
\DeclareFontShapeChangeRule {it}{ulc} {n} {}
\DeclareFontShapeChangeRule {it}{up} {n} {}
\DeclareFontShapeChangeRule {it}{sc} {sc} {it}
\DeclareFontShapeChangeRule {it}{ulc} {n} {}
\DeclareFontShapeChangeRule {it}{up} {n} {}
\DeclareFontShapeChangeRule {it}{sc} {sc} {it}
\DeclareFontShapeChangeRule {it}{ulc} {n} {}
\DeclareFontShapeChangeRule {it}{up} {n} {}
\end{verbatim}

If neither \texttt{scit} nor \texttt{scsl} exist then \texttt{sc} will be used as a fallback albeit with a log entry, so except for the latter there will be no change for CM or Latin Modern fonts.

\begin{verbatim}
\DeclareFontShapeChangeRule {it}{sc} {scit} {scsl}
\DeclareFontShapeChangeRule {it}{ulc} {it} {}
\DeclareFontShapeChangeRule {it}{up} {n} {}
\DeclareFontShapeChangeRule {it}{sc} {sc} {it}
\DeclareFontShapeChangeRule {it}{ulc} {it} {}
\DeclareFontShapeChangeRule {it}{up} {n} {}
\DeclareFontShapeChangeRule {it}{sc} {sc} {it}
\DeclareFontShapeChangeRule {it}{ulc} {n} {}
\end{verbatim}

The next rule might be a bit surprising and rightly so. Correct would be that \texttt{sc} is not affected by \texttt{up}, i.e., remains \texttt{sc} as showed in the commented out rule. However, for nearly three decades commands such as \texttt{sc} or \texttt{\textup} changed small caps back to the “normal” shape. So for backward compatibility we keep that behavior.
As a result, you are currently typesetting in \texttt{scit} or \texttt{scsl} using \texttt{\upshape} twice will return you to the normal shape too, the first will change to \texttt{sc} and the second (because of the rule below) change that to \texttt{n}. This is the way \texttt{fontspec} implemented its version on this interface, so this rule means we are also compatible with the way \texttt{fontspec} behaved. Still it remains an oddity which I would rather liked to have avoided.

\begin{verbatim}
% \DeclareFontShapeChangeRule {scit}{n} {n} {} %
\DeclareFontShapeChangeRule {scit}{it} {scit} {} %
\DeclareFontShapeChangeRule {scit}{ulc} {scit} {} %
\DeclareFontShapeChangeRule {scit}{up} {sc} {} % or scit?
\DeclareFontShapeChangeRule {scit}{sw} {scsw} {sc} % or scit?
\DeclareFontShapeChangeRule {scit}{sc} {scit} {} %
\DeclareFontShapeChangeRule {scit}{ulc} {scit} {} %
\DeclareFontShapeChangeRule {scit}{up} {sc} {} %
\DeclareFontShapeChangeRule {scsl}{n} {n} {} %
\DeclareFontShapeChangeRule {scsl}{it} {scit} {scsl} %
\DeclareFontShapeChangeRule {scsl}{ulc} {n} {} %
\DeclareFontShapeChangeRule {scsl}{up} {sc} {} %
\DeclareFontShapeChangeRule {scsw}{n} {n} {} %
\DeclareFontShapeChangeRule {scsw}{it} {scit} {scsw} %
\DeclareFontShapeChangeRule {scsw}{ulc} {n} {} %
\DeclareFontShapeChangeRule {scsw}{up} {sc} {} %
\DeclareFontShapeChangeRule {sw}{n} {n} {} %
\DeclareFontShapeChangeRule {sw}{it} {it} {} %
\DeclareFontShapeChangeRule {sw}{ulc} {sw} {} %
\DeclareFontShapeChangeRule {sw}{up} {n} {} %
\DeclareFontShapeChangeRule {sc}{up} {sc} {} %
\DeclareFontShapeChangeRule {sc}{n} {} %
\end{verbatim}

The previous rule assumes that if \texttt{scit} exists then it exists as well. If not, the mechanism will save \texttt{ulc} in \texttt{\f@series} which most certainly doesn't exist. So when a font is later selected that would result in a substitution (so no harm done really). Alternatively, we could in this case use \texttt{n} as alternative, which may be a bit faster, but such a setup would be so weird in the first place that this isn't worth the effort.

Supporting rollback ...
2.2 Changing to a new shape

\fontshape

Again the \fontshape now has to do a lookup to get to its new value in \f@shape. The method is exactly the same as in \fontseries.

\fontshapeforce

The unconditional version:

\merge@font@shape

Look up the database entry (if existing) and act accordingly.
Same game now, except that we look at shapes not series values and we can set the shape without the complication of dropping “m”s from the name as we had to for the series.

\def\merge@font@shape@#1#2#3\@nil{%
  \def\reserved@a{#3}%
  \ifx\reserved@a\@empty
    \edef\f@shape{#2}%
  \else
    \reserved@a
    \@font@shape@subst@warning
    \@font@shape@subst@warning
    \edef\f@shape{#1}%
  \fi
}

reserved@ is used in \font@shape@subst@warning so we have to define it in addition to do the \ifcsname test

\edef\reserved@a{\f@encoding /\f@family /\f@series/#1}%
  \ifcsname \reserved@a\endcsname
    \edef\f@shape{#1}%
  \else
    \edef\f@shape{#2}%
    \@font@shape@subst@warning
  \else
    \edef\f@shape{#3}%
    \@font@shape@subst@warning
  \fi
\fi
%
}

(End definition for \merge@font@shape@.)

See definition of \selectfont for how these macros are used.

\def\merge@font@shape@without@substitution#1{%
  \expandafter\expandafter\expandafter
    \merge@font@shape@without@substitution@
    \csname shape@\f@shape @#1\endcsname
}{#1}%
\let\delayed@merge@font@shape\merge@font@shape@without@substitution
%
}

(End definition for \merge@font@shape@without@substitution, \merge@font@shape@without@substitution@, and \delayed@merge@font@shape.)
\normalshape \normalshape resets both sub-axes if the default rules are used.

(End definition for \normalshape.)

3 Make sure we win ...

This code implements one aspect of what the package fontaxes provide. So its redefinitions for the various shape commands, such as \itshape should no longer happen. We therefore force the standard definitions at \AtBeginDocument (later when this is defined. Once fontaxes is no longer doing such redefinitions that could be taken out again.

We use a separate macro so that we can easily disable this (in case of rollback).

\reinstall@nfss@defs I use \protected here not \DeclareRobustCommand to avoid extra status lines.

(End definition for \reinstall@nfss@defs.)

Supporting rollback ...

(2kernel \latexrelease)
(\latexrelease)\EndIncludeInRelease
(\latexrelease)\IncludeInRelease{0000/00/00}%
(\latexrelease) {\merge@font@shape}{Font shape change rules}%
(\latexrelease)
(\latexrelease)\DeclareRobustCommand\fontshape [1]{\edef\f@shape{#1}}
(\latexrelease)\let\fontshapeforce\@undefined
(\latexrelease)\let\merge@font@shape\@undefined
(\latexrelease)\let\merge@font@shape@\@undefined
(\latexrelease)\let\merge@font@shape@\@undefined
(\latexrelease)\let\merge@font@shape@\@undefined
(\latexrelease)\let\merge@font@shape@\@undefined
(\latexrelease)\let\merge@font@shape@\@undefined
(\latexrelease)\let\merge@font@shape@\@undefined
(\latexrelease)

File w: ltfssaxes.dtx Date: 2021/03/18 Version v1.0i
This is always called in \document so don’t make it undefined.

This initializes the 2020/02/02 extensions to NFSS after any changes in the preamble.
File x
ltfsstrc.dtx

1 Introduction

This package contains the code for tracing font loading and font changes. It basically
overlays some of the low-level functions of NFSS with additional code used for tracing.
The package accepts the following options:

errorshow Write all information about font changes etc. only to the transcript file unless
an error happens. This means that information about font substitution will not be
shown on the terminal.

warningshow Show all NFSS warnings on the terminal. This setting corresponds to
the default behaviour of NFSS if the tracefnt package is not loaded!

infoshow Show all NFSS warning and all NFSS info messages (that are normally only
written to the transcript file) also on the terminal. This is the default if the
tracefnt package is loaded.

debugshow In addition to infoshow show also changing of math fonts as far as possible
(this option can produce a large amount of output.

loading Show the name of external fonts when they are loaded. This option shows only
“newly” loaded fonts not those already preloaded in the format or the class file
before the tracefnt package became active.

pausing Turn all font warnings into errors so that \LaTeX will stop.

2 A driver for this document

The next bit of code contains the documentation driver file for \TeX, i.e., the file that will
produce the documentation you are currently reading. It will be extracted from this file
by the DocStrip program.

When this file is processed directly by \LaTeX this will produce the documentation as
well.

\begin{verbatim}
1 ⟨∗driver⟩
2 \documentclass{ltxdoc}
3
4 %\OnlyDescription % comment out for implementation details
5 \begin{document}
6 \DocInput{ltfsstrc.dtx}
7 \end{document}
8 ⟨/driver⟩
\end{verbatim}
3 The Implementation

Warning: Read the macro documentation with a grain of salt. It is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

If we are making a package file it is a good idea to test whether we are running under 2e. This code is actually placed at the very beginning of this file for easier maintenance, thus commented out here.

\begin{verbatim}
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{tracefnt}[??/??/?? v?..??]
\end{verbatim}

The debug module makes use of commands contained in a special package file named trace.sty.

4 Handling Options

\begin{verbatim}
\tracingfonts
\end{verbatim}

Here is the definition of the integer register for the font trace. As a default in a package file we use 1 to give error messages if fonts are substituted. If this code is used for debugging or tracing reasons in the format file (i.e. in \texttt{fam.dtx}) we use 0 as the default. But if no font trace is used we build a definition that will produce a warning message.

\begin{verbatim}
\count@}
\end{verbatim}

The \texttt{\count@} in the line above will remove the number after \texttt{\tracingfonts}. Note that this definition will be overwritten be the next line if one of these modules are included.

\begin{verbatim}
\newcount\tracingfonts\tracingfonts=0
\end{verbatim}

The option errorshow turns off all warnings so that only real errors are shown. warningshow corresponds to the NFSS default (when \texttt{tracefnt} is not loaded). infoshow is the default for this package here; and debugshow, loading, and pausing extend the amount of information even further.

\begin{verbatim}
\DeclareOption{errorshow}{%}
\end{verbatim}

This package is not in distribution at the moment (and probably doesn’t any longer work). Think of this part of the code as being historical artifacts.

File x: ltfsstrc.dtx Date: 2021/04/26 Version v3.0o 459
\def\font@warning#1{\GenericWarning{(Font)\space\space\space\space\space La\-Te\-X Font Warning: #1}}
}

\DeclareOption{warningshow}{
\def\font@info#1{\GenericInfo{(Font)\space\space\space\space\space La\-Te\-X Font Info: \space\space\space #1}}
\def\font@warning#1{\GenericWarning{(Font)\space\space\space\space\space La\-Te\-X Font Warning: #1}}
}

\DeclareOption{infoshow}{
\def\font@info#1{\GenericWarning{(Font)\space\space\space\space\space La\-Te\-X Font Info: \space\space\space #1}}
\def\font@warning#1{\GenericWarning{(Font)\space\space\space\space\space La\-Te\-X Font Warning: #1}}
}

\DeclareOption{loading}{\tracingfonts\tw@

\DeclareOption{debugshow}{\ExecuteOptions{infoshow}\tracingfonts\thr@@

\DeclareOption{pausing}{\def\font@warning#1{\GenericError
{(Font)\space\space\space\space\space La\-Te\-X Font Warning: #1}\(\text{See the La\-Te\-X Companion for details.}\)\(\text{I'll stop for every La\-Te\-X Font Warning because you requested the 'pausing' option to the tracefnt package.}\)}}

We make \texttt{infoshow} the default, which in turn defines \texttt{\font@warning} and \texttt{\font@info}.

\ExecuteOptions{\font@info}
\ProcessOptions
\PackageEnd

We also need a default definition inside the kernel:

\def\font@info#1{\GenericInfo{(Font)\space\space\space\space\space La\-Te\-X Font Info: \space\space\space #1}}
\def\font@warning#1{\GenericWarning{(Font)\space\space\space\space\space La\-Te\-X Font Warning: #1}}

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5 Macros common to fam.tex and tracefnt.sty

In the first versions of tracefnt.dtx some macros of fam.dtx\(^{26}\) were redefined to include the extra tracing information. Now these macros are all defined in this file (i.e. removed from fam.dtx) and different production versions can be obtained simply by specifying a different set of modules to include when generating ltfss.dtx.

5.1 General font loading

\extract@font

This macro organizes the font loading. It first calls \get@external@font which will return in \external@font the name of the external font file (.tfm) as it was determined by the NFSS tables.

\def\extract@font{%
  \get@external@font
}

Then the external font is loaded and assigned to the font identifier stored inside \font@name (for this reason we need \expandafter).

\global\expandafter\font\font@name\external@font\relax

When tracing we typeout the internal and external font name.

\ifnum\tracingfonts@ >\@ne
  \@font@info{External font \external@font loaded as \font@name}
\fi

Finally we call the corresponding “loading action” macros to finish things. First the font is locally selected to allow the use of \font inside the loading action macros.

\font@name \relax

The next two lines execute the “loading actions” for the family and then for the individual font shape.

\csname \f@encoding+\f@family\endcsname
\csname\curr@fontshape\endcsname
\relax
}

\relax at the end needs to be explained. This is inserted to prevent \TeX from scanning too far when it is executing the replacement text of the loading code macros.

\get@external@font

This function tries to find an external font name. It will place the name into the macro \external@font. If no font is found it will return the one that was defined via \DeclareErrorFont.

\Get@external@font\%

We don’t know the external font name at the beginning.

\let\external@font\@empty
\def\font@info{\expandafter\expandafter\expandafter\string
  \csname \curr@fontshape \endcsname}\%
\try@size@range

\end{document}

\footnote{This file is currently not distributed in documented form. Its code is part of ltfss.dtx.}
If this failed, we’ll try to substitute another size of the same font. This is done by the \try@size@substitution macro. It “knows about” \do@extract@font, \font@name, \f@size, and so on.

\begin{Verbatim}
\ifx\external@font\@empty
\try@size@substitution
\ifx\external@font\@empty
\latexerror{Font \expandafter \string\font@name not found}\@eha
\error@fontshape
\get@external@font
\fi
\fi
\end{Verbatim}

\IfNoValueTF{\external@font}{\try@size@substitution}{
\latexerror{Font \expandafter \string\font@name not found}\@eha
\error@fontshape
\get@external@font}

\selectfont The macro \selectfont is called whenever a font change must take place.

\DeclareRobustCommand{\selectfont}{
When \debug is specified we actually want something like ‘undebug’. The font selection is now stable so that using \tracingall on some other macros will show us a lot of unwanted information about font loading. Therefore we disable tracing during font loading as long as \tracingfonts is less than 4.

\begin{Verbatim}
\ifnum\tracingfonts<4 \tracingoff \else \tracingon\p@selectfont \fi
\end{Verbatim}

If \baselinestretch was redefined by the user it will not longer match its internal counterpart \f@linespread. If so we call \set@fontsize to prepare \size@update.

\begin{Verbatim}
\ifx\f@linespread\baselinestretch \else
\set@fontsize\baselinestretch\f@size\f@baselineskip \fi
\end{Verbatim}

The series and shape updates are only prepared by \fontseries and \fontshape but not executed until after we are ready to change the font face. This way they happen after a possibly new family is set which is important because they look at the available font faces in that family and alter the selection based on availability. Several calls to \fontseries or \fontshape are delayed in the order in which they appear, so that by switching them one can work around missing intermediate font faces and avoid substitutions.

We first attempt to do the merge without any substitution. As we might end up with a non-existing font face we may have to restart and therefore save the current values of \f@series and \f@shape before the merge.

But first we make a quick test to see if there are any delayed actions, because if not it is pointless to make all the assignments and try loading a missing fontshape.

\begin{Verbatim}
\ifx\delayed@f@adjustment\@empty
\else
\let\f@shape@saved\f@shape
\let\f@series@saved\f@series
\fi
\end{Verbatim}
The we run the delayed adjustments (which is using the \..\without@substitution commands

\delayed@f@adjustment

We then check if the resulting combination is valid but for this we have to make sure that the appropriate .fd is loaded if that hasn’t happened so far.

\maybe@load@fontshape
\ifcsname \f@encoding/\f@family/\f@series/\f@shape \endcsname

If this macro is defined then we are good and no further action is necessary.

Otherwise the combination is not valid, so we redo the merge but this time with substitutions.

\else
\let\f@shape\f@shape@saved
\let\f@series\f@series@saved
\let\delayed@merge@font@shape\merge@font@shape
\let\delayed@merge@font@series\merge@font@series
\let\delayed@f@adjustment\delayed@f@adjustment@without@substitution
\let\delayed@merge@font@shape\merge@font@shape@without@substitution
\let\delayed@merge@font@series\merge@font@series@without@substitution
\fi

Now the series and shape values are updated and we clear \delayed@f@adjustment. This is important because on the next execution of \selectfont we should not mistakenly redo the delayed actions if there wasn’t any series or shape change.

\let\delayed@f@adjustment\@empty
\fi

If the series was forced we should now cancel that in case the next series change is done with some low-level setting to \f@series.

\@forced@seriesfalse

Then we generate the internal name of the font by concatenating family, series, shape, and current size, with slashes as delimiters between them. This is much more readable than standard \LaTeX’s \twfbf, etc. We define \font@name globally, as always. The reason for this is explained later on.

\xdef\font@name{%
\csname\curr@fontshape/\f@size\endcsname}%

We call the macro \pickup@font which will load the font if necessary.

\pickup@font

Then we select the font.

\font@name

After switching fonts we run a hook, so that packages can make last minute alterations based on the new font (originally provided in everysec but using a different interface).

\UseHook{selectfont}%

Finally we call \size@update. This macro is normally empty but will contain actions (like setting the \baselineskip) that have to be carried out when the font size, the base \baselineskip or the \baselinestretch have changed.

\size@update

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A similar function is called to handle anything related to encoding updates. This one is
changed from \relax by \fontencoding.
\enc@update
Just before ending this macro we have to pop the tracing stack if it was pushed before.
(+debug) \poptracing
}
(End definition for \selectfont.)

selectfont Declare the hook used in selectfont in the kernel, but not inside the tracefnt package.
\NewHook{selectfont}
(End definition for selectfont.)
If \tracingfonts is greater than 2 we also show the font switch inside \selectfont. We do this by adding this code to the hook in the tracefnt package: macro might redefine \font@name.
\AddToHook{selectfont}{\ifnum \tracingfonts>\tw@
\@font@info{Switching to \font@name}\fi}
\font@name
With \selectfont having different definitions in different kernels we also have to provide them in the tracefnt package to support rollback. In packages that works a bit differently and therefore we have to provide an empty block there.
\Selectfont
\set@fontsize The macro \set@fontsize does the actual work. First it assigns new values to \f@size, \f@baselineskip and \f@linespread.
\set@fontsize%
\edef\f@size{\strip@pt\@tempdimb}\
defaultunits{\@tempskipa3pt}\relax\@nil\
\edef\f@baselineskip{\the\@tempskipa}\
\edef\f@linespread{#1}\%

For backward compatibility and for later testing within \selectfont the internal value of \f@linespread is passed back to \baselinestretch.

\let\baselinestretch\f@linespread

Additional processing will happen within \selectfont. For this reason the macro \size@update (which will be called in \selectfont) will be defined to be:

\def\size@update{\
First calculate the new \baselineskip and also store it in normalbaselineskip
\baselineskip\f@baselineskip\relax
\baselineskip\f@linespread\baselineskip
\normalbaselineskip\baselineskip

then to set up a new \strutbox
\setbox\strutbox\hbox{\vrule\@height.7\baselineskip\@depth.3\baselineskip\@width\z@}%

We end with a bit of tracing information.

⟨∗trace⟩
\ifnum \tracingfonts>\tw@\
\iff@linespread\@empty\
\let\reserved@a\@empty
\else\
\def\reserved@a{\f@linespread x}\
\fi
@fontinfo{Changing size to \f@size/\reserved@a \f@baselineskip}\
\aftergroup\type@restoreinfo \fi
⟨/trace⟩

When all this is processed \size@update redefines itself to \relax so that in later calls of \selectfont no extra code will be executed.

\let\size@update\relax

Instead of defining this macro internally we might speed things up by placing the code into a separate macro and use \let!

(\End definition for \set@fontsize.)

\size@update Normally this macro does nothing; it will be redefined by \set@fontsize to initiate an update.
\let\size@update\relax

(\End definition for \size@update.)

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\type@restoreinfo  This macro produces some info when a font size and/or baseline change will get restored.

\def\type@restoreinfo{%
  \ifx\f@linespread\@empty
    \let\reserved@a\@empty
  \else
    \def\reserved@a{\f@linespread x}\
  fi
  \@font@info{Restoring size to
    \f@size/\reserved@a/\f@baselineskip}}
\end{def}

\glb@settings\glb@currsize  The macro \glb@settings globally selects all math fonts for the current size if necessary.
\def\glb@settings{%
  When \glb@settings gains control a size change was requested and all previous font assignments need to be replaced. Therefore the old values of the fonts are no longer needed. For every math group the new assignments are appended to \math@fonts. But this happens only if the \math@fonts switch is set to true. However, we always set up the correct math sizes for script and scriptscript fonts since they may be needed even if we don’t set up the whole math machinery.

  Here we set the math size, script size and scriptscript size. If the S@... macro is not defined we have to first calculate the three sizes.
\expandafter\ifx\csname S@[\f@size]\endcsname\relax
  \calculate@math@sizes
\fi

  The effect of this is that \calculate@math@sizes may or may not define the S@... macro. In the first case the next time the same size is requested this macro is used, otherwise \calculate@math@sizes is called again. This also sets the \math@fonts switch. If it is true we must switch the math fonts.
\csname S@[\f@size]\endcsname\ifmath@fonts
\ifnum \tracingfonts>\tw@
  \@font@info{Setting up math fonts for
    \f@size/\f@baselineskip}/fi
\fi
\end{ifnum}
\end{def}

Inside a group we execute the macro for the current math version. This sets \math@fonts to a list of \textfont... assignments. \getanddefine@fonts (which may be called at this point) needs the \escapechar parameter to be set to \texttt{-1}.

\begingroup
  \escapechar\m@ne
  \csname mv@[\math@version]\endcsname
\end{begingroup}

Then we set \globaldefs to 1 so that all following changes are done globally. The math font assignments recorded in \math@fonts are executed and \glb@currsize is set equal to \f@size. This signals that the fonts for math in this size are set up.
\globaldefs\one
\math@fonts

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Finally we execute any code that is supposed to happen whenever the math font setup changes. This register will be executed in local mode which means that everything that is supposed to have any effect should be done globally inside. We can’t execute it within \globaldefs\@ne as we don’t know what ends up inside this register, e.g., it might contain calculations which use some local registers to calculate the final (global) value.

\the\every@math@size

Otherwise we announce that the math fonts are not set up for this size.

\else
  \ifnum \tracingfonts>\tw@
    \@font@info{No math setup for \f@size/\f@baselineskip}\fi
\fi

\fi

(End definition for \glb@settings and \glb@currsize.)

\baselinestretch

In \selectfont we used \baselinestretch as a factor when assigning a value to \baselineskip. We use 1 as a default (i.e. no stretch).

\def\baselinestretch{1}

(End definition for \baselinestretch.)

\every@math@size

We must still define the hook \every@math@size we used in \glb@settings. We initialize it to nothing. It is important to remember that everything that goes into this hook should go to global updates, local changes will have weird effects.

\newtoks\every@math@size

\every@math@size={}

(End definition for \every@math@size.)

5.2 Math fonts setup

5.2.1 Outline of algorithm for math font sizes

\TeX uses the math fonts that are current when the end of a formula is reached. If we don’t want to keep font setups local to every formula (which would result in an enormous overhead, we have to be careful not to end up with the wrong setup in case formulas are nested, e.g., we need to be able to handle

$ a=b+c \text{ small for all } b, c \in \mathbb{Z}$

Here the inner formulae $b$ and $c \in \mathbb{Z}$ are typeset in \small but we have to return to \normalsize before we reach the closing $ of the outer formula.

This is handled in the following way:

1. At any point in the document the global variable \glb@currsize contains the point size for which the math fonts currently are set up.

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2. Whenever we start a formula we compare its value with the local variable $\texttt{f@size}$ that describes the current text font size.

3. If both are the same we assume that we can use the current math font setup without adjustment.

4. If they differ we call $\texttt{gb@settings}$ which changes the math font setup and updates $\texttt{gb@currsize}$.

   (a) If we are recursively inside another formula ($\texttt{if@inmath}$) we ensure that $\texttt{gb@settings}$ is executed again in the outer formula, so that the old setup is automatically restored.

   (b) Otherwise, we set the switch $\texttt{inmath}$ locally to $\texttt{true}$ so that all nested formulae will be able to detect that they are nested in some outer formula.

The above algorithm has the following features:

- For sizes which are not containing any formula no math setup is done. Compared to the original algorithm of NFSS this results in the following savings:
  
  - No unnecessary loading of math fonts for sizes that are not used to typeset any math formulae (explicit or implicit ones).
  
  - No time overhead due to unnecessary changes of the math font setup on entrance and exit of the text font size.

- Math font setup changes for top-level formulae will survive (there is no restoration after the formula) thus any following formula in the same size will be directly typesetable. Compared to original implementation in NFSS2 the new algorithm has the overhead of one test per formula to see if the current math setup is valid (in the original algorithm the setup was always valid, thus no test was necessary).

- In nested formulae the math font setup is restored in the outer formula by a series of $\texttt{aftergroup}$ commands and checks. Compared to the original algorithm this involves additional checks ($2 \times \langle\text{non-math levels}\rangle$ per inner formula).

### 5.2.2 Code for math font size setting

In the $\texttt{check@mathfonts}$ macros we implement the steps 2 to 4 except that instead of a switch the macro $\texttt{init@restore@gb@settings}$ is used.

```latex
\begin{verbatim}
\check@mathfonts
\ifx \glb@currsize \f@size
  \ifnum \tracingfonts>\thr@@
    \@font@info{*** MATH: no change \f@size\space curr/global (\curr@math@size/\glb@currsize)}\fi
\else
  \ifnum \tracingfonts>\thr@@
    \@font@info{*** MATH: setting up \f@size\space curr/global (\curr@math@size/\glb@currsize)}\fi
  \else
    \aftergroup \texttt{\check@mathfonts}\thr@@
\fi
\fi
\end{verbatim}
```

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\glb@settings
\init@restore@glb@settings
\fi
\let\curr@math@size\f@size
\def\init@restore@glb@settings{\aftergroup\restglb@settings}%
}

(End definition for \check@mathfonts.)
\init@restore@glb@settings  This macro does by default nothing but get redefined inside \check@mathfonts to initiate fontsize restoring in nested formulas.
\langle -trace \rangle \let\init@restore@glb@settings\relax
\langle \ast trace \rangle
\def\init@restore@glb@settings{%
  \ifnum\tracingfonts>\thr@@
    \@font@info{*** MATH: no resetting (not in nested math)}\fi
\langle /trace \rangle
\langle /trace \rangle
\begin{group}
  \let\f@size\curr@math@size
  \ifx\glb@currsize\f@size
    \langle \ast trace \rangle
    \ifnum\tracingfonts>\thr@@
      \@font@info{*** MATH: ... already okay (\f@size)}\fi
\langle /trace \rangle
  \else
    \langle \ast trace \rangle
    \ifnum\tracingfonts>\thr@@
      \@font@info{*** MATH: ... to \f@size}\fi
\langle /trace \rangle
  \fi
  \glb@settings
  \fi
\end{group}
\fi
\restglb@settings  This macro will be executed the first time after the current formula.
\langle -trace \rangle \def\restglb@settings{%
  \langle \ast trace \rangle
  \ifnum\tracingfonts>\thr@@
    \@font@info{*** MATH: restoring}\fi
\langle /trace \rangle
\langle /trace \rangle
\begingroup
  \let\f@size\curr@math@size
  \ifx\glb@currsize\f@size
    \langle \ast trace \rangle
    \ifnum\tracingfonts>\thr@@
      \@font@info{*** MATH: ... already okay (\f@size)}\fi
\langle /trace \rangle
  \else
    \langle \ast trace \rangle
    \ifnum\tracingfonts>\thr@@
      \@font@info{*** MATH: ... to \f@size}\fi
\langle /trace \rangle
  \fi
\glb@settings
\fi
\endgroup
\fi

(End definition for \restglb@settings.)

5.2.3 Other code for math

\use@mathgroup  The \use@mathgroup macro should be used in user macros to select a math group. Depending on whether or not the margid option is in force it has two or three arguments. For this reason it should be called as the last macro. First we test if we are inside math mode since we don’t want to apply a useless definition.
\def\use@mathgroup#1#2{%\relax\ifmmode
If so we first call the ‘=’ macro (i.e. argument three) to set up special things for the selected math group. Then we call \texttt{\textbackslash mathgroup} to select the group given by argument two and finally we place \texttt{#1} (i.e. the argument of the \texttt{⟨math alphabet identifier⟩}) at the end. This part of the code is surrounded by two commands which behave like \texttt{\textbackslash begingroup} and \texttt{\textbackslash endgroup} if we want \texttt{⟨math alphabet identifier⟩}s but will expand into \texttt{\textbackslash empty} if we want simply switches to a new math group. Since argument number 2 may be a digit instead of a control sequence we add a \texttt{\relax}. Otherwise something like \texttt{\mit{1}} would switch to math group 11 (and back) instead of printing an oldstyle 1.

\texttt{\textbackslash math@bgroup}
\texttt{\expandafter\ifx\csname M@f@encoding\endcsname#1\else #1\fi \textbackslash mathgroup#2\relax}

Before we reinsert the swallowed token (arg. three) into the input stream, in the case that the \texttt{⟨math alphabet identifier⟩} isn’t called in math mode, we remove the \texttt{\fi} with the \texttt{\expandafter} trick. This is necessary if the token is actually an macro with arguments. In such a case the \texttt{\fi} will be misinterpreted as the first argument which would be disastrous.

\texttt{\expandafter\texttt{\textbackslash math@egroup}\texttt{\textbackslash fi}}%

The surrounding macros equal \texttt{\textbackslash begingroup} and \texttt{\textbackslash endgroup}. But using internal names makes it possible to overwrite their meaning in certain cases. This is for example used in \texttt{AMS-\TeX} macros for placing accents.

\texttt{\textbackslash getanddefine@fonts}
\texttt{\getanddefine@fonts} has two arguments: the \texttt{⟨math group number⟩} and the \texttt{family/series/shape} name as a control sequence.

\texttt{\def\getanddefine@fonts#1#2{}}

First we turn of tracing when \texttt{\textbackslash tracingfonts} is less than 4.

\texttt{\def\getanddefine@fonts#1#2{}}

\texttt{\def\getanddefine@fonts#1#2{}}

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We append the current \tf@size to #2 to obtain the font name.\footnote{One might ask why this expansion does not generate a macro name that starts with an additional \ character. The solution is that \escapechar is set to −1 before \getanddefine@fonts is called.} Again, \font@name is defined globally, for the reasons explained in the description of \wrong@fontshape.

\xdef\font@name{\csname \string#2/\tf@size\endcsname}\
\pickup@font \let\textfont@name\font@name

Same game for \scriptfont and \scriptscriptfont:

\xdef\font@name{\csname \string#2/\sf@size\endcsname}\
\pickup@font \let\scriptfont@name\font@name
\xdef\font@name{\csname \string#2/\ssf@size\endcsname}\
\pickup@font

Then we append the new \textfont... assignments to the \math@fonts.

\edef\math@fonts{\math@fonts\textfont#1\textfont@name\
\scriptfont#1\scriptfont@name\
\scriptscriptfont#1\font@name}\

Just before ending this macro we have to pop the tracing stack if it was pushed before.

\poptracing

\end{macro}

\section{Scaled font extraction}

\ifnot@nil We begin with a simple auxiliary macro. It checks whether its argument is the token \@nil. If so, it expands to \@gobble which discards the following argument, otherwise it expands to \@firstofone which reproduces it argument.

\begin{macro}
\def\ifnot@nil#1{\def\reserved@a{#1}\
\ifx\reserved@a\@nnil \expandafter\@gobble\else \expandafter\@firstofone\fi}
\end{macro}

\begin{list}
\remove@to@nnil\remove@angles\remove@star

Three other auxiliary macros will be needed in the following: \remove@to@nnil gobbles up everything up to, and including, the next \@nnil token, and \remove@angles and \remove@star do the same for the character > and *, respectively, instead of \@nnil.

\begin{macro}
\def\ifnot@nil#1\@nnil{\def\reserved@a[#1]\
\ifx\reserved@a\@nnil \expandafter\@gobble\else \expandafter\@firstofone\fi}
\end{macro}

\begin{macro}
\def\remove@to@nnil#1\@nnil{\def\reserved@a{#1}\
\def\remove@to@nnil#1\@nnil{\set@simple@size@args}
\def\remove@star#1\@nnil{\set@simple@size@args}
\end{macro}

\end{list}
\extract@sizefn

This macro takes a size specification and parses it into size function and the optional and mandatory arguments.

\def\extract@sizefn#1*#2\@nil{% 
  \if>#2>\set@size@funct@args#1\@nil 
  \let\sizefn@info\@empty 
  \else\expandafter\set@size@funct@args\remove@star#2\@nil 
  \def\sizefn@info(#1)\fi 
}%

(End definition for \extract@sizefn.)

\try@simple@size

This function tries to extract the given size (specified by \f@size) for the requested font shape. The font information must already be present in \font@info. The central macro that does the real work is \extract@fontinfo. We will first give a simple example how this macro works, and describe it in full generality later.

Assume that the requested parameters are: encoding scheme 'OT1', family 'cm', series 'sansserif', shape 'normal', and size '12'. The corresponding font definitions have already been extracted from the macro \OT1/cm/sansserif/normal and stored in \font@info. (Otherwise \extract@fontinfo doesn't get called.) This information consists of a token list made of characters of category code 12 of the form

\<10*>cmss10<12*>cmss12<17*>cmss17

For reasonable packages one usually needs more sizes but this is sufficient to get the flavour. We will define a macro \extract@fontinfo to find the external font name ('cmss12') for us:

\def\extract@fontinfo#1<12*#2>#3<#4\@nnil{% 
  \set@simple@size@args#3<#4\@nnil 
  \execute@size@function{#2}}

so that when it gets called via

\extract@fontinfo<10*>cmss10<12*>cmss12<17*>cmss17\@nnil

#1 will contain all characters before \<12*>, #2 will be empty, #3 will be exactly cmss12, and #3 will be \<17*>cmss17. The expansion is therefore

\set@simple@size@args cmss12<17*>cmss17\@nnil 
\execute@size@function{}

This means: the default (empty) size function will be executed, with its optional argument set to empty and its mandatory argument set to cmss12 by \set@simple@size@args. As we discussed earlier, the effect of the default size function is to load the given external font (cmss12) at the specified size (12)—which is exactly what was intended.

But this is only part of the whole story. It may be that the size requested does not occur in the token list \font@info. And the simple definition of \extract@fontinfo we gave above does not allow to specify give more than one size specification in front of the external font name.

Let's address these two problems separately. The first one is solved with the following trick: We define \extract@fontinfo as follows:

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How does this work? We call \texttt{\extract@fontinfo} via

\begin{verbatim}
\expandafter \extract@fontinfo \fontinfo <12*> \nil \nil
\end{verbatim}
i.e. by appending \texttt{\nil\nil}. If the size (‘12’ in this case) appears in \texttt{\fontinfo} everything works as explained above, the only difference being that argument \texttt{#4} of \texttt{\extract@fontinfo} additionally gets the tokens \texttt{\nil\nil}. However, if the size is not found everything up to the final \texttt{\nil\nil} is in argument \texttt{#1}, \texttt{#3} gets \texttt{\nil\nil}, and \texttt{#2} and \texttt{#4} are empty. The macro \texttt{\ifnot@nil} will discard the calls to \texttt{\set@simple@size@args} and \texttt{\execute@size@function}, and hence \texttt{\fontinfo} will continue to be equal to \texttt{\@empty}. This means that no simple size specification matching the requested size could be found.

The second problem (more than one simple size specification for one external font name) will be addressed in \texttt{\set@simple@size@args} below.

The macros are hidden inside other control sequences so that we have to build \texttt{\extract@fontinfo} in several steps.

So here’s the actual definition of \texttt{\extract@fontinfo} in \texttt{\try@simple@size}.

\begin{verbatim}
\def \try@simple@size { \\
reserved@a \is made an abbreviation for the head of the definition of the macro \texttt{\extract@fontinfo}. \\
\def \reserved@a { \def \extract@fontinfo####1 } \\
\expandafter \reserved@a \expandafter < \f@size \expandafter > \nil \nil \nil \nil \\
\ifnot@nil { \nil } \\
\set@simple@size@args \nil \nil \nil \\
\execute@size@function \sizefn@info \\
}
\end{verbatim}

Now we call \texttt{\extract@fontinfo}. Note the \texttt{\nil} tokens at the end.

\begin{verbatim}
\expandafter \reserved@a \expandafter \expandafter < \f@size > <12\texttt{*}}
\end{verbatim}

(End definition for \texttt{\try@simple@size}.)

\texttt{\set@simple@size@args}

As promised above, the macro \texttt{\set@simple@size@args} will handle the case of several size specifications in a row. If another size specification follows, the very first token of its argument list is the character \texttt{<}. By starting the definition as follows,

\begin{verbatim}
\def \set@simple@size@args { \texttt{*} } \\
\end{verbatim}
parameter #1 is empty in this case, and contains the size function’s arguments otherwise. We distinguish these two cases (Note that the character < cannot appear in #1) by calling \remove@angles for empty #1 and \extract@sizefn otherwise. In the latter case we have to take care of the remaining character tokens and discard them. This is done by \remove@to@nnil. Note also the use of Kabelschacht’s method.

\begin{verbatim}
if<#1<%
  \expandafter\remove@angles
\else
  \extract@sizefn#1*\@nil
  \expandafter\remove@to@nnil
\fi}
\end{verbatim}

(End definition for \set@simple@size@args.)

Now, we are through with the case of a simple size, except for calling the size function. This will be handled later, as it is the same mechanism for all types of size specification. We will now proceed to macros for extraction of size range specification.

\extract@rangefontinfo \extract@rangefontinfo goes through a font shape definition in the input until it recognizes the tokens <\@nil->. It looks for font ranges with font size functions. It’s operation is rather simple: it discards everything up to the next size specification and passes this on to \is@range for inspection. The specification (parameter #2 is inserted again, in case it is needed later.

\begin{verbatim}
\def\extract@rangefontinfo#1<#2>{%
  \is@range#2->\@nil#2>
\end{verbatim}

(End definition for \extract@rangefontinfo.)

\is@range \is@range is again a sort of dispatcher macro: if the size specification it is looking at is not a range specification it discards it and calls \extract@rangefontinfo to continue the search. Otherwise it calls \check@range to check the requested size against the specified range.

From the way \is@range is called inside \extract@rangefontinfo we see that #2 is the character > if the size specification found is a simple one (as it does not contain a - character. This is checked easily enough and \extract@rangefontinfo called again. Note that the extra tokens inserted after the \@nil in the call to \is@range appear at the beginning of the first argument to \extract@rangefontinfo and are hence ignored.

\begin{verbatim}
\def\is@range#1-#2->\@nil{%
  \ifnot@nil{#3}{%
  \else
  \expandafter\check@range\fi}
\end{verbatim}

(End definition for \is@range.)

\check@range \check@range takes lower bound as parameter #1, upper bound as #2, size function as #3 and the size function’s arguments as #4. If #3 is the special token \@nil \font@info is exhausted and we can stop searching.

\begin{verbatim}
\def\check@range#1-#2->#3<#4\@nnil{%
  \ifnot@nil{#3}{%
  \else
  \expandafter\check@range\fi}
\end{verbatim}

If #3 wasn’t \@nil we have a range. We start by assuming that we have to recurse. Note that we have to reinsert an < as it was already removed by scanning.

\begin{verbatim}
\def\reserved@f{\extract@rangefontinfo<#4\@nnil)}
\end{verbatim}
We have to make sure that both boundaries are present, if not we have to set them. Here we check the upper bound. If \texttt{\upper@bound} is zero after the assignment we set it to \texttt{\maxdimen} (upper open range). We need to use a \texttt{(dimen)} register for the scan since we may have a decimal number as the boundary.

\begin{verbatim}
\upper@bound0#2\p@
\ifdim\upper@bound=\z@ \upper@bound\maxdimen\fi
\end{verbatim}

Now we check the upper boundary against \texttt{\f@size}. If it is larger or equal than \texttt{\f@size} this range is no good and we have to recurse.

\begin{verbatim}
\ifdim \f@size \p@<\upper@bound
\else
\fi
\end{verbatim}

Otherwise we have to check the lower bound. This time it is not necessary to scan the boundary value into a register because if it is empty we get zero as desired. We could even omit the \texttt{0} which would result in \texttt{1pt} as default lower boundary. If \texttt{\f@size} is smaller than the boundary we have to recurse.

\begin{verbatim}
\lower@bound0#1\p@
\ifdim \f@size \p@<\lower@bound
\else
\fi
\end{verbatim}

If both tests are passed we can try executing the size function.

\begin{verbatim}
\set@simple@size@args#3<#4\@nnil
\execute@size@function\sizefn@info
\end{verbatim}

If the function was successful it should have left an external font name in \texttt{\external@font}. We use this to see if we can stop scanning. Otherwise we recurse.

\begin{verbatim}
\if\external@font\empty
\else
\let\reserved@f\@empty
\fi
\fi
\reserved@f}
\end{verbatim}

\texttt{(End definition for \check@range.)}

\texttt{\lower@bound} \texttt{\upper@bound} We use two dimen registers \texttt{\lower@bound} and \texttt{\upper@bound} to store the lower and upper endpoints of the range we found.

\begin{verbatim}
\newdimen\lower@bound
\newdimen\upper@bound
\end{verbatim}

\texttt{(End definition for \lower@bound and \upper@bound.)}

\texttt{\check@single} \texttt{\check@single} takes the size as parameter \texttt{#1}, size function as \texttt{#2} and the size function’s arguments as \texttt{#3}. We can assume that there is always something in the pipeline since the very last entry is a faked range (see above).

\begin{verbatim}
\def\check@single#1>\#2<\#3\@nnil{%}
\end{verbatim}

We start by assuming that we have to recurse. Note that we have to reinsert an \texttt{<} as it was already removed by scanning.

\begin{verbatim}
\def\reserved@f{\extract@rangefontinfo<\#3\@nnil}%
\end{verbatim}

Now we check the size against \texttt{\f@size}. If it is not equal \texttt{\f@size} it is no good and we have to recurse.

\begin{verbatim}
\ifdim \f@size \p@=\#1\p@
\end{verbatim}
Otherwise if this test is passed we can try executing the size function.

\set@simple@size@args#2<#3\@nnil
\execute@size@function\sizefn\info

If the function was successful it should have left an external font name in \external@font. We use this to see if we can stop scanning. Otherwise we recurse.

\ifx\external@font\@empty
\else
\let\reserved@f\@empty
\fi
\fi
\reserved@f

(End definition for \check@single.)

\set@size@funct@args
\set@size@funct@args@

This macro sets the optional and mandatory arguments for a size function. If the optional argument is not present it is set to the empty token list. The mandatory argument is delimited by the token \@nil.

\def\set@size@funct@args{\@ifnextchar[{
\set@size@funct@args@{\@ifnextchar[{
\set@size@funct@args@{[}\}]}}}

(End definition for \set@size@funct@args and \set@size@funct@args@.)

\DeclareSizeFunction

This function defines a new size function hiding the internal from the designer. The body of the size function may use \optional@arg and \mandatory@arg denoting the optional and mandatory argument that may follow the size specification <...>.

\def\DeclareSizeFunction#1#2{\@namedef{s@fct@#1}{#2}}
\@onlypreamble\DeclareSizeFunction

(End definition for \DeclareSizeFunction.)

\execute@size@function

This macro is very simple. The only point worth noting is that calling an undefined size function will do nothing (actually execute a \relax).

\def\execute@size@function#1{%
\@ifundefined{s@fct@#1}{%\errmessage{Undefined font size function #1}%
\s@fct@}%{\csname s@fct@#1\endcsname}%
}

(End definition for \execute@size@function.)
This macro tries to find a suitable range for requested size (specified by \f@size) in \font@info. All the relevant action is done in \extract@rangefontinfo. All that needs to be done is to stuff in the token list in \font@info so that \extract@rangefontinfo can inspect it. Note the \texttt{\textbackslash -\textbackslash \textbackslash nnil} token at the end to stop scanning.

\begin{verbatim}
\def\try@size@range{\expandafter\extract@rangefontinfo\font@info \texttt{\textbackslash nnil} \texttt{\textbackslash nnil}}
\end{verbatim}

(End definition for \texttt{\textbackslash try@size@range}.)

This is the last thing that can be tried. If the desired \f@size is found neither among the simple size specifications nor in one of the ranges the whole list of size specifications is searched for a nearby simple size.

\begin{verbatim}
\gdef\try@size@substitution{\let\@tempdimb\maxdimen\let\best@size\@empty
\expandafter\try@simples\font@info \texttt{\textbackslash number\textbackslash @M}\texttt{\textbackslash nnil}}
\end{verbatim}

(End definition for \texttt{\textbackslash try@size@substitution}.)

The macro \font@submax records the maximal deviation from the desired size encountered so far. Its value is used in a warning message at \texttt{\textbackslash \textendash \textbackslash \textbackslash \textbackslash end\textbackslash document}. The macro \fontsubfuzz contains the amount that will not cause terminal warnings (warnings still go into the transcript file).

\begin{verbatim}
\def\font@submax{0pt}\def\fontsubfuzz{.4pt}
\end{verbatim}

(End definition for \texttt{\textbackslash font@submax} and \texttt{\textbackslash fontsubfuzz}.)

\begin{verbatim}
\def\try@simples#1<#2>\try@simples{\tryif@simple#2->\tryif@simple}
\end{verbatim}

(End definition for \texttt{\textbackslash try@simples}.)

\begin{verbatim}
\gdef\tryis@simple{\is@range. If it sees a simple size, it checks it against the value of \f@size and sets \texttt{\textbackslash lower\textbackslash \textbackslash \textbackslash font\textbackslash \textbackslash \textbackslash \textbackslash size} or \texttt{\textbackslash higher\textbackslash \textbackslash \textbackslash \textbackslash font\textbackslash \textbackslash \textbackslash \textbackslash size}. In the latter case, it stops the iteration. By adding \texttt{\textbackslash number\textbackslash @M} at the end of the line we always have an end point. This is a hack which probably should be corrected.

First it checks whether it is finished already, then whether the size specification in question is a simple one.

\begin{verbatim}
\gdef\tryif@simple#1<#2>\tryif@simple{\tryif@simple#1-#2}\tryif@simple}
\end{verbatim}

(End definition for \texttt{\textbackslash try@simples}.)

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Most common case for `\reserved@f` first:

```
\let \reserved@f \try@simples
\if#2%
```

If so, it compares it to the value of `\f@size`. This is done using a dimen register since there may be fractional numbers.

```
\dimen@ #1\p@
\ifdim \dimen@<\@M\p@
```

If `\dimen@` is `\@M\p@` we have reached the end of the fontspec (hopefully) otherwise we compare the value with `\f@size` and compute in `\@tempdimc` the absolute value of the difference between the two values.

```
\ifdim \f@size\p@<\dimen@
\@tempdimc \dimen@
\advance\@tempdimc -\f@size\p@
\else
\@tempdimc \f@size\p@
\advance\@tempdimc -\dimen@
\fi
```

The result is then compared with the smallest difference we have encountered, if the new value (in `\@tempdimc` is smaller) we have found a size which is a better approximation so we make it the `\best@size` and adjust `\@tempdimb`.

```
\ifdim \@tempdimc<\@tempdimb
\@tempdimb \@tempdimc
\def \best@size{#1}%
\fi
```

When we have reached the end of the fontspec we substitute the best size found (if any). We code this inline to save macro space; in the past this was done by a macro called `\subst@size`.

```
\else
\fi
```

This macro substitutes the size recorded in `\best@size` for the unavailable size `\f@size`. `\font@submax` records the maximum difference between desired size and selected size in the whole run.

```
% \%\subst@size % % coded inline
% \%\def\subst@size{%
\ifx \external@font\@empty
\ifx \best@size\@empty
\else
\ifdim \@tempdimb>\font@submax \relax
\xdef \font@submax {\the\@tempdimb}%
\fi
\let \f@user@size \f@size
\let \f@size \best@size
\ifdim \@tempdimb>\font@subfuzz\relax
\@font@warning{Font\space shape\space ‘\curr@fontshape’\space in\space size\space not\space available\space substituted}\%
\fi
\let \f@user@size \f@size
\let \f@size \best@size
```

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This brings us back into the main part of \texttt{tryif@simple}. Finally we get rid of any rubbish left over on the input stack.
\begin{verbatim}
\let \reserved@f \remove@to@nnil
\fi
\fi
\fi
\let \reserved@f \remove@to@nnil
\fi
\fi
\end{verbatim}
If it’s a range iterate also.
\begin{verbatim}
\reserved@f
\end{verbatim}
\textit{(End definition for \texttt{tryis@simple} and \texttt{subst@size}).}

\section{Sizefunctions}

In the following we define some useful size functions.

\texttt{% \s@fct@}

This is the default size function. Mandatory argument is an external font name, optional argument a scale factor. The font is scaled to \texttt{\f@size} if no optional argument is present, and to \texttt{\f@size} multiplied by the optional argument otherwise.
\begin{verbatim}
\DeclareSizeFunction{}{\empty@sfcnt\@font@warning}
\DeclareSizeFunction{s}{\empty@sfcnt\@font@info}
\def\empty@sfcnt#1{\@tempdimb \f@size\p@
\ifx\optional@arg\@empty
\else
\@tempdimb \optional@arg\@tempdimb
#1{Font\ space \shape\ space \curr@fontshape\space
will\ space \textbf{be}\ \MessageBreak
scaled\ space \texttt{to}\ \space \space \size\ \texttt{\the@tempdimb}}%}
\fi
\edef\external@font{\mandatory@arg\space at\the@tempdimb}}
\end{verbatim}
\textit{(End definition for \texttt{s@fct@}).}

\texttt{% \s@fct@gen \s@fct@sgen}

This size function generates the external name from the mandatory argument and the requested user size, and thus can be used for external names where the size is encoded in the font name. The optional argument a scale factor. The font is scaled to \texttt{\f@size} if no optional argument is present, and to \texttt{\f@size} multiplied by the optional argument otherwise.
\begin{verbatim}
\DeclareSizeFunction{gen}{\gen@sfcnt\@font@warning}
\DeclareSizeFunction{sgen}{\gen@sfcnt\@font@info}
\def\gen@sfcnt{\edef\mandatory@arg{\mandatory@arg\f@size}
\empty@sfcnt}
\end{verbatim}
\textit{(End definition for \texttt{s@fct@gen} and \texttt{s@fct@sgen}).}
This size function is similar to \texttt{gen}, but for fonts where the size is encoded in the font name in centipoints, as in the DC fonts version 1.2. The font is scaled to \texttt{\f@size} if no optional argument is present, and to \texttt{\f@size \times \text{optional argument}} otherwise.

\begin{verbatim}
\DeclareSizeFunction{genb}{\genb@sfcnt\@font@warning}
\DeclareSizeFunction{sgenb}{\genb@sfcnt\@font@info}
\def\genb@sfcnt{%
  \edef\mandatory@arg{\mandatory@arg\expandafter\genb@x\f@size..\@@}%
  \empty@sfcnt}
\end{verbatim}

(End definition for \texttt{\s@fct@genb} and \texttt{\s@fct@sgenb}.)

The auxiliary macros \texttt{\genb@x} and \texttt{\genb@y} are used to convert the \texttt{\f@size} into centipoints.

\begin{verbatim}
\def\genb@x#1.#2.#3\@@{
two@digits{#1}\genb@y#200\@@}
\def\genb@y#1#2#3\@@{#1#2}
\end{verbatim}

(End definition for \texttt{\genb@x} and \texttt{\genb@y}.)

This size function handles font substitution. The mandatory argument is a family/series/shape combination, the optional argument (if present) is ignored. The font encoding scheme cannot be changed. Therefore, the first thing we do is to prepend the encoding scheme.

\begin{verbatim}
\DeclareSizeFunction{sub}{\sub@sfcnt\@font@warning}
\DeclareSizeFunction{ssub}{\sub@sfcnt\@font@info}
\def\sub@sfcnt#1{%
  \edef\mandatory@arg{\f@encoding/\mandatory@arg}%
  \expandafter\split@name\mandatory@arg/\@nil
  \try@load@fontshape
}\end{verbatim}

Next action is split the arg into its individual components and allow for a late font shape load.

\begin{verbatim}
\begingroup
\expandafter\split@name\mandatory@arg/\@nil
\try@load@fontshape
\endgroup
\end{verbatim}

Then we record the current \texttt{\f@size} since it may get clobbered.

\begin{verbatim}
\let\@user@size\f@size
\end{verbatim}

Then we check whether this new combination is defined and give an error message if not. In this case we also switch to \texttt{\error@fontshape}.

\begin{verbatim}
\expandafter
\iffalse
\mandatory@arg\endcsname\relax
\errmessage{No space declaration for \space \shape \mandatory@arg}%
\error@fontshape
\else
\fi
\end{verbatim}

Otherwise we warn the user about the substitution taking place.

\begin{verbatim}
#1\lbrace Font \space shape \space `\texttt{\f@size}\space in\space size\space `<\texttt{\f@size}\space not\space available}\MessageBreak
\Font\space shape \space `\texttt{\f@size}\space tried\space instead}\rbrace
\expandafter\split@name\mandatory@arg/\@nil
\fi
\end{verbatim}

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Then we restart the font specification scan by calling `\get@external@font`.

```
\edef\f@size{\f@user@size}\
\get@external@font
```

Finally `\do@subst@correction` is called to get the font name right.

```
\do@subst@correction
```

(End definition for `\s@fct@sub`.)

\@font@aliasinfo

Sometimes a substitution is only done to map a long font name to a standard shape or series, e.g.,

```
DeclareFontShape{T1}{Roboto-LF}{b}{it}{<-> alias * Roboto-LF/bold/it}{}
```

Using the `ssub` function in that case will give a strange (and incorrect) warning. As an alternative we therefore offer the size function `alias`. It will still add some info into the `.log` file, but no longer complains that the font shape is not available. It is implemented by grabbing the default warning text and replacing it with a new one.

```
\@font@aliasinfo
```

The `subf` size function allows substitution of another font. The mandatory argument is the external name of the font to be substituted, the optional argument a size scaling factor like in the default size function. The main difference to the default size function is the warning message.

```
\DeclareSizeFunction{subf}{\subf@sfcnt@font@warning}
\DeclareSizeFunction{ssubf}{\subf@sfcnt@font@info}
```

(End definition for `\s@fct@subf`.)
The \texttt{\textbackslash s@fct@fixed} size function is for using a font at a different size than requested. A warning message is printed, and the external font to be used is taken from the mandatory argument. If an optional argument is present it is used as the ‘at’ size for the font. Otherwise the font is loaded at its design size.

\begin{verbatim}
\DeclareSizeFunction{fixed}{\fixed@sfcnt\font@warning}
\DeclareSizeFunction{sfixed}{\fixed@sfcnt\font@info}
\def\fixed@sfcnt#1{\ifx\optional@arg\@empty\let\external@font\mandatory@arg\else\edef\external@font{\mandatory@arg\space at\optional@arg pt}\fi#1{External\space font ‘\external@font’\space loaded\space for\space size\MessageBreak<\f@size}}}\end{verbatim}

(End definition for \texttt{\textbackslash s@fct@fixed}.)

\bigbreak

File x: \texttt{ltfsstrc.dtx} Date: 2021/04/26 Version v3.0o
This file contains the implementation of commands giving compatibility with the original ‘NFSS1’ release of the Font Selection Scheme.

**Warning:** The macro documentation is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

Version 1 of NFSS is obsolete now for about 20 years (and was “current” only for a short intermediate time) so with the 2015 release these internal interface commands are removed from the kernel and made available via `latexrelease` package so that backward compatibility remains ensured for very old documents.

```latex
\IncludeInRelease{2015/01/01}{\new@fontshape}{NFSS version1 commands}
\let\new@fontshape\@undefined
\let\warn@rel@i\@undefined
\let\scan@fontshape\@undefined
\let\scan@@fontshape\@undefined
\let\subst@fontshape\@undefined
\let\extra@def\@undefined
\let\default@mextra\@undefined
\let\preload@sizes\@undefined
\let\err@rel@i\@undefined
\let\newmathalphabet\@undefined
\let\newmathalphabet@\@undefined
\let\newmathalphabet@@\@undefined
\let\if@no@font@opt\@undefined
\let\@no@font@optfalse\@undefined
\let\define@mathalphabet\@undefined
\let\define@mathgroup\@undefined
\let\addtoversion\@undefined
\EndIncludeInRelease

In older releases we provide the original definitions.
\IncludeInRelease{0000/00/00}{\new@fontshape}{NFSS version1 commands}
```

\new@fontshape The interface is now `\DeclareFontShape`.
\warn@rel@i The warning message used above.

---

File y: ltfsscmp.dtx Date: 2020/12/05 Version v3.0f 483
\noexpand\MessageBreak
\string#2.\MessageBreak
\MessageBreak

*** Update by using release 2 command
*** Recovery is probably possible%
}
\onlypreamble\warn@rel@i

(End definition for \warn@rel@i.)

\scan@fontshape
This will scan the old font shape definition syntax.
\gdef\scan@fontshape{%
  \let\reserved@f\@empty
  \let\reserved@e\@empty % holds last info
  \scan@@fontshape%
}
\onlypreamble\scan@fontshape

(End definition for \scan@fontshape.)

\scan@@fontshape
\gdef\scan@@fontshape#1>#2#3<{%
  \ifx\@nil#1%
    \edef\reserved@f{\reserved@f\reserved@e}%
  \else
    \def\reserved@b{#1}% nick names
    \def\reserved@c{#3}%
    \in@{ at}{#3}%
    \ifin@
    \in@{pt}{#3}% not a proof but a good chance
    \else
    \fi
  \ifnum 0<0#2%
    \edef\reserved@d{subf\*\reserved@c}%
    \ifcase#2
      \else
        \errmessage{*** What’s this? NFSS release 0? ***}%
        \fi
      \else
        \edef\reserved@d{#2\reserved@c}%
      \fi
      \ifx\reserved@d\reserved@e%
        \edef\reserved@f{\reserved@f<\reserved@b>}%
      \else
        \edef\reserved@f{\reserved@f\reserved@e<\reserved@b>}%
        \let\reserved@e\reserved@f
      \fi
    \fi
  \fi
}\reserved@a#3\@nil
\fi
\fi
\ifnum 0<0#2%
  \edef\reserved@d{subf\*\reserved@c}%
  \ifcase #2\or
  \else
    \errmessage{*** What’s this? NFSS release 0? ***}%
    \fi
  \else
    \edef\reserved@d{#2\reserved@c}%
  \fi
  \ifx\reserved@d\reserved@e%
    \edef\reserved@f{\reserved@f<\reserved@b>}%
  \else
    \edef\reserved@f{\reserved@f\reserved@e<\reserved@b>}%
    \let\reserved@e\reserved@f
  \fi
}
\end{verbatim}

\texttt{\ subst@fontshape} This is now also handled by the extend syntax of \texttt{\ DeclareFontShape}.

\begin{verbatim}
\gdef\subst@fontshape#1#2#3#4#5#6{%
  \warnrel\ subst@fontshape\ DeclareFontShape
  \ DeclareFontShape{U}{#1}{#2}{#3}{<->sub*#4/#5/#6}{}%
}\onlypreamble\subst@fontshape
\end{verbatim}

\texttt{\ extra@def} This was replaced by \texttt{\ DeclareFontFamily}.

\begin{verbatim}
\gdef\extra@def#1#2#3{%
  \warnrel\ extra@def\ DeclareFontFamily
  \ DeclareFontFamily{U}{#1}{}%
}\onlypreamble\extra@def
\end{verbatim}

\texttt{\ default@mextra} The new name is \texttt{\ DeclareFontEncodingDefaults} but in this case we don’t feel comfortable with this either.

\begin{verbatim}
\gdef\default@mextra{%
  \warnrel\ default@mextra\ DeclareFontEncodingDefaults
  \ DeclareFontEncodingDefaults\relax%
}\onlypreamble\default@mextra
\end{verbatim}

\texttt{\ preload@sizes} The new interface is \texttt{\ DeclarePreloadSizes}.

\begin{verbatim}
\gdef\preload@sizes{%
  \warnrel\ preload@sizes\ DeclarePreloadSizes
  \ DeclarePreloadSizes U%
}\onlypreamble\preload@sizes
\end{verbatim}

\texttt{\ err@rel@i} This macro is used in cases where emulation with NFSS2 features is not really possible.

\begin{verbatim}
\gdef\err@rel@i#1#2{%
  \latexerror{*** NFSS release 1 command \noexpand#1found%
    ^^J*** Recovery not possible. Use \string#2}%
  \noexpand#1command^^Jany longer.\%}
  \noexpand#2command.}%
\end{verbatim}

File \texttt{y: ltfsccmp.dtx} Date: 2020/12/05 Version v3.0f
Let’s die.

\begin{verbatim}
\newmathalphabet \newmathalphabet@@ \newmathalphabet@@
\newmathalphabet is the old form.
\gdef\newmathalphabet{%
  \if@no@font@opt
    \latex@error{*** NFSS release 1 command
    \noexpand\newmathalphabet found}
    ^^J \space*** Automatic recovery not possible.^^J
    ^^^J \space*** TYPE H for Help}%
  \else
    \warn@rel@i\newmathalphabet\DeclareMathAlphabet
  \fi
}\gdef\newmathalphabet@@#1{
  \DeclareMathAlphabet{#1}{U}{}{}{}}
\gdef\newmathalphabet@@@#1#2#3#4{
  \DeclareMathAlphabet{#1}{U}{#2}{#3}{#4}}
\end{verbatim}

\begin{verbatim}
\if@no@font@opt
  \global\let\if@no@font@opt\iffalse
\else
  \warn@rel@i\newmathalphabet\DeclareMathAlphabet
\fi
\end{verbatim}

\begin{verbatim}
\define@mathalphabet
This is a case where dying is best.
\gdef\define@mathalphabet{%
  \err@rel@i\define@mathalphabet\DeclareMathAlphabet}
\end{verbatim}

\begin{verbatim}
\define@mathgroup
And here is another one
\gdef\define@mathgroup{%
  \err@rel@i\define@mathgroup\DeclareSymbolFont}
\end{verbatim}

File y: ltfsscmp.dtx Date: 2020/12/05 Version v3.0f
\addtoversion \addtoversion is the old form.
\begin{verbatim}
def\addtoversion#1#2\{% 
  \warn@rel@i\addtoversion\SetMathAlphabet
  \SetMathAlphabet#2{#1}{U}\%
\end{verbatim}
(End definition for \addtoversion.)

Finishing off this huge \IncludeInRelease argument:
\EndIncludeInRelease ⟨/latexrelease⟩
This file contains the main implementation of the font selection scheme commands. See other parts of the \TeX{} distribution, or The \TeX{} Companion for higher level documentation of these commands.

**Warning:** The macro documentation is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

## 1 Interface Commands

`\in@`  `\notin` is a utility macro with two arguments. It determines whether its first argument occurs in its second and sets the switch `\notin@` accordingly. The first argument may not contain braces nor # (more precisely, tokens of category code 1, 2, or 6).

\begin{verbatim}
\def\in@#1#2\{
\begingroup
\def\in@@##1#1{}\{
\toks@\expandafter{\in@@#2{}{}#1}\\edef\in@@{\the\toks@}\\expandafter\endgroup\\ifx\in@@\@empty\in@false\else\in@true\fi\}
\end{verbatim}

(End definition for `\in@` and `\notin@`.)

Before the `\begin{document}` command several \emph{(math versions)} and \emph{(math alphabet identifiers)} may be declared. In principle, there should be exactly one family/series/shape combination be declared for each version/alphabet pair. But we want to allow for defaults as well for automagical filling of holes.

While building the tables for math alphabet identifiers and math versions we keep several lists:

- the list of all math versions, `\version@list`, each entry prefixed by the control sequence `\version@elt`, i.e. this list has the following form
  \begin{verbatim}
  \version@elt(version_1)\version@elt(version_2)\ldots\version@elt(version_n)
  \end{verbatim}

- the list of all math alphabet identifiers. Here every entry has the form:
  \begin{verbatim}
  \group@elt(math group number)
  \{{(default family)}{(default series)}{(default shape)}\}.
  \end{verbatim}
Each defined math alphabet identifier holds a list containing information about the versions for which it is defined. This list has a more complicated structure: it looks as follows:

\setalpha{the alphabet identifier itself}
\reservedc{(math version)(font info)}
\@nil

where (font info) is either \reserved@e (if the combination is not defined yet) or \{{(family)}{(series)}{(shape)}\}

\versionlist

We initialize the version list to be empty.
\let\versionlist=\@empty
\@onlypreamble\versionlist

\versionelt

\let\versionelt=\relax
\@onlypreamble\versionelt

\newmathversion

The macro \newmathversion is called with the version control sequence as its argument.
\def\newmathversion#1{%

The first thing this macro does is to check if the version identifier is already present in \versionlist. We enclose \versionlist in braces since it might be empty (if no version is defined yet). But this means that we need a suitable number of \expandafter primitives.
\expandafter\in@\expandafter#1\expandafter{\versionlist}%
\ifin@

If so it prints an error message. The \next macro is used to get rid of the four characters \mv@ that would otherwise appear at the begin of the version name in the error message.
\latexerror{Math version \expandafter@gobblefour\string#1 already defined}\@eha

Otherwise we have a new version, and we can proceed with entering it into the tables. We add it to \versionlist. This is very easy: we define \versionelt (which is the delimiter in \versionlist) to protect itself and the following token from being expanded and simply redefine \versionlist.
\else

\edef\versionlist{\versionlist\versionelt#1}%
Then we prepare to enter the new version into all math alphabet identifier lists. Remember that these lists use \reserved@c as delimiter, and that there appears the control sequence \reserved@e that must not be expanded. Therefore we take suitable precautions.

\begin{verbatim}
\def\reserved@c{\noexpand\reserved@c\noexpand}
\let\reserved@e\relax
\end{verbatim}

We will now go through the \alpha@list to process every \textit{math alphabet identifier} in turn. Since this list has \group@elt as a delimiter we define this control sequence. It has three arguments as every entry consists of three items (as explained above).

\begin{verbatim}
\def\group@elt##1##2##3{\%
\edef##1{\expandafter\remove@nil##1\%\reserved@c
\noexpand\reserved@e
\noexpand}\@nil}}%
\end{verbatim}

The first of these arguments is the \textit{math alphabet identifier}. We redefine it by appending the information about the new version at the end of the list contained in it. However, there is one subtlety: the definitions for \reserved@c and \reserved@e made above prevent the main part of the list from being expanded. But we still have to take care of the header and the trailer. To do this we remove the trailer by means of the macro \remove@nil which also protect the header from being expanded. Its definition is given below. Now we can prepare to add the new version.

\begin{verbatim}
\edef##1{\expandafter\remove@nil##1\%\reserved@c
\reserved@c
\reserved@e
\remove@nil\%}
\end{verbatim}

Finally we call \alpha@list which will now execute the macro \group@elt once for every defined \textit{math alphabet identifier}. And that’s all for now.

\begin{verbatim}
\alpha@list
% \fi}
\end{verbatim}

(End definition for \new@mathversion.)

\alpha@list  As we explained above every entry in \alpha@list has the form \alpha@elt
\textit{alphabet identifier}(\textit{internal group number})(\textit{default font assignments})…
We initialize it to \@empty.
\begin{verbatim}
\let\alpha@list\@empty
\onlypreamble\alpha@list
\end{verbatim}

(End definition for \alpha@list.)

\alpha@elt
\begin{verbatim}
\let\alpha@elt\relax
\onlypreamble\alpha@elt
\end{verbatim}

(End definition for \alpha@elt.)

\newgroup  Start the group (fam) allocation at 0. (Doesn’t belong here.)
\begin{verbatim}
\count18=-1
\end{verbatim}

(End definition for \newgroup.)

\stepcounter

(End definition for \stepcounter.)
We surround \select@group with braces so that functions using it can be used directly after _ or ^ . However, if we use oldstyle syntax where the math alphabet doesn’t have arguments (ie if \math@bgroup is not \bgroup) we need to get rid of the extra group.

\begin{verbatim}
\select@group
\end{verbatim}
\@onlypreamble restore@mathversion

(End definition for \select@group.)

\init@restore@version

\def\init@restore@version{%
  \global\let\init@restore@version\relax
  \edef\restore@mathversion{
    {\expandafter\noexpand\csname mv@\math@version\endcsname
      \global\csname c@mv@\math@version\endcsname
      \number\csname c@mv@\math@version\endcsname\relax}}%
  \aftergroup\dorestore@version
}\
\@onlypreamble\init@restore@version

(End definition for \init@restore@version.)

\non@alpherr

\gdef\non@alpherr#1{\@latex@error{The command here will have a space at the end of its name, so we make sure not to insert an extra one.
\string#1allowed only in math mode}\@ehd}

(End definition for \non@alpherr.)

\dorestore@version

\def\dorestore@version
{\ifmmode
  \aftergroup\dorestore@version
  \else
  \global\let\init@restore@version\relax
  \edef\restore@mathversion{
    {\expandafter\noexpand\csname mv@\math@version\endcsname
      \global\csname c@mv@\math@version\endcsname
      \number\csname c@mv@\math@version\endcsname\relax}}%
  \aftergroup\dorestore@version
  \begingroup
  \let\getanddefine@fonts\@gobbletwo
  \restore@mathversion
  \endgroup
  \fi}%\@onlypreamble\dorestore@version

(End definition for \dorestore@version.)
To avoid hitting the “no more math fams available” limit of 16, we keep a defined number of math alphabets flexible/local. If we have to allocate any of those we roll back the allocation after the formula has ended, so the next formula can use other alphabets in the slot(s). This makes the processing a bit slower if you are working at the limit, but that is better than dying with “out of memory”.

We don’t really undo the declaration on rollback (as that would be hard to maintain), so rolling forward needs to check if the declaration was already made.

There is no need to have this counter as part of the include checkpoints, given that it makes little sense to alter its settings mid document. All we want is the ability to change it using the \setcounter interface.

By default we keep two math fams flexible.

\newcount\c@localmathalphabets
\setcounter{localmathalphabets}{2}
\fi

(End definition for \c@localalphabets.)

The \document@select@group command is the version of \select@group (inside math versions) that is used in the document body to set up math alphabets (if used).

\def\document@select@group#1#2#3#4{%}
\ifx\math@bgroup\bgroup\else\relax\expandafter\@firstofone\fi
{\ifmmode

We first check if there is still room for allocating another mathgroup. If there is, we check if it can be globally allocated or if we have reached the limit which is given by \e@mathgroup@top with \c@localmathalphabets subtracted.

\ifnum\csname c@mv@\math@version\endcsname<\e@mathgroup@top
\ifnum \numexpr\e@mathgroup@top-\c@localmathalphabets
>\csname c@mv@\math@version\endcsname
\else
We have to pass the current value of \math@version not the macro itself, because some of the processing is delayed to a point where the value may have changed again—not doing this caused a puzzling error in one setup.

\expandafter\freeze@math@version\expandafter\math@version\%}
\fi
\fi
\begingroup
\escapechar\m@ne
\getanddefine@fonts{\csname c@mv@\math@version\endcsname#3%}
\globaldefs\@ne \math@fonts
\endgroup

File z: ltfssdcl.dtx Date: 2021/10/15 Version v3.0y
We surround \texttt{\select@group} with braces so that functions using it can be used directly after \_ or ^.

If the legacy interface is used, e.g., $\mathsf{-1}$ the math alphabet \#1 does not take an argument so we better do not surround \#4 with braces, because then we get \{\relax\} into the formula and introduce an extra Ord atom. The two different cases can be distinguished by looking at the current value of \texttt{\math@bgroup}.

\begin{verbatim}
\expandafter#1\ifx\math@bgroup\bgroup{#4}\else#4\fi}
\end{verbatim}

This command stores the current state of the math version and sets things up to return to it after each formula from now on. We use L3 programming layer code to set it up.

\begin{verbatim}
\ExplSyntaxOn
\cs_new_protected:Npn\freeze@math@version #1 { \font@info{Freeze\ math\ alphabet\ allocation\ in\ version\ #1. MessageBreak Allocated\math\groups:\ \int_use:c{c@mv@#1} \local:\ \int_use:N\c@localmathalphabets} \cs_gset_eq:cc { mv@#1@frozen } { mv@#1 } \tl_gset:cx { g__nfss_frozen_mv_#1_tl } { \int_use:c { c@mv@#1 } } Doing the reset the first time, we wait until we are out of math mode, so we use some recursive \texttt{\group_insert_after:N} for this before we execute \texttt{\mv@\langle version\rangle@reset}.
\end{verbatim}

\begin{verbatim}
\group_insert_after:N \_nfss_init_mv_freeze:N \exp_after:wN \group_insert_after:N \cs:w mv@\#1/reset \cs_end:
\end{verbatim}

The \texttt{\check@mathfonts} is called at the very beginning of each math formula, so it is a good way to hook in the resetting. Again that has to happen after the formula has ended, but we know because of the place where \texttt{\check@mathfonts} is used that a single \texttt{\aftergoup} is sufficient.

\begin{verbatim}
\tl_gput_right:No \check@mathfonts { \exp_after:wN \group_insert_after:N \cs:w mv@\#1/reset \cs_end: }
\end{verbatim}
Here is the definition of `\mv@⟨version⟩@reset`. If there has been no new math alphabet allocation, doing a reset would just cause a lot of unnecessary processing, so we do a quick check upfront for this.

\begin{verbatim}
\cs_gset:cpn{mv@#1@reset}
\int_compare:nNnTF { \int_use:c{c@mv@#1} } > \tl_use:c{g__nfss_frozen_mv_ #1 _tl}
{ \@font@info{Undo math alphabet allocation in version #1}
\cs_gset_eq:cc { mv@#1 }{ mv@#1@frozen }
\int_gset:cn { c@mv@#1 }{ \tl_use:c { g__nfss_frozen_mv_ #1 _tl } }
}
\end{verbatim}

If the undo is necessary, we restore the `\mv@⟨version⟩` code. But we also should undo changes to the math alphabet definitions. We therefore run this code with a modified definition for `\getanddefine@fonts` because there is no need to do anything to the symbol fonts that are permanently allocated.

\begin{verbatim}
group_begin:
\cs_set_eq:NN \getanddefine@fonts \use_none:nn \use:c { mv@#1 }
group_end:
\end{verbatim}

If there was no change, we report that in the log (but this branch could go completely).

\begin{verbatim}
\@font@info{No math alphabet change to frozen version #1}
\end{verbatim}

To do the initial freeze in a safe place, we check if we are in math mode and if so try again after the group has ended by pushing the command and its single token argument with two `\group_insert_after:N`s after the current group. If we are no longer in math mode we bypass the conditional and so the next token is our argument which is then finally executed.

\begin{verbatim}
\cs_new_protected:Npn \_nfss_init_mv_freeze:N #1 {%
\mode_if_math:T { \group_insert_after:N \_nfss_init_mv_freeze:N __nfss_init_mv_freeze:N #1 }
}
\ExplSyntaxOff
\end{verbatim}
Grouping is important for two reasons, first \texttt{\cdp@elt} will get redefined if \texttt{\Declare...} functions are executed within the external \texttt{.fd} file and secondly \texttt{\try@load@fontshape} changes a lot of catcodes without surrounding itself with a group.

\begin{verbatim}
\begingroup
    \def\f@encoding{##1}\def\f@family{##2}\try@load@fontshape
\endgroup
\end{verbatim}
Now we make sure that \error@fontshape is okay.
\begingroup
\escapechar\m@ne
\error@fontshape
\expandafter\ifx\csname \curr@fontshape\endcsname\relax
\begingroup
\try@load@fontshape
\endgroup
\fi
\expandafter\ifx\csname \curr@fontshape\endcsname\relax
\@latex@error{This NFSS system isn’t set up properly}\
{The system maintainer forgot to specify a suitable substitution
font shape using the \noexpand\DeclareErrorFont command}\
\fi
\endgroup

Set \select@group to its meaning used within the document body.
\let\select@group\document@select@group

Install the default font attributes as they are currently pointing to error font face. We can speed up the process by just using \edef, thereby avoiding all kind of extra processing. Don’t use \reset@font since that would trigger \selectfont.
\fontencoding\encodingdefault
\edef\f@family{\familydefault}\
\edef\f@series{\seriesdefault}\
\edef\f@shape{\shapedefault}\

Drop stuff not longer needed. We need to add many more!!!!!!
\everyjob{}\
}
\@onlypreamble\process@table

\DeclareMathVersion
(){2ekernel})
(+2kernel|latexrelease)
(latexrelease)\IncludeInRelease{2021/11/15}{\DeclareMathVersion}{local alphabets}\
\def\DeclareMathVersion#1{\
\@namedef{g__nfss_frozen_mv_#1_tl}{}\
\expandafter\new@mathversion\csname mv@#1\endcsname}
\@onlypreamble\DeclareMathVersion
(+2kernel|latexrelease)
(latexrelease)\EndIncludeInRelease

File z: ltfsdcl.dtx Date: 2021/10/15 Version v3.0y
\newmathversion
\def\newmathversion#1{%\fi
\expandafter\in@\expandafter#1\expandafter{\version@list}\
\ifin@
\@font@info{Redeclaring math version '\expandafter\@gobblefour\string#1'}%
\else
\expandafter\newcount\csname c@\expandafter\@gobble\string#1\endcsname
\edef\version@elt{\noexpand\version@elt\noexpand}%
\edef\version@list{\version@list\version@elt#1}%
\fi
\toks@{}%
\count@\z@
Now we loop over \group@list to add all math groups defined so far to the version and at the same time to count them.
\def\group@elt##1##2{\advance\count@\@ne
\addto@hook\toks@{\getanddefine@fonts##1##2}%
}%
\group@list
We set the counter for this math version to the number of math groups found in \group@list.
\global\csname c@\expandafter\@gobble\string#1\endcsname\count@
Now we loop over \alpha@list to add all math alphabets known so far. We have to distinguish the case that an alphabet by default should produce an error in new versions.
\def\alpha@elt##1##2##3{%\fi
\ifx##2\no@alphabet@error
\toks@\expandafter{\the\toks0\install@mathalphabet##1{}{\no@alphabet@error##1}}%
\else
\toks@\expandafter{\the\toks0\install@mathalphabet##1{}{\select@group##1##2##3}}%
\fi
}%
\alpha@list
Finally we define the math version to expand to the contents of \toks@.
\edef#1{\the\toks0}%
}:
\@onlypreamble\newmathversion
\DeclareSymbolFont\mathversion

\def\DeclareSymbolFont#1#2#3#4#5{% 
\@tempswafalse 
\edef\reserved@b{#2}\
\def\cdp@elt##1##2##3##4{% 
\def\reserved@c{##1}\
\ifx\reserved@b\reserved@c \@tempswatrue\fi}\
\cdp@list 
\if\tempswa 
\@ifundefined{sym#1}{% 
\ifnum\count18<15 % 
\expandafter\new@mathgroup\csname sym#1\endcsname 
\expandafter\new@symbolfont\csname sym#1\endcsname 
\else 
\@latex@error{Too many symbol fonts declared}\@eha 
\fi }% 
\@font@info{Redeclaring symbol font ‘#1’}\
\else 
\def\group@elt##1##2##3##4##5{% 
\noexpand\group@elt
\expandafter\ifx\csname sym#1\endcsname##1% 
\expandafter
\csname#2/#3/#4/#5\endcsname 
\else 
\noexpand##2% 
\fi }% 
\xdef\group@list{\group@list}\
\else 
\@latex@error{Encoding scheme ‘#2’ unknown}\@eha 
\fi }% 
\@onlypreamble\DeclareSymbolFont 
\let\group@list\@empty 
\@onlypreamble\group@list 
\end definition for \DeclareSymbolFont 

\group@list 
\let\group@list\empty 
\@onlypreamble\group@list 
\end definition for \group@list 

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\new@symbolfont
\def\new@symbolfont##1##2##3##4##5{\%\toks0\expandafter{\group@list}\%\edef\group@list{\the\toks0\noexpand\group@elt\noexpand#1\%\expandafter\noexpand\csname#2/#3/#4/#5\endcsname}%\def\version@elt##1{\toks0\expandafter{##1}\%\edef##1{\the\toks0\noexpand\getanddefine@fonts#1\expandafter\csname#2/#3/#4/#5\endcsname}%\global\advance\csname c@\expandafter\@gobble\string##1\endcsname\@ne}\%\version@list\%\@onlypreamble\new@symbolfont
\SetSymbolFont
\def\SetSymbolFont##1##2##3##4##5##6{\%\@tempswafalse\edef\reserved@b{##3}\%\def\cdp@elt##1##2##3##4{\def\reserved@c{##1}\ifx\reserved@b\reserved@c \@tempswatrue\fi}\\cdp@list\if@tempswa\expandafter\SetSymbolFont@\csname mv@#2\expandafter\endcsname\csname#3/#4/#5/#6\expandafter\endcsname\csname sym#1\endcsname\else\@latex@error{Encoding scheme \string##3 unknown}\@eha\fi}\%\@onlypreamble\SetSymbolFont
\SetSymbolFont@
\def\SetSymbolFont@##1##2##3{\%\@tempswafalse\edef\reserved@b{##3}\%\def\cdp@elt##1##2##3##4##5{\def\reserved@c{##1}\ifx\reserved@b\reserved@c \@tempswatrue\fi}\\cdp@list\if@tempswa\expandafter\SetSymbolFont\csname#2\expandafter\endcsname\csname sym#1\endcsname\else\@latex@error{Encoding scheme \string##3 unknown}\@eha\fi}\%\@onlypreamble\SetSymbolFont@
\end{document}

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501
\new@mathalphabet\relax
\new@mathalphabet #1{#2}{#3}{#4}{#5}\
\else
\edef\reserved@a{\noexpand\in@{\string\select@group}\
{\expandafter\meaning\csname \expandafter
@gobble\string#1\space\endcsname}}\
\reserved@a
\ifin@
\@font@info{Redeclaring math alphabet \string#1}%
\def\version@elt##1{\
\expandafter\SetMathAlphabet@\expandafter
##1\csname#2/#3/#4/#5\expandafter\endcsname
\csname M@#2\expandafter\endcsname
\csname \expandafter\@gobble\string#1\space\endcsname#1}\
\version@list
\else
Check if it is a math alphabet defined via \DeclareSymbolFontAlphabet.
\edef\reserved@a{\noexpand\in@{\string\use@mathgroup}\
{\expandafter\meaning\csname \expandafter
@gobble\string#1\space\endcsname}}\
\reserved@a
\ifin@
In that case overwriting is simple since there is nothing inserted in the math version
macros.
\@font@info{Redeclaring math alphabet \string#1}%
\new@mathalphabet #1{#2}{#3}{#4}{#5}\
\else
\@latex@error{Command \string#1 already defined}\@eha
\fi
\fi
\else
\@latex@error{Encoding scheme \string#2 unknown}\@eha
\fi
\fi
\fi
\else
\@latex@error{Command \string#1 already defined}\@eha
\fi
\fi
\fi
\fi
\fi
\@font@info{Redeclaring math alphabet \string#1}%
\new@mathalphabet #1{#2}{#3}{#4}{#5}%
\else
\@latex@error{Command \string#1 already defined}\@eha
\fi
\fi
\fi
\else
\@latex@error{Encoding scheme \string#2 unknown}\@eha
\fi
\@onlypreamble\DeclareMathAlphabet
(End definition for \DeclareMathAlphabet.)
\new@mathalphabet
\def\new@mathalphabet #1#2#3#4#5{%\
toks0\expandafter{\alpha@list}\
edef#1\expandafter{\noexpand\expandafter\csname \expandafter
@gobble\string#1\space\endcsname}
\edef#1\expandafter{\noexpand\expandafter\csname \expandafter
@gobble\string#1\space\endcsname}\if#5/%\
\noexpand\noalphabeterror
\noexpand\noalphabeterror
\else
\expandafter{\noexpand\csname M#2\endcsname}
(End definition for \new@mathalphabet.)
\SetMathAlphabet
\def\SetMathAlphabet#1#2#3#4#5#6{% 
\@tempswafalse 
\edef\reserved@b{#3}% 
\def\cdp@elt##1##2##3##4{% 
\def\reserved@c{##1}% 
\ifx\reserved@b\reserved@c \@tempswatrue\fi}% 
\cdp@list 
\if@tempswa 
\expandafter\SetMathAlphabet@ 
\csname mv@#2\expandafter\endcsname\csname#3/#4/#5/#6\expandafter
\endcsname \csname M@#3\expandafter\endcsname \csname 
\expandafter\@gobble\string#1\space\endcsname#1% 
\else 
\@latex@error{Encoding scheme ‘#3’ unknown}\@eha 
\fi 
\fi}% 
\@onlypreamble\SetMathAlphabet
(End definition for \SetMathAlphabet.)
\SetMathAlphabet@
If the math alphabet was defined via \texttt{\textbackslash DeclareSymbolFontAlphabet} we have remove its external definition and add it as a normal math alphabet to every version before trying to change it in one version.

\begin{verbatim}
def\reserved@a{\noexpand\in@{\string\use@mathgroup}{\meaning#4}}
def\reserved@b\use@mathgroup\reserved@c{\expandafter\select@group\expandafter#4\reserved@c\reserved@b{\gobblefour\string\reserved@b}}

\ifnum\reserved@c=\reserved@b
\addto@hook\toks@{\install@mathalphabet\reserved@b{\gobblefour\string\reserved@b}}
\else
\addto@hook\toks@{\install@mathalphabet\reserved@b{\gobblefour\string\reserved@b}}
\fi
\end{verbatim}
\version@elt##1{%
\toks@{}%
##1%
\xdef##1{\the\toks@}%
}%
\version@list
\endgroup

Put it into the \alpha@list with default ‘error’
\expandafter\def\expandafter\alpha@list\expandafter
{\alpha@list
\alpha@elt #4
\no@alphabet@error \no@alphabet@error}%
\gdef#4{\no@alphabet@error #5}% fake things :-)

Then call the internal setting routine again:
\SetMathAlphabet@{#1}{#2}{#3}#4#5%
\else
\@latex@error{Command ‘\string#5’ not defined as a math alphabet}%
(Use \noexpand\DeclareMathAlphabet to define it.)%
\fi
\fi
\else
\@latex@error{Math version ‘\expandafter\@gobblefour\string#1’
is not defined}{You probably misspelled the name of the math version.^^JOr you have to specify an additional package.}%
\fi
\fi
\%\onlypreamble\SetMathAlphabet@

(End definition for \SetMathAlphabet@.)

\DeclareMathAccent
Could do with more checks like allowing single number in \#4 lowercase in \#4 etc

\begin{group}
\count\z@=#4\relax
\count\tw@0\count\z@\divide\count\z@0\six@0\n\count@\count\z@\multiply\count@0\six@0\n\advance\count@\tw@0\count@\n\if\relax\noexpand\#1% is command?
\edef\reserved@a{\noexpand\in@\expandafter\@gobble\string\mathaccent}
\expandafter\expandafter\expandafter\expandafter\\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandaстерать тебе больше могу:
\set@mathaccent
\DeclareMathSymbol
(End definition for \DeclareMathAccent.)
(End definition for \set@mathaccent.)
\DeclareMathSymbol
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Store the command name with a space attached inside \reserved@b in case we look at a robust definition.

\edef\reserved@b{%
\expandafter\noexpand
\csname\expandafter\@gobble\string#1\space\endcsname}%
Test both #1 and #1␣ for containing mathchar.
\edef\reserved@a{
\noexpand\in@{\expandafter\@gobble\string\mathchar}{
\meaning#1\expandafter\meaning\reserved@b}}%
Drop #1␣ in case it was defined before.
\global\expandafter\let\reserved@b\@undefined
\ifin@
\expandafter\set@mathsymbol
\csname sym#3\endcsname#1#2%
{\hexnumber@\count@\hexnumber@\count@}
\@font@info{Redeclaring math symbol \string#1}%
\else
\expandafter\ifx
\csname\expandafter\@gobble\string#1\endcsname\relax
\expandafter\set@mathsymbol
\csname sym#3\endcsname#1#2%
{\hexnumber@\count@\hexnumber@\count@}
\else
\@latex@error{Command \string#1 already defined}\@eha
\fi
\fi
\else
\@latex@error{Symbol font \string#3 is not defined}\@eha
\fi
}\@onlypreamble\DeclareMathSymbol
(End definition for \DeclareMathSymbol)
\set@mathchar
\def\set@mathchar#1#2#3#4{%
\global\mathcode#2=\mathchar@type#3\hexnumber@\count@#4\relax}
\@onlypreamble\set@mathchar
(End definition for \set@mathchar)
\set@mathsymbol
\def\set@mathsymbol#1#2#3#4{%
\global\mathchardef#2"\mathchar@type#3\hexnumber@#1#4\relax}
\@onlypreamble\set@mathsymbol
(End definition for \set@mathsymbol.)
\%\def\mathsymbol#1#2#3{%
% \@tempcnta=#3\relax
% \@tempcntb\@tempcnta
% \divide\@tempcnta\sixt@@n
% \count@\@tempcnta
% \multiply\count@\sixt@@n
% \advance\@tempcntb\count@
% \mathchar\\mathchar@type#1\hexnumber@#2\
% \hexnumber@\@tempcnta\hexnumber@\@tempcntb\relax}
%\%\def\DeclareMathAlphabetCharacter#1#2#3{%
% \DeclareMathSymbol{#1}7{#2}{#3}}
\DeclareMathDelimiter
\def\DeclareMathDelimiter#1{%
\if\relax\noexpand#1%\expandafter\@DeclareMathDelimiter
\else\expandafter\@xxDeclareMathDelimiter\fi
#1}
\@onlypreamble\DeclareMathDelimiter
(End definition for \DeclareMathDelimiter.)
\@xxDeclareMathDelimiter
This macro checks if the second arg is a “math type” such as \mathopen. The undocumented original code didn’t use math types when the delimiter was a single letter. For this reason the coding is a bit strange as it tries to support the undocumented syntax for compatibility reasons.
\def\@xxDeclareMathDelimiter#1#2#3#4{%
7 is the default value returned in the case that \mathchar@type is passed something unexpected, like a math symbol font name. We locally move \mathalpha out of the way so if you use that the right branch is taken. This will still fail if an explicit number 7 is used!
\begingroup
\let\mathalpha\mathord
\ifnum7=\mathchar@type{#2}%
\endgroup
If this branch is taken we have old syntax (5 arguments).
\expandafter\@firstofone
\else
If this branch is taken \mathchar@type is different from 7 so we assume new syntax. In this case we also use the arguments to set up the letter as a math symbol for the case where it is not used as a delimiter.
\endgroup
\DeclareMathSymbol{#1}{#2}{#3}{#4}%
Then we arrange that \texttt{\xDeclareMathDelimiter} only gets \texttt{#1}, \texttt{#3}, \texttt{#4} \ldots as it does not expect a math type as argument.

\begin{verbatim}
\expandafter\@firstoftwo
\if\endlinechar
{\xDeclareMathDelimiter#1}{#2}{#3}{#4}
\endlinechar
\endlinechar
\@onlypreamble\xxDeclareMathDelimiter

(End definition for \texttt{\xDeclareMathDelimiter}.)
\end{verbatim}

\texttt{\xDeclareMathDelimiter}
We have to end the definition of a math delimiter like \lfloor with a space and not with \relax as we did before, because otherwise constructs involving \abovewithdelims will prematurely end (pr/1329)
We use \protect not \MakeRobust so that \bigl\lfloor etc. works inside the argument of \protect\edef.

\protected
\xdef#3{\delimiter"\mathchar\hexnumber\#1\#2\#6}%
% \MakeRobust#3%
}
\@onlypreamble\set@mathdelimiter
\@onlypreamble\set@mathdelimiter
\EndIncludeInRelease
\IncludeInRelease{0000/00/00}{\set@mathdelimiter}{make delimiters robust}{\set@mathdelimiter}{make delimiters robust}{\set@mathdelimiter}{make delimiters robust}{\set@mathdelimiter}{make delimiters robust}{\set@mathdelimiter}{make delimiters robust}{\set@mathdelimiter}{make delimiters robust}{\set@mathdelimiter}{make delimiters robust}

(End definition for \set@mathdelimiter.)

\set@@mathdelimiter
\def\set@@mathdelimiter#1#2#3#4#5{
\global\delcode#3="\hexnumber#1\#2\#6\relax}
\@onlypreamble\set@@mathdelimiter

(End definition for \set@@mathdelimiter.)

\DeclareMathRadical
\def\DeclareMathRadical#1#2#3#4#5{
Below is a crude fix to make this macro work if \#1 is undefined or \relax. Should be improved!
\expandafter\ifx
\csname\expandafter\@gobble\string#1\endcsname
\relax
\let\#1\radical
\fi
\edef\reserved@a{\noexpand\in@}
{\expandafter\gobble\string\radical}{\meaning\#1}%
\reserved@a
\ifin\n\expandafter\in\csname sym\#2\expandafter\endcsname
\expandafter{\group\list}\n\ifin\n\expandafter\in\csname sym\#4\expandafter\endcsname
\expandafter{\group\list}\n\ifin
\begingroup
\count\z@=#3\relax
\count\tw@\count\z@
\divide\count\z@\sixt@@n
\count\z@\count\z@
\multiply\count\z@\sixt@@n
\advance\count\tw@\count\z@
\edef\reserved@c{\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
\count\z@=#5\relax
\count\tw@\count\z@
\divide\count\z@\sixt@@n
\count\z@\count\z@
\multiply\count\z@\sixt@@n
\advance\count\tw@\count\z@
\edef\reserved@d{\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
\edef\reserved@e{%
\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%

Coded inline instead of using \set@mathradical
% \expandafter\set@mathradical % \csname sym#2\expandafter\endcsname
% \csname sym#4\endcsname#1% \reserved@c\reserved@d
\xdef#1{%\radical"\expandafter\hexnumber@
\csname sym#2\endcsname\reserved@c
\expandafter\hexnumber@
\csname sym#4\endcsname\reserved@d
\relax}%
\endgroup
\else
\@latex@error{Symbol font ‘#4’ is not defined}\@eha
\fi
\else
\@latex@error{Symbol font ‘#2’ is not defined}\@eha
\fi
\else
\@latex@error{Command ‘\string#1’ already defined}\@eha
\fi
}
\onlypreamble\DeclareMathRadical
(End definition for \DeclareMathRadical.)

Definition below was wrong it contained \delimiter!

\def\set@mathradical#1#2#3#4#5{%
\xdef#3{%\radical"\hexnumber@#1#4\hexnumber@#2#5\relax}}

\mathalpha just a dummy currently
\let\mathalpha\relax
(End definition for \mathalpha.)

\mathchar@type
\def\mathchar@type#1{%
\ifodd#1#1#1
\else % is this non-negative number?
\fi
}
\DeclareSymbolFontAlphabet\mathchar@type{\}
\@onlypreamble\mathchar@type

(End definition for \mathchar@type.)

\DeclareSymbolFontAlphabet\DeclareSymbolFontAlphabet\mathchar@type{\}
\@onlypreamble\DeclareSymbolFontAlphabet

(End definition for \DeclareSymbolFontAlphabet.)

\DeclareSymbolFontAlphabet@{\}
\def\DeclareSymbolFontAlphabet@#1#2#3{\We use the switch \if@tempswa
to decide if we can declare this symbol font.
\@tempswatrue
First check if #2 is known to be a symbol font.
\expandafter\in@\csname sym#2\expandafter\endcsname\expandafter{\group@list}\
\ifin@
Check if #1 is defined as a math alphabet defined via \DeclareMathAlphabet:
\expandafter\in@\expandafter#1\expandafter{\alpha@list}\
\ifin@
If so remove it from the \alpha@list and from all math version macros.
\@font@info{Redeclaring math alphabet \string#3}\
\toks@{}\
\def\alpha@elt##1##2##3{\ifx##1#1\else\addto@hook	oks@\alpha@elt##1##2##3\fi}\
\alpha@list\
\xdef\alpha@list{\the	oks@}

Now we loop over all versions and remove the math alphabet:
\def\version@elt##1{\begingroup\
\toks@{}\
\def\getanddefine@fonts####1####2{\File z: 1tfssdcl.dtx Date: 2021/10/15 Version v3.0y}
\addto@hook\toks@{\getanddefine@fonts####1####2}\%  
\def\install@mathalphabet####1####2{%  
  \ifx####1#1\else  
    \addto@hook\toks@{\install@mathalphabet####1{####2}}\fi\%  
}  

##1  
\xdef##1{\the\toks@}\%  
\endgroup  
\version@list  
\else  
If \#3 is not defined as a math alphabet check if it is defined at all:  
\expandafter\ifx  
\csname\expandafter\@gobble\string#1\space\endcsname\relax\atexerror{Command '\string#3' already defined}\@eha  
\fi  
\fi  
\fi  
\else  
Since the symbol font is not known we better skip defining this alphabet.  
\@tempswafalse  
\@latexerror{Unknown symbol font '\#2'}\@eha  
\fi  
\fi  
\else  
Since the command \#3 is defined to be something which is not a math alphabet we have to skip redefining it.  
\@tempswafalse  
\@latexerror{Command '\string#3' already defined}\@eha  
\fi  
\fi  
\else  
When we reach this point we are allowed to define \#1 to be a symbol font math alphabet. This means that we have to set it to  
\use@mathgroup ⟨math-settings⟩ \sym⟨name⟩  

The ⟨math-settings⟩ are the one for the encoding that is used in the font shape where \sym⟨name⟩ is pointing to. This means that we have to get it from the information stored in \group@list. Thus we loop through that list after defining \group@elt in a suitable way.  
\def\group@elt##1##2{%  
  \expandafter\ifx\csname sym#2\endcsname##1%  
    \reserved@a\string##2\@nil\fi\%  
  \reserved@a\string#1##2\reserved@s##2\@nil\%  
}  
\def\reserved@a##1##2/##3\@nil{\@latexerror{Redeclaring math alphabet \string#3}\@eha\if\reserved@s\@latexerror{Unknown symbol font \#2}\@eha\fi\fi\fi\fi  
\fi  
\fi  
\fi  
\if\reserved@s  
When we reach this point we are allowed to define \#1 to be a symbol font math alphabet. This means that we have to set it to  
\use@mathgroup ⟨math-settings⟩ \sym⟨name⟩  

The ⟨math-settings⟩ are the one for the encoding that is used in the font shape where \sym⟨name⟩ is pointing to. This means that we have to get it from the information stored in \group@list. Thus we loop through that list after defining \group@elt in a suitable way.
\def\reserved@a{#2}\
\group@list
\toks@{\relax\ifmmode\else\non@alpherr#1\fi}\
edef#1{\the\toks@
\noexpand\use@mathgroup
\expandafter\noexpand\csname M@\reserved@a\endcsname
\csname sym#2\endcsname}\
\def#3{\protect#1}\
\fi
\@onlypreamble\DeclareSymbolFontAlphabet@
⟨/
⟩
(End definition for \DeclareSymbolFontAlphabet@.)
1 NFSS Initialization

Finally, there are six commands that are to be used in \TeX{} and that we will therefore protect against expansion at the wrong point: \texttt{\textbackslash fontfamily}, \texttt{\textbackslash fontseries}, \texttt{\textbackslash fontshape}, \texttt{\textbackslash fontsize}, \texttt{\selectfont}, and \texttt{\mathversion}.

\begin{verbatim}
1 NFSS Initialization

Finally, there are six commands that are to be used in \TeX{} and that we will therefore protect against expansion at the wrong point: \texttt{\textbackslash fontfamily}, \texttt{\textbackslash fontseries}, \texttt{\textbackslash fontshape}, \texttt{\textbackslash fontsize}, \texttt{\selectfont}, and \texttt{\mathversion}.

1.1 Providing math versions
\TeX{} provides two versions. We call them \texttt{normal} and \texttt{bold}, respectively.
\begin{verbatim}
\DeclareMathVersion{normal}
\DeclareMathVersion{bold}
\end{verbatim}
\end{verbatim}

Now we define the standard font change commands. We don’t allow the use of \texttt{\textbackslash rmfamily} etc. in math mode.

(Actually most are now defined further down in the file.)

First the changes to another \texttt{family}:
\begin{verbatim}
1.1 Providing math versions
\TeX{} provides two versions. We call them \texttt{normal} and \texttt{bold}, respectively.
\begin{verbatim}
\DeclareMathVersion{normal}
\DeclareMathVersion{bold}
\end{verbatim}
\end{verbatim}

\begin{verbatim}
Now we define the standard font change commands. We don’t allow the use of \texttt{\textbackslash rmfamily} etc. in math mode.

(Actually most are now defined further down in the file.)

First the changes to another \texttt{family}:
\begin{verbatim}
\DeclareRobustCommand\rmfamily
  {
ot@math@alphabet\rmfamily\rmdefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\sffamily
  {
ot@math@alphabet\sffamily\mathsf
   \fontfamily\sfdefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\ttfamily
  {
ot@math@alphabet\ttfamily\mathtt
   \fontfamily\ttdefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\bfseries
  {
ot@math@alphabet\bfseries\mathbf
   \fontseries\bfdefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\mdseries
  {
ot@math@alphabet\mdseries\relax
   \fontseries\mddefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\upshape
  {
ot@math@alphabet\upshape\relax
   \fontshape\updefault\selectfont}
\end{verbatim}
\end{verbatim}

Then the commands changing the \texttt{series}:
\begin{verbatim}
Then the commands changing the \texttt{series}:
\begin{verbatim}
% \DeclareRobustCommand\bfseries
  {
ot@math@alphabet\bfseries\bfdefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\mdseries
  {
ot@math@alphabet\mdseries\relax
   \fontseries\mddefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\upshape
  {
ot@math@alphabet\upshape\relax
   \fontshape\updefault\selectfont}
\end{verbatim}
\end{verbatim}

Then the commands changing the \texttt{shape}:
\begin{verbatim}
Then the commands changing the \texttt{shape}:
\begin{verbatim}
% \DeclareRobustCommand\slshape
  {
ot@math@alphabet\slshape\relax
   \fontshape\sldefault\selectfont}
\end{verbatim}
\begin{verbatim}
% \DeclareRobustCommand\scshape
  {
ot@math@alphabet\scshape\relax
   \fontshape\scdefault\selectfont}
\end{verbatim}
\end{verbatim}

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2 Custom series settings for main document families

This section was introduced 2020/02/02 and for now we support a full rollback (may need splitting later).

One problem with the NFSS approach of handling the series axis turned out to be that (especially with respect to “boldness”) different font families implemented different strategies. For example, with Computer Modern fonts you normally only have \texttt{bx} whereas most PostScript fonts offered only \texttt{b} but not \texttt{bx}. As a result \LaTeX’s standard setting for \texttt{bfdefault} didn’t work with such fonts, but if it got changed to produce \texttt{b}, then that didn’t work with Computer Modern if the fonts got combined (e.g., using Computer Modern Typewriter with such fonts).

The solution back then was to provide substitution rules in the font .fd such that if a \texttt{bx} series got requested the \texttt{b} series got used. While this works in that particular case, it isn’t a very general solution. For example, if you happen to have a font family that has several weights you may want to typeset the whole document in a somewhat lighter or darker font but if you then modify \texttt{mddefault} to allow for this, then of course your change only works with that particular family but not with the typewriter or sans serif family you also want to use.

A better solution was provided by the \texttt{mweights} package by Bob Tennent that offers defaults on the level of the three main font families in the document: for “rm”, “sf” and “tt” so that font packages could define defaults for the sans serif document font by providing \texttt{\bfseries@sf} which then was used when \texttt{\bfseries} got executed and the current family was the \texttt{sffamily}.

We now support this concept directly from within \LaTeX{} and for use in font packages (or the document preamble) we offer \texttt{\DeclareFontSeriesDefault}. This declaration takes three arguments:

\begin{itemize}
\item \textbf{document family interface}: Can either be \texttt{rm}, \texttt{sf} or \texttt{tt}. This is optional and if not given the overall default.
\item \textbf{document series interface}: Can be \texttt{md} or \texttt{bf}.
\item \textbf{series value}: This is the value that is going to be used with the combination is requested.
\end{itemize}

For example, \texttt{\DeclareFontSeriesDefault[rm]{bf}{sb}} would use \texttt{sb} (semi-bold) when \texttt{\rffamily \bfseries} is asked for.

\texttt{\DeclareFontSeriesDefault[bf]{b}} then this is like redefining \texttt{bfdefault} or \texttt{mddefault}.
If some family specify defaults aren’t given, e.g. if there are no declarations for, say, \texttt{tt} then the format defaults of \texttt{mddefault} and \texttt{bfdefault} are assumed. If those are later changed this is \textit{not} reflected!\footnote{I see no easy way to achieve this without compromising compatibility with existing packages that currently use \texttt{mweights} and directly define (some) of the \texttt{mdseries@..} commands but not others.}

\begin{verbatim}
\DeclareFontSeriesDefault

The command to declare font series defaults for the “rm”, “sf” or “tt” family.
\let\DeclareFontSeriesDefault\@undefined % for rollback
\newcommand\DeclareFontSeriesDefault[3][3]{%
\expand@font@defaults
\maybe@update@bfseries@defaults
\maybe@update@mdseries@defaults
\def\reserved@a{#1}%%
\ifx\reserved@a\@empty
\ifcsname #2series\endcsname % supported are
% \[md/bf\]default
\expandafter\def\csname #2default\endcsname{#3\@empty}%
\expandafter\def\csname #2default@previous\endcsname{#3\@empty}%
\else
\@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
{(Mandatory first argument must be 'md' or 'bf'.)}
\fi
\else
\expandafter\def\csname #2series\#1\endcsname{#3}\% % \[md/bf\]series@\[rm/sf/tt\]
\else
\@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
{(Optional argument must be 'rm', 'sf', or 'tt'. \MessageBreak
Mandatory first argument must be 'md' or 'bf'.)}
\fi
\fi}
\end{verbatim}

No optional argument: set up general default.

\begin{verbatim}
\ife\reserved@a\@empty
\ifcsname #2series\endcsname % supported are
% \[md/bf\]default
\expandafter\edef\csname #2series\#1\endcsname{#3}\%
\expandafter\let\csname #2series@#1@kernel\endcsname\@undefined
\else
\@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
{(Mandatory first argument must be 'md' or 'bf').}
\fi
\else
\ifcsname #2series@#1\endcsname % supported are
% \[md/bf\]series@\[rm/sf/tt\]
\expandafter\let\csname #2series@#1\endcsname\undefined
\else
\@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
{(Optional argument must be 'rm', 'sf', or 'tt'. \MessageBreak
Mandatory first argument must be 'md' or 'bf'.)}
\fi
\fi
\end{verbatim}
\{2ekernel | \latexrelease\}
\EndIncludeInRelease
\IncludeInRelease{2020/02/02}{\DeclareFontSeriesDefault}{Custom series}%
\latexrelease\def\reserved@a(#1)%
\latexrelease\if\reserved@a@empty
\latexrelease\ifcsname #2series\endcsname % supported are
% \[md/bf\]default
\expandafter\def \csname #2default\endcsname{#3@empty}%
\expandafter\def \csname #2default@previous\endcsname{#3@empty}%
\else
\latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
\{Mandatory first argument must be 'md' or 'bf'.\}
\fi
\fi
\latexrelease\else
\latexrelease\ifcsname #2series@#1\endcsname % supported are
% \[md/bf\series@\[rm/sf/tt\]
\expandafter\edef \csname #2series@#1\endcsname{#3}%
\expandafter\let \csname #2series@#1@kernel\endcsname\@undefined
\else
\latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
\MessageBreak
\{Optional argument must be 'rm', 'sf', or 'tt'. \MessageBreak
Mandatory first argument must be 'md' or 'bf'.\}
\fi
\fi
\latexrelease\else
\latexrelease\ifcsname #2series@#1\endcsname % supported are
% \[md/bf\]series@\[rm/sf/tt\]
\expandafter\def \csname #2series@#1\endcsname{#3@empty}%
\else
\latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
\MessageBreak
\{Mandatory first argument must be 'md' or 'bf'.\}
\fi
\endinput
This is always called in \document so don’t make it undefined.

\let\init@series@setup\relax
\EndIncludeInRelease

\newcommand{\mdseries@rm}{m}
\newcommand{\mdseries@sf}{m}
\newcommand{\mdseries@tt}{m}

(End definition for \mdseries@rm and others.)

\prepare@family@series@update

This is core command that prepares for the family update. The big difference to the documented code above is that the nested \ifx statements seem to be missing. Instead we loop through an internal list that holds the names of the three meta families. This approach allows us to extend the mechanism at a later stage to allow for additional named meta families.
Here is the current definition of that list:

\def\@meta@family@list{\@elt{rm}\@elt{sf}\@elt{tt}}

\def\prepare@family@series@update#1#2{\if@forced@series
\begin{verbatim}
+debug series@change@debug{No series preparation (forced \f@series)}\on@line\end{verbatim}
\fontfamily#2
\else
\begin{verbatim}
+debug series@change@debug{Preparing for switching to #1 (#2)}\on@line\end{verbatim}
\expand@font@defaults
\end{verbatim}
\fi

We prepare for changing the current series. We have to find it before changing the family as discussed above.

\let\target@series@value\@empty
\def\target@meta@family@value{#1}

As the very last item in the meta family list we add \@elt{??} and define this pseudo meta family to be the current font family. So if none of the real meta families matched then this will match. This will cover the following case:

- \bfseries is called for a family using bx (e.g., CMR)
- Switch to a font family that is none of the meta families, e.g., via \fontfamily{ptm}\allowbreak\verb=
- Then none of the real meta families, match but the final \@elt{??} will.
- Therefore if the current series is \mddefault or \bfdefault it will be detected and the corresponding target series selected.

\expandafter\edef\csname ??def@ult\endcsname{\f@family}

To find it we loop over the meta family list with a suitable definition of \@elt.

\let\@elt\update@series@target@value
\@meta@family@list

Last resort pseudo meta family. Will only be looked at f none of the real ones have matched.

\@elt{??}
\let\@elt\relax

That will figure out the correct series value to use without updating it. Now we can change the family.

\fontfamily#2

After that we update the series. That code is again like the one above.

\ifx\target@series@value\@empty
\begin{verbatim}
+debug series@change@debug{Target series still empty ...}\on@line\end{verbatim}
\else
\begin{verbatim}
+debug \f@series@target@series@value\end{verbatim}
\begin{verbatim}
+debug \series@change@debug{Target series unchanged: \f@series \space = \target@series@value}\on@line\end{verbatim}
\else
\maybe@load@fontshape
\begin{verbatim}
+debug \series@change@debug{Target series: \f@series \space -> \target@series@value}\on@line\end{verbatim}
The \texttt{target@series@value} may contain something like cm (coming from a default) and so we can’t directly assign it to \texttt{f@series} be have to drop any surplus m first.

\begin{verbatim}
167 \let\f@series\target@series@value
168 \series@maybe@drop@one@m\target@series@value\f@series
169 \fi
170 \fi
171 \fi
172 }
\end{verbatim}

(End definition for \texttt{prepare@family@series@update} and \texttt{@meta@family@list}.)

In this macro used in the look you basically find the nested \texttt{ifxs} from the outline above. The only difference is that is it is parameterized instead of being written out and only for one block of tests because the code is called repeatedly when looping over the meta family list. From the list we get each meta family name in turn.

\begin{verbatim}
173 \def\update@series@target@value#1{%
174 \def\reserved@a{#1}%
175 \ifx\target@meta@family@value\reserved@a % rm -> rm do nothing
176 \else
177 \series@change@debug{Trying to match #1: \csname#1def@ult\endcsname
178 \series@change@debug{space = \f@family\space ?}%
179 \expandafter\ifx\csname#1def@ult\endcsname\f@family
180 \series@change@debug{Targets for mdseries and bfseries:
181 \reserved@b\space and \reserved@c}%
182 \let\@elt\@gobble
183 \let\reserved@b\csname mdseries@\target@meta@family@value\endcsname
184 \let\reserved@c\csname bfseries@\target@meta@family@value\endcsname
185 \series@change@debug{mdseries@#1 matched -> \reserved@b}%
186 \let\target@series@value\reserved@b
187 \series@maybe@drop@one@m
188 \csname mdseries@#1\endcsname\reserved@d
189 \ifx\reserved@d\f@series
190 \series@change@debug{mdseries@#1 matched -> \reserved@b}%
191 \let\target@series@value\reserved@b
192 \else
\end{verbatim}

There is one additional test at the beginning, because the list contains all meta families and we need to ignore the case where current one from the list and target one are identical.

\begin{verbatim}
178 \def\reserved@a{#1}%
179 \ifx\target@meta@family@value\reserved@a % rm -> rm do nothing
180 \else
181 \series@change@debug{Trying to match #1: \csname#1def@ult\endcsname
182 \series@change@debug{space = \f@family\space ?}%
183 \expandafter\ifx\csname#1def@ult\endcsname\f@family
184 \series@change@debug{this is now identical to the nested \texttt{ifx} block from the outline, except that it there appeared twice in \texttt{rmfamily}. This is now covered by looping and stopping the loop when a match was found.}
185 \expandafter\let\expandafter\reserved@b\csname mdseries@\target@meta@family@value\endcsname
186 \expandafter\let\expandafter\reserved@c\csname bfseries@\target@meta@family@value\endcsname
187 \series@change@debug{Targets for mdseries and bfseries:
188 \reserved@b\space and \reserved@c}%
189 \expandafter\let\expandafter\reserved@d\csname mdseries@#1\endcsname
190 \ifx\reserved@d\f@series
191 \series@change@debug{mdseries@#1 matched -> \reserved@b}%
192 \let\target@series@value\reserved@b
193 \else
\end{verbatim}

If that’s the case we know that this is the block that applies (only one meta family can match). So to speed things up we change \texttt{@elt} so that the rest of the loop gets gobbled.

Then we try to find the right new value for the series (as explained above). The two macros defined first are only there because we now need to use \texttt{csname} and this way the code will be a little faster.

\begin{verbatim}
181 \expandafter\let\expandafter\reserved@b\csname mdseries@\target@meta@family@value\endcsname
182 \expandafter\let\expandafter\reserved@c\csname bfseries@\target@meta@family@value\endcsname
183 \expandafter\let\expandafter\reserved@d\csname mdseries@#1\endcsname
184 \ifx\reserved@d\f@series
185 \series@change@debug{mdseries@#1 matched -> \reserved@d}%
186 \let\target@series@value\reserved@d
187 \else
\end{verbatim}

This here is now identical to the nested \texttt{ifx} block from the outline, except that it there appeared twice in \texttt{rmfamily}. This is now covered by looping and stopping the loop when a match was found.

We have to sanitize the default value first because it may contain something like mc and that would never match \texttt{f@series} because there it would be called c with the m dropped. It would be probably better to do that differently these days, but it is hard to adjust without causing a lot of issues, so we do the dropping in various places instead.

\begin{verbatim}
186 \expandafter\let\expandafter\reserved@d\csname mdseries@#1\endcsname
187 \ifx\reserved@d\f@series
188 \series@change@debug{mdseries@#1 matched -> \reserved@d}%
189 \let\target@series@value\reserved@d
190 \else
\end{verbatim}

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Again do some sanitizing.

\begin{verbatim}
\def\init@series@setup{%  
  \ifx\bfseries@rm\bfseries@rm  
    \expandafter\in@\expandafter{\rmdefault}{}{cmr,cmss,cmtt,lcmss,lcmtt,lmr,lmss,lmtt}%  
    \ifin@ \else \def\bfseries@rm{b}\fi\fi  
\end{verbatim}

This is code to be run at begin document …

We only want bx in \texttt{\bfseries\texttt{rm}} if the roman font is Computer Modern or Latin Modern, otherwise it should be b. It was set to bx in the kernel so that any font use with the default families in the preamble get this value. Now at the real document start we check if the fonts have been changed. If there was a \texttt{\DeclareFontSeriesDefault} declaration or \texttt{\bfseries\texttt{rm}} was directly altered then it differs from \texttt{\bfseries\texttt{rm@kernel}} and we do nothing. Otherwise we check if \texttt{\rmdefault} is one of the CM/LM font families and if so we keep bx otherwise we change it to b.

This approach doesn’t cover one case: CM/LM got changed to a different family that supports bx, but the support package for that family used \texttt{\bfseries\texttt{rm@kernel}} instead of using \texttt{\DeclareFontSeriesDefault}. In that case the code here changes it to b. Solution: use the \texttt{\DeclareFontSeriesDefault} interface.

Same approach for \texttt{\bfseries\texttt{sf}} and \texttt{\bfseries\texttt{tt}}:

If the document preamble has changed the \texttt{\familydefault} or if the if the \texttt{\rmdefault} contains a new font family, we may have to adjust the series defaults accordingly, before starting typesetting.

Similarly, if the user has changed the \texttt{\mddefault} or the medium series for the family selected as document font we may also have to adjust the \texttt{\seriesdefault}.

On the other hand if the document font is still CM or LM then \texttt{\bfdefault} is wrong, because it is now saying b and not bx as it should for such fonts.
To fix all this we first run \reset@font (the internal kernel name for \normalfont). This will set up the document encoding, family, series and shape based on the current values of \encodingdefault, \familydefault, \seriesdefault and \shapedefault. However, if the family (from \familydefault) has special medium default we should switch to that (and not use what is current value from \seriesdefault). This can be achieved by afterwards calling \mediumseries and then changing \seriesdefault to the now current series value (in \f@series).

But what should happen if \seriesdefault got explicitly changed? In that case the explicit change should survive and we should not alter \seriesdefault. This is solved by comparing the current value of \seriesdefault with a kernel version saved in the format and if they differ we do not call \mdseries or change \seriesdefault.

219 \reset@font
220 \ifx\seriesdefault\seriesdefault@kernel
221 \mdseries
222 \let\seriesdefault\f@series
223 \fi
224 \%
(End definition for \init@series@setup.)

As the kernel code now implements the same functionality as mweights, albeit internally coded slightly differently, that package shouldn’t be loaded any more. We therefore pretend that it already got loaded. Thus, a font package that tries to load it and then sets \mdseries@... etc. will continue to work but will now use the kernel code.

Of course, mid-term such package should probably use \DeclareFontSeriesDefault instead of making using low-level definitions.

225 \expandafter\let\csname ver@mweights.sty\endcsname\fmtversion
226 ⟨/2ekernel⟩⟨latexrelease⟩
227 ⟨latexrelease⟩\EndIncludeInRelease
228 ⟨latexrelease⟩\IncludeInRelease{0000/00/00}{\mdseries@rm}{Custom series}⟨latexrelease⟩
229 ⟨latexrelease⟩\let\bfseries@rm@kernel\@undefined
230 ⟨latexrelease⟩\let\bfseries@sf@kernel\@undefined
231 ⟨latexrelease⟩\let\bfseries@tt@kernel\@undefined
232 ⟨latexrelease⟩\let\mdseries@rm\@undefined
233 ⟨latexrelease⟩\let\mdseries@sf\@undefined
234 ⟨latexrelease⟩\let\mdseries@tt\@undefined
235 ⟨latexrelease⟩\expandafter\let\csname ver@mweights.sty\endcsname\@undefined
236 ⟨latexrelease⟩\let\@meta@family@list\@undefined
237 ⟨latexrelease⟩\let\prepare@family@series@update\@undefined
238 ⟨latexrelease⟩\let\update@series@target@value\@undefined
239 ⟨latexrelease⟩
240 ⟨latexrelease⟩\%
(End IncludeInRelease)

This is always called in \document so don’t make it undefined.

241 ⟨latexrelease⟩\let\init@series@setup\relax
242 ⟨latexrelease⟩\EndIncludeInRelease

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\\textbfseries This document command switches to the bold series.

\ DeclareRobustCommand{\textbfseries}{% 
\ not@math@alphabet{\bfseries}\mathbf 
\ In the original NFSS definition it then called \textfontseries with the value \textbfdefault. 
In the new scheme we have more alternatives and therefore check if the current family \textfontfamily is the current \textrmfamily, \textsffamily or \textttfamily and the select the correct family default in that case.

\ expand@font@defaults 
\ maybe@update@bfseries@defaults 
\ ifx\textfontfamily\rmfamily\textbfdefault \textfontseries\bfseries@rm 
\ else ifx\textfontfamily\sffamily\textbfdefault \textfontseries\bfseries@sf 
\ else ifx\textfontfamily\ttfamily\textbfdefault \textfontseries\bfseries@tt 
\ If not \textbfdefault is used.
\ else \textfontseries\bfdefault 
\ This hook in contrast is always executed.

\ UseHook{bfseries} 
\ selectfont 
\ }

\maybe@update@bfseries@defaults 
\ If \textbfdefault and \textbfdefault@previous are different then the default got changed directly through the legacy interface (i.e., via \def or \renewcommand. In that case we reset all meta family defaults so that the document behaves like it was the case before the new mechanism was introduced.

\ def\maybe@update@bfseries@defaults{% 
\ ifx\textbfdefault\textbfdefault@previous\else 
We add \empty and then let \textbfdefault@previous to \textbfdefault so that we can detect any further change.

\ expandafter\def expandafter\textbfdefault 
\ expandafter{\textbfdefault@empty} 
\ let\textbfdefault@previous\textbfdefault 
\ And we reset the meta family defaults (\textbfult is an expanded version of \textbfdefault.

\ let\textbfseries@rm\textbfult 
\ let\textbfseries@sf\textbfult 
\ let\textbfseries@tt\textbfult 
\ Formats that set up parallel fonts, e.g., for Japanese, can use this hook to add resets here. Not that this hook is only run when resets are necessary.

\ UseHook{bfseries/defaults} 
\ fi 
\ }

(End definition for \maybe@update@bfseries@defaults.)
\mdseries This document command switches to the medium series.
\DeclareRobustCommand\mdseries{
\not@math@alphabet\mdseries\relax
\expand@font@defaults
\maybe@update@mdseries@defaults
\ifx\f@family\rmdef@ult \fontseries\mdseries@rm
\else\ifx\f@family\sfdef@ult \fontseries\mdseries@sf
\else\ifx\f@family\ttdef@ult \fontseries\mdseries@tt
\else \fontseries\mddefault
\fi\fi\fi
\UseHook{mdseries}\
\selectfont}

(End definition for \mdseries.)
\maybe@update@mdseries@defaults
\def\maybe@update@mdseries@defaults{
\ifx\mddefault\mddefault@previous\else
\expandafter\def\expandafter\mddefault\expandafter{\mddefault\@empty}\
\let\mddefault@previous\mddefault
\let\mdseries@rm\mddef@ult
\let\mdseries@sf\mddef@ult
\let\mdseries@tt\mddef@ult
\UseHook{mdseries/defaults}\
\fi}

(End definition for \maybe@update@mdseries@defaults.)
\langle 2ekernel|latexrelease\rangle
\langle latexrelease\rangle\EndIncludeInRelease
\langle latexrelease\rangle\IncludeInRelease{2020/10/01}{\bfseries}{Custom series with hooks}\
\langle latexrelease\rangle
\langle latexrelease\rangle
\langle latexrelease\rangle
\langle latexrelease\rangle
\DeclareRobustCommand\bfseries{
\not@math@alphabet\bfseries\mathbf
\expand@font@defaults
\ifx\bfdefault\bfdefault@previous\else
\expandafter\def\expandafter\bfdefault\expandafter{\bfdefault@empty}\
\let\bfdefault@previous\bfdefault
\let\bfseries@rm\bfdef@ult
\let\bfseries@sf\bfdef@ult
\let\bfseries@tt\bfdef@ult
\UseHook{bfseries/defaults}\
\fi
\ifx\f@family\rmdef@ult \fontseries\bfseries@rm
\else\ifx\f@family\sfdef@ult \fontseries\bfseries@sf
\else\ifx\f@family\ttdef@ult \fontseries\bfseries@tt
\else \fontseries\bfdefault
\fi\fi\fi
\selectfont
}

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The family specific defaults are fully expanded, i.e., they are defined via \edef inside \DeclareFontSeriesDefault. However, the overall defaults, e.g., \bfdefault may have been redefined by the user and thus may not be fully expanded. So to enable reliable comparison we make expanded versions of them. That we rerun each time. The alternative would be to only allow for changes before begin document.

\def\expand@font@defaults{\edef\rmdef@ult{\rmdefault}\edef\sfdef@ult{\sfdefault}\edef\ttdef@ult{\ttdefault}\edef\bfdef@ult{\bfdefault}\series@maybe@drop@one@m\bfdefault\bfdef@ult\series@maybe@drop@one@m\mddefault\mddef@ult\series@maybe@drop@one@m\bfdefault\bfdef@ult}

Formats that set up parallel fonts, e.g., for Japanese, can use this hook to add additional code here.

\UseHook{expand@font@defaults}

(End definition for \expand@font@defaults and others.)

Here are the document level commands for changing the main font families, or rather, here is a documented outline of the code, the actual code is then streamlined and somewhat generalized.

\DeclareRobustCommand\rmfamily{\not@math@alphabet\rmfamily\mathrm}  
\if@math@alphabet\rmfamily\sfdefault{\sfdefault}\else\not@math@alphabet\sfdefault\fi
\if@math@alphabet\rmfamily\ttdefault{\ttdefault}\else\not@math@alphabet\ttdefault\fi
\if@math@alphabet\rmfamily\bfdefault{\bfdefault}\else\not@math@alphabet\bfdefault\fi

If families are changed then we have to do a bit more work. In the original NFSS implementation a family change kept encoding, series shape and size unchanged but now we can’t any longer simply reuse the current series value. Instead we may have to change it from one family default to the next.
\expand@font@defaults

We have to do the testing while the current family is still unchanged but we have to do the adjustment of the series after it got changed (because the new family might have different sets of shapes available and we certainly don’t want to see substitution going on. So we use \texttt{\target@series@value} to hold the target series (if any).

\let\target@series@value\@empty

Thus, if the current family is the sans family

\ifx\f@family\sfdef@ult

and if we using the medium series of the sans family

\iffalse\f@series\mdseries@sf

then lets switch to the medium series for the serif family

\let\target@series@value\mdseries@rm

and if we use the bold series of the sans family switch to the bold default of the serif family:

\else\ifx\f@series\bfseries@sf \let\target@series@value\bfseries@rm

However, the sans family may not have any specific defaults set, so we also compare with the overall defaults.

\else\ifx\f@series\mddef@ult \let\target@series@value\mdseries@rm
\else\ifx\f@series\bfdef@ult \let\target@series@value\bfseries@rm
\fi\fi\fi\fi

If neither test was true we leave the series alone. This way a special manual setting such as \texttt{\fontseries\{lc\}} is not undone if the family changes (of course there may not be any support for it in the new family but then the NFSS substitution kicks in and sorts it out).

\fi\fi\fi\fi

We need to do the same if the current family is the typewriter family:

\else\ifx\f@family\ttdef@ult

\iffalse\f@series\mdseries@tt \let\target@series@value\mdseries@rm
\else\ifx\f@series\bfseries@tt \let\target@series@value\bfseries@rm
\else\ifx\f@series\mddef@ult \let\target@series@value\mdseries@rm
\else\ifx\f@series\bfdef@ult \let\target@series@value\bfseries@rm
\fi\fi\fi\fi

With these preparations for series out of the way we can now change the font family to \texttt{\rmdefault}.

\fontfamily\rmdefault
If \texttt{target@series@value} is still empty there is nothing more to do other than selecting the new family. However, if not then we should update the font series now as well. But there is one further subtle issue. We may not have loaded an \texttt{.fd} file for our target font family yet. In the past that was done in \texttt{\selectfont} if necessary but since we are now doing all the comparisons in \texttt{\fontseries} we need to make sure that the font family specifications are already loaded prior to calling \texttt{\fontseries}.

\begin{verbatim}
  \if\texttt{target@series@value}@empty \else
    \maybe@load@fontshape
  \fi

  Updating the series in this case means directly changing \texttt{\f@series} to the target value. We don’t want to go through \texttt{\fontseries} because that would apply the mappings and then \texttt{bx + b} would keep \texttt{bx} instead of changing to \texttt{b} as desired. as

  \begin{verbatim}
  \let\f@series=\texttt{target@series@value}
  \end{verbatim}
\end{verbatim}

So now for the real definition: most of the code above gets delegated to a helper command \texttt{\prepare@family@series@update} so that the definition becomes again fairly short. In addition we add a hook, mainly for our Japanese friends so that the code can be extended prior to the call to \texttt{\selectfont}.

\begin{verbatim}
\DeclareRobustCommand\rmfamily{\
  \not@math@alphabet\rmfamily\mathrm
}
\prepare@family@series@update{rm}\rmdefault
\UseHook{rmfamily}\
\selectfont}
\end{verbatim}

This holds all the code discussed above, first argument is the meta family, i.e., \texttt{rm} in this case, and second argument is the default family name, e.g., \texttt{cmr} indirectly accessed via \texttt{\rmdefault}. This is calling \texttt{\fontfamily} and if necessary \texttt{\fontseries} as outline above.

Then comes the hook code (by default a no-op) and finally the call to \texttt{\selectfont}.

\begin{verbatim}
\DeclareRobustCommand\sffamily{\
  \not@math@alphabet\sffamily\mathsf
}\prepare@family@series@update{sf}\sfdefault
\UseHook{sffamily}\
\selectfont}
\end{verbatim}

\begin{verbatim}
\DeclareRobustCommand\ttfamily{\
  \not@math@alphabet\ttfamily\mathtt
}\prepare@family@series@update{tt}\ttdefault
\UseHook{ttfamily}\
\selectfont}
\end{verbatim}

(\textit{End definition for \texttt{\rmfamily}, \texttt{\sffamily}, and \texttt{\ttfamily}.})
Declare the hooks used above.

\NewHook{rmfamily}
\NewHook{sffamily}
\NewHook{ttfamily}
\NewHook{normalfont}
\NewHook{expand@font@defaults}
\NewHook{bfseries}
\NewHook{bfseries/defaults}
\NewHook{mdseries}
\NewHook{mdseries/defaults}

(End definition for rmfamily and others.)

\@rmfamilyhook
\@sffamilyhook
\@ttfamilyhook
\@defaultfamilyhook

These four hooks have legacy versions used in 2020/02/02 so we should support them until they aren’t any longer used.

By default the hooks do nothing.

\let\@rmfamilyhook\@empty
\let\@sffamilyhook\@empty
\let\@ttfamilyhook\@empty
\let\@defaultfamilyhook\@empty %FMi sort out

(End definition for \@rmfamilyhook and others.)
With the ability for \textbf{bfseries} or \textmd{mdseries} to be mapped to different NFSS axis values it becomes important to have the ability to determine the current context as we can no longer look at \texttt{f@series} to answer a question such as “am I currently typesetting in a bold typeface?”

This is provided by the test \texttt{\IfFontSeriesContextTF}. It takes three arguments:

- The context we try to check (either \texttt{bf} for bold or \texttt{md} for medium, i.e., the same that can go into the first mandatory argument of \texttt{\DeclareFontSeriesDefault},
- what to do if we are in this context (true case) and
- what to do if we are not (false case).

This allows you to define commands like \texttt{\IfBold}, e.g.,

\newcommand{\IfBold}[2]{\IfSeriesContextTF{bf}{#1}{#2}}

and then do

This is \texttt{\IfBold{bold}{non-bold}} text.
and get the appropriate result.

```latex
\langle 2 \text{kernel} \rangle
\langle \text{latexrelease} \rangle
\langle \text{latexrelease} \rangle \backslash \text{IncludeInRelease}(2020/10/01)\%
\langle \text{latexrelease} \rangle \{\text{IfFontSeriesContextTF}\text{(Font series context)}\%
\backslash \text{DeclareRobustCommand}\text{IfFontSeriesContextTF}[1]{{%}
\backslash \text{expand@font@defaults}
\backslash @font@series@contextfalse
\backslash \text{@font@series@contextfalse}
\backslash \text{def}\text{\textbackslash requested@test@context}(\text{#1})\%
\backslash \text{expandafter}\text{edef}\text{\textbackslash csname }\text{??\textbackslash def@ult}\text{\textbackslash endcsname}\{\text{f}@\text{family}\}\
\backslash \text{expandafter}\text{edef}\text{csname }\text{??}\text{def@ult}\text{\textbackslash endcsname}\{\text{f}@\text{family}\}\
\backslash \text{let}@\text{elt}\text{\textbackslash test@font@series@context}
\backslash \text{@meta@family@list}
\\text{\textbackslash elt}(??)\%
\backslash \text{let}@\text{elt}\text{relax}
\backslash \text{ \textbackslash test@font@series@context}
Following that we evaluate the status of \text{\textbackslash if@font@series@context} to determine which of the remaining arguments (true/false case) we have to execute.
\text{\textbackslash if@font@series@context}
\\text{\textbackslash expandafter}\text{\textbackslash firstoftwo}
\\text{\textbackslash else}
\\text{\textbackslash expandafter}\text{\textbackslash secondoftwo}
\\text{\textbackslash fi}
\}
(End definition for \text{\textbackslash IfFontSeriesContextTF}.)
\text{\textbackslash test@font@series@context}
This tests the context (stored in \text{\textbackslash requested@test@context}) and updates the boolean if the right context is found.
\text{\textbackslash def}\text{\textbackslash test@font@series@context}(\text{#1})%
First task is to figure out whether the current family matches \text{\textbackslash rmfamily}, \text{\textbackslash sffamily}, etc. so in \text{\textbackslash reserved@a} we store the value of \text{\textbackslash rmdef@ult} (or whatever the given meta family is) and compare that to \text{\textbackslash f}@\text{family}.
\text{\textbackslash def}\text{\textbackslash reserved@a}(\text{csname }\text{#1}\text{\textbackslash def@ult}\text{\textbackslash endcsname})%
\text{\textbackslash ifx}@\text{\textbackslash f}@\text{family}\text{\textbackslash reserved@a}
If they match we have found the right meta family so we don’t need to test any of the remaining meta family and therefore change \text{\textbackslash elt} to \text{\textbackslash gobble}.
\text{\textbackslash let}@\text{elt}\text{\textbackslash gobble}
```
Now we have to test if \texttt{f@series} matches the requested context (e.g., whether \texttt{bfseries@rm} has that value if the current meta family is \texttt{rm} and we are looking for the \texttt{bf} context).

\begin{verbatim}
\expandafter\ifx\csname\requested@test\context\series#1\endcsname\f@series
\@font@series@contexttrue
\else
\expandafter\ifx\csname\requested@test\context\def@ult\endcsname\f@series
\@font@series@contexttrue
\fi\fi\fi
\end{verbatim}

(End definition for \texttt{test@font@series@context}.)

The boolean to signal if we found the requested font series context.

\begin{verbatim}
\newif\if@font@series@context
\end{verbatim}

(End definition for \texttt{if@font@series@context}.)

\begin{verbatim}
\DeclareEmphSequence
\emforce
\end{verbatim}

This declaration expects a comma separated list of (font) change declarations corresponding to increasing levels of emphasis. The mechanism tries to be “smart” and verifies that the declarations actually alter the font. If not it will ignore this level and tries the next one—the assumption being that there was a manual font change in the document.

3 Supporting nested emphasis

By default \LaTeX{} supports two levels of nested emphasis: if the current font has an upright shape then it switches to \texttt{itshape} otherwise to \texttt{emnershape} (which defaults to \texttt{upshape}). This means nested emphasis will oscillate between italic and upright shapes.

Sometimes it would be nice to allow for a more lengthy sequence, but instead of providing a fixed one \LaTeX{} now offers a general mechanism that allows to define arbitrary sequences.
to the font that is now supposed to be used for emphasis. Of course, this only works if the declarations in the list actually change the font and not, say, just the color. In such a case one has to use \emforce to which directs the mechanism to use the level even if the font attributes haven’t changed.

\emreset If the nesting is so deep, that the specified levels are exhausted then \emreset is used as a final set of declarations (which by default returns back to the upright shape). Any additional nesting levels will then reuse the list from its beginning.

\DeclareEmphSequence \DeclareEmphSequence expects a clist of declaration. Spaces in the argument are dropped to avoid spurious spaces in the output. The declarations are additive. At the very end the shape is reset using \emreset and \emforce so that this case is never skipped.\footnote{Maybe we should not add \emforce but allow that case to be skipped as well. Of course, that might result in an endless loop if somebody defines a sequence without any font change and without \emforce but ...} Further nested calls restart at the beginning.

By default the it is empty, in which case \eminnershape is used by \LaTeX{}.

\let\emfontdeclare@clist\@empty (End definition for \DeclareEmphSequence.)

\emreset Reset the font to upright and upper/lower case. With the default rules using \shapedefault does that for us but to be on the safe side we do it like this:

\DeclareRobustCommand\emreset{\upshape\ulcshape} (End definition for \emreset.)

\em The new definition for \em (and implicitly \emph) is the same as before as long as \emfontdeclare@clist is empty.

\DeclareRobustCommand\em{\@nomath\em}
\if\emfontdeclare@clist\@empty
  \ifdim\fontdimen\@ne\font>\z@ \eminnershape \else \itshape \fi
\else
  \edef\em@currfont{\csname\curr@fontshape/\f@size\endcsname}
\fi}

But if not we use the list to decide how to do emphasis.

We use the current font to check if the declarations have any effect, so even a size change is allowed and identified as a modification (but a color change, for example, isn’t). So first we save the current status.

\edef\em@currfont{\csname\curr@fontshape/\f@size\endcsname}

Then we grab the next element from the list and check if it can be used.

\expandafter\do@emfont@update\emfontdeclare@clist\do@emfont@update
\fi
\else
\fi

\footnote{Maybe we should not add \emforce but allow that case to be skipped as well. Of course, that might result in an endless loop if somebody defines a sequence without any font change and without \emforce but ...}
We know that the list (if not empty) has at least 2 elements separated by a comma, so we pick up the first in \#1 and the rest in \#2.

First action is to alter the list and move the first entry to the end

Then we execute current declaration. Appending \selectfont means one can write just \fontshape{it}} and that works then too.

We then compare the current font with our saved version, but with a slight twist: we add \em@force at the end of the name. Normally this is empty so has no effect but if there was an \emforce as part of \#1 it will append a / to the font name (making it invalid) thus this will then always fail the test.

If the test fails we are done and the declarations will be used. Otherwise we will try the next declaration in the sequence.

For the comparison with \@ifx we have to expand \em@currfont once as the relevant info is inside.

If \emforce was used, we have to undo its effect:

The definition of \emforce is simple: change \em@force to make the above test always invalid.

These are the older definitions for \em, prior to 2020.

We also have to define the emphasize font change command (i.e. \em). This command will look is the current font is sloped (i.e. has a positive \fontdimen1) and will then select either \upshape or \itshape.
\not@math@alphabet  This function generates an error message when it is called in math mode. The same function should be defined in newlfont.sty.

\def\not@math@alphabet#1#2{% 
\relax 
\ifmmode\@latex@error{Command \noexpand#1invalid in math mode}% 
\else 
\ifx#2\relax \noexpand\texttt{"}\% 
\else 
\noexpand\texttt{"}\% 
\fi 
\fi 
}

(End definition for \not@math@alphabet.)

Finally we provide two abbreviations to switch to the \TeX versions.

\DeclareRobustCommand\boldmath{%
\mathversion{bold}\boldmath
}
\DeclareRobustCommand\unboldmath{%
\mathversion{normal}\unboldmath
}

Here we switch to the default math version by defining the internal macro \math@version. We dare not to call \mathversion at this place because this would call \glb@settings.
\def\math@version{normal}
3.1 Legacy

We start by defining a few macros that are part of standard \LaTeX’s user interface. The use of these functions is not encouraged, but they will allow to process older documents without changes to the source.

\begin{verbatim}
\def\newfont#1#2{\@ifdefinable#1{\font#1=#2\relax}}
\end{verbatim}

(End definition for \newfont.)

\begin{verbatim}
\def\symbol[1]{\Ucharcat#1 12\relax}
\end{verbatim}

(End definition for \symbol.)

3.2 Miscellaneous

This abbreviation is used by \LaTeX’s user level size changing commands, such as \texttt{\texttt{\large}}.

\begin{verbatim}
\def\@setfontsize#1#2#3{\@nomath#1% 
 \fontsize{#2}{#3}\selectfont}
\end{verbatim}

For the benefit of people relying on keeping the name of the current font command saved in \texttt{\currsize} we define it. To ensure that \texttt{\@setfontsize} keeps being robust we omit this assignment during times where \protect differs from \@typeset@protect.

\begin{verbatim}
\def\@setsize#1#2#3#4{\@setfontsize#1{#4}{#2}}
\end{verbatim}

(End definition for \@setfontsize and \@setsize.)
\texttt{\textbackslash hexnumber@} To set up $\LaTeX$’s special math character definitions we first provide a macro to generate hexadecimal numbers. It is a rather simple \texttt{\textbackslash ifcase}.
\begin{verbatim}
def\hexnumber@#1{\ifcase\number#1 0\or 1\or 2\or 3\or 4\or 5\or 6\or 7\or 8\or 9\or A\or B\or C\or D\or E\or F\fi}
\end{verbatim}

(End definition for \texttt{\hexnumber@}.)

\texttt{\textbackslash nfss@text} In it simplest form \texttt{\textbackslash nfss@text} is an \texttt{\mbox}. This will produce unbreakable text outside math and inside math you will get text with the same fonts as outside. The only drawback is that such item won’t change sizes in subscripts. But this behavior can be easily changed. With the \texttt{amstex} style option one will get a sub style called \texttt{amstext} which will redefine the \texttt{\textbackslash nfss@text} macro to produce correct text in all sizes.

We have to use \texttt{\textbackslash def} instead of the shorter \texttt{\textbackslash let} since \texttt{\mbox} is undefined when we reach this point.
\begin{verbatim}
def\nfss@text#1{{\mbox{#1}}}
\end{verbatim}

(End definition for \texttt{\nfss@text}.)

\texttt{\textbackslash copyright} The definition of \texttt{\copyright} was changed so that it works in other type styles, and to make it robust. We leave the family untouched so that the copyright notice will come out differently if a different font family is in use. This command is commented out, since it is now defined in ltoutenc.dtx.
\begin{verbatim}
%\DeclareRobustCommand\copyright
% {\ooalign{\hfil\raise.07ex\hbox{\mdseries\upshape c}\hfil\crcr
% \mathhexbox20D}}
\end{verbatim}

(End definition for \texttt{\copyright}.)

\texttt{\textbackslash normalfont} The macro \texttt{\reset@font} is used in $\LaTeX$ to switch to a standard font, in order to initialize the current font in situations where typesetting is done in a new visual context (e.g. in a footnote). We define it here to allow the test for the new $\LaTeX$ version above but nevertheless are able to run all kind of mixtures.

The user interface name for \texttt{\reset@font} is \texttt{\normalfont}:
\begin{verbatim}
\IncludeInRelease{2021/06/01}{\normalfont}{Add hook to \normalfont}
\DeclareRobustCommand\normalfont{%
\fontencoding\encodingdefault
\edef\f@family{\familydefault}%
\edef\f@series{\seriesdefault}%
\edef\f@shape{\shapedefault}%
\let\delayed@f@adjustment\@empty
\UseHook{normalfont}%
\end{verbatim}

Instead of calling \texttt{\usefont}, as it was done in the past, we inline the code from \texttt{\usefont} as we want to add the hook before \texttt{\selectfont}, but after all the font attributes are set.
\begin{verbatim}
\edef\f@family{\familydefault}%
\edef\f@series{\seriesdefault}%
\edef\f@shape{\shapedefault}%
\end{verbatim}

Any earlier \texttt{\fontseries}, etc. should be canceled and we should switch unconditionally to the requested font face so we drop any code that may have been stored in \texttt{\delayed@f@adjustment}.
\begin{verbatim}
\let\delayed@f@adjustment\@empty
\UseHook{normalfont}%
\end{verbatim}
This is the old name for the hook introduced in 2020/02/02. It will be removed in one of the future releases!

\defaultfamilyhook % hookname from 2020/02 will vanish
\selectfont
\let\reset@font\normalfont

(End definition for \normalfont and \reset@font.)

% \changes{v3.2g}{2021/03/18}
% {Add missing 2020/02/02 latexrelease entry.}
⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{2020/10/01}{\normalfont}{Add hook to \normalfont}
⟨latexrelease⟩\DeclareRobustCommand\normalfont{\fontencoding\encodingdefault
\edef\f@family{\familydefault}\edef\f@series{\seriesdefault}\edef\f@shape{\shapedefault}\usefont\encodingdefault\familydefault\seriesdefault\shapedefault}
⟨latexrelease⟩\let\reset@font\normalfont
⟨latexrelease⟩\let\@defaultfamilyhook\@empty
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}{\normalfont}{Add hook to \normalfont}
⟨latexrelease⟩\DeclareRobustCommand\normalfont{\usefont\encodingdefault\familydefault\seriesdefault\shapedefault

File A: ltfssini.dtx Date: 2021/09/10 Version v3.2i
We left out the special \LaTeX fonts which are not automatically included in the base version of the font selection since these fonts contain only a few characters which are also included in the AMS fonts so anybody who is using these fonts doesn’t need them. But for compatibility reasons we will define these symbols.

\def\not@base#1\{\@latex@error
{Command \noexpand#1 not provided in base \LaTeX2e}\
{Load the latexsym or the amsfonts package to
define this symbol}\}
\def\mho\{\not@base\mho\}
\def\Join\{\not@base\Join\}
\def\Box\{\not@base\Box\}
\def\Diamond\{\not@base\Diamond\}
\def\leadsto\{\not@base\leadsto\}
\def\sqsubset\{\not@base\sqsubset\}
\def\sqsupset\{\not@base\sqsupset\}
\def\lhd\{\not@base\lhd\}
\def\unlhd\{\not@base\unlhd\}
\def\rhd\{\not@base\rhd\}
\def\unrhd\{\not@base\unrhd\}

We now initialize all variables set by \DeclareErrorFont. These values are not really important since they will be overwritten later on by the definition in fontdef.ltx. However, if fontdef.cfg is corrupted then at least a hopefully suitable error font is present.

\DeclareErrorFont{OT1}{cmr}{m}{n}{10} %% don’t modify this setting
%% overwrite it in fontdef.cfg
%% if necessary
We also set some default values for \f@family etc. Note that we don’t yet have any encodings that comes later. In the past this was implicitly done by \DeclareErrorFont.

\fontfamily{cmr}

Previously the default values for series and shape were set by calling \fontseries and \fontshape, but their action is now delayed until \selectfont which isn’t called inside the format (to avoid unnecessarily loading a font that may never get used). We therefore have to set \f@series and \f@shape directly instead.

\def\f@series\{m\} % \fontseries{m}
\def\f@shape\{n\} % \fontshape{n}
\fontsize{10}{10}

The initial fontenc package load list. This will get overwitten in fonttext and is only provided in case an old fonttext.cfg does not define the command:

\def\@fontenc@load@list{\@elt{T1,OT1}}
We now load the customizable parts of NFSS.
\InputIfFileExists{fonttext.cfg}
{\typeout{====================================\%}
 \def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
 }%
 \input{fonttext.ltx}
\let\@addtofilelist\@gobble

Ditto for math although I don't think that we will get a lot of customisation :-)
\InputIfFileExists{fontmath.cfg}
{\typeout{====================================\%}
 \def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
 }%
 \input{fontmath.ltx}
\let\@addtofilelist\@gobble

Then we preload several fonts. This file might be customized without changing the
behavior of the format (i.e. necessary font definitions will be loaded at runtime if they
are not preloaded). This is done in the file \texttt{preload.ltx}.
\InputIfFileExists{preload.cfg}
{\typeout{====================================\%}
 \def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
 }%
 \input{preload.ltx}
\let\@addtofilelist\@gobble

After \texttt{\seriesdefault} got defined inside \texttt{fonttext.ltx} or a \texttt{.cfg} file overwriting it, we
alter its value by appending \texttt{\@empty} to it. This will vanish if expanded but allows us
to check if the default gets altered (even to the same value) in the document preamble.
All we have to do is to save the current value somewhere and later compare the two. For
this we use \texttt{\seriesdefault@kernel}.
\expandafter\def\expandafter\seriesdefault\expandafter{\seriesdefault\@empty}
\let\seriesdefault@kernel\seriesdefault
(End definition for \texttt{\seriesdefault} and \texttt{\seriesdefault@kernel}.)

We also save the values of some accents in \texttt{\@acci}, \texttt{\@accii} and \texttt{\@acciii} so they can
be restored by a \texttt{minipage} inside a \texttt{tabbing} environment.
\let\@acci\ \let\@accii\ \let\@acciii= (End definition for \texttt{\@acci}, \texttt{\@accii}, and \texttt{\@acciii}.)

Here were the two old (alphabet identifiers).
(End definition for \texttt{\textbackslash cal} and \texttt{\textbackslash mit}.)

\texttt{\textbackslash 2ekernel}
1 Introduction

This file is used to generate the files fonttext.ltx (text font declarations) and fontmath.ltx (math font declarations), which are used during the format generation. It contains the declaration of the standard text encodings used at the site as well as a minimal subset of font shape groups that NFSS will look at to ensure that the specified encodings are valid.

The math part contains the setup for math encodings as well as the default math symbol declarations that belong to the encoding.

It is possible to change this setup (by using other fonts, or defaults) without losing the ability to process documents written at other sites. Portability in this sense means that a document will compile without errors. It does not mean, however, that identical output will be produced. For this it is necessary that the distributed setup is used at both installations.

2 Customization

You are not allowed to change this source file! If you want to change the default encodings and/or the font shape groups preloaded you should create a copy of fonttext.ltx under the name fonttext.cfg and change this copy. If \LaTeX{} finds a file of this name it will use it, otherwise it uses the standard file which is fontdef.ltx.

If you don’t plan to use Computer Modern much or at all, it might (!) be a good idea to make your own fonttext.cfg. Look at the comments below (docstrip module ‘text’) to see what should go into such a file.

To change the math font setup use a copy of fontmath.ltx under the name fontmath.cfg and change this copy. However, dealing with this interface is even more a job for an expert than changing the text font setup — in short, we don’t encourage either.

Warning: please note that we don’t support customised \LaTeX{} versions. Thus, before sending in a bug report please try your test file with a \LaTeX{} format which is not customised and send in the log from that version (unless the problem goes away).

Please note: the following standard encodings have to be defined in all local variants of font....cfg to guarantee that all \LaTeX{} installations behave in the same way.

\begin{verbatim}
T1  Cork \TeX{} text encoding
OT1 old \TeX{} text encoding
U  unknown encoding
OML old \TeX{} math letters encoding
OMS old \TeX{} math symbols encoding
OMX old \TeX{} math extension symbols encoding
TU  Unicode
\end{verbatim}
Notice that some of these encodings are ‘old’ in the sense that we hope that they will be superseded soon by encoding standards defined by the \TeX\ user community. Therefore this set of default encodings may change in the future.

The first candidate is \texttt{OT1} which will soon be replaced by \texttt{T1}, the official \TeX\ text encoding.

**Warning:** If you add additional encodings to this file there is no guarantee any longer that files processable at your installation will also be processable at other installations. Thus, if you make use of such an encoding in your document, e.g. if you intend to typeset in Cyrillic (\texttt{OT2} encoding), you need to specify this encoding in the preamble of your document prior to sending it to another installation. Once the encoding is specified in that place in your document, the document is processable at all \TeX\ installations (provided they have suitable fonts installed).

For this reason we suggest that you define a short package file that sets up an additional encoding used at your site (rather than putting the encoding into this file) since this package can easily be shipped with your document.

### 3 The docstrip modules

The following modules are used to direct \texttt{docstrip} in generating external files:

- \texttt{driver} produce a documentation driver file
- \texttt{text} produce the file \texttt{fonttext.ltx}
- \texttt{math} produce the file \texttt{fontmath.ltx}
- \texttt{cfgtext} produce a dummy \texttt{fonttext.cfg} file
- \texttt{cfgmath} produce a dummy \texttt{fontmath.cfg} file

A typical \texttt{docstrip} command file would then have entries like:

```
\begin{document}
\DocInput{fontdef.dtx}
\end{document}
```

### 4 A driver for this document

The next bit of code contains the documentation driver file for \TeX, i.e. the file that will produce the documentation you are currently reading. It will be extracted from this file by the \texttt{DOCSTRIP} program.

```
\documentclass{ltxdoc}
\GetFileInfo{fontdef.dtx}
\begin{document}
\DocInput{fontdef.dtx}
\end{document}
```

### 5 The fonttext.ltx file

The identification is done earlier on with a \texttt{ProvidesFile} declaration.

```
\typeout{=== Don’t modify this file, use a .cfg file instead ===}
```

File B: \texttt{fontdef.dtx} Date: ? Version ?
5.1 Encodings

This file declares the standard encodings for text and math fonts. All others should be declared in packages or in the documents directly.

For every text encoding there are normally a number of encoding specific commands, e.g. accents, special characters, etc. (The definition for such a command might have to change when the encoding is changed, because the character is in a different position, or not available at all, or the accent is produced in a different way.) This is handled by a general mechanism which is described in `ltoutenc.dtx`.

By convention, text encoding specific declarations, including the `\DeclareFontEncoding` declaration, are kept in separate file of the form `<enc>enc.def`, e.g. `ot1enc.def`. This allows other applications to make use of the declarations as well.

Similar to the default encoding, the loading of the encoding files for the two major text encodings shouldn’t be changed. In particular, the `inputenc` package depends on this.

```
\input {omlenc.def}
\input {omsenc.def}
```

Documents containing a lot of accented characters should really be using T1 fonts. We therefore load this last so that T1 encoding specific commands are executed as fast as possible (encoding files are no longer reloaded in `fontenc`).

```
\input {ot1enc.def}
\input {t1enc.def}
\input{ts1enc.def}
```

We then set the default text font encoding. This will hopefully change some day to T1. This setting should not be changed to produce a portable format.

```
\fontencoding{OT1}
```

The initial `fontenc` package load list if an 8-bit TeX engine is used:

```
\def\@fontenc@load@list{\@elt{T1,OT1}}
\def\rmsubstdefault{cmr}
\def\sfsubstdefault{cmss}
\def\ttsubstdefault{cmtt}
\LoadFontDefinitionFile{TS1}{cmr}
```

```
\else
```

Unicode.

```
\fontencoding{TU}
```

The initial `fontenc` package load list if a Unicode engine is used:

```
\def\@fontenc@load@list{\@elt{TU}}
\DeclareFontSubstitution{TU}{lmr}{m}{n}
\LoadFontDefinitionFile{TU}{lmr}
\LoadFontDefinitionFile{TU}{lmss}
\LoadFontDefinitionFile{TU}{lmtt}
\def\rmsubstdefault{lmr}
\def\sfsubstdefault{lmss}
\def\ttsubstdefault{lmtt}
\LoadFontDefinitionFile{TS1}{lmr}
```

File B: `fontdef.dtx` Date: ? Version ?
End of Unicode branch.
\fi
If different encodings for text fonts are in use one could put the common setup into \DeclareFontEncodingDefaults. There is now a better mechanism so using this interface is discouraged!
\DeclareFontEncodingDefaults{}{}
Then we define the default substitution for every encoding. This release of \LaTeX2ε assumes that the ec fonts are available. It is possible to change this to point to some other font family (e.g., Times with the appropriate encoding if it is available) without making documents non-portable. However, in such a case documents will produce different page breaks at other sites. The substitution defaults can all be changed without losing portability as long as there are font shape definitions for the selected substitutions.
\DeclareFontSubstitution{T1}{cmr}{m}{n}
\DeclareFontSubstitution{OT1}{cmr}{m}{n}
For every encoding declaration, \LaTeX2ε will try to verify that the given substitution information makes sense, i.e. that it is impossible to go into an endless loop if font substitution happens. This is done at the moment the \begin{document} is encountered. \LaTeX2ε will then check that for every encoding the substitution defaults form a valid font shape group, which means that it will check if there is a \DeclareFontShape declaration for this combination. We will therefore load the corresponding .fd files now. If we don’t do this they would be loaded at verification time (i.e. at \begin{document} which would delay processing unnecessarily.

**Warning:** Please note that this means that you have to regenerate the format whenever you change any of these .fd files since \LaTeX2ε will not read .fd files if it already knows about the encoding/family combination.

The \texttt{nfss@catcodes} ensures that white space is ignored in any definitions made in the .fd files.
\begingroup
\nfss@catcodes
\input {t1cmr.fd}
\input {ot1cmr.fd}
\endgroup
We also load some other font definition files which are normally needed in a document. This is only done for processing speed and you can comment the next two lines out to save some memory. If necessary these files are then loaded when your document is processed. (Loading .fd files is a less drastic step compared to preloading fonts because the number of fonts is limited 255 at (nearly) every \TeX installation, while the amount of main memory is not a limiting factor at most installations.)
\begingroup
\nfss@catcodes
\input {ot1cmss.fd}
\input {ot1cmtt.fd}
\endgroup
Even with all the precautions it is still possible that NFSS will run into problems, for example, when a .fd file contains corrupted data. To guard against such cases NFSS has a very low-level fallback font that is installed with the following line.

\DeclareErrorFont{OT1}{cmr}{m}{n}{10}

This means, “if everything else fails use Computer Modern Roman normal shape at 10pt in the old text encoding”. You can change the font used but the encoding should be the same as the one specified with \fontencoding above.

5.2 Defaults

To allow the use of \rmfamily, \sffamily, etc. in documents even if non-standard families are used we provide nine macros which hold the name of the corresponding families, series, and so on. This makes it easy to use other font families (like Times Roman, etc.). One simply has to redefine these defaults.

All these hooks have to be defined in this file but you can change their meaning (except for \encodingdefault) without making documents non-portable.

The following three definitions set up the meaning for \rmfamily, \sffamily, and \ttfamily.

\encodingdefault \rmdefault \sfdefault \ttdefault

\ifx\Umathcode\@undefined
  \newcommand\encodingdefault{OT1}
  \newcommand\rmdefault{cmr}
  \newcommand\sfdefault{cmss}
  \newcommand\ttdefault{cmtt}
  \else
  \newcommand\encodingdefault{TU}
  \newcommand\rmdefault{lmr}
  \newcommand\sfdefault{lmss}
  \newcommand\ttdefault{lmtt}
  \fi

\langle /text \rangle
\langle latexrelease \rangle IncludeInRelease{2017/01/01} %
\langle latexrelease \rangle \{\encodingdefault\} {TU encoding default} %
\langle latexrelease \rangle ifx \Umathcode \@undefined
\langle latexrelease \rangle IncludeInRelease{2017/01/01} %
\langle latexrelease \rangle \fontencoding{\encodingdefault} %
\langle latexrelease \rangle \newcommand\encodingdefault{OT1}
\langle latexrelease \rangle \newcommand\rmdefault{cmr}
\langle latexrelease \rangle \newcommand\sfdefault{cmss}
\langle latexrelease \rangle \newcommand\ttdefault{cmtt}
\langle latexrelease \rangle \else
\langle latexrelease \rangle \renewcommand\encodingdefault{TU}
\langle latexrelease \rangle \renewcommand\rmdefault{lmr}
\langle latexrelease \rangle \renewcommand\sfdefault{lmss}
\langle latexrelease \rangle \renewcommand\ttdefault{lmtt}
\fi

\langle latexrelease \rangle EndIncludeInRelease
\langle latexrelease \rangle IncludeInRelease{0000/00/00} %
\langle latexrelease \rangle \{\encodingdefault\} {TU encoding default} %
(End definition for \encodingdefault and others.)

\bfdefault Series changing commands are influenced by the following hooks.
\mddefault \newcommand\bfdefault{b} % overwritten below (for rollback)
\newcommand\mddefault{m} % overwritten below (for rollback)

(End definition for \bfdefault and \mddefault.)

\itdefault Shape changing commands use the following hooks.
\sldefault \scdefault \updefault \newcommand\itdefault{it}
\newcommand\sldefault{sl}
\newcommand\scdefault{sc}
\newcommand\updefault{up} % overwritten below (for rollback)

(End definition for \itdefault and others.)

We append \@empty to the series value so that we can detect if it got changed via \def or \renewcommand later.

\renewcommand\bfdefault{b\@empty}
\renewcommand\mddefault{m\@empty}
\let\bfdefault@previous\bfdefault
\let\mddefault@previous\mddefault

\EndIncludeInRelease

(∗text)
Finally we have the hooks that describe the behaviour of the \normalfont command. 
To stay portable, the definition of \encodingdefault should not be changed and should match the setting above for \fontencoding. All other values can be set according to your taste.

\newcommand\familydefault{\rmdefault}
\newcommand\seriesdefault{\mddefault}

In previous releases \shapedefault pointed to \updefault which resolved to n, but these days that is no longer the case (and up is wrong when you want to do a reset. So we now use n explicitly.

\newcommand\shapedefault{n}

\newcommand\familydefault{\rmdefault}
\newcommand\seriesdefault{\mddefault}
\newcommand\shapedefault{n}

(End definition for \familydefault, \seriesdefault, and \shapedefault.)

This finishes the low-level setup in fonttext.ltx.

6 The fontmath.ltx file

The identification is done earlier on with a \ProvidesFile declaration.

\typeout{=== Don't modify this file, use a .cfg file instead ===}

6.1 The font encodings used

\DeclareFontEncoding{OML}{}{}
\DeclareFontEncoding{OMS}{}{}
\DeclareFontEncoding{OMX}{}{}

Finally a declaration for \encodingdefault which serves for all fonts that do not fit standard encodings. For math this sets up \noaccents@ providing for AMS-LTEXT. This macro is used therein to handle accented characters if they are not supported by the font. In other words, if fonts with \encodingdefault are used in math, all accents (like from \breve) are obtained from some other font that has them.

\DeclareFontEncoding{U}{}{\noaccents@}

The encodings for math are next:

\DeclareFontSubstitution{OML}{cmm}{m}{it}
\DeclareFontSubstitution{OMS}{cmsy}{m}{n}
\DeclareFontSubstitution{OMX}{cmex}{m}{n}
\DeclareFontSubstitution{U}{cmr}{m}{n}

\begingroup
\nfss@catcodes\input {omlcmm.fd}
\input {omscmsy.fd}
\input {omxcmex.fd}
\input {ucmr.fd}
\endgroup

6.1.1 Symbolfont and Alphabet declarations

We now define the basic symbol fonts used by LTEXT. These four symbol fonts must be defined by this file.

It is possible to make the symbol fonts point to other external fonts without losing the ability to process documents written at other sites, as long as one defines the same
symbol font names with the same encodings, e.g. operators with OT1 etc. If other encodings are used documents become non-portable. Such a change should therefore be done in a package file.

\DeclareSymbolFont{operators}{OT1}{cmr}{m}{n}
\DeclareSymbolFont{letters}{OML}{cmm}{m}{it}
\DeclareSymbolFont{symbols}{OMS}{cmsy}{m}{n}
\DeclareSymbolFont{largesymbols}{OMX}{cmex}{m}{n}
\SetSymbolFont{operators}{bold}{OT1}{cmr}{bx}{n}
\SetSymbolFont{letters}{bold}{OML}{cmm}{b}{it}
\SetSymbolFont{symbols}{bold}{OMS}{cmsy}{b}{n}

Below are the seven math alphabets which are defined by NFSS. Again they must be defined by this file. However, as before you can change the fonts used without losing portability, but you should be careful when changing the encoding since that may make documents come out wrong.

\DeclareSymbolFontAlphabet\mathrm{operators}
\DeclareSymbolFontAlphabet\mathnormal{letters}
\DeclareSymbolFontAlphabet\mathcal{symbols}
\DeclareMathAlphabet\mathbf{OT1}{cmr}{bx}{n}
\DeclareMathAlphabet\mathsf{OT1}{cmss}{m}{n}
\DeclareMathAlphabet\mathit{OT1}{cmr}{m}{it}
\DeclareMathAlphabet\mathtt{OT1}{cmtt}{m}{n}

6.2 Math font sizes

The declarations below declare the text, script and scriptscript size to be used for each text font size.

All occurrences of sizes longer than a single character are replaced with the macro name that holds them, saving a number of tokens (but losing a bit of speed, so this may not stay this way).

\DeclareMathSizes{5}{5}{5}{5}
\DeclareMathSizes{6}{6}{5}{5}
\DeclareMathSizes{7}{7}{5}{5}
\DeclareMathSizes{8}{8}{6}{5}
\DeclareMathSizes{9}{9}{6}{5}

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6.3 The math symbol assignments

We start by setting up math codes for most of the characters typed in directly from the keyboard. Most of them are normally already set up in the same way by InTiP\TeX. However, we repeat them here to have a complete setup which can be exchanged with another if desired.

6.3.1 The letters

\begin{verbatim}
\DeclareMathSymbol{a}{\mathalpha}{letters}{'a}
\DeclareMathSymbol{b}{\mathalpha}{letters}{'b}
\DeclareMathSymbol{c}{\mathalpha}{letters}{'c}
\DeclareMathSymbol{d}{\mathalpha}{letters}{'d}
\DeclareMathSymbol{e}{\mathalpha}{letters}{'e}
\DeclareMathSymbol{f}{\mathalpha}{letters}{'f}
\DeclareMathSymbol{g}{\mathalpha}{letters}{'g}
\DeclareMathSymbol{h}{\mathalpha}{letters}{'h}
\DeclareMathSymbol{i}{\mathalpha}{letters}{'i}
\DeclareMathSymbol{j}{\mathalpha}{letters}{'j}
\DeclareMathSymbol{k}{\mathalpha}{letters}{'k}
\DeclareMathSymbol{l}{\mathalpha}{letters}{'l}
\DeclareMathSymbol{m}{\mathalpha}{letters}{'m}
\DeclareMathSymbol{n}{\mathalpha}{letters}{'n}
\DeclareMathSymbol{o}{\mathalpha}{letters}{'o}
\DeclareMathSymbol{p}{\mathalpha}{letters}{'p}
\DeclareMathSymbol{q}{\mathalpha}{letters}{'q}
\DeclareMathSymbol{r}{\mathalpha}{letters}{'r}
\DeclareMathSymbol{s}{\mathalpha}{letters}{'s}
\DeclareMathSymbol{t}{\mathalpha}{letters}{'t}
\DeclareMathSymbol{u}{\mathalpha}{letters}{'u}
\DeclareMathSymbol{v}{\mathalpha}{letters}{'v}
\DeclareMathSymbol{w}{\mathalpha}{letters}{'w}
\DeclareMathSymbol{x}{\mathalpha}{letters}{'x}
\DeclareMathSymbol{y}{\mathalpha}{letters}{'y}
\DeclareMathSymbol{z}{\mathalpha}{letters}{'z}
\end{verbatim}

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6.3.2 The digits

\DeclareMathSymbol{0}{\mathalpha}{operators}{0}
\DeclareMathSymbol{1}{\mathalpha}{operators}{1}
\DeclareMathSymbol{2}{\mathalpha}{operators}{2}
\DeclareMathSymbol{3}{\mathalpha}{operators}{3}
\DeclareMathSymbol{4}{\mathalpha}{operators}{4}
\DeclareMathSymbol{5}{\mathalpha}{operators}{5}
\DeclareMathSymbol{6}{\mathalpha}{operators}{6}
\DeclareMathSymbol{7}{\mathalpha}{operators}{7}
\DeclareMathSymbol{8}{\mathalpha}{operators}{8}
\DeclareMathSymbol{9}{\mathalpha}{operators}{9}

6.3.3 Punctuation, brace, etc. keys

\DeclareMathSymbol{!}{\mathclose}{operators}{21}
\DeclareMathSymbol{+}{\mathbin}{operators}{2B}
\DeclareMathSymbol{,}{\mathpunct}{letters}{3B}
\DeclareMathSymbol{-}{\mathbin}{symbols}{00}
\DeclareMathSymbol{.}{\mathord}{letters}{3A}
\DeclareMathSymbol{;}{\mathpunct}{operators}{3B}
\DeclareMathSymbol{=}{{\mathrel}{operators}{3D}
\DeclareMathSymbol{?}{\mathclose}{operators}{3F}

The following symbols are defined as delimiters below which automatically defines them as math symbols.

\DeclareMathSymbol{(}{\mathopen}{operators}{28}
\DeclareMathSymbol{)}{{\mathclose}{operators}{29}
\DeclareMathSymbol{\{}{{\mathopen}{symbols}{66}
\DeclareMathSymbol{\}}{{\mathclose}{symbols}{67}
\DeclareMathSymbol{\backslash}{{\mathcode'}=8000 {\mathcode'}='8000 ^{\prime}
\DeclareMathSymbol{\_}{{\mathcode'}=8000 _{\_}

6.3.4 Delimitercodes for characters

[to be completed]

Finally, \texttt{\LaTeX} sets all \texttt{\delcode} values to -1, except \texttt{\delcode'}=0

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The next two are considered to be relations when not used in the context of a delimiter! And worse, they do even represent different glyphs when being used as delimiter and not as delimiter. This is a user level syntax inherited from plain \TeX{}. Therefore we explicitly redefine the math symbol definitions for these symbols afterwards.

\DeclareMathDelimiter{<}{\mathopen}{symbols}{"68}{largesymbols}{"0A}
\DeclareMathDelimiter{>}{\mathclose}{symbols}{"69}{largesymbols}{"0B}
\DeclareMathSymbol{<}{\mathrel}{letters}{"3C}
\DeclareMathSymbol{>}{\mathrel}{letters}{"3E}

And here is another case where the non-delimiter version produces a glyph different from the delimiter version.

\DeclareMathDelimiter{/}{\mathord}{operators}{"2F}{largesymbols}{"0E}
\DeclareMathSymbol{/}{\mathord}{letters}{"3D}
\DeclareMathDelimiter{|}{\mathord}{symbols}{"6A}{largesymbols}{"0C}
\expandafter\DeclareMathDelimiter\@backslashchar
\DeclareMathSymbol{|}{\mathord}{letters}{"3E}

N.B. { and } should NOT get delcodes; otherwise parameter grouping fails!

6.4 Symbols accessed via control sequences

6.4.1 Greek letters

\DeclareMathSymbol{\alpha}{\mathord}{letters}{"0B}
\DeclareMathSymbol{\beta}{\mathord}{letters}{"0C}
\DeclareMathSymbol{\gamma}{\mathord}{letters}{"0D}
\DeclareMathSymbol{\delta}{\mathord}{letters}{"0E}
\DeclareMathSymbol{\epsilon}{\mathord}{letters}{"0F}
\DeclareMathSymbol{\zeta}{\mathord}{letters}{"10}
\DeclareMathSymbol{\eta}{\mathord}{letters}{"11}
\DeclareMathSymbol{\theta}{\mathord}{letters}{"12}
\DeclareMathSymbol{\iota}{\mathord}{letters}{"13}
\DeclareMathSymbol{\kappa}{\mathord}{letters}{"14}
\DeclareMathSymbol{\lambda}{\mathord}{letters}{"15}
\DeclareMathSymbol{\mu}{\mathord}{letters}{"16}
\DeclareMathSymbol{\nu}{\mathord}{letters}{"17}
\DeclareMathSymbol{\xi}{\mathord}{letters}{"18}
\DeclareMathSymbol{\pi}{\mathord}{letters}{"19}
\DeclareMathSymbol{\rho}{\mathord}{letters}{"1A}
\DeclareMathSymbol{\sigma}{\mathord}{letters}{"1B}
\DeclareMathSymbol{\tau}{\mathord}{letters}{"1C}
\DeclareMathSymbol{\upsilon}{\mathord}{letters}{"1D}
\DeclareMathSymbol{\phi}{\mathord}{letters}{"1E}
\DeclareMathSymbol{\chi}{\mathord}{letters}{"1F}
\DeclareMathSymbol{\psi}{\mathord}{letters}{"20}
\DeclareMathSymbol{\omega}{\mathord}{letters}{"21}
\DeclareMathSymbol{\varepsilon}{\mathord}{letters}{"22}
\DeclareMathSymbol{\vartheta}{\mathord}{letters}{"23}
\DeclareMathSymbol{\varpi}{\mathord}{letters}{"24}
6.4.2 Ordinary symbols

\DeclareMathSymbol{\aleph}{\mathord}{symbols}{"40}
\DeclareMathSymbol{\imath}{\mathord}{letters}{"7B}
\DeclareMathSymbol{\jmath}{\mathord}{letters}{"7C}
\DeclareMathSymbol{\ell}{\mathord}{letters}{"60}
\DeclareMathSymbol{\wp}{\mathord}{letters}{"7D}
\DeclareMathSymbol{\Re}{\mathord}{symbols}{"3C}
\DeclareMathSymbol{\emptyset}{\mathord}{symbols}{"3B}
\DeclareMathSymbol{\nabla}{\mathord}{symbols}{"30}
\DeclareMathSymbol{\top}{\mathord}{symbols}{"3E}
\DeclareMathSymbol{\bot}{\mathord}{symbols}{"3F}
\DeclareMathSymbol{\triangle}{\mathord}{symbols}{"34}
\DeclareMathSymbol{\forall}{\mathord}{symbols}{"38}
\DeclareMathSymbol{\exists}{\mathord}{symbols}{"39}
\DeclareMathSymbol{\neg}{\mathord}{symbols}{"3A}

\let\lnot=\neg
\DeclareMathSymbol{\lnot}{\mathord}{symbols}{"3A}
\DeclareMathSymbol{\flat}{\mathord}{letters}{"5B}
\DeclareMathSymbol{\natural}{\mathord}{letters}{"5C}
\DeclareMathSymbol{\sharp}{\mathord}{letters}{"5D}
\DeclareMathSymbol{\clubsuit}{\mathord}{symbols}{"7C}
\DeclareMathSymbol{\diamondsuit}{\mathord}{symbols}{"7D}
\DeclareMathSymbol{\heartsuit}{\mathord}{symbols}{"7E}
\DeclareMathSymbol{\spadesuit}{\mathord}{symbols}{"7F}
\DeclareRobustCommand{\bar}[1]{\mathchar"26\mkern-9mu#1}
\DeclareRobustCommand{\surd}[1]{\mathchar"1270}
\DeclareRobustCommand{\angle}[1]{\vbox{\ialign{$\scriptstyle###$\crcr
\not@mathrel\mkern14mu
\noalign{\nointerlineskip}
\mkern2.5mu
\leaders\hrule@height.34pt\hfill
\mkern2.5mu}

\begin{Verbatim}
6.4.3 Large Operators
\end{Verbatim}
342
343
344
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347
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351
352
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357

\DeclareMathSymbol{\bigvee}{\mathop}{largesymbols}{"57}
\DeclareMathSymbol{\bigwedge}{\mathop}{largesymbols}{"56}
\DeclareMathSymbol{\biguplus}{\mathop}{largesymbols}{"55}
\DeclareMathSymbol{\bigcap}{\mathop}{largesymbols}{"54}
\DeclareMathSymbol{\bigcup}{\mathop}{largesymbols}{"53}
\DeclareMathSymbol{\intop}{\mathop}{largesymbols}{"52}
\DeclareRobustCommand\int{\intop\nolimits}
\DeclareMathSymbol{\prod}{\mathop}{largesymbols}{"51}
\DeclareMathSymbol{\sum}{\mathop}{largesymbols}{"50}
\DeclareMathSymbol{\bigotimes}{\mathop}{largesymbols}{"4E}
\DeclareMathSymbol{\bigoplus}{\mathop}{largesymbols}{"4C}
\DeclareMathSymbol{\bigodot}{\mathop}{largesymbols}{"4A}
\DeclareMathSymbol{\ointop}{\mathop}{largesymbols}{"48}
\DeclareRobustCommand\oint{\ointop\nolimits}
\DeclareMathSymbol{\bigsqcup}{\mathop}{largesymbols}{"46}
\DeclareMathSymbol{\smallint}{\mathop}{symbols}{"73}

6.4.4
358
359
360
361

Binary symbols

\DeclareMathSymbol{\triangleleft}{\mathbin}{letters}{"2F}
\DeclareMathSymbol{\triangleright}{\mathbin}{letters}{"2E}
\DeclareMathSymbol{\bigtriangleup}{\mathbin}{symbols}{"34}
\DeclareMathSymbol{\bigtriangledown}{\mathbin}{symbols}{"35}

Alias:
362
363
364
365

%
\let \varbigtriangledown \bigtriangledown
%
\let \varbigtriangleup \bigtriangleup
\DeclareMathSymbol{\varbigtriangleup}{\mathbin}{symbols}{"34}
\DeclareMathSymbol{\varbigtriangledown}{\mathbin}{symbols}{"35}

These last two synonyms are needed because the stmaryrd package redefines them as
Operators.
366
367

\DeclareMathSymbol{\wedge}{\mathbin}{symbols}{"5E}
\DeclareMathSymbol{\vee}{\mathbin}{symbols}{"5F}

Alias:
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387

%
\let\land=\wedge
%
\let\lor=\vee
\DeclareMathSymbol{\land}{\mathbin}{symbols}{"5E}
\DeclareMathSymbol{\lor}{\mathbin}{symbols}{"5F}
\DeclareMathSymbol{\cap}{\mathbin}{symbols}{"5C}
\DeclareMathSymbol{\cup}{\mathbin}{symbols}{"5B}
\DeclareMathSymbol{\ddagger}{\mathbin}{symbols}{"7A}
\DeclareMathSymbol{\dagger}{\mathbin}{symbols}{"79}
\DeclareMathSymbol{\sqcap}{\mathbin}{symbols}{"75}
\DeclareMathSymbol{\sqcup}{\mathbin}{symbols}{"74}
\DeclareMathSymbol{\uplus}{\mathbin}{symbols}{"5D}
\DeclareMathSymbol{\amalg}{\mathbin}{symbols}{"71}
\DeclareMathSymbol{\diamond}{\mathbin}{symbols}{"05}
\DeclareMathSymbol{\bullet}{\mathbin}{symbols}{"0F}
\DeclareMathSymbol{\wr}{\mathbin}{symbols}{"6F}
\DeclareMathSymbol{\div}{\mathbin}{symbols}{"04}
\DeclareMathSymbol{\odot}{\mathbin}{symbols}{"0C}
\DeclareMathSymbol{\oslash}{\mathbin}{symbols}{"0B}
\DeclareMathSymbol{\otimes}{\mathbin}{symbols}{"0A}
\DeclareMathSymbol{\ominus}{\mathbin}{symbols}{"09}

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As $\neq$ is robust we should not use \texttt{\let} to define \texttt{\ne} as then it would change if \texttt{\neq} changes.

\begin{verbatim}
\DeclareRobustCommand\neq{\not=}
\end{verbatim}

It would ok to use \texttt{\let} for those declared by \texttt{\DeclareMathSymbol} but for a cleaner interface we avoid it always (just in case the internals change).

\begin{verbatim}
\DeclareMathSymbol{\leq}{\mathrel}{symbols}{"14}
\DeclareMathSymbol{\geq}{\mathrel}{symbols}{"15}
\end{verbatim}

\textbf{Alias:}

\begin{verbatim}
% \let\le=\leq
% \let\ge=\geq
\end{verbatim}

\begin{verbatim}
\DeclareMathSymbol{\le}{\mathrel}{symbols}{"14}
\DeclareMathSymbol{\ge}{\mathrel}{symbols}{"15}
\end{verbatim}

\begin{verbatim}
\DeclareMathSymbol{\leq}{\mathrel}{symbols}{"14}
\DeclareMathSymbol{\geq}{\mathrel}{symbols}{"15}
\end{verbatim}

\textbf{Alias:}

\begin{verbatim}
% \let\owns=\ni
\end{verbatim}
\DeclareMathSymbol{\owns}{\mathrel}{symbols}{"33}
\DeclareMathSymbol{\gg}{\mathrel}{symbols}{"1D}
\DeclareMathSymbol{\ll}{\mathrel}{symbols}{"1C}
\DeclareMathSymbol{\not}{\mathrel}{symbols}{"36}
\DeclareMathSymbol{\leftrightarrows}{\mathrel}{symbols}{"24}
\DeclareMathSymbol{\leftarrow}{\mathrel}{symbols}{"20}
\DeclareMathSymbol{\rightarrow}{\mathrel}{symbols}{"21}

Alias:
% \let\gets=\leftarrow
% \let\to=\rightarrow
\DeclareMathSymbol{\gets}{\mathrel}{symbols}{"20}
\DeclareMathSymbol{\to}{\mathrel}{symbols}{"21}
\DeclareMathSymbol{\mapstochar}{\mathrel}{symbols}{"37}
\DeclareRobustCommand\mapsto{\mapstochar\rightarrow}
\DeclareMathSymbol{\sim}{\mathrel}{symbols}{"18}
\DeclareMathSymbol{\simeq}{\mathrel}{symbols}{"27}
\DeclareMathSymbol{\perp}{\mathrel}{symbols}{"3F}
\DeclareMathSymbol{\equiv}{\mathrel}{symbols}{"11}
\DeclareMathSymbol{\asymp}{\mathrel}{symbols}{"10}
\DeclareMathSymbol{\smile}{\mathrel}{letters}{"5E}
\DeclareMathSymbol{\frown}{\mathrel}{letters}{"5F}
\DeclareMathSymbol{\leftharpoonup}{\mathrel}{letters}{"28}
\DeclareMathSymbol{\leftharpoondown}{\mathrel}{letters}{"29}
\DeclareMathSymbol{\rightharpoonup}{\mathrel}{letters}{"2A}
\DeclareMathSymbol{\rightharpoondown}{\mathrel}{letters}{"2B}

Here cometh much profligate robustification of math constructs. Warning: some of these commands may become non-robust if an AMS package is loaded.

Further potential problems: some math font packages may make unfortunate assumptions about some of these definitions that are not true of the robust versions we need.

\DeclareRobustCommand
\cong{\mathrel{\mathpalette\@vereq\sim}} % congruence sign
\def\@vereq#1#2{\lower.5\p@\vbox{\lineskiplimit\maxdimen\lineskip-.5\p@
\ialign{$\m@th#1\hfil##\hfil$\crcr#2\crcr\=\crcr}}}
\DeclareRobustCommand
\notin{\mathrel{\m@th\mathpalette\c@ncel\in}}
\def\c@ncel#1#2{\m@th\ooalign{$\hfil#1\mkern1mu/\hfil$\crcr$#1#2$}}
\DeclareRobustCommand
\rightleftharpoons{\mathrel{\mathpalette\rlh@{}}}
\def\rlh@#1{\vcenter{\m@th\hbox{$#1\rightharpoonup$}$#1\leftharpoondown$}}
\DeclareRobustCommand
\doteq{\buildrel\textstyle.\over=}
\joinrel{\mathrel{\mkern-3mu}}
\relbar{\mathrel{\smash{-}}} % \smash, because - has the same height as +
In contrast to \texttt{plain.tex} \textbackslash Relbar got braces around the equal sign to guard against it being “math active” expanding to \texttt{\futurelet}... This might be the case when packages are implementing shorthands for math, e.g. \texttt{\Rightarrow} meaning \texttt{\rightarrow}. It would actually be better not to use = in such definitions but instead define something like \texttt{\mathequalsign} and use this. However we can’t do this now as it would break other math layouts where characters are in different places (since those wouldn’t know about the need for a new command name).

\begin{verbatim}
\DeclareRobustCommand \Relbar{\mathrel{=}}
\DeclareMathSymbol{\lhook}{\mathrel}{letters}{"2C}
\DeclareRobustCommand\hookrightarrow{\lhook\joinrel\rightarrow}
\DeclareMathSymbol{\rhook}{\mathrel}{letters}{"2D}
\DeclareRobustCommand\hookleftarrow{\leftarrow\joinrel\rhook}
\DeclareRobustCommand\bowtie{\mathrel\triangleright\joinrel\mathrel\triangleleft}
\DeclareRobustCommand\models{\mathrel{|}\joinrel\Relbar}
\DeclareRobustCommand\Longrightarrow{\Relbar\joinrel\Rightarrow}
\end{verbatim}

LaTeX Change: \texttt{\longrightarrow} and \texttt{\longleftarrow} redefined to make then robust.

\begin{verbatim}
\DeclareRobustCommand\longrightarrow{\relbar\joinrel\rightarrow}
\DeclareRobustCommand\longleftarrow{\leftarrow\joinrel\relbar}
\end{verbatim}

6.4.7 Punctuation symbols

This is commented out, since \texttt{\ldots} is now defined in \texttt{ltoutenc.dtx}.

\begin{verbatim}
\%\def\@ldots{\mathinner{\ldotp\ldotp\ldotp}}
\%\DeclareRobustCommand\ldots{\relax\ifmmode\@ldots\else\mbox{$\m@th\@ldots\,$}\fi}
\end{verbatim}

\begin{verbatim}
\DeclareMathSymbol{\ldotp}{\mathpunct}{letters}{"3A}
\DeclareMathSymbol{\cdotp}{\mathpunct}{symbols}{"01}
\DeclareMathSymbol{\colon}{\mathpunct}{operators}{"3A}
\end{verbatim}

This is commented out, since \texttt{\ldots} is now defined in \texttt{ltoutenc.dtx}.

\begin{verbatim}
\%\DeclareRobustCommand\ldots{\relax\ifmmode\@ldots\else\mbox{$\m@th\@ldots\,$}\fi}
\end{verbatim}

\begin{verbatim}
\%\DeclareRobustCommand\ldots{\relax\ifmmode\@ldots\else\mbox{$\m@th\@ldots\,$}\fi}
\end{verbatim}

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6.4.8 Math accents

\DeclareMathAccent{\acute}{\mathalpha}{operators}{"13}
\DeclareMathAccent{\grave}{\mathalpha}{operators}{"12}
\DeclareMathAccent{\ddot}{\mathalpha}{operators}{"7F}
\DeclareMathAccent{\tilde}{\mathalpha}{operators}{"7E}
\DeclareMathAccent{\bar}{\mathalpha}{operators}{"16}
\DeclareMathAccent{\breve}{\mathalpha}{operators}{"15}
\DeclareMathAccent{\check}{\mathalpha}{operators}{"14}
\DeclareMathAccent{\hat}{\mathalpha}{operators}{"5E}
\DeclareMathAccent{\vec}{\mathord}{letters}{"7E}
\DeclareMathAccent{\dot}{\mathalpha}{operators}{"5F}
\DeclareMathAccent{\widetilde}{\mathord}{largesymbols}{"65}
\DeclareMathAccent{\widehat}{\mathord}{largesymbols}{"62}

For some reason plain \TeX{} never bothered to provide a ring accent in math (although it is available in the fonts), but since we got a request for it here we go:

\DeclareMathAccent{\mathring}{\mathalpha}{operators}{"17}

6.4.9 Radicals

\DeclareMathRadical{\sqrtsign}{symbols}{"70}{largesymbols}{"70}

6.4.10 Over and under something, etc

\DeclareRobustCommand{\overrightarrow}[1]{\vbox{\m@th\\ialign{##\crcr\rightarrowfill\crcr\\noalign{\kern-\p@\nointerlineskip}\\hfil\m@th$\hfil$\displaystyle{#1}\hfil$\crcr}}}
\DeclareRobustCommand{\overleftarrow}[1]{\vbox{\m@th\\ialign{##\crcr\leftarrowfill\crcr\\noalign{\kern-\p@\nointerlineskip}\\hfil\m@th$\hfil$\displaystyle{#1}\hfil$\crcr}}}
\DeclareRobustCommand{\overbrace}[1]{\mathop{\vbox{\\ialign{\noalign{\kern3\p@}\\\downbracefill\\noalign{\kern3\p@\nointerlineskip}\\hfil\m@th$\hfil$\displaystyle{#1}\hfil$\crcr}}}}
\DeclareRobustCommand{\underbrace}[1]{\mathop{\vtop{\\ialign{\\hfil\m@th$\hfil$\displaystyle{#1}\hfil$\\noalign{\kern3\p@\nointerlineskip}\\upbracefill\\noalign{\kern3\p@}}}}}

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\bracelu\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\bracerd$}
\DeclareRobustCommand\upbracefill{$\m@th \setbox\z@\hbox{$\braceld$}%
\bracelu\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\bracerd
\braceld\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\braceru$}

6.4.11
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Delimiters

\DeclareMathDelimiter{\lmoustache}
% top from (, bottom from )
{\mathopen}{largesymbols}{"7A}{largesymbols}{"40}
\DeclareMathDelimiter{\rmoustache}
% top from ), bottom from (
{\mathclose}{largesymbols}{"7B}{largesymbols}{"41}
\DeclareMathDelimiter{\arrowvert}
% arrow without arrowheads
{\mathord}{symbols}{"6A}{largesymbols}{"3C}
\DeclareMathDelimiter{\Arrowvert}
% double arrow without arrowheads
{\mathord}{symbols}{"6B}{largesymbols}{"3D}
\DeclareMathDelimiter{\Vert}
{\mathord}{symbols}{"6B}{largesymbols}{"0D}

\DeclareMathDelimiter produces a command that is robust (with an internal macro
containing the payload) so we should not use \let for making an alias
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%\let\|=\Vert
\DeclareMathDelimiter{\|}
{\mathord}{symbols}{"6B}{largesymbols}{"0D}
\DeclareMathDelimiter{\vert}
{\mathord}{symbols}{"6A}{largesymbols}{"0C}
\DeclareMathDelimiter{\uparrow}
{\mathrel}{symbols}{"22}{largesymbols}{"78}
\DeclareMathDelimiter{\downarrow}
{\mathrel}{symbols}{"23}{largesymbols}{"79}
\DeclareMathDelimiter{\updownarrow}
{\mathrel}{symbols}{"6C}{largesymbols}{"3F}
\DeclareMathDelimiter{\Uparrow}
{\mathrel}{symbols}{"2A}{largesymbols}{"7E}
\DeclareMathDelimiter{\Downarrow}
{\mathrel}{symbols}{"2B}{largesymbols}{"7F}
\DeclareMathDelimiter{\Updownarrow}
{\mathrel}{symbols}{"6D}{largesymbols}{"77}
\DeclareMathDelimiter{\backslash}
% for double coset G\backslash H
{\mathord}{symbols}{"6E}{largesymbols}{"0F}
\DeclareMathDelimiter{\rangle}
{\mathclose}{symbols}{"69}{largesymbols}{"0B}
\DeclareMathDelimiter{\langle}
{\mathopen}{symbols}{"68}{largesymbols}{"0A}
\DeclareMathDelimiter{\rbrace}
{\mathclose}{symbols}{"67}{largesymbols}{"09}
\DeclareMathDelimiter{\lbrace}
{\mathopen}{symbols}{"66}{largesymbols}{"08}
\DeclareMathDelimiter{\rceil}
{\mathclose}{symbols}{"65}{largesymbols}{"07}
\DeclareMathDelimiter{\lceil}
{\mathopen}{symbols}{"64}{largesymbols}{"06}
\DeclareMathDelimiter{\rfloor}
{\mathclose}{symbols}{"63}{largesymbols}{"05}
\DeclareMathDelimiter{\lfloor}
{\mathopen}{symbols}{"62}{largesymbols}{"04}

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There are three plain \TeX delimiters which are not fully supported by NFSS, since they partly point into a bold \texttt{cmm} font. Allocating a full symbol font, just to have three delimiters seems a bit too much given the limited space available. For this reason only the extensible sizes are supported. If this is not desired one can use, without losing portability, define \texttt{\mathbf} and \texttt{\mathtt} as font symbol alphabet (setting up \texttt{cmm/bx/n} and \texttt{cmtt/m/n} as symbol fonts first) and modify the delimiter declarations to point with their small variant to those symbol fonts. (This is done in \texttt{oldlfont.dtx} so look there for examples.)

\begin{verbatim}
\DeclareMathDelimiter{\lgroup} % extensible ( with sharper tips
{\mathopen}{largesymbols}{"3A}{largesymbols}{"3A}
\DeclareMathDelimiter{\rgroup} % extensible ) with sharper tips
{\mathclose}{largesymbols}{"3B}{largesymbols}{"3B}
\DeclareMathDelimiter{\bracevert} % the vertical bar that extends braces
{\mathord}{largesymbols}{"3E}{largesymbols}{"3E}
\end{verbatim}

(End definition for \texttt{\lgroup}, \texttt{\rgroup}, and \texttt{\bracevert}.)

\section{Math versions of text commands}

The \texttt{\mathunderscore} here is really a text definition, so it has been put back into \texttt{ltoutenc.dtx} (by Chris, 30/04/97) and should be removed from here. These symbols are the math versions of text commands such as \texttt{\P}, \texttt{\$}, etc.

\begin{verbatim}
\DeclareMathSymbol{\mathparagraph}{\mathord}{symbols}{"7B}
\DeclareMathSymbol{\mathsection}{\mathord}{symbols}{"78}
\DeclareMathSymbol{\mathdollar}{\mathord}{operators}{"24}
\DeclareRobustCommand{\mathsterling}{\mathit{\mathchar"7024}}
\DeclareRobustCommand{\mathunderscore}{\kern.06em\vbox{\hrule\@width.3em}}
\end{verbatim}

(End definition for \texttt{\mathparagraph} and others.)

\section{Other special functions and parameters}

\subsection{Biggggg}

\begin{verbatim}
\DeclareRobustCommand{\bigg}[1]{\leavevmode@ifvmode{\hbox{$\left#1\vbox to8.5\p@{\right.\n@space}$}}}
\DeclareRobustCommand{\Bigg}[1]{\leavevmode@ifvmode{\hbox{$\left#1\vbox to11.5\p@{\right.\n@space}$}}}
\end{verbatim}

(End definition for \texttt{\mathellipsis}.)
6.6.2 The log-like functions

The \texttt{\textbackslash operator@font} determines the symbol font used for log-like functions.

\begin{verbatim}
\def\operator@font{\mathgroup\symoperators}
\end{verbatim}

(End definition for \operator@font.)

6.6.3 Parameters

\begin{verbatim}
\thinnmuskip=3mu
\medmuskip=4mu plus 2mu minus 4mu
\thickmuskip=5mu plus 5mu
\end{verbatim}

This finishes the low-level setup in \texttt{fontmath.ltx}.

(/math)

7 Default cfg files

We provide default \texttt{cfg} files here to ensure that on installations that search large file
trees we do not pick up some strange customisation files from somewhere.

\begin{verbatim}
% Load the standard setup:
% % Small changes could go here; see documentation in cfgguide.tex for
% % allowed modifications.
% % In particular it is not allowed to misuse this configuration file
% % to modify internal LaTeX commands!
% % If you use this file as the basis for configuration please change
% % the \ProvidesFile lines to clearly identify your modification, e.g.,
% \ProvidesFile{fonttext.cfg}[2001/06/01]
\end{verbatim}

File B: fontdef.dtx Date: ? Version ?
%%
(\cfgtext | \cfgmath | \cfgprel)
1 Overview

This file contains a number of possible settings for preloading fonts during installation of NFSS2 (which is used by \LaTeX\). It will be used to generate the following files:

- `preload.min`: minimal subset of fonts necessary to run NFSS2
- `preload.ori`: preload of CM fonts similar to the old `lfonts.tex`
- `preload.ltx`: The standard selection of preloads
- `cmpreloa.xpt`: preload of CM fonts for 10pt document size
- `cmpreloa.xip`: preload of CM fonts for 11pt document size
- `cmpreloa.xii`: preload of CM fonts for 12pt document size
- `dcpreloa.xpt`: preload of DC fonts for 10pt size
- `dcpreloa.xip`: preload of DC fonts for 11pt size
- `dcpreloa.xii`: preload of DC fonts for 12pt size

These files are for installations that make use of Computer Modern fonts either old encoding (OT1) or Cork encoding (T1). The Computer Modern fonts with Cork encoding are known as DC-fonts.

Most important is `preload.ltx` which is used during format generation. You are not allowed to change this file.

2 Customization

You can customize the preloaded fonts in your \LaTeX\ system by installing a file with the name `preload.cfg`. If this file exists it will be used in place of the system file `preload.ltx`. You can, for example, copy one of the files mentioned above (that can be generated from this source) to `preload.cfg`.

Or you can define completely other preloads. In that case start from `preload.min` since that contains the fonts that have to be preloaded by *all* \LaTeX\ systems.

Avoid using `preload.ori`, it will load so many fonts that on most installations it is nearly impossible to load other font families afterwards. This file is only generated to show what fonts have been preloaded by \LaTeX\ 2.09.

If you normally use other fonts than Computer Modern `preload.min` might be best.

**Warning:** If you preload fonts with encodings other than the normally supported encodings you have to declare that encoding in a `fontdef.cfg` configuration file (see the documentation in the file `fontdef.dtx`). Adding an extra encoding to the format might produce non-portable documents, thus this should be avoided if possible.

3 Module switches for the \texttt{DOCSTRIP} program

The \texttt{DOCSTRIP} will generate the above file from this source using the following module directives:
A typical \texttt{docstrip} command file would then have entries like:
\begin{verbatim}
generateFile{preload.min}{t}{\from{preload.dtx}{preload,min}}
\end{verbatim}
for generating preload files.

\section{A driver for this document}

The next bit of code contains the documentation driver file for \TeX, i.e., the file that will produce the documentation you are currently reading. It will be extracted from this file by the \texttt{docstrip} program.

\begin{verbatim}
\langle{*driver}\rangle
\documentclass{ltxdoc}
%\OnlyDescription % comment out for implementation details
\begin{document}
\DocInput{preload.dtx}
\end{document}
\langle{/driver}\rangle
\end{verbatim}

\section{The code}

We begin by loading the math extension font (cmex10) and the \LaTeX\ line and circle fonts. It is necessary to do this explicitly since these are used by the \LaTeX\ format. Since the internal font name contains / characters and digits we construct the name via \texttt{\csname}. These are the only fonts (!) that must be loaded in this file.

All \texttt{\DeclarePreloadSizes} can be removed or others can be added, they only influence the processing speed.

\begin{verbatim}
\expandafter\font\csname OMX/cmex/m/n/10\endcsname=cmex10\relax
\font\tenln =line10 \font\tenlnw =linew10\relax
\font\tencirc=lcircle10 \font\tencircw=lcirclew10\relax
\end{verbatim}

The above fonts should not be touched but anything below this point here in the preload suggestions can be modified without any problems.

\begin{verbatim}
\langle{-tex}\rangle%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\langle{-tex}\rangle% Start any modification below this point **
\langle{-tex}\rangle%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\langle{-tex}\rangle
\%\%
\% Computer Modern Roman:
\%----------------------------------------
\end{verbatim}

File C: \texttt{preload.dtx} Date: 2021/10/04 Version v2.1g
\DeclarePreloadSizes{OT1}{cmr}{m}{n} {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74,24.88}
\DeclarePreloadSizes{OT1}{cmr}{bx}{n}{9,10,10.95,12,14.4,17.28}
\DeclarePreloadSizes{OT1}{cmr}{m}{sl}{10,10.95,12}
\DeclarePreloadSizes{OT1}{cmr}{m}{it}{7,8,9,10,10.95,12}
\DeclarePreloadSizes{OT1}{cmss}{m}{n} {5,6,7,8,9,10,10.95,12}
\DeclarePreloadSizes{T1}{cmr}{m}{n} {5,7,10}
\DeclarePreloadSizes{T1}{cmss}{m}{n} {5,7,10}
\DeclarePreloadSizes{T1}{cmtt}{m}{n} {9,10,10.95,12}
\DeclarePreloadSizes{T1}{cmss}{m}{n} {9,10,10.95,12}
\DeclarePreloadSizes{T1}{cmtt}{m}{n} {9,10,10.95,12}
\DeclarePreloadSizes{OML}{cmm}{m}{it} {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74}
\DeclarePreloadSizes{OMS}{cmsy}{m}{n} {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74}

\ DeclarePreloadSizes{OML}{cmm}{m}{it} {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74}
\ DeclarePreloadSizes{OMS}{cmsy}{m}{n} {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74}

The math fonts are the same for both DC and CM fonts. So far there isn’t an agreed
on standard.
File D
ltfntcmd.dtx

Abstract

The commands defined in this file ltfntcmd are part of the kernel code for \LaTeX\2e/NFSS2. It is also meant to serve as documentation for package writers since it demonstrates how to define high-level font changing commands using a small number of creator functions.

1 Introduction

Font changes such as \texttt{\bfseries}, \texttt{sffamily}, etc. are declarations; this means that their scope is delimited by the grouping structure, either by the next \texttt{end} of some environment or by explicitly using a group, e.g., writing something like {\texttt{\bfseries...}} in the source. If you make the mistake of writing \texttt{\bfseries...} (thinking of \texttt{\bfseries} as a command with one argument) then the result is rather striking.

Font declarations are an artifact of the \TeX\ system and for several reasons it is better to avoid them on the user level whenever possible. In \LaTeX\3 they will probably all be replaced by environments and by font commands taking one argument.

This file defines a creator function for such declarative font switches. This function creates commands which can be used in both math and text.

This file also defines a number of high-level commands (all starting with \texttt{\text..}) that have one argument and typeset this argument in the requested way. Thus these commands are for typesetting short pieces of text in a specific family, series or shape. These are all produced as examples of the use of a creator function which is itself also defined in this file.

Table 1 shows all these high-level commands in action. A further advantage of using these commands is that they automatically take care of any necessary italic correction on either side of their argument.

Thus, when using such commands, one does not have to worry about forgetting the italic correction when changing fonts. Only in very few situations is this additional space wrong but, for example, most typographers recommend omitting the italic correction if a small punctuation character, like a comma, directly follows the font change. Since the amount of correction required is partly a matter of taste, you can define in what situations the italic correction should be suppressed. This is done by putting the characters that should cancel a preceding italic correction in the list \texttt{\nocorrlist}. The default definition for this list is produced by the following.

\texttt{\newcommand \nocorrlist {,.}}

It is best to declare the most often used characters first, because this will make the processing slightly faster. For example,

\texttt{\emph{When using the \texttt{\NFSS} high-level commands, the \texttt{\emph{proper}} use of italic corrections is automatically taken care of}. Only}

\footnote{Any package that changes the \texttt{\catcode} of a character inside \texttt{\nocorrlist} must then explicitly reset the list. Otherwise the changed character will no longer be recognized by the suppression algorithm.}
Table 1: Font-change commands with arguments

The font change commands provided here all start with \text... to emphasize that they are for use in normal text and to be easily memorable. They automatically take care of any necessary italic correction on either side of the argument.

\emph{sometimes} one has to help \LaTeX{} by adding a \verb|\nocorr| command.

which results in:

When using the NFSS high-level commands, the proper use of italic corrections is automatically taken care of. Only sometimes one has to help \LaTeX{} by adding a \verb|\nocorr| command.

In contrast, the use of the declaration forms is often more appropriate when you define your own commands or environments.

\begin{verbatim}
\newenvironment{bfitemize}{\begin{itemize}\normalfont\bfseries}{\end{itemize}}
\begin{bfitemize}
  \item This environment produces boldface items.
  \item It is defined in terms of \LaTeX’s\ texttt{itemize} environment and NFSS
        declarations.
\end{bfitemize}
\end{verbatim}

This gives:

\begin{itemize}
  \item This environment produces boldface items.
  \item It is defined in terms of \LaTeX’s\ itemize environment and NFSS declarations.
\end{itemize}

In addition to global customization of when to insert the italic correction, it is of course sometimes necessary to explicitly insert one with \verb|\slash|.
It is also possible to suppress the italic correction in individual instances. For this, the command \nocorr is provided.

The \nocorr must appear as the first or last token inside the braces of the argument of the \text\ldots commands, at that end of the text where you wish to suppress the italic correction.

It is worth pointing out here that inserting a \slash in places where it can have no function (i.e. anywhere except immediately after a slanted letter) is not an error—it will just be silently ignored. Unfortunately this is not true if the redefinition of \slash in amstex.sty is used as this version can cause space to be removed immediately before the \slash.

\section{The implementation}

\texttt{\DeclareTextFontCommand} This is the creator function for \text\ldots commands. It gives a warning if \texttt{foo} or \texttt{fragfoo} is already defined.

In math mode it simply puts the font declaration and text into a box (possibly an automagically sized one).

Otherwise it first scans the text to see where \nocorr occurs within it. This sets the \check@ic commands to do what is necessary concerning the italic correction at both ends.

The algorithm for deciding whether to put in an italic correction is not very subtle: one is added whenever the newly current font is not itself positively sloped, unless the next token is a character in the ‘nocorr’ list. At the end of the text this is done after closing the group so as to check the ‘outer font’. Note that this will often result in adding an italic correction token after a character in an unsloped font; we believe (in early 2003) that this is perhaps inefficient but not dangerous.

It also now checks for empty contents of the text command and optimizes this case. Some care is also taken to check that doing dangerous things in vertical mode is avoided.

The italic correction token is added to the horizontal list before (in the list) an immediately preceding non-zero glob of glue (skip) and any non-zero penalty preceding that since, in the typical case, this puts it immediately after the last character in the preceding word.

Note that it is necessary to put in the \texttt{\aftergroup\maybe@ic} at the end of the group so that it comes after any other aftergroup tokens and immediately before the following tokens. It is also necessary to remove the \texttt{\fi} from the token list before the group ends; this is done by adding an \texttt{\expandafter} just before the closing brace.

\begin{verbatim}
\def \DeclareTextFontCommand #1#2{\
  \DeclareRobustCommand#1[1]{\%
    \ifmmode
      \nfsa@text{#2##1}\%
    \else
      \hmode@bgroup
      \text@command{##1}\%
      #2\check@icl ##1\check@icr
      \expandafter
    \hmode@egroup
    \aftergroup\maybe@ic
    \if\fi
    \fi
  }%
}
\end{verbatim}
Now we define the \text{family} commands in terms of the above; \texttt{ttt} does not look very nice!

\begin{verbatim}
\DeclareTextFontCommand{\textrm}{\rmfamily}
\DeclareTextFontCommand{\textsf}{\sffamily}
\DeclareTextFontCommand{\texttt}{\ttfamily}
\DeclareTextFontCommand{\textnormal}{\normalfont}
\end{verbatim}

For the series attribute:

\begin{verbatim}
\DeclareTextFontCommand{\textbf}{\bfseries}
\DeclareTextFontCommand{\textmd}{\mdseries}
\end{verbatim}

And for the shapes:

\begin{verbatim}
\DeclareTextFontCommand{\textit}{\itshape}
\DeclareTextFontCommand{\textsl}{\slshape}
\DeclareTextFontCommand{\textsc}{\scshape}
\DeclareTextFontCommand{\textup}{\upshape}
\end{verbatim}

Finally we have the \textit{em} font change declaration of \LaTeX. The corresponding definition with argument is

\begin{verbatim}
\DeclareTextFontCommand{\emph}{\em}
\end{verbatim}

This is just a label, so it does nothing; it should also be unexpandable.

\let\nocorr\relax
We define these defaults in case some error causes them to be expanded at the wrong time.

\let \check@icl \@empty
\let \check@icr \@empty

This checks for a \nocorr as the first token in its argument and also for one in any other position not protected within braces (the latter is treated as if it were at the end of the argument).

Is this the correct action in the ‘empty’ case? It is efficient but typographically it is, strictly, incorrect!

\text@command \check@nocorr@

The two checks are initialised here to their values in the normal case.

\let \check@icl \maybe@ic
\def \check@icr {\ifvmode \else \aftergroup \maybe@ic \fi}
\def \reserved@a {\nocorr}
\def \reserved@b {#1}
\def \reserved@c {#3}
\ifx \reserved@a \reserved@b
\ifx \reserved@c \@empty
\let \check@icl \@empty
\let \check@icr \@empty
\else
\check@nocorr@ #1\nocorr\@nil
\fi
\fi

In this case there is a \nocorr at the start but not at the end, so \check@icl should be empty.

\let \check@icl \@empty
\else

Otherwise there is a \nocorr both at the start and elsewhere, so no italic corrections should be added.

\let \check@icl \@empty
\let \check@icr \@empty
\fi
In this case there is no \texttt{\nocorr} anywhere, so we need to check for an italic correction at both the beginning and the end. This has been set up as the default so no code is needed here.

In this case there is no \texttt{\nocorr} at the start but there is one elsewhere, so no \texttt{\aftergroup} is needed.

\let \check@icr \@empty
\fi
\fi
\}

\texttt{\ifmaybe@ic} Switch used solely within \texttt{\maybe@ic} not interfering with other switches.
\newif\ifmaybe@ic
\texttt{\maybe@ic} \texttt{\maybe@ic@} These macros implement the italic correction.
\def \maybe@ic {\futurelet\@let@token\maybe@ic@}
\def \maybe@ic@ {%
We first check to see if the current font is positively sloped. (But do not forget the message Rainer sent about an upright font with non-zero slope! Or is this an urban myth?) It has been suggested that this should test against a small positive value, but what?
\ifdim \fontdimen\@ne\font>\z@%
\else
\maybe@ictrue
\fi

It would be possible, but probably not worthwhile, to continue the forward scan beyond any closing braces.
\expandafter\@tfor\expandafter\reserved@a\expandafter=%\nocorrlist
We have to hide the \texttt{\@let@token} in the macro \texttt{\t@st@ic} rather than testing it directly in the loop since it might be \texttt{\let} to a \texttt{\fi} or \texttt{\else}, which would result in chaos.
\do \t@st@ic

Frank thinks that the next bit is inefficient if done after the second change. Chris thinks that most all of this is inefficient for the commonest cases: but that is the price of a cleverer algorithm. It is certainly needed to deal with the use of \texttt{\nolinebreak}.
\ifmaybe@ic \sw@slant \fi
\fi
}

\texttt{\ifmaybe@ic} \texttt{\maybe@ic} \texttt{\maybe@ic@}
The next token in the input stream is stored in \@let\@token via a \let, the current token from \nocorrlist is stored via \def in \reserved@a. To compare them we have to fiddle around a bit.

If the only things to check were characters then this could be done via an \if thus their catcodes would not matter; but this will not work whilst \futurelet is used above.

\def \t@st@ic {%
\expandafter\let\expandafter\reserved@b\expandafter=\reserved@a\relax
\ifx\reserved@b\@let@token
If they are the same we record the fact and jump out of the loop.
\maybe@cfalse
\@break@tfor
\fi
}

(End definition for \t@st@ic.)

\sw@slant

The definition of the mysterious \sw@slant command is as follows.

\def \sw@slant {%
It is surely correct to put in an italic correction when there is no skip. If the last thing on the list is actually a zero skip (including things whose dimension part is zero, such as \hfill), or anything other than a character, then the italic correction will have no effect.

In order to work correctly with unbreakable spaces from - (and other common forms of line-breaking control) we also move back across a penalty before the glue.

\ifdim \lastskip=\z@ \fix@penalty
\else
\skip@ \lastskip
\unskip
\fix@penalty
\hskip \skip@
\fi
}

The above code means: “If there is a non-zero space just before the current position (\ifdim...) save the amount of that space (\skip@\lastskip), remove it (\unskip), then do a similar thing if there is a penalty just before the skip, and finally put the space back in.”

Since zero glue cannot be distinguished in this context from no glue, we dare not put in an \hskip in this case as this may produce an unwanted breakpoint. This is not satisfactory.

The penalty before the glue is handled similarly, with the same caveats concerning the zero case. Is this the first recorded use of \unpenalty in standard \LaTeX code?

\def \fix@penalty {%
\ifnum \lastpenalty=\z@ \@@italiccorr
\else
\count@ \lastpenalty
\unpenalty
\@@italiccorr

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This holds the list of characters that should prevent italic correction. They should be ordered by decreasing frequency of use. If any such character is made active later on one needs to redefine the list so that the active character becomes part of it.

\def \nocorrlist {,.}

This command will by default behave like a \LaTeX \verb+mbox+ but may be redefined by packages such as \verb+amstext.sty+ to be a bit cleverer.

\iffx \nfss@text\@undefined
\def \nfss@text {\leavevmode\hbox}
\fi

This is the function used to create declarative font-changing commands that can also be used to change alphabets in math-mode.

Usage: \texttt{\DeclareOldFontCommand \fn{⟨font-change decls⟩} ⟨math-alphabet⟩}

Here \texttt{\fn} is the font-declaration command being defined, ⟨font-change decls⟩ is the declaration it will expand to in text-mode, and ⟨math-alphabet⟩ is the (single) math alphabet specifier which is to be used in math-mode.

It does not care whether the command being defined already exists but it does give a warning if it redefines anything.

Here are some typical examples of its use in conjunction with more basic NFSS2 font commands.

\texttt{\DeclareOldFontCommand{\rm}{\normalfont\rmfamily}{\mathrm}}
\texttt{\DeclareOldFontCommand{\sf}{\normalfont\sffamily}{\mathsf}}
\texttt{\DeclareOldFontCommand{\tt}{\normalfont\ttfamily}{\mathtt}}

These two commands actually do the necessary tests and declarative font- or alphabet-changing.

\def \@fontswitch #1#2#3{%
\DeclareRobustCommand \#1{\@fontswitch \#2\{\#3\}}%
}

\texttt{\@math@egroup \@math@egroup}
We need to have a \texttt{\relax} in the following line in case the \texttt{#2} is something like \texttt{\mathsf{f}}
grabbing the next token as an argument. For this reason the code also uses explicit
arguments again (see pr/1275).

\begin{verbatim}
#2\relax
\else
  #1%
\fi
\let \@@math@bgroup \math@bgroup
\let \@@math@egroup \math@egroup
\end{verbatim}

(End definition for \texttt{@fontswitch}, \texttt{\@@math@egroup}, and \texttt{\@@math@egroup}.)

These commands are available only in the preamble.

\begin{verbatim}
\onlypreamble \DeclareTextFontCommand
\onlypreamble \DeclareOldFontCommand
\end{verbatim}

3 Initialization

\texttt{\normalsize} This is defined to produce an error.

\begin{verbatim}
\def\normalsize{%
  \@latex@error {The font size command \protect\normalsize\space
    is not defined:\MessageBreak
    there is probably something wrong with\MessageBreak
    the class file}@eha
}
\end{verbatim}

(End definition for \texttt{\normalsize}.)
This file contains the implementation for accessing the glyphs provided by the TS1 encoding (Text Companion Encoding). This is now offered as part of the kernel and so the textcomp package which used to provide the definitions is now mainly needed for compatibility reasons (and doesn’t do much any more).

\DeclareRobustCommand\legacyoldstylenums[1]{%
\begingroup
provide spacing using the interword space of the current font.
}\spaceskip\fontdimen\tw@\font
Then switch to the math italic font. We don’t change the current value of f@series which means that you can use bold numerals if bfseries is in force. As family we use \rmdefault which means that this only works if there exist an OML encoded version of that font or rather a corresponding .fd file (which is the case for standard \TeX fonts even though they only contain substitutions).
\usefont{OML}{\rmdefault}{f@series}{it}%
\mathgroup\symletters #1%
\endgroup
}

And here is the improved one that adjusts depending on surroundings.
\DeclareRobustCommand\oldstylenums[1]{%
\begingroup
if in math mode
\mathgroup\symletters #1%
\else
The \texttt{CheckEncodingSubset} is discussed below.
\CheckEncodingSubset\@use@text@encoding{TS1}\tc@oldstylesubst2{{#1}}%
\fi
\endgroup
}

The helper to select the substitution if needed.
\def\tc@oldstylesubst#1{%\tc@errorwarn
\{Oldstyle digits unavailable for family f@family.\MessageBreak Default oldstyle digits used instead\}@eha
\bgroup
\expand@font@defaults
\endgroup
}
The substitution defaults are provided in the file `fonttext.ltx`.

\begin{verbatim}
\ifx\f@family\rmdef\ult
  \fontfamily\rmsubstdefault
\else\ifx\f@family\sfdef\ult
  \fontfamily\sfsubstdefault
\else\ifx\f@family\ttdef\ult
  \fontfamily\ttsubstdefault
\else
  \fontfamily\textcompsubstdefault
\fi\fi\fi
\fontencoding{TS1}\selectfont#1%
\end{verbatim}

(End definition for \oldstylenums and \legacyoldstylenums.)

\textcompsubstdefault Here is the default for the “unknown” case:
\def\textcompsubstdefault{\rmsubstdefault}

(End definition for \textcompsubstdefault.)

\DeclareEncodingSubset The declaration takes 3 mandatory arguments: an encoding for which a subsetting is wanted (currently always TS1, and most likely forever), the font family for which we declare the subset and finally the subset number (between 0 (all of the encoding is supported) and 9 many glyphs are missing.

For TS1 the numbers have been chosen in a way that most fonts can be fairly correctly categorized, but the default settings are always conservative, that is they may claim that less glyphs are supported than there actually are.

As these days many font families are set up to end in -LF (lining figures), -OsF (oldstyle figures), etc. the declaration supports a shortcut: if the font family name ends in -* then the star gets replaced by these common ending, e.g.,
\begin{verbatim}
\DeclareEncodingSubset{TS1}{Alegreya-*}{2}
\end{verbatim}

is the same as writing
\begin{verbatim}
\DeclareEncodingSubset{TS1}{Alegreya-LF}{2}
\DeclareEncodingSubset{TS1}{Alegreya-OsF}{2}
\DeclareEncodingSubset{TS1}{Alegreya-TLF}{2}
\DeclareEncodingSubset{TS1}{Alegreya-TosF}{2}
\end{verbatim}

If only some are needed then one can define them individually but in many cases all four are wanted, hence the shortcut.

The coding of the declaration has no error checking as it is mostly for internal use.
\begin{verbatim}
\def\DeclareEncodingSubset#1#2{%
  \DeclareEncodingSubset@aux#1#2\DeclareEncodingSubset@aux
}
\end{verbatim}
if #3 is empty then there was no star, otherwise we define all four variants.

\expandafter\ifx\expandafter X\detokenize{#3}X%
  \DeclareEncodingSubset{#1}{#2}{#4}\
\else
  \DeclareEncodingSubset{#1}{#2LF}{#4}\
  \DeclareEncodingSubset{#1}{#2TLF}{#4}\
  \DeclareEncodingSubset{#1}{#2OsF}{#4}\
  \DeclareEncodingSubset{#1}{#20sF}{#4}\
\fi
}

The subset info is stored in a command with the name \family:subset so if that already exists we change otherwise declare a subset.

\def\DeclareEncodingSubset#1#2#3{%
  \ifundefined{#1:#2}%
    {\font@info{Setting #2 sub-encoding to #1/#3}}%
    {\font@info{Changing #2 sub-encoding to #1/#3}}%
  \@namedef{#1:#2}{#3}\
}

Any reason to allow those in the middle of documents?

\onlypreamble\DeclareEncodingSubset\onlypreamble\DeclareEncodingSubset@aux
\onlypreamble\DeclareEncodingSubset (End definition for \DeclareEncodingSubset.)

\CheckEncodingSubset  The command \CheckEncodingSubset will check if the current font family has the right encoding subset to typeset a certain command. It takes five arguments as follows: first argument is either \UseTextSymbol, \UseTextAccent depending on whether or not the symbol is a text symbol or a text accent.

The second argument is the encoding from which this symbol should be fetched.

The third argument is either a fake accessor command or an error message. the code in that argument (if ever executed) receives two arguments: #2 and #5 of \CheckEncodingSubset.

Argument four is the subset encoding id to test against: if this value is higher than the subset id of the current font family then we typeset the symbol, i.e., execute #1{#2}#5 otherwise it runs #3#5, e.g., to produce an error message or fake the glyph somehow.

Argument five is the symbol or accent command that is being checked.

For usage examples see definitions below.

\def\CheckEncodingSubset#1#2#3#4#5{%
  \ifnum #4>%
    \ifnum #4>\relax
      \expandafter\csname #2:\f@family\endcsname\relax
      0\csname #2:\endcsname
    \else
      \csname #2:\f@family\endcsname
    \fi
    \relax
  \else
    \expandafter@firstoftwo
  \fi
  \expandafter@secondoftwo
  \fi
  \{#1(#2)}(#3)\%
  \#5%
}

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To set up the glyphs for the subsets we need a number of helpers.

```latex
\tc@errorwarn
```

To we produce errors, warnings, or only info in the transcripts if glyphs require substitutions? By default it is “info” only. With the `textcomp` package that can be changed.

```latex
76 \def\tc@errorwarn#1#2{\@latex@info{#1}}
```

```latex
\tc@subst
```

```
77 \def\tc@subst#1{%
78 \tc@errorwarn
79 \{Symbol \string#1 not provided by\MessageBreak
80 font family \f@family\space
81 in TS1 encoding.\MessageBreak Default family used instead\}@eha
82 \bgroup
83 \expand@font@defaults
84 \ifx\f@family\rmdef@ult
85 \fontfamily\rmsubstdefault
86 \else\ifx\f@family\sfdef@ult
87 \fontfamily\sfsubstdefault
88 \else\ifx\f@family\ttdef@ult
89 \fontfamily\ttsubstdefault
90 \else
91 \fontfamily\textcompsubstdefault
92 \fi\fi\fi
93 \@namedef{TS1:\f@family}{0}%
94 \selectfont#1%
95 \egroup
96 }
```

Whatever default was chosen, we claim now (locally hopefully) that it can handle all slots (even if not true) to avoid looping in certain situations, e.g., when something was set up incorrectly.

```latex
93 \@namedef{TS1:\f@family}{0}%
94 \selectfont#1%
95 \egroup
96 }
```

```latex
\tc@fake@euro
```

```
97 \def\tc@fake@euro#1{%
98 \leavevmode
99 \@font@info{Faking \noexpand#1for font family \f@family\MessageBreak in TS1 encoding}%
100 \f@family\MessageBreak Default family used in place of #1 in TS1 encoding}%
101 \valign{##\cr
102 \vfil\hbox to 0.07em{\dimen@@size\p@
103 \math@fontsfalse
104 \fontsize{.7\dimen0}\z0\selectfont=\hss}%
105 \vfil\cr%
106 \hbox{C}\cr}
107 }
108 }
```

(`End definition for `\tc@fake@euro.`)
These are two abbreviations that we use below to check symbols and accents in TS1. Only there to save some space, e.g., we can then write

\DeclareTextCommandDefault{\textcurrency}{\tc@check@symbol\textcurrency}

to ensure that \textcurrency is only typeset if the current font has a TS1 subset id of less than 3. Otherwise \tc@error is called telling the user that for this font family \textcurrency is not available.

\def\tc@check@symbol{\CheckEncodingSubset\UseTextSymbol{TS1}\tc@subst}

Accents have been made an error in the textcomp package when not available. Now that we provide the functionality in the kernel we avoid the error by swapping in a T1 accent if the TS1 accent is not available.

\def\tc@check@accent{\CheckEncodingSubset\UseTextAccent{TS1}\tc@error}

\def\tc@check@accent#1{\CheckEncodingSubset\UseTextAccent{TS1}{\tc@swap@accent#1}}

\def\tc@swap@accent#1#2{\UseTextAccent{T1}{#1}}

(End definition for \tc@check@symbol and \tc@check@accent.)

1 Sub-encodings

Here are the default definitions for the TS1 symbols. First those that we assume are always available if a font implements TS1.

\DeclareTextSymbolDefault{\textdollar}{TS1}
\DeclareTextSymbolDefault{\textsterling}{TS1}
\DeclareTextSymbolDefault{\textperthousand}{TS1}
\UndeclareTextCommand{\textdollar}{OT1} % don't use the OT1 def any longer
\UndeclareTextCommand{\textsterling}{OT1}% don't use the OT1 def any longer
\UndeclareTextCommand{\textperthousand}{T1} % don't use the T1 def

Using \UndeclareTextCommand above is enough only if the encoding definition files are not reloaded afterwards. In the past that happened if fontenc was used in the document preamble (not any longer). So in some sense it is better to fully remove them from the encoding files, but for rollbacks it is easier to keep them in for now.

These are the standard itemize and footnote symbols originally taken from OMS and now from TS1:

\DeclareTextSymbolDefault{\textasteriskcentered}{TS1}
\DeclareTextSymbolDefault{\textbullet}{TS1}
\DeclareTextSymbolDefault{\textdaggerdbl}{TS1}
\DeclareTextSymbolDefault{\textdagger}{TS1}
\DeclareTextSymbolDefault{\textparagraph}{TS1}
\DeclareTextSymbolDefault{\textperiodcentered}{TS1}
\DeclareTextSymbolDefault{\textsection}{TS1}

And here are the other TS1 glyphs that are implemented by every font (or nearly every)—a few are commented out and moved to sub-encoding 9, because they aren’t around in some fonts.

\%\%\DeclareTextSymbolDefault{\textbardbl}{TS1} % subst in sub-enc 9 above
\%\%\DeclareTextSymbolDefault{\textbrokenbar}{TS1}
\%\%\DeclareTextSymbolDefault{\textcelsius}{TS1} % subst in sub-enc 9 above
\DeclareTextSymbolDefault{\textcent}{TS1}
In the following sections the remaining default definitions are ordered by sub-encoding in which they are become unavailable, i.e., they are not provided in the sub-encoding with that number and all sub-encodings with higher numbers. Thus the symbols that are available in sub-encoding \(x\) are the symbols above (always available) and the symbols listed as becoming unavailable in sub-encodings \(x + 1\) and higher.

1.1 Unavailable in sub-encoding 1 and higher (drop symbols not working in Latin Modern)

The \textcircled{} is available but the glyph is simply too small so we keep using the OMS glyph.

\begin{verbatim}
\DeclareTextCommandDefault{\textcircled}{\CheckEncodingSubset\UseTextAccent{TS1}{\UseTextAccent{OMS}}1\textcircled}
\end{verbatim}

1.2 Unavailable in sub-encoding 2 (majority of new OTF fonts via autoinst) and higher

Capital accents are really only very seldom implemented, so from sub-encoding 2 onwards we use the normal \textsc{T1} accents if they are asked for in the document. In Unicode engines we don’t implement them at all but always use the basic accents instead, whether that works or not really depends on the font, something like \textquotedblleft X usually comes out wrong in Unicode engines.

\begin{verbatim}
\ifx\Umathcode\@undefined
\DeclareTextCommandDefault{\capitalacute}{\CheckEncodingSubset\UseTextAccent{TS1}{\UseTextAccent{OML}}2\capitalacute}
\fi
\end{verbatim}
\DeclareTextCommandDefault{\capitalacute}{\tc@check@accent{"}2\capitalacute}
\DeclareTextCommandDefault{\capitalbreve}{\tc@check@accent{\u}2\capitalbreve}
\DeclareTextCommandDefault{\capitalcaron}{\tc@check@accent{\v}2\capitalcaron}
\DeclareTextCommandDefault{\capitalcedilla}{\tc@check@accent{\c}2\capitalcedilla}
\DeclareTextCommandDefault{\capitalcircumflex}{\tc@check@accent{\^}2\capitalcircumflex}
\DeclareTextCommandDefault{\capitaldieresis}{\tc@check@accent{"}2\capitaldieresis}
\DeclareTextCommandDefault{\capitaldotaccent}{\tc@check@accent{\.}2\capitaldotaccent}
\DeclareTextCommandDefault{\capitalgrave}{\tc@check@accent{\'}2\capitalgrave}
\DeclareTextCommandDefault{\capitalhungarumlaut}{\tc@check@accent{\H}2\capitalhungarumlaut}
\DeclareTextCommandDefault{\capitalmacron}{\tc@check@accent{=}2\capitalmacron}
\DeclareTextCommandDefault{\capitalnewtie}{\tc@check@accent{\t}2\capitalnewtie}
\DeclareTextCommandDefault{\capitalogonek}{\tc@check@accent{\k}2\capitalogonek}
\DeclareTextCommandDefault{\capitallering}{\tc@check@accent{\r}2\capitallering}
\DeclareTextCommandDefault{\capitaltie}{\tc@check@accent{\t}2\capitaltie}
\DeclareTextCommandDefault{\capitaltilde}{\tc@check@accent{\~}2\capitaltilde}
\DeclareTextCommandDefault{\newtie}{\tc@check@accent{\t}2\newtie}
\DeclareTextCommandDefault{\capitalnewtie}{\tc@check@accent{\t}2\capitalnewtie}

For \newtie and \capitalnewtie this is actually wrong, they should pick up the accent from the substitution font (not done yet).

\else
\\DeclareTextCommandDefault{\capitalacute}{\@tabacckludge'}
\\DeclareTextCommandDefault{\capitalbreve}{\u}
\\DeclareTextCommandDefault{\capitalcaron}{\v}
\\DeclareTextCommandDefault{\capitalcedilla}{\c}
\\DeclareTextCommandDefault{\capitalcircumflex}{\^}
\\DeclareTextCommandDefault{\capitaldieresis}{\''}
\\DeclareTextCommandDefault{\capitaldotaccent}{\.}
\\DeclareTextCommandDefault{\capitalgrave}{\'}
\\DeclareTextCommandDefault{\capitalhungarumlaut}{\H}
\\DeclareTextCommandDefault{\capitalmacron}{\=}
\\DeclareTextCommandDefault{\capitalnewtie}{\t}
\\DeclareTextCommandDefault{\capitalogonek}{\k}
\\DeclareTextCommandDefault{\capitallering}{\r}
\\DeclareTextCommandDefault{\capitaltie}{\t}
\\DeclareTextCommandDefault{\capitaltilde}{\~}
\\DeclareTextCommandDefault{\newtie}{\t}
\fi
The next two symbols exist in some fonts (faked?), but we ignore that to keep the subsets reasonable compact and most important linear.

\DeclareTextCommandDefault{\textlbrackdbl}{\tc@check@symbol2\textlbrackdbl}
\DeclareTextCommandDefault{\textrbrackdbl}{\tc@check@symbol2\textrbrackdbl}

Old style numerals are again in some fonts but using \text{-OsF} etc. is the better approach to get them, so we claim they aren’t in sub-encoding 2 as that’s true for most fonts.

\DeclareTextCommandDefault{\texteightoldstyle}{\tc@check@symbol2\texteightoldstyle}
\DeclareTextCommandDefault{\textfiveoldstyle}{\tc@check@symbol2\textfiveoldstyle}
\DeclareTextCommandDefault{\textfouroldstyle}{\tc@check@symbol2\textfouroldstyle}
\DeclareTextCommandDefault{\textnineoldstyle}{\tc@check@symbol2\textnineoldstyle}
\DeclareTextCommandDefault{\textoneoldstyle}{\tc@check@symbol2\textoneoldstyle}
\DeclareTextCommandDefault{\textsevenoldstyle}{\tc@check@symbol2\textsevenoldstyle}
\DeclareTextCommandDefault{\textsixoldstyle}{\tc@check@symbol2\textsixoldstyle}
\DeclareTextCommandDefault{\textthreeoldstyle}{\tc@check@symbol2\textthreeoldstyle}
\DeclareTextCommandDefault{\texttwooldstyle}{\tc@check@symbol2\texttwooldstyle}
\DeclareTextCommandDefault{\textzerooldstyle}{\tc@check@symbol2\textzerooldstyle}

The next set of glyphs is special to \TeX{} fonts (and available with a few older PS fonts supported through virtual fonts), but not any longer in the majority of fonts provided through autoinst, so we pretend there aren’t available in sub-encoding 2 and below.

\DeclareTextCommandDefault{\textacutedbl}{\tc@check@symbol2\textacutedbl}
\DeclareTextCommandDefault{\textasciiacute}{\tc@check@symbol2\textasciiacute}
\DeclareTextCommandDefault{\textasciibreve}{\tc@check@symbol2\textasciibreve}
\DeclareTextCommandDefault{\textasciicaron}{\tc@check@symbol2\textasciicaron}
\DeclareTextCommandDefault{\textasciidieresis}{\tc@check@symbol2\textasciidieresis}
\DeclareTextCommandDefault{\textasciigrave}{\tc@check@symbol2\textasciigrave}
\DeclareTextCommandDefault{\textasciimacron}{\tc@check@symbol2\textasciimacron}
\DeclareTextCommandDefault{\textgravedbl}{\tc@check@symbol2\textgravedbl}
\DeclareTextCommandDefault{\texttildelow}{\tc@check@symbol2\texttildelow}

Finally those below are only available in CM-based fonts but in no font that has its origin outside of the \TeX{} world.

\DeclareTextCommandDefault{\textbaht}{\tc@check@symbol2\textbaht}
\DeclareTextCommandDefault{\texttildelow}{\tc@check@symbol2\texttildelow}
\DeclareTextCommandDefault{\textbaht}{\tc@check@symbol2\textbaht}
The \textpertenthousand also belongs in this group but here we have a choice: in T1 there is a definition for \textpertenthousand making the symbol up from % and
\char 24 (twice) but in many fonts that char doesn’t exist and the slot is reused for random ligatures. So better not use it because often it is wrong. But pointing to TS1 is also not great as only a few fonts have it as a real symbol, so we get a substitution to CM or LM.

Alternatively we could just state that the symbol is unavailable in those fonts. For now I substitute.

1.3 Unavailable in sub-encoding 3 and higher

Sub-encoding 2 is the one where we loose many symbols. In the higher-numbered sub-encodings we see only a few dropped additionally.

1.4 Unavailable in sub-encoding 4 and higher

Most older PS fonts (supported in LaTeX since the early nineties when virtual fonts became available) are sorted under this sub-encoding. But in reality, many of them don’t have all glyphs that should be available in sub-encoding 5. Instead they show little squares, i.e., they produce “tofu” if you are unlucky.

But the coverage is so random that it is impossible to sort them properly and if we tried to ensure that they only typeset those glyphs that are really always available, we would have to put them all into sub-encoding 9; so putting them into 5 is really a compromise.

Modern fonts usually don’t typeset a tofu character if a glyph is missing. They are therefore only classified as sub-encoding 5 if they really support its glyph set completely.

1.5 Unavailable in sub-encoding 5 (most older PS fonts) and higher
1.6 Unavailable in sub-encoding 6 and higher

\DeclareTextCommandDefault {\textnumero}
{\tc@check@symbol5\textnumero}

1.7 Unavailable in sub-encoding 7 and higher

\DeclareTextCommandDefault {\textflorin}
{\tc@check@symbol6\textflorin}
\DeclareTextCommandDefault {\textcurrency}
{\tc@check@symbol6\textcurrency}

1.8 Unavailable in sub-encoding 8 and higher

\DeclareTextCommandDefault {\textfractionsolidus}
{\tc@check@symbol7\textfractionsolidus}
\DeclareTextCommandDefault {\textohm}
{\tc@check@symbol7\textohm}
\DeclareTextCommandDefault {\textmu}
{\tc@check@symbol7\textmu}
\DeclareTextCommandDefault {\textminus}
{\tc@check@symbol7\textminus}

1.9 Unavailable in Sub-encoding 9 (most missing)

\DeclareTextCommandDefault {\textcelsius}
{\tc@check@symbol9\textcelsius}
\DeclareTextCommandDefault {\textonesuperior}
{\tc@check@symbol9\textonesuperior}
\DeclareTextCommandDefault {\textthreequartersemdash}
{\tc@check@symbol9\textthreequartersemdash}
\DeclareTextCommandDefault {\textthreequartersemdash}
{\tc@check@symbol9\textthreequartersemdash}
\DeclareTextCommandDefault {\texttwosuperior}
{\tc@check@symbol9\texttwosuperior}
\DeclareTextCommandDefault {\texttwosuperior}
{\tc@check@symbol9\texttwosuperior}
\DeclareTextCommandDefault {\textbardbl}
{\tc@check@symbol9\textbardbl}

2 Unicode engine specials

If we are using a unicode engine we handle some glyphs differently, so this here are the
definitions for the Unicode encoding (overwriting the defaults above).

\ifx \Umathcode@undefined \else
This set should be taken from TS1 encoding even if it means you get it from the default font for that encoding.

\DeclareTextSymbol{\textcopyleft}{TS1}{171}
\DeclareTextSymbol{\textdblhyphen}{TS1}{45}
\DeclareTextSymbol{\textdblhyphenchar}{TS1}{127}
\DeclareTextSymbol{\textquotestraightbase}{TS1}{13}
\DeclareTextSymbol{\textquotestraightdblbase}{TS1}{18}
\DeclareTextSymbol{\textleaf}{TS1}{108}
\DeclareTextSymbol{\texttwelveudash}{TS1}{21}
\DeclareTextSymbol{\textthreequartersemdash}{TS1}{22}

If oldstyle numerals are asked for we just use \oldstylenums.

\DeclareTextCommand{\textzerooldstyle} {\UnicodeEncodingName{\oldstylenums{0}}}
\DeclareTextCommand{\textoneoldstyle} {\UnicodeEncodingName{\oldstylenums{1}}}
\DeclareTextCommand{\texttwooldstyle} {\UnicodeEncodingName{\oldstylenums{2}}}
\DeclareTextCommand{\textthreeoldstyle} {\UnicodeEncodingName{\oldstylenums{3}}}
\DeclareTextCommand{\textfouroldstyle} {\UnicodeEncodingName{\oldstylenums{4}}}
\DeclareTextCommand{\textfiveoldstyle} {\UnicodeEncodingName{\oldstylenums{5}}}
\DeclareTextCommand{\textsixoldstyle} {\UnicodeEncodingName{\oldstylenums{6}}}
\DeclareTextCommand{\textsevenoldstyle} {\UnicodeEncodingName{\oldstylenums{7}}}
\DeclareTextCommand{\texteightoldstyle} {\UnicodeEncodingName{\oldstylenums{8}}}
\DeclareTextCommand{\textnineoldstyle} {\UnicodeEncodingName{\oldstylenums{9}}}

These have Unicode slots so this should be integrated into TU explicitly

\DeclareTextSymbol{\textpilcrow} {\UnicodeEncodingName{"00B6}}
\DeclareTextSymbol{\textborn} {\UnicodeEncodingName{"002A}}
\DeclareTextSymbol{\textdied} {\UnicodeEncodingName{"2020}}
\DeclareTextSymbol{\textlbrackdbl} {\UnicodeEncodingName{"27E6}}
\DeclareTextSymbol{\textrbrackdbl} {\UnicodeEncodingName{"27E7}}
\DeclareTextSymbol{\textguarani} {\UnicodeEncodingName{"20B2}}

We could make \textcentoldstyle and \textdollaroldstyle point to dollar and cent in the Unicode encoding

\DeclareTextSymbol{\textcentoldstyle} {\UnicodeEncodingName{"00A2}}
\DeclareTextSymbol{\textdollaroldstyle} {\UnicodeEncodingName{"0024}}

but I think it is better to pick them up from TS1 even if that usually means LMR fonts

\DeclareTextSymbol{\textdollaroldstyle}{TS1}{138}
\DeclareTextSymbol{\textcentoldstyle} {TS1}{139}
\fi

% --- END of Unicode engines specials

3 Font family sub-encodings setup

We declare the subsets for a good number of fonts in the kernel ...

But first the default for anything that is not declared. We use 9 which is most likely much too conservative, but with the advantage that we aren’t getting missing glyphs (or at least that this is very unlikely). For nearly all font in the TeX Live distribution of 2019 “correct” classifications are given below, so that this default is only used for new font families, and over time the right classifications can be added here too.

\DeclareEncodingSubset{TS1}{?}{9}
This first block contains the fonts that have been already supported by the textcomp package way back, i.e., the font families that have TeX support since the mid-nineties.

\DeclareEncodingSubset{TS1}{ccr} {0}
\DeclareEncodingSubset{TS1}{cmbr} {0}
\DeclareEncodingSubset{TS1}{cmr} {0}
\DeclareEncodingSubset{TS1}{cmss} {0}
\DeclareEncodingSubset{TS1}{cmtl} {0}
\DeclareEncodingSubset{TS1}{cmtt} {0}
\DeclareEncodingSubset{TS1}{cmvtt} {0}
\DeclareEncodingSubset{TS1}{pxr} {0}
\DeclareEncodingSubset{TS1}{pxss} {0}
\DeclareEncodingSubset{TS1}{pxtt} {0}
\DeclareEncodingSubset{TS1}{qag} {0}
\DeclareEncodingSubset{TS1}{qbk} {0}
\DeclareEncodingSubset{TS1}{qcr} {0}
\DeclareEncodingSubset{TS1}{qcs} {0}
\DeclareEncodingSubset{TS1}{qhvc} {0}
\DeclareEncodingSubset{TS1}{qhv} {0}
\DeclareEncodingSubset{TS1}{qpl} {0}
\DeclareEncodingSubset{TS1}{qtm} {0}
\DeclareEncodingSubset{TS1}{txr} {0}
\DeclareEncodingSubset{TS1}{txss} {0}
\DeclareEncodingSubset{TS1}{txtt} {0}
\DeclareEncoding Subset{TS1}{lmr} {1}
\DeclareEncodingSubset{TS1}{lmdh} {1}
\DeclareEncodingSubset{TS1}{lmss} {1}
\DeclareEncodingSubset{TS1}{lmssq} {1}
\DeclareEncodingSubset{TS1}{lmvtt} {1}
\DeclareEncodingSubset{TS1}{latt} {1}  \% missing TM, SM and pertenthousand for some reason
\DeclareEncodingSubset{TS1}{ptmx} {2}
\DeclareEncodingSubset{TS1}{ptmj} {2}
\DeclareEncodingSubset{TS1}{bch} {5}  \% tofu for blank, ohm
\DeclareEncodingSubset{TS1}{futj} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{futs} {5}  \% tofu for blank, ohm
\DeclareEncodingSubset{TS1}{futx} {5}  \% probably (currently broken distrib)
\DeclareEncodingSubset{TS1}{pag} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{pbk} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{pcr} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{phv} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{pnc} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{plj} {5}  \% tofu for blank
\DeclareEncodingSubset{TS1}{plx} {5}  \% tofu for blank
\DeclareEncodingSubset{TS1}{pl} {5}  \% tofu for blank interrobang/down
\DeclareEncodingSubset{TS1}{ptm} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{pcz} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{ul19} {5}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{dayroms} {6}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{dayrom} {6}  \% tofu for blank, interrobang/down, ohm
\DeclareEncodingSubset{TS1}{augie} {8}  \% really only missing euro
\DeclareEncodingSubset{TS1}{put} {8}
\DeclareEncodingSubset{TS1}{uag} {8} \% probably (currently broken distrib)
\DeclareEncodingSubset{TS1}{ugq} {8}
\DeclareEncodingSubset{TS1}{zi4} {9}
\DeclareEncodingSubset{TS1}{hls} {5}
\DeclareEncodingSubset{TS1}{hlst} {5}
\DeclareEncodingSubset{TS1}{hlct} {5}
\DeclareEncodingSubset{TS1}{hh} {8}
\DeclareEncodingSubset{TS1}{hlc} {8}
\DeclareEncodingSubset{TS1}{hlnc} {8}
\DeclareEncodingSubset{TS1}{hlcf} {8}
\DeclareEncodingSubset{TS1}{hlce} {8}
\DeclareEncodingSubset{TS1}{hlcn} {8}
\DeclareEncodingSubset{TS1}{hlcw} {8}
\DeclareEncodingSubset{TS1}{lato-*} {0} % with a bunch of tofu inside
\DeclareEncodingSubset{TS1}{opensans-*} {0} % with a bunch of tofu inside
\DeclareEncodingSubset{TS1}{cantarell-*} {0} % with a bunch of tofu inside
\DeclareEncodingSubset{TS1}{fbb-*} {0} % missing centoldstyle
\DeclareEncodingSubset{TS1}{Alegreya-*} {2}
\DeclareEncodingSubset{TS1}{AlegreyaSans-*} {2}
\DeclareEncodingSubset{TS1}{DejaVuSans-TLF} {2}
\DeclareEncodingSubset{TS1}{DejaVuSansCondensed-TLF} {2}
\DeclareEncodingSubset{TS1}{DejaVuSansMono-TLF} {2}
\DeclareEncodingSubset{TS1}{EBGaramond-*} {2}
\DeclareEncodingSubset{TS1}{Tempora-TLF} {2}
\DeclareEncodingSubset{TS1}{Tempora-TOsF} {2}
\DeclareEncodingSubset{TS1}{Arimo-TLF} {3}
\DeclareEncodingSubset{TS1}{Carlito-*} {3}
\DeclareEncodingSubset{TS1}{FiraSans-*} {3}
\DeclareEncodingSubset{TS1}{IBMPlexSans-TLF} {3}
\DeclareEncodingSubset{TS1}{Merriweather-UsF} {3}
\DeclareEncodingSubset{TS1}{Montserrat-TLF} {3}
\DeclareEncodingSubset{TS1}{MontserratAlternates-*} {3}
\DeclareEncodingSubset{TS1}{SourceCodePro-TLF} {3}
\DeclareEncodingSubset{TS1}{SourceCodePro-TOsF} {3}
\DeclareEncodingSubset{TS1}{SourceSansPro-*} {3}
\DeclareEncodingSubset{TS1}{Source SerifPro-*} {3}
\DeclareEncodingSubset{TS1}{Tinos-TLF} {3}
\DeclareEncodingSubset{TS1}{AccanthisADFStdNoThree-LF} {4}
\DeclareEncodingSubset{TS1}{Cabin-TLF} {4}
\DeclareEncodingSubset{TS1}{Caladea-TLF} {4}
\DeclareEncodingSubset{TS1}{Chivo-*} {4}

LucidaBright (sold through TUG) probably not quite correct, I guess as I have the older fonts ...

Below are the newer fonts that have support files for \LaTeX\%. With very few exceptions the classifications are done so that all characters are correctly produced (either being available in the font or substituted.

There are a few fonts that contain “tofu” squares in places (instead of a real glyph) and in a few cases some really seldom needed chars are unavailable, i.e., produce missing glyphs (to avoid that a large number of available chars are unnecessarily substituted.
\UseLegacyTextSymbols

\def\UseLegacyTextSymbols{%
\DeclareTextSymbolDefault{\textasteriskcentered}{OMS}%
\DeclareTextSymbolDefault{\textbardbl}{OMS}%
\DeclareTextSymbolDefault{\textbullet}{OMS}%
\DeclareTextSymbolDefault{\textdaggerdbl}{OMS}%
\DeclareTextSymbolDefault{\textdagger}{OMS}%
\DeclareTextSymbolDefault{\textparagraph}{OMS}%
\UndeclareTextCommand{\textsection}{T1}%
\expandafter\let\csname oldstylenums \expandafter\endcsname
\csname legacyoldstylenums \endcsname
\}

4 Legacy symbol support for lists and footnote symbols
Here are new names for the legacy symbols that \LaTeX used to pick up from the OMS encoded fonts (and used for itemize lists or footnote symbols. We go the roundabout way via separate OMS declarations so that
\begin{verbatim}
\renewcommand\textbullet{\textlegacybullet}
\end{verbatim}
doesn’t produce an endless loop.

\begin{verbatim}
\DeclareTextSymbol{\textlegacyasteriskcentered}{OMS}{3} % "03
\DeclareTextSymbol{\textlegacybardbl}{OMS}{107} % "6B
\DeclareTextSymbol{\textlegacybullet}{OMS}{15} % "0F
\DeclareTextSymbol{\textlegacydaggerdbl}{OMS}{122} % "7A
\DeclareTextSymbol{\textlegacydagger}{OMS}{121} % "79
\DeclareTextSymbol{\textlegacyparagraph}{OMS}{123} % "7B
\DeclareTextSymbol{\textlegacyperiodcentered}{OMS}{1} % "01
\DeclareTextSymbol{\textlegacysection}{OMS}{120} % "78
\end{verbatim}

Supporting rollback ...

\begin{verbatim}
(End definition for \textlegacyasteriskcentered and others.)
\end{verbatim}
5 The \textcomp{} package

\providecommand\DeclareRelease[3]{}
\providecommand\DeclareCurrentRelease[2]{}
\DeclareRelease{2018-08-11}{textcomp-2018-08-11.sty}
\DeclareCurrentRelease{2020-02-02}
\ProvidesPackage{textcomp} [2020/02/02 v2.0n Standard LaTeX package]

This is implemented by defining the default subset:
\DeclareOption{full}{\DeclareEncodingSubset{TS1}{?}{0}}
\DeclareOption{almostfull}{\DeclareEncodingSubset{TS1}{?}{1}}
\DeclareOption{euro}{\DeclareEncodingSubset{TS1}{?}{8}}
\DeclareOption{safe}{\DeclareEncodingSubset{TS1}{?}{9}}

The default is set up in the kernel is “safe” these days for unknown fonts but LaTeX has definitions for most families so it seldom applies.

If a different default is used then one needs to check the results to ensure that there aren’t “missing glyphs”.

The next set of options define the warning level (default in the kernel is info only). Using the package options you can change this behavior.
\DeclareOption{error}{\gdef\tc@errorwarn\PackageError{textcomp}}}\DeclareOption{warn}{\gdef\tc@errorwarn#1#2\PackageWarning{textcomp}{#1}}}\DeclareOption{info}{\gdef\tc@errorwarn#1#2\PackageInfo{textcomp}{#1}}}\DeclareOption{quiet}{\gdef\tc@errorwarn#1#2{}}

The “force” option basically changes the sub-encoding to that of the default (which, unless changes, is 9 these days), i.e., it no longer depends on the font in use. This is
mainly there because it might have been used in older documents, but not something that is recommended.

\DeclareOption{force}{%
\def\CheckEncodingSubset#1#2#3#4#5{%
  \ifnum #4>0\csname #2:?\endcsname
  \relax
  \expandafter\@firstoftwo
  \else
  \expandafter\@secondoftwo
  \fi
  \{#1{#2}{#3}{#4}{#5}\}
}
\ExecuteOptions{info}
\ProcessOptions\relax

There is not much else to do nowadays, because everything is already set up in the \TeX{} kernel.
\InputIfFileExists{textcomp.cfg}{%\PackageInfo{textcomp}{Local configuration file used}}{}

\section{The old textcomp package code}

This section contains the old code for the textcomp package and its documentation. It is only used if we roll back prior to 2020. Thus all the rest is mainly for historians. Note that the old code categorized in the sub-encodings only into 6 classes not 10.

\ProvidesPackage{textcomp}
\[2018/08/11 v2.0j Standard \LaTeX{} package\]

This one is for the TS1 encoding which contains text symbols for use with the T1-encoded text fonts. It therefore first inputs the file TS1enc.def and then sets (or resets) the defaults for the symbols it contains. The result of this is that when one of these symbols is accessed and the current encoding does not provide it, the symbol will be supplied by a silent, local change to this encoding.

Since many PostScript fonts only implement a subset of TS1 many commands only produce black blobs of ink. To resolve the resulting problems a number of options have been introduced and some code has been developed to distinguish sub-encodings.

The sub-encodings have a numerical id and are defined as follows for TS1:

\texttt{#5} those TS1 symbols that are also in the ISO-Adobe character set; without \texttt{textcurrency}, which is often misused for the Euro. Older Type1 fonts from the non-\TeX{} world provide only this subset.

\texttt{#4} = \texttt{#5} + \texttt{texteuro}. Most newer fonts provide this.

\texttt{#3} = \texttt{#4} + \texttt{textomega}. Can also be described as $\text{TS1} \cap (\text{ISO-Adobe} \cup \text{MacRoman})$. (Except for the missing 'currency'.)

\texttt{#2} = \texttt{#3} + \texttt{textestimated} + \texttt{textcurrency}. Can also be described as $\text{TS1} \cap \text{Adobe-Western-2}$. This may be relevant for OpenType fonts, which usually show the Adobe-Western-2 character set.
#1 = TS1 without \textcircled{} and \t. These two glyphs are often not implemented and if their kernel defaults are changed commands like \copyright unnecessarily fail.

#0 = full TS1

And here a summary to go in the transcript file:

\PackageInfo{textcomp}{Sub-encoding information:}
\space\space 5 = only ISO-Adobe without \textcurrency
\space\space 4 = 5 + \texteuro
\space\space 3 = 4 + \textohm
\space\space 2 = 3 + \noexpand\textestimated+
\space\space 1 = TS1 - \noexpand\textcircled{-}\textt
\space\space 0 = TS1 (full)

Font families with sub-encoding setting implement only a restricted character set as indicated. Family ‘?’ is the default used for unknown fonts.

\See the documentation for details\@gobble}

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\DeclareEncod}
\iftc@forced Switch used to implement the force option
\newif\iftc@forced \tc@forcedfalse

(End definition for \iftc@forced.)

This is implemented by defining the default subset:
\DeclareOption{full}{\DeclareEncodingSubset{TS1}{?}{0}}
\DeclareOption{almostfull}{\DeclareEncodingSubset{TS1}{?}{1}}
\DeclareOption{euro}{\DeclareEncodingSubset{TS1}{?}{4}}
\DeclareOption{safe}{\DeclareEncodingSubset{TS1}{?}{5}}

The default is “almostfull” which means that old documents will work except that \textcircled and \t will use the kernel defaults (with the advantage that this also works if the current font (as often the case) doesn’t implement these glyphs.

The “force” option simply sets the switch to true.
\DeclareOption{force}{\tc@forcedtrue}

The suggestions to user is to use the “safe” option always unless that balks in which case they could switch to “almostfull” but then better check their output manually.
\def\tc@errorwarn{\PackageError}
\DeclareOption{warn}{\gdef\tc@errorwarn#1#2#3{\PackageWarning{#1}{#2}}}
\DeclareOption{quiet}{\gdef\tc@errorwarn#1#2#3{}}
\ExecuteOptions{almostfull}
\ProcessOptions

The command \CheckEncodingSubset will check if the current font family has the right encoding subset to typeset a certain command. It takes five arguments as follows: first argument is either \UseTextSymbol, \UseTextAccent depending on whether or not the symbol is a text symbol or a text accent.

The second argument is the encoding from which this symbol should be fetched.

The third argument is either a fake accessor command or an error message. the code in that argument (if ever executed) receives two arguments: #2 and #5 of \CheckEncodingSubset.

Argument four is the subset encoding id to test against: if this value is higher than the subset id of the current font family then we typeset the symbol, i.e., execute #1{#2}#5 otherwise it runs #3#5, e.g., to produce an error message or fake the glyph somehow.

Argument five is the symbol or accent command that is being checked.

For usage examples see definitions below.

\iftc@forced

If the “force” option was given we always use the default for testing against.
\def\CheckEncodingSubset#1#2#3#4#5{%\iftc@forced
  \ifnum #4>%\else{/expandafter}@firstoftwo
    \expandafter\@secondoftwo
      \relax
      \relax
    \else
      \expandafter\@firstoftwo
    \fi
  #1{#2}{#3}#5%
\}
In normal circumstances the test is a bit more complicated: first check if there exists a macro \(\langle\text{arg2}\rangle\langle\text{current-family}\rangle\) and if so use that value to test against, otherwise use the default to test against.

\[
\text{else}
\text{def CheckEncodingSubset\#1\#2\#3\#4\#5\%}
\text{\%}
\text{\ifnum \#4>\%}
\text{\expandafter\ifx\csname \#2:\f@family\endcsname\relax}
\text{\csname \#2:?\endcsname}
\text{\else}
\text{\csname \#2:\f@family\endcsname}
\text{\fi}
\text{\relax}
\text{\expandafter\@firstoftwo}
\text{\else}
\text{\expandafter\@secondoftwo}
\text{\fi}
\text{\{\#1\{\#2\}\{\#3\}\%}
\text{\#5\%}
\text{\}}
\text{\fi}
\text{(End definition for CheckEncodingSubset.)}
\]

\[
\text{tc@subst}
\text{def tc@subst\#1\%}
\text{\tc@errorwarn{textcomp}\%
\{Symbol \string\#1 not provided by\MessageBreak
\font family \f@family\space
\ in TS1 encoding.\MessageBreak Default family used instead\}@\eha
\text{\bgroup\fontfamily{textcompsubstdefault}\selectfont\#1\egroup}
\}
\text{(End definition for tc@subst.)}
\]

\[
\text{tc@error}\text{tc@error is going to be used in arg \#3 of CheckEncodingSubset when a symbol is not available in a certain font family. It gets pass the encoding it normally lives in (arg one) and the name of the symbol or accent that has a problem.}
\]

\[
\% error commands take argument:
\%
\text{\def tc@error\#1\%}
\text{\PackageError{textcomp}\% \ should be latex error if general}
\text{\{Accent \string\#1 not provided by\MessageBreak
\font family \f@family\space
\ in TS1 encoding\}@\eha
\}
\text{(End definition for tc@error.)}
\]

\[
\text{tc@fake@euro}\text{tc@fake@euro is an example of a “fake” definition to use in arg \#3 of CheckEncodingSubset when a symbol is not available in a certain font family. Here we produce an Euro symbol by combining a “C” with a “=”.}
\]

\[
\text{\def tc@fake@euro\#1\%}
\text{\leavevmode}
\text{\PackageInfo{textcomp}{Faking \noexpand\#1 for font family}
\]

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These are two abbreviations that we use below to check symbols and accents in TS1. Only there to save some space, e.g., we can then write

\DeclareTextCommandDefault{\textcurrency}{\tc@check@symbol\textcurrency}

\DeclareTextAccentDefault{\capitalcedilla}{TS1}
\DeclareTextAccentDefault{\capitalogonek}{TS1}
\DeclareTextAccentDefault{\capitalgrave}{TS1}
\DeclareTextAccentDefault{\capitalacute}{TS1}
\DeclareTextAccentDefault{\capitalcircumflex}{TS1}
\DeclareTextAccentDefault{\capitaltilde}{TS1}
\DeclareTextAccentDefault{\capitaldieresis}{TS1}
\DeclareTextAccentDefault{\capitalhungarumlaut}{TS1}
\DeclareTextAccentDefault{\capitalring}{TS1}
\DeclareTextAccentDefault{\capitalcaron}{TS1}
\DeclareTextAccentDefault{\capitalbreve}{TS1}
\DeclareTextAccentDefault{\capitalmacron}{TS1}
\DeclareTextAccentDefault{\capitaldotaccent}{TS1}

...and then the other glyphs.

\DeclareTextSymbolDefault{\textcapitalcompwordmark}{TS1}
\DeclareTextSymbolDefault{\textascendercompwordmark}{TS1}
\DeclareTextSymbolDefault{\textquotestraightbase}{TS1}
\DeclareTextSymbolDefault{\textquotestraightdblbase}{TS1}
\DeclareTextSymbolDefault{\texttwelveudash}{TS1}
\DeclareTextSymbolDefault{\textthreequartersemdash}{TS1}
\DeclareTextSymbolDefault{\textdollar}{TS1}
\DeclareTextSymbolDefault{\textquotesingle}{TS1}
\DeclareTextSymbolDefault{\textasteriskcentered}{TS1}
\DeclareTextSymbolDefault{\textfractionsolidus}{TS1}
\DeclareTextSymbolDefault{\textminus}{TS1}
\DeclareTextSymbolDefault{\textlbrackdbl}{TS1}
\DeclareTextSymbolDefault{\textrbrackdbl}{TS1}
\DeclareTextSymbolDefault{\textasciigrave}{TS1}
The \texteuro is only available for subsets with id 4 or less. Otherwise we fake the glyph using \tc@fake@euro

\DeclareTextCommandDefault{\texteuro}{\CheckEncodingSubset\UseTextSymbol{TS1}\tc@fake@euro5\texteuro}

The \textohm is only available for subsets with id 3 or less. Otherwise we produce an error.

\DeclareTextCommandDefault{\textohm}{\tc@check@symbol4\textohm}

The \textestimated and \textcurrency are only provided for fonts with subset encoding with id 2 or less.

\DeclareTextCommandDefault{\textestimated}{\tc@check@symbol3\textestimated}
\DeclareTextCommandDefault{\textcurrency}{\tc@check@symbol3\textcurrency}
Nearly all of the remaining glyphs are provided only with fonts with id 1 or 0, i.e., are essentially complete.

\DeclareTextCommandDefault{\capitaltie}{\tc@check@accent2\capitaltie}
\DeclareTextCommandDefault{\newtie}{\tc@check@accent2\newtie}
\DeclareTextCommandDefault{\capitalnewtie}{\tc@check@accent2\capitalnewtie}
\DeclareTextCommandDefault{\textleftarrow}{\tc@check@symbol2\textleftarrow}
\DeclareTextCommandDefault{\textrightarrow}{\tc@check@symbol2\textrightarrow}
\DeclareTextCommandDefault{\textblank}{\tc@check@symbol2\textblank}
\DeclareTextCommandDefault{\textdblhyphen}{\tc@check@symbol2\textdblhyphen}
\DeclareTextCommandDefault{\textzerooldstyle}{\tc@check@symbol2\textzerooldstyle}
\DeclareTextCommandDefault{\textoneoldstyle}{\tc@check@symbol2\textoneoldstyle}
\DeclareTextCommandDefault{\texttwooldstyle}{\tc@check@symbol2\texttwooldstyle}
\DeclareTextCommandDefault{\textthreeoldstyle}{\tc@check@symbol2\textthreeoldstyle}
\DeclareTextCommandDefault{\textfouroldstyle}{\tc@check@symbol2\textfouroldstyle}
\DeclareTextCommandDefault{\textfiveoldstyle}{\tc@check@symbol2\textfiveoldstyle}
\DeclareTextCommandDefault{\textsixoldstyle}{\tc@check@symbol2\textsixoldstyle}
\DeclareTextCommandDefault{\textsevenoldstyle}{\tc@check@symbol2\textsevenoldstyle}
\DeclareTextCommandDefault{\texteightoldstyle}{\tc@check@symbol2\texteightoldstyle}
\DeclareTextCommandDefault{\textnineoldstyle}{\tc@check@symbol2\textnineoldstyle}
\DeclareTextCommandDefault{\textlangle}{\tc@check@symbol2\textlangle}
\DeclareTextCommandDefault{\textrangle}{\tc@check@symbol2\textrangle}
\DeclareTextCommandDefault{\textmho}{\tc@check@symbol2\textmho}
\DeclareTextCommandDefault{\textbigcircle}{\tc@check@symbol2\textbigcircle}
\DeclareTextCommandDefault{\textuparrow}{\tc@check@symbol2\textuparrow}
\DeclareTextCommandDefault{\textdownarrow}{\tc@check@symbol2\textdownarrow}
\DeclareTextCommandDefault{\textborn}{\tc@check@symbol2\textborn}
\ DeclareTextCommandDefault{\Textdivorced}{\tc@check@symbol2\textdivorced}
\DeclareTextCommandDefault{\textdied}{\tc@check@symbol2\textdied}
The `\textcircled` and `\t` are handled specially, unless the current font has a subset id of 0 (i.e., full TS1) we pick the symbols up from the math font encodings, i.e., the third argument to `\CheckEncodingSubset` uses `\UseTextAccent` to get them from there.

Finally input the encoding-specific definitions for TS1 thus making the top-level definitions optimized for this encoding (and not for the default encoding).

Now having the new glyphs available we also want to make sure that they are used. For most cases this will automatically happen but for some glyphs there are inferior definitions already known to \LaTeX{} which will prevent the usage of the TS1 versions. So we better get rid of them:

```
\UndeclareTextCommand{\textsterling}{OT1}
\UndeclareTextCommand{\textdollar}{OT1}
```

Similar declarations should probably be made for other encodings like OT4 if they are in use.

```
\UndeclareTextCommand{\textsterling}{OT4}
\UndeclareTextCommand{\textdollar}{OT4}
```

From the T1 encoding there are two candidates for removal: \textperthousand and \textpertenthousand since these are both constructed from % followed by a tiny '/perthousandzero' rather than being a single glyph. The problem with this approach is that in PostScript fonts this small zero is usually not available resulting in % rather than \textperthousand while the real glyph (at least for `\textperthousand`) is available in the PostScript version of TS1. So for the moment we compromise by removing the T1 declaration for `\textperthousand` but keeping the one for `\textpertenthousand`. This will have the effect that with Computer Modern fonts everything will come out (although \textperthousand and \textpertenthousand are not taken from the same physical font) and with PostScript fonts \textperthousand will come out correctly while \textpertenthousand will most likely look like %— which is probably an improvement over just getting a single ‘’ to indicate a completely missing glyph, which would have happen if we also ‘undeclared’ `\textpertenthousand`.

```
\UndeclareTextCommand{\textperthousand}{T1}
%\UndeclareTextCommand{\textpertenthousand}{T1}
```

### 5.1.1 Supporting oldstyle digits

```
\DeclareRobustCommand{\oldstylenums}[1]{
  \begingroup
    \ifmmode
      \mathgroup\symletters #1
    \else
      \CheckEncodingSubset@\@use@text@encoding{TS1}\%
    \fi
  \endgroup
}
```

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5.1.2 Subset encoding defaults

For many font families commonly used in the \TeX{} world we provide the subset encoding data here. Users can add additional font families in the file \texttt{textcomp.cfg} if they own other fonts.

However, if the option “forced” was given then all subset encoding specifications are ignored, so there is no point in setting any of them up:

\begin{verbatim}
\iftc@forced \else
\fi

Computer modern based fonts (e.g., CM, CM-Bright, Concrete):
\begin{verbatim}
\end{verbatim}

PSNFSS fonts:
\begin{verbatim}
\end{verbatim}

Other CTAN fonts (probably not complete):
\begin{verbatim}
\end{verbatim}

Latin Modern and \TeX{} Gyre:
\begin{verbatim}
\end{verbatim}
The remaining settings for Lucida are conservative: the following fonts contain the \textohm character but not the \texteuro, i.e., belong to neither subset 4 nor subset 3. If you want to use the \textohm with these fonts copy these definition to textcomp.cfg and change the subset to 3. However in that case make sure that you do not use the \texteuro.

If the file textcomp.cfg exists it will be loaded at this point. This allows to define further subset encodings for font families not covered by default.
1 Page Numbering

Page numbers are produced by a page counter, used just like any other counter. The only difference is that \c@page contains the number of the next page to be output (the one currently being produced), rather than one minus it. Thus, it is normally initialized to 1 rather than 0. \c@page is defined to be \count0, rather than a count assigned by \newcount.

The user sets the page number style with the \pagenumbering{⟨foo⟩} command, which sets the page counter to 1 and defines \thepage to be ⟨foo⟩. For example, \pagenumbering{roman} causes pages to be numbered i, ii, etc.
1 Cross Referencing

The user writes \texttt{\label{⟨foo⟩}} to define the following cross-references:

\ref*{⟨foo⟩}: value of most recently incremented referenceable counter. in the current environment. (Chapter, section, theorem, footnote and enumeration counters and other counters stepped with \texttt{\refstepcounter} are referenceable.)

\pageref*{⟨foo⟩}: page number at which \texttt{\label{foo}} command appeared. where foo can be any string of characters not containing ‘\’, ‘{’ or ‘}’.

Note: The scope of the \texttt{\label} command is delimited by environments, so \texttt{\begin{theorem} \label{foo} ... \end{theorem} \label{bar}} defines \texttt{\ref{foo}} to be the theorem number and \texttt{\ref{bar}} to be the current section number.

Note: \texttt{\label} does the right thing in terms of spacing – i.e., leaving a space on both sides of it is equivalent to leaving a space on either side.

Note: the starred versions \texttt{\ref*} and \texttt{\pageref*} are provided to align with the use of \texttt{hyperref}. Without \texttt{hyperref} (or some other package using the starred form) the star is simply ignored.

1.1 Cross Referencing

\textit{Historical \LaTeX 2.09 comments (not necessarily accurate any more):}

1 \langle∗2ekernel\rangle
2 \message{x-ref,}

This is implemented as follows. A referenceable counter \texttt{CNT} is incremented by the command \texttt{\refstepcounter{CNT}}, which sets \texttt{@currentlabel == {CNT}{eval\p@cnt\theCNT}}. The command \texttt{\label{FOO}} then writes the following on file \texttt{@auxout}:

\texttt{\newlabel{FOO}{{eval{@currentlabel}{{eval{\thepage}}}}}}

\texttt{\ref{FOO} == BEGIN}
\texttt{\hspace{1em} if \texttt{\r@foo} undefined}
\texttt{\hspace{2em} then \texttt{@refundefined := G T}}
\texttt{\hspace{1em} ??}
\texttt{\hspace{1em} Warning: 'reference foo on page ... undefined'}
\texttt{\hspace{1em} else \texttt{@car eval(\r@FOO)\@nil}}
\texttt{\hspace{1em} fi}
\texttt{\hspace{1em} END}

\texttt{\pageref{foo} = BEGIN}
\texttt{\hspace{1em} if \texttt{\r@foo} undefined}
\texttt{\hspace{2em} then \texttt{@refundefined := G T}}
\texttt{\hspace{1em} ??}

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Warning: 'reference foo on page ... undefined'

\ifcdr \eval(\ref{FOO})\nil
\fi
END

End of historical Bt\TeX\ 2.09 comments.

{\labelformat}
A reference via \ref produces by default the data associated with the corresponding \label command (typically a number); any additional formatting has to be provided by the user. If, for example, references to equations are always to be typeset as “equation \text{(number)}”, one has to code \textit{“equation \ref{(key)}”}. With \labelformat there is a possibility to generate such frills automatically without resorting to low-level coding. The command takes two arguments: the first is the name of a counter and the second is its representation when referenced. This means that for a successful usage, one has to know the counter name being used for generating the label, though in practice this should not pose a problem. The current counter number is picked up as an argument. Here are two examples:

\labelformat{section}{section~#1}
\labelformat{equation}{equation~(#1)}

{\Ref}
A side effect of using \labelformat is that, depending on the defined formatting, it becomes impossible to use \ref at the beginning of a sentence (if its replacement text starts with a lowercase letter). To overcome this problem we introduce the command \Ref that behave like \ref except that it uppercases the first token of the generated string.

To make \Ref work properly the very first token in the second argument of \labelformat has to be a simple ASCII or UTF-8 letter, otherwise the capitalization will fail or worse, you will end up with some error messages. If you actually need something more complicated in this place (e.g., an accented letter not written as a UTF-8 character) you have to explicitly surround it with braces, to identify the part that needs to be capitalized. For example, for figure references in the Hungarian language you might want to write \labelformat{figure}{{‘a}bra~\thefigure} or use \labelformat{figure}{ábra~\thefigure} which avoids the brace problem.

{\G@refundefinedtrue}
{\G@refundefined}
This does not save on name-space (since \G@refundefinedfalse was never needed) but it does make the implementation of such one-way switches more consistent. The extra macro to make the change is used since this change appears several times.

Note despite its name, \G@refundefinedtrue does not correspond to an \if command, and there is no matching \false. It would be more natural to call the command \G@refundefined (as inspection of the change log will reveal) but unfortunately such a change would break any package that had defined a \ref-like command that mimicked the definition of \ref, calling \G@refundefinedtrue. Inspection of the \TeX\ archives revealed several such packages, and so this command has been named \true so that the definition of \ref need not be changed, and the packages will work without change.

\% newif/ifG@refundefined
\% \def\G@refundefinedtrue{\global\let/ifG@refundefined/iftrue}
\% \def\G@refundefinedfalse{\global\let/ifG@refundefined/iffalse}
\% \def\G@refundefinedtrue{%
\% \gdef\G@refundefined({%
\% \latex@warning@no@line{There were undefined references}}}
\% \let/\G@refundefinedrelax

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Referencing a \label. RmS 91/10/25: added a few extra \reset@font, as suggested by Bernd Raichle.

RmS 92/08/14: made \ref and \pageref robust
RmS 93/09/08: Added setting of \refundefined switch.

\def\@setref#1#2#3{\ifx#1\relax\protect\G@refundefinedtrue\nfss@text\reset@font\bfseries ??\else\expandafter#2#1\null\fi}
\langle/2ekernel\rangle
\langle\latexrelease\rangle\IncludeInRelease{2022/06/01}{\ref}{Add starred reference commands}\langle\latexrelease\rangle
\def\@kernel@sref#1{\expandafter\@setref\csname r@#1\endcsname\@firstoftwo{#1}}
\def\@kernel@spageref#1{\expandafter\@setref\csname r@#1\endcsname\@secondoftwo{#1}}
\let\@kernel@ref\@kernel@sref
\let\@kernel@pageref\@kernel@spageref
\NewDocumentCommand\ref{s}{\IfBooleanTF{#1}{\@kernel@sref}{\@kernel@ref}}
\NewDocumentCommand\pageref{s}{\IfBooleanTF{#1}{\@kernel@spageref}{\@kernel@pageref}}
\langle/2ekernel\rangle
\langle\latexrelease\rangle\EndIncludeInRelease
\langle\latexrelease\rangle\IncludeInRelease{0000/00/00}{\ref}{Add starred reference commands}\langle\latexrelease\rangle
\def\ref#1{\expandafter\@setref\csname r@#1\endcsname\@firstoftwo{#1}}
\def\pageref#1{\expandafter\@setref\csname r@#1\endcsname\@secondoftwo{#1}}
\langle/2ekernel\rangle
\langle\latexrelease\rangle\EndIncludeInRelease
\langle/2ekernel\rangle
\langle\latexrelease\rangle
\EndIncludeInRelease
\langle/2ekernel\rangle
\langle\latexrelease\rangle
\EndIncludeInRelease
\langle\latexrelease\rangle
\EndIncludeInRelease
\langle/2ekernel\rangle

As the commands are now protected we also need expandable versions for use in \ifthenelse:
\def\@kernel@pageref@exp#1{\csname cs_if_exist:cTF\endcsname{r@#1}{\csname tl_item:cn\endcsname{r@#1}{2}}{0}}
\def\@kernel@ref@exp#1{\csname cs_if_exist:cTF\endcsname{r@#1}{\csname tl_item:cn\endcsname{r@#1}{1}}{0}}
\langle/2ekernel\rangle
\langle\latexrelease\rangle\EndIncludeInRelease
\langle\latexrelease\rangle\IncludeInRelease{0000/00/00}{\ref}{Add starred reference commands}\langle\latexrelease\rangle
\langle/2ekernel\rangle
\langle\latexrelease\rangle\EndIncludeInRelease
\langle\latexrelease\rangle
\EndIncludeInRelease
\langle\latexrelease\rangle
\EndIncludeInRelease
\langle/2ekernel\rangle

This command will be written to the .aux file to pass label information from one run to another.
The internal form of \newlabel and \cite. Note that this macro does it's work inside a group. That way the local assignments it needs to do don’t clutter the save stack. This prevents large documents with many labels to run out of save stack.

\begin{verbatim}
def\newlabelf\@newlabel#1#2#3{{%  
@ifundef\@newlabel#1{#2#3}{%    \relax%      \{\gdef \@multiplelabels {%%        \latexwarning{There were multiply-defined labels}%        \latexwarning{Label ‘#2’ multiply defined}%        \global\namedef{#1@#2}{#3}%;%      \}\def\newlabel{\@newlabel r}%      \onlypreamble\@newlabel%  }\endverbatim

\end{verbatim}

This is redefined to produce a warning if at least one label is defined more than once. It is executed by the \enddocument command.

\begin{verbatim}
\let \@multiplelabels \relax%  \end{verbatim}

\label The commands \label and \refstepcounter have been changed to allow \protect’ed commands to work properly. For example,

\begin{verbatim}
def\thechapter{\protect\foo{\arabic{chapter}.\roman{section}}}% will cause a \label{bar} command to define \ref{bar} to expand to something like \foo{4.d}. Change made 20 Jul 88.
\end{verbatim}

\begin{verbatim}
def\label#1{%0bsphack%  \protected\write\@auxout{%      \string\newlabel{#1}{{\@currentlabel}{\thepage}}}%;% \0bsphack%  }%\end{verbatim}

\end{verbatim}

(End definition for \label.)

\begin{verbatim}
⟨2ekernel⟩% ⟨∗2ekernel|latexrelease⟩% ⟨latexrelease\IncludeInRelease{2022/06/01}{}⟩% ⟨latexrelease\Ref{Add starred version}⟩%\end{verbatim}

\refstepcounter Step the counter and allow for labels to point to its current value.

\begin{verbatim}
def\currentcounter{%   \def\refstepcounter#1{\stepcounter{#1}%;\edef\@currentcounter{#1}%;\protected\edef\@currentlabel{\csnamethe#1\csname#1\endcsname}}%\end{verbatim}

By generating the second csname first the \p@... command can grab it as an argument which can be helpful for more complicated typesetting arrangements.

The trick is to ensure that \csname the#1\endcsname is turned into a single token before \p@... is expanded further. This way, if the \p@... command is a macro with one argument it will receive \the... With the original kernel code (i.e., without the \expandafter) it will instead pick up \csname which would be disasateurs.

Using \expandafter instead of braces delimiting the argument is better because, assuming that the \p@... command is not defined as a macro with one argument, the
braces will stay and prohibit kerning that might otherwise happen between the glyphs

\hspace{2em}
generated by \texttt{\textbackslash the}... and surrounding glyphs.

\hspace{2em}
\{\texttt{\textbackslash csname p#1\expandafter\endcsname\textbackslash csname the#1\endcsname}\%

\hspace{2em}
\}

(End definition for \texttt{\textbackslash refstepcounter}.)

\texttt{\textbackslash labelformat} A shortcut to set the \texttt{\textbackslash p\ldots} macro for a counter. It will pick up the counter representation as an argument so that it can be specially formatted.

\hspace{2em}
\{\texttt{\textbackslash expandafter\texttt{\textbackslash def\textbackslash csname p#1\endcsname}#1}\}

(End definition for \texttt{\textbackslash labelformat}.)

\texttt{\textbackslash Ref} This macro expands the result of \texttt{\textbackslash ref} and then uppercases the first token. Only useful if the label was generated via \texttt{\textbackslash labelformat} and contains some lower case letter at its start. If the label starts with a complicated construct (e.g., an accented letter that is provided via a command, e.g., \texttt{"a} instead of a UTF-8 character like ä) one has to surround everything that needs uppcasing in a brace group in the definition of \texttt{\textbackslash labelformat}.\footnote{There is one problem with this approach: the braces are kept in a normal \texttt{\textbackslash ref} which might spoil kerning. Perhaps one day this needs redoing.}

\hspace{2em}
\def\@kernel@Ref#1{\protected@edef\@tempa{\@kernel@ref{#1}}\%\texttt{\textbackslash expandafter\texttt{\textbackslash MakeUppercase}}\@tempa}\%

\hspace{2em}
\edef\@kernel@sRef#1{\protected@edef\@tempa{\@kernel@sref{#1}}\%\texttt{\textbackslash expandafter\texttt{\textbackslash MakeUppercase}}\@tempa}\%

\hspace{2em}
\NewDocumentCommand\Ref{s}{\IfBooleanTF{#1}{\@kernel@sRef}{\@kernel@Ref}}\%

(End definition for \texttt{\textbackslash Ref}.)

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\@currentlabel  Default for \label commands that come before any environment.
\def\@currentlabel{}
(End definition for \@currentlabel.)
1 Miscellaneous Environments

This section implements the basic environment mechanism, and also a few specific environments including \texttt{document}. The math environments and related commands, the ‘flushing’ environments, (\texttt{center}, \texttt{flushleft}, \texttt{flushright}), and \texttt{verbatim}.

\begin{foo}
\end{foo}

\begin{foo}
\end{foo}
are used to delimit environment foo.

\begin{foo}
\end{foo}
starts a group and calls \texttt{foo} if it is defined, otherwise it does nothing.

\begin{foo}
\end{foo}
checks to see that it matches the corresponding \texttt{begin} and if so, it calls \texttt{endfoo} and does an \texttt{endgroup}. Otherwise, \texttt{endfoo} does nothing.

If \texttt{endfoo} needs to ignore blanks after it, then \texttt{endfoo} should globally set the \texttt{@ignore} switch true with \texttt{@ignoretrue} (this will automatically be global).

\texttt{\@@end} is defined to be the \texttt{end} command of \TeX82.

\texttt{\enddocument} is the user’s command for ending the manuscript file.

\texttt{\stop} is a panic button — to end \TeX in the middle.

\texttt{\enddocument} ==
\begin{foo}
\end{foo}
\checkend{document} \; \% checks for unmatched \texttt{begin}
\clearpage
\begingroup
\if@filesw \closefile @mainaux
\ifG@refundefined = true
\LaTeX Warning: 'There are undefined references.' fi
\if@multiplelabels = true
\LaTeX Warning: 'One or more label(s) multiply defined.'
\else
\@setckpt {ARG1}{ARG2} == null
\newlabel{LABEL}{VAL} ==
\begin{foo}
\reserved@a == VAL
\ifdef\reserved@a = def(\r@LABEL)
\else \tempswa := true fi
\end{foo}
\bibcite{LABEL}{VAL} == null
\begin{foo}
\reserved@a == VAL
\ifdef\reserved@a = def(\g@LABEL)
\else \tempswa := true fi
\end{foo}

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END
@tempswa := false
make @ a letter
\input \jobname.AUX
if @tempswa = true
then LaTeX Warning: 'Label may have changed.
Rerun to get cross-references right.'
fi fi fi
\endgroup
finish up
END

@writefile{EXT}{ENTRY} ==
if tf@EXT undefined
else \write\tf@EXT{ENTRY}
fi
End of historical \TeX\ 2.09 comments.

@currenvir The name of the current environment. Initialized to \texttt{document}
to so that \texttt{\end{document}} works correctly.
3 \def@currenvir{document}
(End definition for \currenvir.)

@ifignore 
\ignoretrue 
\ignorefalse
4 \def\ignorefalse{\global\let@ifignore\iffalse}
5 \def\ignoretrue {\global\let@ifignore\iftrue}
6 \ignorefalse
(End definition for \ifignore, \ignoretrue, and \ignorefalse.)

\ignorespacesafterend
7 \let\ignorespacesafterend\ignoretrue
(End definition for \ignorespacesafterend.)

document(text)
8 ⟨/2ekernel⟩
9 ⟨*2ekernel || latexrelease⟩
10 ⟨latexrelease⟩\IncludeInRelease{2020/10/01}%
11 ⟨latexrelease⟩ {\enddocument}{Use Hooks}%
12 \def\enddocument{%
The \texttt{\end{document}} hook is executed first. If necessary it can contain a \texttt{\clearpage} to output dangling floats first. In this position it can also contain something like \texttt{\end{foo}} so that the whole document effectively starts and ends with some special environment. However, this must be used with care, eg if two applications would use this without knowledge of each other the order of the environments will be wrong after all. \texttt{\AtEndDocument} is redefined at this point so that and such commands that get into the hook do not chase their tail...
13 \@kernel@before@enddocument
14 \UseOneTimeHook{enddocument}%
15 \@kernel@after@enddocument

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The previous line is equiv to setting
\def\newlabel{\@testdef r}\
\def\bibcite{\@testdef b}\

We use \@@input to load the .aux file, so that it doesn’t show up in the list of files
produced by \listfiles.
\newcommand{\tempswafalse}{\makeatletter \@input\jobname.aux \fi}\
\UseOneTimeHook{enddocument/afteraux}\

Next hook is expect to contain only code for writing info messages on the terminal.
\UseOneTimeHook{enddocument/afterlastpage}\
\UseOneTimeHook{enddocument/afteraux}\
\UseOneTimeHook{enddocument/info}\
\UseOneTimeHook{enddocument/end}\

The public hooks used in \enddocument:
\AddToHook{enddocument/info}{\kernel/filelist}{\@dofilelist}\
\AddToHook{enddocument/info}{\kernel/warnings}{\@enddocument@kernel@warnings}\
\DeclareHookRule{enddocument/info}{\kernel/filelist}{before}{\kernel/warnings}\
\def\@enddocument@kernel@warnings{\
\ifdim \font@submax >\fontsubfuzz\relax\
\@font@warning{Size substitutions with differences up to \font@submax space have occurred.}\
\fi}

First we check for font size substitution bigger than \fontsubfuzz. The \relax is
necessary because this is a macro not a register.
\ifdim \font@submax >\fontsubfuzz\relax\
@font@warning{Size substitutions with differences up to \font@submax space have occurred.}\
\fi
The macro \defaultsubs is initially \relax but gets redefined to produce a warning if there have been some default font substitutions.

\defaultsubs

The macro \reffundefined is initially \relax but gets redefined to produce a warning if there are undefined refs.

\reffundefined

If a label is defined more than once, \tempswa will always be true and thus produce a “Label(s) may ...” warning. But since a rerun will not solve that problem (unless one uses a package like varioref that generates labels on the fly), we suppress this message.

\if@filesw
  \if\multiplelabels \relax
    \latex@warning@no@line{Label(s) may have changed. Rerun to get cross-references right}\
  \else
    \multiplelabels
  \fi
  \if\extra@page@added \relax
    \latex@warning@no@line{Temporary extra page added at the end. Rerun to get it removed}\
  \fi
\fi

We could think of adding a warning that nothing can be corrected while \nofiles is in force. In the past the warnings related to the aux file are simply suppressed in this case.

odiumocument\\kernel\warnings

(End definition for \enddocument\kernel\warnings.)

\def\enddocument{%
\let\AtEndDocument\@firstofone
\enddocumenthook
\checkend{document}
\begingroup
\if@filesw
  \immediate\closeout\@mainaux
  \setckpt\gobbletwo
  \newlabel\testdef
  \tempswafalse
  \makeatletter
\fi
\dofilelist
\checkcmd{\font@submax >\fontsubfuzz}{\font@warning{Size substitutions with differences \MessageBreak up to \font@submax\space have occurred.\gobbletwo}}

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The \@kernel@before@enddocument hook is slightly different because we initialize it with \par so that \enddocument always returns to vertical mode as its first action.

The rollback code renders it harmless.

Reading data from auxiliary files (like .toc normally happens in vertical mode and it therefore doesn’t matter if line endings are converted to spaces by \TeX during that process.

However, especially the .toc file might be read in L-R mode (in cases the \tableofcontents attempts to put, say a list of sub-sections as a paragraph. In that case the newlines after a line like

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might result in spurious spaces (e.g., when that level is not included).

That could be fixed by reading in the file using `\endlinechar=-1` but that has the
danger that it drops some valid endlines that should be converted to spaces (for example
when the user edited the TOC and then used `\nofiles` to preserve it.

So the approach taken instead is this:

- `\addcontentsline` adds the command `\protected@file@percent` to the end of
  the second argument of `\@writefile` that is written to the .aux. As the name
  indicates this is a protected macro so it doesn’t change if it is written out.
- When the .aux is read back in at the end of the run, `\@writefile` is executed and
  writes its second argument unmodified to the file with the extension given by its
  first argument. Or rather that was how it was in the past.
- Instead we change `\@writefile` slightly: basically it looks at the second argument
  and if the last token in there is `\protected@file@percent` then it is replaced by a
  percent character and that is then written out. If not (for example, if the data came
  from a user issued `\addtocontents`, or from some package that uses `\@writefile`
  for writing its own files) then the command behaves exactly as before.

\protected@file@percent Dummy cs to be replaced by a percent sign inside `\@writefile`. If it survives (when
used incorrectly) it will expand to nothing in a typesetting context.

\add@percent@to@temptokena Helper function which is used to inspect a sequence of tokens (the second argument of
`\@writefile` and if the last token is `\protected@file@percent` it will replace it by a
harmless percent. The result is saved in `\@temptokena` for later use.

\begin{verbatim}
\catcode`\^^A=9
\long\gdef\add@percent@to@temptokena
  #1\protected@file@percent#2\add@percent@to@temptokena
\end{verbatim}

When we call this macro in `\@writefile` we stick in `\empty` at the beginning, so that
in case the tokenlist consists of a single brace group the braces aren’t stripped. The
\expandafter then expands this extra token away again.

\begin{verbatim}
\expandafter\ifx\expandafter X\detokenize{#2}X\expandafter\dont@add@percent@to@temptokena
  \expandafter\do@add@percent@to@temptokena\fi{#1}
\end{verbatim}

If `\latexrelease` will read this code in high-speed mode in certain situations. During that
it will only look for `\if` tests but not actually execute the `\catcode` change above. As
a result it will drop anything after the `%` character in the definition. Therefore the `\fi`
needs to be on the next line and we need locally another comment character to avoid
getting spaces into the definition—a weird problem :-)
\catcode`\%=12
\catcode`\^^A=14
\long\gdef\do@add@percent@to@temptokena#1{\@temptokena\expandafter{#1%}\^^A
Can’t be on the same line as the % — see above.
}}
\endgroup

(End definition for \add@percent@to@temptokena.)

\@writefile{
\long\def\@writefile#1#2{\@ifundefined{tf@#1}\relax
\{%
If we write to the file we first prepare #2 using \add@percent@to@temptokena and then
write the token register out.
\add@percent@to@temptokena
\add@percent@to@temptokena
\immediate\write\csname tf@#1\endcsname{\the\@temptokena}%
\}
\}

(\2ekernel | \latexrelease)
(\latexrelease)\EndIncludeInRelease
(\latexrelease)\IncludeInRelease{0000/00/00}{Mask line endings}%
(\latexrelease)\protected@file@percent\undefined
(\latexrelease)\let\add@percent@to@temptokena\undefined
(\latexrelease)\let\do@add@percent@to@temptokena\undefined
(\latexrelease)\let\dont@add@percent@to@temptokena\undefined
(\latexrelease)\long\def\@writefile#1#2{%
(\latexrelease)\@ifundefined{tf@#1}\relax
(\latexrelease)\immediate\write\csname tf@#1\endcsname{\the\@temptokena}%
(\latexrelease)}

(End definition for \@writefile.)

\stop
\def\stop{\clearpage\deadcycles\z\let\par\@@par\@end}

(End definition for \stop.)

Historical \LaTeX2e comments (not necessarily accurate any more):
\everypar{\@nodocument} % To get an error if text appears before the
\nullfont % \begin{document}
\begin, \end, and \@checkend changed so \end{document} will catch an unmatched \begin. Changed 24 May 89 as suggested by Frank Mittelbach and Rainer Sch"opf.

\begin{NAME} == BEGIN
 IF \NAME undefined THEN \reserved@a == BEGIN report error END
 ELSE \reserved@a == (\@currenvir :=L NAME) \NAME
FI
\@ignore := G F \% Added 30 Nov 88
\begingroup
\@endpe := F
\@currenvir := L NAME
\NAME
END
\end{NAME} == BEGIN
\endNAME \@checkend{NAME} == BEGIN
 IF \@currenvir = NAME ELSE \@badend{NAME} FI
END
\@checkend{NAME} == BEGIN
 IF \@currenvir = NAME ELSE \@badend{NAME} FI
END

End of historical \LaTeX{} 2.09 comments.
Before the \document code is executed we have to first undo the \endgroup as there should be none for this environment to avoid that changes on top-level unnecessarily go to \TeX’s savestack, and we have to initialize all hooks in the hook system. So we need to test for this environment name. But once it has been found all this testing is no longer needed and so we redefine \execute@begin@hook to simply use the hook.

If this is an environment before \begin{document} we just run the hook so this can be outside the test.

The top level definition for \end. for an explanation see below (this is the same as the 2019 version where it was introduced, but for rollback we have to repeat it).

Version that adds hooks (so different from the 2019 version). It fixes tlb3722 but the change should perhaps be made in \tabularx instead.
Version without the fix for tlb3722 for the record:

\@namedef{end }#1{% 
% \UseHook{env/#1/end} %
% \csname end#1\endcsname \@checkend{#1} %
% \expandafter\endgroup\if@endpe\@doendpe\fi
% \UseHook{env/#1/after} %
% \if@ignore\@ignorefalse\ignorespaces\fi} %
\langle /2ekernel | latexrelease \rangle
\EndIncludeInRelease
\langle latexrelease \rangle \IncludeInRelease{2019/10/01}%
\langle latexrelease \rangle \DeclareRobustCommand\begin[1]{% 
\@ifundefined{#1}{% 
\@namedef{begin }#1{% 
% \UseHook{env/#1/end} %
% \csname end#1\endcsname \@checkend{#1} %
% \expandafter\endgroup\if@endpe\@doendpe\fi
% \UseHook{env/#1/after} %
% \if@ignore\@ignorefalse\ignorespaces\fi} %
\edef\begin {\unexpanded {\protect\begin {\protect\@currenvir}}}%
\ifx\protect\@typeset@protect \expandafter\@gobble \fi
\protect\csname begin \endcsname %}
\@namedef{begin }#1{% 
% \UseHook{env/#1/end} %
% \csname end#1\endcsname \@checkend{#1} %
% \expandafter\endgroup\if@endpe\@doendpe\fi
% \UseHook{env/#1/after} %
% \if@ignore\@ignorefalse\ignorespaces\fi} %
\begingroup \@endpefalse \reserved@a}
\end

A version that doesn’t start out with \relax when in typesetting mode would be the following, but since \begin issues a \begingroup it wouldn’t help much with respect to allowing things like \noalign or \multicolumn inside.

\edef\begin 
% \{"unexpanded{% 
% \ifx\protect\@typeset@protect 
% \expandafter\@gobble 
% \fi 
% \protect 
% }% 
% \expandafter\noexpand\csname begin \endcsname 
% } 
\@namedef{begin }#1{% 
% \UseHook{env/#1/end} %
% \csname end#1\endcsname \@checkend{#1} %
% \expandafter\endgroup\if@endpe\@doendpe\fi
% \UseHook{env/#1/after} %
% \if@ignore\@ignorefalse\ignorespaces\fi} %
\begingroup \@endpefalse \reserved@a}

While \begin was made robust simply by using \DeclareRobustCommand we need to be a bit more subtle with \end as there are packages out there that try to look into the top-level contents of \end{foo} (that is at the expansion of \endfoo) to see if it contains certain macros. This is done by hitting \end{foo} with three \expandafters, the first to get
\langle latexrelease \rangle \begingroup \@endpefalse \reserved@a 
\end{foo} \csname endfoo\endcsname \@checkend{foo} % etc.

the second to expand the \csname, i.e., to get to
and the third to finally get to the top-level content of \endfoo, i.e.
<top-level content of \endfoo> \@checkend{foo}% etc.

Therefore a robust replacement should produce the same results after three expansions (there first is obviously different).

Basically the definition of \end should either produce \protect\end (when not doing typesetting) or it should produce \end (without the \protect) when doing typesetting. Furthermore, it should (when in typesetting mode) show exactly the same result as \end (which is the original fragile definition of \end) when you expand either of them twice, i.e.,

\endfoo \@checkend{foo}% etc.

That is achieved with the code below (which is worth studying carefully).

There is some trickery involved here: in particular we use \romannumeral to change a single expansion into three successive expansions in one go. That primitive expands until it has scanned a number (0 in this case, so it doesn’t produce any output) and so it allows us to place arbitrary many \expandafter\s inside that are all going to be executed when \romannumeral is hit by a single \expandafter.

And here is the original definition of \end the way it was in \LaTeX for several decades now hidden in \end.<br>

An here the rollback in case that is ever needed.
Also undo the internal commands as some packages unfortunately test for their existence instead of using \IfFormatAtLeastTF.

\let\@currenvline\@empty

We do need a default value for \@currenvline on top-level since the document environment cancels the brace group. This means that a mismatch with \begin{document} will not produce a line number. Thus the outer default must be \@empty or we will end up with two spaces.

We provide 4 high-level hook interfaces directly, the others only when etoolbox is loaded

\AtBeginEnvironment
\AtEndEnvironment
\BeforeBeginEnvironment
\AfterEndEnvironment
1.2 Center, Flushright, Flushleft

\message{center,}

Historical \TeX{} 2.09 comments (not necessarily accurate any more):

\center, \flushright and \flushleft set
\rightskip = 0pt or \@flushglue (as appropriate)
\leftskip = 0pt or \@flushglue (as appropriate)
\parindent = 0pt
\parfillskip = 0pt. (except \flushleft)
\\ == \par \vskip -\parskip
\\[\LENGTH] == \par \vskip \LENGTH
\\* == \par \penalty 10000 \vskip -\parskip
\\*[\LEN] == \vskip \LENGTH

They invoke the trivlist environment to handle vertical spacing before
and after them.

\centering, \raggedright and \raggedleft are the declaration analogs
of the above.

\raggedright has a more universal effect, however. It sets
\@rightskip := flushglue. Every environment, like the list
environments,
that set \rightskip to its 'normal' value set it to \@rightskip

End of historical \TeX{} 2.09 comments.

\@centercr

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End definition for \@centercr.

\@xcentercr
\def\@xcentercr{\addvspace{-\parskip}\@ifnextchar
  \@icentercr\ignorespaces}

(End definition for \@xcentercr.)

\@icentercr
\def\@icentercr[#1]{\@vspace@calcify{#1}\ignorespaces}

(End definition for \@icentercr.)

center (env.) We use \relax to prevent \item scanning too far.
\def\center{\trivlist \centering\item\relax}
\def\endcenter{\endtrivlist}

\centering
\DeclareRobustCommand\centering{\let\\@centercr
\rightskip\@flushglue\leftskip\@flushglue
\finalhyphendemerits=\z@
\parindent\z@\parfillskip\z@skip}

(End definition for \centering.)

\raggedright
\DeclareRobustCommand\raggedright{\let\\@centercr
\rightskip\@flushglue\leftskip\@flushglue
\finalhyphendemerits=\z@
\parindent\z@\parfillskip\z@skip}

(End definition for \raggedright.)
\raggedleft
\DeclareRobustCommand\raggedleft{\
  \let\\@centercr
  \rightskip\z@skip\leftskip\@flushglue
  \parindent\z@\parfillskip\z@skip}

(End definition for \raggedleft.)

\DeclareRobustCommand\centering{\
  \let\\@centercr
  \rightskip\@flushglue\leftskip\@flushglue
  \parindent\z@\parfillskip\z@skip}

\DeclareRobustCommand\raggedright{\
  \let\\@centercr\@rightskip\@flushglue \rightskip\@rightskip
  \leftskip\z@skip
  \parindent\z@}

\kernel@make@fragile\centering\kernel@make@fragile\raggedright
\kernel@make@fragile\raggedleft

(End definition for \@rightskip.)

\flushleft (env.) We use \relax to prevent \item scanning too far.
\def\flushleft{\trivlist \raggedright\item\relax}
\def\endflushleft{\endtrivlist}

\flushright (env.) We use \relax to prevent \item scanning too far.
\def\flushright{\trivlist \raggedleft\item\relax}
\def\endflushright{\endtrivlist}
1.3 Verbatim

\message{verbatim,}

The verbatim environment uses the fixed-width \ttfamily font, turns blanks into spaces, starts a new line for each carriage return (or sequence of consecutive carriage returns), and interprets every character literally. I.e., all special characters \ as, $, etc. are \catcode\d to 'other'.

The command \verb produces in-line verbatim text, where the argument is delimited by any pair of characters. E.g., \verb #...# takes '...' as its argument, and sets it verbatim in \ttfamily font.

The *-variants of these commands are the same, except that spaces print as the \TeXbook's space character instead of as blank spaces.

\vobeyspaces

\gdef\vobeyspaces{\catcode\' =\active%}

(End definition for \vobeyspaces.)

\xobeysp

(End definition for \xobeysp.)

\verbatim

Real start of verbatim environment We use \relax to prevent \item scanning too far.

\verbatim
def@verbatim{\trivlist \item\relax
\if@minipage\else\vskip\parskip\fi
\leftskip\@totalleftmargin\rightskip\z@skip
\parindent\z@\parfillskip\@flushglue\parskip\z@skip
\@@par to clear possible \parshape definition from a surrounding list (the verbatim guru says). Switch language when in vertical mode.

\@par

Set \language here to suppress hyphenation. Done this way rather than setting \hyphenchar as that is a global setting.

\language\l@nohyphenation
\tempswafalse
\def\par{%
\if@tempswa

\IncludeInRelease{2017-04-15}{\verbatim} %
\IncludeInRelease{2017-04-15}{\verbatim}

\IncludeInRelease{2017-04-15}{\verbatim}
\IncludeInRelease{2017-04-15}{\verbatim}
A `\leavevmode` added: needed if, for example, a blank verbatim line is the first thing in a list item (wow!).

```latex
\leavevmode \null \@@par\penalty\interlinepenalty
\else
\@tempswatrue
\ifhmode\@@par\penalty\interlinepenalty\fi
\fi\%
```

To allow customization we hide the font used in a separate macro.

```latex
\let\do@makeother \dospecials
\obeylines \verbatim@font \@noligs
```

To avoid a breakpoint after the labels box, we remove the penalty put there by the list macros: another use of `\unpenalty`!

```latex
\everypar \expandafter{\the\everypar \unpenalty}\%
```

A \texttt{\verbatim@font} macro to select the font used for verbatim typesetting. It also does other work if necessary for the font used.

```latex
\verbatim@font
```

File H: \texttt{ltmiscen.dtx} Date: 2021/06/05 Version v1.1z
\verbvisiblespace  This defines how to get a visible space in \verb* and friends. In classic \TeX this is just the slot 32, but in TU encoded fonts we switch fonts and take the character from cmtt.

\@setupverbvisiblespace  In pdf\TeX a catcode 12 space will produce the character in slot 32 which is assumed to be a visible space character (in a typewriter font in OT1 or T1 encoding). In Xe\TeX or Lua\TeX a font in TU encoding is normally used and that has a real space in this slot. So what we do in this case is this: we check the definition of \verbvisiblespace and if it is \verbvisiblespace we assume that the char32 can be used (e.g., in pdf\TeX). We then redefine \@xobeysp so that after running \@vobeyspaces we get characters from slot 32 for each active space.

\verbvisiblespacebox  The box to hold the visible space character if it isn’t in slot 32 in the current typewriter font.
For \verb*[env.] we also set up the correct visible space character definition and then run \@vobeyspaces. As this code is not called as part of the normal verbatim environment (the method is done the other way around this time) we don’t have to check if space is already active—it shouldn’t be.

\@namedef{verbatim*}{\@verbatim
\@setupverbvisiblespace
\frenchspacing\@vobeyspaces\@sxverbatim}
\expandafter\let\csname endverbatim*\endcsname =\endverbatim

\IncludeInRelease{2020/10/01}{\@verb}{Drop spaces before \verb delimiter}

Definitions of \@sverb and \@verb changed so \verb+ foo+ does not lose leading blanks when it comes at the beginning of a line. Change made 24 May 89. Suggested by Frank Mittelbach and Rainer Schöpf.

\def\@sverb#1{%\if\noexpand#1 \expandafter\@sverb\else\@@sverb{#1}\fi}
\def\@@sverb#1{%\catcode'#1=\active
\lccode'\~'=\active
\gdef\verb@balance@group{\verb@egroup
\@latex@error{\noexpand\verb illegal in argument}\@ehc}
\aftergroup\verb@balance@group
\lowercase{\let\~\verb@egroup}}

If \@sverb is called from \@verb then space is already active and supposed to produce a real space. In this case we do nothing. Otherwise we run \@setupverbvisiblespace to setup the right visible space char and afterwards \@vobeyspaces to make it the definition for the active space character.
(End definition for @verb and @sverb.)

(End definition for @makeother.)

(End definition for @verb@balance@group.)

(End definition for @verb@eol@error.)

File H: ltmiscen.dtx Date: 2021/06/05 Version v1.1z
\verb|Typesetting a small piece verbatim.|

\verbatim@nolig@list\def\verbatim@nolig@list{\do\do\do\do\do\do}

(End definition for \verbatim@nolig@list.)

\do@nolig\def\do@nolig\catcode'#1=active
\begin{group}
\lccode'\-'#1=\relax
\lowercase{\endgroup\def-\leavevmode\kern'\char'\active}

(End definition for \do@nolig.)

\@nolig\def\@nolig\let\do@makeother \dospecials
\verbatim@font\@nolig\@ifstar\@sverb\@verb}

(End definition for \verbatim@font\@nolig\@ifstar\@sverb\@verb.)

\@verb\def\@verb\@vobeyspaces \frenchspacing \@sverb

(End definition for \@verb.)

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1 Math setup

This file contains a lot of the original plain \TeX code, as well as the \LaTeX environments for math. It still needs sorting out.

\message{math definitions,}

1.1 Math commands based on plain \TeX

1.1.1 The log-like functions

\log The standard operators:

\begin{verbatim}
\DeclareRobustCommand\log{\mathop{\operator@font log}\nolimits}
\DeclareRobustCommand\lg{\mathop{\operator@font lg}\nolimits}
\DeclareRobustCommand\ln{\mathop{\operator@font ln}\nolimits}
\DeclareRobustCommand\lim{\mathop{\operator@font lim}}
\DeclareRobustCommand\limsup{\mathop{\operator@font lim\,sup}}
\DeclareRobustCommand\liminf{\mathop{\operator@font lim\,inf}}
\DeclareRobustCommand\sin{\mathop{\operator@font sin}\nolimits}
\DeclareRobustCommand\arcsin{\mathop{\operator@font arcsin}\nolimits}
\DeclareRobustCommand\sinh{\mathop{\operator@font sinh}\nolimits}
\DeclareRobustCommand\cos{\mathop{\operator@font cos}\nolimits}
\DeclareRobustCommand\arccos{\mathop{\operator@font arccos}\nolimits}
\DeclareRobustCommand\cosh{\mathop{\operator@font cosh}\nolimits}
\DeclareRobustCommand\tan{\mathop{\operator@font tan}\nolimits}
\DeclareRobustCommand\arctan{\mathop{\operator@font arctan}\nolimits}
\DeclareRobustCommand\tanh{\mathop{\operator@font tanh}\nolimits}
\DeclareRobustCommand\cot{\mathop{\operator@font cot}\nolimits}
\DeclareRobustCommand\coth{\mathop{\operator@font coth}\nolimits}
\DeclareRobustCommand\sec{\mathop{\operator@font sec}\nolimits}
\DeclareRobustCommand\csc{\mathop{\operator@font csc}\nolimits}
\DeclareRobustCommand\max{\mathop{\operator@font max}}
\DeclareRobustCommand\min{\mathop{\operator@font min}}
\DeclareRobustCommand\sup{\mathop{\operator@font sup}}
\DeclareRobustCommand\inf{\mathop{\operator@font inf}}
\DeclareRobustCommand\arg{\mathop{\operator@font arg}\nolimits}
\DeclareRobustCommand\ker{\mathop{\operator@font ker}\nolimits}
\DeclareRobustCommand\dim{\mathop{\operator@font dim}\nolimits}
\DeclareRobustCommand\hom{\mathop{\operator@font hom}\nolimits}
\DeclareRobustCommand\det{\mathop{\operator@font det}}
\DeclareRobustCommand\exp{\mathop{\operator@font exp}\nolimits}
\DeclareRobustCommand\Pr{\mathop{\operator@font Pr}}
\DeclareRobustCommand\gcd{\mathop{\operator@font gcd}}
\DeclareRobustCommand\deg{\mathop{\operator@font deg}\nolimits}
\end{verbatim}

(End definition for \log.)

\bmod And some operators have to be done by hand:
\DeclareRobustCommand\bmod{\nonscript\mskip-\medmuskip\mkern5mu\mathbin{\operator@font mod}\penalty900\mkern5mu\nonscript\mskip-\medmuskip}

(End definition for \bmod.)

\pmod

\DeclareRobustCommand\pmod\[1]{\allowbreak\mkern18mu({\operator@font mod}\,#1)}

(End definition for \pmod.)

1.1.2 Biggggg

\big Variants on \big and friends for use with delimiters:

\DeclareRobustCommand\bigl{\mathopen\big}
\DeclareRobustCommand\bigm{\mathrel\big}
\DeclareRobustCommand\bigr{\mathclose\big}
\DeclareRobustCommand\Bigl{\mathopen\Big}
\DeclareRobustCommand\Bigm{\mathrel\Big}
\DeclareRobustCommand\Bigr{\mathclose\Big}
\DeclareRobustCommand\biggl{\mathopen\bigg}
\DeclareRobustCommand\biggm{\mathrel\bigg}
\DeclareRobustCommand\biggr{\mathclose\bigg}
\DeclareRobustCommand\Biggl{\mathopen\Bigg}
\DeclareRobustCommand\Biggm{\mathrel\Bigg}
\DeclareRobustCommand\Biggr{\mathclose\Bigg}

(End definition for \big.)

1.1.3 The UNSORTED Rest

The other math commands are lifted from plain \TeX.

\jot

\newdimen\jot
\jot=3pt

(End definition for \jot.)

\interdisplaylinepenalty

\newcount\interdisplaylinepenalty
\interdisplaylinepenalty=100

(End definition for \interdisplaylinepenalty.)

\choose

\def\choose{\atopwithdelims()}

(End definition for \choose.)

\brack

\def\brack{\atopwithdelims[]}

(End definition for \brack.)
\brace
\def\brace{\atopwithdelims\{}\}

(End definition for \brace.)

\mathpalette
\def\mathpalette#1#2{\mathchoice{#1\displaystyle{#2}}{#1\textstyle{#2}}{#1\scriptstyle{#2}}{#1\scriptscriptstyle{#2}}}

(End definition for \mathpalette.)

\root
\def\root#1\of{\setbox\rootbox\hbox{$\m@th\scriptscriptstyle{#1}$}\mathpalette\r@@t}
\def\r@@t#1#2{\setbox\z@\hbox{$\m@th#1\sqrtsign{#2}$}\dimen@\ht\z@ \advance\dimen@-\dp\z@ \mkern5mu\raise.6\dimen@\copy\rootbox\mkern-10mu\box\z@}

(End definition for \root, \rootbox, and \r@@t.)

\phantom
\def\phantom#1\of{}\def\ifv@{}\def\ifh@{}\newif\v@
ewif\h@
ewif\ph@nt
\DeclareRobustCommand\vphantom{\v@true\h@false\ph@nt}
\DeclareRobustCommand\hphantom{\v@false\h@true\ph@nt}
\DeclareRobustCommand\phantom{\v@true\h@true\ph@nt}
\DeclareRobustCommand\mathstrut{\vphantom(}

(End definition for \phantom, \vphantom, \hphantom, and \phantom.)

\mathstrut
\DeclareRobustCommand\mathstrut{\vphantom{}}

(End definition for \mathstrut.)

\{2ekernel\}
\begin{document}
\textbf{File I: ltmass. dtx Date: 2022/05/08 Version v1.2l}
\def\phantom{
  \ifmmode
    \expandafter\mathpalette\expandafter\mathphantom
  \else
    \expandafter\makephantom
  \fi}
\def\makephantom#1{
  \setbox\z@hbox{\color@begingroup#1\color@endgroup}\finphantom}
\def\mathphantom#1#2{
  \setbox\z@hbox{$\m@th#1{#2}$}\finphantom}
⟨/2ekernel⟩
⟨∗2ekernel|latexrelease⟩
⟨latexrelease⟩\IncludeInRelease{2018/12/01}⟨latexrelease⟩{
  \finphantom}{Start LR-mode}⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}⟨latexrelease⟩{
  \finphantom}{Start LR-mode}⟨latexrelease⟩\EndIncludeInRelease
⟨/2ekernel⟩

(End definition for \phantom and others.)

\smash
\DeclareRobustCommand\smash{
  \relax % \relax, in case this comes first in \halign
  \ifmmode
    \expandafter\mathpalette\expandafter\mathsmash
  \else
    \expandafter\makesmash
  \fi}
\def\makesmash#1{
  \setbox\z@hbox{\color@begingroup#1\color@endgroup}\finishmash}
\def\mathsmash#1#2{
  \setbox\z@hbox{$\m@th#1{#2}$}\finishmash}
⟨/2ekernel⟩
⟨∗2ekernel|latexrelease⟩
⟨latexrelease⟩\IncludeInRelease{2018/12/01}⟨latexrelease⟩{
  \finishmash}{Start LR-mode}⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}⟨latexrelease⟩{
  \finishmash}{Start LR-mode}⟨latexrelease⟩\EndIncludeInRelease
⟨/2ekernel⟩

File I: lmtex.dtx Date: 2022/05/08 Version v1.2
\def\buildrel #1\over #2{\mathrel{\mathop{\kern\z@#2}\limits^{#1}}}
 Originally \LaTeX{} only provided a small set of spacing commands for use in text and math, some of the commands like \; were only supported in math mode. \texttt{amsmath} normalized and provided all of them in text and math. This code has now been moved to the kernel so that it is generally available.

\begin{verbatim}
\DeclareRobustCommand\tmspace[3]{
\ifmmode\mskip#1#2\else\leavevmode@ifvmode\kern#1#3\fi\relax}
\end{verbatim}
In `amsmath` the text kern is `.1667em`. For compatibility reasons we keep the longer one.

```
\DeclareRobustCommand\{\tmspace+\thinmuskip{.16667em}}
\let\thinspace,\tmspace+
\DeclareRobustCommand\!{\tmspace-\thinmuskip{.16667em}}
\let\negthinspace,\tmspace-
\DeclareRobustCommand\:\{\tmspace+\medmuskip{.2222em}}
\let\medspace,\tmspace+
\DeclareRobustCommand\;{\tmspace+\thickmuskip{.2777em}}
\let\thickspace,\tmspace+
\DeclareRobustCommand\!{\tmspace-\thickmuskip{.2777em}}
```

\TeX has a second name for this in its manual:

```
\DeclareRobustCommand\{\relax\ifmmode\mskip\thinmuskip\else\thinspace\fi}
\let\:=\>
\def\;!{\mskip\thickmuskip}
\def\!{\mskip\medmuskip}
```

(End definition for `\tmspace` and others.)

```
\DeclareRobustCommand\*{\discretionary{\thinspace\the\textfont2\char2}{}{}}
```

(End definition for `\*`.)

`\!` Nickname for the medium space since `\>` is not available inside `tabbing`.

```
\let\:=\>
```

(End definition for `\!`.)

`\active@math@prime` This is the definition of the active math prime.

```
\def\active@math@prime{\bgroup\prim@s}
```

(End definition for `\active@math@prime`.)

File I: `ltmath.dtx` Date: 2022/05/08 Version v1.2l  645
\prim@s

\def\prim@s{% 
  \futurelet\@let@token\pr@m@s}

\def\pr@m@s{% 
  \ifx'\@let@token \expandafter\pr@@@s \else 
    \ifx^\@let@token \expandafter\expandafter\expandafter\pr@@@t \else 
      \egroup 
    \fi 
  \fi}

\def\pr@@@s#1{\prim@s}

\def\pr@@@t#1#2{#2\egroup}

\enddefinition for \prim@s.

\catcode'\_\mathcode_{\active \gdef_{\_}} % _ in math is 
  % either subscript or \_

1.2 Math Environments

\( \) Produces \$...\$ with checks that \( \) isn’t used in math mode, and that \( \) is only used 
in math mode begun with \( .\)

\enddefinition for \( and \).
\DeclareRobustCommand\[{\relax\ifmmode
\@badmath
\else
\ifvmode
\nointerlineskip
\makebox[.6\linewidth]{}\fi
$$%%$$ BRACE MATCH HACK
\fi
\else
\@badmath
\fi
\ignorespaces
}\}%
\DeclareRobustCommand\]{\relax\ifmmode
\ifinner
\@badmath
\else
$$%%$$ BRACE MATCH HACK
\fi
\else
\@badmath
\fi
\ignorespaces
}\}%
\endinput
math (env.) Disguises for \{\ldots\} and \{\ldots\}.

\begin{verbatim}
let \math = \{
let \endmath = \}
def \displaymath {\[}
def \enddisplaymath {\]} \ignorespaces
\end{verbatim}

(End definition for \let and \endmath.)

displaymath (env.) Disguises for \(...\) and \[...\].

\begin{verbatim}
let \math = \{
let \endmath = \}
def \displaymath {\[}
def \enddisplaymath {\]} \ignorespaces
\end{verbatim}

(End definition for \let and \endmath.)

equation (env.) Numbered equations, using the counter \c@equation. Note: The document style must define \theequation etc., and do the appropriate \@addtoreset. It should also redefine \@eqnnum if another format for the equation number is desired other than the standard (...), or to move the equation numbers to the flushleft. (See comment on the \def of \@eqnnum.)

\begin{verbatim}
definecounter {equation}
def equation { \refstepcounter {equation} }
def endequation { \eqno \hbox { \@eqnnum } \@ignoretrue }
\end{verbatim}

(End definition for \c@equation.)

\@eqnnum Produces the equation number for equation and eqnarray environments. The following definition is for flushright numbers; for flushleft numbers, see leqno.clo. The equation number is set in black roman type even if an eqnarray environment appears in an italic environment.

\begin{verbatim}
def \@eqnnum { \normalfont \normalcolor ( \theequation ) }
\end{verbatim}

(End definition for \@eqnnum.)

\stackrel A disguise for plain \TeX’s \buildrel.

\begin{verbatim}
declarerobustcommand \stackrel [2] { \mathrel { \mathop { #2 } \limits ^ { #1 } } }
\end{verbatim}

(End definition for \stackrel.)

\frac A disguise for plain \TeX’s \over.

\begin{verbatim}
declarerobustcommand \frac [2] { { \begingroup #1 \endgroup \over #2 } }
\end{verbatim}

(End definition for \frac.)

\sqrt \@sqrt Add an optional argument to plain’s \sqrt to give the \textit{nth root of an expression} \sqrt[n]{e}.

\begin{verbatim}
declarerobustcommand \sqrt { \@ifnextchar [ \@sqrt \sqrtsign }
def \@sqrt [ #1 ] { \root #1 \of }
\end{verbatim}

(End definition for \sqrt and \@sqrt.)

eqnarray (env.) Here’s the eqnarray environment: Default is for left-hand side of equations to be flushright. To make them flushleft, \let \@eqnsep = \hfil.

\begin{verbatim}
newcount \@eqcnt
newcount \@eqpen
newif \if@eqnsw
newif \if@eqntrue
newskip \@centering
@centering = 0pt plus 1000pt
\end{verbatim}

File I: ltmath.dtx Date: 2022/05/08 Version v1.2l
To get a proper \@currentlabel we have to redefine it for the whole display. Note that we can’t use \refstepcounter as this results in \@currentlabel getting restored at the wrong and thus always writing the first label to the .aux file.

\def\eqnarray{\stepcounter{equation}\
def\@currentlabel{p@equation\theequation}\\def\@currentcounter{equation}\\global\@eqncutrue\\m@th\\global\@eqcnt\z@\\\tab skipped\@centering\\let\\eqncr$$\everycr{}\halign to\displaywidth\bgroup\\hskip\@centering$\displaystyle\tabskip\z@skip{##}$\@eqnsel\\&\global\@eqcnt\@ne\hskip \tw@\arraycolsep $\displaystyle{##}$\hfil	abskip\@centering\\&\global\@eqcnt\tw@\hskip \tw@\arraycolsep$\displaystyle{##}$\hfil\tabskip\@centering\\&\global\@eqcnt\thr@@ \hb@xt@\z@\bgroup\hss##\egroup\tabskip\z@skip\\cr\}\\def\endeqnarray{\@@eqncr\\global\advance\c@equation\m@ne$$\@ignoretrue}\\let\@eqnsel=\relax

//eqnarray support calc syntax
\def\@xeqncr[\#1]{\ifnum0='\fi}\\def\@yeqncr{\protected\def\@yeqncr{%}{\ifnum0='}\fi}\\@ifstar{%\global\@eqpen\@M\@yeqncr}{%\global\@eqpen\interdisplaylinepenalty \@yeqncr}{%}

\def\@yeqncr{\@testopt\@yeqncr\z@skip}\def\@yeqncr{\@testopt\@yeqncr\z@skip}

\@eqncr
\@xeqncr
\@yeqncr

\protected\def\@xeqncr{%}{\ifnum0='}\fi}\\@ifstar{%\global\@eqpen\@M\@xeqncr}{%\global\@eqpen\interdisplaylinepenalty \@xeqncr}{%}

\def\@xeqncr{\@testopt\@xeqncr\z@skip}

\nonumber Switches off equation numbering.
\def\nonumber{\global\@eqnswfalse}(End definition for \@eqncr and others.)

\@eqncr
\@xeqncr
\@yeqncr

\protected\def\@yeqncr{%}{\ifnum0='}\fi}\\@ifstar{%\global\@eqpen\@M\@yeqncr}{%\global\@eqpen\interdisplaylinepenalty \@yeqncr}{%}

\def\@yeqncr{\@testopt\@yeqncr\z@skip}

\nonumber Switches off equation numbering.
\def\nonumber{\global\@eqnswfalse}(End definition for \@eqncr and others.)

\@eqncr
\@xeqncr
\@yeqncr

\protected\def\@xeqncr{%}{\ifnum0='}\fi}\\@ifstar{%\global\@eqpen\@M\@xeqncr}{%\global\@eqpen\interdisplaylinepenalty \@xeqncr}{%}

\def\@xeqncr{\@testopt\@xeqncr\z@skip}

\nonumber Switches off equation numbering.
\def\nonumber{\global\@eqnswfalse}(End definition for \@eqncr and others.)
(End definition for \@eqncr, \@xeqncr, and \@yeqncr.)

\def\@xeqncr[#1]{% 
  \ifnum0='{\fi} \\
  \@@eqncr \\
  \noalign{\penalty\@eqpen\vskip\jot\vskip #1\relax}% \\
}

(End definition for \@eqncr.)

\def\lefteqn#1{\rlap{$\displaystyle #1$}}

(End definition for \lefteqn.)

\DeclareRobustCommand{\ensuremath}{% 
  \ifmmode \\
  \expandafter\@firstofone \else \\
  \expandafter\@ensuredmath \fi}

File I: ltmath.dtx Date: 2022/05/08 Version v1.2l 650
The \relax stops \ensuremath{} starting display math.

\long\def\@ensuredmath#1{$\relax#1$}

Lua\TeX\ contains new math primitives to place expression over or under horizontally extensible glyphs. Before Lua\TeX\ 1.14 these did not work correctly with the \mathstyle primitive and sometimes did not use cramped style in consistent ways. For newer versions, we opt into the corrected behavior.

\ifx\mathdefaultsmode\@undefined\else\mathdefaultsmode=1\fi

\langle /\texttt{kernel} \rangle

1.3 External options to the standard document classes

1.3.1 Left equation numbering

\eqnnum

To put the equation number on the left side of an equation we have to use a little trick. The number is shifted \displaywidth to the left inside a box of (approximately) zero width. This fails when the equation is too wide, the equation number than may overprint the equation itself.

\newcommand\@eqnnum{\hb@xt@.01\p@{}% \rlap{\normalfont\normalcolor \hskip -\displaywidth(\theequation)}%
\hskip -\displaywidth(\theequation)}

\langle /\texttt{leqno} \rangle

\begin{trivlist}
\@beginparpenalty\predisplaypenalty
\end{trivlist}

\langle /\texttt{leqno} \rangle

\end{definition}

1.3.2 Flush left equations

To get the displayed math environments to print the contents flush left (with an indentation) we have to redefine all of \LaTeX\'s displayed math environments.

\mathindent

The amount of indentation of the equations is stored in a register.

\newskip\mathindent

The setting of \mathindent has to be deferred until the class file has been processed, because \leftmargini is still 0pt wide at the moment fleqn.clo is read in.

\AtEndOfClass{\mathindent\leftmargini}

\end{definition}

\begin{flushleft}

\begin{center}

\begin{align}
\end{align}

\end{center}

\end{flushleft}

\langle /\texttt{fleqn} \rangle

\end{definition}
The equation environment
Ensure that there is at least a space between formula and equation number so that they
don’t bump in each other.

\begin{eqnarray}
\end{eqnarray}

eqnarray (env.) The \texttt{eqnarray} environment

When the documentclass uses a non-zero $\backslash$parskip$ setting the $\backslash$topsep might have a nega-
tive value to compensate for that. Therefore we add $\backslash$parskip to $\backslash$abovedisplayskip.
1 List, and related environments

The generic commands for creating an indented environment – enumerate, itemize, quote, etc – are:

\list{(LABEL)}{(COMMANDS)} ...
\endlist

which can be invoked by the user as the list environment. The LABEL argument specifies item labeling. COMMANDS contains commands for changing the horizontal and vertical spacing parameters.

Each item of the environment is begun by the command \item[ITEMLABEL] which produces an item labeled by ITEMLABEL. If the argument is missing, then the LABEL argument of the \list command is used as the item label.

The label is formed by putting \makelabel{⟨ARG⟩} in an hbox whose width is either its natural width or else \labelwidth, whichever is larger. The \list command defines \makelabel to have the default definition:

\makelabel{⟨ARG⟩} == BEGIN \hfil ARG END

which, for a label of width less than \labelwidth, puts the label flushright, \labelsep to the left of the item’s text. However, \makelabel can be let to another command by the \list’s COMMANDS argument.

A \usecounter{⟨name⟩} command in the second argument causes the counter ⟨name⟩ to be initialized to zero, and stepped by every \item command without an argument. (\label commands within the list refer to this counter.)

When you leave a list environment, returning either to an enclosing list or normal text mode, LaTeX begins a new paragraph if and only if you leave a blank line after the \end command. This is accomplished by the \@endparenv command.

Blank lines are ignored every other reasonable place i.e.:

• Between the \begin{list} and the first \item,
• Between the \item and the text of that item.
• Between the end of the last item and the \end{list}.

For an environment like quotation, in which items are not labeled, the entire environment is a single item. It is defined by letting \quotation == \list{}\item\relax. (Note the \relax, there in case the first character in the environment is a ‘[’.) The spacing parameters provide a great deal of flexibility in designing the format, including the ability to let the indentation of the first paragraph be different from that of the subsequent ones.

The trivlist environment is equivalent to a list environment whose second argument sets the following parameter values:

\leftmargin = 0: causes no indentation of left margin
\labelwidth = 0: see below for precise effect this has.
\itemindent = 0: with a null label, makes first paragraph have no indentation. Success-
ing paragraphs have \parindent indentation. To give first paragraph same indentation, set \itemindent = \parindent before the \item[].

Every \item in a trivlist environment must have an argument—in many cases, this
will be the null argument (\item[]). The trivlist environment is mainly used for para-
graphing environments, like verbatim, in which there is no margin change. It provides
the same vertical spacing as the list environment, and works reasonably well when it
occurs immediately after an \item command in an enclosing list.

1.1 List and Trivlist

The following variables are used inside a list environment:

\@totalleftmargin The distance that the prevailing left margin is indented from the
outermost left margin,

\linewidth The width of the current line. Must be initialized to \hsize.

\@listdepth A count for holding current list nesting depth.

\makelabel A macro with a single argument, used to generate the label from the ar-
gument (given or implied) of the \item command. Initialized to \@mklab by the
\list command. This command must produce some stretch—i.e., an \hfil.

\@inlabel A switch that is false except between the time an \item is encountered and
the time that \TeX actually enters horizontal mode. Should be tested by commands
that can be messed up by the list environment’s use of \everypar.

\box\@labels When @inlabel = true, it holds the labels to be put out by \everypar.

@noparitem A switch set by \list when @inlabel = true. Handles the case of a \list
being the first thing in an item.

@noparlist A switch set true for a list that begins an item. No \topsep space is added
before or after \item’s such a list.

@newlist Set true by \list, set false by the first text (by \everypar).

@noitemarg Set true when executing an \item with no explicit argument. Used to save
space. To save time, make two separate \@item commands.

@nmbrlist Set true by \usecounter command, causes list to be numbered.

\@listctr \def’ed by \usecounter to name of counter.

@noskipsec A switch set true by a sectioning command when it is creating an in-text
heading with \everypar.

Throughout a list environment, \hsize is the width of the current line, measured
from the outermost left margin to the outermost right margin. Environments like tabbing
should use \linewidth instead of \hsize.

Here are the parameters of a list that can be set by commands in the \list’s
COMMANDS argument. These parameters are all \TeX skips or dimensions (defined by
\newskip or \newdimen), so the usual \TeX or \LaTeX commands can be used to set them.
The commands will be executed in vmode if and only if the \list was preceded by a
\par (or something like an \emph{\textbackslash end\{list\}}), so the spacing parameters can be set according
to whether the list is inside a paragraph or is its own paragraph.
1.2 Vertical Spacing (skips)
\texttt{\topsep}: Space between first item and preceding paragraph.
\texttt{\partopsep}: Extra space added to \texttt{\topsep} when environment starts a new paragraph (is called in vmode).
\texttt{\itemsep}: Space between successive items.
\texttt{\parskip}: Space between paragraphs within an item – the \texttt{\parskip} for this environment.

1.3 Penalties
\texttt{\begin{parpenalty}}: put at the beginning of a list
\texttt{\end{parpenalty}}: put at end of list
\texttt{\itempenalty}: put between items.

1.4 Horizontal Spacing (dimens)
\texttt{\leftmargin}: space between left margin of enclosing environment (or of page if top level list) and left margin of this list. Must be nonnegative.
\texttt{\rightmargin}: analogous.
\texttt{\listparindent}: extra indentation at beginning of every paragraph of a list except the one started by the \texttt{\item} command. May be negative! Usually, labeled lists have \texttt{\listparindent} equal to zero.
\texttt{\itemindent}: extra indentation added right BEFORE an item label.
\texttt{\labelwidth}: nominal width of box that contains the label. If the natural width of the label \( \leq \) \texttt{\labelwidth}, then the label is flushed right inside a box of width \texttt{\labelwidth} (with an \texttt{\hfil}). Otherwise, a box of the natural width is employed, which causes an indentation of the text on that line.
\texttt{\labelsep}: space between end of label box and text of first item.

1.5 Default Values
Defaults for the list environment are set as follows. First, \texttt{\rightmargin}, \texttt{\listparindent} and \texttt{\itemindent} are set to 0pt. Then, one of the commands \texttt{\@listi}, \texttt{\@listii}, ..., \texttt{\@listvi} is called, depending upon the current level of the list. The \texttt{\@list}...commands should be defined by the document style. A convention that the document style should follow is to set \texttt{\leftmargin} to \texttt{\leftmargini}, ..., \texttt{\leftmarginvi} for the appropriate level. Items that aren’t changed may be left alone, but everything that could possibly be changed must be reset. \textit{Historical \LaTeX} 2.09 comments (not necessarily accurate any more):
\texttt{\begin{verbatim}
\list{\text{LABEL}}{\text{COMMANDS}} == BEGIN
if \texttt{\@listdepth} > 5
then \LaTeX{} error: ‘Too deeply nested’
else \texttt{\@listdepth} := G \texttt{\@listdepth} + 1
\end{verbatim}
\end{verbatim}

File J: \texttt{ltlists.dtx} Date: 2020/12/05 Version v1.0t
\rightmargin := 0pt
\listparindent := 0pt
\itemindent := 0pt
\eval(\@list \romannumeral\the\@listdepth) \% Set default values:
\@itemlabel := L \LABEL
\makelabel == \@mklab
\@nmlrlist := L false

COMMANDS
\@trivlist \% commands common to \list and \trivlist

\parskip := L \parsep
\parindent := L \listparindent
\linewidth := L \linewidth - \rightmargin - \leftmargin
\@totalleftmargin := L \@totalleftmargin + \leftmargin
\parshape 1 \@totalleftmargin \linewidth
\ignorespaces \% gobble space up to \item

\endlist == BEGIN \@listdepth := G \@listdepth - l
\endtrivlist

END

\@trivlist ==
BEGIN
if \@newlist = T then \@noitemerr fi
\@topsepadd := L \topsep
if \@noskipsec then leave vertical mode fi \% Added 11 Jun 85
if vertical mode
then \@topsepadd := L \@topsepadd + \partopsep
else \unskip \par \% remove glue from end of last line
fi
if \@inlabel = true
then \@noparitem := L true
   \@noparlist := L true
else \@noparlist := L false
   \@topsep := L \@topsepadd
fi
\@topsep := L \@topsep + \parskip \% Change 4 Sep 85
\leftskip := L 0pt \% Restore paragraphing parameters
\rightskip := L \@rightskip
\parfillskip := L 0pt + 1fil

NOTE: \@setpar called on every \list in case \par has been temporarily munged before the \list command.
\@setpar(if \@newlist = false then \@\@par) fi
\@newlist := G T
\@outerparskip := L \parskip
\trivlist ==
BEGIN
\parsep := \parskip
@numblist := F
@trivlist
\labelwidth := 0
\leftmargin := 0
\itemindent := \parindent
@itemlabel := L "empty"  
\makelabel{LABEL} == LABEL
END

\endtrivlist ==
BEGIN
if @inlabel = T then \indent fi
if horizontal mode then \unskip \par fi
if @noparlist = true
else if \lastskip > 0
then \@tempskipa := \lastskip
\vskip -\lastskip
\vskip \@tempskipa -\@outerparskip + \parskip
fi
\@endparenv
fi
END

\@endparenv ==
BEGIN
\addpenalty{@endparpenalty}
\addvspace{\@topsepadd}
\endgroup
\par == BEGIN
\@restorepar
\everypar{}
\par
END
\everypar == BEGIN remove \lastbox \everypar{} END
\begingroup  
\% to match the \end commands \endgroup
END

\item == BEGIN if math mode then WARNING fi
if next char = [
then \@item
else @noitemarg := true
\@item[@itemlabel]
END

\@item[LAB] ==

File J: ltlists.dtx  Date: 2020/12/05  Version v1.0t
if @noparitem = true
then @noparitem := false
    % NOTE: then clause hardly every taken,
    % so made a macro \@donoparitem
    \box\@labels := G \hbox{\hskip -\leftmargin \box\@labels \hskip \leftmargin }
if @minipage = false then
    \@tempskipa := \lastskip
    \vskip -\lastskip
    \vskip \@tempskipa + \@outerparskip - \parskip
fi
else if @inlabel = true
    then \indent \par % previous item empty.
fi
if hmode then 2 \unskip's
    % To remove any space at end of prev.
    % paragraph that could cause a blank line.
    \par
fi
if @newlist = T then if @nobreak = T % Kludge if list follows \section
    then \addvspace{\@outerparskip - \parskip}
    else \addpenalty{\@beginparpenalty}
        \addvspace{\@topsep}
        \addvspace{\parskip}  % added 4 Sep 85
    fi
else \addpenalty{\@itempenalty}
    \addvspace{\itemspace}
fi
@inlabel := G true
fi
\everypar{ @minipage := G F
    @newlist := G F
    if @inlabel = true
        then @inlabel := G false
            \hskip -\parindent
            \box\@labels
            \penalty 0
            % 3 Oct 85 – allow line break here
            \box\@labels := G null
    fi
\everypar{ }
@nobreak := G false
if @noitemarg = true
    then @noitemarg := false
    if @nmbrlist
        then \refstepcounter{\@listctr}
\everypar{ }
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\@temboxa :=L \hbox{\makelabel{LAB}}
\box@labels :=G \@labels \hskip \itemindent
\hskip - (\labelwidth + \labelsep)
if \wd \@temboxa > \labelwidth
 then \box@temboxa
 else \hbox to \labelwidth {\unhbox\@temboxa}
 fi
\hskip\labelsep
\ignorespaces % gobble space up to text
END
\\makelabel{LABEL} == ERROR  % default to catch lonely \item
\\usecounter{CTR} == BEGIN \@nmblist :=L true
\@listctr == CTR
\setcounter{CTR}{0}
END

DEFINE \dimen’s and \count

End of historical \TeX{} 2.09 comments.

\topskip 1 \hnewskip\topsep
\itemsep 2 \hnewskip\partopsep
\parsep 3 \hnewskip\topsep
\@topsep 4 \hnewskip\itemsep
\@topsepadd 5 \hnewskip\parsep
\@outerparskip 6 \hnewskip\@topsepadd
\@outerparskip 7 \hnewskip\@topsepadd
\@outerparskip 8 \hnewskip\@outerparskip

(End definition for \topskip and others.)

\leftmargin 9 \hnewdimen\leftmargin
\rightmargin 10 \hnewdimen\rightmargin
\listparindent 11 \hnewdimen\listparindent
\itemindent 12 \hnewdimen\itemindent
\labelwidth 13 \hnewdimen\labelwidth
\labelsep 14 \hnewdimen\labelsep
\@totalleftmargin 15 \hnewdimen\@totalleftmargin
\@totalleftmargin 16 \hnewdimen\@totalleftmargin \@totalleftmargin=\z@

(End definition for \leftmargin and others.)
\def\list#1#2{% 
\ifnum \@listdepth >5\relax 
\@toodeep 
\else 
\global\advance\@listdepth\@ne 
\fi 
\rightmargin\z@ 
\listparindent\z@ 
\itemindent\z@ 
\csname @list\romannumeral\the\@listdepth\endcsname 
\def\@itemlabel{#1}% 
\let\makelabel\@mklab 
\@nmbrlistfalse 
#2\relax 
\@trivlist 
\parskip\parsep 
\parindent\listparindent 
\advance\linewidth-\rightmargin 
\advance\linewidth-\leftmargin 
\advance\@totalleftmargin \leftmargin 
\parfillskip\@flushglue 
(End definition for \list.)
}\par@deathcycles 
\newcount\par@deathcycles 
(End definition for \par@deathcycles.)
\@trivlist Because \par is sometimes made a no-op it is possible for a missing \item to produce a loop that does not fill memory and so never gets trapped by \TeX. We thus need to trap this here by setting \par to count the number of times a paragraph ii is called with no progress being made started.
\def\@trivlist{% 
\if@noskipsec leavevmode \fi 
\@topsepappend \topsep 
\iffalse 
\advance\@topsepappend \partopsep 
\else 
\unskip \par 
\fi 
\if@inlabel 
\@noparitemtrue 
\@noparlisttrue 
\else 
\if@newlist \@noitemerr \fi 
\@noparlistfalse 
\@topsep \@topsepappend 
\fi 
\advance\@topsep \parskip 
\leftskip \z@skip 
\rightskip \@rightskip 
\parfillskip \@flushglue 
(End definition for \par@deathcycles.)
We initialise \@itemlabel so that a \trivlist with an \item not having an optional argument doesn't produce an error message.
\let\@itemlabel\@empty
\def\makelabel##1{##1}
(End definition for \trivlist.)

\endlist
\def\endlist{%
\global\advance\@listdepth\m@ne
@endtrivlist}
(End definition for \endlist.)

The definition of \trivlist used to be in ltspace.dtx so that other commands could be ‘let to it’. They now use \def.

\endtrivlist
\def\endtrivlist{%
@if@inlabel
\leavevmode
\global\@inlabelfalse
\else
@if@newlist
\@noitemerr
\global\@newlistfalse
\else
\fi
\fi
\iff@mode\unskip\par
We also check if we are in math mode and issue an error message if so (hoping that \@currenvir resolves suitably). Otherwise the usual “perhaps a missing item” error will get triggered later which is confusing.
\else

File J: ltlists.dtx Date: 2020/12/05 Version v1.0t
To suppress the paragraph indentation in text immediately following a paragraph-making environment, \everypar is changed to remove the space, and \par is redefined to restore \everypar. Instead of redefining \par and \everypar, \@endparenv was changed to set the \endpe switch, letting \end redefine \par and \everypar.

This allows paragraph-making environments to work right when called by other environments. (Changed 27 Oct 86)

\def\@endparenv{% 
  \addpenalty\@endparpenalty\addvspace\@topsepadd\@endpetrue}
(End definition for \endtrivlist.)

\@doendpe

\@endparenv\@doendpe

If a section heading changes \clubpenalty to keep lines after it together then this modification is restored via the \everypar mechanism at the start of the next paragraph. As we destroy the contents of this token here we explicitly set \clubpenalty back to its default.

\clubpenalty\@clubpenalty
\everypar\@par\@endpefalse\everypar

Use \setbox0=\lastbox instead of \hskip -\parindent so that a \noindent becomes a no-op when used before a line immediately following a list environment(23 Oct 86).

{{\setbox\z@\lastbox}\everypar\@par\@endpefalse}}
(End definition for \@endparenv and \@doendpe.)

\if@endpe
\@endpefalse
\@endpeltrue
\newif\if@endpe
\@endpefalse

(End definition for \if@endpe, \@endpefalse, and \@endpeltrue.)
This \if@inlabel check is needed in case an item starts of inside a group so that \everypar does not become empty outside that group.

\if@inlabel
  \global\@inlabelfalse
\fi

The paragraph indent is now removed by using \setbox... since this makes \noindent a no-op here, as it should be. Thus the following comment is redundant but is left here for the sake of future historians: this next command was changed from an hskip to a kern to avoid a break point after the parindent box: the skip could cause a line-break if a very long label occurs in raggedright setting. If \noindent was used after \item want to cancel the \itemindent skip. This case can be detected as the indentation box will be void.

\ifvoid\z@
  \kern-\itemindent
\fi
\box\@labels
\penalty\z@
\fi

This code is intended to prevent a page break after the first line of an item that comes immediately after a section title. It may be sensible to always forbid a page break after one line of an item? As with all such settings of \clubpenalty it is local so will have no effect if the item starts in a group.

Only resetting \nobreak when it is true is now essential since now it is sometimes set locally.

\if@nobreak
  \nobreakfalse
  \clubpenalty \@M
  \else
  \clubpenalty \@clubpenalty
  \everypar{}%
  \fi%
\if@noitemarg
  \noitemargfalse
  \if@nmbrlist
    \refstepcounter\@listctr
  \fi
  \fi

We use \sbox to support colour commands.
\sbox\@tempboxa{\makelabel{#1}}%
\global\setbox\@labels\hbox{%
  \unhbox\@labels
  \hskip \itemindent
  \hskip -\labelwidth
  \hskip -\labelsep
  \ifdim \wd\@tempboxa >\labelwidth
    \box\@tempboxa
  \else
    \fi
  \fi

1.6 Itemize and Enumerate

Enumeration is done with four counters: \texttt{enumi}, \texttt{enumii}, \texttt{enumiii} and \texttt{enumiv}, where \texttt{enumN} controls the numbering of the \texttt{N}th level enumeration. The label is generated by the commands \texttt{\labelenumi} ... \texttt{\labelenumiv}, which should be defined by the document style. Note that \texttt{\p@enum\theenumN} defines the output of a \texttt{\ref} command. A typical definition might be:

\begin{Verbatim}
\def\theenumii{\alph{enumii}}
\def\p@enumii{\theenumi}
\def\labelenumii{(\theenumii)}
\end{Verbatim}

which will print the labels as `(a)', `(b)', ... and print a \texttt{\ref} as `3a'.

The item numbers are moved to the right of the label box, so they are always a distance of \texttt{\labelsep} from the item.

\texttt{\@enumdepth} holds the current enumeration nesting depth. Itemization is controlled by four commands: \texttt{\labelitemi}, \texttt{\labelitemii}, \texttt{\labelitemiii}, and \texttt{\labelitemiv}. To cause the second-level list to be bulleted, you just define \texttt{\labelitemii} to be \texttt{•}. \texttt{\@itemspacing} and \texttt{\@itemdepth} are the analogs of \texttt{\@enumspacing} and \texttt{\@enumdepth}.

Historical \LaTeX 2.09 comments (not necessarily accurate any more):

\begin{Verbatim}
\enumerate ==
BEGIN \\
if \@enumdepth > 3 \\
then errormessage: “Too deeply nested”. \\
else \@enumdepth := L \@enumdepth + 1
\end{Verbatim}
\@enumctr := \text{l eval(enum@\roman\numeral\the\@enumdepth)
\list\label{\@enumctr}
\{usecounter{\@enumctr}
\makelabel{LABEL} == \hss \llap{LABEL}\\
\fi
END
\endenumerate == \endlist

\emph{End of historical \LaTeX\ 2.09 comments.}

\@enumdepth
\newcount\@enumdepth \@enumdepth = 0
(\emph{End definition for \@enumdepth.})
\c@enumi
\c@enumii
\c@enumii
\c@enumiv
\@definecounter{enumi}
\@definecounter{enumii}
\@definecounter{enumiii}
\@definecounter{enumiv}
(\emph{End definition for \c@enumi and others.})

\enumerate (env.)
\def\enumerate{%
\ifnum \@enumdepth >\thr@@ \@toodeep\else
\advance\@enumdepth\@ne
\edef\@enumctr{enum\romannumeral\the\@enumdepth}\
\expandafter\list\csname label\@enumctr\endcsname
\{usecounter{\@enumctr}\def\makelabel##1\{\hss\llap{##1}\}}\\
\fi
\let\endenumerate =\endlist

\textit{Historical \LaTeX\ 2.09 comments (not necessarily accurate any more):}
\itemize == BEGIN
\begin{itemize}
\item if \@itemdepth > 3
\begin{itemize}
\item then errormessage: 'Too deeply nested'.
\item else \@itemdepth := \text{l \@itemdepth + 1
\item \@itemitem == \text{l eval(labelitem\roman\numeral\the\@itemdepth)
\item \list\{\@nameuse{\@itemitem}\}
\item \makelabel{LABEL} == \hss \llap{LABEL}\\
\fi
END
\end{itemize}
\end{itemize}
\itemize == \endlist

\emph{End of historical \LaTeX\ 2.09 comments.}
\@itemdepth
\newcount\@itemdepth \@itemdepth = 0
(End definition for \@itemdepth.)

\itemize (env.)
\def\itemize{%
\ifnum \@itemdepth >\thr@@\@toodeep\else
\advance\@itemdepth\@ne
\edef\@itemitem{labelitem\romannumeral\the\@itemdepth}%
\expandafter\list\csname\@itemitem\endcsname
{\def\makelabel##1{\hss\llap{##1}}}%
\fi
\let\enditemize =\endlist
\langle/2ekernel\rangle
\makebox \makebox[(wid)][(pos)]{(obj)}

Puts (obj) in an \hbox of width \langle wid \rangle, positioned by \langle pos \rangle.

The possible \langle pos \rangle are:

- s stretched,
- l flushleft,
- r flushright,
- c (default) centred.

If \langle wid \rangle is missing, then \langle pos \rangle is also missing and \langle obj \rangle is put in an \hbox of its natural width.

\makebox((x),(y))[(pos)]{(obj)}

Puts \langle obj \rangle in an \hbox of width x * \unilength and height y * \unilength. \langle pos \rangle arguments are s, l, r or c (default) for stretched, flushleft, flushright or centred, and t or b for top, bottom – or combinations like tr or rb. Default for horizontal and vertical are centered. Note that in this picture mode version of \makebox a [b] aligns on the bottom of the text as documented. If you want to align on the baseline use \makebox( , )[b]{\raisebox{0pt}[\height][0pt]{xyz}} or \makebox( , )[b]{\smash{xyz}}.

\newsavebox{\cmd}

\newsavebox \savebox{\cmd}: If \cmd is undefined, then defines it to be a \TeX box register.

\savebox{\cmd} ... : \cmd is defined to be a \TeX box register, and the '...' are any \makebox arguments. It is like \makebox, except it doesn’t produce text but saves the value in \box \cmd.

\sbox{\cmd}{\langle text \rangle}

is an efficient abbreviation for \savebox{\cmd}{\langle text \rangle}.

\begin{lrbox}{\langle cmd \rangle}(\langle text \rangle)\end{lrbox}

is equivalent to \sbox{\langle cmd \rangle}{\langle text \rangle} except that any white space at the beginning and end of \langle text \rangle is ignored.

\parbox \parbox[(pos)][(height)][(inner-pos)]{(width)}{(text)}: Makes a box with \hsize \langle width \rangle, positioned by \langle pos \rangle as follows: c : \vcenter (placed in $...$ if not in math mode) b : \vbox t : \vtop default value is c. Sets \hsize := \langle width \rangle and calls \@parboxrestore, which does the following: Restores the original definitions of:
Resets the following parameters:
\parindent = 0pt
\parskip = 0pt \hsize
\linewidth = \hsize
@totalleftmargin = 0pt
@leftskip = 0pt
@rightskip = 0pt
@rightskip = 0pt
@parfillskip = 0pt plus 1fil
\lineskip = \normallineskip
\baselineskip = \normalbaselineskip

Calls \sloppy

Note: \texttt{@arrayparboxrestore} same as \texttt{@parboxrestore} but it doesn’t restore \texttt{\}.\texttt{minipage} \texttt{(env.)} \texttt{minipage} : Similar to \texttt{\parbox}, except it also makes this look like a page by setting \texttt{textwidth == \columnwidth == box width}

changes footnotes by redefining:
\@mpfn == mpfootnote
\thempfn == \thempfootnote
\@footnotetext == \@mpfootnotetext
resets the following list environment parameters:
\@listdepth == \@mplistdepth
where \texttt{@mplistdepth} is initialized to zero,
and executes \texttt{@minipagerestore} to allow the document style to reset any other parameters it desires. It sets \texttt{@minipage} true, and resets \texttt{\everypar} to set it false. This switch keeps \texttt{\addvspace} from putting space at the top of a minipage.

Change added 24 May 89: \texttt{@minipage} sets \texttt{@minipage} globally; \texttt{@endminipage} resets it false.

\texttt{\textbackslash rule} \texttt{\textbackslash underline} \texttt{\textbackslash raisebox} \texttt{\textbackslash makebox} \texttt{User level command just looks for optional \{ or \}.
\mbox The basic horizontal box command for \TeX.
\DeclareRobustCommand\mbox[1]{\leavevmode\hbox{#1}}

(End definition for \mbox.)

\@makebox Look for a possible second optional argument (defaults to c).
\def\@makebox[#1]{\@ifnextchar [\@imakebox[#1]}\@imakebox[#1][c]}

(End definition for \@makebox.)

\@begin@tempboxa Helper macro for supporting \height, \width etc. Grab #1 into \@tempboxa and measure it.
\long\def\@begin@tempboxa#1#2{\begingroup\setbox\@tempboxa#1{\color@begingroup#2\color@endgroup}\def\width{\wd\@tempboxa}\def\height{\ht\@tempboxa}\def\depth{\dp\@tempboxa}\let\totalheight\@ovri\totalheight\height\advance\totalheight\depth}

(End definition for \@begin@tempboxa.)

\@end@tempboxa End the group started by \@begin@tempboxa, so that the scope of \height only includes the ‘length’ argument to the user-command.
\let\@end@tempboxa\endgroup

(End definition for \@end@tempboxa.)

\bm@c Set up spacing.
\def\bm@c{\hss\unhbox\@tempboxa\hss}
\def\bm@l{\unhbox\@tempboxa\hss}\let\bm@t\bm@l
\def\bm@r{\hss\unhbox\@tempboxa}\let\bm@b\bm@r
\def\bm@s{\unhbox\@tempboxa}

(End definition for \bm@c and others.)

\@imakebox Internal form of \makebox.
\long\def\@imakebox[#1][#2][3]{\@begin@tempboxa\hbox{#3}\setlength\@tempdima{#1}\hb@xt@\@tempdima\csname bm@#2\endcsname\@end@tempboxa}

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\makemakepicbox  Picture mode form of \makebox.
\def\makemakepicbox(#1,#2){%
  \@ifnextchar[{\@imakemakepicbox(#1,#2)}{\@imakemakepicbox(#1,#2)[]}}
(End definition for \makemakepicbox.)

\imakemakepicbox  picture mode version
\long\def\imakemakepicbox(#1,#2)[#3]#4{% #1 #2 #3 #4
  \@defaultunitsset\@tempdimc{#2}\unitlength
  \vbox to\@tempdimc{
    \let\mb@b\vss \let\mb@l\hss \let\mb@r\hss
    \let\mb@t\vss
    \@tfor\reserved@a :=#3\do{% #3
      \if s\reserved@a
        \let\mb@l\relax \let\mb@r\relax
      \else
        \expandafter\let\csname mb@\reserved@a\endcsname\relax
      \fi
    }
    \@defaultunitsset\@tempdimc{#1}\unitlength
    \hb@xt@\@tempdimc{\mb@l #4\mb@r} % #4
    \mb@b}
(End definition for \imakemakepicbox.)

This kern ensures that a b option aligns on the bottom of the text rather than the baseline. This is the documented behaviour in the \LaTeX{} Book. The kern is removed in compatibility mode.
\kern\z@}
(2ekernel)
(\selectlanguage{en}
"2ekernel | \latexrelease
\IncludeInRelease{2020/10/01}{}
(\latexrelease)
\IncludeInRelease{default units}{}
\long\def\imakemakepicbox(#1,#2)[#3]#4{% #1 #2 #3 #4
  \@defaultunitsset\@tempdimc{#2}\unitlength
  \vbox to\@tempdimc{
    \let\mb@b\vss \let\mb@l\hss \let\mb@r\hss
    \let\mb@t\vss
    \@tfor\reserved@a :=#3\do{% #3
      \if s\reserved@a
        \let\mb@l\relax \let\mb@r\relax
      \else
        \expandafter\let\csname mb@\reserved@a\endcsname\relax
      \fi
    }
    \@defaultunitsset\@tempdimc{#1}\unitlength
    \hb@xt@\@tempdimc{\mb@l #4\mb@r} % #4
    \mb@b}
(End definition for \imakemakepicbox.)
\IncludeInRelease{0000/00/00}{}
(\latexrelease)
\long\def\imakemakepicbox(#1,#2)[#3]#4{% #1 #2 #3 #4
  \@defaultunitsset\@tempdimc{#2}\unitlength
  \vbox to\@tempdimc{
    \let\mb@b\vss \let\mb@l\hss \let\mb@r\hss
    \let\mb@t\vss
    \@tfor\reserved@a :=#3\do{% #3
      \if s\reserved@a
        \let\mb@l\relax \let\mb@r\relax
      \else
        \expandafter\let\csname mb@\reserved@a\endcsname\relax
      \fi
    }
    \@defaultunitsset\@tempdimc{#1}\unitlength
    \hb@xt@\@tempdimc{\mb@l #4\mb@r} % #4
    \mb@b}
(End definition for \imakemakepicbox.)
\EndIncludeInRelease
(2ekernel\endinput)\EndIncludeInRelease
(\latexrelease)\IncludeInRelease{0000/00/00}{}
(\latexrelease)
\long\def\imakemakepicbox(#1,#2)[#3]#4{% #1 #2 #3 #4
  \@defaultunitsset\@tempdimc{#2}\unitlength
  \vbox to\@tempdimc{
    \let\mb@b\vss \let\mb@l\hss \let\mb@r\hss
    \let\mb@t\vss
    \@tfor\reserved@a :=#3\do{% #3
      \if s\reserved@a
        \let\mb@l\relax \let\mb@r\relax
      \else
        \expandafter\let\csname mb@\reserved@a\endcsname\relax
      \fi
    }
    \@defaultunitsset\@tempdimc{#1}\unitlength
    \hb@xt@\@tempdimc{\mb@l #4\mb@r} % #4
    \mb@b}
(End definition for \imakemakepicbox.)
\EndIncludeInRelease
(\latexrelease)
\IncludeInRelease{2020/10/01}{}
(\latexrelease)
\long\def\imakemakepicbox(#1,#2)[#3]#4{% #1 #2 #3 #4
  \@defaultunitsset\@tempdimc{#2}\unitlength
  \vbox to\@tempdimc{
    \let\mb@b\vss \let\mb@l\hss \let\mb@r\hss
    \let\mb@t\vss
    \@tfor\reserved@a :=#3\do{% #3
      \if s\reserved@a
        \let\mb@l\relax \let\mb@r\relax
      \else
        \expandafter\let\csname mb@\reserved@a\endcsname\relax
      \fi
    }
    \@defaultunitsset\@tempdimc{#1}\unitlength
    \hb@xt@\@tempdimc{\mb@l #4\mb@r} % #4
    \mb@b}
(End definition for \imakemakepicbox.)
\EndIncludeInRelease
(\latexrelease)}
This macro is initially a no-op, but the color package will redefine it to insert a \special.
\set@color \let\set@color\relax

In the past these macros were initially no-ops, and the color package redefined redefine them to be \begingroup, \endgroup, \begingroup\set@color, \hbox\bgroup\color@begingroup, \color@endgroup\egroup. and \textit{(set to main document color)} respectively.

Nowadays we always set the group already in the kernel as this makes the coding simpler.
\let\color@begingroup\begingroup
\def\color@endgroup{\endgraf\endgroup}
\def\color@setgroup{\color@begingroup} % changed further in color package
\let\normalcolor\relax % remains untouched; only changed in a color package
\let\color@hbox\hbox\bgroup\color@begingroup
\let\color@vbox\vbox\bgroup\color@begingroup
\let\color@endbox{\color@endgroup\egroup}

\newsavebox Allocate a new ‘savebox’.
\def\newsavebox#1{\@ifdefinable{#1}{\newbox#1}}

\savebox Save #1 in a box register.
\def\savebox#1{\if@tempswa\else#1\fi}
\sbox\savebox\@savebox\@savepicbox\lrbox

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\endlrbox \ End the lrbox environment.
\def\endlrbox{\unskip\color@endgroup}
(End definition for \endlrbox.)

\usebox unchanged
\DeclareRobustCommand\usebox[1]{\leavevmode\copy #1\relax}
(End definition for \usebox.)

\frame The following definition of \frame was written by Pavel Curtis (Extra space removed 14 Jan 88) RmS 92/08/24: Replaced occurrence of \@halfwidth by \@wholewidth
\DeclareRobustCommand\frame[1]{\leavevmode \hbox{\hskip-\@wholewidth \vbox{\vskip-\@wholewidth \hrule \@height\@wholewidth \hbox{\vrule \@width\@wholewidth #1 \vrule \@width\@wholewidth} \hrule \@height\@wholewidth \vskip-\@wholewidth} \hskip-\@wholewidth}}
(End definition for \frame.)

\fboxrule user level parameters,
\fboxsep
\newdimen\fboxrule
\newdimen\fboxsep
(End definition for \fboxrule and \fboxsep.)

\fbox Abbreviated framed box command.
\DeclareRobustCommand\fbox[1]{\leavevmode \setbox\@tempboxa\hbox{\color@begingroup \kern\fboxsep\copy #1\kern\fboxsep \color@endgroup} \@frameb@x\relax}
(End definition for \fbox.)

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\framebox\ Framed version of \makebox.

\@framebox\ Deal with optional arguments.

\@iframebox\ The handling the optional arguments. In order to set the whole box, including the frame
to the specified dimension, we first determine that dimension from the natural size of the
text, \#3. calculated width.

\@framebox#x\ Common part of \framebox and \fbox. #1 is a negative kern in the \framebox case so
that the vertical rules do not add to the width of the box.

File K: \ltboxes.dtx Date: 2022/01/31 Version v1.4c
\vrule\@width\fboxrule
#1%
\vbox{\vskip\fboxsep
  \box\@tempboxa
  \vskip\fboxsep}%
#1%
\hrule\@height\fboxrule}%
%
\vrule\@width\fboxrule

\@framepicbox Picture mode version.
\def\@framepicbox(#1,#2){\@ifnextchar[\@iframepicbox(#1,#2)}{\@iframepicbox(#1,#2)}
\long\def\@iframepicbox(#1,#2)[#3]{\frame{\@imakepicbox(#1,#2)[#3]{#4}}}

\parbox The main vertical-box command for \LaTeX.
\DeclareRobustCommand\parbox{\@ifnextchar[\@iparbox}{\@iiiparbox c\relax[\s]}
\expandafter\let\csname parbox \endcsname\@undefined

\@iparbox Optional argument handling.
\def\@iparbox[#1]{\@ifnextchar[\@iiparbox{#1}}{\@iiiparbox{#1}\relax[\s]}
\iiiparbox

Optional argument handling.
\def\iiiparbox[#1]#2{
  \ifnum\pdfstrcmp{#1}{t}=0
    \@iiiparbox{#2}
  \else
    \@iiiparbox{#2}[#1]
  \fi
}

\iiiparbox

The internal version of \parbox.
\let\parboxto\@empty
\long\def\iiiparbox#1#2[#3]#4#5{\leavevmode
  \@pboxswfalse
  \setlength\@tempdima{#4}
  \@begin@tempboxa\vbox{\hsize\@tempdima\@parboxrestore#5\@@par}
  \ifx\relax#2\else
    \setlength\@tempdimb{#2}
    \edef\parboxto{to\the\@tempdimb}
  \fi
  \if#1b\vbox\else
    \if#1t\vtop\else
      \ifmmode\vcenter\else
        \@pboxswtrue \vcenter
      \fi
    \fi
  \fi
  \parboxto{\let\hss\vss\let\unhbox\unvbox
    \csname bm@#3\endcsname}\
  \if@pboxsw \m@th$i
  \@end@tempboxa}

\arrayparboxrestore

Restore various paragraph parameters.

The rational for allowing two normally global flags to be set locally here was stated
originally by Donald Arseneau and extended by Chris Rowley. It is because these flags
are only set globally to true by section commands, and these should never appear within
boxes or, indeed, in any group; and they are only ever set globally to false when they are
definitely true.

If anyone is unhappy with this argument then both flags should be treated as in
\set@nobreak; otherwise this command will be redundant.
Redefined accents to allow changes in font encoding

\let\'\@acci\let\'\@accii\let=\@acciii
\parindent\z@ \parskip\z@skip
\everypar{}
\linewidth\hsize
\@totalleftmargin\z@
\leftskip\z@skip \rightskip\z@skip \@rightskip\z@skip
\parfillskip\@flushglue
\lineskip\normallineskip
\lineskiplimit\normallineskiplimit
\baselineskip\normalbaselineskip
\sloppy}
⟨/2ekernel|\latexrelease⟩
⟨\latexrelease⟩
\EndIncludeInRelease
⟨\latexrelease⟩\IncludeInRelease{0000-00-00}%
⟨\latexrelease⟩\EndIncludeInRelease
⟨∗2ekernel⟩(End definition for \@arrayparboxrestore.)
\@parboxrestore
Restore various paragraph parameters, and also \.
\def\@parboxrestore{"\@arrayparboxrestore\let\\@normalcr}
(End definition for \@parboxrestore.)
⟨/2ekernel⟩
\if@minipage
Switch that is true at the start of a minipage.
\def\@minipagetrue \global\let\if@minipage\iftrue
\def\@minipagefalse \global\let\if@minipage\iffalse
(End definition for \if@minipage.)
\minipage
Essentially an environment form of \parbox.
\def\minipage{%
\@ifnextchar[%
\@iiiminipage c\relax[s]}}

File K: ltxboxes.dtx Date: 2022/01/31 Version v1.4c
Optional argument handling.
\def\@iminipage[#1]{\@ifnextchar[%]{\@iiminipage{#1}}{\@iiiminipage{#1}\relax[\s]}}

Optional argument handling.
\def\@iiminipage#1[#2]{\@ifnextchar[%]{\@iiiminipage{#1}{#2}}{\@iiiminipage{#1}{#2}\[#1\]}}

Internal form of minipage.
\def\@iiiminipage#1#2[#3]#4{\leavevmode\@pboxswfalse\setlength\@tempdima{#4}\def\@mpargs{{#1}{#2}[#3]{#4}}\setbox\@tempboxa\vbox\bgroup\color@begingroup\hsize\@tempdima\textwidth\hsize \columnwidth\hsize \@parboxrestore\color@begingroup\setlength\@mpfootins\@mpfootnotetext\z@\let\@footnotetext\@mpfootnotetext\let\@listdepth\@mplistdepth\@mplistdepth\z@\@minipagerestore\@setminipage}}

Hook so that other styles can reset other commands in a minipage.
\let\@minipagerestore=\relax

\def\endminipage{\par\unskip\ifvoid\@mpfootins\else\vskip\skip\@mpfootins\normalcolor\footnoterule\unvbox\@mpfootins\fi\@minipagerestore%% added 24 May 89\color@endgroup\@setminipage\expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}
\texttt{\textbackslash mpfootnotetext} Minipage version of \texttt{\textbackslash footnotetext}.

Final \texttt{\textbackslash strut} added 27 Mar 89, on suggestion by Don Hosek

\begin{verbatim}
\newcount\@mplistdepth
\newinsert\@mpfootins

\@mpfootnotetext Minipage version of \texttt{\textbackslash footnotetext}.

\end{verbatim}
\rule \text{Draw a rule of the specified size.}

\@rule \text{Internal form of \rule.}

\@@underline \text{Saved primitive \underline.}

\underline \text{\LaTeX\ version works outside math.}
\texttt{\raisebox} Raise a box, and change its vertical dimensions.

\texttt{\@rsbox} Optional argument handling.

\texttt{\@irsbox} Internal version of \texttt{\raisebox} (less than two optional args).

\texttt{\@iirsbox} Internal version of \texttt{\raisebox} (two optional args).
This macro adds a special strut the depth of the box given as #1, and height and width 0pt. It is used for ensuring that the last line of a paragraph has the correct depth in ‘p’ columns of tables and in footnotes. In vertical mode nothing is done, as adding the strut (as done in 2.09) would start a new paragraph. It would be possible to inspect \prevdepth to check the depth of the just-completed paragraph, but we do not do that here. Actually we do even less now, skip the vmode test as it broke tabular ‘p’ columns.

The \nobreak was added (1995/10/31) to allow hyphenation of the final word of the paragraph.

The following commands are basically inherited from plain \TeX.

\leftline, \rightline, \centerline, \@@line

These macros place text on a full line either centred or left or right adjusted.

\rlap, \llap, \clap

These macros place text to the left or right of the current reference point without taking up space.

And here is the version that centers, it was initially introduced by mathtools.

\langle /2ekernel \rangle
1 Tabbing, Tabular and Array Environments

This section deals with ‘Lining It Up in Columns’. First the tabbing environment is defined, and then in second part, \texttt{tabular} together with its variants, \texttt{tabular*} and \texttt{array}.

Note that the \texttt{tabular} defined here is essentially the original \LaTeX{} 2.09 version, not the extended version described in \textit{The \LaTeX{} Companion}. Use the \texttt{array} package to obtain the extended version.

1.1 tabbing

\textit{Historical \LaTeX{} 2.09 comments (not necessarily accurate any more)}:

\begin{verbatim}
\texttt{\textbackslash dimen(\@firsttab + i) = distance of tab stop i from left margin}
0 <= i <= 15 (?).

\texttt{\textbackslash dimen(\@firsttab} is initialized to \texttt{\@totalleftmargin}, so it starts at the prevailing left margin.

\texttt{\@maxtab = number of highest defined tab register}
\texttt{probably = \@firsttab + 12}

\texttt{\@nxttabmar = tab stop number of next line's left margin}

\texttt{\@curtabmar = tab stop number of current line's left margin}

\texttt{\@curtab = number of the current tab. At start of line, it equals \@curtabmar}

\texttt{\@hightab = largest tab number currently defined.}

\texttt{\@tabpush = depth of \textbackslash pushtab's}

\texttt{\textbackslash box(\@curline} = contents of current line, excluding left margin skip, and excluding contents of current field

\texttt{\textbackslash box(\@curfield} = contents of current field

\texttt{\@rjfield} = switch: \texttt{T} iff the last field of the line should be right-justified at the right margin.

\texttt{\textbackslash tabbingsep} = distance left by the \texttt{'} command between the current position and the field that is “left-shifted”.

UTILITY MACROS

\texttt{\@stopfield} : closes the current field

\texttt{\@addfield} : adds the current field to the current line.

\texttt{\@contfield} : continues the current field

\texttt{\@startfield} : begins the next field

\texttt{\@stopline} : closes the current line and outputs it

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\@startline : starts the next line
\@ifatmargin : an \if that is true iff the current line.
has width zero

\@startline ==
BEGIN
\@curtabmar := G \@nxttabmar
\@curtab := G \@curtabmar
\box\@curline := G null
\@startfield
\strut
END

\@stopline ==
BEGIN
\unskip
\@stopfield
if \@rjfield = T
then \@rjfield := G F
    \@tempdima := \@talleftmargin + \linewidth
    \hb@xt \@tempdima\atitemfudge
    \hskip \dimen\@curtabmar
    \box\@curline
    \hfil
    \box\@curfield
else \@addfield
    \hbox {\atitemfudge
        \hskip \dimen\@curtabmar
        \box\@curline}
fi
END

\@startfield ==
BEGIN
    \box\@curfield := G \hbox {
END

\@stopfield ==
BEGIN
}
END

\@contfield ==
BEGIN
    \box\@curfield := G \hbox { \unhbox\@currfield } brace matching
END
\@addfield ==
BEGIN
    \box\@curline := G \unbox\@curline * \unbox\@curfield
END
\ifatmargin ==
BEGIN
if dim of box\curline = 0pt then
END
\tabbing ==
BEGIN
\lineskip :=L 0pt
\> == \rtab
\< == \ltab
\= == \settab
\+ == \tabplus
\- == \tabminus
\' == \tabrj
\' == \tabl
\\ == BEGIN \stopline \startline END
\[DIST] == BEGIN
\\* == BEGIN \stopline \penalty 10000 \startline END
\[DIST] == BEGIN \stopline \penalty 10000 \vskip DIST \startline\ignorespaces END
\hightab == \nxttabmar :=G \firsttab
\tabpush :=G 0
\dimen\firsttab := \totalleftmargin
@rjfield :=G F
\trivlist \item\relax
if @minipage = F then \vskip \parskip fi
\box\tabbox = \rlap{\indent\the\everypar}
% note: \the\everypar sets @inlabel :=G F
\itemfudge == BEGIN \box\tabfbox END
\startline\ignorespaces END
\endtabbing ==
BEGIN
\stopline
if \tabpush > 0 then error message: "unmatched \poptabs’’ fi
\endtrivlist
END
\rtab ==
BEGIN
\stopfield
\addfield
if \curtab < \hightab then \curtab :=G \curtab + 1
else error message “Undefined Tab” fi

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\@tempdima := \dimen\@curtab - \dimen\@curtabmar
- width of box \@curline
\box\@curline := G \hbox{\unhbox\@curline + \hskip\@tempdima}
\@startfield
END

\@settab ==
BEGIN
\@stopfield
\@addfield
if \@curtab < \@maxtab
  then \@curtab := G \@curtab+1
  else error message: “Too many tabs” fi
if \@curtab > \@hightab
  then \@hightab := L \@curtab fi
\dimen\@curtab := L \dimen\@curtabmar + width of \box\@curline
\@startfield
END

\@ltab ==
BEGIN
\@ifatmargin
  then if \@curtabmar > \@firsttab
      then \@curtab := G \@curtab - 1
      \@curtabmar := G \@curtabmar - 1
      else error message “Too many untabs” fi
      else error message “Left tab in middle of line” fi
  END

\@tabplus ==
BEGIN
  if \@nxttabmar < \@hightab
    then \@nxttabmar := G \@nxttabmar+1
    else error message “Undefined tab” fi
END

\@tabminus ==
BEGIN
  if \@nxttabmar > \@firsttab
    then \@nxttabmar := G \@nxttabmar-1
    else error message “Too many untabs” fi
END

\@tabrj ==
BEGIN \@stopfield
\@addfield
@rjfield := G T
The accents ‘\’ , ‘\’ , and ‘=’ that have been redefined inside a tabbing environment can be called by typing \a’ , \a’ , and \a=. The macro \a is defined in \texttt{ltoutenc.dtx}.

\textit{End definition for \a.}

The ‘2ekernel’ code ensures that a \texttt{\usepackage{autotabg}} is essentially ignored if a ‘full’ format is being used that has picture mode already in the format.

```latex
\begin{verbatim}
\chardef\@firsttab=	he\allocationnumber
\newdimen\@gtempa
\newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa
\newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa
\newdimen\@gtempa\newdimen\@gtempa
\chardef\@maxtab=	he\allocationnumber
\dimen\@firsttab=0pt
\end{verbatim}
```

File L: \texttt{lttab.dtx} Date: 2021/04/20 Version v1.1s
It is, in some sense, an error if the current margin tab setting is higher than the value of \@hightab (which is a local variable). That this is allowed is a fundamental design flaw which is not going to be corrected now.

\def\@startline{\ifnum \@nxttabmar > \@hightab \@badtab \global \@nxttabmar \@hightab \fi \global \@curtabmar \@nxttabmar \global \@curtab \@curtabmar \global \setbox \@curline \hbox {}}\@startfield\strut}

\def\@stopline{\if\@rjfield \global \@rjfieldfalse \@tempdima \@totalleftmargin \advance \@tempdima \linewidth \hb@xt@ \@tempdima{\@itemfudge \hskip \dimen \@curtabmar \box \@curline \hfil \box \@curfield} \else \@addfield \hbox {\@itemfudge \hskip \dimen \@curtabmar \box \@curline} \fi}

(End definition for \@startline.)

(End definition for \@stopline.)
tabbing (env.) We use \relax to prevent \item from scanning too far.

\tabbing

\endtabbing

Omitted \global added to \@rtab 17 Jun 86

\@rtab

\endtabbing

\@settab

\@ltab

\@tabplus

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\global\advance\@nxttabmar\@ne
\else
 \@badtab
 \fi
 \ignorespaces}
\@tabminus
\def\@tabminus{%
 \ifnum\@nxttabmar>\@firsttab
 \global\advance\@nxttabmar\m@ne
 \else
 \@badtab
 \fi
 \ignorespaces}
\@tabrj
\def\@tabrj{%
 \@stopfield\@addfield\global\@rjfieldtrue\@startfield\ignorespaces}
\@tablab
\def\@tablab{%
 \@stopfield
 \global\setbox\@curline\hbox{%
 \box\@curline
 \hskip-\wd\@curfield \hskip-\tabbingsep
 \box\@curfield
 \hskip\tabbingsep}%
 \@startfield
 \ignorespaces}
⟨/2ekernel⟩
⟨∗2ekernel|latexrelease⟩
⟨latexrelease⟩\IncludeInRelease{2019/10/01}{
⟨latexrelease⟩}{
pushtabs}{Make commands robust}%
\pushtabs
\DeclareRobustCommand\pushtabs{%
 \@stopfield\@addfield\global\advance\@tabpush\@ne \begingroup
 \@contfield}
It is, in some sense, an error if, after the endgroup, the current tab setting is higher
than the new value of \@hightab (which is a local variable). That this is allowed is a
fundamental design flaw which is not going to be corrected now.
\poptabs
\DeclareRobustCommand\poptabs{\@stopfield\@addfield
\ifnum \@tabpush>\z@ \endgroup
 \global\advance\@tabpush\m@ne
 \ifnum \@curtab>\@hightab \global \@curtab\@hightab
 \@badtab
 \fi
 \else
 \@badpoptabs
 \fi
 \@contfield}
1.2 array and tabular environments

Historical \TeX 2.09 comments (not necessarily accurate any more):

ARRAY PARAMETERS:
\arraycolsep : half the width separating columns in an array environment
\tabcolsep : half the width separating columns in a tabular environment
\arrayrulewidth : width of rules
\doublerulesep : space between adjacent rules in array or tabular
\arraystretch : line spacing in array and tabular environments is done by
placing a strut in every row of height and depth
\arraystretch times the height and depth of the strut
produced by an ordinary \strut command.

PREAMBLE:
The PREAMBLE argument of an array or tabular environment can
contain the following:
1,l,c : indicate where entry is to be placed.
| : for vertical rule
@{EXP} : inserts the text EXP in every column.
\arraycolsep or \tabcolsep spacing is suppressed.
*{N}{PRE} : equivalent to writing N copies of PRE in the preamble.
PRE may contain *{N}{EXP’} expressions.
p{LEN} : makes entry in parbox of width LEN.

SPECIAL ARRAY COMMANDS:
\texttt{\textbackslash{multicolumn}(N)(FORMAT)(ITEM)}: replaces the next N column items by ITEM, formatted according to FORMAT. FORMAT should contain at most one l,r or c. If it contains none, then ITEM is ignored.

\texttt{\textbackslash{vline}}: draws a vertical line the height of the current row. May appear in an array element entry.

\texttt{\textbackslash{hline}}: draws a horizontal line between rows. Must appear either before the first entry (to appear above the first row) or right after a \textbackslash \ command. If followed by another \texttt{\textbackslash{hline}}, then adds a \texttt{\vskip} of \texttt{\doublerulesep}.

\texttt{\textbackslash{cline}}\{i-j\}: draws horizontal lines between rows covering columns i through j, inclusive. Multiple commands may follow one another to provide lines covering several disjoint columns.

\texttt{\textbackslash{extracolsep}}\{WIDTH\}: for use inside an \@ in the preamble. Causes a WIDTH space to be added between columns for the rest of the columns. This is in addition to the ordinary intercolumn space.

\texttt{\textbackslash{array}} ==
BEGIN
\begin{array}
\@acol \== \@arrayacol
\@classz \== \@arrayclassz
\@classiv \== \@arrayclassiv
\\ 
\@halignto \== \@arraycr
\@tabarray
\end{array}
END

\texttt{\textbackslash{endarray}}\{NAME\} == BEGIN \crcr \} \} END

\texttt{\textbackslash{tabular}} ==
BEGIN
\begin{tabular}
\@halignto \== \@tabacol
\end{tabular}
END

\texttt{\textbackslash{tabular}}\{WIDTH\} ==
BEGIN
\begin{tabular}
\@halignto \== \@tabacol
\end{tabular}
END

\texttt{\textbackslash{tabular}} ==
BEGIN
\leavevmode
\hbox { \\
\begin{array}
\@acol \== \@tabacol
\end{array}
END

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\@classz == \@tabclassz
\@classiv == \@tabclassiv
\ \ == \@tabularcr
\@tabarray
END

@endtabular == BEGIN \cr\cr\} \$ \ END

\@tabarray == if next char = [ then \@array else \@array[c] fi

\@array[POS]{PREAMBLE} ==
BEGIN
  define \arstrutbox to make \arstrut produce strut of height
  and depth \arraystretch times the height and
  depth of a normal strut.
\@mkpream{PREAMBLE}
\@preamble == \halign \halignto {\tabskip=0pt\arstrut
  eval{\@preamble}\tabskip = 0pt\cr \}
\@startpbox == \@@startpbox
\@endpbox == \@@endpbox
if POS = t then \vtop
  else if POS = b then \vbox
  else \vcenter
  fi fi
{\par ==L \} \% changed 92/09/18
\@sharp == #
\protect == \relax
\lineskip :=L 0pt
\baselineskip :=L 0pt
\@preamble
END

\@arraycr ==
BEGIN
  \$ \% Prevents extra space at end of row’s last entry.
  if next char = [
    then \@arrayarraycr
  else \$ \cr \% Needed to balance $ \ END

\@arrayarraycr[LENGTH] ==
BEGIN
  \$ \% Needed to balance $ of \@arraycr
  if LENGTH > 0
    then \tempdima := depth of \arstrutbox + LENGTH
       \vrule height 0pt width 0pt depth \tempdima
       \cr
  else \cr \noalign{\vskip LENGTH}

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\extracolsep
This command needs to expand during the tabular preamble construction so can’t be robust.
167 \def\extracolsep#1{\tabkip #1\relax}
(End definition for \extracolsep.)

\extracolsep
array
166 \def\array{\let\@acol\@arrayacol \let\@classz\@arrayclassz
167 \let\@classiv\@arrayclassiv
168 \let\\@arraycr\let\@halignto\@empty\@tabarray}
(End definition for \array.)

\extracolsep
endarray
\extracolsep
endtabular
\extracolsep
endtabular*
171 \def\endarray{\crcr\egroup\egroup}
172 \def\endtabular{\crcr\egroup\egroup $\egroup}
173 \expandafter\let\csname endtabular\endcsname = \endtabular
(End definition for \endarray, \endtabular, and \endtabular*.)

\extracolsep
tabular
174 \def\tabular{\let\@halignto\@empty\@tabular}
(End definition for \tabular.)

\extracolsep
tabular*
Note that the change to use \setlength slightly alters the timing of the expansion and use of the length in \#1 but this is very unlikely to have any practical effect.
175 \@namedef{tabular*}#1{%
176 \setlength\dimen@{#1}%
177 \edef\@halignto{to\the\dimen@}\@tabular}
(End definition for \tabular*.)

\extracolsep
tabular
178 \def\@tabular{\leavevmode \hbox \bgroup $\let\@acol\@tabacol
179 \let\@classz\@tabclassz
180 \let\@classiv\@tabclassiv \let\\@tabarraycr\@tabarray}
(End definition for \@tabular.)

\extracolsep	abarray
RmS 91/11/04 added \m@th.
181 \def\@tabarray{\m@th@ifnextchar[\@array{\@array[c]}}
(End definition for \@tabarray.)

\extracolsep	abarray
RmS 1993/11/03 changed \halign to \ialign and removed superfluous \tabskip assignment

\extracolsep$array
182 \def\@array[#1]#2{%
183 \if #1\vtop \else \if#1b\vbox \else \vcenter \fi\fi

File L: lttab.dtx Date: 2021/04/20 Version v1.1s
This next bit of code sets up the strut and then builds the halign and its preamble according to the specification in the second argument.

This code has been moved inside the box. A side effect of this has been to expose what was a buglet in the previous version: since the \arstrut below is expanded and contains an \ifmmode then it could produce an unnecessary extra box in every row, thus wasting ‘lots of’ main memory.

\setbox\arstrutbox\hbox{\vrule \@height\arraystretch\ht\strutbox \@depth\arraystretch \dp\strutbox \@width\z@} \@mkpream{#2} \edef\@preamble{\ialign \noexpand\@halignto \bgroup \@arstrut \@preamble \tabskip\z@skip \cr} That is the end of setting up the preamble; now we reset things before executing the halign built-up in \@preamble. The restorations could be done by introducing an extra group, thus saving tokens.

\let\@startpbox\@@startpbox \let\@endpbox\@@endpbox \let\par\@empty \let\@sharp## \set@typeset@protect \lineskip\z@skip\baselineskip\z@skip

If the parsing of the preamble goes wrong there may be some characters left which \TeX then tries to typeset, i.e., we would be in horizontal mode. That would produce an endless loop because the halign expects vertical mode thus issues a \par but that is a no-op at this point. So we better test this case issue some error message and make a crude recovery by ending that horizontal mode with force. A better fix would be to ensure that we never pick up more than a single character token (not done).

\fihmode \@preamerr\z@ \@@par\fi \@preamble} (End definition for \array.)

\arraycr Array version of "\.
\protected\def\arraycr{% 
$\{\ifnum0='}\fi\@ifstar\@xarraycr\@xarraycr}$ (End definition for \arraycr.)

\arraycr \def\@xarraycr\[#1\]{\ifnum0='\fi\@xargarraycr\#1}{#1}$ (End definition for \arraycr.)

\arraycr \def\@xargarraycr\[#1\]{\ifnum0='\fi\@xargarraycr\#1}{\#1}\else \@xargarraycr\[#1\]{\#1}$ (End definition for \arraycr.)

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Historical \TeX 2.09 comments (not necessarily accurate any more):
\begin{verbatim}
\def\@addamp{}\end{verbatim}

End of historical \TeX 2.09 comments.

The command \texttt{\def\@addamp{}} was removed from \texttt{\multicolumn} on 6 Dec 86 because it caused embedded array environments not to work. I think that it was included originally to prevent an error message if the 2nd argument to the \texttt{\multicolumn} command had two column specifiers.

8 Feb 89 — \texttt{\hbox{}} added after \texttt{\@preamble} to correct bug that occurred if \texttt{\multicolumn} preceded \texttt{\[
[D]
\]} with \texttt{D > 0}, caused by \texttt{\[\]} command doing an \texttt{\unskip}, which removed \texttt{\tabcolsep} glue inserted by \texttt{\multicolumn}.

This has been made long so that, for example, a \texttt{p}-column can contain multiple paragraphs; maybe the arguments of \texttt{@}-expressions should also be able to contain multiple paragraphs.

(End definition for \texttt{\multicolumn}.)

Historical \TeX 2.09 comments (not necessarily accurate any more):

Codes for classes and character numbers of array, tabular and \texttt{\multicolumn} arguments.

<table>
<thead>
<tr>
<th>Character</th>
<th>Class</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>l</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>r</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>@</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>p</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>{@-exp}</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>{\p-arg}</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

\texttt{\@testpatch \foo}: expands \texttt{\foo}, which should be an array parameter

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token, and sets `\@chclass` and `\@chnum` to its class and number. Uses `\@lastchclass` to distinguish 4 and 5

Preamble error codes
0: 'illegal character'
1: 'Missing @-exp'
2: 'Missing p-arg'

\@addamp ==
BEGIN if @firstamp = true then @firstamp := false
else & fi
END

\@mkpream TOKENLIST ==
BEGIN
@firstamp := T
@lastchclass := 6
@preamble == null
@sharp == \relax
@protect == BEGIN \noexpand\protect\noexpand\END
@startpbox == \relax
@endpbox == \relax
@expast{TOKENLIST}
for \@nextchar := expand{\reserved@a}
d o
@testpach{\@nextchar}
case of \@chclass
0 -> \@classz
1 -> \@classi
...
5 -> \@classv
end case
@lastchclass := \@chclass
end case
\@classz
0 -> \hskip \arraycolsep % lrc
1 -> % l
2 -> \@preamerr1 % 'Missing @-exp' % @
3 -> \@preamerr2 % 'Missing p-arg' % p
4 -> % @-exp
5 -> \hskip \arraycolsep % p-exp
end case
END

\@arrayclassz ==
BEGIN
\@preamble := \@preamble *
case of \@lastchclass
0 -> \hskip \arraycolsep \@addamp \hskip \arraycolsep
1 -> \@addamp \hskip \arraycolsep
2 -> % impossible
3 -> % impossible
4 -> \addamp
5 -> \hskip \arraycolsep \addamp \hskip \arraycolsep
6 -> \addamp \hskip \arraycolsep
end case
* case of \chnum
  0 -> \hfil$\relax\@sharp\hfil$
  1 -> $\relax\@sharp\hfil$
  2 -> \hfil$\relax\@sharp$
end case
END
\tabclassz == similar to \arrayclassz
\classi ==
BEGIN
\preamble := \preamble *
case of \lastchclass
  0 -> \hskip \arraycolsep \arrayrule
  1 -> \hskip \doublerulesep \arrayrule
  2 -> % impossible
  3 -> % impossible
  4 -> \arrayrule
  5 -> \hskip \arraycolsep \arrayrule
  6 -> \arrayrule
end case
END
\classii ==
BEGIN
\preamble := \preamble *
case of \lastchclass
  0 -> \hskip .5\arrayrulewidth
  1 -> \hskip .5\arrayrulewidth
  2 -> % impossible
else ->
end case
END
\classiii ==
BEGIN
\preamble := \preamble *
case of \lastchclass
  0 -> \hskip \arraycolsep \addamp \hskip \arraycolsep
  1 -> \addamp \hskip \arraycolsep
  2 -> % impossible
  3 -> % impossible
  4 -> \addamp
  5 -> \hskip \arraycolsep \addamp \hskip \arraycolsep
  6 -> \addamp \hskip \arraycolsep
end case

-END
\@arrayclassiv ==
BEGIN \@preamble := \@preamble * $ \@nextchar$ END
\@tabclassiv == same as \@arrayclassiv except without the $ \ldots $ \$
\@classiv ==
BEGIN \@preamble := \@preamble * \@startpbox{\@nextchar}\ignorespaces\@sharp \@endpbox
END
\@expast{S}:
Sets \reserved@a := S with all instances of \(\{N\}\{\text{STRING}\}\) replaced by N copies of STRING, where N > 0. An * appearing inside braces is ignored, but *-expressions inside STRING are expanded, so nested *-expressions are handled properly.

\@expast(S) == BEGIN \@xexpast S *0x @} END
\@xexpast S1 *\{N\}\{S2\} S3 @} ==
BEGIN \reserved@a := S1 \@tempcnta := N
if \@tempcnta > 0 then while \@tempcnta > 0 do \reserved@a := \reserved@a S2 \@tempcnta := \@tempcnta - 1 od
\reserved@b == \@xexpast
else \reserved@b == \@xexnoop fi
\expandafter \reserved@b \reserved@a S3 @} END
End of historical \LaTeX\ 2.09 comments.
\@xexnoop
238 \def\@xexnoop #1\@{}{}\$
(End definition for \@xexnoop.)
\@expast
239 \def\@expast#1{\@xexpast #1*0x @}\$
(End definition for \@expast.)
\@expast
\def\@expast#1*#2#3#4\@@{\edef\reserved@a{#1}\@tempcnta#2\relax\ifnum\@tempcnta>\z@\@whilenum\@tempcnta>\z@\do\edef\reserved@a{\reserved@a#3}\advance\@tempcnta \m@ne\fi\let\reserved@b\@xexpast\else\let\reserved@b\@xexnoop\fi\expandafter\reserved@b\reserved@a #4\@@}

(End definition for \@expast.)

@if@firstamp
\@addamp
\newif\if@firstamp
\def\@addamp{\if@firstamp\@firstampfalse\else\edef\@preamble{\@preamble &}\fi}

(End definition for \if@firstamp and \@addamp.)

\@arrayacol \@tabacol \@ampacol \@acolampacol
\def\@arrayacol{\edef\@preamble{\@preamble \hskip \arraycolsep}}
\def\@tabacol{\edef\@preamble{\@preamble \hskip \tabcolsep}}
\def\@ampacol{\@addamp \@acol}
\def\@acolampacol{\@acol\@addamp\@acol}

(End definition for \@arrayacol and others.)

\@mkpream
\def\@mkpream#1{\@firstamptrue\@lastchclass6\let\@preamble\@empty\let\protect\@unexpandable@protect\let\@sharp\relax\let\@startpbox\relax\let\@endpbox\relax\@expast{#1}\expandafter\@tfor\expandafter:\expandafter=\reserved@a\do{\@testpach\@nextchar\ifcase\@chclass\@classz\or\@classi\or\@classii\or\@classiii\or\@classiv\or\@classv\fi\@lastchclass\@chclass}\ifcase\@lastchclass\@acol\or\or\@preamerr\tw@\or\or\@acol\fi}

(End definition for \@mkpream.)
\@arrayclassz
\def\@arrayclassz{%ifcase \@lastchclass \@acolampacol \or \@ampacol \or
 \or \or \@addamp \or
 \@acolampacol \or \@firstampfalse \@acol \fi
edef\@preamble{%@preamble
@ifcase \@chnum
 \hfil$\relax\@sharp$\hfil \or $\relax\@sharp$\hfil
 \or \hfil$\relax\@sharp$\hfil\fi}
(End definition for \@arrayclassz.)

\@tabclassz RmS 01/08/14 inserted extra braces around entry for NFSS
\def\@tabclassz{%ifcase\@lastchclass
 \@acolampacol
 \or \@ampacol
 \or \or \or \or
 \@addamp
 \or \or \or \@acolampacol
 \or \or \@firstampfalse\@acol
 \fi
edef\@preamble{%@preamble
@ifcase\@chnum
 \hfil
 \hskip1sp%\ignorespaces\@sharp\unskip\hfil
 \or
 \hskip1sp\ignorespaces\@sharp\unskip\hfil
 \or
 \hfil\hskip1sp\ignorespaces\@sharp\unskip\fi}}
(End definition for \@tabclassz.)

\@classi
\def\@classi{%ifcase\@lastchclass
 \@acol\@arrayrule
 \or
 \@addtopreamble{\hskip \doublerulesep}\@arrayrule
 \or
 \or
 \or
 \or \@arrayrule
 \or \or \@acol\@arrayrule
 \or

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(End definition for \@classi.)

(End definition for \@classii.)

(End definition for \@classiii.)

(End definition for \@tabclassiv.)

(End definition for \@arrayclassiv.)

(End definition for \@classv.)

(End definition for \@addtopreamble.)

(End definition for \@chclass, \@lastchclass, and \@chnum.)

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\arraystretch \def\arraystretch{1} % Default value.

(End definition for \arraystretch.)

\@arstrutbox \@arstrut \newbox\@arstrutbox \def\@arstrut{% 
\relax\ifmmode\copy\@arstrutbox\else\unhcopy\@arstrutbox\fi}

(End definition for \@arstrutbox and \@arstrut.)

\@arrayrule \def\@arrayrule{%\@addtopreamble{% 
\hskip -.5\arrayrulewidth \vrule \@width \arrayrulewidth \hskip -.5\arrayrulewidth}}

(End definition for \@arrayrule.)

\@testpatch \def\@testpatch#1{%\@chclass {\ifnum \@lastchclass=\tw@ 4 \else
\ifnum \@lastchclass=3 5 \else \z@ \if#1c\@chnum \z@ \else
\if#1l\@chnum \@ne \else
\if#1r\@chnum \tw@ \else
\@chclass \if#1|\@ne \else
\if#1@\tw@ \else
\if#1p3 \else \@preamerr 0\fi
\fi \fi \fi \fi \fi}

(End definition for \@testpatch.)

\hline \def\hline{% 
\noalign{\ifnum0='}\fi\hrule \@height \arrayrulewidth \futurelet 
\reserved@a\@xhline}

(End definition for \hline.)

\@xhline \def\@xhline{%\ifx\reserved@a\hline 
\vskip\doublerulesep Measure from the middle of the rules.
\vskip-\arrayrulewidth \fi 
\ifnum0='\{\fi}

(End definition for \@xhline.)

\vline \def\vline{%\vrule \@width \arrayrulewidth}

(End definition for \vline.)
The old \TeX\ 2.09 implementation of \verb|\cline| used up quite a lot of memory and two precious count registers. This new (1995/09/14) implementation does not use any count registers. It is coded in a way that depends heavily on the definition of \verb|\multispan| so that command has been moved here from the file \verb|ltplain.dtx|.

These counters are no longer declared.

\begin{verbatim}
\newcount\@cla \newcount\@clb
\def\cline#1{\@cline#1\@nil}
\def\@cline#1-#2\@nil{\omit\usecounter{\multicnt}\@multispan\advance\@multispan\m@ne\ifnum\@multicnt=\@ne\@firstofone{&\omit}\fi\@multicnt#2\@nil\advance\@multispan\@ne\leaders\hrule\@height\arrayrulewidth\hfill\cr}
\end{verbatim}

The original had \verb|\unskip| at this point, but how could a skip get here ???

\begin{verbatim}
\leaders\hrule\@height\arrayrulewidth\hfill\cr
\end{verbatim}

This is back spacing is fairly horrible, but it is what happened in the old version... An alternative would be to make \verb|\cline| look ahead for a following \verb|\cline| as does \verb|\hline|.

This would alter the spacing in existing documents so keep the old version in the kernel. Perhaps a package should do this differently.

\begin{verbatim}
\noalign{\vskip-\arrayrulewidth}\cr
\end{verbatim}

(End definition for \verb|\cline| and \verb|\@cline|.)

\begin{verbatim}
\mscount
The \verb|\mscount| counter is no longer declared, saving a csname and a register. It is declared in compatibility mode.

(End definition for \verb|\mscount|.)
\end{verbatim}

\begin{verbatim}
\multispan
\@multispan
\sp@n
Modify \verb|\multispan| slightly from its plain \TeX\ definition to allow more efficient code sharing with \verb|\multicolumn|. Also share a count register with \verb|\multiput|.

\begin{verbatim}
\def\multispan{\omit\@multispan}
\def\@multispan#1{\@multicnt#1\relax\loop\ifnum\@multicnt=\@ne \sp@n\repeat}\def\sp@n{\span\omit\advance\@multicnt\m@ne}
\end{verbatim}

(End definition for \verb|\multispan|, \verb|\@multispan|, and \verb|\sp@n|.)
\end{verbatim}

\begin{verbatim}
\@startpbox
\@endpbox
Helper macros for ‘p’ columns.
\begin{verbatim}
\@startpbox{⟨width⟩} text \egroup is essentially \parbox{⟨width⟩}{⟨text⟩} \end{verbatim}
\end{verbatim}

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14 Jan 89: Def of \endpbox changed from \endpbox{\par\vskip\dp\arstrutbox\egroup\hfil} so vertical spacing works out right if the last line of a ‘p’ entry has a descender. (End definition for \startpbox and \endpbox.)

\let\@startpbox=\startpbox
\let\@endpbox=\endpbox

(End definition for \@startpbox and \@endpbox.)

(/2ekernel)
1 Picture Mode

Picture mode commands. In addition to the commands available in \LaTeX{}2.09, this section adds the new \verb|\qbezier| command for drawing curves.

\verb|\qbezier[\langle N \rangle]| (\verb|\langle AX,AY \rangle|) (\verb|\langle BX,BY \rangle|) (\verb|\langle CX,CY \rangle|) plots a quadratic Bezier curve from (\langle AX,AY \rangle) to (\langle CX,CY \rangle), with (\langle BX,BY \rangle) as the third Bezier point, using \(N + 1\) points equally spaced parametrically. If \(N = 0\) (the default value), then a sufficient number of points are used to draw a connected curve—except that at most \verb|\qbeziermax| + 1 points are drawn. A “point” is a square of side \verb|\@wholewidth|.

In addition, to be compatible with the old \verb|bezier| package, a variant of this command, \verb|\bezier|, is defined, in which the first argument is not optional.

Historical \LaTeX{}2.09 comments (not necessarily accurate any more):

\verb|\unitlength| = value of dimension argument
\verb|\@wholewidth| = current line width
\verb|\@halfwidth| = half of current line width
\verb|\@linefnt| = font for drawing lines
\verb|\@circlefnt| = font for drawing circles

\verb|\linethickness{DIM}| : Sets the width of horizontal and vertical lines in a picture to DIM. Does not change width of slanted lines or circles. Width of all lines reset by \verb|\thinlines| and \verb|\thicklines|

\verb|\picture(XSIZE,YSIZE)(XORG,YORG)|
BEGIN
\verb|\@picht| := \verb|L YSIZE * \unitlength|
box \verb|\@picbox| :=
\verb|\hb@xt@ XSIZE * \unitlength|
{\verb|\hskip -XORG * \unitlength|
\verb|\lower YORG * \unitlength|
\verb|\hbox{|}
\verb|\ignorespaces| %% added 13 June 89
END

\verb|\endpicture| ==
BEGIN
} \hss \}
height of \verb|\@picbox| := \verb|\@picht|
depth of \verb|\@picbox| := 0
\verb|\mbox{\box\@picbox}| %% change 26 Aug 91
END

\verb|\put(X, Y){OBJ}| ==
BEGIN

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\killglue
\raise Y \unitlength \hbox{0pt \hskip X \unitlength \hbox{OBJ hss}}

\ignorespaces
END

\multiput(X,Y)(DELX,DELY){N}{OBJ} ==
BEGIN
\killglue
@multicnt := N
@xdim := X \unitlength
@ydim := Y \unitlength
while \@multicnt > 0 do
  @ydim := @ydim \unitlength
  \raise @ydim \hbox{0pt \hskip @xdim \hbox{OBJ hss}}
  @multicnt := @multicnt - 1
  @xdim := @xdim + DELX \unitlength
  @ydim := @ydim + DELY \unitlength
od
\ignorespaces
END

\shortstack{POS}{TEXT} : Makes a \vbox containing TEXT stacked as a one-column array, positioned l, r or c as indicated by POS.

End of historical \TeX 2.09 comments.
The ‘2ekernel’ code ensures that a \usepackage{autopict} is essentially ignored if a ‘full’ format is being used that has picture mode already in the format.

\wholewidth \halfwidth

\unitlength

\@picbox \@picht

(End definition for \wholewidth and \halfwidth.)

(End definition for \unitlength.)

(End definition for \@picbox and \@picht.)
\defaultunitsset

Set a length register, \#1, accepting number or an etex length expression, \#2, with default unit, \#3.

The register name in \#1 can be prefixed by \advance so that the register is incremented by the supplied value.

\defaultunitsset\{\advance\@vxx\}\{\textwidth-15pt\}\unitlength
\#3 can be a literal unit such as cm or a length register such as \unitlength.

This is used in all picture commands that take picture coordinates. So \put(2,2) as previously but now \put(\textwidth-5cm,0.4\texteight) Note that you can only use expressions with lengths, \put(1+2,0) is not supported.

\picture\#1 should be white space.

\picture\#1 should be a (eating any white space before the bracket),

\@picture

(End definition for \defaultunitsset.)

\picture

(End definition for picture and \picture.)
In the definitions of \put and \multiput, \hskip was replaced by \kern just in case arg #3 = "plus". (Bug detected by Don Knuth. changed 20 Jul 87).
\edef\multiput(#1,#2)#3{\@defaultunitsset\@xdim{#1}\unitlength\@defaultunitsset\@ydim{#2}\unitlength\@multiput{}}

\endincludeinrelease
\endincludeinrelease{2020/10/01}
\endincludeinrelease{0000/00/00}
\endincludeinrelease{0000/00/00}
\endincludeinrelease{0000/00/00}
\endincludeinrelease{0000/00/00}
\endincludeinrelease{0000/00/00}

(End definition for \multiput.)

\killglue
\def\killglue\unskip\@whiledim \lastskip >\z@\do{\unskip}
\thinlines
\thicklines
\linethickness
\ishortstack
\@ishortstack
\@stackcr
\@ixstackcr
\@istackcr
\shortstack
\@shortstack
\EndIncludeInRelease
\IncludeInRelease{0000/00/00}{\shortstack calc support}
\EndIncludeInRelease
\def\@istackcr[#1]{\cr
\noalign{\vskip #1}\ignorespaces}
\EndIncludeInRelease

(End definition for \@istackcr.)

Historical \LaTeX{} 2.09 comments (not necessarily accurate any more):
\line(X,Y)\{LEN\} ==
BEGIN
\@xarg := X
\@yarg := Y
\@linelen := LEN * \unitlength
if \@xarg = 0
then \@vline
else if \@yarg = 0
then \@hline
else \@sline
if
END

\@sline ==
BEGIN
if \@xarg < 0
then @negarg := T
\@xarg := -\@xarg
\@yyarg := -\@yarg
else @negarg := F
\@yyarg := \@yarg
fi
\@tempcnta := |@yyarg|
if \@tempcnta > 6
then error: 'LATEX ERROR: Illegal \line or \vector argument.'
\@tempcnta := 0
fi
\box\@linechar := \hbox{\@linefnt \@getlinechar(\@xarg,\@yyarg) }
if \@yarg > 0 then \@upordown = \raise
\@clnht := 0
else \@upordown = \lower
\@clnht := height of \box\@linechar
fi
\@clnwd := width of \box\@linechar
if @negarg
then \@skip = width of \box\@linechar
\reserved@a == \@skip - 2* width of box \@linechar
else \reserved@a == \relax
fi
%% Put out integral number of line segments
while \@clnwd < \@linelen
  do \@upordown \@clnht \copy\@linechar
      \reserved@a
      \@clnht := \@clnht + ht of \box\@linechar
      \@clnwd := \@clnwd + width of \box\@linechar
  od

%%% Put out last segment
\@clnht := \@clnht - height of \box\@linechar
\@clnwd := \@clnwd - width of \box\@linechar
\@tempdima := \@linelen - \@clnwd
\@tempdimb := \@tempdima - width of \box\@linechar
if @negarg then \hskip -\@tempdimb
  else \hskip \@tempdimb
  fi
\@tempdima := 1000 * \@tempdima
\@tempcnta := \@tempdima / width of \box\@linechar
\@tempdima := (\@tempcnta * ht of \box\@linechar)/1000
\@clnht := \@clnht + \@tempdima
if \@linelen < width of box\@linechar
  then \hskip width of box\@linechar
  else \bbox{\@upordown \@clnht \copy\@linechar}
  fi
END

\@getlinechar(X,Y) ==
BEGIN
  \@tempcnta := 8*X - 9
  if Y > 0
    then \@tempcnta := \@tempcnta + Y
    else \@tempcnta := \@tempcnta - Y + 64
  fi
  \char\@tempcnta
END

\vector(X,Y){LEN} ==
BEGIN
  \@xarg := X
  \@yarg := Y
  \@linelen := LEN * \unitlength
if \@xarg = 0 
then \@vvector 
else if \@yarg = 0 
then \@hvector 
else \@svector 
if 
END

\@hvector == 
BEGIN 
\@hline 
{\@linefnt if \@xarg < 0 then \@getlarrow(1,0) 
else \@getrarrow(1,0) 
fi}
END

\@vvector == if \@yarg < 0 \@downvector else \@upvector fi
\@svector == 
BEGIN 
\@sline \@tempcnta := |\@yarg|
if \@tempcnta < 5 
then \hskip - width of \box\@linechar 
\@upordown \@clnht \bbox 
{\@linefnt 
if @negarg then \@getlarrow(\@xarg,\@yyarg) 
else \@getrarrow(\@xarg,\@yyarg) 
fi 
} 
else error: 'LATEX ERROR: Illegal \line or \vector argument.' 
fi
END

\@getlarrow(X,Y) == 
BEGIN 
if Y = 0 
then \@tempcnta := '33 
else \@tempcnta := 16 * X - 9 
\@tempcntb := 2 * Y 
if \@tempcntb > 0 
then \@tempcnta := \@tempcnta + \@tempcntb 
else \@tempcnta := \@tempcnta - \@tempcntb + 64 
fi 
\char\@tempcnta 
END

\@getrarrow(X,Y) == 
BEGIN 

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\@tempcntb := \@tempcnta

case of \@tempcntb
0 : \@tempcnta := '55
1 : if X < 3
then \@tempcnta := 24*X - 6
else if X = 3
then \@tempcnta := 49
else \@tempcnta := 58 fi
fi
2 : if X < 3
then \@tempcnta := 24*X - 3
else \@tempcnta := 51 fi
else \@tempcnta := 16*X - 2
4 : \@tempcnta := 16*X + 7
endcase
if Y < 0
then \@tempcnta := \@tempcnta + 64
fi
\char\@tempcnta
END

End of historical \TeX2.09 comments.

\if@negarg
\newif\if@negarg
(End definition for \if@negarg.)
\line

(\texttt{\2ekernel})
\latexrelease\IncludeInRelease{2020/10/01}{\line}{default units}\%
\latexrelease\expandafter\let\csname line \endcsname\@undefind
\def\line(#1,#2)#3{%\@xarg #1\relax \@yarg #2\relax \@defaultunitsset \@linelen{#3}\unitlength \ifdim\@linelen<\z@\@badlinearg\else \ifnum\@xarg =\z@ \@vline \else \ifnum\@yarg =\z@ \@hline \else \@sline\fi \fi \fi}

(\texttt{\2ekernel})
\latexrelease\EndIncludeInRelease
\latexrelease\IncludeInRelease{0000/00/00}{\line}{default units}\%
\latexrelease\expandafter\let\csname line \endcsname\@undefind
\def\line(#1,#2)#3{%\@xarg #1\relax \@yarg #2\relax \@defaultunitsset \@linelen{#3}\unitlength \ifdim\@linelen<\z@\@badlinearg\else \ifnum\@xarg =\z@ \@vline \else \ifnum\@yarg =\z@ \@hline \else \@sline\fi \fi \fi

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If we have something like \line(5,5){30} the \@linechar will not contain a char and later on we will end in an infinite loop. So we check the width of the box and put in something as an emergency fix if necessary.

\ifdim\wd\@linechar=\z@ \setbox\@linechar\hbox{.}% \@badlinearg \fi
\ifnum\@yarg>\z@ \let\@upordown\raise\@clnht\z@ \else\let\@upordown\lower\@clnht\ht\@linechar\fi
\@clnwd\wd\@linechar\if@negarg \hskip-\wd\@linechar
def\reserved@a\hskip-2\wd\@linechar\fi\@whiledim\@clnwd<\@linelen\do
\@upordown\@clnht\copy\@linechar\advance\@clnht\ht\@linechar\advance\@clnwd\wd\@linechar
\advance\@clnwd-\wd\@linechar\@tempdimaa\@linelen\advance\@tempdimaa\@clnwd
\@tempdimbb\@tempdimaa\advance\@tempdimbb\@clnwd
\if@negarg\hskip-\@tempdimbb\else\hskip\@tempdimbb\fi\multiply\@tempdimaa\@m
\@tempcntaa\@tempdimaa\divide\@tempcntaa\@tempdimaa
\divide\@tempdimaa\@m\advance\@clnht\@tempdimaa\ifdim\@linelen<\wd\@linechar
\hskip\wd\@linechar\fi

Warn if line gets so short that it can’t be printed. But don’t warn if it is exactly zero since that was probably deliberate (e.g., to get a vector head only).

\ifdim\@linelen=\z@ \else \@picture@warn \fi
\def\hline{\ifnum \@xarg <\z@ \hspace \-\@linelen \fi
\vrule \@height \@halfwidth \@depth \@halfwidth \@width \@linelen
\ifnum \@xarg <\z@ \hspace \-\@linelen \fi}

(End definition for \@hline.)

\def\getlinechar(#1,#2){\@tempcnta#1\relax\multiply\@tempcnta 8\%
\advance\@tempcnta -9\ifnum #2>\z@ \advance\@tempcnta #2\relax\else
\advance\@tempcnta -#2\relax\advance\@tempcnta 64 \fi
\char\@tempcnta}

(End definition for \@getlinechar.)

\def\vector(#1,#2)#3{\@xarg #1\relax \@yarg #2\relax
\@tempcnta \ifnum\@xarg<\z@ -\@xarg\else\@xarg\fi
\ifnum\@tempcnta<5\relax\@defaultunitsset\@linelen{#3}\unitlength
\ifdim\@linelen<\z@\@badlinearg\else
\ifnum\@xarg =\z@ \@vvector
\else \ifnum\@yarg =\z@ \@hvector \else \@svector\fi
\fi
\fi
\fi\else\@badlinearg\fi}

(End definition for \vector.)
\hvector
\def\hvector{\@hline\hb@xt\z@{\@linefnt\ifnum \@xarg <\z@ \@getarrow(1,0)\hss\else \hss\@getarrow(1,0)\fi}}
(End definition for \hvector.)
\vvector
\def\vvector{\ifnum \@yarg <\z@ \@downvector \else \@upvector \fi}
(End definition for \vvector.)
\svector
\def\svector{\@sline
\@tempcnta\@yarg \ifnum\@tempcnta <\z@ \@tempcnta -\@tempcnta\fi
\ifnum\@tempcnta <5\%
\hskip -\wd\@linechar \@upordown\@clnht \hbox{\@linefnt \if@negarg
\@getarrow(\@xarg,\@yyarg)\else \@getrarrow(\@xarg,\@yyarg)\fi}\else\@badlinearg\fi}
(End definition for \svector.)
\getarrow
\def\getarrow(#1,#2){\ifnum #2=\z@ \@tempcnta 27 % '33
\else
\@tempcnta #1\relax\multiply\@tempcnta \sixt@@n\advance\@tempcnta -9 \@tempcntb #2\relax\multiply\@tempcntb \tw@
\ifnum \@tempcntb >\z@ \@badlinearg\else\@getarrow(\@xarg,\@yyarg)\fi}
(End definition for \getarrow.)
\vline
\def\vline{\ifnum \@yarg <\z@ \@downline \else \@upline \fi}

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Historical LaTeX2.09 comments (not necessarily accurate any more):
\dashbox{D}(X,Y) ==
BEGIN
leave vertical mode
\hb@xt@0pt {
  \baselineskip := 0pt
  \lineskip := 0pt
  \% HORIZONTAL DASHES
  \dashdim := X \* \unitlength
  \dashcnt := \dashdim + 200 \% to prevent roundoff error
  \dashdim := D \* \unitlength
  \dashcnt := \dashcnt / \dashdim
  if \dashcnt is odd
    then \dashdim := 0pt
    \dashcnt := (\dashcnt + 1) / 2
  else \dashdim := \dashdim / 2
  \dashcnt := \dashcnt / 2 - 1
  \box\dashbox := \hbox{\vrule height \dashdim depth \dashdim width \dashdim}
  \put(0,0){\copy\dashbox}
  \put(0,Y){\copy\dashbox}
  \put(X,0){\hskip -\dashdim\copy\dashbox}
  \put(X,Y){\hskip -\dashdim\box\dashbox}
  \dashdim := 3 * \dashdim
fi
\box@dashbox := \hbox{\vrule height \@halfwidth depth \@halfwidth width D * \unitlength \hskip D * \unitlength}

@tempcnta := 0
\put(0,0){\hskip \@dashdim \while \@tempcnta < @dashcnt \do \copy@dashbox \@tempcnta := @tempcnta + 1 \od }

@tempcnta := 0
put(0,Y){\hskip \@dashdim \while \@tempcnta < @dashcnt \do \copy@dashbox \@tempcnta := @tempcnta + 1 \od }

%% vertical dashes
@dashdim := Y * \unitlength
@dashcnt := @dashdim + 200 % to prevent roundoff error
@dashdim := D * \unitlength
@dashcnt := @dashcnt / @dashdim
if @dashcnt is odd
  then @dashdim := 0pt
  else @dashdim := @dashdim / 2
       @dashcnt := @dashcnt / 2 - 1
\box@dashbox := \hbox{\hskip -@halfwidth \vrule width \@wholewidth height \@dashdim}

\put(0,0){\copy@dashbox}
\put(X,0){\copy@dashbox}
\put(0,Y){\lower@dashdim\copy@dashbox}
\put(X,Y){\lower@dashdim\copy@dashbox}
@dashdim := 3 * @dashdim
fi
\box@dashbox := \hbox{\vrule width \@wholewidth height D * \unitlength}

@tempcnta := 0
put(0,0){\hskip -@halfwidth \vbox(while @tempcnta < @dashcnt \do \vskip D*\unitlength \copy@dashbox \@tempcnta := @tempcnta + 1 \od \vskip @dashdim \)}

@tempcnta := 0
put(X,0){\hskip -@halfwidth

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\vbox{while \@tempcnta < \dashcnt
  do \vskip D*\unitlength
      \copy\@dashbox
      \@tempcnta := \@tempcnta + 1
  od
  \vskip \@dashdim
} % END DASHES

\@imakepicbox(X,Y)
END

End of historical \LaTeX 2.09 comments.

\dashbox

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\(\texttt{\LaTeX} 2.09\) comments (not necessarily accurate any more):

**CIRCLES AND OVALS**

**USER COMMANDS:**

\(\texttt{\textbackslash circle\{D\}}\) : Produces the circle with the diameter as close as possible to \(D \ast \texttt{\LaTeX}\textbackslash newlength\{unitlength\}\) and puts the circle with its center at \((X,Y)\).

\(\texttt{\textbackslash oval\{X,Y\}\}\) : Makes an oval as round as possible that fits in the rectangle of width \(X \ast \texttt{\LaTeX}\textbackslash newlength\) and height \(Y \ast \texttt{\LaTeX}\textbackslash newlength\). The reference point is the center.

\(\texttt{\textbackslash oval\{X,Y\}\{\textbackslash PHASE\}}\) : Save as \(\texttt{\textbackslash oval\{X,Y\}}\) except it draws only the half or quadrant of the oval indicated by \(\texttt{\textbackslash PHASE}\). E.G., \(\texttt{\textbackslash oval\{X,Y\}\{t\}}\) draws just the top half and \(\texttt{\textbackslash oval\{X,Y\}\{br\}}\) draws just the bottom right quadrant. In all cases, the reference point is the same as the unqualified \(\texttt{\textbackslash oval\{X,Y\}}\) command.

\(\texttt{\textbackslash ovvert\{DELTA1\}\{DELTA2\}}\) : Makes a vbox containing either the left side or the right side of the oval being constructed. The baseline will coincide with the outside bottom edge of the oval; the left side of the box will coincide with the left edge of the vertical
rule. The width of the box will be \@tempdima. DELTA1 and DELTA2 are added to the character number in \@tempcnta to get the characters for the top and bottom quarter circle pieces.

@ovhorz : Makes an hbox containing the straight rule for either the top or the bottom of the oval being constructed. The baseline will coincide with bottom edge of the rule; the left side of the box will coincide with the left side of the oval. The width of the box will be \@ovxx.

@getcirc {DIAM} : Sets \@tempcnta to the character number of the top-right quarter circle with the largest diameter less than or equal to DIAM. Sets \@tempboxa to an hbox containing that character. Sets \@tempdima to \wd \@tempboxa, which is the distance from the circle's left outside edge to its right inside edge. (These characters are like those described in the TeXbook, pp. 389-90.)

@getcirc {DIAM} ==
BEGIN
\@tempcnta := integer coercion of (DIAM + 2pt) + 2pt added 1 Nov 88
\@tempcnta := \@tempcnta / integer coercion of 4pt
if \@tempcnta > 10
  then \@tempcnta := 10 fi
if \@tempcnta > 0
  then \@tempcnta := \@tempcnta-1
else LaTeX Warning: Oval too small. fi
\@tempcnta := 4 * \@tempcnta
\@tempboxa := \hbox{\@circlefnt \char \@tempcnta}
\@tempdima := \wd \@tempboxa
END

@put{X}{Y}{OBJ} ==
BEGIN
\raise Y \hb@xt@ 0pt{\hskip X OBJ \hss}
END

@oval(X,Y)[POS] ==
BEGIN
\begingroup
\bboxmaxdepth := \maxdimen
@ovt := @ovb := @ovl := @ovr := true
for all E in POS
  do @ovE := false od
@ovxx := X * \unitlength
@ovyy := Y * \unitlength
\endgroup
\@tempdimb := \min(\@ovxx, \@ovyy)
\getcirc{\@tempdimb-2pt} \^^2 "-2pt" added 7 Dec 89
\@ovro := \ht \@tempboxa
\@ovri := \dp \@tempboxa
\@ovdx := \@ovxx - \@tempdima
\@ovdx := \@ovdx/2
\@ovdy := \@ovyy - \@tempdima
\@ovdy := \@ovdy/2
\@circlefnt
\@tempboxa := 
\hbox{
  if @ovr
    then \@ovvert{3}{2} \kern -\@tempdima
  fi
  if @ovl
    then \kern \@ovxx \@ovvert{0}{1} \kern -\@tempdima
        \kern -\@ovxx
  fi
  if @ovt
    then \@ovhorz \kern -\@ovxx
  fi
  if @ovb
    then \raise \@ovyy \@ovhorz
  fi
}
\@ovdx := \@ovdx + \@ovro
\@ovdy := \@ovdy + \@ovro
\ht \@tempboxa := \dp \@tempboxa := 0
\@put{-\@ovdx}{-\@ovdy}{\box \@tempboxa}
\endgroup
END

\@ovvert {DELTA1} {DELTA2} ==
BEGIN
  \vbox to \@ovyy {
    if @ovb
      then \@tempcntb := \@tempcnta + DELTA1
          \kern -\@ovro
          \hbox { \char \@tempcntb }
          \nointerlineskip
      else \kern \@ovri \kern \@ovdy
    fi
    \leaders \vrule width \@wholewidth \vfil
    \nointerlineskip
    if @ovt
      then \@tempcntb := \@tempcnta + DELTA2
          \hbox { \char \@tempcntb }
      else \kern \@ovdy \kern \@ovro
    fi
  }

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\@ovhorz ==
BEGIN
\hb@xt@ \@ovxx{
   \kern \@ovro
   if @ovr
      then
      \kern \@ovdx
      fi
   \leaders \hrule height \@wholewidth \hfil
   if @ovl
      then
      \kern \@ovdx
      fi
   \kern \@ovri
}
END

\circle{DIAM} ==
BEGIN
\begingroup
\boxmaxdepth := maxdimen
\@tempdimb := DIAM * \unitlength
if \@tempdimb > 15.5pt
   then \@getcirc{\@tempdimb}
      \@ovro := \ht \@tempboxa
      \@tempboxa := \hbox{
         \@circlefnt
         \@tempcnta := \@tempcnta + 2
         \char \@tempcnta
         \@tempcnta := \@tempcnta - 1
         \char \@tempcnta
         \kern -2\@tempdima
         \@tempcnta := \@tempcnta + 2
         \raise \@tempdima \hbox { \char \@tempcnta }
         \raise \@tempdima \box\@tempboxa
      }
      \ht\@tempboxa := \dp\@tempboxa := 0
      \@put{-\@ovro}{-\@ovro}{\@tempboxa}
   else
      \@circ{\@tempdimb}{96}
   fi
\endgroup
END

\circle*{DIAM} == \@dot{DIAM} == \@circ{DIAM*\unitlength}{112}

\@circ{DIAM}{CHAR} ==
BEGIN

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\@tempcnta := integer coercion of (DIAM + .5pt)/1pt.
if \@tempcnta > 15 then \@tempcnta := 15 fi
if \@tempcnta > 1 then \@tempcnta := \@tempcnta - 1 fi
\@tempcnta := \@tempcnta + CHAR\@circlefnt
\char \@tempcnta
END

End of historical \TeX 2.09 comments.

\if@ovt
  If producing the Top Bottom Left or Right of an oval.
\if@ovb
\if@ovl
\if@ovr
(End definition for \if@ovt and others.)
\@ovxx\@ovyy\@ovdx\@ovdy\@ovro\@ovri
(End definition for \@ovxx and others.)
\advance\@tempdima 2pt\relax
added 1 Nov 88 to fix bug in which size of drawn
circle not monotonic function of argument of \circle, caused by different rounding for
dimensions of large and small circles.
\@getcirc
\@picture@warn
Generic warning for lines, vectors (used in \@sline) and oval or circle (used in \@getcirc)
are not available at right size.
\@picture@warn

\@put
\def\@put#1#2#3{\raise #2\hb@xt@\z@{\hskip #1#3\hss}}

\oval
\def\oval(#1,#2)\[#3\]{\begingroup\boxmaxdepth \maxdimen
\@ovttrue \@ovbtrue \@ovltrue \@ovrtrue
\@ovvlinetrue \@ovhlinetrue
\@tfor\reserved@a :=#3\do{\csname @ov\reserved@a false\endcsname}
\@defaultunitsset\@ovxx{#1}\unitlength
\@defaultunitsset\@ovyy{#2}\unitlength
\@tempdimb \ifdim \@ovyy >\@ovxx \@ovxx \else \@ovyy \fi
\@getcirc \@tempdimb
\@ovro \ht\@tempboxa \@ovri \dp\@tempboxa
\@ovdx\@ovxx \advance\@ovdx -\@tempdima \divide\@ovdx \tw@
\@ovdy\@ovyy \advance\@ovdy -\@tempdima \divide\@ovdy \tw@
\endgroup}\endgroup

\if@ovvline \if@ovhline \Tests whether horizontal or vertical lines are needed.\fi

\if@ovvline \newif\if@ovvline \@ovvlinetrue \fi
\if@ovhline \newif\if@ovhline \@ovhlinetrue \fi
% \begin{macrocode}
% \end{macrocode}
% \latexrelease\IncludeInRelease{2016/03/31}{\@ovlinetrue}{\Avoid almost zero length leaders}{\latexrelease}
% \latexrelease\IncludeInRelease{0000/00/00}{\@ovhlinetrue}{\Avoid almost zero length leaders}{\latexrelease}
% \latexrelease\IncludeInRelease{2020/10/01}{\@oval}{\default units}{\latexrelease}
% \begin{macrocode}
% \end{macrocode}
% \latexrelease\IncludeInRelease{2016/03/31}{\@ovlinetrue}{\Avoid almost zero length leaders}{\latexrelease}
% \latexrelease\IncludeInRelease{0000/00/00}{\@ovhlinetrue}{\Avoid almost zero length leaders}{\latexrelease}
% \latexrelease\IncludeInRelease{2020/10/01}{\@oval}{\default units}{\latexrelease}
% \begin{macrocode}
% \end{macrocode}

\oval
End definition for \@ovro.

(End definition for \@ovvert.)

End definition for \@ovhorz.
\@dot Internal form of \circle*.

\def\@dot#1{\@defaultunitsset\@tempdimb{#1}\unitlength\@circ\@tempdimb{112}}

\def\@circ#1#2{\@tempdima #1\relax \advance\@tempdima .5\p@
\@tempcnta\@tempdima \@tempdima \p@
\divide\@tempcnta\@tempdima
\ifnum\@tempcnta >15\relax \@tempcnta 15\relax \fi
\ifnum\@tempcnta >2\relax \advance\@tempcnta\m@ne\fi
\advance\@tempcnta #2\relax
\@circlefnt \char\@tempcnta}

\newcount\@xarg
\newcount\@yarg
\newcount\@yyarg

\def\@xarg#1\@yarg#2\@yyarg#3{\newcount\@xarg\newcount\@yarg\newcount\@yyarg}

\newcount\@multicnt

\def\@multicnt#1{\newcount\@multicnt}

(End definition for \@xarg, \@yarg, and \@yyarg.)

(End definition for \@multicnt.)
\@xdim \hfil Length registers.
\@ydim \hfil \newdimen\@xdim
\hfil \newdimen\@ydim

(End definition for \@xdim and \@ydim.)

\@linechar Box for holding a line segment character, for sloping lines.
\hfil \newbox\@linechar

(End definition for \@linechar.)

\@linelen Length of the line currently being built.
\hfil \newdimen\@linelen

(End definition for \@linelen.)

\@clnwd Height and width of current line segment.
\@clnht \hfil \newdimen\@clnwd
\hfil \newdimen\@clnht

(End definition for \@clnwd and \@clnht.)

\@dashdim \hfil \newdimen\@dashdim
\@dashbox \hfil \newbox\@dashbox
\@dashcnt \hfil \newcount\@dashcnt

(End definition for \@dashdim, \@dashbox, and \@dashcnt.)

Initialization: “\thinlines”
\let\@linefnt\tenln
\let\@circlefnt\tencirc
\@wholewidth\fontdimen8\tenln
\@halfwidth .5\@wholewidth

1.1 Curves

The new \qbezier command, based on the old \bezier defined in bezier.sty.

Historical \TeX \texttt{2.09} comments (not necessarily accurate any more):

\begin{verbatim}
\qbezier[N] == \bezier[N]

\bezier{N}(AX,AY)(BX,BY)(CX,CY) ==
BEGIN
  IF N = 0
    THEN \@xdim := |BX - AX|
    \@xb := |CX - BX|
    \@xa := Max(\@xa, \@xb)
    \@ya := |BY - AY|
    \@yb := |CY - BY|
    \@ya := Max(\@ya, \@yb)
    @sc := Max(\@xa, \@ya)
    %% The coefficient .5 below is the degree of overlap of
    %% successive points, where 1 is no overlap and 0 is
\end{verbatim}
%% complete overlap. A coefficient of C multiplies
%% the number of points plotted by 1/C.
\@xa := .5 * \@halfwidth
@sc := @sc / \@halfwidth
@sc := Max(@sc, qbeziermax)
ELSE @sc := N
@scp := @sc+1
\@xb := 2 * (BX - AX) * \unitlength
\@xa := ((CX-AX)*\unitlength - \@xb)/@sc
\@yb := 2 * (BY - AY) * \unitlength
@ya := ((CY-AY)*\unitlength - \@yb)/@sc
@pictdot := square rule of width \@wholewidth
\count@ := 0
WHILE \count@ < @scp
DO \@xdim := ((\count@*\@xa + \@xb) / @sc) * \count@
@ydim := ((\count@*\@ya + \@yb) / @sc) * \count@
plot pt with relative coords (\@xdim,\@ydim)
\count@ := \count@+1
OD

End of historical \LaTeX\ 2.09 comments.

\qbeziermax The maximum number of points to plot.
\def\qbeziermax{500}

(End definition for \qbeziermax.)

In the code below, to save registers \@a ... are not used. Instead other registers are
reused.
\newcounter{@sc} -> \c@multicnt
\newcounter{@scp} -> \@tempcnta
\newdimen\@xa -> \@ovxx
\newdimen\@xb -> \@ovdx
\newdimen\@ya -> \@ovyy
\newdimen\@yb -> \@ovdy
\newsavebox{\@pictdot} -> \@tempboxa

\qbezier Main user-level command to plot quadratic bezier curves. \#2 should be \.
\newcommand\qbezier[2][0]\{\bez#1\#2\}

(End definition for \qbezier.)

\bezier Form of \qbezier compatible with 2.09 \bez\texttt{.sty}, but modified to ignore spaces be-
tween its arguments. \#2 should be white space, and \#4 should be \.
\def\bezier#1\#2(#3)#4\{\bez#1\#2(#3)\}

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\@bezier

⟨2ekernel⟩
\latexrelease
(\latexrelease)\IncludeInRelease{2020/10/01}%
(\latexrelease)
\def\bezier(#2,#3)(#4,#5)(#6,#7){%
\ifnum #1=\z@
\defaultunitsset\@ovxx{#4}\unitlength
\defaultunitsset\@ovxx{-#2}\unitlength
\defaultunitsset\@ovdx{#6}\unitlength
\defaultunitsset\@ovdx{-#4}\unitlength
\defaultunitsset\@ovyy{#5}\unitlength
\defaultunitsset\@ovyy{-#3}\unitlength
\defaultunitsset\@ovdy{#7}\unitlength
\defaultunitsset\@ovdy{-#5}\unitlength
\ifdim \@ovyy<\@ovdy \@ovyy \@ovdy \fi
\nested\@ovxx\@ovyy\@ovdx\@ovdy
\kern\@ovxx\@ovyy\@ovdx\@ovdy
\defaultunitsset\@ovxx{-\@ovxx}
\defaultunitsset\@ovdx{-\@ovdx}
\defaultunitsset\@ovyy{-\@ovyy}
\defaultunitsset\@ovdy{-\@ovdy}
\multicnt
\ifdim \@ovxx<\@ovyy \@ovxx \else \@ovyy \fi
\@ovxx .5\@halfwidth \divide\@multicnt\@ovxx
\ifnum \@multicnt<\@ovxx \@ovxx \@ovxx \else \@ovyy \@ovyy \fi
\else \@multicnt\@ovxx\@ovyy\@ovdx\@ovdy
\defaultunitsset\@ovyy{#5}\unitlength
\defaultunitsset\@ovyy{-#3}\unitlength
\defaultunitsset\@ovdy{#7}\unitlength
\defaultunitsset\@ovdy{-#5}\unitlength
\defaultunitsset\@ovxx{#4}\unitlength
\defaultunitsset\@ovxx{-#2}\unitlength
\defaultunitsset\@ovdx{#6}\unitlength
\defaultunitsset\@ovdx{-#4}\unitlength
\advance\@ovxx\@ovdx \divide\@ovxx\@multicnt
\advance\@ovdx\@ovdy \divide\@ovdx\@multicnt
\advance\@ovyy\@ovdy \divide\@ovyy\@multicnt
\setbox\@tempboxa\hbox{%
\hskip -\@halfwidth
\vrule \@height\@halfwidth
\@depth \@halfwidth
\@width \@wholewidth}%
\put(#2,#3){%
\count@\z@
\whilenum\count@<\@tempcnta \do
\@ovxx \divide\@ovxx\@multicnt
\@ovdx \divide\@ovdx\@multicnt
\@ovdy \divide\@ovdy\@multicnt
\count@\z@
As the commands above all use “picture” interface we couldn’t define them with \DeclareRobustCommand so we do that now.

\end{document}
1 Theorem Environments

The user creates his own theorem-like environments with the command
\newtheorem{⟨name⟩}{⟨text⟩}[⟨counter⟩]
\newtheorem{⟨name⟩}{⟨oldname⟩}[⟨text⟩]
This defines the environment ⟨name⟩ to be just as one would expect a theorem environment to be, except that it prints ⟨text⟩ instead of “Theorem”.

If ⟨oldname⟩ is given, then environments ⟨name⟩ and ⟨oldname⟩ use the same counter, so using a ⟨name⟩ environment advances the number of the next ⟨name⟩ environment, and vice-versa.

If ⟨counter⟩ is given, then environment ⟨name⟩ is numbered within ⟨counter⟩.

E.g., if ⟨counter⟩ = subsection, then the first ⟨name⟩ in subsection 7.2 is numbered ⟨text⟩ 7.2.1.

The way ⟨name⟩ environments are numbered can be changed by redefining \the{⟨name⟩}.

Historical \LaTeX2.09 comments (not necessarily accurate any more):

\begin{verbatim}
 DOCUMENT STYLE PARAMETERS

\@thmcounter{COUNTER} : A command such that
    \edef\theCOUNTER{\@thmcounter{\@thmcounter{COUNTER}}} 
 defines \theCOUNTER to produce a number for a theorem environment. 
 The default is:
    BEGIN \noexpand\arabic{\@thmcounter{COUNTER}} END

\@thmcountersep : A separator placed between a theorem number and 
    the number of the counter within which it is numbered.
 E.g., to make the third theorem of section 7.2 be numbered 
    7.2-3, \@thmcountersep should be \def'ed to '-'. Its 
    default is '\'.

\@begintheorem{NAME}{NUMBER} : A command that begins a theorem 
    environment for a 'theorem' named 'NAME NUMBER' – 
    e.g., \@begintheorem{Lemma}{3.7} starts Lemma 3.7.

\@opargbegintheorem{NAME}{NUMBER}{OPARG} : 
 A command that begins a theorem 
    environment for a 'theorem' named 'NAME NUMBER' with optional 
    argument OPARG – e.g., \@begintheorem{Lemma}{3.7}{Jones} 
    starts 'Lemma 3.7 (Jones)':'

\@endtheorem : A command that ends a theorem environment.

\newtheorem{NAME}{TEXT}[COUNTER] ==
    BEGIN 
        if \NAME is definable
\end{verbatim}
\begin{comment}
then \texttt{\textbackslash definecounter}\{\texttt{NAME}\}
\begin{verbatim}
if \texttt{COUNTER} present
    then \texttt{\newctr}\{\texttt{NAME}\}\{\texttt{COUNTER}\} fi
    \texttt{\the\\texttt{NAME}\ \texttt{\= BEGIN}\ \texttt{\the\texttt{COUNTER}\ \texttt{\textbackslash thmcountersep}}
        eval\texttt{\textbackslash thmcounter}\{\texttt{NAME}\}\end{verbatim}
else \texttt{\the\texttt{NAME}\ \texttt{\= BEGIN} eval\texttt{\textbackslash thmcounter}\{\texttt{NAME}\}\texttt{END}}
\texttt{\texttt{\NAME\ \texttt{\= \textbackslash thm}\{\texttt{NAME}\}\{\texttt{TEXT}\}}}
\texttt{\endNAME\ \texttt{\= \textbackslash endtheorem}}
\end{verbatim}
else error
fi
\end{verbatim}
\end{verbatim}
\end{verbatim}
\end{verbatim}
\end{comment}

\newtheorem{\texttt{NAME}}{\texttt{OLDNAME}}{\texttt{TEXT}} ==
\begin{verbatim}
if counter \texttt{OLDNAME} nonexistent
    then ERROR
else
    if \texttt{\NAME} is definable
        then BEGIN
            \texttt{\the\NAME\ \texttt{\= \the\texttt{OLDNAME}}}
            \texttt{\NAME\ \texttt{\= \texttt{\textbackslash thm}\{\texttt{OLDNAME}\}\{\texttt{TEXT}\}}}
            \texttt{\endNAME\ \texttt{\= \textbackslash endtheorem}}
        END
    else error
fi
\end{verbatim}

\texttt{\textbackslash thm}\{\texttt{NAME}\}\{\texttt{TEXT}\} ==
\begin{verbatim}
\texttt{\textbackslash refstepcounter}\{\texttt{NAME}\}
if next char = [
    then \texttt{\ythm}\{\texttt{NAME}\}\{\texttt{TEXT}\}
    else \texttt{\xthm}\{\texttt{NAME}\}\{\texttt{TEXT}\}
fi
\end{verbatim}

\texttt{\xthm}\{\texttt{NAME}\}\{\texttt{TEXT}\} ==
\begin{verbatim}
\texttt{\textbackslash\textbackslash \textbackslash begintheorem}\{\texttt{\textbackslash \textbackslash \\texttt{TEXT}}\}\{\texttt{\textbackslash \textbackslash \texttt{\\NAME}}\}
\texttt{\textbackslash \textbackslash \textbackslash ignorespaces}
\end{verbatim}

\texttt{\ythm}\{\texttt{NAME}\}\{\texttt{TEXT}\}\{\texttt{OPARG}\} ==
\begin{verbatim}
\texttt{\textbackslash \textbackslash \textbackslash opargbegintheorem}\{\texttt{\textbackslash \textbackslash \\texttt{TEXT}}\}\{\texttt{\textbackslash \textbackslash \texttt{\\NAME}}\}\{\texttt{\\OPARG}\}
\texttt{\textbackslash \textbackslash \textbackslash ignorespaces}
\end{verbatim}

\end{verbatim}

\texttt{End of historical \texttt{\LaTeX} 2.09 comments.}
\newtheorem \newtheorem ought really be allowed only in the preamble Which would be good document style, and allow some main memory to be saved by declaring these commands to be \onlypreamble. Unfortunately the \LaTeX book indicates that \newtheorem may be used anywhere in the document...

\begin{verbatim}
\def\newtheorem#1{\
   \@ifnextchar[{{\@othm{#1}}}{\@nthm{#1}}}
\end{verbatim}

(End definition for \newtheorem.)

\begin{verbatim}
\def\@nthm#1#2{\
   \@ifnextchar[{{\@xnthm{#1}{#2}}}{\@ynthm{#1}{#2}}}
\end{verbatim}

(End definition for \@nthm.)

\begin{verbatim}
\def\@xnthm#1#2[#3]{\
   \expandafter\@ifdefinable\csname #1\endcsname #1\@endcsname
   {\@definecounter{#1}\@newctr{#1}[#3]\
    \expandafter\xdef\csname the#1\endcsname{\
    \@thmcountersep
    \@thmcounter{#1}}\
    \global\@namedef{#1}{\@thm{#1}{#2}}\
    \global\@namedef{end#1}{\@endtheorem}}}
\end{verbatim}

(End definition for \@xnthm.)

\begin{verbatim}
\def\@ynthm#1#2{\
   \expandafter\@ifdefinable\csname #1\endcsname #1\@endcsname
   {\@definecounter{#1}\
    \expandafter\xdef\csname the#1\endcsname{\@thmcounter{#1}}\
    \global\@namedef{#1}{\@thm{#1}{#2}}\
    \global\@namedef{end#1}{\@endtheorem}}}
\end{verbatim}

(End definition for \@ynthm.)

\begin{verbatim}
\def\@othm#1[#2][#3]{\
   \@ifundefined{c@#2}{\@nocounterr{#2}}{\@definecounter{#1}\@newctr{#1}[#3]\
    \expandafter\xdef\csname the#1\endcsname{\@thmcounter{#1}}\
    \global\@namedef{#1}{\@nameuse{the#2}}\
    \global\@namedef{#1}{\@thm{#2}{#3}}\
    \global\@namedef{end#1}{\@endtheorem}}}
\end{verbatim}

(End definition for \@othm.)

\begin{verbatim}
\def\@thm#1#2{|\n   \refstepcounter{#1}\
   \@ifnextchar[{{\@ythm{#1}{#2}}}{\@xthm{#1}{#2}}}
\end{verbatim}

(End definition for \@thm.)

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\def\@xthm#1#2{% \@begintheorem{#2}{\csname the#1\endcsname}\ignorespaces}  
\def\@ythm#1#2[#3]{% \@opargbegintheorem{#2}{\csname the#1\endcsname}{#3}\ignorespaces}  

(End definition for \@xthm and \@ythm.)

Default values

\def\@thmcounter#1{\noexpand\arabic{#1}}
\def\@thmcountersep{.}

(End definition for \@thmcounter and \@thmcountersep.)

Providing theorem defaults.

\def\@begintheorem#1#2{\trivlist \item{\hskip \labelsep{\bfseries #1\ #2}}\itshape}  
\def\@opargbegintheorem#1#2#3{\trivlist \item{\hskip \labelsep{\bfseries #1\ #2\ (#3)}}\itshape}  
\def\@endtheorem{\endtrivlist}  

(End definition for \@begintheorem, \@opargbegintheorem, and \@endtheorem.)
1 Sectioning Commands

This file defines the declarations such as \texttt{\author} which are used by \texttt{\maketitle}. \texttt{\maketitle} itself is defined by each class, not in the \TeX{} kernel.

The second part of the file defines the generic commands used for defining sectioning commands such as \texttt{\chapter}. Again the actual document level commands are defined in the class files, in terms of these commands.

\begin{verbatim}
\message{title,1}
\end{verbatim}

1.1 The Title

\begin{verbatim}
\title The user defines the title and author by the declarations \texttt{\title\{\texttt{name}\}}. \texttt{\author\{\texttt{name}\}}
\author Similarly the date is declared with \texttt{\date\{\texttt{date}\}}.
\date Inside these, the \texttt{\thanks\{\texttt{footnote text}\}} command may be used to make acknowledgements, notice of address, etc. in a footnote. If there are multiple authors, they have to be separated with the \texttt{\and} command.
\thanks And finally, the \texttt{\maketitle} command produces the actual title, using the information previously saved with the other commands.
\maketitle
\end{verbatim}

\begin{verbatim}
\DeclareRobustCommand\title[1]{\gdef\@title{#1}}
\author for use in \texttt{\maketitle}. If not given \texttt{\maketitle} will produce an error message.
\DeclareRobustCommand\author[1]{\gdef\@author{#1}}
\end{verbatim}

\begin{verbatim}
\maketitle
\end{verbatim}

\begin{verbatim}
\texttt{(End definition for \texttt{\title}.)}
\maketitle
\end{verbatim}

\begin{verbatim}
\Decla...\author[1]{\gdef\@author{#1}}
\texttt{(End definition for \texttt{\author}.)}
\end{verbatim}

\begin{verbatim}
\maketitle
\end{verbatim}

\begin{verbatim}
\Decla...\date[1]{\gdef\@date{#1}}
\texttt{(End definition for \texttt{\date}.)}
\end{verbatim}

\begin{verbatim}
\Thanks
\end{verbatim}

\begin{verbatim}
\Decla...\thanks[1]{\gdef\@thanks{\texttt{\footnotemark}}
\Thanks
\begin{verbatim}
\Decla...\thanks[1]{\gdef\@thanks{\texttt{\footnotemark}}
\Thanks
\end{verbatim}

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\begin{verbatim}
(End definition for \and.)

\@title
\def\@title{\latex@error{No \noexpand\title given}\@ehc}

(End definition for \@title.)

\@author
\def\@author{\latex@warning@no@line{No \noexpand\author given}}

(End definition for \@author.)

\gdef\@date{\today}

(End definition for \@date.)

\let\@thanks\@empty

(End definition for \@thanks.)

\message{sectioning,}

1.2 Sectioning

\if@noskipsec
\@noskipsectrue
Way back in 1991 (08/26) FMi & RmS set the \@noskipsec switch to true for the preamble and to false in \document. This was done to trap lists and related text in the preamble but it does not catch everything.
\fi
\@noskipsectrue

File O: \texttt{ltsect.dtx} Date: 2021/07/28 Version v1.1f
The \startsection{⟨name⟩}{⟨level⟩}{⟨indent⟩}{⟨beforeskip⟩}
{⟨afterskip⟩}{⟨style⟩}{⟨altheading⟩}{⟨heading⟩} command is the mother of all the user
level sectioning commands. The part after the *, including the * is optional.

name: e.g., 'subsection'

level: a number, denoting depth of section – e.g., chapter = 0, section = 1, etc.

indent: Indentation of heading from left margin

beforeskip: Absolute value = skip to leave above the heading. If negative, then para-
graph indent of text following heading is suppressed.

afterskip: If positive, then skip to leave below heading, else negative of skip to leave to
right of run-in heading.

style: Commands to set style. Since June 1996 release the last command in this argu-
ment may be a command such as \MakeUppercase or \fbox that takes an argument.
The section heading will be supplied as the argument to this command. So setting
#6 to, say, \bfseries\MakeUppercase would produce bold, uppercase headings.

If '/*' is missing, then increment the counter. If it is present, then there should be
no ⟨⟨altheading⟩⟩ argument. The command uses the counter 'secnumdepth'. It contains
a pointer to the highest section level that is to be numbered.

Warning: The \startsection command should be at the same or higher grouping
level as the text that follows it. For example, you should not do something like

\def\foo{ \begingroup ... 
  \paragraph{...}
  \endgroup}

Pseudocode for the \startsection command

Historical \TeX\ 2.09 comments (not necessarily accurate any more):

\startsection
{NAME}{LEVEL}{INDENT}{BEFORESKIP}{AFTERSKIP}{STYLE} ==
BEGIN
IF @noskipsec = T THEN \leavevmode FI
% true if previous section had no body.
\par
\@tempskipa := BEFORESKIP
@afterindent := T
IF \@tempskipa < 0 THEN \@tempskipa := -\@tempskipa
   @afterindent := F
FI
IF @nobreak = true
  THEN \everypar == null
ELSE \addpenalty(\@secpenalty)
   \addvspace(\@tempskipa)
FI
IF * next
THEN \@sect{INDENT}{BEFORESKIP}{AFTERSKIP}{STYLE}
ELSE \dblarg{@sect
{NAME}{LEVEL}{INDENT}
{BEFORESKIP}{AFTERSKIP}{STYLE}}
FI
END

End of historical \TeX\ 2.09 comments.
\def\@startsection#1#2#3#4#5#6{%
\if@noskipsec \leavevmode \fi
\par
\@tempskipa #4\relax
\@afterindenttrue
\ifdim \@tempskipa <\z@\fi
\if@nobreak
\everypar{}\
\else
\addpenalty\@secpenalty\addvspace\@tempskipa
\fi
\@ifstar{%\@ssect{#3}{#4}{#5}{#6}}{%\@dblarg{@sect{#1}{#2}{#3}{#4}{#5}{#6}}}}

(End definition for \@startsection.)

\@sect Pseudocode for the \@sect command Historical \TeX\ 2.09 comments (not necessarily accurate any more):
\@sect{NAME}{LEVEL}
{INDENT}{BEFORESKIP}{AFTERSKIP}
{STYLE}[ARG1][ARG2]
==
BEGIN
IF LEVEL > \c@secnumdepth
THEN \svsec :=L null
ELSE \refstepcOUNTER{NAME}
\svsec :=L BEGIN \seccntformat{#1}\relax END
FI
IF AFTERSKIP > 0
THEN \begingroup
STYLE
\hangfrom{\hskip INDENT\svsec}
\interlinepenalty 10000 ARG2\par
\endgroup
\NAMEmark{ARG1}
\addcontentsline{toc}{NAME}
{ IF LEVEL > \c@secnumdepth
ELSE \protect\numberline{\theNAME} FI
ARG1 }
ELSE \svsechd == BEGIN STYLE
\hskip INDENT\svsec
\def\sect#1#2#3#4#5#6[#7]#8{\%55\protect\edef\@svsec{\@seccntformat{#1}\relax}\%56\ifnum #2>\c@secnumdepth \%57\let\@svsec\@empty \%58\else \%59\refstepcounter{#1}\%60\begingroup \%61\csname #1mark\endcsname{#7}\%62\addcontentsline{toc}{#1}{\protect\numberline{\csname the#1\endcsname}#7}\%63\fi \%64\endgroup \%65\protect\edef\@svsechd{#6{\hskip #3\relax\@svsec #8}}\%66\csname #1mark\endcsname{#7}\%67\addcontentsline{toc}{#1}{#7}}\%68\fi \%69\@xsect{#5}}\%70
\def\@sect#1#2#3#4#5#6[#7]#8{\%71\ifnum #2>\c@secnumdepth \%72\protect\numberline{\csname the#1\endcsname}#7\%73\fi #7}
(End definition for \@sect.)

\@xsect Pseudocode for the \@xsect command Historical \TeX\ 2.09 comments (not necessarily accurate any more):
\@xsect{AFTERSKIP} ==
BEGIN
   IF AFTERSKIP > 0 THEN \par \nobreak \vskip AFTERSKIP \@afterheading
   ELSE @nobreak := G F 
       @noskipsec := G T 
   \everypar{ IF @noskipsec = T THEN @noskipsec := G F 
   \clubpenalty := 10000 \% local \hskip -\parindent \begingroup \@svsechd \endgroup \unskip \@tempskipa #1 \relax
   ELSE \clubpenalty := \@clubpenalty \% local \everypar := NULL
   FI
   }
   FI
END
End of historical \TeX\ 2.09 comments.

\def\@xsect#1{\@tempskipa #1 \relax
\ifdim \@tempskipa > \z@ \vskip \@tempskipa \@afterheading
\else
   \@nobreak\false
   \@noskipsec\true
   \everypar\%
   \if\@noskipsec
   \@noskipsec\false
   \setbox\z@ \lastbox
   \clubpenalty\@M
   \begingroup \@svsechd \endgroup
   \unskip \@tempskipa #1 \relax
   \else
   \@nobreakfalse
   \global\@noskipsecfalse
   \everypar\
   \if\@noskipsec
   \global\@noskipsectrue
   \else
   \@nobreakfalse
   \@tempskipa \#1 \relax

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\hskip -\@tempskipa
\else
\clubpenalty \@clubpenalty
\everypar{}%
\fi%
\fi
\ignorespaces}

(End definition for \xsect.)

\@seccntformat
This command formats the section number including the space following it.
\def\@seccntformat#1{\csname the#1\endcsname\quad}

(End definition for \@seccntformat.)

Pseudocode for the \sssect command
Historical \LaTeX2.09 comments (not necessarily accurate any more):
\sssect{INDENT}{BEFORESKIP}{AFTERSKIP}{STYLE}{ARG} ==
BEGIN
IF AFTERSKIP > 0
THEN \begingroup
STYLE
\@hangfrom{\hskip INDENT}
\{\interlinepenalty 10000 ARG\par
\endgroup
ELSE \@svsechd == BEGIN STYLE
\hskip INDENT ARG
END
FI
\xsect{AFTERSKIP}
END

End of historical \LaTeX2.09 comments.

Pseudocode for the \afterheading command
Historical \LaTeX2.09 comments (not necessarily accurate any more):
\afterheading ==
BEGIN
@nobreak :=G true
\everypar := BEGIN IF @nobreak = T
THEN @nobreak :=G false
\clubpenalty := 10000 % local
IF @afterindent = F
THEN remove \lastbox
FI
ELSE \clubpenalty := \@clubpenalty % local
\everypar := NULL
FI
END

End of historical \LaTeX2.09 comments.
\@ssect
\def\@ssect#1#2#3#4#5{% 
  \@tempskipa #3\relax 
  \ifdim \@tempskipa>\z@ 
    \begingroup 
      This \{ used to be after the argument to \@hangfrom but was moved here to allow commands such as \MakeUppercase to be used at the end of \#4. 
      \#4{% 
        \@hangfrom{\hskip #1}% 
        \interlinepenalty \@M \#5\@par}% 
      \endgroup 
    \else 
      \def\@svsechd{\#4{\hskip #1\relax \#5}}% 
    \fi 
  \@xsect{#3}}
\end{verbatim}

(End definition for \@ssect.)

\@afterindent \@afterindenttrue
\newif\if\afterindent \@afterindenttrue
(End definition for \if\afterindent and \@afterindenttrue.)

\@afterheading
\def\@afterheading{% 
  \@nobreaktrue 
  \everypar{% 
    \if\nobreak 
      \@nobreakfalse 
      \clubpenalty \@M 
      \if\@afterindent \else 
        \setbox\z@\lastbox
      \fi 
    \else 
      \clubpenalty \@clubpenalty 
      \everypar{\% 
      \fi} 
\end{verbatim}

(End definition for \@afterheading.)

\@hangfrom
\@hangfrom{⟨text⟩} : Puts ⟨text⟩ in a box, and makes a hanging indentation of the following material up to the first \par. Should be used in vertical mode.
\def\@hangfrom#1{%\setbox\@tempboxa\hbox{⟨#1⟩}% 
  \hangindent \wd\@tempboxa\noindent\box\@tempboxa}
\end{verbatim}

(End definition for \@hangfrom.)

\c@secnumdepth \c@tocdepth
\newc@secnumdepth 
\newc@tocdepth
(End definition for \c@secnumdepth and \c@tocdepth.)
\secdef\secdef{⟨unstarcmds⟩}{⟨unstarcmds⟩}{⟨starcmds⟩}

When defining a \chapter or \section command without using \@startsection, you can use \secdef as follows:

1. \def\chapter{... \secdef \langle starcmd \rangle \langle unstarcmd \rangle } 
2. \def\langle starcmd \rangle[#1]{...} % Command to define \chapter[#1]{...}
3. \def\langle unstarcmd \rangle{...} % Command to define \chapter*{...}

\def\secdef#1#2{\@ifstar{#2}{\@dblarg{#1}}}

(End definition for \secdef.)

1.2.1 Initializations
\sectionmark
\subsectionmark
\subsubsectionmark
\paragraphmark
\subparagraphmark

\let\sectionmark\@gobble
\let\subsectionmark\@gobble
\let\subsubsectionmark\@gobble
\let\paragraphmark\@gobble

(End definition for \sectionmark and others.)

\message{contents,}

1.3 Table of Contents etc.
1.3.1 Convention
\tf@⟨foo⟩ = file number for output for table foo. The file is opened only if @filesw = true.

1.3.2 Commands
A \l@⟨type⟩{⟨entry⟩}{⟨page⟩} Macro needs to defined by document style for making an entry of type ⟨type⟩ in a table of contents, etc. E.g., the document style should define \l@chapter, \l@section, etc.

Note: When the \protect command is used in the ⟨entry⟩ or ⟨text⟩ of one of the commands below, it causes the following control sequence to be written on the file without being expanded. The sequence will be expanded when the table of contents entry is processed.

Surprise: Inside an \addcontentsline or \addtocontents command argument, the commands: \index, \glossary, and \label are no-ops. This could cause a problem if the user puts an \index or \label into one of the commands he writes, or into the optional ‘short version’ argument of a \section or \caption command.

\@starttoc The \@starttoc{⟨ext⟩} command is used to define the commands: \tableofcontents, \listoffigures, etc.

For example: \@starttoc{lof} is used in \listoffigures. This command reads the .⟨ext⟩ file and sets up to write the new .⟨ext⟩ file.

Historical \LaTeX\ 2.09 comments (not necessarily accurate any more):
\@starttoc{EXT} ==
\begingroup
\makeatletter
read file \jobname.EXT
IF @filesw = true
THEN open \jobname.EXT as \tf@EXT
FI
@nobreak :=G FALSE  %% added 24 May 89
@endgroup
END

End of historical \LaTeX 2.09 comments.
\def \@starttoc #1 {%
\begingroup
\makeatletter
\@input {\jobname.#1} \if@filesw \expandafter \newwrite \csname tf@#1\endcsname \immediate \openout \csname tf@#1\endcsname \jobname.#1 \relax \fi \@nobreakfalse
\endgroup}
(End definition for \@starttoc.)
\addcontentsline The \addcontentsline{⟨table⟩}{⟨type⟩}{⟨entry⟩} command allows the user to add his/her own entry to a table of contents, etc. The command adds the entry \contentsline{⟨type⟩}{⟨entry⟩}{⟨page⟩}{} to the \table file.

This macro is implemented as an application of \addtocontents. Note that \thepage is not expandable during \protected@write therefore one gets the page number at the time of the \shipout.

\def \addcontentsline #1 #2 #3 {%
\addtocontents{#1}{\protect \contentsline {#2}{#3}{\thepage }{} \protected@file@percent}}

We add an empty brace pair at the end of \contentsline so that the number of argument is identical in documents with and without hyperref.

\addtocontents{#1}{\protect \contentsline {#2}{#3}{\thepage }{} \protected@file@percent}

We add \protected@file@percent at the end which is turned inside \@writefile into a percent character to mask the newline after the closing argument brace.
\addtocontents The \addtocontents{⟨table⟩}{⟨text⟩} command adds ⟨text⟩ to the .⟨table⟩ file, with no page number.

\protect The \protect{⟨command⟩} command causes command sequences to be written without expanding them.

\@dottedtocline The \@dottedtocline{⟨level⟩}{⟨indent⟩}{⟨numwidth⟩}{⟨title⟩}{⟨page⟩}: Macro to produce a table of contents line with the following parameters:
level If ⟨level⟩ > \c@tocdepth, then no line produced.

indent Total indentation from the left margin.

numwidth Width of box for number if the ⟨title⟩ has a \numberline command. As of 25 Jan 1988, this is also the amount of extra indentation added to second and later lines of a multiple line entry.

title Contents of entry.

page Page number.

Uses the following parameters, which must be set by the document style. They should be defined with \def's.

pnumwidth Width of box in which page number is set.

tocrmarg Right margin indentation for all but last line of multiple-line entries.

dotsep Separation between dots, in mu units. Should be \def'd to a number like 2 or 1.7

\@dottedtocline

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This command, if placed directly to the right (or left) of a word, will prevent protrusion of that word into the margin. It is used in the toc entry lines as they shouldn’t protrude. It is implemented as to kerns that cancel each other but being there hide the word so that protrusion is not added. Note that a zero kern or an empty box would not work as the protrusion mechanism will skip over those.

\nopromption

Note: \nopromotion’s added 7 Jan 86 to prevent bad line break that left the page number dangling by itself at left edge of a new line.

Changed 25 Jan 88 to use \leftskip instead of \hangindent so leaders of multiple-line contents entries would line up properly.

\numberline \numberline\{\textit{number}\}: For use in a \contentsline command. It puts \textit{number} flush-left in a box of width \texttt{\@tempdima} (Before 25 Jan 88 change, it also added \texttt{\@tempdima} to the hanging indentation.)
1 Floats

The different types of floats are identified by a \langle type\rangle name, which is the name of the counter for that kind of float. For example, figures are of type ‘figure’ and tables are of type ‘table’. Each \langle type\rangle has associated a positive \langle type number\rangle, which is a power of two. E.g., figures might be have type number 1, tables type number 2, programs type number 4, etc.

The locations where a float can go are specified by a \langle placement specifier\rangle, which is a list of the possible locations, each denoted by a letter as follows:

- h : here — at the current location in the text.
- t : top — at the top of a text page.
- b : bottom — at the bottom of a text page.
- p : page — on a separate float page

In addition, in conjunction with these, you can use ‘!’ which means that the current values of the float positioning parameters are ignored for this float. (Has no effect on ‘p’, float page positioning.) For example, ‘pht’ specifies that the float can appear in any of three locations: page, here or top.

1.1 Floating Environments

Historical \TeX{} 2.09 comments (not necessarily accurate any more):

Where floats may appear on a page, and how many may appear there are specified by the following float placement parameters. The numbers are named like counters so the user can set them with the ordinary counter-setting commands.

- \c@topnumber: Number of floats allowed at the top of a column.
- \topfraction: Fraction of column that can be devoted to floats.
- \c@dbltopnumber, \dbltopfraction: Same as above, but for double-column floats.
- \c@bottomnumber, \bottomfraction: Same as above for bottom of page.
- \c@totalnumber: Number of floats allowed in a single column, including in-text floats.
- \textfraction: Minimum fraction of column that must contain text.
- \floatpagefraction: Minimum fraction of page that must be taken up by float page.
- \dblfloatpagefraction: Same as above, for double-column floats.
The document style must define the following.

\fps@TYPE : The default placement specifier for floats of type TYPE.

\ftype@TYPE : The type number for floats of type TYPE.

\ext@TYPE : The file extension indicating the file on which the contents list for float type TYPE is stored.
   For example, \ext@figure = 'lof'.

\fnum@TYPE : A macro to generate the figure number for a caption.
   For example, \fnum@TYPE == Figure \thefigure.

\@makecaption{NUM}{TEXT} : A macro to make a caption, with NUM the value produced by \fnum@... and TEXT the text of the caption.
   It can assume it’s in a \parbox of the appropriate width.

\@float{TYPE}{PLACEMENT} : This macro begins a float environment for a single-column float of type TYPE with PLACEMENT as the placement specifier. The default value of PLACEMENT is defined by \fps@TYPE. The environment is ended by \end@float.
   E.g., \figure == \@float{figure}, \endfigure == \end@float.
In following definition, \par moved from after \addcontentsline to before \addcontentsline because the \write could cause an extra blank line to be added to the paragraph above the caption. (Change made 12 Jun 87)

\caption{TYPE}[STEXT]{TEXT} ==
BEGIN
\par
\addcontentsline{\ext@TYPE}{TYPE}{\numberline{\theTYPE}{STEXT}}
\begingroup
\@parboxrestore
\@normalsize
\@makecaption{\fnum@TYPE}{TEXT}
\par
\endgroup
END

\dblfloat{TYPE}[PLACEMENT] : Macro to begin a float environment for a double-column float of type TYPE with PLACEMENT as the placement specifier. The default value of PLACEMENT is ’tp’.
The environment is ended by \enddblfloat.
E.g., \figure* == \dblfloat{figure},
\endfigure* == \enddblfloat.

\dblfloat{TYPE}[PLACEMENT] ==
Identical to \float{TYPE}[PLACEMENT] except \hsize and \linewidth are set to \textwidth.

End of historical \LaTeX\ 2.09 comments.
\caption \This is set to be an error message outside a float since no captype is defined there; this may need to be changed by some classes.
\begin{verbatim}
def\caption{\iffalse\@captype\@undefined\@latexerror{\noexpand\caption outside float}\@ehd\else\refstepcounter{\@captype}\expandafter\@firstofone\fi{\@dblarg{\@caption\@captype}}}%\end{verbatim} (End definition for \caption.)
\end{verbatim}
\begin{verbatim}
\long\def\@caption#1[#2]#3{\par\addcontentsline{\csname ext@#1\endcsname}{#1}{\protect\numberline{\csname the#1\endcsname}{\ignorespaces #2}}\begingroup The paragraph setting parameters are normalised at this point, however $\@parboxrestore$ resets $\@everypar$ which is not correct in this context so $\@setminipage$ is called if needed.

The float mechanism, like minipage, sets the flag $\@minipage$ true before executing the user-supplied text. Many $\LaTeX$ constructs test for this flag and do not add vertical space when it is true. The intention is that this emulates $\TeX$’s ‘top of page’ behaviour. The flag must be set false at the start of the first paragraph. This is achieved by a redefinition of $\@everypar$, but the call to $\@parboxrestore$ removes that redefinition, so it is re-inserted if needed. If the flag is already false then the $\caption$ was not the first entry in the float, and so some other paragraph has already activated the special $\@everypar$. In this case no further action is needed.
\begingroup\@parboxrestore\if@minipage\@setminipage\fi\normalsize\@makecaption{\csname fnum@#1\endcsname}{\ignorespaces #3}\par\endgroup} (End definition for $\@caption$.)
\end{verbatim}
\begin{verbatim}
def\@float#1{\@ifnextchar[\@xfloat{#1}{\csname fps@#1\endcsname}}\reserved@a}}\reserved@a}\endgroup\end{verbatim} (End definition for $\@float$ and $\@dblfloat$.)
\begin{verbatim}
def\@dblfloat{\if@twocolumn\let\reserved@a\@dbflt\else\let\reserved@a\@float\fi\@makecaption{\csname fnum@#1\endcsname}{\ignorespaces #3}\par\endgroup\end{verbatim} (End definition for $\@dblfloat$.)
\fps@dbl  Note that all double floats have default fps ‘tp’.

\@setfps  This sets the fps, dealing with error conditions by adding the default.

\@xfloat  The first part of this sets the count register that stores all the information about the type and fps of the float.

We assume here that the default specifiers already contain no active characters.

It may be better to store the defaults as numbers, rather than symbol strings.

\def \@xfloat #1[#2]{% 
\@nodocument 
\def \@captype {#1}% 
\def \@fps {#2}% 
\@onelevel@sanitize \@fps 
\def \reserved@b {!}% 
\ifx \reserved@b \@fps 
\@fpsadddefault 
\else 
\ifx \@fps \@empty 
\@fpsadddefault 
\fi 
\fi 
\ifhmode 
\@bsphack 
\@floatpenalty -\@Mii 
\else 
\@floatpenalty-\@Miii 
\fi 
\ifinner 
\@parmoderr\@floatpenalty\z@ 
\else 
\@next\@currbox\@freelist 
\do 
\Start of changes, use a nested if structure, ending in an error. 
\do 
\if \reserved@a h% 
\ifodd \@tempcnta 
\else 
\advance \@tempcnta \@ne 
\fi 
\fi 
\fi
The remainder sets up the box in which the float is typeset, and the typesetting environment to be used. It is essential to have the extra box to avoid the unwanted space that would otherwise often be put at the top of the float.

It ends with a hook; not sure how useful this is but it is needed at present to deal with double-column floats.
\fi
\fi
\iffalse
\@bsphack
\else
\@floatpenalty -\@Mii
\else
\@floatpenalty -\@Miii
\fi
\ifinner
\@parmoderr \@floatpenalty \z@
\else
\@next \@currbox \@freelist
\fi
{\sixt@@n}
\expandafter \@tfor \expandafter \reserved@a :
\do
\if \reserved@a h%
\ifodd \@tempcnta
\else
\advance \@tempcnta \@ne
\fi
\fi
\if \reserved@a t%
\@setfpsbit \tw@
\fi
\if \reserved@a b%
\@setfpsbit 4%
\fi
\if \reserved@a p%
\@setfpsbit 8%
\fi
\if \reserved@a !%
\ifnum \@tempcnta>15
\advance \@tempcnta \sixt@@n
\fi
\fi
\global \csname ftype@ \@captype \endcsname
\multiply \@tempcntb \@xxxii
\global \count \@currbox \@tempcnta
{\@fltovf}
\global \setbox \@currbox \color@vbox \normalcolor
\vbox \bgroup
\hsize \columnwidth
\@parboxrestore
\@floatboxreset
\}\
\global \@tempcnta \sixt@@n
\expandafter \@for \expandafter \reserved@a \expandafter :\expandafter =\@fps \do
\if \reserved@a h%
\ifodd \@tempcnta
\else
\advance \@tempcnta \@ne
\fi
\fi
\if \reserved@a t%
\@setfpsbit \tw@
\fi
\if \reserved@a b%
\@setfpsbit 4%
\fi
\if \reserved@a p%
\@setfpsbit 8%
\fi
\if \reserved@a !%
\ifnum \@tempcnta>15
\advance \@tempcnta \sixt@@n
\fi
\fi
\global \csname ftype@ \@captype \endcsname
\multiply \@tempcntb \@xxxii
\global \count \@currbox \@tempcnta
{\@fltovf}
The rational for allowing these normally global flags to be set locally here, via \parboxrestore, was stated originally by Donald Arseneau and extended by Chris Rowley. It is because these flags are only set globally to true by section commands, and these should never appear within marginals or floats or, indeed, in any group; and they are only ever set globally to false when they are definitely true.

If anyone is unhappy with this argument then both flags should be treated as in \set@nobreak; otherwise this command will be redundant.

\def \@floatboxreset{\reset@font\normalsize\@setminipage}

(End definition for \@floatboxreset.)

\def \@setnobreak{\if@nobreak\let\outer@nobreak\@nobreaktrue\@nobreakfalse\fi}

(End definition for \@setnobreak.)

\def \@setminipage{\@minipagetrue\everypar{\@minipagefalse\everypar{}}}

(End definition for \@setminipage.)

\def\end@float{\@endfloatbox\ifnum\@floatpenalty <\z@}

We make sure that we never exceed \textwidth, otherwise float will never get typeset (01/03/15 FMi).

\def\largefloatcheck{\@cons@currlist\@currbox\ifnum\@floatpenalty <\@Mii\penalty -\@Miv}

Saving and restoring \prevdepth added 26 May 87 to prevent extra vertical space when used in vertical mode.
\penalty@floatpenalty
\else
\vadjust{\penalty -\@Miv \vbox{}\penalty@floatpenalty}\@Esphack
\fi
\fi
}

(End definition for \end@float.)

\end@dblfloat

\langle/2ekernel\rangle\IncludeInRelease{2015/01/01}{\end@dblfloat}{float order in 2-column}\%
\langle/latexrelease\rangle\If@twocolumn
\@endfloatbox
\ifnum\@floatpenalty <\z@\global\dp\@currbox1sp %
\@largefloatcheck
\prevdepth\global\prevdepth\@tempdima% What follows is essentially \end@float without a starting \@endfloatbox.
\ifnum\@floatpenalty <-\@Mii\penalty -\@Miv
\@tempdima\prevdepth\vbox{}%\prevdepth\@tempdima\penalty@floatpenalty
\else
\vadjust{\penalty -\@Miv \vbox{}\penalty@floatpenalty}\@Esphack
\fi
\fi
\else
\end@float
\fi
\}</2ekernel\rangle\If@twocolumn\langle/latexrelease\rangle\EndIncludeInRelease
\langle/latexrelease\rangle\EndIncludeInRelease{0000/00/00}{\end@dblfloat}{float order in 2-column}\%
\langle/latexrelease\rangle
\def\end@dblfloat{\langle/latexrelease\rangle\if@twocolumn\langle/latexrelease\rangle\@endfloatbox\langle/latexrelease\rangle\ifnum\@floatpenalty <\z@%
We make sure that we never exceed \textheight, otherwise float will never get typeset (91/03/15 FMi).
\langle/latexrelease\rangle\@largefloatcheck
\langle/latexrelease\rangle\@cons\@dbldeferlist\@currbox
\langle/latexrelease\rangle\if@twocolumn
\langle/latexrelease\rangle\@endfloatbox
\langle/latexrelease\rangle\ifnum\@floatpenalty <\z@

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\end{document}

This file is part of the \LaTeX{} package \texttt{ltfloat}. It is distributed under the GNU General Public License as published by the Free Software Foundation.

\begin{verbatim}
% This file is automatically generated by makeindex. Do not edit.
% Edit only ltfloat.dtx or ltfloat.ins
\end{verbatim}

\section{Installation}

\subsection{Installation Notes}

\subsection{Installation Procedure}

\subsection{Compilation}

\section{Usage}

\subsection{Usage Notes}

\subsection{Usage Procedure}

\section{Examples}

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\section{Appendix}

\subsection{Appendix Notes}

\subsection{Appendix Procedure}

\end{document}
\@floatplacement  An analysis of \@floatplacement:
This should be called whenever \@colht has been set.
\begin{verbatim}
def\floatplacement{\global\@topnum\c@topnumber
  % Textpage bit, global:
  \global\@toproom \topfraction\@colht
  \global\@bottomnum \c@bottomnumber
  \global\@bottomroom \bottomfraction\@colht
  \global\@colnum \c@totalnumber
  % Floatpage bit, local:
  \@fpmin \floatpagefraction\@colht}
\end{verbatim}
(End definition for \@floatplacement.)

\@dblfloatplacement  This should be called only within a group. Now changed to provide extra checks in \@addtodblcol, needed when processing a BANG float.
\begin{verbatim}
\def\dblfloatplacement{\global\@dbltopnum\c@dbltopnumber
  \global\@dbltoproom \dbltopfraction\@colht
  \@textmin \@colht
  \advance \@textmin -\@dbltoproom
  \@fpmin \@dblfloatpagefraction\texttheight
  \@fptop \@dblftop
  \@fpsep \@dblfpsep
  \@fpbot \@dblfpbot
  \f@depth is used in \@testwrongwidth to look for either column or dbl-column floats. A
  value of 1sp signals the latter. Because of this setting here, \@dblfloatplacement needs
  to be called inside a group which is a questionable design.
  \def\f@depth{1sp}}
\end{verbatim}

Textpage bit: global, but need not be.
\begin{verbatim}
\def\@dblfloatplacement{\global \@dbltopnum \c@dbltopnumber
  \global \@dbltoproom \dbltopfraction\@colht
  \@textmin \@colht
  \advance \@textmin -\@dbltoproom
  \@fpmin \@dblfloatpagefraction\texttheight
  \@fptop \@dblftop
  \@fpsep \@dblfpsep
  \@fpbot \@dblfpbot
\end{verbatim}

Floatpage bit: must be local.
\begin{verbatim}
\def\@fpmin \dblfloatpagefraction\texttheight
\@fptop \@dblftop
\@fpsep \@dblfpsep
\@fpbot \@dblfpbot
\end{verbatim}

When making two column float area, look for floats with 1sp depth.
\begin{verbatim}
\def\@dblfloatplacement{\global \@dbltopnum \c@dbltopnumber
  \global \@dbltoproom \dbltopfraction\@colht
  \@textmin \@colht
  \advance \@textmin -\@dbltoproom
  \@fpmin \@dblfloatpagefraction\texttheight
  \@fptop \@dblftop
  \@fpsep \@dblfpsep
  \@fpbot \@dblfpbot
\end{verbatim}
Historical \LaTeX\ comments (not necessarily accurate any more):

MARGINAL NOTES:

Marginal notes use the same mechanism as floats to communicate with the \texttt{output} routine. Marginal notes are distinguished from floats by having a negative placement specification. The command \texttt{\marginpar \{LTEXT\}} \texttt{\{RTEXT\}} generates a marginal note in a parbox, using LTEXT if it’s on the left and RTEXT if it’s on the right. (Default is RTEXT = LTEXT.) It uses the following parameters.

\marginparwidth : Width of marginal notes.
\marginparparsep : Distance between marginal note and text.
                  the page layout to determine how to move the marginal note into the margin. E.g., \texttt{\@leftmarginskip} == \texttt{\hskip \marginparwidth \hskip -\marginparsep}.
\marginparpush : Minimum vertical separation between \marginpar’s
Marginal notes are normally put on the outside of the page if \@mparswitch = true, and on the right if \@mparswitch = false. The command \texttt{\reversemarginpar} reverses the side where they are put. \texttt{\normalmarginpar} undoes \texttt{\reversemarginpar}. These commands have no effect for two-column output.

SURPRISE: if two marginal notes appear on the same line of text, then the second one could appear on the next page, in a funny position.

\marginpar \{LTEXT\}\{RTEXT\} ==
BEGIN
  if hmode then \@bsphack
    \@floatpenalty := -10002
  else \@floatpenalty := -10003
  fi
  if inner
    then \LaTeX\ Error: 'Not in outer paragraph mode.'
    \@floatpenalty := 0
  else if \@f freelist has two elements:
    then get \@marbox, \@currbox from \@f freelist
    \count\@marbox := G -1
  else \@floatpenalty := 0
    \LaTeX\ Error: 'Too many unprocessed floats';
    \@currbox, \@marbox := \@tempboxa \%use \def
  fi
  if optional argument
    then \% \@xmpar ==
      \@savemarbox\@marbox\{LTEXT\}
      \@savemarbox\@currbox\{RTEXT\}

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\def\marginpar{\
  \ifhmode
  \@bsphack
  \@floatpenalty -\@Mii
  \else
  \@floatpenalty-\@Miii
  \fi
  \ifinner
  \@parmoderr
  \@floatpenalty\z@
  \else
  \@next\@currbox\@freelist{}{}
  \@next\@marbox\@freelist{\global\count\@marbox\m@ne}%
  \@ifnextchar \[
    \@xmpar\@ympar}

(End definition for \marginpar.)

\@xmpar

\long\def\@xmpar[#1]#2{\
  \@savemarbox\@marbox{#1}\
  \@savemarbox\@currbox{#2}\
  \@xympar}

(End definition for \@xmpar.)

\@ympar

\long\def\@ympar#1{\
  \@savemarbox\@marbox{#1}\
  \@savemarbox\@currbox\@freelist\copy\@marbox\
  \@xympar}

(End definition for \@ympar.)
\@savemarbox
\long\def \@savemarbox #1#2{%}
\global\setbox #1
\color@vbox
\vtop{%}
\hsize\marginparwidth
\@parboxrestore
\@marginparreset
#2\par
\@minipagefalse
\@minipagefalse
\outer@nobreak
}%
\color@endbox
}
\EndIncludeInRelease
\IncludeInRelease{0000/00/00}{%}
\IncludeInRelease{2021/06/01}{%}

(The definition for \@savemarbox.)

\@marginparreset
The rational for allowing these normally global flags to be set locally here, via
\@parboxrestore was stated originally by Donald Arseneau and extended by Chris Row-
ley. It is because these flags are only set globally to true by section commands, and these
should never appear within marginals or floats or, indeed, in any group; and they are
only ever set globally to false when they are definitely true.

If anyone is unhappy with this argument then both flags should be treated as in
\set@nobreak; otherwise this command will be redundant.
\def \@marginparreset {%
\reset@font
\normalsize
%    \let\if@nobreak\iffalse
%    \let\if@noskipsec\iffalse

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% \setnobreak
\setminipage}
\end{definition}
\end{minipage}

(End definition for \marginparreset.)

\texttt{\textbackslash xympar}

Setting the box here is done only because the code uses \end@float; it will be empty and gets discarded.
\begin{verbatim}
def \xympar{\ifnum\@floatpenalty <\z@\@cons\@currlist\@marbox\fi
\setbox\@tempboxa\color@vbox\vbox\bgroup\end@float\@ignorefalse\@esphack}
\end{verbatim}
(End definition for \xympar.)

\texttt{\textbackslash reversemarginpar\textbackslash normalmarginpar}
\begin{verbatim}
def\reversemarginpar{\global\@mparbottom\z@ \@reversemargintrue}
def\normalmarginpar{\global\@mparbottom\z@ \@reversemarginfalse}
\end{verbatim}
(End definition for \reversemarginpar and \normalmarginpar.)

\message{footnotes,}

1.2 Footnotes

Historical \TeX\ 2.09 comments (not necessarily accurate any more):

\texttt{\footnote{NOTE}} : User command to insert a footnote.

\texttt{\footnote[NUM]{NOTE}}: User command to insert a footnote numbered NUM, where NUM is a number – 1, 2, etc. For example, if footnotes are numbered *, **, etc. within pages, then \footnote{2}{...} produces footnote ***. This command does not step the footnote counter.

\texttt{\footnotemark[NUM] : Command to produce just the footnote mark in the text, but no footnote. With no argument, it steps the footnote counter before generating the mark.

\texttt{\footnotetext[NUM]{TEXT}} : Command to produce the footnote but no mark. \footnote is equivalent to \footnotemark \footnotetext.

As in PLAIN, footnotes use \insert\footins, and the following parameters:
\footnotesize : Size-changing command for footnotes.
\footnoteseq : The height of a strut placed at the beginning of every footnote.
\skip\footins : Space between main text and footnotes. The rule separating footnotes from text occurs in this space. This space lies above the strut of height \footnoteseq which is at the beginning of the first footnote.
\footnoterule : Macro to draw the rule separating footnotes from text. It is executed right after a \vspace of \skip\footins. It should take zero vertical space–i.e., it should to a negative skip to compensate for any positive space it occupies. (See PLAIN.TEX.)

\interfootnotelinepenalty : Interline penalty for footnotes.
\thefootnote : In usual LaTeX style, produces the footnote number. If footnotes are to be numbered within pages, then the document style file must include an \@addtoreset command to cause the footnote counter to be reset when the page counter is stepped. This is not a good idea, though, because the counter will not always be reset in time to ensure that the first footnote on a page is footnote number one.

\@thefnmark : Holds the current footnote’s mark—e.g., \dag or ’1’ or ’a’.
\@mpfnnumber : A macro that generates the numbers for \footnote and \footnotemark commands. It == \thefootnote outside a minipage environment, but can be changed inside to generate numbers for \footnote’s.
\@makefnmark : A macro to generate the footnote marker from \@thefnmark The default definition was \hbox{$^\@thefnmark$}. This is now replaced by \textsuperscript{\@thefnmark}

\@makefntext{NOTE} : Must produce the actual footnote, using \@thefnmark as the mark of the footnote and NOTE as the text. It is called when effectively inside a \parbox, with \hsize = \columnwidth. For example, it might be as simple as $^\@thefnmark$ NOTE
In a minipage environment, \footnote and \footnotetext are redefined so that
(a) they use the counter mpfootnote
(b) the footnotes they produce go at the bottom of the minipage.
The switch is accomplished by letting \@mpfn == footnote or mpfootnote
and \thempfn == \thefootnote or \thempfootnote, and by redefining
\@footnotetext to be \@mpfootnotetext in the minipage.

\footnote{NOTE} ==
BEGIN
  \stepcounter{mpfootnote}
  begingroup\protect\noexpand\@thefnmark:=G eval(\thempfn)
  endgroup\@footnotemark\@footnotetext{NOTE}
END

\footnote[\#\#\#]{NOTE} ==
BEGIN
  begingroup\protect\noexpand\counter mpfootnote :=L \#\#\#\@thefnmark :=G eval(\thempfn)
  endgroup\@footnotemark\@footnotetext{NOTE}
END

\footnotemark ==
BEGIN\stepcounter{footnote}
  begingroup\protect\noexpand\@thefnmark:=G eval(\thefootnote)
  endgroup\@footnotemark
END

\footnotemark[\#\#\#] ==
BEGIN
  footnote counter :=L \#\#\#\protect\noexpand\@thefnmark :=G eval(\thefootnote)
  endgroup\@footnotemark
END

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\footnotemark ==
BEGIN
leavevmode
IF hmode THEN \@x@sf := \the\spacefactor FI
\@makefnmark % put number in main text
IF hmode THEN \spacefactor := \@x@sf FI
END

\footnotetext ==
BEGIN begingroup \protect == \noexpand
\@thefnmark := \G eval (\thempfn)
endgroup
\footnotetext
END

\footnotetext[NUM] ==
BEGIN begingroup counter \@mpfn := L NUM
\protect == \noexpand
\@thefnmark := \G eval (\thempfn)
endgroup
\footnotetext
END

End of historical \LaTeX 2.09 comments.

\footnote \LaTeX does use the same insert for footnotes as PLAIN.
\newinsert\footnotes \LaTeX leaves these initializations for the \footnotes insert.
\skip\footnotes=\bigskipamount % space added when footnote is present
\count\footnotes=1000 % footnote magnification factor (1 to 1)
\dimen\footins=8in % maximum footnotes per page
(End definition for \footnotes.)

\footnoterule \LaTeX keeps PLAIN \TeX’s \footnoterule as the default.
\def\footnoterule{\kern-3\p@} % the \hrule is .4pt high
(End definition for \footnoterule.)

\thefootnote
\definecounter{footnote}
\def\thefootnote{\@arabic\c@footnote}
(End definition for \thefootnote.)

\thempfootnote The default display for the footnote counter in minipages is to use italic letters. We use \itshape not \textit as the latter would add an italic correction.
\definecounter{mpfootnote}
\def\thempfootnote{{\itshape\@alph\c@mpfootnote}}
(End definition for \thempfootnote.)
\makefnmark Default definition.
\def\@makefnmark{\hbox{$^\@thefnmark$\m@th}}
\def\@makefnmark{\hbox{$\textsuperscript{\@thefnmark}$}}

(End definition for \makefnmark.)

\textsuperscript This command provides superscript characters in the current text font. It’s implementation might change!!!
\DeclareRobustCommand*{\textsuperscript}[1]{% 
  \@textsuperscript{\selectfont#1}}

(End definition for \textsuperscript.)

\@textsuperscript This command should not be used directly, but may be used to define other commands \textsuperscript, \makefnmark. \#1 should always start with a font selection command, to activate the font size switch.
⟨/2ekernel⟩
⟨∗2ekernel|latexrelease⟩
⟨latexrelease⟩\IncludeInRelease{2020/10/01}%%%%
⟨latexrelease⟩\def\@textsuperscript#1{%\m@th\ensuremath{^\mbox{\fontsize\sf@size\sf@size#1}}}\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}%%%%
⟨latexrelease⟩\def\@textsuperscript#1{%\m@th\ensuremath{^\mbox{\fontsize\sf@size\z@#1}}}\EndIncludeInRelease
⟨latexrelease⟩

(End definition for \@textsuperscript.)

\textsubscript
⟨/2ekernel⟩
⟨latexrelease⟩\IncludeInRelease{2015/01/01}%
⟨latexrelease⟩\DeclareRobustCommand*{\textsubscript}[1]{% 
  \@textsubscript{\selectfont#1}}%\EndIncludeInRelease
⟨latexrelease⟩\let\textsubscript\@undefined
⟨latexrelease⟩\EndIncludeInRelease
(End definition for \textsubscript.)
\textsubscript

\textsubscript

\footnotetext

\footnotemark

\footnotetext

\footnotetext

\footnotetext

\footnotetext

\footnotetext

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\footnotemark

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(End definition for \@footnotetext.)
\footref This command generates a footnote mark. The value is produced by referencing a \label placed into a \footnote elsewhere (can be one in the main galley or in a minipage).

We don't remove it when rolling back so that packages offered it in the past do not need to alter their behavior in a rollback situation.

(End definition for \footref.)
1 Index and Glossary Generation

Index and Glossary commands.

\makeindex A preamble command to turn on indexing.
\makeglossary A preamble command to turn on making glossary entries.
\index Make an index entry for \#1.
\glossary Make a glossary entry for \#1.

Historical \LaTeX\ 2.09 comments (not necessarily accurate any more):
\makeindex ==
BEGIN
\index == BEGIN \@bsphack
\begingroup
\protect{X} == \string X\space
%% added 3 Feb 87 for \index commands
%% in \footnotes
re-\texttt{catcode} special characters
to 'other'
\@wrindex
END

@@wrindex{ITEM} ==
BEGIN
  write of \{\indexentry{ITEM}{page number}\}
\endgroup
@@esphack
END

INITIALIZATION:

\index == BEGIN \@bsphack
\begingroup
  \texttt{re-\texttt{catcode}} special characters (in case '%'
  there)
@@index
END

@@index{ITEM} == BEGIN \endgroup \@esphack END

Changes made 14 Apr 89 to write \texttt{\glossaryentry}'s instead of
\texttt{\indexentry}'s on the .glo file.

End of historical \LaTeX\ 2.09 comments.

1 (∗2ekernel)
2 \message{index,}
\makeindex
\def\makeindex{%
   \newwrite\@indexfile
   \immediate\openout\@indexfile=\jobname.idx
   \def\index{\@bsphack\begingroup
   \@sanitize
   \@wrindex}
typeout{Writing index file \jobname.idx}\%
Opening the write channel should be done only once since on some OS multiple opens
are forbidden and in any case it is useless. So we turn this into a no-op after use.
\let\makeindex\@empty
\end{definition}\makeindex
\@wrindex
\def\@wrindex#1{%
   \protected@write\@indexfile{}\%
   \string\indexentry{#1}{\thepage}\%
   \endgroup
   \@esphack}
(End definition for \@wrindex.)
\index
\def\index{\@bsphack\begingroup \@sanitize\@index}
(End definition for \index.)
\@index
\def\@index#1\{\endgroup\@esphack}
(End definition for \@index.)
\makeglossary
\def\makeglossary{%
   \newwrite\@glossaryfile
   \immediate\openout\@glossaryfile=\jobname.glo
   \def\glossary{\@bsphack\begingroup
   \@sanitize
   \@wrglossary}
typeout{Writing glossary file \jobname.glo }\%
Opening the write channel should be done only once since on some OS multiple opens
are forbidden and in any case it is useless. So we turn this into a no-op after use.
\let\makeglossary\@empty
\end{definition}\makeglossary
(End definition for \makeglossary.)
\@wrglossary
\newcommand{\@wrglossary}{%}
\protected@write\@glossaryfile{%}
\string\glossaryentry{#1}{\thepage}%
\endgroup
\@esphack}

(End definition for \@wrglossary.)

\glossary
\newcommand{\glossary}{\@bsphack\begingroup\@sanitize\@index}

(End definition for \glossary.)

⟨/2ekernel⟩
1 Bibliography Generation

A bibliography is created by the `thebibliography` environment, which generates a title such as “References”, and a list of entries. The BIBTEX program will create a file containing such an environment, which will be read in by the `\bibliography` command. With BIBTEX, the following commands will be used:

- `\bibliography{⟨file1,file2, ...,filen⟩}`: specifies the bibdata files. Writes a `\bibdata` entry on the `.aux` file and tries to read in `mainfile.bbl`.
- `\bibliographystyle{⟨style⟩}`: Writes a `\bibstyle` entry on the `.aux` file.

The `thebibliography` environment is a list environment. To save the use of an `thebibliography` (env.) extra counter, it should use `enumiv` as the item counter. Instead of using `\item`, items in the bibliography are produced by the following commands:

- `\bibitem{⟨name⟩}`: Produces a numbered entry cited as `⟨name⟩`.
- `\bibitem[⟨label⟩]{⟨name⟩}`: Produces an entry labeled by `⟨Label⟩` and cited by `⟨name⟩`.

The former is used for bibliographies with citations like [1], [2], etc.; the latter is used for citations like [Knuth82].

The document class must define the `thebibliography` environment. This environment has a single argument, which is the widest bibliography label—e.g., if the [Knuth67] is the widest entry, then this argument will be Knuth67. The `\thebibliography` command must begin a list environment, which the `\endthebibliography` command ends.

Entries are cited by the command `\cite{⟨name⟩}`.

- `\nocite{⟨citations⟩}` puts information on the `.aux` file that causes BIBTEX to include the `{⟨citations⟩}` list in the bibliography, but puts nothing in the text.
- `\nocite{*}` is special: it tells BIBTEX to put the whole of a collection of references into the bibliography.

\cite{⟨2ekernel⟩}
\message{bibliography,}

Historical BIBTEX 2.09 comments (not necessarily accurate any more):

PARAMETERS

- `\cite`: A macro such that `\cite{LABEL1,LABEL2}{NOTE}` produces the output for a `\cite{NOTE}{FOO1,FOO2}` command, where entry FOOi is defined by `\bibitem{LABELi}{FOOi}`.

  The switch `@tempswa` is true if the optional NOTE argument is present.

  The default definition is:

  `\cite{LABELS}{NOTE} == BEGIN [LABELS
  IF @tempswa = T THEN , NOTE FI
  | ]
  END`

- `\biblabel`: A macro to produce the label in the bibliography entry. For `\bibitem{LABEL}{NAME}`, the label is
CONVENTION
\b@FOO: The name or number of the reference created by \cite{FOO}
E.g., if \cite{FOO} -> [17], then \b@FOO -> 17.

End of historical \TeX 2.09 comments.

\bibitem
3 \def\bibitem{\defnextchar{\@bibitem[@bibitem][@bibitem]}
(End definition for \bibitem.)

\@lbibitem
4 \def\@lbibitem[#1]#2{\item[\@biblabel{#1}\hfill]\if@filesw
5 {\let\protect\noexpand
6 \immediate\write\@auxout{\string\bibcite{#2}{#1}}}\fi\ignorespaces}
(End definition for \@lbibitem.)

\@bibitem
8 \def\@bibitem[#1]{\item[\if@filesw \immediate\write\@auxout
9 {\string\bibcite{#1}{\the\value{\@listctr}}}\fi\ignorespaces}
(End definition for \@bibitem.)

\bibcite
10 \def\bibcite{\@newl@bel b}
(End definition for \bibcite.)

\citation
31 \let\citation\@gobble
(End definition for \citation.)

\cite
12 ⟨/2ekernel⟩
13 ⟨/2ekernel|latexrelease⟩
14 ⟨latexrelease\IncludeInRelease{2022/06/01}{\cite}{check for blank}\%\DeclareRobustCommand\cite{%\@for\as \used in \@citere behavi-
16 o\empty argument to \cite did not
17 produce any warning for a missing citation. So we now inject a command before calling \@citere that does the checking for us. It is not done in \@citere directly, because that
18 command is altered by a number of packages/classes and this way is more likely that
19 the check survives.
20 \def\@citere@checkblank[#1]#2{\%\IfBlankTF {#2}\{\@citere[#1]\{\@space\}\%\}\{\@citere[#1][#2]\}\%
21 }\ ⟨/2ekernel|latexrelease⟩

File R: ltbibl.dtx Date: 2022/03/10 Version v1.1t 787
\@citex \penalty\m added to definition of \@citex to allow a line break after the ';' in citations like [Jones80,Smith77] (Added 23 Oct 86)
space added after the ',' (21 Nov 87)
\def\@citex[#1]#2{
\let\@citea\@empty
\@for\@citeb:=#2\do
{\@citea\def\@citea{,\penalty\m\ }%}
\edef\@citeb{\expandafter\@firstofone\@citeb\@empty}%
\if@filesw\immediate\write\@auxout{\string\citation{\@citeb}}\fi
Using \hbox instead of \mbox is fine because of the \leavevmode above. In fact the use of a box around the citation contents is more than questionable in my view (FMi), but within 2e I have to keep that for compatibility reasons as it would probably change too many existing documents. Its main reason is to avoid hyphenation of labels such as [FOOB89] into [FOO- B89] so in certain styles it makes sense; but, for example, in author year citations it becomes more than questionable.
So Chris added yet another hook here, as suggested by, at least, Donald Arseneau.
Note that this one is inside the first argument of the \@cite hook. This decouples the top-level typesetting of the citation from the details of the other business conducted here.
All this really needs a complete rethink to get the right modularity.
\bibdata
\bibstyle
\let\bibdata=\@gobble
\let\bibstyle=\@gobble
\bibliography
\def\bibliography#1{%
\if@filesw
\immediate\write\@auxout{\string\bibdata{\zap@space#1 \empty}}%
\fi
\@input\jobname.bbl}
This puts information on the .aux file that causes BibTeX to include the citation list in the bibliography, but puts nothing in the text.

RmS 93/08/06: Made loop for \nocite like that for \@citex, to get rid of leading spaces.

With the implementation designed already in \LaTeX\ 2.09 the \nocite command will not work before \begin{document} since it tries to write to the .aux file which is not open before that point. As a result the “reference” will appear on the terminal and nothing else will happen.

[This would be easy to fix, but then a document using the fix will silently fail on an older release of \LaTeX, missing all citations done with \nocite. Thus we do only generate an error message and leave the fix for a \LaTeX\ 2\epsilon successor.]

Given that we are now a quarter century into using \LaTeX\ 2\epsilon there is no good reason any more do limit ourself to 2.09 conciderations. So we now simply delay the \nocite if it is issued in the preamble.

Since we are after \begin{document} we can do the citations:

But before \begin{document} we raised an error message in the past but as of 2021/05 not any longer.

Instead we delay the declaration to the start of the document. We have to use a late hook for this, so that it comes after the .aux file is open for writing and after \preamble was executed to change the above test. Therefore \AtBeginDocument would still be too early.

File R: ltbibl.dtx Date: 2022/03/10 Version v1.1t
Since \nocite{*} should not produce a warning about undefined citation keys (see PR 557), we need to set the control sequence ‘b@*’ to something other than \relax. As a result \cite{*} will not warn either (but that never worked with \TeX in the first place).

\expandafter\let\csname b@*\endcsname\@empty

(End definition for \nocite.)

### 1.1 Default definitions

This hook determines the ‘relative formatting’ of the two logical parts of a citation with comment.

\cite

\let\cite\relax

(End definition for \cite.)

\cite@ofmt This is, in general, a command that appears to have one argument whose value is, in the kernel, a single cs whose name is the expansion of b@\citeb: the expansion of this cs will typically be some hmode material that produces the detailed typeset form of just the citations themselves.

\let\cite@ofmt\hbox

(End definition for \cite@ofmt.)

\biblabel

(End definition for \biblabel.)
Abstract

Marks are used to communicate information about the content of a page to the output routine. For example, in order to construct running headers, the output routine needs information about which section names are present on a page, and this information is passed to it through the mark system. However, marks may also be used for other purposes. This module provides a generalized mechanism for marks of independent classes.

1 Introduction

The \TeX{} engines offer a low-level mark mechanism to communicate information about the content of the current page to the asynchronous operating output routine. It works by placing $\texttt{\mark}$ commands into the source document. When the material for the current page is assembled in box 255, \TeX{} scans for such marks and sets the commands $\texttt{\topmark}$, $\texttt{\firstmark}$ and $\texttt{\botmark}$. The $\texttt{\firstmark}$ receives the content of the first $\texttt{\mark}$ seen in box 255 and $\texttt{\botmark}$ the content of the last mark seen. The $\texttt{\topmark}$ holds the content of the last mark seen on the previous page or more exactly the value of $\texttt{\botmark}$ from the previous page. If there are no marks on the current page then all three are made equal to the $\texttt{\botmark}$ from the previous page.

This mechanism works well for simple formats (such as plain \TeX{}) whose output routines are only called to generate pages. It fails, however, in \LaTeX{} (and other more complex formats), because here the output routine is sometimes called without producing a page, e.g., when encountering a float and placing it into one of the float regions. In that case the output routine is called, determines where to place the float, alters the goal for assembling text material (if the float was added to the top or bottom region) and then it resumes collecting textual material.

As a result the $\texttt{\botmark}$ gets updated and so $\texttt{\topmark}$ no longer reflects the situation at the top of the next page when that page is finally boxed.

Another problem for \LaTeX{} was that it wanted to use several “independent” marks and in the early implementations of \TeX{} there was only a single $\texttt{\mark}$ command available. For that reason \LaTeX{} implemented its own mark mechanism where the marks always contained two parts with their own interfaces: $\texttt{\markboth}$ and $\texttt{\markright}$ to set marks and $\texttt{\leftmark}$ and $\texttt{\rightmark}$ to retrieve them.

However, this extended mechanism (while supporting scenarios such as chapter/section marks) was far from general. The mark situation at the top of a page (i.e., $\texttt{\topmark}$) remained unusable and the two marks offered were not really independent of each other because $\texttt{\markboth}$ (as the name indicates) was always setting both.

The new mechanism overcomes both issues:

- It provides arbitrarily many, fully independent named marks, that can be allocated and, from that point onwards, used.
- It offers access for each such marks to retrieve its top, first, and bottom values separately.
- Furthermore, the mechanism is augmented to give access to marks in different “regions” which may not be just full pages.
2 Design-level and code-level interfaces

The interfaces are mainly meant for package developers, but they are usable (with appropriate care) also in the document preamble, for example, when setting up special running headers with \fancyhdr, etc. They are therefore available both as CamelCase commands as well as commands for use in the L3 programming layer. Both are described together below.

\NewMarkClass \mark_new_class:n
\InsertMark \mark_insert:nn

Declares a new \langle class \rangle of marks to be tracked by L\TeX. Each \langle class \rangle must be declared before it is used.

Mark classes can only be declared before \begin{document}.

\InsertMark \mark_insert:nn

Adds a mark to the current galley for the \langle class \rangle, containing the \langle text \rangle.

It has no effect in places in which you can’t place floats, e.g., a mark inside a box or inside a footnote never shows up anywhere.

If used in vertical mode it obeys L\TeX’s internal \@nobreak switch, i.e., it does not introduce a breakpoint if used after a heading. If used in horizontal mode it doesn’t handle spacing (like, for example, \index or \label does, so it should be attached to material that is typeset.

\AddToHook \langle insertmark \rangle

When marks are inserted, the mark content may need some special treatment, e.g., by default \label, \index, and \glossary do not expand at this time (but only later if and when the mark content is actually used. In order to allow packages to augment or alter this setup there is a public hook \insertmark that is executed at this point. It runs in a group so local modification to commands are only applied to the \langle text \rangle argument of \InsertMark or \mark_insert:nn.
\TopMark * \TopMark \{\langle region\rangle\} \{\langle class\rangle\}
\FirstMark * \FirstMark \{\langle region\rangle\} \{\langle class\rangle\}
\LastMark * \LastMark \{\langle region\rangle\} \{\langle class\rangle\}
\mark_use_top:nn * \mark_use_top:nn \{\langle region\rangle\} \{\langle class\rangle\}
\mark_use_first:nn * \mark_use_first:nn \{\langle region\rangle\} \{\langle class\rangle\}
\mark_use_last:nn * \mark_use_last:nn \{\langle region\rangle\} \{\langle class\rangle\}

These functions expand to the appropriate mark \langle text\rangle for the given \langle class\rangle in the specified \langle region\rangle. The default \langle region\rangle in the design-level commands is page. Note that with the L3 layer commands there are no optional arguments, i.e., both arguments have to be provided.

\TeXhackers note: The result is returned within the \texttt{\unexpanded} primitive (\texttt{\exp_not:n}), which means that the \langle text\rangle does not expand further when appearing in an x-type or e-type argument expansion.

The “first” and “last” marks are those seen first and last in the current region/page, respectively. The “top” mark is the last mark of the \langle class\rangle seen in an earlier region, i.e., the \langle text\rangle what would be “current” at the very top of the region.

The commands are only meaningful inside the output routine, in other places their result is (while not random) unpredictable due to the way \LaTeX\ cuts text material into pages.

Currently, \langle region\rangle is one of page, previous-page, column, and previous-column. If a page has just been finished then the region \texttt{page} refers to the current page and \texttt{previous-page}, as the name indicates, to the page that has been finished previously. This means you are able to access mark information for the current page as well as for the page before if you are inside the output routine, without the need to explicitly save that information beforehand.

In single column documents the \texttt{column} is the same as the \texttt{page} region, but in two-column documents, \texttt{column} refers to the current column that just got finished and previous-column to the one previously finished. Code for running headers are (in standard \LaTeX) only evaluated when both columns are assembled, which is another way of saying that in that case \texttt{previous-column} refers to the left column and \texttt{column} to the right column. However, to make this a bit nicer to access, there are also alias regions named \texttt{first-column} and \texttt{last-column}\textsuperscript{32} to access these regions.\textsuperscript{33}

Note that you can only look backwards at already processed regions, e.g., in a twoside document finishing a recto (odd, right-hand) page you can access the data from the facing verso (left-hand) page, but if you are finishing a left-hand page you can’t integrate data from the upcoming right-hand page. If such a scenario needs to be realized then it is necessary to save the left-hand page temporarily instead of finalizing it, process material for the right-hand page and once both are ready, attach running headers and footers and shipout out both in one go.\textsuperscript{34}

\textsuperscript{32}This is called “last” not “second” in anticipation of extending the mechanism to multiple columns, where first and last would still make sense.

\textsuperscript{33}At the moment there aren’t any \texttt{previous-\ldots-column} regions to access the columns from the previous page. If necessary, the mechanism could be easily augmented to cover them too, though.

\textsuperscript{34}As of now that scenario is not yet officially supported.
These conditionals allow you to compare the content of two marks and act based on the result. The commands work in an expansion context, if necessary.

It is quite common when programming with marks to need to interrogate conditions such as whether marks have appeared on a previous page, or if there are multiple marks present on the current page, and so on. The tests above allow for the construction of a variety of typical test scenarios, with three examples presented below.

The first two conditionals cover only the common scenarios. Both marks are picked up from the same ⟨region⟩ (by default page) and they have to be of the same ⟨class⟩.

The ⟨pos⟩ argument can be either top, first, or last.

If you wish to compare marks across different regions or across different classes, you have to do it using the generic test only available in the L3 programming layer or do it manually, i.e., get the marks and then compare the values yourself.

However, the basic version is enough for the following typical use cases:

**Test for at most one mark of class myclass on current page:** If the first and last mark in a region are the same then either there was no mark at all, or there was at most one. To test this on the current page:

\%NewMarkClass{myclass}
\IfMarksEqualTF{myclass}{first}{last}
{ <zero or one mark> }{ <two or more marks> }

**Test for no mark of class myclass in the previous page:** If the top mark is the same as the first mark, there is no mark in the region at all. If we wanted to do this test for the previous page:

\%IfMarksEqualTF[previous-page]{myclass}{top}{first}
{ <no marks> }{ <at least one mark> }

Comparing top and last would give you the same result.

**Test for zero, one, or more than one:** Combining the two tests from above you can test for zero, one or more than one mark.

\%IfMarksEqualTF{myclass}{top}{first}
{ <no marks> }
\%IfMarksEqualTF{myclass}{first}{last}
{ <exactly one mark> }{ <more than one mark> }

If you need one of such tests more often (or if you want a separate command for it for readability), then consider defining:

\%providecommand\IfNoMarkTF[2]{\IfMarksEqualTF[#1]{#2}{first}{last}}

\footnote{If an undeclared mark class is used the tests return true (not an error).}

\footnote{If two undeclared mark classes are compared the result is always true; if a declared and an undeclared mark class is used it is always false.}
2.1 Debugging mark code

\DebugMarksOn \DebugMarksOff
\mark_debug_on:
\mark_debug_off:

Commands to turn the debugging of mark code on or off. The debugging output is rather coarse and not really intended for normal use at this point in time.

3 Application examples

If you want to figure out if a break was taken at a specific point, e.g., whether a heading appears at the top of the page, you can do something like this:

\newcounter{breakcounter}
\NewMarkClass{break}
\newcommand\markedbreak[1]{\stepcounter{breakcounter}\
\InsertMark{break}{\arabic{breakcounter}\
\penalty #1\relax
\InsertMark{break}{-\arabic{breakcounter}}}\

To test if the break was taken you can test if \TopMark{break} is positive (taken) or negative (not taken) or zero (there was never any marked break so far). The absolute value can be used to keep track of which break it was (with some further coding).

*to be extended with additional application examples*

4 Legacy \LaTeX\ 2ε interface

Here we describe the interfaces that \LaTeX\ 2ε offered since the early nineties and some minor extensions.

4.1 Legacy design-level and document-level interfaces

\markboth\markright\markboth\markright
\markboth\markright\markboth\markright

\LaTeX\ 2ε uses two marks which aren’t fully independent. A “left” mark generated by the first argument of \markboth and a “right” mark generated by the second argument of \markboth or by the only argument of \markright. The command \markboth and \markright are in turn called from heading commands such as \chaptermark or \sectionmark and their behavior is controlled by the document class.

For example, in the \article class with \twoside in force the \sectionmark will issue \markboth with an empty second argument and \subsectionmark will issue \markright. As a result the left mark will contain chapter titles and the right mark subsection titles.

Note, however, that in one-sided documents the standard behavior is that only \markright is used, i.e., there will only be right-marks but no left marks!
These functions return the appropriate mark value from the current page and work as before, that is \texttt{\leftmark} will get the last (!) left mark from the page and \texttt{\rightmark} the first (!) right mark.

In other words they work reasonably well if you want to show the section title that is current when you are about to turn the page and also show the first subsection title on the current page (or the last from the previous page if there wasn’t one). Other combinations can’t be shown using this interface.

The commands are fully expandable, because this is how they have been always defined in \LaTeX. However, this is of course only true if the content of the mark they return is itself expandable and does not contain any fragile material. Given that this can’t be guaranteed for arbitrary content, a programmer using them in this way should use \texttt{\protected@edef} and not \texttt{\edef} to avoid bad surprises as far as this is possible, or use the new interfaces (\texttt{\TopMark}, \texttt{\FirstMark}, and \texttt{\LastMark}) which return the \langle text \rangle in \texttt{\exp_not:n} to prevent uncontrolled expansion.

4.2 Legacy interface extensions

The new implementation adds three mark classes: \texttt{2e-left}, \texttt{2e-right} and \texttt{2e-right-nonempty} and patches \texttt{\markboth} and \texttt{\markright} slightly so that they also update these new mark classes, so that the new classes work with existing document classes.

As a result you can use \texttt{\LastMark{2e-left}} and \texttt{\FirstMark{2e-right}} instead of \texttt{\leftmark} and \texttt{\rightmark}. But more importantly, you can use any of the other retrieval commands to get a different status value from those marks, e.g., \texttt{\LastMark{2e-right}} would return the last subsection on the page (instead of the first as returned by \texttt{\rightmark}).

The difference between \texttt{2e-right} and \texttt{2e-right-nonempty} is that the latter will only be updated if the material for the mark is not empty. Thus \texttt{\markboth{title}{} as issued by, say, \texttt{\sectionmark}, sets a \texttt{2e-left} mark with \texttt{title} and a \texttt{2e-right} mark with the empty string but does not add a \texttt{2e-right-nonempty} mark.

Thus, if you have a section at the start of a page and you would ask for \texttt{\FirstMark{2e-right}} you would get an empty string even if there are subsections on that page. But \texttt{2e-right-nonempty} would then give you the first or last subsection on that page. Of course, nothing is simple. If there are no subsections it would tell you the last subsection from an earlier page. We therefore need comparison tools, e.g., if top and first are identical you know that the value is bogus, i.e., a suitable implementation would be

\begin{verbatim}
\IfMarksEqualTF{2e-right-nonempty}{top}{first}
  { <appropriate action if there was no real mark> }
  {\FirstMark{2e-right-nonempty}}
\end{verbatim}

5 Notes on the mechanism

In contrast to vanilla \TeX, \texttt{\LATEX} extends the mark system to allow multiple independent marks. However, it does not solve the \texttt{\topmark} problem which means that \texttt{\LATEX} still needs to manage marks almost independently of \TeX. The reason for this is that the more complex output routine used by \texttt{\LATEX} to handle floats (and related structures)
means that \texttt{\textbackslash topmark(s)} remain unreliable. Each time the output routine is fired up, \TeX moves \texttt{\textbackslash botmark} to \texttt{\textbackslash topmark}, and while \varepsilon-\TeX extends this to multiple registers the fundamental concept remains the same. That means that the state of marks needs to be tracked by \LaTeX itself. An early implementation of this package used \LaTeX's \texttt{\textbackslash botmark} only to ensure the correct interaction with the output routine (this was before the \varepsilon-\TeX mechanism was even available). However, other than in a prototype implementation for \LaTeX3, this package was never made public.

The new implementation now uses \varepsilon-\TeX’s marks as they have some advantages, because with them we can leave the mark text within the galley and only extract the marks during the output routine when we are finally shipping out a page or storing away a column for use in the next page. That means we do not have to maintain a global data structure that we have to keep in sync with informational marks in the galley but can rely on everything being in one place and thus manipulations (e.g. reordering of material) will take the marks with them without a need for updating a fragile linkage.

To allow for completely independent marks we use the following procedure:

- For every type of marks we allocate a mark class so that in the output routine \TeX can calculate for each class the current top, first, and bottom mark independently. For this we use \texttt{\textbackslash newmarks}, i.e., one marks register per class.

- As already mentioned firing up an output routine without shipping out a page means that \TeX’s top marks get wrong so it is impossible to rely on \TeX’s approach directly. What we do instead is to keep track of the real marks (for the last page or more generally last region) in some global variables.

- These variables are updated in the output routine at defined places, i.e., when we do real output processing but not if we use special output routines to do internal housekeeping.

- The trick we use to get correctly updated variables is the following: the material that contains new marks (for example the page to be shipped out) is stored in a box. We then use \TeX primitive box splitting functions by splitting off the largest amount possible (which should be the whole box if nothing goes really wrong). While that seems a rather pointless thing to do, it has one important side effect: \TeX sets up first and bottom marks for each mark class from the material it has split off. This way we get the first and last marks (if there have been any) from the material in the box.

- The top marks are simply the last marks from the previous page or region. And if there hasn’t been a first or bottom mark in the box then the new top mark also becomes new first and last mark for that class.

- That mark data is then stored in global token lists for use during the output routine and legacy commands such as \texttt{\textbackslash leftmark} or new commands such as \texttt{\textbackslash TopMark} simply access the data stored in these token lists.

That’s about it in a nutshell. Of course, there are some details to be taken care of—those are discussed in the implementation sections.
6 Internal output routine functions

The functions in this section are tied to the output routine and used in the interface to \LaTeX{} and perhaps at some later time within a new output routine for \LaTeXX{}. They are not meant for general use and are therefore made internal. Internal means that \@ automatically gets replaced in the code (and in the documentation) so we have to give it a suitable value.

\begin{verbatim}
\__mark_update_singlecol_structures: \__mark_update_singlecol_structures:

\LaTeX{} integration function in case we are doing single column layouts. It assumes that the page content is already stored in \@outputbox{} and processes the marks inside that box. It is called as part of \@opcol{}.

\__mark_update_dblcol_structures: \__mark_update_dblcol_structures:

\LaTeX{} integration function mark used when we are doing double column documents. It assumes that the page content is already stored in \@outputbox{} and processes the marks inside that box. It then does different post-processing depending on the start of the switch \if@firstcolumn. If we are in the second column it also has to update page marks, otherwise it only updates column marks. It too is called as part of \@opcol{}.

\__mark_update_structure:nn \__mark_update_structure:nn \{(region)\} \{(material with marks)\}

Helper function that inspects the marks inside the second argument and assigns new mark values based on that to the \(\text{(region)}\) given in the first argument. For this it first copies the mark structure from \(\text{(region)}\) to \text{previous-\(\text{(region)}\)} and then takes all last mark values currently in the region and makes them the new top mark values. Finally it assigns new first and last values for all mark classes based on what was found in the second argument.

As a consequence, the allowed values for \(\text{(region)}\) are page and column because only they have \text{previous-...} counterparts.

Another important part to keep in mind is that marks are only recognized if they appear on top-level, e.g., if we want to process material stored in boxes we need to put it unboxed (using \unvcopy{} etc.) into the second argument.

\__mark_update_structure_alias:nn \__mark_update_structure_alias:nn \{(alias)\} \{(source)\}

Helper function that copies all mark values in the \(\text{(source)}\) region to \(\text{(alias)}\), i.e., make the structures identical. Used to update the \text{previous-...} structures inside \__mark_update_structure:nn and \text{first-column} and \text{last-column} structures inside \__mark_update_singlecol_structures: or \__mark_update_dblcol_structures:.

\__mark_update_structure_to_err:n \__mark_update_structure_to_err:n \{(region)\}

Helper function that sets all mark values in the \(\text{(region)}\) to an error message. This is currently used for \text{last-column} at times where using marks from it would be questionable/wrong, i.e., when we have just processed the first column in a two-column document.

File S: ltmarks.dtx 798
7 The Implementation

\ExplSyntaxOn
\NewModuleRelease{2022/06/01}{ltmarks}

7.1 Allocating new mark classes

A list holding all the mark classes that have been declared.
\seq_new:N \g__mark_classes_seq

A mark class is created by initializing a number of data structures. First, we get a register number to refer to the mark class. The new mark class is then added to the \g__mark_classes_seq sequence to be able to easily loop over all classes. Finally a number of top-level global token lists are declared that hold various versions of the mark for access.
\cs_new_protected:Npn \mark_new_class:n #1
\seq_if_in:NnTF \g__mark_classes_seq {#1}
\msg_error:nnn { mark } { class-already-defined }
\__mark_new_class:nn {#1}
\endcs_new_protected

This is only available in the preamble.
@onlypreamble \mark_new_class:n

The internal command carries out the necessary allocations.
\cs_new_protected:Npn \__mark_new_class:nn #1
\__mark_debug:n { \iow_term:x { Marks:new-mark:#1-\msg_line_context: } }
\endcs_new_protected

Use the \LTEx2ε interface for now as the L3 programming layer doesn’t have one for marks yet.
\exp_args:Nc \newmarks {c__mark_class_ #1 _mark}

Remember the new class in the sequence.
\seq_gput_right:Nn \g__mark_classes_seq {#1}

We need three token lists for each region, one for top, first, and last.
\tl_new:c { g__mark_page_top_ #1 _tl }
\tl_new:c { g__mark_page_first_ #1 _tl }
\tl_new:c { g__mark_page_last_ #1 _tl }

For the page region we also keep track of the previous-page.
\tl_new:c { g__mark_previous-page_top_ #1 _tl }
\tl_new:c { g__mark_previous-page_first_ #1 _tl }
\tl_new:c { g__mark_previous-page_last_ #1 _tl }

File S: ltmarks.dtx
Same game for column and previous-column

\tl_new:c \{ g__mark_column_top_ \#1 _tl \}
\tl_new:c \{ g__mark_column_first_ \#1 _tl \}
\tl_new:c \{ g__mark_column_last_ \#1 _tl \}
\tl_new:c \{ g__mark_previous-column_top_ \#1 _tl \}
\tl_new:c \{ g__mark_previous-column_first_ \#1 _tl \}
\tl_new:c \{ g__mark_previous-column_last_ \#1 _tl \}

But for columns we also allocate token lists for the alias regions first-column and last-column.

\tl_new:c \{ g__mark_first-column_top_ \#1 _tl \}
\tl_new:c \{ g__mark_first-column_first_ \#1 _tl \}
\tl_new:c \{ g__mark_first-column_last_ \#1 _tl \}
\tl_new:c \{ g__mark_last-column_top_ \#1 _tl \}
\tl_new:c \{ g__mark_last-column_first_ \#1 _tl \}
\tl_new:c \{ g__mark_last-column_last_ \#1 _tl \}

(End definition for \mark_new_class:n and \_mark_new_class:nn. This function is documented on page 792.)

7.2 Updating mark structures

For some operations we need a temporary private box and two private global token lists.

\box_new:N \l__mark_box
\tl_new:N \g__mark_tmp_tl
\tl_new:N \g__mark_new_top_tl

(End definition for \l__mark_box, \g__mark_tmp_tl, and \g__mark_new_top_tl.)

\__mark_update_structure:nn

This function updates the mark structures. The first argument is the region to update and second argument receives the material that holds the marks. Out of this material we extract the first and last marks for all classes (if there are any) to do the assignments.

\cs_new_protected:Npn \__mark_update_structure:nn #1#2
\{ First thing we do is copying the current structure to previous-...; this leaves the current structure untouched so we can update it class by class (which is necessary).
\__mark_update_structure_alias:nn \{ previous-#1 \} \#1

Getting the first and last marks out of the material in #2 is done by putting the material in a box and then doing a split operation to the maximum size possible (which hopefully means all of the content). Because this is an action only for the sake of getting at the mark values we don’t want any underfull box warnings so we turn those (locally) off.

\group_begin:
\dim_set_eq:NN \tex_splitmaxdepth:D \c_max_dim
\int_set_eq:NN \tex_vbadness:D \c_max_int
\dim_set_eq:NN \tex_vfuzz:D \c_max_dim
\group_end:

\footnote{We could verify this, maybe we should.}
There is a further complication: if the region contains infinite shrinking glue then a `\vsplit` operation will balk with a low-level error. Now pages or columns, which are our main concern here, can’t have such infinite shrinkage if they are cut straight from the galley, however the use of `enlargethispage` actually does add some at the very bottom (and also wraps the whole page into a box by itself, so if we leave it this way then a) we get this error and b) we don’t see any marks because they are hidden one level down).

Another possible issue are packages or user code that place stray `\vbox`es directly into the main galley (an example is `marginnote` that attaches its marginals in this way). If such boxes end up as the last item on the page we should not unpack them.

We therefore do an `\unskip` to get rid of that glue if present and also check if we have then a `\vbox` as the last item and if so unpack that too, but only under certain conditions, see below. All this is temporary, just for getting the marks out, so it doesn’t affect the final page production.

In fact, we go one step further and set the box to a large negative height possible and afterwards take a look at the reported badness: if it is zero we know that there has still been infinite shrinkage in the box so that we can’t do a `\vsplit`. If that is the case we generate an error message and bypass extracting the marks. We use only half of `c_max_dim` because otherwise T\TeX will report an overfull vbox despite our setting of `\tex_vfuzz:D`. This test will not find existing infinite shrinkage in all cases, e.g., if there are several glues that cancel each other, but it is the best we can do.

```latex
\vbox_set_to_ht:Nnn \l__mark_box { -.5\c_max_dim } \\
{ \#2
  \tex_unskip:D
  \box_set_to_last:N \l__mark_box
}
```

After having removed the last box from the current list (if there was one) we check if the list is now empty. If not, the the last box is definitely not the one from `enlargethispage` and so we can and should leave it alone. Otherwise we check if this last box is a `\vbox`.

```latex
\int_compare:nNnT \tex_lastnodetype:D < 0 \\
{ \box_if_vertical:NT \l__mark_box
  \vbox_set_to_ht:Nnn \l__mark_box { -.5\c_max_dim } \\
  { \vbox_unpack:N \l__mark_box \\
    \tex_kern:D \c_zero_dim % ensure that box
    % is not empty
  }
}
```

If it is we do a further test and reset the `\l__mark_box` to check if it contains infinitely shrinkable glue.

```latex
\int_compare:nNnT \tex_badness:D > 0 \\
{ \vbox_unpack:N \l__mark_box }
```

If not, then we unpack it, if yes we still ignore it for the process of mark extraction. We do not generate an error though, because in all likelihood this is an ordinary box like a marginal that does contain something like `\vss`.

```latex
\int_compare:nNnT \tex_badness:D > 0 \\
{ \vbox_unpack:N \l__mark_box }
```

If it wasn’t a vbox, it was either an hbox or there was no box. Given that we are only interested in the marks we don’t need put it back in that case. However, we have to
make sure that the outer box under construction is not totally empty (which it might have been from the start, or now), because \TeX{} does not report a badness for empty boxes and that means our test would incorrectly conclude that we have infinite shrinking glue. A simple $\backslash\text{kern}$ is enough to avoid this (the same was already done above).

\begin{verbatim}
  \tex_kern:D \c_zero_dim
  \int_compare:nNnTF \tex_badness:D > 0
\end{verbatim}

If the box had no infinite shrinkage (or rather if our test didn’t show any) we vsplit it. Note that it doesn’t matter that we set it to this strange size first. If there was infinite shrinkage after all, we end up with a low-level \TeX{} error, but if there is, it is a coding error and needs correcting.

\begin{verbatim}
  \vbox_set_split_to_ht:NNn \l__mark_box \l__mark_box \c_max_dim
\end{verbatim}

After this action we can get first and last marks of the various classes through $\backslash\text{tex\_splitfirstmarks:D}$ and $\backslash\text{tex\_splitbotmarks:D}$. So now we loop over all classes stored in $\g__mark_classes_seq$.

\begin{verbatim}
  \seq_map_inline:Nn \g__mark_classes_seq
\end{verbatim}

First action: get the last mark from the previous region, i.e., previous-#1. But because it is also still inside #1, at the moment we use that to construct the name because this is a tiny bit faster. Given that we need this value in various assignments we store it away which avoids unnecessary further csname generations.

\begin{verbatim}
  \tl_gset_eq:Nc \g__mark_new_top_tl \{ \g__mark_#1_last_##1_tl \}
\end{verbatim}

This will first of all become the new top mark for the current class.

\begin{verbatim}
  \tl_gset_eq:cN \{ \g__mark_#1_top_##1_tl \} \g__mark_new_top_tl
\end{verbatim}

Next action is to get ourselves the new last mark from the material supplied.

\begin{verbatim}
  \tl_gset:No \g__mark_tmp_tl
    \{ \tex_splitbotmarks:D \use:c { c__mark_class_##1_mark } \}
\end{verbatim}

If this mark doesn’t exist then obviously first mark does neither, so both become the last mark from the previous region. We have to be a little careful here: something like $\backslash\text{mark\_insert:nn}{foo}{}$ adds an “empty” mark that should not be confused with no mark at all. But no mark in our material will result in $\g__mark_tmp_tl$ being fully empty. This is why we have to make sure that “empty” from $\backslash\text{mark\_insert:nn}$ only appears to be empty but fails the next test (see below how this is done).

\begin{verbatim}
  \tl_if_empty:NTF \g__mark_tmp_tl
  \begin{verbatim}
    \tl_gset_eq:cN \{ \g__mark_#1_last_##1_tl \}
    \g__mark_new_top_tl
    \tl_gset_eq:cN \{ \g__mark_#1_first_##1_tl \}
    \g__mark_new_top_tl
  \end{verbatim}
\end{verbatim}

If it wasn’t empty, i.e., if it had a real value then we use this value for our new last mark instead.

\begin{verbatim}
  \begin{verbatim}
    \tl_gset_eq:cN \{ \g__mark_#1_last_##1_tl \} \g__mark_tmp_tl
  \end{verbatim}
\end{verbatim}
Because we had a last mark we also have a first mark (which might be the same, but might be not), so we pick that up and assign it to the appropriate token list. This explains why we first checked for the last mark because that makes the processing faster in case there is none.

\tl_gset:co \{ g__mark_#1_first_##1_tl \}
{\tex_splitfirstmarks:D \use:c \{ c__mark_class_##1_mark \}}

If the badness was zero (we actually tested for $>0$ but it can’t get negative) then we had infinite shrinkage, so we report that and set all marks to the value the last mark had before.

\msg_error:nnn \{ mark \} \{ infinite-shrinkage \} \{#1\}
\seq_map_inline:Nn \g__mark_classes_seq
\{ \tl_gset_eq:cc \{ g__mark_#1_top_ ##1_tl \} \{ g__mark_#1_last_ ##1_tl \} \tl_gset_eq:cc \{ g__mark_#1_first_##1_tl \} \{ g__mark_#1_last_ ##1_tl \}\}

Once all mark classes have been processed the data structures are updated and we can close the group which undoes our local changes and retains only the global ones.

\group_end:

(End definition for \_mark_update_structure:nn.)

This function copies the structure for one region to another (name), e.g., from page to previous-page above, or later from column to first-column, etc.
\cs_new_protected:Npn \_mark_update_structure_alias:nn #1#2 { This requires a simple loop through all mark classes copying the token list from one name to the next.
\seq_map_inline:Nn \g__mark_classes_seq
\{ \tl_gset_eq:cc \{ g__mark_ #1 _top_ ##1 _tl \} \{ g__mark_ #2 _top_ ##1 _tl \} \tl_gset_eq:cc \{ g__mark_ #1 _first_ ##1 _tl \} \{ g__mark_ #2 _first_ ##1 _tl \} \tl_gset_eq:cc \{ g__mark_ #1 _last_ ##1 _tl \} \{ g__mark_ #2 _last_ ##1 _tl \}\}

(End definition for \_mark_update_structure_alias:nn.)
A slight variation is to install a fixed error message as the value.

```latex
\cs_new_protected:Npn \__mark_update_structure_to_err:n #1 {  
  \seq_map_inline:Nn \g__mark_classes_seq  
  {  
    \tl_gset:cn { g__mark_ #1 _top_ ##1 _tl } { \__mark_error:n {#1} }  
    \tl_gset:cn { g__mark_ #1 _first_ ##1 _tl } { \__mark_error:n {#1} }  
    \tl_gset:cn { g__mark_ #1 _last_ ##1 _tl } { \__mark_error:n {#1} }  
  }  
}
```

Given that this is used in only one place, we could hardwire the argument which would be a bit more compact, but who knows, perhaps we end up with another reason to use this error command elsewhere, so for now we keep the argument.

```latex
\cs_new_protected:Npn \__mark_error:n #1 {  
  \msg_error:nnn { mark } { invalid-use } {#1}  
}
```

(End definition for \__mark_update_structure_to_err:n and \__mark_error:n.)

### 7.3 Placing and retrieving marks

This function puts a mark for some \textit{class} at the current point.

```latex
\cs_new_protected:Npn \mark_insert:nn #1#2  
{  
  \seq_if_in:NnTF \g__mark_classes_seq {#1}  
  {  
    We need to pass the evaluated argument into the mark but protected commands should not expand including those protected using the \texttt{protect} approach of \LaTeX\ 2e. We also disable \texttt{label} and the like.\footnote{Straight copy from \texttt{latex.ltx} but is this even correct? At least a label in a running header makes little sense if it get set several times! Maybe that needs looking at in the 2e kernel.}
    At this point the code eventually should get a public (and a kernel) hook instead of a set of hardwired settings.
    \begin{verbatim}
    \group_begin:
    \end{verbatim}
    Within the group we alter some comments, e.g, \texttt{label} or \texttt{index}, to do the right at this point. This is done in the kernel hook \texttt{\@kernel@before@insertmark} which is followed by the public hook \texttt{insertmark} that can be used by packages to augment or alter that setup as necessary.
    \begin{verbatim}
    \@kernel@before@insertmark  
    \hook_use:n { insertmark }  
    \unrestored@protected@xdef \g__mark_tmp_tl {#2}  
    \end{verbatim}
    \begin{verbatim}
    (\texttt{\textsc{trace}})
    \__mark_debug:n{  
      \iow_term:x { Marks:~ set~#1~<-~\tl_to_str:V \g__mark_tmp_tl }  
    }  
    \end{verbatim}
    \begin{verbatim}
    (\texttt{/trace})
    \tex_marks:D \use:c { c__mark_class_ #1 _mark }  
    \end{verbatim}
    Here is the trick to avoid truly empty marks: if the result from the above processing is empty we add something which eventually becomes empty, but not immediately; otherwise we just put \texttt{\g__mark_tmp_tl} in.
    \begin{verbatim}
    \tl_if_empty:NTF \g__mark_tmp_tl  
    \end{verbatim}
}
```

File S: \texttt{ltmarks.dtx}
A mark introduces a possible break point and in certain situations that should not happen in vertical mode in \TeX. This needs some cleanup ....

If the mark class was not known, raise an error.

\begin{verbatim}
\msg_error:nnx { mark } { unknown-class }
\end{verbatim}

By default \label, \index, and \glossary do nothing when the mark is inserted.

\begin{verbatim}
\cs_set_eq:NN \label \scan_stop:
\cs_set_eq:NN \index \scan_stop:
\cs_set_eq:NN \glossary \scan_stop:
\end{verbatim}

The public hook to augment the setup.

\begin{verbatim}
\hook_new:n {insertmark}
\end{verbatim}

To retrieve the first, last or top region mark, we grab the appropriate value stored in the corresponding token list variable and pass its contents back. These functions should be used only in output routines after \_\_mark_update_structure:nn has acted, otherwise their value will be wrong.

If used with an unknown class or region they generate an error (fairly low-level because we are in an expandable context).

\begin{verbatim}
\cs_new:Npn \mark_use_first:nn #1#2 { \exp_not:v { g__mark_#1_first_#2_tl } }
\cs_new:Npn \mark_use_last:nn #1#2 { \exp_not:v { g__mark_#1_last_#2_tl } }
\cs_new:Npn \mark_use_top:nn #1#2 { \exp_not:v { g__mark_#1_top_#2_tl } }
\end{verbatim}

7.4 Comparing mark values

Test if in a given region (#1) for a given class (#2) the marks in position #3 and #4 (top, first, or last) are identical

\begin{verbatim}
\prg_new conditional:Npnn \mark_if_eq:nnnn #1#2#3#4 { T , F , TF }
\prg_new conditional:Npnn \mark_if_eq:nnnnnn #1#2#3#4 { T , F , TF }
\end{verbatim}
The fully general test (with two triplets of the form \langle region \rangle, \langle class \rangle, and \langle position \rangle) is this:

\begin{verbatim}
176 \prg_new_conditional:Npnn \mark_if_eq:nnnn #1 #2 #3 #4 #5 #6 { T , F , TF }
177 { 
178 \tl_if_eq:ccTF { g__mark_ #1 _ #3 _ #2 _ tl } 
179 { g__mark_ #4 _ #6 _ #5 _ tl } 
180 \prg_return_true:
181 \prg_return_false:
182 }
\end{verbatim}

(End definition for \mark_if_eq:nnnnTF and \mark_if_eq:nnnnnTF. These functions are documented on page 794.)

7.5 Messages

Mark errors are LaTeX kernel errors:

\begin{verbatim}
\prop_gput:Nnn \g_msg_module_type_prop { mark } { LaTeX }
\msg_new:nnnn { mark } { class-already-defined }
{ Mark-class-'#1'-already-defined }
{ \c__msg_coding_error_text_tl
LaTeX-was-asked-to-define-a-new-mark-class-called-'#1':-
this-mark-class-already-exists.
\c__msg_return_text_tl }
\msg_new:nnnn { mark } { unknown-class }
{ Unknown-mark-class-'#1'. }
{ \c__msg_coding_error_text_tl
LaTeX-was-asked-to-manipulate-a-mark-of-class-'#1',-
but-this-class-of-marks-does-not-exist.
}
\msg_new:nnnn { mark } { invalid-use }
{ Mark-region-'#1'-not -usable }
{ \c__msg_coding_error_text_tl
The-region-'#1'-can-only-be-used-after-
all-columns-have-been-assembled.
\c__msg_return_text_tl }
\msg_new:nnnn { mark } { infinite-shrinkage }
{ Infinite-shrinkage-found-in-'#1'. }
{ \c__msg_coding_error_text_tl
The-mark-region-'#1'-contains-some-infinite-negative-glue-
allowing-it-to-shrink-to-an-arbitrary-size.-
This-makes-it-impossible-to-split-the-region-apart-to-
get-at-its-marks.-They-are-lost.
}
\end{verbatim}
7.6 Debugging the mark structures

Code and commands in this section are not final, it needs more experimentation to see what kind of tracing information is going to be useful in practice. For now the tracing is mainly meant to be used for code testing and not so much for application testing.

It is quite likely that the commands and the behavior of the tracing might change in the future once we gained some experience with it.

\g__mark_debug_bool
Holds the current debugging state.

\bool_new:N \g__mark_debug_bool
(End definition for \g__mark_debug_bool.)

\mark_debug_on:
\mark_debug_off:
__mark_debug:n
__mark_debug_gset:

Turns debugging on and off by redefining \__mark_debug:n.

\cs_new_eq:NN \__mark_debug:n \use_none:n
\cs_new_protected:Npn \mark_debug_on:
{ \bool_gset_true:N \g__mark_debug_bool
  \__mark_debug_gset:
}
\cs_new_protected:Npn \mark_debug_off:
{ \bool_gset_false:N \g__mark_debug_bool
  \__mark_debug_gset:
}
\cs_new_protected:Npn \__mark_debug_gset:
{ \cs_gset_protected:Npx \__mark_debug:n ##1
  { \bool_if:NT \g__mark_debug_bool {##1} }
}

(End definition for \mark_debug_on: and others. These functions are documented on page 795.)

\DebugMarksOn
\DebugMarksOff
CamelCase commands for debugging.

\cs_new_eq:NN \DebugMarksOn \mark_debug_on:
\cs_new_eq:NN \DebugMarksOff \mark_debug_off:

(End definition for \DebugMarksOn and \DebugMarksOff. These functions are documented on page 795.)

__mark_class_status:nn
Shows the mark values across all regions for one mark class (#2). The first argument gives some ⟨info⟩ to help identifying where the command was called.

{⟨∗trace⟩}
\cs_new_protected:Npn \__mark_class_status:nn #1#2
{
  \typeout{ Marks: #2- #1:}
  \typeout{\@spaces page- (current):
  \exp_not:v \g__mark_page_top_ #2 _tl }
  \exp_not:v \g__mark_page_first_ #2 _tl }
  \exp_not:v \g__mark_page_last_ #2 _tl }
\typeout{\@spaces page- (previous):
  \exp_not:v \g__mark_previous_page_top_ #2 _tl }
  \exp_not:v \g__mark_previous_page_first_ #2 _tl }
  \exp_not:v \g__mark_previous_page_last_ #2 _tl }
\typeout{\@spaces column- (previous):

File S: ltmaks.dtx 807
\__mark_status:n \typeout{\@spaces column~ (current):\}
| \exp_not:v { g__mark_column_top_ #2 _tl } |
| \exp_not:v { g__mark_column_first_ #2 _tl } |
| \exp_not:v { g__mark_column_last_ #2 _tl } |
\typeout{\@spaces column~ (first):\}
| \exp_not:v { g__mark_first-column_top_ #2 _tl } |
| \exp_not:v { g__mark_first-column_first_ #2 _tl } |
| \exp_not:v { g__mark_first-column_last_ #2 _tl } |
\typeout{\@spaces column~ (second):\}
| \exp_not:v { g__mark_last-column_top_ #2 _tl } |
| \exp_not:v { g__mark_last-column_first_ #2 _tl } |
| \exp_not:v { g__mark_last-column_last_ #2 _tl } |
}
\typeout{(/trace)\n}
(End definition for \__mark_class_status:nn.)
\__mark_status:n Show all mark class values across all regions.
\cs_new_protected:Npn \__mark_status:n #1 \{
\seq_map_inline:Nn \g__mark_classes_seq
{ \__mark_class_status:nn {#1} {##1} }
\}
(End definition for \__mark_status:n.)

7.7 Designer-level interfaces
\NewMarkClass\InsertMark These two are identical to the L3 programming layer commands.
\cs_new_eq:NN \NewMarkClass \mark_new_class:n
@onlypreamble \NewMarkClass
\cs_new_eq:NN \InsertMark \mark_insert:nn
(End definition for \NewMarkClass and \InsertMark. These functions are documented on page 792.)
\TopMark\FirstMark\LastMark The following commands take an optional argument that defaults to page. There is no
checking that the region is actually valid. If not there is simply an empty return.
\NewExpandableDocumentCommand \FirstMark { O{page} m } \{
\mark_use_first:nn {#1}{#2} \}
\NewExpandableDocumentCommand \LastMark { O{page} m } \{
\mark_use_last:nn {#1}{#2} \}
\NewExpandableDocumentCommand \TopMark { O{page} m } \{
\mark_use_top:nn {#1}{#2} \}
(End definition for \TopMark, \FirstMark, and \LastMark. These functions are documented on page 793.)
\IfMarksEqualTF

We only provide a CamelCase command for the case with one region (optional) and one class. One could think of also providing a version for the general case with several optional arguments, but use cases for this are most likely rare, so not done yet.

\NewExpandableDocumentCommand \IfMarksEqualTF {O{page}mmm} {
  \mark_if_eq:nnnnTF {#1}{#2}{#3}{#4}
}

(End definition for \IfMarksEqualTF. This function is documented on page 794.)

8 \LaTeX\ ε integration

8.1 Core \LaTeX\ ε integration

This command updates the mark structures if we are producing a single column document.

\cs_new_protected:Npn \_mark_update_singlecol_structures: {
First we update the page region (which also updates the previous-page.

The \@outputbox is normally in \vbox in \LaTeX but we can’t take that for granted (an amsmath test document changed it to an \hbox just to trip me up) so we are a little careful with unpack now.

\box_if_vertical:NTF \@outputbox {
  \_mark_update_structure:nn {page} { \vbox_unpack:N \@outputbox }
}
\box_if_vertical:NTF \@outputbox {
  \_mark_update_structure:nn {page} { \hbox_unpack:N \@outputbox }
}

The we provide the necessary updates for the aliases.

\_mark_update_structure_alias:nn {previous-column}{previous-page}
\_mark_update_structure_alias:nn {column}{page}
\_mark_update_structure_alias:nn {first-column}{page}
\_mark_update_structure_alias:nn {last-column}{page}

(*trace)

% move this into status itself?
\_mark_debug:n

{ \_mark_status:n

  { in- OR- ( 
    \legacy_if:nTF \@twoside
    { twoside-
      \int_if_odd:nTF \c@page
        { odd }{ even }
    }
  }
}

)/trace

File S: ltmarks.dtx

809
This command handles the updates if we are doing two-column pages.

First we update the column and previous-column regions using the material assembled in @outputbox.

How we have to update the alias regions depends on whether or not \@opcol was called to process the first column or to produce the completed page.

If we are processing the first column then column is our first-column and there is no last-column yet, so we make those an error.

If we produce the completed page then the first-column is the same as the new previous-column. However, the structure should already be correct if you think about it (because it was set to column last time which is now the previous-column), thus there is no need to make an update.

However, we now have a proper last-column so we assign that.

What now remains doing is to update the page and previous-page regions. For this we have to copy the settings in page into previous-page and then update page such that the top and first marks are taken from the first-column region and the last marks are taken from the last-column region. All this has to be done for all mark classes so we loop over our sequence.

Note that one loop is needed if we arrange the copy statements in a suitable way.

(End definition for \_mark_update_singlecol_structures:)
The page updates need to come after the corresponding updates for previous-page otherwise we lose the necessary value.

\tl_gset_eq:cc { g__mark_page_top_ \#1_tl }  
\tl_gset_eq:cc { g__mark_first-column_top_ \#1_tl }  
\tl_gset_eq:cc { g__mark_page_first_ \#1_tl }  
\tl_gset_eq:cc { g__mark_first-column_first_ \#1_tl }  
\tl_gset_eq:cc { g__mark_page_last_ \#1_tl }  
\tl_gset_eq:cc { g__mark_last-column_last_ \#1_tl }  

\__mark_debug:n  
\__mark_status:n  
{  
in- OR- (  
\legacy_if:nTF {@twoside}  
{  
twoside-  
\int_if_odd:nTF \c@page  
{  
odd }{ even }  
}  
{  
oneside }  
\space  
\legacy_if:nTF {@firstcolumn}  
{  
first- }{ second- }  
column }  
}  
(End definition for \__mark_update_dblcol_structures:)  

(End definition for \__mark_update_singlecol_structures:)  

8.2 Other \LaTeX{} 2e output routines

This section will cover multicol and other packages altering or providing their own output routine. Not done yet.

We keep the interface commands around even if we roll back in case they are used in packages that don’t roll back. Not likely to do a lot of good, but then there is not much we can do, but this at least then doesn’t give errors.
Same here, this avoided extra roll back code in the OR.

\let\@expl@@@mark@update@singlecol@structures\relax
\let\@expl@@@mark@update@dblcol@structures\relax
\ExplSyntaxOff

Reset module prefix:
1 Page styles and related commands

1.1 Page Style Commands

\pagestyle{⟨style⟩} : sets the page style of the current and succeeding pages to ⟨style⟩.
\thispagestyle{⟨style⟩} : sets the page style of the current page only to ⟨style⟩.

To define a page style ⟨style⟩, you must define \ps@⟨style⟩ to set the page style parameters.

1.2 How a page style makes running heads and feet

The \ps@...command defines the macros \@oddhead, \@oddfoot, \@evenhead, and \@evenfoot to define the running heads and feet. (See output routine.) To make headings determined by the sectioning commands, the page style defines the commands \chaptermark, \sectionmark, etc., where \chaptermark{⟨text⟩} is called by \chapter to set a mark. The \...mark commands and the \...head macros are defined with the help of the following macros.

(All the \...mark commands should be initialized to no-ops.)

1.3 marking conventions

\LaTeX{} extends \TeX{}’s \mark facility by producing two kinds of marks a ‘left’ and a ‘right’ mark, using the following commands:
\markboth{⟨left⟩}{⟨right⟩} : Adds both marks.
\markright{⟨right⟩} : Adds a ‘right’ mark.
\leftmark : Used in the output routine, gets the current ‘left’ mark. Works like \TeX{}’s \botmark.
\rightmark : Used in the output routine, gets the current ‘right’ mark. Works like \TeX{}’s \firstmark. The marking commands work reasonably well for right marks ‘numbered within’ left marks—e.g., the left mark is changed by a \chapter command and the right mark is changed by a \section command. However, it does produce somewhat anomalous results if 2 \markboth’s occur on the same page.

Commands like \tableofcontents that should set the marks in some page styles use a \@mkboth command, which is \let by the pagestyle command (\ps@...) to \markboth for setting the heading or to \@gobbletwo to do nothing.

\pagestyle User command to set the page style for this and following pages.
\def\pagestyle#1{%
\@ifundefined{ps@#1}{}{%
\undefinedpagestyle \@nameuse{ps@#1}}
}(End definition for \pagestyle.)
\thispagestyle User command to set the page style for this page only.
\edef\thispagestyle#1{%\@ifundefined{ps@#1}{\undefinedpagestyle}{\{\global@specialpagetrue\gdef\@specialstyle{#1}}} (End definition for \thispagestyle.)

\ps@empty The empty page style: No head or foot line.
\def\ps@empty{%\let\@mkboth\@gobbletwo \let\@oddhead\@empty \let\@oddfoot\@empty \let\@evenhead\@empty \let\@evenfoot\@empty} (End definition for \ps@empty.)

\ps@plain The plain page style: No head, centred page number in foot.
\def\ps@plain{%\let\@mkboth\@gobbletwo \let\@oddhead\@empty \let\@evenhead\@empty \def\@oddfoot{\reset@font\hfil\thepage\hfil} \let\@evenfoot\@oddfoot} (End definition for \ps@plain.)

\@leftmark We implement \@leftmark and \@rightmark in terms of already defined commands to save token space. We can’t get rid of them since they are sometimes used in applications.
\let\@leftmark\@firstoftwo \let\@rightmark\@secondoftwo (End definition for \@leftmark and \@rightmark.)

\markboth User commands for setting \LaTeX marks. \ExplSyntaxOn
\DeclareRobustCommand*\markboth[2]{%\begingroup \let\label\relax \let\index\relax \let\glossary\relax \unrestored@protected@xdef\@themark {{#1}{#2}}% \@temptokena \expandafter{\@themark}}% In addition to generating the legacy mark we output the individual ones as well at the very same point. The legacy mark is kept unchanged in order to work with packages that expect that mark in exactly the way it is right now.

We might want to think about how to improve this in one-side documents, see comments below.

We have not changed all of the code to L3 prog layer convention, in case packages attempt to do some patching and expect the 2e names being around. Eventually this should and will change.
\mark_insert:nn{2e-left}{#1} \mark_insert:nn{2e-right}{#2}

File T: ltpage.dtx Date: 2022/04/03 Version v1.0n
Protection is handled inside \markright.

Same game with \markright more or less ...

The legacy \LaTeX\ mechanism always sets left and right mark, i.e., if a sub-mark (i.e., right mark) is set the corresponding main mark also is getting a mark with the same value it had previously. However, for the individual mark classes this means we are losing information so for them that is not done.

(End definition for \markboth and \markright. These functions are documented on page 7\text{95}.)
\@markright
\leftmark
\rightmark

\@markright\leftmark\rightmark
\def\@markright#1#2#3\@temptokena{#1}\unrestored@protected@xdef\@themark{\the\@temptokena#3}
\def\leftmark{\expandafter\@leftmark\botmark\@empty\@empty}
\def\rightmark{\expandafter\@rightmark\firstmark\@empty\@empty}

(End definition for \@markright, \leftmark, and \rightmark.)

\@themark
\def\@themark{{}{}\@themark}

(End definition for \@themark.)

\mark
\AtBeginDocument{\mark{{}{}{}}}

(End definition for \mark.)

\raggedbottom
\raggedbottom typesets pages with no vertical stretch, so they have their natural height instead of all being exactly the same height. (Uses a space of .0001fil to avoid interfering with the 1fil space of \newpage.)

\DeclareRobustCommand\raggedbottom{%
\def\@textbottom{\vskip \z@ \@plus.0001fil}\let\@texttop\relax}

(End definition for \raggedbottom.)

\flushbottom \flushbottom: Inverse of \raggedbottom — makes all pages the same height.

\DeclareRobustCommand\flushbottom{%
\let\@textbottom\relax \let\@texttop\relax}

(End definition for \flushbottom.)

\sloppy \sloppy will never (well, hardly ever) produce overfull boxes, but may produce underfull ones. (14 June 85)

\DeclareRobustCommand\sloppy{%
\tolerance 9999%
\emergencystretch 3em%
\hfuzz .5\p@
\vfuzz\hfuzz}

(End definition for \sloppy.)

sloppypar (env.) A sloppypar environment is equivalent to {\par \sloppy ... \par}.

\def\sloppypar{\par\sloppy}
\def\endsloppypar{\par}

File T: ltpage.dtx Date: 2022/04/03 Version v1.0n 816
\fussy \textit{Resets \TeX’s parameters to their normal finicky values.}

\begin{verbatim}
\DeclareRobustCommand\fussy{%
  \emergencystretch\z@ \tolerance 200\%
  \hfuzz .1\p@ \vfuzz\hfuzz}
\end{verbatim}

(End definition for \fussy.)

\overfullrule \textit{\LaTeX default is no overfull box rule. Changed by document class option.}

\begin{verbatim}
\overfullrule \z@ \end{verbatim}

(End definition for \overfullrule.)

(2ekernel)
1 Introduction

This file implements the following declarations, which replace \documentstyle in \LaTeX\ documents.

Note that old documents containing \documentstyle will be run using a compatibility option—thus keeping everyone happy, we hope!

The overall idea is that there are two types of 'style files': 'class files' which define elements and provide a default formatting for them; and 'packages' which provide extra functionality. One difference between \LaTeX\ and \LaTeX\ is that \LaTeX\ packages may have options. Note that options to classes packages may be implemented such that they input files, but these file names are not necessarily directly related to the option name.

2 User interface

\documentclass[⟨main-option-list⟩]{⟨class⟩}[⟨version⟩]

There must be exactly one such declaration, and it must come first. The ⟨main-option-list⟩ is a list of options which can modify the formatting of elements which are defined in the ⟨class⟩ file as well as in all following \usepackage declarations (see below). The ⟨version⟩ is a version number, beginning with a date in the format YYYY/MM/DD. If an older version of the class is found, a warning is issued.

\documentstyle[⟨main-option-list⟩]{⟨class⟩}[⟨version⟩]

The \documentstyle declaration is kept in order to maintain upward compatibility with \LaTeX\ documents. It is similar to \documentclass, but it causes all options in ⟨main-option-list⟩ that the ⟨class⟩ does not use to be passed to \RequirePackage after the options have been processed. This maintains compatibility with the 2.09 behaviour. Also a flag is set to indicate that the document is to be processed in \LaTeX\ compatibility mode. As far as most packages are concerned, this only affects the warnings and errors \LaTeX\ generates. This flag does affect the definition of font commands, and \sloppy.

\usepackage[⟨package-option-list⟩]{⟨package-list⟩}[⟨version⟩]

There can be any number of these declarations. All packages in ⟨package-list⟩ are called with the same options.

Each ⟨package⟩ file defines new elements (or modifies those defined in the ⟨class⟩), and thus extends the range of documents which can be processed. The ⟨package-option-list⟩ is a list of options which can modify the formatting of elements defined in the ⟨package⟩ file. The ⟨version⟩ is a version number, beginning with a date in the format YYYY/MM/DD. If an older version of the package is found, a warning is issued.

Each package is loaded only once. If the same package is requested more than once, nothing happens, unless the package has been requested with options that were not given the first time it was loaded, in which case an error is produced.

As well as processing the options given in the ⟨package-option-list⟩, each package processes the ⟨main-option-list⟩. This means that options that affect all of the packages can be given globally, rather than repeated for every package.
Note that class files have the extension .cls, packages have the extension .sty.

The environment \filecontents is intended for passing the contents of packages, options, or other files along with a document in a single file. It has one argument, which is the name of the file to create. If that file already exists (maybe only in the current directory if the OS supports a notion of a ‘current directory’ or ‘default directory’) then nothing happens (except for an information message) and the body of the environment is bypassed. Otherwise, the body of the environment is written verbatim to the file name given as the first argument, together with some comments about how it was produced.

The environment can also be called with an optional argument which is used to alter some of its behavior: option \force or \overwrite will allow for overwriting existing files, option \nosearch will only check the current directory when looking if the file exists. This can be useful if you want to generate a local (modified) copy of some file that is already in the search tree of \TeX. Finally, you can use \noheader to prevent it from writing the standard blurb at the top of the file (this is actually the same as using the star form of the environment).

The environment is now allowed anywhere in the document, but to ensure that all packages or options necessary are available when the document is run, it is normally best to place it at the top of your file (before \documentclass). A possible use case for using it inside the document body is if you want to reuse some text several times in the document you could then write it and later use \input to retrieve it where needed.

The begin and end tags should each be on a line by itself.

2.1 Option processing

When the options are processed, they are divided into two types: local and global:

- For a class, the options in the \documentclass command are local.
- For a package, the options in the \usepackage command are local, and the options in the \documentclass command are global.

The options for \documentclass and \usepackage are processed in the following way:

1. The local and global options that have been declared (using \DeclareOption as described below) are processed first.
   - In the case of \ProcessOptions, they are processed in the order that they were declared in the class or package.
   - In the case of \ProcessOptions*, they are processed in the order that they appear in the option-lists. First the global options, and then the local ones.

2. Any remaining local options are dealt with using the default option (declared using the \DeclareOption declaration described below). For document classes, this usually does nothing, but records the option on a list of unused options. For packages, this usually produces an error.

Finally, when \begin{document} is reached, if there are any global options which have not been used by either the class or any package, the system will produce a warning.
3 Class and Package interface

3.1 Class name and version

\ProvidesClass A class can identify itself with the \ProvidesClass{(name)}{(version)} command. The (version) should begin with a date in the format YYYY/MM/DD.

3.2 Package name and version

\ProvidesPackage A package can identify itself with the \ProvidesPackage{(name)}{(version)} command. The (version) should begin with a date in the format YYYY/MM/DD.

3.3 Requiring other packages

\RequirePackage Packages or classes can load other packages using \RequirePackage{(options)}{(name)}{(version)}. If the package has already been loaded, then nothing happens unless the requested options are not a subset of the options with which it was loaded, in which case an error is called.

\LoadClass Similar to \RequirePackage, but for classes, may not be used in package files.

\PassOptionsToPackage Packages can pass options to other packages using: \PassOptionsToPackage{(options)}{(package)}.

\PassOptionsToClass This adds the (options) to the options list of any future \RequirePackage or \usepackage command. For example:

\PassOptionsToPackage{foo,bar}{fred}

is the same as:

\RequirePackage[foo,bar,baz]{fred}

\LoadClassWithOptions \LoadClassWithOptions{(name)}{(version)}: This is similar to \LoadClass, but it always calls class (name) with exactly the same option list that is being used by the current class, rather than an option explicitly supplied or passed on by \PassOptionsToClass. \RequirePackageWithOptions is the analogous command for packages.

This is mainly intended to allow one class to simply build on another, for example:

\LoadClassWithOptions{article}

This should be contrasted with the slightly different construction

\DeclareOption*{\PassOptionsToClass{\CurrentOption}{article}} \ProcessOptions \LoadClass{article}

As used here, the effects are more or less the same, but the version using \LoadClassWithOptions is slightly quicker (and less to type). If, however, the class declares options of its own then the two constructions are different; compare, for example:

\DeclareOption{landscape}{...} \ProcessOptions \LoadClassWithOptions{article}
with:
\DeclareOption{landscape}{...}
\DeclareOption*{\PassOptionsToClass{\CurrentOption}{article}}
\ProcessOptions
\LoadClass{article}

In the first case, the article class will be called with option landscape precisely when the current class is called with this option; but in the second example it will not as in that case article is only passed options by the default option handler, which is not used for landscape as that option is explicitly declared.

\IfPackageLoadedTF To find out if a package has already been loaded, use
\IfClassLoadedTF \IfPackageLoadedTF{⟨package⟩}{⟨true⟩}{⟨false⟩}
\@ifpackageloaded
or the old name \@ifpackageloaded.

\IfPackageAtLeastTF To find out if a package has already been loaded with a version equal to or more recent than ⟨date⟩, use
\IfClassAtLeastTF \IfPackageAtLeastTF{⟨package⟩}{⟨date⟩}{⟨true⟩}{⟨false⟩}
\@ifpackagelater
or the old name \@ifpackagelater.

\IfFormatAtLeastTF To test the format date use
\IfFormatAtLeastTF{⟨date⟩}{⟨true⟩}{⟨false⟩}

\IfPackageLoadedWithOptionsTF To find out if a package has already been loaded with at least the options ⟨options⟩,
\IfClassLoadedWithOptionsTF \IfPackageLoadedWithOptionsTF{⟨package⟩}{⟨options⟩}{⟨true⟩}{⟨false⟩}
\@ifpackagewith
or the old name \@ifpackagewith.

There exists one package that can’t be tested with the above commands: the fontenc package pretends that it was never loaded to allow for repeated reloading with different options (see ltoutenc.dtx for details).

3.4 Declaring new options

Options for classes and packages are built using the same macros.
\DeclareOption To define a built-in option, use \DeclareOption{(name)}{(code)}.
\DeclareOption* To define the default action to perform for local options which have not been declared, use \DeclareOption*{(code)}.

Note: there should be no use of \RequirePackage, \DeclareOption, \DeclareOption* or \ProcessOptions inside \DeclareOption or \DeclareOption*.
Possible uses for \DeclareOption* include:
\DeclareOption*{} Do nothing. Silently accept unknown options. (This suppresses the usual warnings.)
\DeclareOption*{\@unknownoptionerror} Complain about unknown local options. (The initial setting for package files.)
\DeclareOption*{\PassOptionsToPackage{\CurrentOption}{⟨pkg-name⟩}} Handle the current option by passing it on to the package ⟨pkg-name⟩, which will presumably be loaded via \RequirePackage later in the file. This is useful for building
‘extension’ packages, that perhaps handle a couple of new options, but then pass everything else on to an existing package.

\DeclareOption*{\InputIfFileExists{xx-\CurrentOption.yyy}}% 
\{\OptionNotUsed\}

Handle the option foo by loading the file xx-foo.yyy if it exists, otherwise do nothing, but declare that the option was not used. Actually the \OptionNotUsed declaration is only needed if this is being used in class files, but does no harm in package files.

3.5 Safe Input Macros

\InputIfFileExists{⟨file⟩}{⟨then⟩}{⟨else⟩}

Inputs ⟨file⟩ if it exists. Immediately before the input, ⟨then⟩ is executed. Otherwise ⟨else⟩ is executed.

\IfFileExists

As above, but does not input the file.

One thing you might like to put in the ⟨else⟩ clause is

\@missingfileerror

This starts an interactive request for a filename, supplying default extensions. Just hitting return causes the whole input to be skipped and entering x quits the current run.

\input

This has been redefined from the LaTeX2.09 definition, in terms of the new commands \InputIfFileExists and \@missingfileerror.

\listfiles

Giving this declaration in the preamble causes a list of all files input via the ‘safe input’ commands to be listed at the end. Any strings specified in the optional argument to \ProvidesPackage are listed alongside the file name. So files in standard (and other non-standard) distributions can put informative strings in this argument.

4 Implementation

\if@compatibility

The flag for compatibility mode.

\newif\if@compatibility

(End definition for \if@compatibility.)

\@documentclasshook

This legacy hook is called after the first \documentclass command. It is not integrated with the new 2020 hook management system! By default this checks to see if \@normalsize is undefined, and if so, sets it to \normalsize.

\def\@documentclasshook{%
  \ifx\@normalsize\@undefined
    \let\@normalsize\normalsize
  \fi
}

(End definition for \@documentclasshook.)

\@declaredoptions

This list is automatically built by \DeclareOption. It is the list of options (separated by commas) declared in the class or package file and it defines the order in which the corresponding \ds@⟨option⟩ commands are executed. All local ⟨option⟩s which are not declared will be processed in the order defined by the optional argument of \documentclass or \usepackage.

\let\declaredoptions@empty

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
\@classoptionslist List of options of the main class.
\let\@classoptionslist\relax
(End definition for \@classoptionslist.)
\@raw@classoptionslist List of options of the main class (unprocessed).
\let\@raw@classoptionslist\relax
(End definition for \@raw@classoptionslist.)
\@unusedoptionlist List of options of the main class that haven’t been declared or loaded as class option files.
\let\@unusedoptionlist\@empty
\@currpath Path to the current file if explicitly given.
\let\@currpath\@empty
(End definition for \@currpath.)
\@currname Name of current package or option.
\let\@currname\@empty
(End definition for \@currname.)
\@currext The current file extension.
\global\let\@currext=\@empty
(End definition for \@currext.)
\@clsextension The two possible values of \@currext.
\@pkgextension
\def\@clsextension{cls}
\def\@pkgextension{sty}
Commands to push and pop the file name and extension.

#1 current name.
#2 current extension.
#3 current catcode of @.
#4 Rest of the stack.

The push and pop macros are injected in \pushfilename and \popfilename so that they correctly keep track of the hook labels.

This needs cleanup with the expl3 interfaces also playing here, e.g., \explpushfilename@@ needs cleanup and (and should probably not have this name either).

Temporarily add a stack for \currpath here. This should be integrated in the main file stack eventually, but other packages rely on \currnamestack having three elements per file, so that isn’t a trivial change. The prefix \kernel@@... hopefully discourages people from using it.

The following version of \pushfilename didn’t formally exist in this file, but in the 2020/02/02 release, expl3 was preloaded and it patched \pushfilename (and \popfilename) by adding some hooks in there. But rolling back to 2020/02/02, expl3 doesn’t patch these macros again, so rolling back has to take those hooks into account. Same goes for \popfilename.
When we roll back from a release that has expl3 preloaded, the definitions of `\@pushfilename` and `\@popfilename` can’t be completely rolled back otherwise expl3-based packages won’t have the automatic `\ExplSyntaxOff` at the end. Here and below for `\@popfilename`, we don’t roll back all the way through if coming from LaTeX > 2020−02−02.

```latex
\GenericInfo{}{Defining 00-00-00\string\@pushfilename.}
\GenericInfo{}{Defining 2020-02-02\string\@pushfilename.}
\GenericInfo{}{Defining 00-00-00\string\@popfilename.}
```

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
\@kernel@currpathstack \hspace{1em} Path to the current file if explicitly given. The auxiliary is needed here to insert a \@empty to prevent the loss of braces.

If rolling backwards to this release, \@kernel@currpathstack will be defined, so the \gdef line should not be executed, thus the \@gobblethree will take it out, so the stack isn’t touched.

If rolling forward to this release, then the \gdef line above will define the path stack to be empty (which it can’t be, inside a file), so the code below will traverse the \@currnamestack, and add as many empty items to \@kernel@currpathstack as there are items in \@currnamestack, so both are back in sync. Most of the time latexrelease is loaded on top-level, so only one item is needed, but platexrelease loads it internally, so the more complicated loop is needed.
\optionlist Returns the option list of the file.
\def\optionlist#1{\@ifundefined{opt@#1}\@empty{\csname opt@#1\endcsname}}
\@onlypreamble\optionlist

(End definition for \optionlist.)

\@ifpackageloaded \@ifclassloaded \@ifpackageloaded{⟨name⟩} \@ifpackageloaded{⟨name⟩}{YYYY/MM/DD}{⟨false code⟩}{⟨true code⟩} Checks to see whether a file has been loaded. \def\@ifpackageloaded{\@ifl@ter\@pkgextension} \def\@ifclassloaded{\@ifl@ter\@clsextension}

(End definition for \@ifpackageloaded and \@ifclassloaded.)

\@ifpackagelater \@ifclasslater \@ifpackagelater{⟨name⟩}{YYYY/MM/DD}{⟨false code⟩}{⟨true code⟩} Checks that the package loaded is more recent or equal to the given date. A better name for it would therefore been \@ifpackagelaterorequal but it is in use for more than 30 years, so ...
\def\@ifpackagelater{\@ifl@ter\@pkgextension} \def\@ifclasslater{\@ifl@ter\@clsextension}

(End definition for \@ifpackagelater and \@ifclasslater.)

\IfPackageAtLeastTF \IfClassAtLeastTF \IfFormatAtLeastTF \IfFormatAtLeastTF{YYYY/MM/DD}{⟨false code⟩}{⟨true code⟩} Test if the format is later or equal to the given date.
\def\IfPackageAtLeastTF{⟨false code⟩}{⟨true code⟩}{⟨false code⟩}{⟨true code⟩} Test if the format is later or equal to the given date.
\let\IfPackageAtLeastTF\@ifpackagelater \let\IfClassAtLeastTF\@ifclasslater

For rollback pretend it was available since the beginning of dawn.
\def\IfPackageAtLeastTF{⟨false code⟩}{⟨true code⟩}{⟨false code⟩}{⟨true code⟩} Test if the format is later or equal to the given date.
\let\IfPackageAtLeastTF\@ifpackagelater \let\IfClassAtLeastTF\@ifclasslater

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
\@ifl@ter
\def\@ifl@ter#1#2{\expandafter\@ifl@t@r \csname ver@#2.#1\endcsname}

This internal macro is also used in \NeedsTeXFormat.

\def\@parse@version#1/#2/#3#4#5\@nil{\@parse@version@dash #1-#2-#3#4 \@nil}

The \if test here ensures that an argument with no / or - produces 0 (actually 00).

\@ifpackagewith \@ifclasswith \@ifpackagewith{⟨name⟩}{⟨option-list⟩} Checks that ⟨option-list⟩ is a subset of the options with which ⟨name⟩ was loaded.

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c 828
\def\@if@ptions#1#2{\@expandtwoargs\@if@pti@ns{\@ptionlist{#2.#1}}}

Probably shouldn’t use \CurrentOption here...(changed to \reserved@b.)

⟨/2ekernel⟩\IncludeInRelease{2017/01/01}{Spaces in option clash check}⟨latexrelease⟩
\def\@if@ptions#1#2{\let\reserved@a\@firstoftwo\edef\reserved@b{\zap@space#2 @empty}\@for\reserved@b:=\reserved@b\do{\ifx\reserved@b@empty\else\expandafter\in@\expandafter{\expandafter,#1,}\ifin@\else\let\reserved@a\@secondoftwo\fi}\fi}⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}{Spaces in option clash check}⟨latexrelease⟩\def\@if@ptions#1#2{\let\reserved@a\@firstoftwo\@for\reserved@b:=#2\do{\ifx\reserved@b@empty\else\expandafter\in@\expandafter{\expandafter,#1,}\ifin@\else\let\reserved@a\@secondoftwo\fi}\fi}\reserved@a}⟨latexrelease⟩\EndIncludeInRelease

(End definition for \@ifpackagewith and \@ifclasswith.)

More public names for the commands already available for a long time.

\IfPackageLoadedTF More public names for the commands already available for a long time.
\IfClassLoadedTF
\IfClassLoadedWithOptionsTF

File U: \texttt{ltclass.dtx} Date: 2022/06/20 Version v1.5c
For rollback pretend it was available since the beginning of dawn.

\OpensPackage  Checks that the current filename is correct, and defines \ver@filename.

Here \@currpath is explicitly added to the file name to report when a package or class is loaded using an explicit path. Loading using a path in the argument is supported but not encouraged.

\ProvidesPackage (End definition for and others.)

\OpensPackage  (End definition for .)

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
\texttt{\@pr@videpackage} This is the helper command for \texttt{\ProvidesPackage}. It tries to be cautious when handling the identification string in case it contains UTF-8 characters.

```latex
\def\@pr@videpackage[#1]{% \expandafter\protected@xdef \csname ver@\@currname.@currext\endcsname{#1} \ifx\@currext\@clsextension \typeout{Document Class: \@gtempa\space#1} \else \protected@wlog{Package: \@gtempa\space#1} \fi}
```

(End definition for \texttt{\@pr@videpackage}.)

\texttt{\protected@wlog} This is like plain \TeX’\textsc{s} \texttt{\wlog} but gracefully handles protected commands.

```latex
\long\def\protected@wlog#1{\begingroup \set@display@protect \immediate \write \m@ne {#1}\endgroup}
```

(End definition for \texttt{\protected@wlog}.)
\ProvidesClass
Like \ProvidesPackage, but for classes. This needs a dummy \latexrelease block to copy the definition of \ProvidesPackage as it changes across releases.
\endinput
\ProvidesFile
Like \ProvidesPackage, but for arbitrary files. Do not apply \@onlypreamble to these, as we may want to label files input during the document.
\Endinput
\PassOptionsToPackage
If the package has been loaded, we check that it was first loaded with the options. Otherwise we add the option list to that of the package.
\endinput
\UseRawInputEncoding
\documentclass{article}
\usepackage{ltclass}

\begin{document}
\section*{Option Handling}

\textbf{\DeclareOption*} adds an option as a \texttt{\textbackslash ds@} command, or the default \texttt{\textbackslash default@ds} command.

\begin{verbatim}
\def\DeclareOption*{\@ifundefined{opt@reserved\reserved@a}{\empty}{\csname opt@reserved\reserved@a\endcsname,}\zap@space}
\def\DeclareOption{\expandafter\let\csname opt@#3.#1\expandafter\endcsname\csname opt@reserved\reserved@a\endcsname}
\end{verbatim}

\end{document}
\let\@fileswithoptions@badrequireerror
\Ifstar\@defdefault@ds\@declareoption}
\long\def\@declareoption#1#2{%
\xdef\@declaredoptions{\@declaredoptions,#1}%
\toks@{#2}%
\expandafter\edef\csname ds@#1\endcsname{\the\toks@}}%
\long\def\@defdefault@ds#1{%
\toks@{#1}%
\edef\default@ds{\the\toks@}}%
\@onlypreamble\DeclareOption
\@onlypreamble\@declareoption
\@onlypreamble\@defdefault@ds
\end{verbatim}

(End definition for \DeclareOption and \DeclareOption*)

\OptionNotUsed\@remove@eq@value
If we are in a class file, add \CurrentOption to the list of unused options. Otherwise, in a package file do nothing.
\end{verbatim}

\end{verbatim}

(End definition for \OptionNotUsed and \@remove@eq@value.)

\default@ds\@remove@eq@value
The default option code. Set by \@onefilewithoptions to either \OptionNotUsed for classes, or \@unknownoptionerror for packages. This may be reset in either case with \DeclareOption*.
\end{verbatim}

(End definition for \default@ds.)
\ProcessOptions\ProcessOptions*

\ProcessOptions calls \ds@option for each known package option, then calls \default@ds for each option on the local options list. Finally resets all the declared options to \relax. The empty option does nothing, this has to be reset on the off chance it’s set to \relax if an empty element gets into the \@declaredoptions list.

The star form is similar but executes options given in the order specified in the document, not the order they are declared in the file. In the case of packages, global options are executed before local ones.

\def\ProcessOptions{% 
  \let\ds@@empty 
  \edef\@curroptions{\@ptionlist{\@curpname.@current}}% 
  \@ifstar\@xprocess@ptions\@process@ptions
\@onlypreamble\ProcessOptions
\def\@process@ptions{% 
  \@for\CurrentOption:=\@declaredoptions\do{ 
    \ifx\CurrentOption\@empty\else 
      \@expandtwoargs\in@{,\CurrentOption,}{% 
        ,\ifx\@currext\@clsextension\else\@classoptionslist,\fi 
        \@curroptions,}% 
      \ifin@
        \@use@ption 
        \expandafter\let\csname ds@\CurrentOption\endcsname\@empty 
      \fi
    \fi} 
\@process@ptions
\@onlypreamble\@process@ptions
}
The common part of \ProcessOptions and \ProcessOptions*.

Clear all the definitions for option code. First set all the declared options to \relax, then reset the ‘default’ and ‘empty’ options, and the lst of declared options.

There should not be any non-empty definition of \CurrentOption at this point, as all the declared options were executed earlier. This is for compatibility with 2.09 styles which use \def ds@... directly, and so have options which do not appear in \@declaredoptions.

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
\options  \options is a synonym for \ProcessOptions* for upward compatibility with \TeX\ 2.09 style files.
\def\@options{\ProcessOptions*}
\@onlypreamble\@options
(End definition for \options.)
\executeoptions Execute the code for the current option.
\def\executeoptions#1{\@fortmp\begin{verbatim}
Use \@fortmp here as it is anyway cleared during \@for loop so does not change any existing names.
\edef\@fortmp{\zap@space#1 \@empty}\
\def\reserved@a##1\@nil{\@for\CurrentOption:=\@fortmp\do\csname ds@\CurrentOption\endcsname}\
\expandafter\reserved@a\CurrentOption\@nil}
\@onlypreamble\executeoptions
(End definition for \executeoptions.)
The top-level commands, which just set some parameters then call the internal command, \@fileswithoptions.

\documentclass
The main new-style class declaration.
\def\documentclass{% 
  \let\documentclass\@twoclasseserror 
  \if@compatibility\else\let\usepackage\RequirePackage\fi 
  \@fileswithoptions\@clsextension} 
(End definition for \documentclass.)

\documentstyle
2.09 style class ‘style’ declaration.
\def\documentstyle{% 
  \makeatletter
input{latex209.def}\makeatother 
  \documentclass} 
(End definition for \documentstyle.)

\RequirePackage
Load package if not already loaded.
\def\RequirePackage{% 
  \@fileswithoptions\@pkgextension} 
(End definition for \RequirePackage.)

\LoadClass
Load class.
\def\LoadClass{% 
  \ifx@currentext@pkgextension 
  \@latex@error 
  \else\input{latex209.def}\fi 
  \documentclass} 
(End definition for \LoadClass.)
\texttt{\@loadwithoptions} Pass the current option list on to a class or package. \texttt{#1} is \texttt{\cls-or-pkgextension}, \texttt{#2} is \texttt{\RequirePackage} or \texttt{\LoadClass}, \texttt{#3} is the class or package to be loaded.

\begin{verbatim}
\def\@loadwithoptions#1#2#3{\expandafter\let\csname opt@#3.#1\expandafter\endcsname\csname opt@\@currname.\@currext\endcsname\expandafter\let\csname @raw@opt@#3.#1\expandafter\endcsname\csname @raw@opt@\@currname.\@currext\endcsname#2{#3}}
\end{verbatim}

\texttt{\LoadClassWithOptions} Load class ‘\texttt{#1}’ with the current option list.

\begin{verbatim}
\def\LoadClassWithOptions{% \@loadwithoptions\@clsextension\LoadClass}
\end{verbatim}

\texttt{\RequirePackageWithOptions} Load package ‘\texttt{#1}’ with the current option list.

\begin{verbatim}
\def\RequirePackageWithOptions{% \AtEndOfPackage{\expandafter\let\csname unprocessedoptions-\@currname.\@currext\endcsname\relax}% \@loadwithoptions\@pkgextension\RequirePackage}
\end{verbatim}

The resetting of the unprocessed options is now done on a par package basis.

\begin{verbatim}
\AtEndOfPackage\expandafter\let\csname unprocessedoptions-\@currname.\@currext\endcsname\relax%
\end{verbatim}
\usepackage To begin with, \usepackage produces an error. This is reset by \documentclass.
\def\usepackage#1#{%
\@latex@error
{\noexpand \usepackage before \string\documentclass}%
\{\noexpand \usepackage may only appear in the document
preamble, i.e., \MessageBreak
between \noexpand \documentclass and
\string \begin{document}.}%
\@gobble}
\@onlypreamble\usepackage
(End definition for \usepackage.)
\NeedsTeXFormat Check that the document is running on the correct system.
\def\NeedsTeXFormat#1{%
\def\reserved@a{#1}%
\ifx\reserved@a\fmtname
\expandafter\@needsformat
\else
\@latex@error{This file needs format '\reserved@a'
\MessageBreak but this is '\fmtname'}{%
The current input file will not be processed
further, \MessageBreak
because it was written for some other flavor of
TeX. \MessageBreak@end}%
\endinput}
\@onlypreamble\@needsformat
\def\@needsf@rmat[#1]{%
\@ifl@t@r\fmtversion{#1}{}%
\@latex@warning@no@line
{You have requested release '#1' of LaTeX, \MessageBreak
but only release '{\fmtversion} is available'}}
\@onlypreamble\@needsf@rmat
(End definition for \NeedsTeXFormat.)
\zap@space \zap@space foo\langle space\rangle\@empty removes all spaces from foo that are not protected by
{ } groups.
\def\zap@space#1 #2{%
#1%
The common part of \documentclass and \usepackage.

\def\@fileswithoptions#1{\@ifnextchar\[%\]{\@fileswith@ptions#1}{\@fileswith@ptions#1[\]}}
\@onlypreamble\@fileswithoptions
\def\@fileswith@ptions#1[#2][#3][#4]{\@ifnextchar\[%\]{\@fileswith@pti@ns#1[#2][#3][#4]}{\@fileswith@pti@ns#1[#2][#3][#4][\]}}
\@onlypreamble\@fileswith@ptions

Then we do some work.

First of all, we define the global variables. Then we look to see if the file has already been loaded. If it has, we check that it was first loaded with at least the current options. If it has not, we add the current options to the package options, set the default version to be 0000/00/00, and load the file if we can find it. Then we check the version number.

Finally, we restore the old file name, reset the default option, and we set the catcode of @.

For classes, we can immediately process the file. For other types, #2 could be a comma separated list, so loop through, processing each one separately.

Save raw class list.

build up a list of calls to @\onefilewithoptions (one for each package) without thrashing the parameter stack.

\def\reserved@b##1,\{% If #1 is \@nnil we have reached the end of the list (older version used \@nil here but \@nil is undefined so \ifx equal to all undefined commands)
If \texttt{\textbackslash{}@nnil#1\@nnil} is true then \texttt{#1} is (presumably) empty (Older code used \texttt{\relax} which is slightly easier to get into \texttt{#1} by mistake, which would spoil this test.)

\begin{verbatim}
\if\@nnil\@nnil\else
    \noexpand\@onefilewithoptions\@clsetext\unexpanded{#2}\unexpanded{#4}\%
\fi
\expandafter\reserved@b
\edef\reserved@a{\zap@space#3 \@empty}\
\edef\reserved@a{\expandafter\reserved@b\reserved@a,\@nnil,}\
\fi
\reserved@a
\end{verbatim}

File U: \texttt{ltclass.dtx} Date: 2022/06/20 Version v1.5c
This macro is used when loading packages or classes.

\load@onefilewithoptions  Have the main argument as #1, so we only need one \expandafter above.

\usepackage{some/local/path/array}
\usepackage{array}


won’t load array.sty twice. It is remotely possible that those are two different files, but as a matter of principles, we will consider that the base file name uniquely identifies a package, regardless of where it lives. This assumption already holds for file hooks, for example, which address the hook to a file by its base name only.

We’ll use \exp@filehook\set\curr@file\nNN to parse the file name and return the \textit{(path)} and \textit{(base+ext)} in separate token lists. Further ahead, most operations use \curr@name which doesn’t have a path attached to it; only few actions prepend \curr@path to \curr@name (namely loading, as we have to respect the given path).

A file substitution isn’t followed just yet because at this point we are parsing user input, so the file is still what the user asked for, and not the file actually loaded.

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
The command `\ver@[file].⟨ext⟩` is used to signal that a package is already loaded, either because it is in fact loaded, or because its loading was suppressed. In minimal installations, said package may not exist but still have its loading suppressed with `\ver@[file].⟨ext⟩`, so before checking if the file exists we have to check that we do need to load it with `@ifl@aded`. If we don’t, then there’s no point in checking for a typo or load-disabling.

`@ifl@aded\@current\@currname`  

In the current preferred approach, a key family name will exist for processing using `ltkeys`. In that case, we replace the previous package options with the new ones, then call the key handler. Otherwise, we use the more classical clash handler.

```latex
\@ifundefined{opt@fam@\@currname.\@currext}{{@onefilewithoptions@clashchk{#2}}}{}
```

The next line seems to be necessary for 2.09 compatibility (the way the code is written there) This seems questionable and should be look at as in 2e it is definitely unnecessary at this point!

`\@reset@ptions`  

First we take the ⟨name⟩ and ⟨ext⟩ given in the argument and check if the file exists, and issue an error otherwise asking for a correction with `@missingfileerror`. For checking if the file exists we use `\@currpath` (usually empty) before `\@currname`.

`\IfFileExists{\@currpath\@currname.\@currext}{}{{\@missing@onefilewithoptions{#2}}}`

If `\@currname` is empty (the user replied to the “Enter file name” prompt with ⟨RETURN⟩), so stop here (do `\@popfilename` to pop the item just added above).

This `\@gobble` omits the date check at the end.

```
\ifx\@currname\@empty
\expandafter\@gobble
\else
```

If the file exists, check if it was load-prevented, and otherwise do the bookkeeping with `\filehook@file@push` then call `\set@curr@file` to set `\@curr@file` (and do any required substitution), then actually load the class/package with `\load@onefile@withoptions`. `\set@curr@file` also needs the file path.

```
\@disable@package@load@do{\@currname.\@currext}{}
\expandafter\filehook@file@push\@currname.\@currext\@currpath\@currname.\@currext\@filehook@set@CurrentFile
```

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
The \setcurrfile line above might have replaced the file, so \currname and \currext may no longer hold the actual package being loaded, so in that case we need to update these two token lists (\currfile holds the file name after replacement, so we parse that).

The requested file is saved in \currpkgreqd to be used in \InputIfFileExists later: if the updated \currname and \currext are used we lose track of the substitution, so \CurrentFile and \CurrentFileUsed will be (incorrectly) the same.

\expandafter\@swaptwoargs\expandafter
\expandafter{\@currpkgreqd} % <
\@currpkgreqd doesn’t take a path because it is used later to assign \opt... and \ver....

\edef\@currpkgreqd{\@currname.\@currext} %
\ifx\CurrentFile\CurrentFileUsed %
\filenameparse\@currfile
\edef\@currpath{\stringmakeletter\filenamearea}%
\edef\@currname{\stringmakeletter\filenamebase}%
\edef\@currext{\stringmakeletter\filenameext}%
\fi
\loadonefilewithoptions{#2} %
\def\@currpkgreqd{%\@currpkgreqd} % >

Now just clean up and exit.
\@expl@@@filehook@file@pop@@}
\expandafter\@firstofone %
Except in the case where \currname is empty, the date is checked against the date marked in the package file:
\@ifl@ter\@currext{\@currname}{#3}{}%
{\@latex@warning@no@line
{You have requested,\oneline, version\MessageBreak
'\#3' of \@cls\space \@currname,\MessageBreak
but only version\MessageBreak
'\@clsextension\space \@currname'\MessageBreak
is available})%
\ifx\@currext\@clsextension\let\LoadClass\@twoloadclasserror\fi}
\@popfilename
\@resetoptions}

If the package is already loaded, check that there were no option clashes.
\def\@onefilewithoptions@clashchk#1{%
\@if@ptions\@currext{\@currname}{#1}{}%
{\@latex@error
{Option clash for \@cls\space \@currname}%
{The package \@currname\space has already been loaded
with options:\otaptionlist{\@currname.\@currext}\MessageBreak
\space\space[\@optionlist{\@currname.\@currext}]\MessageBreak
There has now been an attempt to load it

File U: ltc\texttt{c\texttt{lass}}.dtx Date: 2022/06/20 Version v1.5c 845
Adding the global options:\MessageBreak
  \@ptionlist{\@currname.\@currext},#1\MessageBreak
to your \noexpand\documentclass declaration may fix this.\%

Try typing \space <return> \space to proceed.}}%
Now actually load the file (at this point we are certain it exists, but use `\InputIfFileExists` so that file hooks are executed). `\@currpath` is needed here too.

\begin{verbatim}
\InputIfFileExists{\@currpath\@currpkg@reqd}{}%
{\@latexerror{The \@cls@pkg\@currpkg@reqd failed to load}@ehd}%
\end{verbatim}

In older versions of the code `\@unprocessedoptions` would generate an error for each specified option in a package unless a `\ProcessOptions` has appeared in the package file.

This has changed in 2020. We now use a separate macro per package to avoid interference in case of nested packages. The whole code for handling this issue (GitHub 22) was provided by Hironobu Yamashita, thanks for that.

\begin{verbatim}
\expandafter\let\csname unprocessedoptions-\@currname.\@currext\endcsname\@@unprocessedoptions\csname\@currname.\@currext-h@@k\endcsname\expandafter\let\csname\@currname.\@currext-h@@k\endcsname\@undefined
\end{verbatim}

Catch the case where the packages has handled the options and redefined `\@unprocessedoptions` to \relax (old interface). In that case no error should be produced.

\begin{verbatim}
\ifx\@unprocessedoptions\relax\let\@unprocessedoptions\@undefined\else\csname unprocessedoptions-\@currname.\@currext\endcsname\fi
\end{verbatim}

In either case we drop the macro afterwards as it is no longer needed.

\begin{verbatim}
\expandafter\let\csname unprocessedoptions-\@currname.\@currext\endcsname\@undefined
\end{verbatim}

And same procedure, James, when we are finished loading, except that the hook order is now reversed.

\begin{verbatim}
\expandafter\let\csname unprocessedoptions-\@currname.\@currext\endcsname\@undefined
\end{verbatim}
Now declare the non-generic package and class hooks used above:

\NewHook{package/before}
\NewHook{class/before}
\NewReversedHook{package/after}
\NewReversedHook{class/after}

Because of the way \@onfilewithoptions is changed for rollback handling below we have to define \load@onfilewithoptions when rolling back!

\def\load@onfilewithoptions#1[#2][#3]{%
\@pushfilename
\xdef\@currname{#1}%
\global\let\@currext=#4%
\let\CurrentOption\@empty
\@reset@ptions
\makeatletter
\def\reserved@a{%
\@ifl@aded\@currext{#1}{#2}{%
{\@latex@error
{Option clash for \@cls@pkg\space #1}
The package #1 has already been loaded
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext}]\MessageBreak
There has now been an attempt to load it
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext},#2]
Adding the global options:\MessageBreak
\space\space
Try typing \space <return> \space to proceed.}}%
\@pass@ptions\@currext{#2}{#1}{%
\@latex@warning@no@line
1000⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}%
⟨latexrelease⟩\IncludeInRelease{Hooks and unused options issue}%
⟨latexrelease⟩
Because of the way \@onfilewithoptions is changed for rollback handling below we have to define \load@onfilewithoptions when rolling back!

\def\load@onfilewithoptions#1[#2][#3][#4]{%
\@pushfilename
\xdef\@currname{#1}%
\global\let\@currext=#4%
\let\CurrentOption\@empty
\@reset@ptions
\makeatletter
\def\reserved@a{%
\@ifl@aded\@currext{#1}{#2}{%
{\@latex@error
{Option clash for \@cls@pkg\space #1}
The package #1 has already been loaded
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext}]\MessageBreak
There has now been an attempt to load it
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext},#2]
Adding the global options:\MessageBreak
\space\space
Try typing \space <return> \space to proceed.}}%
\@pass@ptions\@currext{#2}{#1}{%
\@latex@warning@no@line
1000⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}%
⟨latexrelease⟩\IncludeInRelease{Hooks and unused options issue}%
⟨latexrelease⟩
Because of the way \@onfilewithoptions is changed for rollback handling below we have to define \load@onfilewithoptions when rolling back!

\def\load@onfilewithoptions#1[#2][#3][#4]{%
\@pushfilename
\xdef\@currname{#1}%
\global\let\@currext=#4%
\let\CurrentOption\@empty
\@reset@ptions
\makeatletter
\def\reserved@a{%
\@ifl@aded\@currext{#1}{#2}{%
{\@latex@error
{Option clash for \@cls@pkg\space #1}
The package #1 has already been loaded
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext}]\MessageBreak
There has now been an attempt to load it
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext},#2]
Adding the global options:\MessageBreak
\space\space
Try typing \space <return> \space to proceed.}}%
\@pass@ptions\@currext{#2}{#1}{%
\@latex@warning@no@line
1000⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}%
⟨latexrelease⟩\IncludeInRelease{Hooks and unused options issue}%
⟨latexrelease⟩
Because of the way \@onfilewithoptions is changed for rollback handling below we have to define \load@onfilewithoptions when rolling back!

\def\load@onfilewithoptions#1[#2][#3][#4]{%
\@pushfilename
\xdef\@currname{#1}%
\global\let\@currext=#4%
\let\CurrentOption\@empty
\@reset@ptions
\makeatletter
\def\reserved@a{%
\@ifl@aded\@currext{#1}{#2}{%
{\@latex@error
{Option clash for \@cls@pkg\space #1}
The package #1 has already been loaded
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext}]\MessageBreak
There has now been an attempt to load it
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext},#2]
Adding the global options:\MessageBreak
\space\space
Try typing \space <return> \space to proceed.}}%
\@pass@ptions\@currext{#2}{#1}{%
\@latex@warning@no@line
1000⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}%
⟨latexrelease⟩\IncludeInRelease{Hooks and unused options issue}%
⟨latexrelease⟩
Because of the way \@onfilewithoptions is changed for rollback handling below we have to define \load@onfilewithoptions when rolling back!

\def\load@onfilewithoptions#1[#2][#3][#4]{%
\@pushfilename
\xdef\@currname{#1}%
\global\let\@currext=#4%
\let\CurrentOption\@empty
\@reset@ptions
\makeatletter
\def\reserved@a{%
\@ifl@aded\@currext{#1}{#2}{%
{\@latex@error
{Option clash for \@cls@pkg\space #1}
The package #1 has already been loaded
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext}]\MessageBreak
There has now been an attempt to load it
with options:\MessageBreak
\space\space[\@ptionlist{#1.\@currext},#2]
Adding the global options:\MessageBreak
\space\space
Try typing \space <return> \space to proceed.}}%
\@pass@ptions\@currext{#2}{#1}{%
\@latex@warning@no@line
1000⟨/2ekernel|latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨latexrelease⟩\IncludeInRelease{0000/00/00}%
⟨latexrelease⟩\IncludeInRelease{Hooks and unused options issue}%
⟨latexrelease⟩
Because of the way \@onfilewithoptions is changed for rollback handling below we have to define \load@onfilewithoptions when rolling back!
4.1 Hooks

Allow code to be saved to be executed at specific later times.

Save things in macros, I considered using toks registers, (and \addto\hook from the NFSS code, that would require stacking the contents in the case of required packages, so just generate a new macro for each package.)

\begindocumenthook Stuff to appear at the beginning or end of the document.
\enddocumenthook
The access functions.

\def\AtEndOfPackage{\expandafter\g@addto@macro\csname\@currname.\@currext-h@@k\endcsname}
\let\AtEndOfClass\AtEndOfPackage
\@onlypreamble\AtEndOfPackage
\@onlypreamble\AtEndOfClass
\ IncludeInRelease{2020/10/01}\
\begin{document}
\AtBeginDocument{\AddToHook{begindocument}}
\AtEndDocument{\AddToHook{enddocument}}
\EndIncludeInRelease
\ IncludeInRelease{0000/00/00}\
\AtBeginDocument{\AddToHook{env/document/end}} % alternative impl
\EndIncludeInRelease
\end{document}

\def\@cls@pkg{\ifx\@currext\@clsextension document class\else package\fi}
\@onlypreamble\@cls@pkg

(End definition for \AtEndOfPackage and others.)

\def\@unknownoptionerror{\@latex@error{Unknown option '\CurrentOption' for \@cls@pkg\space'\@currname'}{The option '\CurrentOption' was not declared in \@cls@pkg\space'\@currname', perhaps you\MessageBreak misspelled its name.\Try typing \space <return> \space to proceed.}}
\@onlypreamble\@unknownoptionerror

(End definition for \@unknownoptionerror.)
\@unprocessedoptions  Declare an error for each option, unless a \ProcessOptions occurred.
\def\@@unprocessedoptions{%
    \ifx\@current\@pkgextension
        \edef\@curroptions{\@optionlist{\@currname.\@current}}%
        \for\CurrentOption:=\@curroptions\do{%
            \ifx\CurrentOption\@empty\else\@unknownoptionerror\fi}
    \fi}
\onlypreamble\@unprocessedoptions
\onlypreamble\@@unprocessedoptions

(End definition for \@unprocessedoptions.)

\@badrequireerror \RequirePackage or \LoadClass occurs in the options section.
\def\@badrequireerror#1[#2]#3[#4]{%
    \@latex@error {\noexpand\RequirePackage or \noexpand\LoadClass
        in Options Section}\
    {The \@cls@pkg space '{\@currname}' is defective.\MessageBreak
        It attempts to load '#3' in the options section, i.e.,\MessageBreak
        between \noexpand\DeclareOption and \string\ProcessOptions.}}
\onlypreamble\@badrequireerror

(End definition for \@badrequireerror.)

\@twoloadclasserror Two \LoadClass in a class.
\def\@twoloadclasserror{%
    \@latex@error {Two \noexpand\LoadClass commands}\
    {You may only use one \noexpand\LoadClass in a class file}}
\onlypreamble\@twoloadclasserror

(End definition for \@twoloadclasserror.)

\@twoclasseserror Two \documentclass or \documentstyle.
\def\@twoclasseserror#1#{%
    \@latex@error {Two \noexpand\documentclass or \noexpand\documentstyle commands}\
    {The document may only declare one class.}\@gobble}
\onlypreamble\@twoclasseserror

(End definition for \@twoclasseserror.)

4.2 Providing shipment
\two@digits  Prefix a number less than 10 with '0'.
\def\two@digits\ifnum<10 \@empty 0\fi\number\fi

(End definition for \two@digits.)

file\\begin{filecontents*}{\filecontents}{Define \q@curr@file directly (gh/220)}\
\end{filecontents*}

This environment implements inline files. The star-form does not write extra comments
into the file.

⟨/2ekernel⟩
⟨∗ 2ekernel | latexrelease ⟩
⟨latexrelease⟩\IncludeInRelease{2020/10/01}{\filec@ntents}{Define \q@curr@file directly (gh/220)}%
We use \@tempswa to mean no preamble writing and reuse \@files to indicate no overwriting:

\def\filecontents{\@tempswatrue\@filestrue
\@ifnextchar\[\filecontents@opt\filecontents
}
\@namedef{filecontents*}{\@tempswafalse\@filestrue
\@ifnextchar\[\filecontents@opt\filecontents
}

To handle the optional argument we execute for each option the command \filecontents@OPTION if it exist or complain about unknown option.

\def\filecontents@opt[#1]{%
\edef\@fortmp{\zap@space#1 \@empty}%
\@for\reserved@a:=\@fortmp\do{%
\ifcsname filecontents@\reserved@a\endcsname
\csname filecontents@\reserved@a\endcsname
\else
\@latex@error{Unknown filecontents option \reserved@a}%
{Valid options are force (or overwrite), nosearch, noheader}%
\fi}%
\filecontents}

Option force (or overwrite) changes the overwriting switch
\let\filecontents@force\@filesfalse
\let\filecontents@overwrite\@filesfalse % alternative name
and option noheader the preamble switch (which is equivalent to using the star form of the environment).

\let\filecontents@noheader\@tempswafalse

Option nosearch only checks the current directory not the whole \texttt{T\LaTeX} tree for the existence of the file to write.

\def\filecontents@noset{%
\let\filecontents@checkdir\@currdir
\def\filecontents@where{in current directory}}

By default we search the whole tree:
\let\filecontents@checkdir\@empty
\def\filecontents@where{exists on the system}
\begingroup
\@tempcnta=1
\loop
\catcode\@tempcnta=12  %
\advance\@tempcnta\@ne  %
\ifnum\@tempcnta<32  %
\repeat  %
\catcode\``=11  %
\catcode`\^^M=12active%  
\catcode`\^^L=1active%  
\let\relax%  
\catcode`\^^I=1active%
\gdef\filecontents#1{%
\set\@curr@file{filecontents@checkdir#1}%
\edef\q@curr@file{"\@curr@file}%

File U: ltcust.dtx Date: 2022/06/20 Version v1.5c
LuaTeX has more writes (and 18 is safe here).

\chardef\reserved@c\ifx\directlua\@undefined 15 \else 127 \fi%
\openin\@inputcheck\q@curr@file \space%
\ifeof\@inputcheck%
\@latex@note@no@line%
{Writing file ‘\@currdir\@curr@file’}%
\ch@ck7\reserved@c\write\relax%
\@latex@note@no@line%
\let\write\@gobbletwo%
\let\closeout\@gobble%
\else%
\if@filesu%
\@latex@note@no@line%
{File ‘\@curr@file’ already \filecontents@where.\MessageBreak%
Not generating it from this source}%
\let\write\@gobbletwo%
\let\closeout\@gobble%
\else%
\edef\reserved@b{\detokenize\expandafter{\jobname}}%
\ifx\@curr@file\reserved@b%
\@fileswtrue%
\else%
\edef\reserved@b{\reserved@b\detokenize{.tex}}%
\ifx\@curr@file\reserved@b
\@fileswtrue%
\fi%
\fi%
\fi%
\fi%

Closing the \@inputcheck is done here to avoid having to do this in each branch.
If there are active characters in the upper half (e.g., from \texttt{inputenc} there would be confusion so we render everything harmless.

```latex
\count@ 128\relax
\loop\count@ \ifnum\count@<\c@vii
  \advance\count@ 1
\repeat
\edef\E{\@backslashchar end\string{\@currenvir\string}}
\edef\reserved@b{\noexpand\reserved@b
####1\E####2\E####3\relax}
\reserved@b{\ifx\relax##3\relax\immediate\write\reserved@c{##1}\else\immediate\write\reserved@c{##1}\@latex@warning{Writing text '##1' before \string\end\string\@currenvir as last line of \string\curr\string}\fi
\ifx\relax##2\relax\else\@latex@warning{Ignoring text '##2' after \string\end\string\@currenvir}\fi\fi}
\catcode\^^L\active
\let\L\@undefined
\def\^^L{\expandafter\ifx\csname L\endcsname\relax\fi \string
\catcode\^^I\active
\let\I\@undefined
\def\^^I{\expandafter\ifx\csname I\endcsname\relax\fi \space\string
\catcode\^^M\active
\edef\^^M##1\string{##1}
```

There was no \texttt{end}{}\texttt{filecontents}.

```latex
\immediate\write\reserved@c{\ifx\relax
\else\immediate\write\reserved@c{\@latex@warning{Writing text '##1' before \string\end\string\@currenvir as last line of \string\curr\string}\fi
\ifx\relax
\else\@latex@warning{Ignoring text '##2' after \string\end\string\@currenvir}\fi\fi}
```

There was a \texttt{end}{}\texttt{filecontents}, so stop this time.

```latex
\edef\^^M{\noexpand\end{\@currenvir}}
```

Text before the \texttt{end}, write it with a warning.

```latex
\@latex@warning{Writing text '##1' before \string\end\string\@currenvir\MessageBreak as last line of \string\curr\string}\immediate\write\reserved@c{\ifx\relax
\else\immediate\write\reserved@c{\@latex@warning{Writing text '##1' before \string\end\string\@currenvir as last line of \string\curr\string}\fi
\ifx\relax
\else\@latex@warning{Ignoring text '##2' after \string\end\string\@currenvir}\fi\fi}
```

Text after the \texttt{end}, ignore it with a warning.

```latex
\@latex@warning{\MessageBreak\@latex@warning{Ignoring text '##2' after \string\end\string\@currenvir}}
```

File U: ltclass.dtx Date: 2022/06/20 Version v1.5c
5 Package/class rollback mechanism

We no longer prevent the code to be used after begin document (no rollback needed for this change).

The macro (!) \requestedLaTeXdate holds the globally requested rollback date (via \latexrelease) or zero if no such request was made.

\def\requestedLaTeXdate{0}

\pkgcls@debug For testing we have a few extra lines of code that by default do nothing but one can set \pkgcls@debug to \typeout to get extra info. Sometime in the future this will be dropped.

\let\pkgcls@debug\typeout
\let\pkgcls@debug\@gobble

(End definition for \pkgcls@debug.)
If a rollback for a package or class is requested then \pkgcls@targetdate holds the requested date as a number YYYYMMDD (if there was one, otherwise the value of \requestedLaTeXdate) and \pkgcls@targetlabel will be empty. If there was a request for a named version then \pkgcls@targetlabel holds the version name and \pkgcls@targetdate is set to 1. \pkgcls@targetdate=0 is used to indicate that there was no rollback request. While loading an old release \pkgcls@targetdate is also reset to zero so that \DeclareRelease declarations are bypassed.

In contrast \pkgcls@innerdate will always hold the requested date (in a macro not a counter) if there was one, otherwise, e.g., if there was no request or a request to a version name it will contain TeX largest legal number. While loading a file this can be used to provide conditionals that select code based on the request.

\begin{verbatim}
1480 \ifx\pkgcls@targetdate\@undefined
1481 \newcounter{\pkgcls@targetdate}
1482 \fi
1483 \let\pkgcls@targetlabel\@empty
1484 \def\pkgcls@innerdate{\maxdimen}
\end{verbatim}

When looping through the \DeclareRelease declarations we record if the release is the best candidate we have seen so far. This is recorded in \pkgcls@candidate and we update it whenever we see a better one.

In \pkgcls@releasedate we keep track of the release date of that candidate.

\begin{verbatim}
1485 \let\pkgcls@candidate\@empty
1486 \let\pkgcls@releasedate\@empty
\end{verbatim}

the best place to add the rollback code is at the point where \@onefilewithoptions is called to load a single class or package.

To make things easy we save the old definition as \load@onefilewithoptions and then provide a new interface.

Important: as this code is also unconditionally placed into latexrelease we can only do this name change once otherwise both macros will contain the same code.

\begin{verbatim}
1487 \ifx\load@onefilewithoptions\@undefined
1488 \let\load@onefilewithoptions\@onefilewithoptions
1489 \def\@onefilewithoptions#1[#2][#3][#4]{
\end{verbatim}

First a bit of tracing normally disabled.

\begin{verbatim}
1490 \let\tracerollback\null
1491 \pkgclsdebug{--- File loaded request (noexpand\usepackage or ...)}%
1492 \pkgclsdebug{@spaces 1: #1}%
1493 \pkgclsdebug{@spaces 2: #2}%
1494 \pkgclsdebug{@spaces 3: #3}%
1495 \pkgclsdebug{@spaces 4: #4}%
1496 \let\tracerollback\null
\end{verbatim}

Two of the arguments are needed later on in error/warning messages so we save them.

\begin{verbatim}
1497 \def\pkgcls@name(#1)% % for info message
1498 \def\pkgcls@arg (#3)% % for info message
\end{verbatim}
then we parse the final optional argument to determine if there is a specific rollback request for the current file. This will set \pkgcls@targetdate, \pkgcls@targetlabel and \pkgcls@mindate.

\pkgcls@parse@date@arg\% When determining the correct release to load we keep track of candidates in \pkgcls@candidate and initially we don’t have any:

\let\pkgcls@candidate\@empty

If we had a rollback request then \#3 may contain data but not necessarily a “minimal date” so instead of passing it on we pass on the content of \pkgcls@mindate. We need to pass the value not the command, otherwise nested packages may pick up the wrong information.

\begin{group}
\edef\reserved@a{\endgroup
\unexpanded{\load@onefilewithoptions#1[#2]}\%
\unexpanded{\pkgcls@mindate}\%
\unexpanded{\#4}\%
\reserved@a
\i
\end{group}

(End definition for \load@onefilewithoptions and \@onefilewithoptions.)

\pkgcls@parse@date@arg The \pkgcls@parse@date@arg command parses the second optional argument of \usepackage, \RequirePackage or \documentclass for a rollback request setting the values of \pkgcls@targetdate and \pkgcls@targetlabel.

This optional argument has a dual purpose: If it just contains a date string then this means that the package should have at least that date (to ensure that a certain feature is actually available, or a certain bug has been fixed). When the package gets loaded the information in \Provides... will then be checked against this request.

But if it starts with an equal sign followed by a date string or followed by a version name then this means that we should roll back to the state of the package at that date or to the version with the requested name.

If there was no optional argument or the optional argument does not start with “=” then the \pkgcls@targetdate is set to the date of the overall rollback request (via latexrelease) or if that was not given it is set to 0. In either case \pkgcls@targetlabel will be made empty.

If the argument doesn’t start with “=” then it is supposed to be a “minimal date” and we therefore save the value in \pkgcls@mindate, otherwise this macro is made empty.

So in summary we have:

\begin{tabular}{|l|l|l|l|}
\hline
Input & \pkgcls@targetdate & \pkgcls@targetlabel & \pkgcls@mindate \\
\hline
\texttt{\{empty\}} & \{global-rollbackdate-as-number\} & \{empty\} & \{empty\} \\
\texttt{\{date\}} & \{global-rollbackdate-as-number\} & \{empty\} & \{date\} \\
\texttt{\{date\}} & \{date-as-number\} & \{empty\} & \{empty\} \\
\texttt{\{version\}} & 1 & \{version\} & \{empty\} \\
\texttt{\{other\}} & \{global-rollbackdate-as-number\} & \{empty\} & \{other\} \\
\hline
\end{tabular}

where \{global-rollbackdate-as-number\} is a date request given via latexrelease or if there wasn’t one 0.

\def\pkgcls@parse@date@arg #1{%
If the argument is empty we use the rollback date from `latexrelease` which has the value of zero if there was no rollback request. The label and the minimal date is made empty in that case.

```latex
\ifx\@nil#1\@nil
  \pkgcls@targetdate\requestedLaTeXdate\relax
  \let\pkgcls@targetlabel\@empty
  \let\pkgcls@mindate\@empty
\else
  \pkgcls@parse@date@arg@#1=\@nil\relax
\fi
```

Otherwise we parse the argument further, checking for a `=` as the first character. We append a `=` at the end so that there is at least one such character in the argument.

```latex
\else
  \pkgcls@parse@date@arg@#1=\@nil\relax
\fi
```

The actual parsing work then happens in `\pkgcls@parse@date@arg@`:

```latex
\def\pkgcls@parse@date@arg@#1=#2\@nil{%
  We set `\pkgcls@targetdate` depending on the parsing result; the code is expandable so we can do the parsing as part of the assignment.

  `\pkgcls@targetdate`
  If a `=` was in first position then `#1` will be empty. In that case `#2` will be the original argument with a `=` appended.

  This can be parsed with `\@parse@version`, the trailing character is simply ignored. This macro returns the parsed date as a number (or zero if it wasn’t a date) and accepts both YYYY/MM/DD and YYYY-MM-DD formats.

  `\@parse@version` doesn’t allow for a leading `@` and so we must append an `=` to the argument.

  Whatever is returned is thus assigned to `\pkgcls@targetdate` and therefore we can now test its value. If the value is zero we assume that the remaining argument string represents a version and change `\pkgcls@targetdate` and set `\pkgcls@targetlabel` to the version name (after stripping off the trailing `=`).

  `\ifnum \pkgcls@targetdate=\z@`
  `\pkgcls@targetdate\@ne`
  `\def\pkgcls@innerdate{\@maxdimen}`
  `\pkgcls@parse@date@arg@version#2`%
  `\else`
  `\def\pkgcls@innerdate{\the\pkgcls@targetdate}`%
  `\fi`
  `\let\pkgcls@mindate\@empty`
  `\else`

  If `#1` was not empty then there wasn’t a `=` character in first position so we are dealing either with a “minimum date” or with some incorrect data. We assume the former and make the following assignments (the first one finishing the assignment of `\pkgcls@targetdate`):

  `\requestedLaTeXdate\relax`
  `\let\pkgcls@targetlabel\@empty`
  `\def\pkgcls@innerdate{\@maxdimen}`
  `\def\pkgcls@mindate[#1]`%
```
If the min-date is after the requested rollback date (if there is any, i.e., if it is not zero) then we have a conflict and therefore issue a warning.

\ifnum \pkgcls@targetdate > \z@
  \ifnum \@parse@version#1//00\@nil > \pkgcls@targetdate
    \@latex@warning@no@line{Suspicious rollback/min-date date given}
    A minimal date of #1 has been specified for
    \@cls@pkg\MessageBreak \pkgcls@name'. \MessageBreak
    But this is in conflict
    with a rollback request to \requestedpatchdate}
  \fi
  \fi
\fi

Strip off the trailing = and assign the version name to \pkgcls@targetlabel.
\def\pkgcls@parse@date@arg@version#1={%
\def\pkgcls@targetlabel{#1}}

\DeclareRelease

First argument is the “name” of the release and it can be left empty if one doesn’t like to give a name to the release. The second argument is that from which on this release was available (or should be used in case of minor updates). The final argument is the external file name of this release, by convention this should be ⟨pkg/cls-name⟩⟨date⟩⟨extension⟩ but this is not enforced and through this argument one can overwrite it.

\def\DeclareRelease#1#2#3{%
  \ifnum\pkgcls@targetdate>\z@ % some sort of rollback request
    \pkgcls@debug{---\string\DeclareRelease:}%
    \pkgcls@debug{\@spaces 1: #1}%
    \pkgcls@debug{\@spaces 2: #2}%
    \pkgcls@debug{\@spaces 3: #3}%
  \fi
  \else % End definition for \pkgcls@parse@date@arg

If the date argument #2 is empty we are dealing with a special release that should be only accessible via its name; a typical use case would be a “beta” release. So if we are currently processing a date request we ignore it and otherwise we check if we can match the name and if so load the corresponding release file.

\ifx\@nil#2\@nil
  \ifnum\pkgcls@targetdate=\@ne % named request
    \def\reserved@a{#1}%
    \ifx\pkgcls@targetlabel\reserved@a
      \pkgcls@use@this@release{#3}{}
    \else
      \pkgcls@debug{Label doesn’t match}%
    \fi
  \else
    \pkgcls@debug{Date request: ignored}%
  \fi
\else
  \ifx\@nil#2\@nil
    \ifnum\pkgcls@targetdate=\@ne % named request
      \def\reserved@a{#1}%
      \ifx\pkgcls@targetlabel\reserved@a
        \pkgcls@use@this@release{#3}{}
      \else
        \pkgcls@debug{Label doesn’t match}%
      \fi
    \else
      \pkgcls@debug{Date request: ignored}%
    \fi
  \else
    \fi
\fi

\endinput
If the value of `\pkgcls@targetdate` is greater than 1 (or in reality greater than something like 19930101) we are dealing with a rollback request to a specific date.

\ifnum\pkgcls@targetdate>\@ne % a real request

So we parse the date of this release to check if it is before or after the request date.

\ifnum\@parse@version\$2/00\@nil
\else
\fi

If it is after we have to distinguish between two cases: If there was an earlier candidate we use that one because the other is too late, but if there wasn’t one (i.e., if current release is the oldest that exists) we use it as the best choice. However in that case something is wrong (as there shouldn’t be a rollback to a date where a package used doesn’t yet exists. So we make a complained to the user.

\ifx\pkgcls@candidate\@empty
\else
\fi

Otherwise, if the release date of this version is before the target rollback and we record it as a candidate. But we don’t use it yet as there may be another release which is still before the target rollback.

\def\pkgcls@candidate{#3}%
\def\pkgcls@releasedate{#2}%
\langle∗
tracerollback
⟩
\pkgcls@debug{New candidate: #3}%
\langle/
tracerollback
⟩
\fi
\else
\fi

If we end up in this branch we have a named version request. So we check if `\pkgcls@targetlabel` matches the current name and if yes we use this release immediately, otherwise we do nothing as a later declaration may match it.

\def\reserved@a{#1}%
\ifx\pkgcls@targetlabel\reserved@a
\else
\fi
\fi
\else
\fi

\}
(End definition for \DeclareRelease.)

\pkgcls@use@this@release If a certain release has been selected (stored in the external file given in #1) we need to input it and afterwards stop reading the current file.

\def\pkgcls@use@this@release#1#2%
Before that we record the selection made inside the transcript.

\pkgcls@showselection(#1)(#2)

We then set the \pkgcls@targetdate to zero so that any \DeclareRelease or \DeclareCurrentRelease in the file we now load are bypassed\footnote{The older release may also have such declarations inside if it was a simply copy of the .sty or .cls file current at that date. Removing these declarations would make the file load a tiny bit faster, but this way it works in any case.} and then we finally load the correct release.

After loading that file we need to stop reading the current file so we issue \endinput. Note that the \relax before that is essential to ensure that the \endinput is only happening after the file has been fully processed, otherwise it would act after the first line of the \@@input!

\pkgcls@targetdate z@\@@input #1\relax \endinput

(End definition for \pkgcls@use@this@release.)

\pkgcls@showselection

This command records what selection was made. As that is needed in two places (and it is rather lengthy) it was placed in a separate command. The first argument is the name of the external file that is being loaded and is only needed for debugging. The second argument is the date that corresponds to this file and it is used as part of the message.

\def\pkgcls@showselection#1#2{\langle∗\tracerollback⟩\pkgcls@debug{Result: use #1}\langle\/tracerollback⟩\GenericInfo{\@spaces\@spaces\space}{Rollback for \@cls@pkg\space‘\@currname’ requested -> \ifnum\pkgcls@targetdate>_@ne date \ifnum\requestedLaTeXdate=\pkgcls@targetdate \requestedpatchdate \else \expandafter\@gobble\pkgcls@arg \fi.\MessageBreak Instead of “best approximation” we could say that we have been able to exactly match the date (if it is exact), but that would mean extra tests without much gain, so not done. Best approximation is \else \version ‘\pkgcls@targetlabel’.\MessageBreak This corresponds to \fi \ifx\@nil#2\@nil a special release\% \else the release introduced on #2\% \fi \@gobble}\rangle\rangle
\pkgcls@rollbackdate@error  This is called if the requested rollback date is earlier than the earliest known release of a
package or class.

A similar error is given if global rollback date and min-date on a specific package
conflict with each other, but that case is happens only once so it is inlined.

\begin{verbatim}
\def\pkgcls@rollbackdate@error#1{\latex@error{Suspicious rollback date given}\MessageBreak
  (The \pkg\space'\currname' has no rollback data before #1 which\MessageBreak
  is after your requested rollback date --- so something may be wrong here.\MessageBreak
  Continue and we use the earliest known release.)}
\end{verbatim}

\DeclareCurrentRelease  This declares the date (and possible name) of the current version of a package or class.

\begin{verbatim}
\def\DeclareCurrentRelease#1#2{\ifnum\pkgcls@targetdate>\z@ % some sort of rollback request
  (tracerollback)\pkgcls@debug{---DeclareCurrentRelease}\pkgcls@debug{ 1: #1}\pkgcls@debug{ 2: #2} (tracerollback)
  \ifnum\pkgcls@targetdate>\@ne % a date request
    \ifnum\@parse@version#2//00\@nil >\pkgcls@targetdate
      \ifx\pkgcls@candidate\@empty \pkgcls@rollbackdate@error{#2} \else \pkgcls@use@this@release\pkgcls@candidate \fi
    \else \pkgcls@show@selection{current version}{#2} \fi
  \else % a label request
  \fi\fi\fi
\end{verbatim}

File U: \texttt{ltclass.dtx} Date: 2022/06/20 Version v1.5c 866
Otherwise we have a rollback request to a named version so we check if that fits the current name and if not give an error as this was the last possible opportunity.

\IfTargetDateBefore

This enables a simple form of conditional code inside a class or package file. If there is a date request and the request date is earlier than the first argument the code in the second argument is processed otherwise the code in the third argument is processed. If there was no date request then we also execute the third argument, i.e., we will get the “latest” version of the file.

Most often the second argument (before-date-code) will be empty.

\AfterPreamble

After Preamble

Finally we declare a package that allows all the commands declared above to be \onlypreamble to be used after \begin{document}.

\AfterPreamble
1 Creating and using keyval options

As with any key–value input, using key–value pairs as package or class options has two parts: creating the key options and setting (using) them. Options created in this way may be used after package loading as general key–value settings: this will depend on the nature of the underlying code.

\DeclareKeys \[\{family\}\] \{(declarations)\}

Creates a series of options from a comma-separated \textit{(declarations)} list. Each entry in this list is a key–value pair, with the \textit{(key)} having one or more \textit{(properties)}. A small number of “basic” \textit{(properties)} are described below. The full range of properties, provided by \texttt{l3keys}, can also be used for more powerful processing. See \texttt{interface3} for the full details.

The basic properties provided here are

- \texttt{.code} — execute arbitrary code
- \texttt{.if} — sets a \TeX~\texttt{\if...} switch
- \texttt{.store} — stores a value in a macro
- \texttt{.usage} — defines whether the option can be given only when loading (\texttt{load}), in the preamble (\texttt{preamble}) or has no limitation on scope (\texttt{general})

The part of the \textit{(key)} before the \textit{(property)} is the \textit{(name)}, with the \textit{(value)} working with the \textit{(property)} to define the behaviour of the option.

For example, with

\begin{verbatim}
\DeclareKeys[mypkg]
{
    draft.if = @mypkg@draft ,
    draft.usage = preamble ,
    name.store = @mypkg@name ,
    name.usage = load ,
    second-name.store = @mypkg@other@name
}
\end{verbatim}

three options would be create. The option \texttt{draft} can be given anywhere in the preamble, and will set a switch called \texttt{\if@mypkg@draft}. The option \texttt{name} can only be given during package loading, and will save whatever value it is given in \texttt{@mypkg@name}. Finally, the option \texttt{second-name} can be given anywhere, and will save its value in \texttt{@mypkg@other@name}.

Keys created \textit{before} the use of \texttt{\ProcessKeyOptions} act as package options.

\DeclareUnknownKeyHandler \[\{family\}\] \{(code)\}

The function \texttt{\DeclareUnknownKeyHandler} may be used to define the behavior when an undefined key is encountered. The \textit{(code)} will receive the unknown key name as \texttt{#1} and the value as \texttt{#2}. These can then be processed as appropriate, e.g. by forwarding to another package.
\ProcessKeyOptions \ProcessKeyOptions ([family])

The \ProcessKeyOptions function is used to check the current option list against the keys defined for (family). Global (class) options and local (package) options are checked when this function is called in a package.

\SetKeys \SetKeys ([family]) { (keyvals) }

Sets (applies) the explicit list of (keyvals) for the (family): it the latter is not given, the value of \@currname used. This command may be used within a package to set options before or after using \ProcessKeyOptions.

1.1 Implementation of ltkeys

\ExplSyntaxOn
1.2 Key properties

\group_begin:
\cs_set_protected:Npn \__keys_tmp:nn #1#2
\{ \quark_if_recursion_tail_stop:n {#1} \cs_new_eq:cc
\{ \c__keys_props_root_str . #2 \}
\{ \c__keys_props_root_str . #1 \}
\__keys_tmp:nn \}
\__keys_tmp:nn \{ code:n \} \{ code \}
\{ legacy_if_set:n \} \{ if \}
\{ tl_set:N \} \{ store \}
\{ usage:n \} \{ usage \}
\{ \q_recursion_tail \} \{ \}
\q_recursion_stop
\group_end:

(End definition for .code and others.)

1.3 Main mechanism

\cs_generate_variant:Nn \clist_put_right:Nn \l__keys_options_clist
A single list is used for all options, into which they are collected before processing.
\clist_new:N \l__keys_options_clist

(End definition for \l__keys_options_clist.)

\l__keys_options_loading_bool

Used to indicate we are in the loading phase: controls the outcome of warnings.
The main function calls functions to collect up the global and local options into \_\_\_\_\_\_\_keys_options_clist before calling the underlying functions to actually do the processing. So that a suitable message is produced if the option is unknown, the special unknown key is set if it does not already exist for the current family, and is cleaned up afterwards if required. To allow the \LaTeX 2\epsilon layer to know this mechanism is active, and to deal with the key family not matching the file name, we store the family in all cases.

\begin{verbatim}
\cs_new_protected:Npn \__keys_options:n #1
\{ \__keys_options_expand_module:Nn \__keys_options_aux:n \{#1\} \}
\cs_new_protected:Npn \__keys_options_aux:n #1
\{ { \cs_gset_nopar:cpn \{ opt@fam@\@currname.\@currext \} \{#1\} } \}
\cs_set_protected:Npn \__keys_option_end: { \}
\clist_clear:N \l__keys_options_clist
\__keys_options_global:n \{#1\}
\__keys_options_local:
\keys_if_exist:nnF \{#1\} \{ unknown \}
\{ {
\keys_define:nn \{#1\}
\{ unknown .code:n = 
\{ { \msg_error:nnxx \{ keys \} \{ option-unknown \}
\{ \l_keys_key_str \} \{ \@currname \}
\}
\}
\}
\cs_set_protected:Npn \__keys_option_end: { \keys_define:nn \{#1\} \{ unknown .undefine: \} \}
\}
\bool_set_true:N \l__keys_options_loading_bool
\keys_set:nV \{#1\} \l__keys_options_clist
\bool_set_false:N \l__keys_options_loading_bool
\AtEndOfPackage \{ \cs_set_eq:NN \@unprocessedoptions \scan_stop: \}
\__keys_option_end:
\__keys_options_loaded:n \{#1\}
\msg_new:nnnn \{ keys \} \{ option-unknown \}
\{ Unknown-option-'#1'-for-package-'#2'. \}
\{ \LaTeX-has-been-asked-to-set-an-option-called-'#1'-but-the-'#2-package-has-not-created-an-option-with-this-name. \}
\}
\end{verbatim}

(End definition for \_\_\_\_\_\_\_keys_options:n, \_\_\_\_\_\_\_keys_options_aux:n, and \_\_\_\_\_\_\_keys_options_end:.)

\_\_\_\_\_\_\_keys_options_global:n

Global (class) options are handled differently for \LaTeX 2\epsilon packages and classes. Hence this function is essentially a check on the current file type. The initial test is needed as \LaTeX 2\epsilon allows variables to be equal to \scan_stop:, which is usually forbidden in expl3 code.

\begin{verbatim}
\cs_new_protected:Npn \__keys_options_global:n \{#1\}
{ \cs_if_eq:NNF \@raw@classoptionslist \scan_stop: \}
{ \cs_if_eq:NNF \@unprocessedoptions \scan_stop: \}
\}
\end{verbatim}

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\_keys_options_class:n
\_keys_options_class:nnn

For classes, each option (stripped of any content after =) is checked for existence as a key. If found, the option is added to the combined list for processing. On the other hand, unused options are stored up in \@unusedoptionlist. Before any of that, though, there is a simple check to see if there is an unknown key. If there is, then everything will match and the mapping can be skipped.

\cs_new_protected:Npn \_keys_options_class:n #1
\{ 
 \cs_if_free:cF \{ @raw@opt@ \@currname . \@currext \}
 \{ 
 \keys_if_exist:nnTF {#1} { unknown } 
 \{ 
 \clist_put_right:Nv \l__keys_options_clist 
 \{ @raw@opt@ \@currname . \@currext \} 
 \} 
 \{ 
 \clist_map_inline:cn \{ @raw@opt@ \@currname . \@currext \} 
 \{ 
 \exp_args:Ne \_keys_options_class:nnn 
 \{\_keys_remove_equals:n \{##1\} \} 
 \{##1\} \{#1\} 
 \} 
 \} 
\}
\cs_new_protected:Npn \_keys_options_class:nnn #1#2#3
\{ 
 \clist_map_inline:Nn \@raw@classoptionslist 
 \{ 
 \exp_args:Ne \_keys_options_class:nnn 
 \{\_keys_remove_equals:n \{##1\} \} 
 \{##1\} \{#1\} 
 \} 
\}

(End definition for \_keys_options_global:n)

\_keys_options_package:n
\_keys_options_package:nnn

For global options when processing a package, the tasks are slightly different from those for a class. The check is the same, but here there is nothing to do if the option is not applicable. Each valid option also needs to be removed from \@unusedoptionlist.

\cs_new_protected:Npn \_keys_options_package:n #1
\{ 
 \clist_map_inline:Nn \@raw@classoptionslist 
 \{ 
 \exp_args:Ne \_keys_options_package:nnn 
 \{\_keys_remove_equals:n \{##1\} \} 
 \} 
\}

(End definition for \_keys_options_class:n and \_keys_options_class:nnn.)
\cs_new_protected:NNn \__keys_options_package:nnn \#1\#2\#3
\keys_if_exist:nnT \#3 \#1
\clist_put_right:Nn \l__keys_options_clist \#2
\clist_remove_all:Nn \@unusedoptionlist \#1
\}

(End definition for \__keys_options_package:n and \__keys_options_package:nnn.)

\__keys_options_local: If local options are found, they are added to the processing list. \LaTeX \TeX uses options for each file in a macro which may or may not exist, hence the need to use \cs_if_exist:c.
\cs_new_protected:NNn \__keys_options_local:
\cs_if_eq:NNF \@currext \@clsextension
\cs_if_exist:cT \raw@opt\@currname . \@currext
\clist_put_right:Nn \l__keys_options_clist \raw@opt\@currname . \@currext
\}
\}

(End definition for \__keys_options_local::)

\__keys_remove_equals:n \__keys_remove_equals:w
As the name suggests, this is a simple function to remove an equals sign from the input. This is all wrapped up in an n function so that there will always be a sign available.
\cs_new:Npn \__keys_remove_equals:n #1
\{ \__keys_remove_equals:w #1 = \s__keys_stop \}
\cs_new:Npn \__keys_remove_equals:w #1 = #2 \s__keys_stop \{ \exp_not:n \{#1\} \}

(End definition for \__keys_remove_equals:n and \__keys_remove_equals:w.)

1.4 The document interfaces
\cs_generate_variant:Nn \keys_define:nn \{ nx \}
\__keys_options_expand_module:Nn \__keys_options_expand_module:nN
To deal with active characters inside the module argument whilst also expanding that argument, we use a combination of c- and f-type expansion. This works as the definitions for active UTF-8 bytes contain an \ifincsname test.
\cs_new:Npn \__keys_options_expand_module:Nn \#1\#2
\{ \cs:w _\keys_options_expand_module:nN \use:e \{ \cs_end: \{\#2\} \} \#1 \}
\cs_new_protected:NNn \__keys_options_expand_module:nN \#1\#2
\{ \#2 \{\#1\} \}

(End definition for \__keys_options_expand_module:Nn and \__keys_options_expand_module:nN.)
Defining key options is quite straight-forward: we have an intermediate function to allow for potential set-up steps.

\begin{verbatim}
\NewDocumentCommand \DeclareKeys { O { \@currname } +m } {
\__keys_options_expand_module:Nn \keys_define:nn {#1} {#2} }
\end{verbatim}

(End definition for \DeclareKeys. This function is documented on page 868.)

\begin{verbatim}
\NewDocumentCommand \DeclareUnknownKeyHandler { O { \@currname } +m } {
\cs_set_protected:cpn { __keys_unknown_handler_ #1 :nn } ##1##2 {#2}
\__keys_options_expand_module:Nn \keys_define:nx {#1}
\begin{verbatim}
\unknown .code:n =\exp_not:N \exp_args:NV
\exp_not:c { __keys_unknown_handler_ #1 :nn }
\exp_not:N \l_keys_key_str {###1}
\end{verbatim}
}
\end{verbatim}

(End definition for \DeclareUnknownKeyHandler. This function is documented on page 868.)

\begin{verbatim}
\NewDocumentCommand \ProcessKeyOptions { O { \@currname } } {
\__keys_options:n {#1} }
\@onlypreamble \ProcessKeyOptions
\end{verbatim}

(End definition for \ProcessKeyOptions. This function is documented on page 869.)

1.5 Option usage scope

Indicates that the load-time options for a package have been processed: once this has happened, make them unavailable either with a warning or an error.

\begin{verbatim}
\cs_new_protected:Npn \__keys_options_loaded:n #1
\begin{verbatim}
{ \prop_get:NnNT \l_keys_usage_load_prop (#1) \l__keys_tmpa_tl
{ \clist_map_inline:Nn \l__keys_tmpa_tl
{ \keys_define:nn (#1)
{ ##1 .code:n = \__keys_options_loaded:nn {#1} {##1}
}
}
\end{verbatim}
\cs_new_protected:Npn \__keys_options_loaded:nn #1#2
\begin{verbatim}
{ \bool_if:NTF \l__keys_options_loading_bool
{ \msg_warning:nnxx { keys } { load-option-ignored } }
\end{verbatim}
\end{verbatim}

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\{ \use:c { opt@fam\@\curname.\@currext } \} {#2}
\msg_error:nnnn { keys } { load-only } {#1} {#2} 
\msg_new:nnn { keys } { load-option-ignored }
\{ Package-"#1"-has-already-been-loaded:-ignoring-load-time-option-"#2". \}
\msg_new:nnn { keys } { load-only }
\{ Key-"#2"-may-only-be-used-in-the-during-loading-of-package-"#1". \}
\{ LaTeX-was-asked-to-set-a-key-called-"#2",-but-this-is-only-allowed-
in-the-optional-argument-when-loading-package-"#1". \}
\msg_new:nnnn { keys } { preamble-only }
\{ Key-"#1"-may-only-be-used-in-the-preamble. \}
\{ LaTeX-was-asked-to-set-a-key-called-"#1",-but-this-is-only-allowed-
before-\begin{document}.-You-will-need-to-set-the-key-earlier. \}
\msg_error:nnn { keys } { preamble-only } {#1} {#2} 
\tl_gput_left:Nn \@kernel@after@begindocument
\{
\prop_map_inline:Nn \l_keys_usage_preamble_prop
\{
\clist_map_inline:nn {#2}
\{\keys_define:nn {#1}
\{##1 .code:n = \msg_error:nnn { keys } { preamble-only } {##1}
\}
\}
\}
\msg_new:nnnn { keys } { preamble-only }
\{ Key-"#1"-may-only-be-used-in-the-preamble. \}
\{ LaTeX-was-asked-to-set-a-key-called-"#1",-but-this-is-only-allowed-
before-\begin{document}.-You-will-need-to-set-the-key-earlier. \}
\}
\msg_new:nnnn { keys } { load-option-ignored }
\{ Package-"#1"-has-already-been-loaded:-ignoring-load-time-option-"#2". \}
\msg_new:nnn { keys } { load-only }
\{ Key-"#2"-may-only-be-used-in-the-during-loading-of-package-"#1". \}
\{ LaTeX-was-asked-to-set-a-key-called-"#2",-but-this-is-only-allowed-
in-the-optional-argument-when-loading-package-"#1". \}
\msg_new:nnnn { keys } { preamble-only }
\{ Key-"#1"-may-only-be-used-in-the-preamble. \}
\{ LaTeX-was-asked-to-set-a-key-called-"#1",-but-this-is-only-allowed-
before-\begin{document}.-You-will-need-to-set-the-key-earlier. \}
\}

\SetKeys A simple wrapper.
\NewDocumentCommand \SetKeys { O { \@currname } +m }
\{ \__keys_options_expand_module:Nn \keys_set:nn {#1} {#2} \}
(End definition for \SetKeys. This function is documented on page 869.)
\ExplSyntaxOff
(\2ekernel)

1.6 General key setting
\SetKeys A simple wrapper.
\NewDocumentCommand \SetKeys { O { \@currname } +m }
\{ \__keys_options_expand_module:Nn \keys_set:nn {#1} {#2} \}
(End definition for \SetKeys. This function is documented on page 869.)
1 Introduction

1.1 Provided hooks

The code offers a number of hooks into which packages (or the user) can add code to support different use cases. Many hooks are offered as pairs (i.e., the second hook is reversed. Also important to know is that these pairs are properly nested with respect to other pairs of hooks.

There are hooks that are executed for all files of a certain type (if they contain code), e.g., for all “include files” or all “packages”, and there are also hooks that are specific to a single file, e.g., do something after the package \texttt{foo.sty} has been loaded.

1.2 General hooks for file reading

There are four hooks that are called for each file that is read using document-level commands such as \texttt{\input}, \texttt{\include}, \texttt{\usepackage}, etc. They are not called for files read using internal low-level methods, such as \texttt{\@input} or \texttt{\openin}.

These are:

\begin{itemize}
  \item \texttt{file/before}
  \item \texttt{file/⟨file-name⟩/before}
  \item \texttt{file/⟨file-name⟩/after}
  \item \texttt{file/after}
\end{itemize}

These hooks are executed in that order just before the file is loaded for reading. The code of the first hook is used with every file, while the second is executed only for the file with matching \texttt{⟨file-name⟩} allowing you to specify code that only applies to one file.

\texttt{file/⟨file-name⟩/after, file/after} These hooks are after the file with name \texttt{⟨file-name⟩} has been fully consumed. The order is swapped (the specific one comes first) so that the \texttt{/before} and \texttt{/after} hooks nest properly, which is important if any of them involve grouping (e.g., contain environments, for example). Furthermore both hooks are reversed hooks to support correct nesting of different packages adding code to both \texttt{/before} and \texttt{/after} hooks.

So the overall sequence of hook processing for any file read through the user interface commands of \LaTeX is:

\begin{verbatim}
\UseHook{\texttt{file/before}}
\UseHook{\texttt{file/⟨file name⟩/before}}
\langle file contents⟩
\UseHook{\texttt{file/⟨file name⟩/after}}
\UseHook{\texttt{file/after}}
\end{verbatim}

The file hooks only refer to the file by its name and extension, so the \texttt{(file name)} should be the file name as it is on the filesystem with extension (if any) and without paths. Different from \texttt{\input} and similar commands, the .\texttt{tex} extension is not assumed in hook \texttt{(file name)}, so .\texttt{tex} files must be specified with their extension to be recognized. Files within subfolders should also be addressed by their name and extension only.
Extensionless files also work, and should then be given without extension. Note however that \TeX{} prioritizes .\texttt{tex} files, so if two files \texttt{foo} and \texttt{foo.tex} exist in the search path, only the latter will be seen.

When a file is input, the \texttt{⟨file name⟩} is available in \texttt{\CurrentFile}, which is then used when accessing the \texttt{file/⟨file name⟩/before} and \texttt{file/⟨file name⟩/after}.

\textbf{\CurrentFile}\ The name of the file about to be read (or just finished) is available to the hooks through \texttt{\CurrentFile} (there is no expl3 name for it for now). The file is always provided with its extension, i.e., how it appears on your hard drive, but without any specified path to it. For example, \texttt{\input{sample}} and \texttt{\input(app/sample.tex)} would both have \texttt{\CurrentFile} being \texttt{sample.tex}.

\textbf{\CurrentFilePath}\ The path to the current file (complement to \texttt{\CurrentFile}) is available in \texttt{\CurrentFilePath} if needed. The paths returned in \texttt{\CurrentFilePath} are only user paths, given through \texttt{\input@path} (or expl3's equivalent \texttt{\_file_search_path_seq}) or by directly typing in the path in the \texttt{\input} command or equivalent. Files located by \texttt{kpsewhich} get the path added internally by the \TeX{} implementation, so at the macro level it looks as if the file were in the current folder, so the path in \texttt{\CurrentFilePath} is empty in these cases (package and class files, mostly).

In normal circumstances these are identical to \texttt{\CurrentFile} and \texttt{\CurrentFilePath}. They will differ when a file substitution has occurred for \texttt{\CurrentFile}. In that case, \texttt{\CurrentFileUsed} and \texttt{\CurrentFilePathUsed} will hold the actual file name and path loaded by \TeX{}, while \texttt{\CurrentFile} and \texttt{\CurrentFilePath} will hold the names that were \textit{asked for}. Unless doing very specific work on the file being read, \texttt{\CurrentFile} and \texttt{\CurrentFilePath} should be enough.

1.3 Hooks for package and class files

Commands to load package and class files (e.g., \texttt{\usepackage}, \texttt{\RequirePackage}, \texttt{\LoadPackageWithOptions}, etc.) offer the hooks from section 1.2 when they are used to load a package or class file, e.g., \texttt{file/array.sty/after} would be called after the \texttt{array} package got loaded. But as packages and classes form as special group of files, there are some additional hooks available that only apply when a package or class is loaded.

These are:

\texttt{package/before, package/after} These hooks are called for each package being loaded.

\texttt{package/⟨name⟩/before, package/⟨name⟩/after} These hooks are additionally called if the package name is \texttt{⟨name⟩} (without extension).

\texttt{class/before, class/after} These hooks are called for each class being loaded.

\texttt{class/⟨name⟩/before, class/⟨name⟩/after} These hooks are additionally called if the class name is \texttt{⟨name⟩} (without extension).
All \textit{after} hooks are implemented as reversed hooks. The overall sequence of execution for \texttt{usepackage} and friends is therefore:

\begin{verbatim}
\UseHook{\texttt{package/before}}
\UseHook{\texttt{package/\langle package name \rangle/before}}
\UseHook{\texttt{file/before}}
\UseHook{\texttt{file/\langle package name \rangle.sty/before}}
\UseHook{\texttt{file/\langle package name \rangle.sty/after}}
\UseHook{\texttt{file/after}}
\end{verbatim}

\begin{itemize}
\item code from \texttt{AtEndOfPackage} if used inside the package
\item \texttt{AtEndOfClass}
\end{itemize}

and similar for class file loading, except that \texttt{package/} is replaced by \texttt{class/} and \texttt{AtEndOfPackage} by \texttt{AtEndOfClass}.

If a package or class is not loaded (or it was loaded before the hooks were set) none of the hooks are executed!

All class or package hooks involving the name of the class or package are implemented as one-time hooks, whereas all other such hooks are normal hooks. This allows for the following use case

\begin{verbatim}
\AddToHook{\texttt{package/varioref/after}}
{ ... apply my customizations if the package gets
  loaded (or was loaded already) ... }
\end{verbatim}

without the need to first test if the package is already loaded.

1.4 Hooks for \texttt{include} files

To manage \texttt{include} files, \LaTeX{} issues a \texttt{clearpage} before and after loading such a file. Depending on the use case one may want to execute code before or after these \texttt{clearpages} especially for the one that is issued at the end.

Executing code before the final \texttt{clearpage}, means that the code is processed while the last page of the included material is still under construction. Executing code after it means that all floats from inside the include file are placed (which might have added further pages) and the final page has finished.

Because of these different scenarios we offer hooks in three places.\footnote{If you want to execute code before the first \texttt{clearpage} there is no need to use a hook—you can write it directly in front of the \texttt{include}.} None of the hooks are executed when an \texttt{include} file is bypassed because of an \texttt{includeonly} declaration. They are, however, all executed if \LaTeX{} makes an attempt to load the \texttt{include} file (even if it doesn’t exist and all that happens is “No file \texttt{\langle filename\rangle.tex}”).

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These are:

\texttt{include/before}, \texttt{include/(name)/before} These hooks are executed (in that order) after the initial \texttt{clearpage} and after .\texttt{aux} file is changed to use \texttt{(name).aux}, but before the \texttt{(name).tex} file is loaded. In other words they are executed at the very beginning of the first page of the \texttt{include} file.

\texttt{include/(name)/end}, \texttt{include/end} These hooks are executed (in that order) after \LaTeX{} has stopped reading from the \texttt{include} file, but before it has issued a \texttt{clearpage} to output any deferred floats.

\texttt{include/(name)/after}, \texttt{include/after} These hooks are executed (in that order) after \LaTeX{} has issued the \texttt{clearpage} but before is has switched back writing to the main \texttt{.aux} file. Thus technically we are still inside the \texttt{include} and if the hooks generate any further typeset material including anything that writes to the \texttt{.aux} file, then it would be considered part of the included material and bypassed if it is not loaded because of some \texttt{includeonly} statement.\footnote{For that reason another \texttt{clearpage} is executed after these hooks which normally does nothing, but starts a new page if further material got added this way.}

\texttt{include/excluded}, \texttt{include/(name)/excluded} The above hooks for \texttt{include} files are only executed when the file is loaded (or more exactly the load is attempted). If, however, the \texttt{include} file is explicitly excluded (through an \texttt{includeonly} statement) the above hooks are bypassed and instead the \texttt{include/excluded} hook followed by the \texttt{include/(name)/excluded} hook are executed. This happens after \LaTeX{} has loaded the \texttt{.aux} file for this include file, i.e., after \LaTeX{} has updated its counters to pretend that the file was seen.

All \texttt{include} hooks involving the name of the included file are implemented as one-time hooks (whereas all other such hooks are normal hooks).

If you want to execute code that is run for every \texttt{include} regardless of whether or not it is excluded, use the \texttt{cmd/include/before} or \texttt{cmd/include/after} hooks.

\subsection{1.5 High-level interfaces for \LaTeX{}}

We do not provide any additional wrappers around the hooks (like filehook or scrfile do) because we believe that for package writers the high-level commands from the hook management, e.g., \texttt{AddToHook}, etc. are sufficient and in fact easier to work with, given that the hooks have consistent naming conventions.
1.6 Internal interfaces for \LaTeX

\declare@file@substitution \declare@file@substitution \{(file) \}(\{replacement-file\})
\undeclare@file@substitution \undeclare@file@substitution \{(file)\}

If \{file\} is requested for loading replace it with \{replacement-file\}. \CurrentFile remains pointing to \{file\} but \CurrentFileUsed will show the file actually loaded.

The main use case for this declaration is to provide a corrected version of a package that can’t be changed (due to its license) but no longer functions because of \LaTeX{} kernel changes, for example, or to provide a version that makes use of new kernel functionality while the original package remains available for use with older releases.

The \undeclare@file@substitution declaration undoes a substitution made earlier.

Please do not misuse this functionality and replace a file with another unless if really needed and only if the new version is implementing the same functionality as the original one!

\disable@package@load \disable@package@load \{(package)\} \{(alternate-code)\}
\reenable@package@load \reenable@package@load \{(package)\}

If \{package\} is requested do not load it but instead run \{alternate-code\} which could issue a warning, error or any other code.

The main use case is for classes that want to restrict the set of supported packages or contain code that make the use of some packages impossible. So rather than waiting until the document breaks they can set up informative messages why certain packages are not available.

The function is only implemented for packages not for arbitrary files.

1.7 A sample package for structuring the log output

As an application we provide the package \texttt{structuredlog} that adds lines to the .log when a file is opened and closed for reading keeping track of nesting level es well. For example, for the current document it adds the lines

\begin{verbatim}
= (LEVEL 1 START) tilmr.fd
= (LEVEL 1 STOP) tilmr.fd
= (LEVEL 1 START) supp-pdf.mkii
= (LEVEL 1 STOP) supp-pdf.mkii
= (LEVEL 1 START) nameref.sty
== (LEVEL 2 START) refcount.sty
== (LEVEL 2 STOP) refcount.sty
== (LEVEL 2 START) gettitlestring.sty
== (LEVEL 2 STOP) gettitlestring.sty
= (LEVEL 1 STOP) nameref.sty
= (LEVEL 1 START) ltfilehook-doc.out
= (LEVEL 1 STOP) ltfilehook-doc.out
= (LEVEL 1 START) ltfilehook-doc.out
= (LEVEL 1 STOP) ltfilehook-doc.out
= (LEVEL 1 START) ltfilehook-doc.hd
\end{verbatim}

File W: ltfilehook.dtx
Thus if you inspect an issue in the .log it is easy to figure out in which file it occurred, simply by searching back for LEVEL and if it is a STOP then remove 1 from the level value and search further for LEVEL with that value which should then be the START level of the file you are in.

2 The Implementation

2.1 Document and package-level commands

User-level macros that hold the current file name and file path. These are used internally as well because the code takes care to protect against a possible redefinition of these macros in the loaded file (it's necessary anyway to make hooks work with nested \input). The versions \CurrentFile, \CurrentFilePath, \CurrentFileUsed, and \CurrentFilePathUsed hold the actual file name and path that is loaded by \LaTeX, whereas the other two hold the name as requested. They will differ in case there's a file substitution.

\ExplSyntaxOn
\tl_new:N \CurrentFile
\tl_new:N \CurrentFilePath
\tl_new:N \CurrentFileUsed
\tl_new:N \CurrentFilePathUsed
\ExplSyntaxOff
\EndIncludeInRelease
2.2 expl3 helpers

\ExplSyntaxOn
\__filehook_file_parse_full_name:nN
A utility macro to trigger expl3’s file-parsing and lookup, and return a normalized representation of the file name. If the queried file doesn’t exist, no normalization takes place. The output of \__filehook_file_parse_full_name:nN is passed on to the \#2—a 3-argument macro that takes the ⟨path⟩, ⟨base⟩, and ⟨ext⟩ parts of the file name.

\cs_new:Npn \__filehook_file_parse_full_name:nN #1
\cs_new:Npn \__filehook_full_name:nn #1 #2
\cs_new:Npn \__filehook_if_no_extension:nTF #1
\cs_new_protected:Npn \__filehook_drop_extension:N #1

Some actions depend on whether the file extension was explicitly given, and sometimes the extension has to be removed. The macros below use \__filehook_file_parse_full_name:nN to split up the file name and either check if ⟨ext⟩ (\#3) is empty, or discard it.

\cs_new:Npn \__filehook_if_no_extension:nTF #1
\cs_new_protected:Npn \__filehook_drop_extension:N #1
\tl_gset:Nx #1

(End definition for \CurrentFile and others. These functions are documented on page 876.)
Yet another stack, to keep track of \CurrentFile and \CurrentFilePath with nested inputs. At the beginning of \InputIfFileExists, the current value of \CurrentFilePath and \CurrentFile is pushed to \g__filehook_input_file_seq and at the end, it is popped and the value reassigned. Some other places don’t use \InputIfFileExists directly (\include) or need \CurrentFile earlier (\@onefilewithoptions), so these are manually used elsewhere as well.

\tl_new:N \l__filehook_internal_tl
\seq_if_exist:NF \g__filehook_input_file_seq { \seq_new:N \g__filehook_input_file_seq }
\cs_new_protected:Npn \__filehook_file_push: {
    \seq_gpush:Nx \g__filehook_input_file_seq {
        \CurrentFilePathUsed \CurrentFileUsed
        \CurrentFilePath \CurrentFile
    }
}
\cs_new_protected:Npn \__filehook_file_pop: {
    \seq_gpop:NNTF \g__filehook_input_file_seq \l__filehook_internal_tl
    { \exp_after:wN \__filehook_file_pop_assign:nnnn \l__filehook_internal_tl }
    { \msg_error:nnn { \latexe } { should-not-happen }
        \CurrentFilePathUsed \CurrentFileUsed
        \CurrentFilePath \CurrentFile
    }
}
\cs_new_protected:Npn \__filehook_file_pop_assign:nnnn #1 #2 #3 #4 {
    \tl_set:Nn \CurrentFilePathUsed {#1}
    \tl_set:Nn \CurrentFileUsed {#2}
    \tl_set:Nn \CurrentFilePath {#3}
    \tl_set:Nn \CurrentFile {#4}
}\ExplSyntaxOff

(End definition for \g__filehook_input_file_seq and others.)
\ExplSyntaxOn
\cs_if_exist:NF \file_parse_full_name_apply:nN
\cs_new:Npn \file_parse_full_name_apply:nN #1
\exp_args:Ne \__file_parse_full_name_auxi:nN
{ \__kernel_file_name_sanitiz\enquote{n} {#1} }
\cs_new:Npn \__file_parse_full_name_auxi:nN #1
{ \__file_parse_full_name_area:nw { } #1
/ \s__file_stop }
\cs_new:Npn \__file_parse_full_name_area:nw #1 #2 / #3 \s__file_stop
{ \tl_if_empty:nTF {#3}
{ \tl_if_empty:nTF {#1}
{ \tl_if_empty:nTF {#2}
{ \use_none:n #1 \prg_do_nothing: }
{ #2 }
{ #3 \s__file_stop } }
{ #2 }
{ #3 \s__file_stop } }
{ #1 \s__file_stop } }
\cs_new:Npn \__file_parse_full_name_tidy:nnnN #1 #2 #3 #4
{ \exp_args:Nee #4
{ \str_if_eq:nnF {#3} { / } { \use_none:n } #3 \prg_do_nothing:
{ \use_none:n #1 \prg_do_nothing: }
{ #2 }
\prg_do_nothing:
\ExplSyntaxOff
\EndIncludeInRelease
\endinput
2.3 Declaring the file-related hooks

These hooks have names with three-parts that start with file/, include/, class/ or package/ and end with /before or /after (or /end in the case of include/). They are all generic hooks so will be declared only if code is added to them; this declaration is done for you automatically and, indeed, they should not be declared explicitly.

Those named .../after and include/.../end are, when code is added, declared as reversed hooks.

2.4 Patching \LaTeX's \texttt{\InputIfFileExists} command

Most of what we have to do is adding \texttt{\UseHook} into several \LaTeXe core commands, because of some circular dependencies in the kernel we do this only now and not in \texttt{ltfiles}.

\begin{verbatim}
\InputIfFileExists loads any file if it is available so we have to add the hooks file/before and file/after in the right places. If the file doesn’t exist no hooks should be executed.
\let\InputIfFileExists\@undefined
\DeclareRobustCommand \InputIfFileExists[2]{% 
  \IfFileExists{#1}%  
  {%  
    \@exp@@@filehook@file@push@@  
    \@filehook@set@CurrentFile  
    We pre-expand \texttt{\@filef@und} so that in case another file is loaded in the true branch of \InputIfFileExists, these don’t change their value meanwhile. This isn’t a worry with \CurrentFile... because they are kept in a stack.
    \expandafter\@swaptwoargs\expandafter
    {
      \expandafter\@input@file@exists@with@hooks
      \expandafter{\@filef@und}}%  
    {#2}%  
    \@expl@@@filehook@file@pop@@  
  }%}
\def\@input@file@exists@with@hooks#1{%
  \expandafter\texttt{\file_full_name:n}
  normalizes the file name (to factor out differences in the .tex extension), and then does a file lookup to take into account a possible path from \texttt{\l_file_search_path_seq} and \texttt{\input@path}. However only the file name and extension
\end{verbatim}
are returned so that file hooks can refer to the file by their name only. The path to the file is returned in \CurrentFilePath.

\edef\reserved@a{%
  \@expl@@@filehook@file@pop@assign@@nnnn
  \CurrentFilePathUsed%
  \CurrentFileUsed%
  \CurrentFilePath%
  \CurrentFile%
\expandafter\@swaptwoargs\expandafter{\reserved@a}%

Before adding to the file list we need to make all (letter) characters catcode 11, because several packages use constructions like

\filename@parse{<filename>}
\ifx\filename@ext\@clsextension...
\fi

and that doesn’t work if \filename@ext is \detokenized. Making \@clsextension a string doesn’t help much because some packages define their own \<prefix>@someextension with normal catcodes. This is not entirely correct because packages loaded (somehow) with catcode 12 alphabetic tokens (say, as the result of a \string or \detokenize command, or from a \TeX string like \jobname) will have these character tokens incorrectly turned into letter tokens. This however is rare, so we’ll go for the all-letters approach (grepping the packages in \TeX Live didn’t bring up any obvious candidate for breaking with this catcode change).

{\edef\reserved@a{\unqu@tefilef@und#1\@nil}%
  \@addtofilelist{\string@makeletter\reserved@a}%
  \UseHook{file/before}%

The current file name is available in \CurrentFile so we use that in the specific hook.

\UseHook{file/\CurrentFile/before}%
\@@input #1% <- trailing space comes from \@filef@und%
}

And here, \CurrentFile is restored (by \@expl@@@filehook@file@pop@assign@@nnnn) so we can use it once more.

\UseHook{file/\CurrentFile/after}%
\UseHook{file/after}%
\def\unqu@tefilef@und"#1" \@nil{"#1}

Now declare the non-generic file hooks used above:

\NewHook{file/before}
\NewReversedHook{file/after}
\latexrelease\EndIncludeInRelease\latexrelease\EndIncludeInRelease\latexrelease\EndIncludeInRelease\latexrelease\EndIncludeInRelease

Now define \InputIfFileExists to input #1 if it seems to exist. Immediately prior to the input, #2 is executed. If the file #1 does not exist, execute ‘#3’.

\latexrelease\EndIncludeInRelease{2019/10/01}%
\latexrelease\EndIncludeInRelease\latexrelease\EndIncludeInRelease\latexrelease\EndIncludeInRelease

Now define \InputIfFileExists to input #1 if it seems to exist. Immediately prior to the input, #2 is executed. If the file #1 does not exist, execute ‘#3’.

File W: ltfilehook.dtx
Also undo the internal command as some packages unfortunately test for their existence instead of using \IfFormatAtLeastTF.

\let\csname InputIfFileExists \endcsname\@undefined
\let\@input@file@exists@with@hooks\@undefined
\let\unqu@tefilef@und\@undefined
\EndIncludeInRelease

\EndIncludeInRelease{0000/00/00}{Hook management (files)}

\long\def \InputIfFileExists#1#2{\
    \IfFileExists{#1}\
    {#2\@addtofilelist{#1}\@@input \@filef@und}}

2.5 Declaring a file substitution

\__filehook_subst_add:nn\__filehook_subst_remove:n\__filehook_subst_file_normalize:Nn
\__filehook_subst_empty_name_chk:NN
\__filehook_subst_add:nn declares a file substitution by doing a (global) definition of the form \def\@file-subst@⟨file⟩{⟨replacement⟩}. The file names are properly sanitised, and normalized with the same treatment done for the file hooks. That is, a file replacement is declared by using the file name (and extension, if any) only, and the file path should not be given. If a file name is empty it is replaced by .tex (the empty csname is used to check that).

\cs_new_protected:Npn \__filehook_subst_add:nn #1 #2
\{
\group_begin:
\cs_set:cpx { } { \exp_not:o { \cs:w\cs_end: } }
\int_set:Nn \tex_escapechar:D { -1 }
\cs_gset:cpx
\{
    @file-subst@
\__filehook_subst_file_normalize:Nn \use_ii_iii:nnn {#1}
\}
\__filehook_subst_file_normalize:Nn \__filehook_file_name_compose:nnn
\{
\}
\group_end:
\}
\cs_new_protected:Npn \__filehook_subst_remove:n #1
\{
\group_begin:
\cs_set:cpx { } { \exp_not:o { \cs:w\cs_end: } }
\int_set:Nn \tex_escapechar:D { -1 }
\cs_gset:cpx
\{
    @file-subst@
\__filehook_subst_file_normalize:Nn \use_ii_iii:nnn {#1}
\}
\__filehook_subst_file_normalize:Nn \__filehook_file_name_compose:nnn
\{
\}
\group_end:
\}
\declare@file@substitution  
\undeclare@file@substitution  

\use_ii_iii:nnn  
A variant of \use... to discard the first of three arguments.

\Todo: this should move to expl3  
\ExplSyntaxOff  
\EndIncludeInRelease{2020/10/01}{\declare@file@substitution}{File substitution}  
\ExplSyntaxOn  
\cs_new_eq:NN \declare@file@substitution \__filehook_subst_add:nn  
\cs_new_eq:NN \undeclare@file@substitution \__filehook_subst_remove:n  
\ExplSyntaxOff  
\EndIncludeInRelease{2020/10/01}{\declare@file@substitution}{File substitution}  
\let \declare@file@substitution \@gobbletwo  
\let \undeclare@file@substitution \@gobble  
\EndIncludeInRelease{2020/10/01}{\declare@file@substitution}{File substitution}  

We are not fully rolling back the file substitutions in case a rollback encounters a package that contains them, but is itself not setup for rollback. So we just bypass them and hope for the best.

\IncludeInRelease{0000/00/00}{\declare@file@substitution}{File substitution}  
\EndIncludeInRelease{0000/00/00}{\declare@file@substitution}{File substitution}  
\let \declare@file@substitution \@gobbletwo  
\let \undeclare@file@substitution \@gobble  
\EndIncludeInRelease{0000/00/00}{\declare@file@substitution}{File substitution}  

File W: lfilehook.dtx  
887
(End definition for `\declare@file@substitution` and `\undeclare@file@substitution`. These functions are documented on page 879.)

\ExplSyntaxOff

2.6 Selecting a file (`\set@curr@file`)

Now we hook into `\set@curr@file` to resolve a possible file substitution, and add `\@expl@@@filehook@if@file@replaced@@TF` at the end, after `\curr@file` is set.

A file name is built using `\expandafter\string\csname \filename \endcsname` to avoid expanding utf8 active characters. The `\csname` expands the normalization machinery and the routine to resolve a file substitution, returning a control sequence with the same name as the file.

It happens that when `(\filename)` is empty, the generated control sequence is `\csname\endcsname`, and doing `\string` on that results in the file `csnameendcsname.tex`. To guard against that we `\ifx`-compare the generated control sequence with the empty csname. To do so, `\csname\endcsname` has to be defined, otherwise it would be equal to `\relax` and we would have false positives. Here we define `\csname\endcsname` to expand to itself to avoid it matching the definition of some other control sequence.

Two file names are set here: `\@curr@file@reqd` which is the file requested by the user, and `\@curr@file` which should be the same, except when we have a file substitution, in which case it holds the actual loaded file. `\@curr@file` is resolved first, to check if a substitution happens. If it doesn’t, `\@expl@@@filehook@if@no@extension@@nTF` short-cuts and just copies `\@curr@file`, otherwise the full normalization procedure is executed.

At this stage the file name is parsed and normalized, but if the input doesn’t have an extension, the default `.tex` is *not* added to `\@curr@file` because for applications other than `\input` (graphics, for example) the default extension may not be `.tex`. First check if the input has an extension, then if the input had no extension, call `\@expl@@@filehook@drop@extension@@N`. In case of a file substitution, `\@curr@file` will have an extension.
{%tempswatrue}{tempswafalse}%
\ Kernelse\filename\csname curfile
\expl@@@filehook\resolve\filename\substr\w \#1\%
\expl@@@filehook\if\filename\replaced\w \#1\%
\@tempswa \expl@@@filehook\drop\extension\ON\curfile\reqd \fi%
\expl@@@filehook\drop\extension\ON\curfile \fi
\global\let\curfile\reqd\curfile\%
\expl@@@filehook\clear\replacement\flag \%
\endgroup
\Kernel\latexrelease
\EndIncludeInRelease
\latexrelease\IncludeInRelease{2021/06/01}\
\latexrelease\def\set\curfile\#1{\
\latexrelease\begingroup\
\latexrelease\let\csname\endcsname\
\latexrelease\@tempswatrue\@tempswafalse\%
\@kernel\make\filename\csname curfile\reqd\%
\expl@@@filehook\resolve\filename\substr\w \#1\%
\expl@@@filehook\if\filename\replaced\w \#1\%
\@tempswatrue\@tempswafalse\%
\@kernel\make\filename\csname curfile\reqd\%
\expl@@@filehook\normalize\filename\w \#1\%
\@tempswatrue\@tempswafalse\%
\@kernel\make\filename\csname curfile\reqd\%
\expl@@@filehook\drop\extension\ON\curfile\reqd \fi%
\if\tempswa \expl@@@filehook\drop\extension\ON\curfile \fi
\global\let\curfile\reqd\curfile\%
\expl@@@filehook\clear\replacement\flag \%
\endgroup
\let\set\curfile\nosearch\@undefined
\EndIncludeInRelease
\latexrelease\IncludeInRelease{2020/10/01}\
\latexrelease\def\set\curfile\#1{\
\latexrelease\begingroup\
\latexrelease\let\csname\endcsname\
\latexrelease\@tempswatrue\@tempswafalse\%
\@kernel\make\filename\csname curfile\%
\expl@@@filehook\resolve\filename\substr\w \#1\%
\expl@@@filehook\if\filename\replaced\w \#1\%
\@tempswatrue\@tempswafalse\%
\@kernel\make\filename\csname curfile\%
\expl@@@filehook\normalize\filename\w \#1\%
\if\tempswa \expl@@@filehook\drop\extension\ON\curfile\reqd \fi%
\global\let\curfile\reqd\curfile\%
\expl@@@filehook\clear\replacement\flag \%
\endgroup
\latexrelease\EndIncludeInRelease
\latexrelease\EndIncludeInRelease
\latexrelease\def\set\curfile\#1{\
\latexrelease\begingroup\
\latexrelease\let\csname\endcsname\
\latexrelease\tempswatrue\tempswafalse\%
\@kernel\make\filename\csname curfile\%
\expl@@@filehook\resolve\filename\substr\w \#1\%
\expl@@@filehook\if\filename\replaced\w \#1\%
\tempswatrue\tempswafalse\%
\@kernel\make\filename\csname curfile\%
\expl@@@filehook\normalize\filename\w \#1\%
\tempswatrue\tempswafalse\%
\@kernel\make\filename\csname curfile\%
\expl@@@filehook\drop\extension\ON\curfile\reqd \fi%
\global\let\curfile\reqd\curfile\%
\expl@@@filehook\clear\replacement\flag \%
\endgroup
\latexrelease\EndIncludeInRelease

File W: lfilehook.dtx
\latexrelease \@expl@@@filehook@clear@replacement@flag@@ 
\latexrelease \let\set@curr@file@nosearch\@undefined 
\EndIncludeInRelease 
\latexrelease \IncludeInRelease{2019/10/01}{} 
\latexrelease \def\set@curr@file#{Setting current file name}{} 
\latexrelease \begingroup 
\latexrelease \begin{comment} 
\latexrelease \xdef\@curr@file{\expandafter\expandafter\expandafter\unquote@name \expandafter\expandafter\expandafter{\expandafter\string\csname\@firstofone\@empty\endcsname}} 
\latexrelease \end{comment} 
\latexrelease \endgroup 
\latexrelease \let\set@curr@file@nosearch\@undefined 
\EndIncludeInRelease 
\latexrelease \IncludeInRelease{0000/00/00}{} 
\latexrelease \def\set@curr@file\@undefined 
\latexrelease \let\set@curr@file@nosearch\@undefined 
\EndIncludeInRelease 
\latexrelease (End definition for \set@curr@file and others.)

\@filehook@set@CurrentFile 
\@kernel@make@file@csname 
\@set@curr@file@aux

Todo: This should get internalized using \@expl@ names

\latexrelease (\@2ekernel)
\latexrelease \@kernel@make@file@csname 
\latexrelease \def\@kernel@make@file@csname#1#2#3{\xdef#1{\expandafter\@set@curr@file@aux \csname\expandafter#2\@firstofone#3\@nil\endcsname}}

This auxiliary compares \(\langle\text{filename}\rangle\) with \csname endcsname\endcsname to check if the empty .tex file was requested.

\latexrelease \def\@set@curr@file@aux#1{\expandafter\ifx\csname endcsname\endcsname#1\.tex\else\string#1\fi}

Then we call \@expl@@@filehook@set@curr@file@nNN once for \@curr@file to set \CurrentFile(\Path)Used and once for \@curr@file@reqd to set \CurrentFile. Here too the slower route is only used if a substitution happened, but here \@expl@@@filehook@if@file@replaced@0TF can’t be used because the flag is reset at the \endgroup above, so we check if \@curr@file and \@curr@file@reqd differ. This macro is issued separate from \set@curr@file because it changes \CurrentFile, and side-effects would quickly get out of control.

\latexrelease \def\@filehook@set@CurrentFile\@expl@@@filehook@set@curr@file@nNN\{\@curr@file\}
\latexrelease \@expl@@@filehook@set@curr@file@nNN\{\@curr@file\}
\latexrelease \CurrentFileUsed\CurrentFilePathUsed
\latexrelease \if\@curr@file@reqd\@curr@file

File W: lfilehook.dtx
\let\CurrentFile\CurrentFileUsed
\let\CurrentFilePath\CurrentFilePathUsed
\else
  \exp@\CurrentFile\set\curr@file@\@\nNN{\curr@file@\reqd}%
  \CurrentFile\CurrentFilePath
\fi}
⟨/2ekernel⟨latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨*/2ekernel⟩

(End definition for \filehook\set@CurrentFile, \@kernel@make@file@csname, and \@set@curr@file@aux.)

\@@_set_curr_file:nNN
\@@_set_curr_file_assign:nnnNN

When inputting a file, \set@curr@file does a file lookup (in \input@path and \l_file_search_path_seq) and returns the actual file name ((base) plus (ext)) in \CurrentFileUsed, and in case there’s a file substitution, the requested file in \CurrentFile (otherwise both are the same). Only the base and extension are returned, regardless of the input (both path/to/file.tex and file.tex end up as file.tex in \CurrentFile). The path is returned in \CurrentFilePath, in case it’s needed.

\ExplSyntaxOn
\cs_new_protected:Npn \__filehook_set_curr_file:nNN #1
  {\exp_args:Nf \__filehook_file_parse_full_name:nN {#1}
   \__filehook_set_curr_file_assign:nnnNN}
\cs_new_protected:Npn \__filehook_set_curr_file_assign:nnnNN #1 #2 #3 #4 #5
  {\str_set:Nn #5 {#1}
   \str_set:Nn #4 {#2#3}}
\ExplSyntaxOff
⟨/2ekernel⟨latexrelease⟩
⟨latexrelease⟩\EndIncludeInRelease
⟨*/2ekernel⟩

(End definition for \@@_set_curr_file:nNN and \@@_set_curr_file_assign:nnnNN.)

2.7 Replacing a file and detecting loops

Start by sanitizing the file with \__filehook_file_parse_full_name:nN then do \__filehook_file_subst_begin:nnm{(path)}{(name)}{(ext)}.

\filehook_resolve_file_subst:w
\filehook_normalize_file_name:w
\filehook_file_name_compose:mmn

File W: lfilehook.dtx
Since the file replacement is done expandably in a \csname, use a flag to remember if a substitution happened. We use this in \set\currentfile to short-circuit some of it in case no substitution happened (by far the most common case, so it’s worth optimizing).

The flag raised during the file substitution algorithm must be explicitly cleared after the \__filehook_if_file_replaced:TF conditional is no longer needed, otherwise further uses of \__filehook_if_file_replaced:TF will wrongly return true.

\flag_new:n { __filehook_file_replaced }
\cs_new:Npn \__filehook_if_file_replaced:TF #1 #2 #3
{ \flag_if_raised:nTF { __filehook_file_replaced } {#1} {#2} }
\cs_new_protected:Npn \__filehook_clear_replacement_flag:
{ \flag_clear:n { __filehook_file_replaced } }
\__filehook_file_subst_begin:nnn

First off, start by checking if the current file (⟨name⟩+⟨ext⟩) has a declared substitution. If not, then just put that as the name (including a possible ⟨path⟩ in this case): this is the default case with no substitutions, so it’s the first to be checked. The auxiliary \__filehook_file_subst_tortoise_hare:nn sees that there’s no replacement for #2#3 and does nothing else.

\cs_new:Npn \__filehook_file_subst_begin:nnn #1 #2 #3
{ \__filehook_file_subst_tortoise_hare:nn { #2#3 } { #2#3 } {#1} {#2} {#3} }
\ExplSyntaxOff
\langle 2ekernel | latexrelease \rangle
\langle latexrelease \rangle \EndIncludeInRelease
\langle ∗ 2ekernel \rangle

### 2.7.1 The Tortoise and Hare algorithm

If there is a substitution (⟨true⟩ in the first \cs_if_exist:cTF below), then first check if there is no substitution down the line: this should be the second most common case, of one file replaced by another. In that case just leave the substitution there and the job is done. If any substitution happens, then the \flag __filehook_file_replaced is raised (conditionally, because checking if a flag is raised is much faster than raising it over and over again).

If, however there are more substitutions, then we need to check for a possible loop in the substitutions, which would otherwise put \TeX{} in an infinite loop if just an exhaustive expansion was used.

To detect a loop, the Tortoise and Hare algorithm is used. The name of the algorithm is an analogy to Aesop’s fable, in which the Hare outruns a Tortoise. The two pointers here are the csnames which contains each file replacement, both of which start at the position zero, which is the file requested. In the inner part of the macro below, \__filehook_file_subst_loop:cc is called with \@file-subst\⟨file⟩ and \@file-subst\@file-subst\⟨file⟩; that is, the substitution of ⟨file⟩ and the substitution of that substitution: the Tortoise walks one step while the Hare walks two.

Within \__filehook_file_subst_loop:NN the two substitutions are compared, and if they lead to the same file it means that there is a loop in the substitutions. If there’s
no loop, \cs_if_exist:cTF below will go \langle false \rangle and the algorithm will end; otherwise it will run until the Hare reaches the same spot as the tortoise and a loop is detected.

\begin{verbatim}
\cs_new:Npn \__filehook_file_subst_tortoise_hare:nn #1 #2 #3
{ \cs_if_exist:cTF { \file-subst@ #2 } { \flag_if_raised:nF { \_filehook_file_replaced } { \flag_raise:n { \_filehook_file_replaced } } \cs_if_exist:cTF { \file-subst@ \use:c { \file-subst@ #2 } } { \_filehook_file_subst_loop:cc { \file-subst@ #1 } { \file-subst@ \use:c { \file-subst@ #2 } } } { \use:c { \file-subst@ #2 } } { \_filehook_file_subst_tortoise_hare:nn #1 #2 #3 } }
\end{verbatim}

This is just an auxiliary to check if a loop was found, and continue the algorithm otherwise. If a loop is found, the .tex file is used as fallback and \cs_if_exist:cTF is called to report the error.

\begin{verbatim}
\cs_new:Npn \__filehook_file_subst_cycle_error:NN #1 #2
{ \msg_expandable_error:nnff { latex2e } { file-cycle } { \filehook_file_subst_cycle_error:cN \filehook_file_subst_tortoise_hare:nn \#1 \#2 \#2 } }
\end{verbatim}

Showing this type of error expandably is tricky, as we have a very limited amount of characters to show and a potentially large list. As a work around, several errors are printed, each showing one step of the loop, until all the error messages combined show the loop.

\begin{verbatim}
\cs_new:Npn \_filehook_file_subst_cycle_error:NN \_filehook_file_subst_cycle_error:cN
{ \msg_expandable_error:nnff { latex2e } { file-cycle } { \filehook_file_subst_cycle_error:cN \filehook_file_subst_tortoise_hare:nn \#1 \#2 \#2 } }
\end{verbatim}

File W: ltfilehook.dtx 893
2.8 Preventing a package from loading

We support the use case of preventing a package from loading but not any other type of files (e.g., classes).

\disable@package@load defines \pkg-disable@{package} to expand to some code \#2 instead of loading the package.

\reenable@package@load undefines \pkg-disable@{package} to reallow loading a package.

\@disable@packageload@do

2.9 High-level interfaces for \LaTeX\n
None so far and the general feeling for now is that the hooks are enough. Packages like filehook, etc., may use them to set up their interfaces (samples are given below) but for the now the kernel will not provide any.
2.10 Internal commands needed elsewhere

Here we set up a few horrible (but consistent) \LaTeX2e names to allow for internal commands to be used outside this module (and in parts that still use \LaTeX2e syntax. We have to unset the \texttt{@@} since we want double “at” sign in place of double underscores.

\InputIfFileExists{2020/10/01}{\@expl@@@filehook@if@no@extension@@nTF}{2e tmp interfaces}
\ExplSyntaxOn
\cs_new_eq:NN \@expl@@@filehook@if@no@extension@@nTF \__filehook_if_no_extension:nTF
\cs_new_eq:NN \@expl@@@filehook@set@curr@file@@nNN \__filehook_set_curr_file:nNN
\cs_new_eq:NN \@expl@@@filehook@resolve@file@subst@@w \__filehook_resolve_file_subst:w
\cs_new_eq:NN \@expl@@@filehook@normalize@file@name@@w \__filehook_normalize_file_name:w
\cs_new_eq:NN \@expl@@@filehook@if@file@replaced@@TF \__filehook_if_file_replaced:TF
\cs_new_eq:NN \@expl@@@filehook@clear@replacement@flag@@ \__filehook_clear_replacement_flag:
\cs_new_eq:NN \@expl@@@filehook@drop@extension@@N \__filehook_drop_extension:N
\cs_new_eq:NN \@expl@@@filehook@file@push@@ \__filehook_file_push:
\cs_new_eq:NN \@expl@@@filehook@file@pop@@ \__filehook_file_pop:
\cs_new_eq:NN \@expl@@@filehook@file@pop@assign@@nnnn \__filehook_file_pop_assign:nnnn
\ExplSyntaxOff

This one specifically has to be undefined because it is left over in the input stream from \InputIfFileExists and executed when \texttt{latexrelease} is loaded. It cannot be \texttt{\let} to \texttt{\@undefined} otherwise it would error as well, so it is \texttt{\let} to \texttt{\relax} to be silently ignored when loading \texttt{latexrelease}.

\InputIfFileExists{0000/00/00}{\@expl@@@filehook@if@no@extension@@nTF}{2e tmp interfaces}
\let\@expl@@@filehook@file@pop@@ \relax
\EndIncludeInRelease

This ends the kernel code in this file.
3 A sample package for structuring the log output

\ProvidesExplPackage{structuredlog}{\ltfilehookdate}{\ltfilehookversion}
{Structuring the TeX transcript file}

\g__filehook_nesting_level_int
Stores the current package nesting level.

\int_new:N \g__filehook_nesting_level_int
Initialise the counter with the number of files in the \@currnamestack (the number of items divided by 3) minus one, because this package is skipped when printing to the log.

\int_gset:Nn \g__filehook_nesting_level_int
{ ( \tl_count:N \@currnamestack ) / 3 - 1 }
(End definition for \g__filehook_nesting_level_int.)

\__filehook_log_file_record:n
This macro is responsible for increasing and decreasing the file nesting level, as well as printing to the log. The argument is either STOPTART or STOP and the action it takes on the nesting integer depends on that.

\cs_new_protected:Npn \__filehook_log_file_record:n #1
{ \str_if_eq:nnT {#1} {START} { \int_gincr:N \g__filehook_nesting_level_int } \iow_term:x
  \str_if_eq:nnT {#1} {STOP} { \int_gdecr:N \g__filehook_nesting_level_int }
}

Now just hook the macro above in the generic file/before...\AddToHook{file/before}{ \__filehook_log_file_record:n { START } }...and file/after hooks. We don’t want to install the file/after hook immediately, because that would mean it is the first time executed when the package finishes. We therefore put the declaration inside \AddToHookNext so that it gets only installed when we have left this package.

\AddToHookNext{file/after}
{ \AddToHook{file/after}{ \__filehook_log_file_record:n { STOP } } }
(End definition for \__filehook_log_file_record:n.)
4 Package emulations

4.1 Package \texttt{atveryend} emulation

With the new hook management and the hooks in \texttt{\enddocument} all of \texttt{atveryend} is taken care of. We can make an emulation only here after the substitution functionality is available:

\begin{verbatim}
\usepackage{atveryend}
\begin{document}
\AtVeryEndDocument
\AfterLastShipout
\AtEndAfterFileList
\AtVeryVeryEnd
\BeforeClearDocument
\end{document}
\end{verbatim}

Here is the package file we point to:

\begin{verbatim}
\ProvidesPackage{atveryend-ltx}
\[2020/08/19 v1.0a
Emulation of the original atveryend package^^Jwith kernel methods]
\end{verbatim}

Here are new definitions for its interfaces now pointing to the hooks in \texttt{\enddocument}:

\begin{verbatim}
\newcommand\AfterLastShipout {\AddToHook{\enddocument/afterlastpage}}
\newcommand\AtVeryEndDocument {\AddToHook{\enddocument/afteraux}}
\newcommand\AtEndAfterFileList{\AddToHook{\enddocument/info}}
\newcommand\AtVeryVeryEnd {\AddToHook{\enddocument/end}}
\end{verbatim}

This one is the only one we don’t implement or rather don’t have a dedicated hook in the code:

\begin{verbatim}
\ExplSyntaxOn
\newcommand\BeforeClearDocument[1]
\AtEndDocument[#1]
\atveryend@DEPRECATED{BeforeClearDocument \tl_to_str:n{#1}}
\cs_new:Npn\atveryend@DEPRECATED #1
{\iow_term:x{======~DEPRECATED~USAGE~#1~==========}}
\ExplSyntaxOff
\end{verbatim}

(End definition for \texttt{\BeforeClearDocument}.)
1 Introduction

The code provides an interface to the `\shipout` primitive of \TeX which is called when a finished page is finally “shipped out” to the target output file, e.g., the `.dvi` or `.pdf` file. A good portion of the code is based on ideas by Heiko Oberdiek implemented in his packages `atbegshi` and `atenddvi` even though the interfaces are somewhat different.\footnote{Heiko's interfaces are emulated by the kernel code, if a document requests his packages, so older documents will continue to work.}

1.1 Overloading the `\shipout` primitive

\begin{verbatim}
\shipout
With this implementation \TeX's shipout primitive is no longer available for direct use. Instead `\shipout` is running some (complicated) code that picks up the box to be shipped out regardless of how that is done, i.e., as a constructed `\vbox` or `\hbox` or as a box register.

It then stores it in a named box register. This box can then be manipulated through a set of hooks after which it is shipped out for real.

Each shipout that actually happens (i.e., where the material is not discarded for one or the other reason) is recorded and the total number is available in a readonly variable and in a \TeX{} counter.
\end{verbatim}

\begin{verbatim}
\RawShipout
This command implements a simplified shipout that bypasses the foreground and background hooks, e.g., only `shipout/firstpage` and `shipout/lastpage` are executed and the total shipout counters are incremented.

The command doesn't use `\ShipoutBox` but its own private box register so that it can be used inside of shipout hooks to do some additional shipouts while already in the output routine with the current page being stored in `\ShipoutBox`. It does have access to `\ShipoutBox` if it is used in `shipout/before` (or `shipout/after`) and can use its content.

It is safe to use it in `shipout/before` or `shipout/after` but not necessarily in the other `shipout/...` hooks as they are intended for special processing.
\end{verbatim}
This box register is called \ShipoutBox (alternatively available via the L3 name \l_shipout_box).

This box is a “local” box and assignments to it should be done only locally. Global assignments (as done by some packages with older code where this is box is known as 255) may work but they are conceptually wrong and may result in errors under certain circumstances.

During the execution of \shipout/before this box contains the accumulated material for the page, but not yet any material added by other shipout hooks. During execution of \shipout/after, i.e., after the shipout has happened, the box also contains any background or foreground material.

Material from the hooks \shipout/firstpage or \shipout/lastpage is not included (but only used during the actual shipout) to facilitate reuse of the box data (e.g., \shipout/firstpage material should never be added to a later page of the output).

The shipout box dimensions are available in the L3 registers \l_shipout_box_ht_dim, etc. (there are no \LaTeX\ names). These variables can be used inside the hook code for \shipout/before, \shipout/foreground and \shipout/background if needed.

1.2 Provided hooks

The code for \shipout offers a number of hooks into which packages (or the user) can add code to support different use cases. These are:

- **\shipout/before** This hook is executed after the finished page has been stored in \ShipoutBox / \l_shipout_box). It can be used to alter that box content or to discard it completely (see \DiscardShipoutBox below).

  You can use \RawShipout inside this hook for special use cases. It can make use of \ShipoutBox (which doesn’t yet include the background and foreground material).

  **Note:** It is not possible (or say advisable) to try and use this hook to typeset material with the intention to return it to main vertical list, it will go wrong and give unexpected results in many cases—for starters it will appear after the current page not before or it will vanish or the vertical spacing will be wrong!

- **\shipout/background** This hook adds a picture environment into the background of the page with the (0,0) coordinate in the top-left corner using a \unitlength of 1pt.

  It should therefore only receive \put commands or other commands suitable in a picture environment and the vertical coordinate values would normally be negative.

\[^{43}\text{Might need changing, but HO’s version as strings is not really helpful I think.}\]
Technically this is implemented by adding a zero-sized \hbox as the very first item into the \ShipoutBox containing that picture environment. Thus the rest of the box content will overprint what ever is typeset by that hook.

shipout/foreground  This hook adds a picture environment into the foreground of the page with the (0,0) coordinate in the top-left corner using a \unitlength of 1pt. Technically this is implemented by adding a zero-sized \hbox as the very last item into the \ShipoutBox and raising it up so that it still has its (0,0) point in the top-left corner. But being placed after the main box content it will be typeset later and thus overprints it (i.e., is in the foreground).

shipout/firstpage  The material from this hook is executed only once at the very beginning of the first output page that is shipped out (i.e., not discarded at the last minute). It should only contain \special or similar commands needed to direct post processors handling the .dvi or .pdf output.44 This hook is added to the very first page regardless of how it is shipped out (i.e., with \shipout or \RawShipout).

shipout/lastpage The corresponding hook to add \specials at the very end of the output file. It is only executed on the very last page of the output file — or rather on the page that \TeX believes is the last one. Again it is executed regardless of the shipout method.

It may not be possible for \TeX to correctly determine which page is the last one without several reruns. If this happens and the hook is non-empty then \TeX will add an extra page to place the material and also request a rerun to get the correct placement sorted out.

shipout/after  This hook is executed after a shipout has happened. If the shipout box is discarded this hook is not looked at.

You can use \RawShipout inside this hook for special use cases and the main \ShipoutBox is still available at this point (but in contrast to shipout/before it now includes the background and foreground material).

Note: Just like shipout/before this hook is not meant to be used for adding typeset material back to the main vertical list—it might vanish or the vertical spacing will be wrong!

As mentioned above the hook shipout/before is executed first and can manipulate the prepared shipout box stored in \ShipoutBox or set things up for use in \write during the actual shipout. It is even run if there was a \DiscardShipoutBox request in the document.

The other hooks (except shipout/after) are added inside hboxes to the box being shipped out in the following order:

shipout/foreground only on the last page

shipout/after only on the first page

44In \TeX that was already existing, but implemented using a box register with the name \@begindvibox.
If any of the hooks has no code then that particular no box is added at that point.

Once the (page) box has been shipped out the shipout/after hook is called (while you are still inside the output routine). It is not called if the shipout box was discarded.

In a document that doesn’t produce pages, e.g., only makes \typeout{}s, none of the hooks are ever executed (as there is no shipout) not even the shipout/lastpage hook.

If \RawShipout{} is used instead of \shipout{} then only the hooks shipout/firstpage and shipout/lastpage are executed (on the first or last page), all others are bypassed.

### 1.3 Legacy \LaTeX{} commands

\begin{verbatim}
\AtBeginDvi \langle\{code\}\rangle
\end{verbatim}

\AtBeginDvi is the existing \LaTeX{} 2e interface to fill the shipout/firstpage hook. This is not really a good name as it is not just supporting .dvi but also .pdf output or .xdv.

\AtEndDvi is the counterpart that was not available in the kernel but only through the package atenddvi. It fills the shipout/lastpage hook.

Neither interface can set a code label but uses the current default label.

As these two wrappers have been available for a long time we continue offering them (but not enhancing them, e.g., by providing support for code labels).

For new code we strongly suggest using the high-level hook management commands directly instead of “randomly-named” wrappers. This will lead to code that is easier to understand and to maintain and it also allows you to set code labels if needed.

For this reason we do not provide any other “new” wrapper commands for the above hooks in the kernel, but only keep the existing ones for backward compatibility.

### 1.4 Special commands for use inside the hooks

\begin{verbatim}
\DiscardShipoutBox \AddToHookNext {shipout/before} {...\DiscardShipoutBox...}
\end{verbatim}

The \DiscardShipoutBox{} declaration (L3 name \shipout_discard:) requests that on the next shipout the page box is thrown away instead of being shipped to the .dvi or .pdf file.

Typical applications wouldn’t do this unconditionally, but have some processing logic that decides to use or not to use the page.

Note that if this declaration is used directly in the document it may depend on the placement to which page it applies, given that \LaTeX{} output routine is called in an asynchronous manner! Thus normally one would use this only as part of the shipout/before code.

Todo: Once we have a new mark mechanism available we can improve on that and make sure that the declaration applies to the page that contains it.

In the atbegshi package there are a number of additional commands for use inside the shipout/before hook. They should normally not be needed any more as one can instead simply add code to the hooks shipout/before, shipout/background or shipout/foreground.\footnote{If that assumption turns out to be wrong it would be trivial to change them to public functions (right now they are private).} If atbegshi gets loaded then those commands become available as public functions with their original names as given below.
1.5 Provided Lua\TeX\ callbacks

\begin{verbatim}
pre_shipout_filter

Under Lua\TeX\ the pre\_shipout\_filter Lua callback is provided which gets called immediately before the shipout primitive gets invoked. The signature is

\begin{verbatim}
function(<node> head)
 return true
end
\end{verbatim}

The head is the list node corresponding to the box to be shipped out. The return value should always be true.

\end{verbatim}

1.6 Information counters

\begin{verbatim}
\ReadonlyShipoutCounter \ifnum\ReadonlyShipoutCounter=...
\g_shipout_readonly_int % expl3 usage

This integer holds the number of pages shipped out up to now (including the one to be shipped out when inside the output routine). More precisely, it is incremented only after it is clear that a page will be shipped out, i.e., after the \texttt{shipout/before} hook (because that might discard the page)! In contrast \texttt{shipout/after} sees the incremented value.

Just like with the page counter its value is only accurate within the output routine. In the body of the document it may be off by one as the output routine is called asynchronously!

Also important: it must not be set, only read. There are no provisions to prevent that restriction, but if you manipulate it, chaos will be the result. To emphasize this fact it is not provided as a \LaTeX\ counter but as a \TeX\ counter (i.e., a command), so \texttt{\Alph{\ReadonlyShipoutCounter}} etc, would not work.

\end{verbatim}

\begin{verbatim}
totalpages \arabic{totalpages}
\g_shipout_totalpages_int % expl3 usage

In contrast to \texttt{\ReadonlyShipoutCounter}, the totalpages counter is a \LaTeX\ counter and incremented for each shipout attempt including those pages that are discarded for one or the other reason. Again \texttt{shipout/before} sees the counter before it is incremented. In contrast \texttt{shipout/after} sees the incremented value.

Furthermore, while it is incremented for each page, its value is never used by \LaTeX. It can therefore be freely reset or changed by user code, for example, to additionally count a number of pages that are not build by \LaTeX but are added in a later part of the process, e.g., cover pages or picture pages made externally.

Important: as this is a page-related counter its value is only reliable inside the output routine!

\end{verbatim}

\begin{verbatim}
\PreviousTotalPages \thetotalpages/\PreviousTotalPages

Command that expands to the number of total pages from the previous run. If there was no previous run or if used in the preamble it expands to 0. Note that this is a command and not a counter, so in order to display the number in, say, Roman numerals you have to assign its value to a counter and then use \texttt{\Roman} on that counter.

\end{verbatim}
1.7 Debugging shipout code

\DebugShipoutsOn
\DebugShipoutsOff
\shipout_debug_on:
\shipout_debug_off:

Turn the debugging of shipout code on or off. This displays changes made to the shipout data structures.

*Todo: This needs some rationalizing and may not stay this way.*

2 Emulating commands from other packages

The packages in this section are no longer necessary, but as they are used by other packages, they are emulated when they are explicitly loaded with \usepackage or \RequirePackage.

Please note that the emulation only happens if the package is explicitly requested, i.e., the commands documented below are not automatically available in the TeX kernel! If you write a new package we suggest to use the appropriate kernel hooks directly instead of loading the emulation.

2.1 Emulating \texttt{atbegshi}

\AtBeginShipoutUpperLeft
\AtBeginShipoutUpperLeftForeground

This adds a picture environment into the background of the shipout box expecting \langle code\rangle to contain picture commands. The same effect can be obtained by simply using kernel features as follows:

\AddToHook{shipout/background}{\langle code\rangle}

There is one technical difference: if \AtBeginShipoutUpperLeft is used several times each invocation is put into its own box inside the shipout box whereas all \langle code\rangle going into shipout/background ends up all in the same box in the order it is added or sorted based on the rules for the hook chunks.

\AtBeginShipoutUpperLeftForeground is similar with the difference that the picture environment is placed in the foreground. To model it with the kernel functions use the hook shipout/foreground instead.

\AtBeginShipoutAddToBox
\AtBeginShipoutAddToBoxForeground

These work like \AtBeginShipoutUpperLeft and \AtBeginShipoutUpperLeftForeground with the difference that \langle code\rangle is directly placed into an \hbox inside the shipout box and not surrounded by a picture environment.

To emulate them using shipout/background or shipout/foreground you may have to wrap \langle code\rangle into a \put statement but if the code is not doing any typesetting just adding it to the hook should be sufficient.

\AtBeginShipoutBox

This is the name of the shipout box as \texttt{atbegshi} knows it.

File X: \texttt{ltshipout.dtx} 903
\AtBeginShipoutOriginalShipout

This is the name of the \shipout primitive as \atbegshi knows it. This bypasses all the mechanisms set up by the \LaTeX{} kernel and there are various scenarios in which it can therefore fail. It should only be used to run existing legacy \atbegshi code but not in newly developed applications.

The kernel alternative is \RawShipout which is integrated with the \LaTeX{} mechanisms and updates, for example, the \ ReadonlyShipoutCounter counter. Please use \RawShipout for new code if you want to bypass the before, foreground and background hooks.

\AtBeginShipoutInit

By default \atbegshi delayed its action until \begin{document}. This command was forcing it in an earlier place. With the new concept it does nothing.

\AtBeginShipout \AtBeginShipoutNext

\AtBeginShipout\{\langle code\rangle\} \equiv \AddToHook\{shipout/before\}\{\langle code\rangle\}
\AtBeginShipoutNext\{\langle code\rangle\} \equiv \AddToHookNext\{shipout/before\}\{\langle code\rangle\}

This is equivalent to filling the shipout/before hook by either using \AddToHook or \AddToHookNext, respectively.

\AtBeginShipoutFirst \AtBeginShipoutDiscard

The \atbegshi names for \AtBeginDvi and \DiscardShipoutBox.

2.2 Emulating everyshi

The everyshi package is providing commands to run arbitrary code just before the shipout starts. One point of difference: in the new shipout hooks the page is available as \ShipoutBox for inspection of change, one should not manipulate box 255 directly inside shipout/before, so old code doing this would change to use \ShipoutBox instead of 255 or @cclv.

\EveryShipout \AtNextShipout

\EveryShipout\{\langle code\rangle\} \equiv \AddToHook\{shipout/before\}\{\langle code\rangle\}
\AtNextShipout\{\langle code\rangle\} \equiv \AddToHookNext\{shipout/before\}\{\langle code\rangle\}

However, most use cases for everyshi are attempts to put some picture or text into the background or foreground of the page and that can be done today simply by using the shipout/background and shipout/foreground hooks without any need to coding.

2.3 Emulating atenddvi

The atenddvi package implemented only a single command: \AtEndDvi and that is now available out of the box so the emulation makes the package a no-op.
2.4 Emulating everypage

This package patched the original \begindvi hook and replaced it with its own version. Its functionality is now covered by the hooks offered by the kernel so that there is no need for such patching any longer.

\AddEverypageHook
\AddEverypageHook\{(code)\} ≡ \AddToHook\{shipout/background\}\{\put(1in,-1in)\{(code)\}\}

\AddEverypageHook is adding something into the background of every page at a position of 1in to the right and 1in down from the top left corner of the page. By using the kernel hook directly you can put your material directly to the right place, i.e., use other coordinates in the \put statement above.

\AddThispageHook
\AddThispageHook\{(code)\} ≡ \AddToHookNext\{shipout/background\}\{\put(1in,-1in)\{(code)\}\}

The \AddThispageHook wrapper is similar but uses \AddToHookNext.

3 The Implementation

At the moment the whole module rolls back in one go, but if we make any modifications in later releases this will then need splitting.

\ExplSyntaxOn
3.1 Debugging

\g__shipout_debug_bool Holds the current debugging state.
\bool_new:N \g__shipout_debug_bool
(End definition for \g__shipout_debug_bool.)

\shipout_debug_on: \shipout_debug_off: \shipout_debug:n \shipout_debug_gset:

Turns debugging on and off by redefining \__shipout_debug:n.

\cs_new_eq:NN \__shipout_debug:n \use_none:n
\cs_new_protected:Npn \shipout_debug_on:
{ \bool_gset_true:N \g__shipout_debug_bool \__shipout_debug_gset:
}
\cs_new_protected:Npn \shipout_debug_off:
{ \bool_gset_false:N \g__shipout_debug_bool \__shipout_debug_gset:
}
\cs_new_protected:Npn \__shipout_debug_gset:
{ \bool_if:NT \g__shipout_debug_bool {\#1} }
The box filled with the page to be shipped out (both \L3 and \TeX\2\c name).

\l_shipout_box
\ShipoutBox
\box_new:N \l_shipout_box
\cs_set_eq:NN \ShipoutBox \l_shipout_box

\l_shipout_raw_box
\RawShipout gets its own box but it is internal as there is no hook manipulation for it.
\box_new:N \l__shipout_raw_box

\__shipout_finalize_box:
For \TeX\ invoke the \texttt{pre\_shipout\_filter} callback.
\sys_if_engine_luatex:TF
\newprotectedluacmd \__shipout_finalize_box:
\exp_args:Nx \everyjob { \exp_not:V \everyjob
\exp_not:N \lua_now:n { lua.get_functions_table()[\the \allocationnumber] = function()
\local-head = getbox(\the \l_shipout_box)
\local-result = call(\texttt{pre\_shipout\_filter}, head)
if \not (result == head) then
\setbox(\the \l_shipout_box, result-or-nil)
end
end
}
\cs_set_eq:NN \__shipout_finalize_box: \scan_stop:

\__shipout_execute:
This is going to be the code run by \texttt{\shipout}. The code follows closely the ideas from \texttt{atbegshi}, so not documenting that here for now.
\cs_set_protected:Npn \__shipout_execute:
\tl_set:Nx \l__shipout_group_level_tl
{ \int_value:w \tex_currentgrouplevel:D }
\tex_afterassignment:D \__shipout_execute_test_level:
\tex_setbox:D \l_shipout_box

\shipout
Overloading the \texttt{\shipout} primitive:
\cs_set_eq:NN \shipout \__shipout_execute:

\end{definition}
\__shipout_group_level_tl  Helper token list to record the group level at which \__shipout_execute: is encountered.

\tl_new:N \l__shipout_group_level_tl
(End definition for \__shipout_group_level_tl)

\__shipout_execute_test_level:  If the group level has changed then we are still constructing \l_shipout_box and to con-
tinue we need to wait until the current group has finished, hence the \tex_aftergroup:D.
\cs_new:Npn \__shipout_execute_test_level: { \int_compare:nNnT \l__shipout_group_level_tl < \tex_currentgrouplevel:D \tex_aftergroup:D \__shipout_execute_cont: }
(End definition for \__shipout_execute_test_level:)

\__shipout_execute_cont:  This does the actual shipout running several hooks as part of it. The code for them is
passed as argument #2 to #4 to \__shipout_execute_main_cont:Nnnn; the first argu-
ment is the box to be shipped out.
\cs_new:Npn \__shipout_execute_cont: { \l_shipout_box \__shipout_execute_main_cont:Nnnn \l__shipout_group_level_tl \tl_new:N \l__shipout_group_level_tl
\__shipout_execute_main_cont:Nnnn
\l_shipout_box
\{ \hook_use:n {shipout/before} \}
\{ \hook_if_empty:nF {shipout/foreground}
\{ \__shipout_add_foreground_picture:n
\{ \hook_use:n {shipout/foreground} \}
\}
\}
\hook_use:n {shipout/after}
\}
(End definition for \__shipout_execute_cont:)

\__shipout_execute_main_cont:Nnnn  When we have reached this point the shipout box has been processed and is available in
\l_shipout_box and ready for real ship out (unless it gets discarded during the process).
The three arguments hold hook code that is executed just before the actual shipout (#1), within the shipout adding background and foreground material (#2) and after the shipout has happened (#3). These are passed as arguments because the same
code without those hooks is also used when doing a “raw” shipout implemented by
\RawShipout. The only hook that is always executed is that for the very last page, i.e.,
shipout/lastpage.

File X: ltshipout.dtx
First we quickly check if it is void (can’t happen in the standard \LaTeX output routine but \texttt{\textbackslash shipout} might be called from a package that has some special processing logic). If it is void we aren’t shipping anything out and processing ends.\footnote{In that case we don’t reset the deadcycles, that would be up to the OR processing logic to do.}
\begin{verbatim}
\cs_new:Npn \_\_shipout_execute_main_cont:Nnnn #1#2#3#4 { 
  \box_if_empty:NTF #1
  { \@latex@warning@no@line{ Ignoring void shipout box } }
  {
    Otherwise we assume that we will ship something and prepare for final adjustments (in particular setting the state of \texttt{\protect} while we are running the hook code). We also save the current \texttt{\protect} state to restore it later.
    \% \bool_gset_false:N \g__shipout_discard_bool \% setting this would disable \% \DiscardShipoutBox on doc-level
    \cs_set_eq:NN \__shipout_saved_protect: \protect
    \set@typeset@protect
    We also store the current shipout box dimension in registers, so that they can be used in the hook code.\footnote{This is not really necessary as the code could access them via \texttt{\box_ht:N}, etc., but it is perhaps convenient.}
    \__shipout_get_box_size:N #1
    Then we execute the \texttt{\shipout/before} hook (or nothing in case of \texttt{\RawShipout}).
    \#2
    In \texttt{\g_shipout_totalpages_int} we count all shipout attempts so we increment that counter already here (the other one is incremented later when we know for sure that we do a \texttt{\shipout}.
    We increment it after running the above hook so that the values for \texttt{\g_shipout_totalpages_int} and \texttt{\g_shipout_readonly_int} are in sync while the hook is executed (in the case that totalpages isn’t manually altered or through discarding pages that is).
    \int_gincr:N \g_shipout_totalpages_int
    The above hook might contain code that requests the page to be discarded so we now test for it.
    \bool_if:NTF \g__shipout_discard_bool
    { \@latex@info@no@line{Completed page discarded} \bool_gset_false:N \g__shipout_discard_bool
      As we are discarding the page box and not shipping anything out, we need to do some house cleaning and reset \TeX’s deadcycles so that it doesn’t complain about too many calls to the OR without any shipout.
      \tex_deadcycles:D \c_zero_int
    }
    \% Todo: In \texttt{atbegshi} the box was dropped but is that actually needed? Or the resetting of \texttt{\protect} to its kernel value?
    \% \group_begin:
    \% \box_set_eq_drop:NN #1 #1
    \% \group_end:
    \% \cs_set_eq:NN \protect \exp_not:N
  }
\end{verbatim}

File X: \texttt{ltshipout.dtx}
Even if there was no explicit request to discard the box it is possible that the code for the hook `shipout/before` has voided the box (by mistake or deliberately). We therefore test once more but this time make it a warning, because the best practice way is to use the request mechanism.

97 \{ \box_if_empty:NTF #1
98 \{ \@latex@warning@no@line { Ignoring~ void~ shipout~ box. \MessageBreak The~ shipout~ box~ was~ voided~ by~ hook~ code } \}

Finally, if the box is still non-empty we are nearly ready to ship it out. First we increment the total page counter so that we can later test if we have reached the final page according to our available information.48

\{" \int_gincr:N \g_shipout_readonly_int
103 \__shipout_debug:n \{
104 \typeout{Absolute~ page~ =~ \int_use:N \g_shipout_readonly_int
105 \space (target:~ \@abspage@last)}\}

Then we store the box sizes again (as they may have changed) and then look at the hooks `shipout/foreground` and `shipout/background`. If either or both are non-empty we add a `picture` environment to the box (in the foreground and/or in the background) and execute the hook code inside that environment.

\{" \__shipout_get_box_size:N \#1

The first hook we run is the `shipout/firstpage` hook. This is only done once, then the \__shipout_run_firstpage_hook: command redefines itself to do nothing. If the hook contains \specials for integration at the top of the page they will be temporarily stored in a safe place and added later with \__shipout_add_firstpage_specials:.

\{" \__shipout_run_firstpage_hook:

Run the hooks for background and foreground or, if this is called by \RawShipout, copy the box \l\__shipout_raw_box to \l_shipout_box so that firstpage and lastpage material gets added if necessary (that is always done to \l_shipout_box).

\{" #3

We then run \__shipout_add_firstpage_specials: that adds the content of the hook `shipout/firstpage` to the start of the first page (if non-empty). It is then redefined to do nothing on later pages.

\{" \__shipout_add_firstpage_specials:

Then we check if we have to add the `shipout/lastpage` hook or the corresponding kernel hook because we have reached the last page. This test will be false for all but one (and hopefully the correct) page.

\{" \int_compare:nNnT \@abspage@last = \g_shipout_readonly_int
114 \{ \boool_lazy_and:nnF
115 \{ \hook_if_empty_p:n \{shipout/lastpage\} \}
116 \{ \tl_if_empty_p:N \@kernel@after@shipout@lastpage \}
117 \{ \__shipout_debug:n \{ \typeout{Executing~ lastpage~ hook~ on~ page~ \int_use:N \g_shipout_readonly_int } \}
118 \{ \__shipout_add_foreground_box:n \UseHook{shipout/lastpage}\}

48Doing that earlier would be wrong because we might end up with the last page counted but discard and then we have no place to add the final objects into the output file.
\@kernel@after@shipout\lastpage
\bool_gset_true:N \g__shipout_lastpage_handled_bool

We record that we have handled the shipout/lastpage hook but only if we really did.

}\__shipout_finalize_box:

Finally we run the actual \TeX primitive for shipout. As that will expand delayed \write statements inside the page in which protected commands should not expand we first change \protect to the appropriate definition for that case.
\cs_set_eq:NN \protect \exp_not:N
\tex_shipout:D \box_use:N \l_shipout_box

The \l_shipout_box may contain the firstpage material if this was the very first shipout. That makes it unsuitable for reuse in another shipout, so as a safety measure the next command resets \l_shipout_box to its earlier state if that is necessary. On later pages this is then a no-op.
\__shipout_drop_firstpage_specials:
The shipout/after hook (if in \#4) needs to run with \protect\ed commands again being executed, because that hook will “typeset” material added at the top of the next page.
\set@typeset@protect
\__shipout_execute_raw:

This implements the “raw” shipout which bypasses the before, foreground, background and after hooks. It follows the same pattern than \__shipout_execute_raw: except that it finally calls \__shipout_execute_main_cont:Nnnn with three empty arguments, instead of the hook code.
\cs_set_protected:Npn \__shipout_execute_raw: {
\tl_set:Nx \l__shipout_group_level_tl { \int_value:w \tex_currentgrouplevel:D }
\tex_afterassignment:D \__shipout_execute_test_level_raw:
\tex_setbox:D \l__shipout_raw_box
}
\ca_new:Npn \__shipout_execute_test_level_raw: {
\int_compare:nNnT
\l__shipout_group_level_tl < \tex_currentgrouplevel:D \\
\tex_aftergroup:D \__shipout_execute_nohooks_cont:
}

Well, not totally empty arguments, we add some debugging if we are actually doing a shipout.
\ca_new:Npn \__shipout_execute_nohooks_cont: {
\__shipout_execute_main_cont:Nnnn \l__shipout_raw_box

File X: ltshipout.dtx 910
\RawShipout The interface name for raw shipout.

\__shipout_saved_protect: Remember the current \protect state.

shipout/before Declaring all hooks for the shipout code.

\KernelAfterShipoutLastpage And here are the internal kernel hooks going before or after the public ones where needed.

\__shipout_run_firstpage_hook: There are three commands to handle the shipout/firstpage hook: \__shipout_run_firstpage_hook:, \__shipout_add_firstpage_specials: and \__shipout_drop_firstpage_specials:.

That hook is supposed to contain \specials and similar material to be placed at the very beginning of the output page and so it needs careful placing to avoid that anything else gets in front of it. And this means we have to wait with this until other hooks such as shipout/background have added their bits. It is also important that such \specials show up only on the very first page, so if this page gets saved before \shipout for later reuse, we have to make sure that they aren’t in the saved version.

In addition the hook may also contain code to be executed “first”, e.g., visible from code in shipout/background and this conflicts with adding the \specials late.

Therefore the processing is split into different parts: \__shipout_run_firstpage_hook: is done early and checks if there is any material in the hook.
If not then we define the other two commands to do nothing.

```latex
{\cs_gset_eq:NN \__shipout_add_firstpage_specials: \prg_do_nothing:
\cs_gset_eq:NN \__shipout_drop_firstpage_specials: \prg_do_nothing: }
```

If there is material we execute inside a box, which means any `\special` will end up in that box and any other code is executed and can have side effects (as long as they are global).

```latex
{\hbox_set:Nn \l__shipout_firstpage_box { \UseHook{shipout/firstpage} } }
```

Once we are here we change the definition to do nothing next time and we also change the command used to implement `\AtBeginDvi` to become a warning and not add further material to a hook that is never used again.

```latex
\cs_gset_eq:NN \__shipout_run_firstpage_hook: \prg_do_nothing:
\cs_gset:Npn \__shipout_add_firstpage_material:Nn ##1 ##2 {
\@latex@warning{ First~ page~ is~ already~ shipped~ out,~ ignoring \MessageBreak \string##1 }
}
```

```latex
(End definition for \__shipout_run_firstpage_hook:.)
```

The `\__shipout_add_firstpage_specials:` then adds the `\specials` stored in `\l__shipout_firstpage_box` to the page to be shipped out when the time is ready. Note that if there was no material in the `shipout/firstpage` hook then this command gets redefined to do nothing. But for most documents there is something, e.g., some PostScript header, or some meta data declaration, etc. so by default we assume there is something to do.

```latex
\cs_new:Npn \__shipout_add_firstpage_specials: {
First we make a copy of the \l_shipout_box that we can restore it later on.
\box_set_eq:NN \l__shipout_raw_box \l_shipout_box
Adding something to the beginning means adding it to the background as that layer is done first in the output.
\__shipout_add_background_box:n { \hbox_unpack_drop:N \l__shipout_firstpage_box }
After the actual shipout `\__shipout_drop_firstpage_specials:` is run to restore the earlier content of `\l_shipout_box` and then redefines itself again to do nothing.
As a final act we change the definition to do nothing next time.
\cs_gset_eq:NN \__shipout_add_firstpage_specials: \prg_do_nothing: }
```

The `\__shipout_drop_firstpage_specials:` is run after the shipout has occurred but before the shipout/afterpage hook is executed. That is the point where we have to restore the `\ShipoutBox` to its state without the `shipout/firstpage` material.

```latex
\cs_new:Npn \__shipout_drop_firstpage_specials: {
\box_set_eq:NN \l__shipout_drop_firstpage_specials: \l__shipout_raw_box
```

If there was no such material then `\__shipout_run_firstpage_hook:` will have changed the definition to a no-op already. Otherwise this is what we do here.

```latex
\cs_gset_eq:NN \__shipout_drop_firstpage_specials: \prg_do_nothing: }
```

File X: ltshipout.dtx
\l__shipout_firstpage_box
The box to hold any firstpage \specials.

\box_new:N \l__shipout_firstpage_box

\g__shipout_lastpage_handled_bool
A boolean to signal if we have already handled the shipout/lastpage hook.

\bool_new:N \g__shipout_lastpage_handled_bool

\__shipout_add_firstpage_material:Nn
This command adds material to the shipout/firstpage hook. It is used in \AtBeginDvi, etc. The first argument is the command through which it is called. Initially this is ignored but once we are passed the first page it can be used to generate a warning message mentioning the right user command.

\cs_new:Npn \__shipout_add_firstpage_material:Nn #1#2 { \AddToHook{shipout/firstpage}{#2} }

\__shipout_get_box_size:N
Store the box dimensions in dimen registers.

Todo: This could/should perhaps be generalized to set height depth and width given an arbitrary box.

\dim_new:N \l__shipout_box_ht_dim
\dim_new:N \l__shipout_box_dp_dim
\dim_new:N \l__shipout_box_wd_dim
\dim_new:N \l__shipout_box_ht_plus_dp_dim

And here are the variables set by \__shipout_get_box_size:N.

\l__shipout_box_ht_dim
\l__shipout_box_dp_dim
\l__shipout_box_wd_dim
\l__shipout_box_ht_plus_dp_dim

\g__shipout_discard_bool
Indicate whether or not the current page box should be discarded

\bool_new:N \g__shipout_discard_bool

\l__shipout_tmp_box
We need a box for the background and foreground material and a token register to remember badness settings as we disable them during the buildup below.

\tl_new:N \l__shipout_saved_badness_tl

File X: ltshipout.dtx
In standard \LaTeX{} the shipout box is always a \texttt{vbox} but here we are allow for other usage as well, in case some package has its own output routine.

\cs_new:Npn \__shipout_add_background_box:n #1
{ \__shipout_get_box_size:N \l_shipout_box
  \box_if_vertical:NTF \l_shipout_box
  { Save current values of $\vfuzz$ and $\vbadness$ then change them to allow box manipulations without warnings.
    \tl_set:Nx \l__shipout_saved_badness_tl
    { \vfuzz=\the\vfuzz\relax
      \vbadness=\the\vbadness\relax
    }
    \vfuzz=\c_max_dim
    \vbadness=\c_max_int
  }
  \box_set_to_ht:Nnn \l_shipout_box \l_shipout_box_ht_plus_dp_dim
  \hbox_set:Nn \l__shipout_tmp_box
  { \l__shipout_saved_badness_tl #1 }
  \box_set_wd:Nn \l__shipout_tmp_box \c_zero_dim
  \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
  \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
  \kern \c_zero_dim
  \box_set_ht:Nn \l_shipout_box \l_shipout_box_ht_dim
  \box_set_dp:Nn \l_shipout_box \l_shipout_box_dp_dim
  \kern \c_zero_dim
}

\box_if_horizontal:NTF \l_shipout_box
{ \tl_set:Nx \l__shipout_saved_badness_tl
  \box_set_to_ht:Nnn \l_shipout_box \l_shipout_box_ht_plus_dp_dim
  \hbox_set:Nn \l__shipout_tmp_box
  { \l__shipout_saved_badness_tl #1 }
  \box_set_wd:Nn \l__shipout_tmp_box \c_zero_dim
  \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
  \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
  \kern \c_zero_dim
  \box_set_ht:Nn \l_shipout_box \l_shipout_box_ht_dim
  \box_set_dp:Nn \l_shipout_box \l_shipout_box_dp_dim
}

\textit{Todo: The whole boxing maneuver looks a bit like overkill to me, but for the moment I leave.}

A horizontal box is handled in a similar way. The last case would be a void box in which case we do nothing hence the missing \texttt{F} branch.

\box_if_horizontal:NT \l_shipout_box
{ \tl_set:Nx \l__shipout_saved_badness_tl
  \box_set_to_ht:Nnn \l_shipout_box \l_shipout_box_ht_plus_dp_dim
  \hbox_set:Nn \l__shipout_tmp_box
  { \l__shipout_saved_badness_tl
    \hfuzz=\the\hfuzz\relax
  }
  \box_set_wd:Nn \l__shipout_tmp_box \c_zero_dim
  \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
  \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
  \kern \c_zero_dim
  \box_set_ht:Nn \l_shipout_box \l_shipout_box_ht_dim
  \box_set_dp:Nn \l_shipout_box \l_shipout_box_dp_dim
}
\hbadness=\the\hbadness\relax \\
hfuzz=\c_max_dim \\
hbadness=\c_max_int \\
hbox_set_to_wd:Nnn \l_shipout_box \l_shipout_box_wd_dim \\
  \{ \\
hbox_set:Nn \l__shipout_tmp_box \\
  \{ \l__shipout_saved_badness_tl \#1 \} \\
hbox_set_wd:Nn \l__shipout_tmp_box \c_zero_dim \\
hbox_set_ht:Nn \l__shipout_tmp_box \c_zero_dim \\
hbox_set_dp:Nn \l__shipout_tmp_box \c_zero_dim \\
hbox_move_up:nn \\
  \l_shipout_box_ht_dim \\
  \{ \box_use:N \l__shipout_tmp_box \} \\
  \hbox_unpack:N \l_shipout_box \\
  \} \\
\l__shipout_saved_badness_tl \\
\} \\
\} \\
\} \\
\} \\
\} \\
\} \\
\} \\
\box_if_vertical:NTF \l_shipout_box \\
  \{ \\
  \tl_set:Nx \l__shipout_saved_badness_tl \\
  \{ \v fuzz=\the\v fuzz\relax \\
    \vbadness=\the\vbadness\relax \} \\
  \v fuzz=\c_max_dim \\
  \vbadness=\c_max_int \\
  \vbox_set_to_ht:Nnn \l_shipout_box \l_shipout_box_ht_plus_dp_dim \\
  \} \\
  \hbox_set:Nn \l__shipout_tmp_box \\
  \{ \l__shipout_saved_badness_tl \#1 \} \\
  \hbox_set_wd:Nn \l__shipout_tmp_box \c_zero_dim \\
  \hbox_set_ht:Nn \l__shipout_tmp_box \c_zero_dim \\
  \hbox_set_dp:Nn \l__shipout_tmp_box \c_zero_dim \\
  \skip_zero:N \baselineskip \\
  \skip_zero:N \lineskip \\
  \skip_zero:N \lineskiplimit \\
  \vbox_unpack:N \l_shipout_box \\
  \kern -\l_shipout_box_ht_plus_dp_dim \\
  \box_use:N \l__shipout_tmp_box \\
  \kern \l_shipout_box_ht_plus_dp_dim \\
  \} \\
\l__shipout_saved_badness_tl \\
\box_set_ht:Nn \l_shipout_box \l_shipout_box_ht_dim \\
\box_set_dp:Nn \l_shipout_box \l_shipout_box_dp_dim \\
\} \\
\} \\
\box_if_horizontal:NT \l_shipout_box 

(End definition for \__shipout_add_background_box:n.)

\__shipout_add_foreground_box:n Foreground boxes are done in the same way, only the order and placement of boxes has to be done differently.
\cs_new:Npn \__shipout_add_foreground_box:n #1 \\
  \{ \\
  \box_if_vertical:NTF \l_shipout_box \\
    \{ \\
    \tl_set:Nx \l__shipout_saved_badness_tl \\
    \{ \v fuzz=\the\v fuzz\relax \\
      \vbadness=\the\vbadness\relax \} \\
    \v fuzz=\c_max_dim \\
    \vbadness=\c_max_int \\
    \vbox_set_to_ht:Nnn \l_shipout_box \l_shipout_box_ht_plus_dp_dim \\
    \} \\
    \hbox_set:Nn \l__shipout_tmp_box \\
    \{ \l__shipout_saved_badness_tl \#1 \} \\
    \hbox_set_wd:Nn \l__shipout_tmp_box \c_zero_dim \\
    \hbox_set_ht:Nn \l__shipout_tmp_box \c_zero_dim \\
    \hbox_set_dp:Nn \l__shipout_tmp_box \c_zero_dim \\
    \skip_zero:N \baselineskip \\
    \skip_zero:N \lineskip \\
    \skip_zero:N \lineskiplimit \\
    \vbox_unpack:N \l_shipout_box \\
    \kern -\l_shipout_box_ht_plus_dp_dim \\
    \box_use:N \l__shipout_tmp_box \\
    \kern \l_shipout_box_ht_plus_dp_dim \\
    \} \\
\l__shipout_saved_badness_tl \\
\box_set_ht:Nn \l_shipout_box \l_shipout_box_ht_dim \\
\box_set_dp:Nn \l_shipout_box \l_shipout_box_dp_dim \\
\} \\
\} \\
\box_if_horizontal:NT \l_shipout_box
\__shipout_add_foreground_box:n

Two constants holding the offset of the top-left with respect to the media box.
Setting the constants this way is courtesy of Bruno.
We delay setting the constants to the last possible place as there might be updates in the preamble or even in the \begindocument hook that affects their setup.

\__shipout_init_page_origins:

Two constants holding the offset of the top-left with respect to the media box.
Setting the constants this way is courtesy of Bruno.
We delay setting the constants to the last possible place as there might be updates in the preamble or even in the \begindocument hook that affects their setup.

\__shipout_picture_overlay:n

Put the argument into a picture environment that doesn’t take up any size and uses 1pt for \unitlength.

Todo: Could perhaps be generalized as it might be useful elsewhere. For now it is not.
\cs_new:Npn \__shipout_picture_overlay:n #1 {  
\__shipout_init_page_origins:
\kern -\c__shipout_horigin_tl \scan_stop:
\vbox_to_zero:n {  
\kern -\c__shipout_vorigin_tl \scan_stop:
\unitlength 1pt \scan_stop:
This mimics a simple zero-sized picture environment. The \hss is need in case there is horizontal material (without using \put with a positive width.
\hbox_set_to_wd:Nnn \l__shipout_tmp_box \c_zero_dim { \ignorespaces #1 \hss }
\box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
\box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
\box_use:N \l__shipout_tmp_box
\tex_vss:D
}
(End definition for \__shipout_picture_overlay:n.)
\__shipout_add_background_picture:n
Put a picture env in the background of the shipout box with its reference point in the top-left corner.
\cs_new:Npn \__shipout_add_background_picture:n #1 {  
\__shipout_add_background_box:n { \__shipout_picture_overlay:n (#1) }
}
(End definition for \__shipout_add_background_picture:n)
\__shipout_add_foreground_picture:n
Put a picture env in the foreground of the shipout box with its reference point in the top-left corner.
\cs_new:Npn \__shipout_add_foreground_picture:n #1 {  
\__shipout_add_foreground_box:n { \__shipout_picture_overlay:n (#1) }
}
(End definition for \__shipout_add_foreground_picture:n)
\shipout_discard: Request that the next shipout box should be discarded. At the moment this is just setting a boolean, but we may want to augment this behavior that the position of the call is taken into account (in case \LaTeX looks ahead and is not using the position for on the next page).
\cs_new_protected:Npn \shipout_discard: {  
\bool_gset_true:N \g__shipout_discard_bool
}
(End definition for \shipout_discard:. This function is documented on page 901.)
3.2 Handling the end of job hook

At the moment this is partly solved by using the existing hooks. But rather than putting the code into these hooks it should be moved to the right place directly as we shouldn’t prefill hooks with material unless it needs to interact with other code.

`\g_shipout_readonly_int \ ReadonlyShipoutCounter`

We count every shipout activity that makes a page (but not those that are discarded) in order to know how many pages got produced.

\begin{verbatim}
\int_new:N \g_shipout_readonly_int
For \LaTeX2\epsilon it is available as a command (i.e., a \TeX{} counter only.
\cs_new_eq:NN \ReadonlyShipoutCounter \g_shipout_readonly_int
(End definition for \g_shipout_readonly_int and \ ReadonlyShipoutCounter. These functions are documented on page 902.)
\end{verbatim}

`\g_shipout_totalpages_int \ c@totalpages`

We count every shipout attempt (even those that are discarded) in this counter. It is not used in the code but may get used in user code.

\begin{verbatim}
\int_new:N \g_shipout_totalpages_int
For \LaTeX2\epsilon this is offered as a \LaTeX{} counter so can be easily typeset inside the output routine to display things like \texttt{\thepage/\thetotalpages}, etc.
\cs_new_eq:NN \c@totalpages \g_shipout_totalpages_int
\cs_new:Npn \thetotalpages { \arabic{totalpages} }
(End definition for \g_shipout_totalpages_int and \c@totalpages. These functions are documented on page 902.)
\end{verbatim}

`@abspage@last`

In \texttt{@abspage@last} record the number of pages from the last run. This is written to the .aux and this way made available to the next run. In case there is no .aux file or the statement is missing from it we initialize it with the largest possible number in \TeX{}. We use this as the default because then we are inserting the \texttt{shipout/lastpage} on the last page (or after the last page) but not on page 1 for a multipage document.

\begin{verbatim}
\xdef\@abspage@last{\number\maxdimen}
(End definition for \@abspage@last.)
\end{verbatim}

\texttt{\enddocument}

Instead of using the hooks \texttt{enddocument} and \texttt{enddocument/afterlastpage} we add this code to private kernel hooks to be 100% sure when it is executed and to avoid cluttering the hooks with data that is always there.

Inside \texttt{\enddocument} there is a \texttt{\clearpage}. Just before that we execute this code here. There is a good chance that we are on the last page. Therefore, if we don’t know the value from the last run, we assume that the current page is the right one. So we set \texttt{@abspage@last} and as a result the next shipout will run the \texttt{shipout/lastpage} code. Of course, if there are floats that still need a placement this guess will be wrong but then rerunning the document will give us the correct value next time around.

\begin{verbatim}
\g@addto@macro \@kernel@after@enddocument { 
\int_compare:nNnT \@abspage@last = \maxdimen 
\{ 
\xdef\@abspage@last{\int_eval:n {\g_shipout_readonly_int + 1} }
\}
}
\end{verbatim}

File X: \texttt{ltshipout.dtx}
Once the `\clearpage` has done its work inside `\enddocument` we know for sure how many pages this document has, so we record that in the `.aux` file for the next run.

There is one special case: If no output is produced then there is no point in a) recording the number as 0 will never match the page number of a real page and b) adding an extra page to run the `shipout/lastpage` is pointless as well (as it would remain forever). So we test for this and run the code only if there have been pages.

This ends up in the `.aux` so we use \LaTeX\TeX\ works here.

\textit{Todo: This needs an interface for `\nofiles` in expl3, doesn't at the moment!}

If the hook was already executed, we have to test if that total shipouts match the shipouts from last run (because that corresponds to the page it was executed). If not we output a warning.

If the hook was not run, we need to add an extra page and place it there. However, making this extra page in case the hook is actually empty would be forcing a rerun without any reason, so we check that condition and also check if `\@kernel@after@shipout@lastpage` contains any code. If both are empty we omit the page generation.
This extra page could be totally empty except for the hook content, but to help the user understanding why it is there we put some text into it.

\__shipout_excuse_extra_page: \null \}

At this point we also signal to \LaTeX{}’s endgame that a rerun is necessary so that an appropriate message can be shown on the terminal. We do this by simply defining a command used as a flag and tested in \enddocument.

\cs_gset_eq:NN \@extra@page@added \relax \}

(End definition for \enddocument, \@kernel@after@enddocument, and \@kernel@after@enddocument@afterlastpage.)

\__shipout_excuse_extra_page: Say mea culpa ...

\cs_new:Npn \__shipout_excuse_extra_page: { \vfil \begin{center} \bfseries Temporary~ page! \end{center} \LaTeX{}~ was~ unable~ to~ guess~ the~ total~ number~ of~ pages~ correctly.~ As~ there~ was~ some~ unprocessed~ data~ that~ should~ have~ been~ added~ to~ the~ final~ page~ this~ extra~ page~ has~ been~ added~ to~ receive~ it. \par If~ you~ rerun~ the~ document~ (without~ altering~ it)~ this~ surplus~ page~ will~ go~ away,~ because~ \LaTeX{}~ now~ knows~ how~ many~ pages~ to~ expect~ for~ this~ document. \vfil \}

(End definition for \__shipout_excuse_extra_page:.)

\PreviousTotalPages In the preamble before the aux file was read \PreviousTotalPages is always zero.

\def\PreviousTotalPages{0}

(End definition for \PreviousTotalPages and \@kernel@before@begindocument. These functions are documented on page 902.)
4 Legacy \TeX\ 2\epsilon interfaces

\DiscardShipoutBox Request that the next shipout box is to be discarded.
\begin{verbatim}
\cs_new_eq:NN \DiscardShipoutBox \shipout_discard:
\end{verbatim}

(End definition for \DiscardShipoutBox. This function is documented on page 901.)

\AtBeginDvi If we roll forward from an earlier kernel \AtBeginDvi is defined so we better not use
\begin{verbatim}
\cs_set_protected:Npn \AtBeginDvi
\end{verbatim}

(End definition for \AtBeginDvi. This function is documented on page 901.)

\DebugShipoutsOn \DebugShipoutsOff
\begin{verbatim}
\cs_new_eq:NN \DebugShipoutsOn \shipout_debug_on:
\cs_new_eq:NN \DebugShipoutsOff \shipout_debug_off:
\end{verbatim}

(End definition for \DebugShipoutsOn and \DebugShipoutsOff. These functions are documented on page 903.)

5 Internal commands needed elsewhere

These internal commands use double and triple \@ signs so we need to stop getting them
translated to the module name.
\begin{verbatim}
\ExplSyntaxOff
\end{verbatim}

Some internals needed elsewhere.
\begin{verbatim}
\cs_set_eq:NN \atexpl@@@shipout@add@firstpage@material@@Nn
\__shipout_add_firstpage_material:Nn
\cs_set_eq:NN \atexpl@@@shipout@add@background@box@@n
\__shipout_add_background_box:n
\cs_set_eq:NN \atexpl@@@shipout@add@foreground@box@@n
\__shipout_add_foreground_box:n
\cs_set_eq:NN \atexpl@@@shipout@add@background@picture@@n
\__shipout_add_background_picture:n
\cs_set_eq:NN \atexpl@@@shipout@add@foreground@picture@@n
\__shipout_add_foreground_picture:n
\end{verbatim}

(End definition for \atexpl@@@shipout@add@firstpage@material@@Nn and others.)
\begin{verbatim}
\ExplSyntaxOff
(\Zekernel | \latexrelease)
\ExplSyntaxOff\EndIncludeInRelease
\end{verbatim}

Rolling back here doesn’t undefine the interface commands as they may be used in
packages without rollback functionality. So we just make them do nothing which may or
may not work depending on the code usage.
\begin{verbatim}
(\latexrelease)\IncludeInRelease{0000/00/00}\%
(\latexrelease)\shipout\{}Hook management (shipout)\}\%
(\latexrelease)
\end{verbatim}

File X: ltshipout.dtx 921
If we roll forward then \texttt{\tex_shipout:D} may not be defined in which case \shipout does have its original definition and so we must not \let it to something else which is \relax!

We do not undo a substitution when rolling back. As the file support gets undone the underlying data is no longer used (and sufficiently obscure that it should not interfere with existing commands) and properly removing it would mean we need to make the \undeclare@... and its support macros available in all earlier kernel releases which is pointless (and actually worse).

We do not reenable a disabled package load when rolling back. As the file support gets undone the underlying data is no longer checked (and sufficiently obscure that it should not interfere with existing commands) and properly removing it would mean we need to make the \reenable@package@load command available in all earlier kernel releases which is pointless (and actually worse).
6 Package emulation for compatibility

6.1 Package \texttt{atenddvi} emulation

\AtEndDvi
\begin{verbatim}
This package has only one public command, so simulating it is easy and actually sensible to provide as part of the kernel.
\end{verbatim}

\begin{verbatim}
\ExplSyntaxOn
\cs_new_protected:Npn \AtEndDvi #1 \{ \AddToHook{shipout/lastpage}{#1} \}
\ExplSyntaxOff
\end{verbatim}

As the package is integrate we prevent loading (no need to roll that back):

\begin{verbatim}
\disable@package@load{atenddvi}
{ \PackageWarning{atenddvi} { Functionality of this package is already provided by LaTeX. It is there no longer necessary to load it and you can safely remove it. Found on }}
\end{verbatim}

\begin{verbatim}
\end{verbatim}

(End definition for \AtEndDvi. This function is documented on page 901.)

6.2 Package \texttt{atbegshi} emulation

\AtBeginShipoutBox
\begin{verbatim}
\ProvidesPackage{atbegshi-ltx} \[2021/01/10 v1.0c\]
Emulation of the original \texttt{atbegshi} package with kernel methods
\end{verbatim}

\AtBeginShipoutBox
\begin{verbatim}
\let \AtBeginShipoutBox \ShipoutBox
\end{verbatim}

(End definition for \AtBeginShipoutBox. This function is documented on page 903.)

\AtBeginShipoutInit
\begin{verbatim}
\let \AtBeginShipoutInit \empty
\end{verbatim}

(End definition for \AtBeginShipoutInit. This function is documented on page 904.)

\AtBeginShipoutNext
\begin{verbatim}
\protected\long\def\AtBeginShipout #1 \{ \AddToHook{shipout/lastpage}{#1} \}
\protected\long\def\AtBeginShipoutNext #1 \{ \AddToHookNext{shipout/lastpage}{#1} \}
\end{verbatim}

File X: \texttt{ltshipout.dtx}
\AtBeginShipoutFirst

Slightly more complex as we need to know the name of the command under which the shipout/firstpage hook is filled.

\let \AtBeginShipoutDiscard \DiscardShipoutBox

\AtBeginShipoutAddToBox
\AtBeginShipoutAddToBoxForeground
\AtBeginShipoutUpperLeft
\AtBeginShipoutUpperLeftForeground

We don’t expose them.

\AtBeginShipoutOriginalShipout

This offers the raw \shipout primitive of the engine. A page shipped out with this is not counted by \ ReadonlyShipoutCounter counter and thus the mechanism to place \specials at the very end of the output might fail, etc. It should therefore not be used in new applications but is only provided to allow running legacy code. For new code use the commands provided by the kernel instead.

\ShipoutBoxHeight
\ShipoutBoxWidth
\ShipoutBoxDepth

This is somewhat different from the original in atbegshi where \ShipoutBoxHeight etc. only holds the \the\ht<box> value. This may have some implications in some use cases and if that is a problem then it might need changing.

File X: \ltshipout.dtx
6.3 Package everyshi emulation

This is now directly handled in that package so emulation is not necessary any more.
   Rather important :-)
File Y
ltoutput.dtx

1 Output Routine

1.1 Floats

The ‘2ekernel’ code ensures that a \usepackage{autoout1} is essentially ignored if a ‘full’ format is being used that has the autoload file mode already in the format.

Historical BTeX 2.09 comments (not necessarily accurate any more):

PAGE LAYOUT PARAMETERS

\topmargin : Extra space added to top of page.
@twoside : boolean. T if two-sided printing
\oddsidemargin : IF @twoside = T
  THEN extra space added to left of odd-numbered pages.
  ELSE extra space added to left of all pages.
\evensidemargin : IF @twoside = T
  THEN extra space added to left of even-numbered pages.
\headheight : height of head
\headsep : separation between head and text
\footskip : distance separation between baseline of last line of text and baseline of foot.
  Note difference between \footskip and \headsep.
\textheight : height of text on page, excluding head and foot
\textwidth : width of printing on page
\columnsep : IF @twocolumn = T
  THEN width of space between columns
\columnseprule : IF @twocolumn = T
  THEN width of rule between columns (0 if none).
\columnwidth : IF @twocolumn = T
  THEN (\textwidth - \columnsep)/2
  ELSE \textwidth
  It is set by the \twocolumn and \onecolumn commands.
\@textbottom : Command executed at bottom of vbox holding text of page (including figures). The \raggedbottom command almost \let’s this to \vfil (actually sets it to \vskip \z@ plus.0001fil). Should have depth 0pt.

\@texttop : Command executed at top of vbox holding text of page (including figures). Used by letter style; can also be used to produce centered pages. Let to \relax by \raggedbottom and \flushbottom.

Page layout must initialize \@colht and \@colroom to \textheight.

PAGE STYLE PARAMETERS:

\floatsep : Space left between floats.
\textfloatsep : Space between last top float or first bottom float and the text.
\topfigrule : Command to place rule (or whatever) between floats at top of page and text. Executed in inner vertical mode right before the \textfloatsep skip separating the floats from the text. Must occupy zero vertical space. (See \footnoterule.)
\botfigrule : Same as \topfigrule, but put after the \textfloatsep skip separating text from the floats at bottom of page.
\intextsep : Space left on top and bottom of an in-text float.
\dblfloatsep : Space between double-column floats.
\dbltextfloatsep : Space between top double-column floats and text.
\dblfigrule : Similar to \topfigrule, but for double-column floats.
\@fptop : Glue to go at top of float column – must be 0pt + stretch
\@fpsep : Glue to go between floats in a float column.
\@fpbot : Glue to go at bottom of float column – must be 0pt + stretch
\@dblfpsep, \@dblfpbot : Analogous for double-column float page in two-column format.

FOOTNOTES: As in PLAIN, footnotes use \insert\footins.

PAGE LAYOUT SWITCHES AND MACROS

@twocolumn : Boolean. T if two columns per page globally.

PAGE STYLE MACROS AND SWITCHES
\@oddhead : IF @twoside = T
THEN macro to generate head of odd-numbered
pages.
ELSE macro to generate head of all pages.

\@evenhead : IF @twoside = T
THEN macro to generate head of even-numbered
pages.

\@oddfoot : IF @twoside = T
THEN macro to generate foot of odd-numbered
pages.
ELSE macro to generate foot of all pages.

\@evenfoot : IF @twoside = T
THEN macro to generate foot of even-numbered
pages.

@specialpage : boolean. T if current page is to have a special
format.

\@specialstyle : If its value is foo then
IF @specialpage = T
THEN the command \ps@foo is executed to
temporarily reset the page style parameters
before composing the current page.
This command should execute only \def’s and
\edef’s, making only local definitions.

FLOAT PLACEMENT PARAMETERS

The following parameters are set by the macro \@floatplacement.
When \@floatplacement is called,
\@colht is the height of the page or column being built. I.e.:
* For single-column page it equals \textheight.
* For double-column page it equals \textheight - height
of double-column floats on page.

Note that some are set globally and some locally:
\@topnum :=G Maximum number of floats allowed on the top of a
column.
\@toproom :=G Maximum amount of top of column devoted to floats–
excluding \textfloatsep separation below the floats
and \floatsep separation between them. For
two-column output, should be computed as a function
of \@colht.
\@botnum, \@botroom : Analogous to above.
\@colnum :=G Maximum number of floats allowed in a column,
including in-text floats.
\@textmin :=L Minimum amount of text (excluding footnotes) that
must appear on a text page.
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\@fpmin :=L Minimum height of floats in a float column.

The macro \@dblfloatplacement sets the following parameters.
\@dbltopnum :=G Maximum number of double-column floats allowed at the top of a two-column page.
\@dbltoproom :=G Maximum height of double-column floats allowed at top of two-column page.
\@fpmin :=L Minimum height of floats in a float column.

It should also perform the following local assignments where necessary – i.e., where the new value differs from the old one:
\@fptop :=L \@dblfptop
\@fpsep :=L \@dblfpsep
\@fpbot :=L \@dblfpbot

OUTPUT ROUTINE VARIABLES

\@colht : The total height of the current column. In single column style, it equals \textheight. In two-column style, it is \textheight minus the height of the double-column floats on the current page. MUST BE INITIALIZED TO \textheight.

\@colroom : The height available in the current column for text and footnotes. It equals \@colht minus the height of all floats committed to the top and bottom of the current column.

\@textfloatsheight : The total height of in-text floats on the current page.

\footins : Footnote insertion number.

\@maxdepth : Saved value of TeX’s \maxdepth. Must be set when any routine sets \maxdepth.

CALLING THE OUTPUT ROUTINE

The output routine is called either by TeX’s normal page-breaking mechanism, or by a macro putting a penalty < or = -10000 in the output list. In the latter case, the penalty indicates why the output routine was called, using the following code.

penalty reason
-10000 \pagebreak
\newpage
-10001 \clearpage \penalty -10000 \vbox{} \penalty -10001
-10002 float insertion, called from horizontal mode
-10003 float insertion, called from vertical mode.
-10004 float insertion.
Note: A float or marginpar puts the following sequence in the output list: (i) a penalty of -10004,
(ii) a null \vbox
(iii) a penalty of -10002 or -10003.
This solves two special problems:
1. If the float comes right after a \newpage or \clearpage, then the first penalty is ignored, but the second one invokes the output routine.
2. If there is a split footnote on the page, the second 'page' puts out the rest of the footnote.

THE OUTPUT ROUTINE

FUNCTIONS USED IN THE OUTPUT ROUTINE:

\@outputpage : Produces an output page with the contents of box \@outputbox as the text part.
Also sets \@colht := G \textheight.
The page style is determined as follows.
IF @thispagestyle = true
THEN use \thispagestyle style
ELSE use ordinary page style.

\@tryfcolumn \FLIST : Tries to form a float column composed of floats from \FLIST (if nonempty) with the following parameters:
\@colht : height of box
\@fpmin : minimum height of floats in the box
\@fpsep : interfloat space
\@fptop : glue at top of box
\@fpbot : glue at bottom of box.
If it succeeds, then it does the following:
* \@outputbox := L the composed float box.
* @fcolmade := G true
* \FLIST := G \FLIST - floats put in box
* \@freelist := G \@freelist + floats put in box
If it fails, then:
* @fcolmade := G false

NOTE: BIT MUST BE A SINGLE TOKEN!

\@makefcolumn \FLIST : Same as \@tryfcolumn except that it fails to make a float column only if \FLIST is empty.
Otherwise, it makes a float column containing at least the first box in \FLIST, disregarding \@fpmin.

\@startcolumn :
Calls \@tryfcolumn@deferlist. If \@tryfcolumn returns with (globally set) @fcolmade = false, then:
* Globally sets \@toplist and \@botlist to floats
from `\@deferlist` to go at top and bottom of column, deleting them from `\@deferlist`. It does this using `\@colht` as the total height, the page style parameters `\@floatsep` and `\@textfloatsep`, and the float placement parameters `\@topnum`, `\@toproom`, `\@botnum`, `\@botroom`, `\@colnum` and `\textfraction`.

* Globally sets `\@colroom` to `\@colht` minus the height of the added floats.

```latex
\@startdblcolumn : 
Calls \@tryfcolumn@dbldeferlist{8}. If \@tryfcolumn returns with (globally set) \@fcolmade = false, then:
* Globally sets \@dbltoplist to floats from \@dbldeferlist to go at top and bottom of column, deleting them from \@dbldeferlist.
It does this using `\textheight` as the total height, and the parameters `\@dblfloatsep`, etc.
* Globally sets `\@colht` to `\textheight` minus the height of the added floats.
```

```latex
\@combinefloats : Combines the text from box \@outputbox with the floats from \@toplist and \@botlist, putting the new box in \@outputbox. It uses `\@floatsep` and `\@textfloatsep` for the appropriate separations. It puts the elements of `\TOPLIST` and `\BOTLIST` onto `\@freelist`, and makes those lists null.
```

```latex
\@makecol : Makes the contents of `\box255` plus the accumulated footnotes, plus the floats in `\@toplist` and `\@botlist`, into a single column of height `\@colht` (unless the page height has been locally changed), which it puts into box `\@outputbox`. It puts boxes in `\@midlist` back onto `\@freelist` and restores `\maxdepth`.
```

```latex
\@opcol : Outputs a column whose text is in box `\@outputbox`
If `\@twocolumn = false`, then it calls `\@outputpage`, sets `\@colht :=G \@textheight`, and calls `\@floatplacement`.

If `\@twocolumn = true`, then:
  If `\@firstcolumn = true`, then it puts box `\@outputbox` into `\@leftcolumn` and sets `\@firstcolumn :=G false`.

  If `\@firstcolumn = false`, then it puts out the current two-column page, any possible two-column float pages, and determines `\@dbltoplist` for the next page.
```

**USER COMMANDS THAT CALL OR AFFECT THE OUTPUT ROUTINE**

File Y: `1toutput.dtx` Date: 2022/04/03 Version v1.4i
\newpage == BEGIN \par\vfil\penalty -10000 END

\clearpage == BEGIN \newpage
\write -1{} \% Part of hack to make sure no \vbox{} \% \write's get lost.
\penalty -10001
END

\cleardoublepage == BEGIN \clearpage
if @twoside = true and c@page is even
then \hbox{} \newpage fi
END

\twocolumn[BOX] : starts a new page, changing to twocolumn setting
and puts BOX in a parbox of width \textwidth across the to.
Useful for full-width titles for double-column pages.
SURPRISE: The stretch from \@dbltextfloatsep will be inserted
between the BOX and the top of the two columns.

FLOAT-HANDLING MECHANISMS

The float environment obtains an insertion number B from the \@freelist (see below for a description of list manipulation), puts
the float into box B and sets \count B to a FLOAT SPECIFIER. For
a normal (not double-column) float, it then causes a page break
in one of the following two ways:
- In outer hmode: \vadjust{\penalty -10002}
- In vmode : \penalty -10003.
For a double-column float, it puts B onto the \@dbldeferralist.
The float specifier has two components:
* A PLACEMENT SPECIFICATION, describing where the float may
  be placed.
* A TYPE, which is a power of two–e.g., figures might be
  type 1 floats, tables type 2 floats, programs type 4 floats, etc.
The float specifier is encoded as follows, where bit 0 is the least
significant bit.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 iff the float may go where it appears in the text.</td>
</tr>
<tr>
<td>1</td>
<td>1 iff the float may go on the top of a page.</td>
</tr>
<tr>
<td>2</td>
<td>1 iff the float may go on the bottom of a page.</td>
</tr>
<tr>
<td>3</td>
<td>1 iff the float may go on a float page.</td>
</tr>
<tr>
<td>4</td>
<td>1 unless the PLACEMENT includes a !</td>
</tr>
<tr>
<td>5</td>
<td>1 iff a type 1 float</td>
</tr>
</tbody>
</table>

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A negative float specifier is used to indicate a marginal note.

MACROS AND DATA STRUCTURES FOR PROCESSING FLOATS

A FLOAT LIST consisting of the floats in boxes boxa ... boxN has the form:

\@elt boxa ... \@elt boxN

where boxI is defined by

\newinsert\boxI

Normally, \@elt is \let to \relax. A test can be performed on the entire float list by locally \def'ing \@elt appropriately and executing the list.

This is a lot more efficient than looping through the list.

The following macros are used for manipulating float lists.

\@next \CS \LIST {NONEMPTY}{EMPTY} == \relax
\begin{verbatim}
BEGIN assume that \LIST == \@elt B1 ... \@elt Bn
if n == 0 then EMPTY
else \CS :=L B1 \LIST :=G \@elt B2 ... \@elt Bn
NONEMPTY
fi
END
\end{verbatim}

\@bitor\NUM\LIST: Globally sets switch \@test to the disjunction for all I of bit \log2 \NUM of the float specifiers of all the floats in \LIST.

I.e., \@test is set to true iff there is at least one float in \LIST having bit \log2 \NUM of its float specifier equal to 1.

Note: \log2 [(\count I)/32] is the bit number corresponding to the type of float I. To see if there is any float in \LIST having the same type as float I, you run \@bitor with \NUM = [(\count I)/32] * 32.

\@bitor\NUM\LIST ==
\begin{verbatim}
BEGIN @test :=G false
{ \@elt \CTR == if \NUM <> 0 then
  if \count\CTR / \NUM is odd
    then @test := true fi
fi
\end{verbatim}

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\@cons\LIST\NUM : Globally sets \LIST := \LIST \* \@elt \NUM

\@cons\LIST\NUM ==
BEGIN { \@elt == \relax
\LIST := G \LIST \@elt \NUM
}

BOX LISTS FOR FLOAT-PLACEMENT ALGORITHMS
\@freelist : List of empty boxes for placing new floats.
\@toplist : List of floats to go at top of current column.
\@midlist : List of floats in middle of current column.
\@botlist : List of floats to go at bottom of current column.
\@deferlist : List of floats to go after current column.
\@dbltoplist : List of double-col. floats to go at top of current page.
\@dbldeferlist : List of double-column floats to go on subsequent pages.

FLOAT-PLACEMENT ALGORITHMS

\@addtobot : Tries to put insert \@currbox on \@botlist.
   Called only when:
   * \ht \BOX < \@colroom
   * type of \@currbox not on \@deferlist
   * \@colnum > 0
   * @insert = false
   If it succeeds, then:
   * sets @insert true
   * decrements \@botroom by \ht \BOX
   * decrements \@botnum and \@colnum by 1
   * decrements \@colroom by \ht \BOX + either \floatsep
     or \textfloatsep, as appropriate.
   * sets \maxdepth to 0pt

\@addtotoporbot : Tries to put insert \@currbox on \@toplist or
\@botlist.
   Called only under same conditions as \@addtobot.
   If it succeeds, then:
   * sets @insert true
   * decrements \@toproom or \@botroom by \ht \BOX
   * decrements \@colnum and either \@topnum or
     \@botnum by 1
   * decrements \@colroom by \ht \BOX + \floatsep
or \textfloatsep, as appropriate.

\@addtocurcol : Tries to add \@currbox to current column, setting \@insert true if it succeeds, false otherwise. It will add \@currbox to top only if bit 0 of \count \@currbox is 0, and to the bottom only if bit 0 = 0 or an earlier float of the same type is put on the bottom. If the float is put in the text, then \penalty\interlinepenalty is put right after the float, before the following \vskip, and \outputpenalty :=L 0.

\@addtonextcol : Tries to add \@currbox to the next column, setting \@insert true if it succeeds, false otherwise.

\@addtodbcol : Tries to add \@currbox to the next double-column page, adding it to \@dbltoplist if it succeeds and \@dbldeflist if it fails.

\@addmarginpar ==
BEGIN
  if \@currlist nonempty
    then remove \@marbox from \@currlist
    add \@marbox and \@currbox to \@freelist
    \% NOTE: \@currbox = left box
    else LaTeX error: ? \% shouldn’t happen
  fi
  \@tempcna := 1 \% 1 = right, -1 = left
  if @twocolumn = true
    then if @firstcolumn = true
      then \@tempcna := -1
      fi
    else if @mparswitch = true
      then if count0 odd
        \else \@tempcna := -1
        \fi
      \fi
    \fi
  if @reversemargin = true
    then \@tempcna := -\@tempcna
  \fi
  if \@tempcna < 0 then \box\@marbox :=G \box\@currbox
  fi
  \@tempdim :=L maximum(\@mparbottom - \@pageht
  + ht of \@marbox, 0)
  if \@tempdim > 0 then LaTeX warning: ‘marginpar moved’ \fi
  \@mparbottom :=G \@pageht + \@tempdim + depth of \@marbox
  + \marginparpush
Floats and marginpars add a lot of dead cycles.

End of historical \TeX\ 2.09 comments.

\maxdeadcycles = 100
\let\@elt\relax
\def\@next#1#2#3#4{\ifx#2\@empty #4\else
\expandafter\@xnext #2\@@#1#2#3\fi}
\def\@xnext\@elt #1#2\@@#3#4{\def#3{#1}\gdef#4{#2}}
\def\@testfalse{\global\let\if@test\iffalse}
\def\@testtrue{\global\let\if@test\iftrue}
\@testfalse
\def\@bitor#1#2{\@testfalse {\let\@elt\@xbitor
\@tempcnta #1\relax #2}}
\let\@elt\newinsert
\def\@freelist{File Y: ltoutput.dtx
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936

\def\@ Previous line
\@previous line
The new algorithm stores page wide floats together with column floats in a single \@deferlist list. We keep \@dbldeferlist initialised as empty so that packages that are testing for deferred floats can use the same code for old or new float handling.

\gdef\@dbldeflist{}

\def\@toplist{}
\def\@botlist{}
\def\@midlist{}
\def\@currlist{}
\def\@deferlist{}

\def\@dbldeferlist{}

\newdimen\topmargin
\newdimen\oddsidemargin
\newdimen\evensidemargin
\let\@themargin=\oddsidemargin
\newdimen\headheight
\newdimen\headsep
\newdimen\footskip

\let\@themargin=\oddsidemargin
\newdimen\footskip
\newdimen\headheight
\newdimen\headsep
\newdimen\footskip

\gdef\@toplist{}
\gdef\@botlist{}
\gdef\@midlist{}
\gdef\@currlist{}
\gdef\@deferlist{}
\gdef\@dbltoplist{}

\newdimen\topmargin
\newdimen\oddsidemargin
\newdimen\evensidemargin
\let\@themargin=\oddsidemargin
\newdimen\headheight
\newdimen\headsep
\newdimen\footskip

\gdef\@toplist{}
\gdef\@botlist{}
\gdef\@midlist{}
\gdef\@currlist{}
\gdef\@deferlist{}
\gdef\@dbltoplist{}

\newdimen\topmargin
\newdimen\oddsidemargin
\newdimen\evensidemargin
\let\@themargin=\oddsidemargin
\newdimen\headheight
\newdimen\headsep
\newdimen\footskip

\gdef\@toplist{}
\gdef\@botlist{}
\gdef\@midlist{}
\gdef\@currlist{}
\gdef\@deferlist{}
\gdef\@dbltoplist{}

\newdimen\topmargin
\newdimen\oddsidemargin
\newdimen\evensidemargin
\let\@themargin=\oddsidemargin
\newdimen\headheight
\newdimen\headsep
\newdimen\footskip

\gdef\@toplist{}
\gdef\@botlist{}
\gdef\@midlist{}
\gdef\@currlist{}
\gdef\@deferlist{}
\gdef\@dbltoplist{}

\newdimen\topmargin
\newdimen\oddsidemargin
\newdimen\evensidemargin
\let\@themargin=\oddsidemargin
\newdimen\headheight
\newdimen\headsep
\newdimen\footskip

\gdef\@toplist{}
\gdef\@botlist{}
\gdef\@midlist{}
\gdef\@currlist{}
\gdef\@deferlist{}
\gdef\@dbltoplist{}

\newdimen\topmargin
\newdimen\oddsidemargin
\newdimen\evensidemargin
\let\@themargin=\oddsidemargin
\newdimen\headheight
\newdimen\headsep
\newdimen\footskip

\gdef\@toplist{}
\gdef\@botlist{}
\gdef\@midlist{}
\gdef\@currlist{}
\gdef\@deferlist{}
\gdef\@dbltoplist{}

The new algorithm stores page wide floats together with column floats in a single \@deferlist list. We keep \@dbldeferlist initialised as empty so that packages that are testing for deferred floats can use the same code for old or new float handling.
\newdimen\textheight
\newdimen\textwidth
\newdimen\columnwidth
\newdimen\columnsep
\newdimen\columnseprule
\newdimen\marginparwidth
\newdimen\marginparsep
\newdimen\marginparpush

\AtBeginDvi
\@begindvibox
We use a box register in which to put stuff that must appear before anything else in the .dvi file.
The stuff in the box should not add any typeset material to the page when it is unboxed.
This interface is no longer used. Instead a new one is inside lshipout.dtx. We only keep the box in case some old code refers to it directly (or we do some rollback).

\newbox\@begindvibox
%\DeclareRobustCommand \AtBeginDvi \[1\]{%\global \setbox \@begindvibox \vbox{\unvbox \@begindvibox #1} \}

@end definition for \AtBeginDvi and \@begindvibox. These functions are documented on page 901.

\@maxdepth
This is not the right place to set this; it needs to be set in a class/style file when \maxdepth is set.
Also, many settings to \maxdepth should be to \@maxdepth, probably?
\newdimen\@maxdepth
\@maxdepth = \maxdepth

@end definition for \@maxdepth.

\paperheight
\paperwidth
New \paper... registers.
\newdimen\paperheight
\newdimen\paperwidth

@end definition for \paperheight and \paperwidth.

\if@insert
\if@fcolmade
\if@specialpage
\if@firstcolumn
\if@twocolumn
\if@twoside
\if@reversemarginpar
\if@mparswitch
\col@number
Local switches first:
\newif \if@insert
These should definitely be global:
\newif \if@fcolmade
\newif \if@specialpage \@specialpagefalse
These should be global but are not always set globally in other files.
\newif \if@firstcolumn \@firstcolumntrue
\newif \if@twocolumn \@twocolumnfalse
Not sure about these: two questions. Should things which must apply to a whole document be local or global (they probably should be 'preamble only' commands)? Are these three such things?
\newif \if@twoside \@twosidefalse
\newif \if@reversemargin \@reversemarginfalse
\newif \if@mparswitch \@mparswitchfalse

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This counter has been imported from ‘multicol’.
\newcount \col@number
\col@number \@ne

(End definition for \if@insert and others.)

Historical \LaTeX{} 2.09 comments (not necessarily accurate any more):

\begin{verbatim}
\newcount\@topnum
\newdimen\@toproom
\newcount\@dbltopnum
\newdimen\@dbltoproom
\newdimen\@botnum
\newdimen\@botroom
\newcount\@colnum
\newdimen\@textmin
\newdimen\@fpmin
\newdimen\@colht
\newdimen\@colroom
\newdimen\@pageht
\newdimen\@pagedp
\newdimen\@mparbottom \@mparbottom\z@
\newcount\@currtype
\newbox\@outputbox
\newbox\@leftcolumn
\newbox\@holdpg
\def\@thehead{\@oddhead} % initialization
\def\@thefoot{\@oddfoot}
\end{verbatim}

(End of historical \LaTeX{} 2.09 comments.)

\clearpage

The tests at the beginning are an experimental attempt to avoid a completely empty page after a \texttt{\twocolumn[...]} . This prevents the text from the argument vanishing into a float box, never to be seen again. We hope that it does not produce wrong formatting in other cases.

\begin{verbatim}
\def\clearpage{%
  \ifvmode
    \ifnum \@dbltopnum =\m@ne
      \ifdim \pagetotal <\topskip
        \hbox{}%
      \fi
    \fi
  \fi
  \newpage
  \write\m@ne{}%
  \vbox{}%
  \penalty -\@Mi
}
\end{verbatim}

(End definition for \clearpage.)
The two checks at the beginning ensure that an item label or run-in section title immediately before a \newpage get printed on the correct page, the one before the page break.

All three tests are largely to make error processing more robust; that is why they all reset the flags explicitly, even when it would appear that this would be done by a \leavevmode.

The \vfill at the end of the macro before the break penalty will normally result in the page being run short, even with \flushbottom in effect (in contrast to the behavior of \pagebreak). However, if there is some explicit stretch on the page, say, a \vfill, it has the undesired side-effect, that the last line will not align at its baseline if it contains characters going below the baseline, as the value of \prevdepth is no longer taken into account by \TeX. So we back up by that amount (or by \maxdepth if it is really huge), to mimic the normal behavior without the \newpage.
\maxdepth
\else
    \prevdepth
\fi
\fi
\vfil
\penalty -\@M}
⟨/2ekernel|latexrelease|ftrace⟩
⟨latexrelease\EndIncludeInRelease
⟨latexrelease\IncludeInRelease{0000/00/00}%
⟨latexrelease\def \newpage {%
⟨latexrelease \if@noskipsec
⟨latexrelease \ifx \@nodocument\relax
⟨latexrelease \leavevmode
⟨latexrelease \if@inlabel
⟨latexrelease \leavevmode
⟨latexrelease \if@nobreak @nobreakfalse \everypar{}/fi
⟨latexrelease \par
⟨latexrelease \vfil
⟨latexrelease \penalty -\@M}
⟨∗/2ekernel|ftrace⟩(End definition for \newpage.)
\@emptycol It may be better to use an invisible rule rather than an empty box here.
\def \@emptycol {\vbox{}/penalty -\@M}
(End definition for \@emptycol.)
\twocolumn There are several bug fixes to the two-column stuff here.
\def \twocolumn {%
\clearpage
\global\columnwidth\textwidth
\global\advance\columnwidth-\columnsep
\global\divide\columnwidth\tw@
\global\hspace{columnwidth}
\global\linewidth\columnwidth
\global\linewidth\columnwidth
\global\twocolumntrue
\global\@firstcolumntrue
\col@number \tw@
There is no reason to put a \@dblfloatplacement here since \@topnewpage ignores these settings. The \@floatplacement is needed in case this comes after some changes.
\@ifnextchar [\@topnewpage\@floatplacement
}
Note that here, getting a box from the freelist can assume success since this comes just after a `\clearpage`.

\begin{verbatim}
\long\def \@topnewpage [#1]{% 
  \@nodocument \@next \@currbox \@freelist{}{}% 
  \global \setbox \@currbox \color@vbox \normalcolor 
  \vbox {\hsize \textwidth \@parboxrestore \col@number @one
    \vskip -\dbltextfloatsep
  }% 
  \color@endbox

  \ifdim \ht\@currbox > \textheight
    \ht\@currbox \textheight
  \fi

  \global \count\@currbox \tw@
  \@tempdima -\ht\@currbox
  \advance \@tempdima -\dbltextfloatsep
  \global \advance \@colht \@tempdima
  \ifx \@dbltoplist \@empty
    \else
    \@latex@error{Float(s) lost}\@ehb
    \let \@dbltoplist \@empty
  \fi
  \@cons \@dbltoplist \@currbox

  \global \@dbltopnum \m@ne 

  \langle∗trace\rangle \fl@trace{dbltopnum set to -1 (= \the \@dbltopnum) (topnewpage)}%
  \langle/trace\rangle
\end{verbatim}

This setting of `\@dbltopnum` is used only to change the typesetting in `\@combinedblfloats`.

\begin{verbatim}
\global \@dbltopnum \m@ne

  \if@trace
    \f@trace{dbltopnum set to -1 (= \the \@dbltopnum) (topnewpage)}%
  \fi
\end{verbatim}

At points such as this we need to check that there is still a minimal amount of room left on the page; this uses an arbitrary small value at present; but note that this value is larger than that used when checking that page is too full of normal floats.

If there is little room left we just force a page-break, OK? This involves producing two empty columns. The second empty column may be produced by `\output`, in which case an extra, misleading, warning will be generated, OK? (This happens only when there is too little room left on the page for any float.) Otherwise (i.e. if the size is such that it is allowed as a normal float) the extra `\@emptycol` will be invoked in the second column by the conditional code guarded by the `\if@firstcolumn` test.
I now think that the cut-off point here should be $3\text{\baselineskip}$, but we make it a bit less so that 3 lines of text will be allowed, OK?

Since this happens only when there is nothing on the page but the ‘top-box’, the empty box should not cause any problem other than some overfull box messages, which is not entirely misleading.

Here we need two page-ends since both columns need to be empty.

\begin{verbatim}
\ifdim \@colht<2.8\baselineskip
  \@latex@warning{Optional argument of \noexpand\twocolumn too tall on page \thepage}\%
\@emptycol
\if@firstcolumn
\else
  \@emptycol
\fi
\else
  \global \vsize \@colht
  \global \@colroom \@colht
  \@floatplacement
\fi
\end{verbatim}

(End definition for \twocolumn and \@topnewpage.)

This needs some small adjustments. We cannot guarantee that the float mechanism will interact correctly with this stuff, but that mechanism does not always work properly with footnotes already.

RmS 91/09/29:

added reset of \par to the output routine. This avoids problems when the output routine is called within a list where \par may be a no-op.

\begin{verbatim}
\let \par \@@par
\ifnum \outputpenalty<-\@M
  \@specialoutput
\else
  \@makecol
  \@opcol
\fi
\end{verbatim}

Moved to \@opcol: \@floatplacement.

\begin{verbatim}
\@opcol\@startcolumn
\end{verbatim}

This loop could be replaced by an \expandafter tail recursion in \@startcolumn.

\begin{verbatim}
\@whilesv \if@fcolmade \fi
{\%
\@trace
  \@f@trace{PAGE: float \if@twocolumn column \else page \fi completed}\%
\@trace
\@opcol@\@startcolumn}\%
\fi
\ifnum \outputpenalty>-\@Miv
\end{verbatim}
At points such as this we need to check that there is still a minimal amount of room left on the page; this uses an arbitrary small value at present. If there is little room left we just force a page-break, OK?

This bit is essential only if a float has just been processed so maybe it should be moved; but this is the natural place at which to set the vsize and a test would need to be done anyway. A check has been added to ensure that there really has been a change in the value of \@colroom.

Since this happens only when there is nothing on the page but floats, the empty box should not cause any problem other than some overfull box messages, which is not entirely misleading.

The twocolumn case does not need any extra code here since this is the \output itself; in the second column there will still not be enough room left so \@emptycol will be executed again when the OR is called by the-page builder when it gets to the penalty inserted by the first execution. (The page-builder is never invoked whilst the OR is being executed since it builds a inner vlist; thus any conditional code for the two-column case within \output may not get executed with the correct value of \if@firstcolumn.

\begin{verbatim}
\ifdim \@colroom<1.5\baselineskip
  \ifdim \@colroom<\textheight
    \@latex@warning@no@line {Text page \thepage\space contains only floats}%
    \@emptycol
    % \if@twocolumn
    % \if@firstcolumn
    % \else
    % \@emptycol
    % \fi
    % \fi
  \else
    \global \vsize \@colroom
    \fi
\else
  \global \vsize \@colroom
\fi
\else
  \global \vsize \maxdimen
\fi
}
\end{verbatim}

Historical \LaTeX2.09 comments (not necessarily accurate any more):

CHANGES TO \@specialoutput:

* \penalty\z@ changed to \penalty\interlinepenalty so \samepage works properly with figure and table environments.
(Changed 23 Oct 86)

* Definition of \@specialoutput changed 26 Feb 88 so \@pageht and \@pagedp aren’t changed for a marginal note.
(Change suggested by Chris Rowley.)

End of historical \LaTeX2.09 comments.

\begin{verbatim}
\gdef\@specialoutput{%
  \ifnum \outputpenalty>\@Mii
    \@doclearpage
  \else
    \global \vsize \@colroom
  \fi
  \else
    \global \vsize \maxdimen
  \fi
}
\end{verbatim}
Note that \texttt{boxmaxdepth} should not be set here since we wish to record the natural depth of the holdpg box.

This is changed so as to not lose anything, such as writes and marks, which may get into box 255 and should be returned to the list. This should only happen when the first penalty in the mechanism is discarded and therefore \texttt{holdpg} should always be void in this case. This can happen because a penalty is discarded whenever there is no box on the list.

It was just: \texttt{setbox}@\texttt{tempboxa} \texttt{box} \texttt{@cclv}.

The last box which is removed is the box put there by the double-penalty mechanism. The \texttt{unskip} then removes the \texttt{topskip} which is put there since the box is the first on the page.

We must now remove the box added by the float mechanism and the \texttt{topskip} glue therefore added above it by \texttt{TeX}.

These two are needed as separate dimensions only by \texttt{addmarginpar}; for other purposes we put the whole size into \texttt{pageht} (see below).

Putting the whole size into \texttt{pageht} (see above).

We want to make the adjustment due to this insert only if the non-star form is used. The *-form will probably not work with floats, but maybe it still could make some adjustment here even so?

File Y: \texttt{loutput.dtx} Date: 2022/04/03 Version v1.4i
This version puts the inserts back just before the additional material; it could be moved earlier, before unboxing the page-so-far. Neither is guaranteed not to put things on the wrong page. This version is similar to the original version.

A 2e change: use \addpenalty instead of \penalty here. Some penalty is needed to create a potential break-point immediately after the reinserts (or the marginal). Otherwise there can be no possibility to break here and this can cause the reinserts or the marginal to appear on the next page (which is often incorrect). However, if the nobreak flag is true, a \nobreak must be correct.

\ifnum \outputpenalty<\z@ \if@nobreak \nobreak \else \addpenalty \interlinepenalty \fi \fi \fi \fi

⟨/2ekernel | fltrace⟩

\edef\@testwrongwidth #1{\ifdim\dp#1=\f@depth \fl@trace{\string#1\ifdim\f@depth=\z@ single \else double \fi column float -- ok}\fi \else \global\@testtrue \fl@trace{\string#1\ifdim\f@depth=\z@ double \else single \fi column float -- wrong}\fi⟩

Normally looking for single column floats, which have zero depth.

\let\f@depth\z@
This is a very much an emergency action, just dumping everything: footnotes first then floats. A more sophisticated version is needed; but even more urgent is a bug-free version (see, for example, pr/3528).

Also, it puts any left-over non-boxes (writes, specials, etc.) back after any float pages created: this is a very bad bug since, for example, a kludge insert will be in quite the wrong place and, worse, be irremovable and uncancelable.

All the remaining changes are replacing the double column defer list or inserting the extra test \@testwrongwidth\{⟨box⟩\} at suitable places. That is at places where a box is taken off the deferlist.
the next line is needed to avoid losing floats in certain circumstances a single call to the
original \doclearpage will now no longer output all floats.

\ifx\@deferlist\@empty \else\clearpage \fi
\else
\vbox{}\clearpage
\fi
\fi
\endgroup
\else
\vbox{}
clearpage
\fi
\fi
\else
\setbox\@cclv\vbox{\box\@cclv\vfil}\
@makecol@opcol
\clearpage
\fi
\fi
\else
\setbox\@tempboxa\vsplit\@cclv\to\z@
unvbox\@tempboxa
\setbox\@tempboxa\box\@cclv
\xdef\@deferlist{\@toplist\@botlist\@deferlist}
\global\let\@toplist\@empty
\global\let\@botlist\@empty
\global\@colroom\@colht
\ifx\@currlist\@empty
\else\latexerr{Float(s) lost}\@ehb
\global\let\@currlist\@empty
\fi
\@makefcolumn\@deferlist
\@whilesw\if@fcolmade \fi
{\@opcol\@makefcolumn\@deferlist}\
\if@twocolumn
\if@firstcolumn
\xdef\@dbldeferlist{\@dbltoplist\@dbldeferlist}
\else
\latexerr{Float(s) lost}\@ehb
\global\let\@currlist\@empty
\fi
\fi
\@makefcolumn\@deferlist
\@whilesw\if@fcolmade \fi
{\@opcol\@makefcolumn\@deferlist}\
\if@twocolumn
\if@firstcolumn
\xdef\@dbldeferlist{\@dbltoplist\@dbldeferlist}
\else
\latexerr{Float(s) lost}\@ehb
\global\let\@currlist\@empty
\fi
\fi
\fi
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\file{Y: ltoutput.dtx Date: 2022/04/03 Version v1.4i}
\@opcol Several changes in detail here.
\begin{verbatim}
(\$2ekernel|\$trace)\def\@opcol{\if@twocolumn
\@expl@@@mark@update@dblcol@structures@@
\@outputdblcol
\else\@expl@@@mark@update@singlecol@structures@@
\@outputpage
\fi\else\fi\end{verbatim}
\end{verbatim}

The funny-looking internal commands are interfacing with the new marks mechanism. We make sure (elsewhere) that those are always defined, even when we roll back, so here we add them unconditionally. This still need turning into a hook or config point eventually:
\begin{verbatim}
\@expl@@@mark@update@dblcol@structures@@
\@outputdblcol
\else
\@expl@@@mark@update@singlecol@structures@@
\@outputpage
\fi\end{verbatim}

Not needed since it comes after \@outputpage:
\begin{verbatim}
\$ \global\@colht\texttheight
\fi
\end{verbatim}

These do not need to be done every time \@opcol is used: they should be grouped together since they all need to be done at the end of the non-special output routine, or at the end of a clearpage one.
\begin{verbatim}
\global\@mparbottom \z@ \global \@textfloatsheight \z@
\@floatplacement
\end{verbatim}

\end{verbatim}

(End definition for \@doclearpage.)
\makecol

We must rewrite this macro to allow for variations in page-makeup required by changes in page-length.

This uses a different macro if a special-length column is being produced.

\gdef\makecol{%
\ifvoid\footins
\setbox\@outputbox\box\@cclv
\else
\setbox\@outputbox\vbox{%
This \boxmaxdepth setting is to ensure that deep footnotes do not overwrite the footer (on account of the negative skip added later): it should use \maxdepth otherwise the change is pointless when there are footnotes.

But see also its use when combining floats.

\boxmaxdepth\maxdepth
%
\@tempdima\dp\@cclv
\unvbox\@cclv
%
\vskip-\@tempdima
\vskip\skip\footins
\color@begingroup
\normalcolor
\footnoterule
\unvbox\footins
\color@endgroup
}%
\fi

The h floats have now been finally committed to this page so we can reset their list. The top and bottom floats are then added to the page.

\let\elt\relax
\xdef\freelist{\freelist\@midlist}%
\global\let\midlist\empty
\@combinefloats

The variations start here in case \enlargethispage has been used.

\ifvbox\kludgeins
\@makespecialcolbox
\else
This extra reboxing is only needed to add the \texttop and \textbottom but this could be done earlier, when the floats are added.

The \boxmaxdepth resetting here will have no effect unless \textbottom ends with a box or rule. So is this (or possibly \maxdepth) the correct value?

The \vskip -\dimen@ ensures that the visible depth of the box does not affect the placement of anything on the page. Thus very deep pages will overprint the footer; but these should have been prevented by suitable settings of the maxdepths at appropriate times.

If \textbottom ends with a box or rule of non-zero depth then this skip adjustment should be done again after it.

I think that the final boxing of the main text page could have a common ending which may make it simpler to see what is going on.
This needs further investigation, especially in the 'special case'.
Also, the \boxmaxdepth setting here affects what happens within \@texttop and
\@textbottom, should it? Is it needed at all?
RmS 91/10/22: Replaced \dimen128 by \dimen@.

\setbox\@outputbox \vbox to\@colht {%
  \boxmaxdepth \maxdepth
  \@texttop
  \dimen@ \dp\@outputbox
  \unvbox \@outputbox
  \vskip -\dimen@
  \@textbottom
}%
\fi
\global \maxdepth \@maxdepth
}

(End definition for \@makecol.)

\@reinserts This is the code which reinserts the inserts. It puts them all in one place; this can make
some of them come out on the wrong page. It has been put into a separate macro to
expedite experimentation.
\gdef \@reinserts{%
  \ifvoid\footins\else\insert\footins{\unvbox\footins}\fi
  \ifvbox\@kludgeins\insert\@kludgeins
    {\unvbox\@kludgeins}\fi
}%(End definition for \@reinserts.)

\@makespecialcolbox This implements certain variations in page-makeup.
\gdef \@makespecialcolbox {%
  \@trace{Kludgeins ht \the\ht\@kludgeins\space
  dp \the\dp\@kludgeins\space
  wd \the\wd\@kludgeins}%
}(trace)

First we find the natural height of the column.
See above for discussion of what is happening here.
This needs further investigation, especially in this 'special case'.
\setbox\@outputbox \vbox {%
  \@texttop
  \dimen@ \dp\@outputbox
  \unvbox \@outputbox
  \vskip -\dimen@
}%
\global \@tempdima \@colht
\ifdim \wd\@kludgeins>\z@
Note that in this case (the \*-version), the height of the \@kludgeins box is not used since its value is somewhat arbitrary: it need only be big enough to ensure that the page-break is not taken prematurely.

Here we calculate how much vertical space needs to be added in order to enable the column to fit into a box of size \@colht using the best information we have about the amount of shrink available (another thing which is known internally about a box, but cannot be accessed at the \TeX level!).

This needs \TeX3 otherwise \pageshrink is zero anyway; it may not be exactly the figure we wish as it is the total available from the all the material collected before the page-break decision is made. It will, we think, always be an overestimate of the actual shrink in the box; therefore this should always force the shortest possible column with the possibility of an overfull box.

This should work for both flush- and ragged-bottom setting since it makes the contents no smaller than the size (\@colht) of the box into which they are put.

Their should perhaps be an upper limit, of 0pt?, on the extra space added to force shrinking.

See above for a discussion of the \boxmaxdepth setting here.

\begin{verbatim}
\advance \@tempdima -\ht\@outputbox
\advance \@tempdima \pageshrink
\f@trace {Natural ht of col: \the \ht\@outputbox}\
\f@trace {\string \@colht: \the \@colht}\
\f@trace {Pageshrink added: \the \pageshrink}\
\f@trace {Hence, space added: \the \@tempdima}\
\end{verbatim}

For the unstarred version, the final size of the page is precisely specified. Therefore, at least for the flush-bottom case, we need to ensure that, visually, it has this size exactly.

Thus we calculate this size and set the material in a box of this size, which is then put into a box of size \@colht with \vss at the bottom.

\begin{verbatim}
\else
\advance \@tempdima -\ht\@kludgeins
\f@trace {Natural ht of col: \the \ht\@outputbox}\
\f@trace {\string \@colht: \the \@colht}\
\f@trace {Extra size added: \the \@kludgeins}\
\f@trace {Hence, height of inner box: \the \@tempdima}\
\f@trace {Max? pageshrink available: \the \pageshrink}\
\end{verbatim}

This type of final packaging could be done always; this may simplify all of this page-making.

It is not necessary to set \boxmaxdepth here since the \@outputbox ends with glue.

\begin{verbatim}
\setbox \@outputbox \vbox to \@colht {\
\vbox to \@tempdima {\vss}}
\end{verbatim}

File Y: loutoutput.dtx Date: 2022/04/03 Version v1.4i
Finally we need to explicitly make the insert box void.

(End definition for \makespecialcolbox.)

\@texttop
\@textbottom
These do nothing as a default.

(End definition for \@texttop and \@textbottom.)

\@resetactivechars
\@activechar@info
RmS 03/09/06: added hook to protect against certain active characters in the output routine. Default checks are for active space and end-of-line.

Do not put any spaces in this next bit!

(End definition for \resetactivechars and \activechar@info.)

\@outputpage
\@shipoutsetup
\@writesetup
The \color@hbox hooks here are used to avoid putting just a colour special into an otherwise empty box (in a header or footer). These boxes are often set to be completely empty and so adding a special produces a very underfull box message.

There has been extensive tidying up of the old code here; including the removal of a level of grouping.

The setting of \protect immediately before the \shipout is needed so that protected commands within \writes are handled correctly.

Within shipout’s vbox it is reset to its default value, \relax.

Resetting it to its default value after the shipout has been completed (and the contents of the writes have been expanded) must be done by use of \aftergroup. This
is because it must have the value \relax before macros coming from other uses of \aftergroup within this box are expanded.

Putting this into the \aftergroup token list does not affect the definition used in expanding the \writes because the aftergroup token list is only constructed when popping the save-stack, it is not expanded until after the shipout is completed.

Question: should things from an \aftergroup within the shipped out box be executed in the environment set up for the writes, or after it finishes? A lot of this code has been in-lined to prevent mis-use of internal commands as hooks.

\def\@outputpage{%
\begingroup
Now all the set-up stuff has been in-lined for Frank.

First the stuff for the writes.

From here ... was in the command \@writesetup.

\let \protect \noexpand
RmS 93/08/19: Redefined accents to allow changes in font encoding; but exactly why was this needed?

Reset \language to the value current at \begin{document}. In particular this ensures that a pagebreak in verbatim does not prevent hyphenation in the page head.

The \catcode`\ = 10 was removed as it was considered useless (presumably because nothing gets tokenized during shipout).

This was put in as some error produced active spaces in a mark, I think.

Why was the hyphen reset?

\@resetactivechars

If a page break happens between the start of a list and its first item the \@newlist will be true and this will mess up any list that is used in the header or footer of the page. So we have to reset that flag.

\global\let\@if@newlist\if@newlist
\global\@newlistfalse

This next hook replaces the following:

\let\\@dischyph
\let`\@acci\let`\@acci\let`\@acci\let`\@acci
\let\\\@normalcr
\let\par\@par % 15 Sep 87 (this was once inside the box)

and it does more than they did; in particular it sets:
... to here was in the command \@writesetup.

\shipout \vbox{%
\set@typeset@protect
\aftergroup \endgroup
Correct? or just restore by ending the group?
\aftergroup \set@typeset@protect
This first bit has been moved inside the shipped out box.
Now the setup inside the shipped out box; this should contain all the stuff that could
only affect typesetting; other stuff may need to be reset for the writes also.
From here ... was in the command \@shipoutsetup.
\if@specialpage
\global@specialpagefalse\@nameuse{ps@\specialstyle}%
\fi
\if@twoside
\ifodd\count\z@ \let@thehead@oddhead \let@thefoot@oddfoot
\let@thetmargin@oddbsidemargin
\else \let@thehead@evenhead
\let@thefoot@evenfoot \let@thetmargin@evensbsidemargin
\fi
\fi
The rest was always inside the box.
RmS 91/08/15: added this line:
\reset@font
RmS 93/08/06 Added \lineskiplimit=Opt to guard against it being nonzero: e.g. by
\offinterlineskip being in effect.
There are probably lots of other things that may need resetting.
\normalsize
Reset the space factors.
\normalsfcodes
Reset these here (previously reset separately for head and foot)
\let@label@gobble
\let@index@gobble
\let@glossary@gobble
\baselineskip@skip \lineskip@skip \lineskiplimit@skip

... to here was in the command \@shipoutsetup.
\begin{verbatim}
   \@begindvi
   \vskip \topmargin
   \moveright\@themargin \vbox {%
      \setbox\@tempboxa \vbox to\headheight{%
         \vfil
         \color@hbox \normalcolor
         \hb@xt@\textwidth{\@thehead}%
         \color@endbox
      \dp\@tempboxa \z@
      \box\@tempboxa
      \vskip \headsep
      \box\@outputbox
      \baselineskip \footskip
      \color@hbox \normalcolor
      \hb@xt@\textwidth{\@thefoot}%
      \color@endbox
   %}
\endgroup now inserted by \aftergroup Restore \if@newlist
   \global\let\if@newlist\@@if@newlist
   \global \@colht \textheight
   \stepcounter{page}%
\end{verbatim}

It is now clear that this does something useful, thanks to Piet van Oostrum. It is needed because a float page is made without using TeX's page-builder; thus the output routine is never called so the marks are not updated.
\let\firstmark\botmark
\end{verbatim}

File Y: ltoutput.dtx Date: 2022/04/03 Version v1.4i
\begindvi This boxes stuff that must appear before anything else in the .dvi file, then returns that box register to the free list and cancels itself.

The stuff in the box should not add any typeset material to the page.
\enddef
\begindvi
\unvbox \@begindvibox
\normalcolor
\hb@xt@\textwidth{\@thehead}%
\color@endbox
\enddef
\endofsection

(End definition for \begindvi.)
The \texttt{boxmaxdepth} setting here was not made local to a box so was dangerous. It is needed only within the box made by \texttt{@cflt} (and not normally even there), so it has been moved there; this also agrees with the original pseudocode.

\begin{verbatim}
\def \@combinefloats {%
  \boxmaxdepth \maxdepth
  \ifx \@toplist \@empty \else \@cflt \fi
  \ifx \@botlist \@empty \else \@cflb \fi
%
\def \@cflt{%
  \let \@elt \@comflelt
  \setbox\@tempboxa \vbox{}%
  \@toplist
  \setbox\@outputbox \vbox{%
    \boxmaxdepth \maxdepth
    \unvbox\@tempboxa
    \vskip -\floatsep
    \topfigrule
    \vskip \textfloatsep
    \unvbox\@outputbox
  }%
  \let\@elt\relax
  \xdef\@freelist{\@freelist\@toplist}%
  \global \let \@toplist\@empty
%
\def \@cflb {%
  \let \@elt \@comdblflelt
  \setbox\@tempboxa \vbox{}%
  \@botlist
  \setbox\@outputbox \vbox{%
    \unvbox\@outputbox
    \vskip \textfloatsep
    \botfigrule
    \unvbox\@tempboxa
    \vskip -\floatsep
  }%
  \let\@elt\relax
  \xdef\@freelist{\@freelist\@botlist}%
  \global \let \@botlist\@empty
}
\end{verbatim}

(End definition for \texttt{\@combinefloats}, \texttt{\@cflt}, and \texttt{\@cflb}.)

\begin{verbatim}
\@comflelt
\@comdblflelt
\@combinedblfloats
\def \@comflelt#1{\setbox\@tempboxa \vbox{\unvbox\@tempboxa\box #1\vskip\floatsep}}
\def \@comdblflelt#1{\setbox\@tempboxa \vbox{\unvbox\@tempboxa\box #1\vskip\dblfloatsep}}
\def \@combinedblfloats{%
  \ifx \@dbltoplist \@empty \else \setbox\@tempboxa \vbox{}% \vbox{\unvbox\@tempboxa\box #1\vskip\dblfloatsep} \fi
  \global \let \@dbltoplist \@empty
  \let \@elt \@comdblflelt
\end{verbatim}

File Y: \texttt{ltoutput.dtx} Date: 2022/04/03 Version v1.4i
\@dbltoplist
\let \@elt \relax
\def \@freelist \{\@freelist\@dbltoplist\}
\global \let \@dbltoplist \empty
\setbox\@outputbox \vbox to\textwidth

The setting of \texttt{\boxmaxdepth} here has no effect since the \texttt{\outputbox} should already have depth zero. Even so, it would have no effect on the layout of the page.

\%\texttt{\boxmaxdepth\maxdepth} \texttt{\% probably not needed, CAR}
\unvbox\@tempboxa \vskip-\dblfloatsep
Here we need different typesetting if the top float comes from \texttt{\@topnewpage}.

\ifnum \@dbltopnum>\m@ne
\dblfigrule
\fi
\vskip \dbltextfloatsep
If pdf links are present in the galley and those links get broken across pages they have to end up being on the same level of boxing (even if not actually in the same structure) due to some engine restrictions in \TeX{} and \LaTeX{}. We therefore unbox \texttt{\outputbox} here (which only contains a single \texttt{\hbox}) so that this case has the same boxing level as a normal twocolumn page without top floats.

\unvbox\@outputbox
}\fi
\fi
\fi
\fi}

\Halmos
\def \@startcolumn {\global \@colroom \@colht \@tryfcolumn \@deferlist
\if@fcolmade
\fl@trace{PAGE: float \if@twocolumn column \else page \fi completed}\
\fi
\else
\begingroup
\let \reserved@b \@deferlist
\global \let \@deferlist \@empty
\let \@elt \scolelt
\reserved@b
\endgroup
\fi
\fi}

\Halmos
\def \@startdblcolumn
\@startcolumn
\@startcolumn
\@startcolumn

We could combine (most of) these two into \texttt{\@startcol \texttt{\&list}}. Note that \texttt{\@xstartcol} was only used once (i.e. in \texttt{\@startcolumn}); it has therefore been removed. This is not quite as efficient but it now has the same structure as \texttt{\@startdblcolumn}.

The empty-list test has been moved to \texttt{\@tryfcolumn}.

\Halmos
\def \@startdblcolumn {\%\texttt{\boxmaxdepth\maxdepth} \texttt{\% probably not needed, CAR}
\unvbox\@tempboxa \vskip-\dblfloatsep
Here we need different typesetting if the top float comes from \texttt{\@topnewpage}.

\ifnum \@dbltopnum>\m@ne
\dblfigrule
\fi
\vskip \dbltextfloatsep
If pdf links are present in the galley and those links get broken across pages they have to end up being on the same level of boxing (even if not actually in the same structure) due to some engine restrictions in \TeX{} and \LaTeX{}. We therefore unbox \texttt{\outputbox} here (which only contains a single \texttt{\hbox}) so that this case has the same boxing level as a normal twocolumn page without top floats.

\unvbox\@outputbox
}\fi
\fi
\fi
\fi}

\Halmos
\def \@startcolumn {\global \@colroom \@colht \@tryfcolumn \@deferlist
\if@fcolmade
\fl@trace{PAGE: float \if@twocolumn column \else page \fi completed}\
\fi
\else
\begingroup
\let \reserved@b \@deferlist
\global \let \@deferlist \@empty
\let \@elt \scolelt
\reserved@b
\endgroup
\fi
\fi}

\Halmos
\def \@startdblcolumn
\@startcolumn
\@startcolumn
\@startcolumn

We could combine (most of) these two into \texttt{\@startcol \texttt{\&list}}. Note that \texttt{\@xstartcol} was only used once (i.e. in \texttt{\@startcolumn}); it has therefore been removed. This is not quite as efficient but it now has the same structure as \texttt{\@startdblcolumn}.

The empty-list test has been moved to \texttt{\@tryfcolumn}.
This one does not need to set \colht.

\@tryfcolumn \@deferlist
\if@fcolmade
\begingroup
\let \reserved@b \@deferlist
\global \let \@deferlist \@empty
\let \@elt \@sdblcolelt
\reserved@b
\endgroup
\fi
\%\@tryfcolumn \@deferlist
\global \@fcolmadefalse
\ifx \@empty
\else
\fl@trace{PAGE: double float page completed}\%
\fi
\%
\end{
\@tryfcolumn \@deferlist
\if@fcolmade
\begingroup
\let \reserved@b \@deferlist
\global \let \@deferlist \@empty
\let \@elt \@sdblcolelt
\reserved@b
\endgroup
\fi
\%
\end{

\@tryfcolumn
\begin{itemize}
\item Now tests if its list is empty before any further exertion.
\item \fl@trace(PAGE: try float \if@twocolumn column/page\else page\fi
---\string #1)\%
\end{itemize}
\@trace{----- \string #1: #1}\
\endgroup

(End definition for \@tryfcolumn.)

\@scolelt
\def\@scolelt#1{\def\@currbox{#1}\@addtonextcol}
(End definition for \@scolelt.)

\@sdblcolelt
\def\@sdblcolelt#1{\def\@currbox{#1}\@addtodblcol}
(End definition for \@sdblcolelt.)

\@vtryfc
\def\@vtryfc #1{%\global\setbox\@outputbox\vbox{}%\let\@elt\@wtryfc\@flsucceed\global\setbox\@outputbox \vbox to\@colht{%\vskip \@fptop\vskip -\@fpsep\unvbox \@outputbox\vskip \@fpbot}\let\@elt\relax\xdef #1{\@failedlist\@flfail}\xdef\@freelist{\@freelist\@flsucceed}}
(End definition for \@vtryfc.)

\@wtryfc
\def\@wtryfc #1{%\global\setbox\@outputbox\vbox{\unvbox \@outputbox\vskip \@fpsep\box #1}}
(End definition for \@wtryfc.)
\@xtryfc

\def\@xtryfc #1{% 
\@next\reserved@a\@trylist{}% 
\@currtype \count #1% 
\divide\@currtype\@xxxii 
\@bitor \@currtype \@failedlist 
\@testfp #1% 
\@testwrongwidth #1% 
\ifdim \ht #1>\@colht 
\@testtrue 
\fi 
\if@test 
\@cons\@failedlist #1% 
\else 
\@ytryfc #1% 
\fi 
\EndIncludeInRelease

(End definition for \@xtryfc.)

\@ytryfc

\def\@ytryfc #1{% 
\begingroup 
\gdef\@flsucceed{\@elt #1}% 
\global\let\@flfail\@empty 
\@tempdima\ht #1% 
\let\@elt\@ztryfc 
\@trylist 
\EndIncludeInRelease

File Y: ltoutput.dtx Date: 2022/04/03 Version v1.4i 962
\endgroup
\if@fcolmade
\let\@elt\@gobble
\fi

(End definition for \texttt{@ztryfc}.)

\if@fcolmade
\else
\fi

\let\@elt\@gobble
\fi

\endinput

\endinput
The major changes for float suppression and the changes to the float mechanism to make it conform to the documentation are in these next macros.

\@addtobot

Lots of changes.

This next line means that this page is produced with box 255 having depth zero, rather than the normal maxdepth: is this needed, useful?

\@inserttrue
Lots of changes.

\def \addtotoporbot {%
\ifodd \tempcnta OK \else not \fi top:
   \the \fpstype%
\fi%
\ifodd \tempcnta
  \@flsetnum \@topnum
  \@flsetnum \@topnum\z@
  \@tempswafalse
  \@fcheckspace \@toproom \@toplist
  \if@tempswa
    \@bitor \@currtype \@midlist \@botlist%
  \fi%
\else
  \fl@test%
  \fl@trace\{(mid+bot)list: \@midlist, \@botlist:
    (addtotoporbot-before)}%
\fi%
\if@test
  \fl@trace\{type already on list: mid or bot---sent to addtobot}%
\else
  \@flupdates \@topnum \@toproom \@toplist
  \@fltempwa
  \@bitor \@currtype \@midlist \@botlist%
  \fi%
\else
  \fl@trace\{Fail: topnum = \the \@topnum: fpstype
    \the \fpstype=ORD?\}%
  \ifnum \@fpstype<\sixt@@n
    \fl@trace\{ERROR: !t float not successful (addtotoporbot)}%
  \fi%
\fi%
\if@inserttrue
  \@inserttrue
\fi
\else
  \fl@trace\{sent to addtobot (addtotoporbot)}%
\fi
\fi
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\fi
\fi
\fi
\fl@trace\{***Success: top}%
\fi
\fi
\fi
\fi
\fi
Lots of changes.

This is a new adjustment which is quite a major change in functionality; but it implements the documentation. Note that \@reqcolroom will include the whole of the page-so-far, and hence includes \@textfloatsheight of floats, so before comparing it with \@textmin, we add this to \@textmin also.

This line must be removed since \@specialoutput changed.

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We need to defer the float also if its width doesn’t fit.

\testwrongwidth\currbox

\*trace\*\echo{deferlist: \deferlist: (addtocurcol-before)}%
\*trace\*
\if@test\*\echo{type already on list: defer (addtocurcol)}%
\else\*\echo{botlist: \botlist: (addtocurcol-before)}%
\if@test\*\echo{type already on list: bot---sent to addtobot}%
\else
\addtobot
\fi
\fi
\fi
\fl@trace{fpstype \ifodd \tempcnta OK \else not \fi here: \the \@fpstype}%
\fi
\fi
\fi
\fi
\fi
\advance \reqcolroom \intextsep
\ifdim \colroom>\reqcolroom
\global \advance \colnum \m@ne
\global \advance \textfloatsheight \ht\currbox

This may sometimes give an overestimate.

\global \advance \textfloatsheight 2\intextsep
\cons \midlist \currbox
\*trace\*
\fl@trace{***Success: here}%
\fl@trace{textfloatsheight (after-here) = \the \textfloatsheight}%
\fl@trace{colnum (after-here) = \the \colnum}%

CHANGE TO \addtocurcol:
\penalty\z@ changed to \interlinepenalty so \samepage works properly with figure and table environments. (Changed 23 Oct 86)

There is also an \addpenalty\interlinepenalty above.

Since in 2e \samepage is no longer supported, these could be removed.

Although it is best to use \addvspace in case two h floats come together, this makes other spacing more difficult to adjust; whereas if a user specifies two h floats together then they can more easily get the spacing correct by ad hoc commands.
It is necessary to adjust for the addition of \texttt{\parskip} here in case the float is added between paragraphs (i.e. when in vertical mode).

If the nobreak switch is true we need to reset it and clear \texttt{\everypar} since the float may not reset the flag and cannot reset the \texttt{\everypar} globally.

Typesetting starts here (we are in vertical mode).

\begin{verbatim}
\if@nobreak
  \nobreak
\@nobreakfalse
\everypar{}%
\else
  \addpenalty \interlinepenalty
  \vskip \intextsep
  \box\@currbox
  \addpenalty \interlinepenalty
  \vskip \intextsep
  \ifnum \outputpenalty <-\@Mii \vskip -\parskip\fi
\fi
\end{verbatim}

Typesetting ends here.

\begin{verbatim}
\outputpenalty \z@
\@inserttrue
\else
\fl@trace{Fail---no room at 2nd test of colroom
  (addtocorcol \string\intextsep)}%
\fi
\fi
\fi
\fi
\end{verbatim}

Next set of docstrip guards are a bit weird, essentially \texttt{\@addtotoporbot} ends up inside the kernel and the \texttt{\fltrace} package and \texttt{\@addtobot} shows up in the \texttt{\fiafter} package. Guess that could have been done a bit more obvious :-)

\begin{verbatim}
(+2ekernel | \fltrace | \latexrelease)
(+trace)
(/trace)
\fl@trace(not here: sent to addtotoporbot)%
(+2ekernel | \fltrace | \latexrelease)
(+trace)
(/trace)
\addtotoporbot
(+2ekernel | \fltrace | \latexrelease)
(+!2ekernel & !\fltrace & !\latexrelease)
(+trace)
(/trace)
\addtobot
(+2ekernel | \fltrace | \latexrelease)
\fi
\fi
(+trace)
\else
\fl@trace(Fail: colnum = \the \@colnum:
  fptype \the \@fptype=ORD?)%
\fi
\ifnum \@fptype<\sixt@@n
\end{verbatim}
This is a new adjustment which is quite a major change in functionality; but it implements the documentation. Note that \@reqcolroom will include the whole of the page-so-far, and hence includes \@textfloatsheight of floats, so before comparing it with \@textmin, we add this to \@textmin also.
This line must be removed since \specialoutput changed.
This may sometimes give an overestimate.

There is also an \addvspace in case two h floats come together, this makes other spacing more difficult to adjust; whereas if a user specifies two h floats together then they can more easily get the spacing correct by ad hoc commands.

It is necessary to adjust for the addition of \parskip here in case the float is added between paragraphs (i.e. when in vertical mode).

If the nobreak switch is true we need to reset it and clear \everypar since the float may not reset the flag and cannot reset the \everypar globally.

Typesetting starts here (we are in vertical mode).

Typesetting ends here.
Next set of docstrip guards are a bit weird, essentially \@addtotoprobott ends up inside the kernel and the \ftrace package and \@addtotoprobott shows up in the \flafter package. Guess that could have been done a bit more obvious :-)
\@addtonextcol  Lots of changes.

(End definition for \@addtocurcol.)

\@addtonextcol Lots of changes.
\begin{verbatim}
\{\*trace\}
\fl@trace\{type already on list: defer \{addtonextcol\}\}%
\{/trace\}
\else
\{/trace\}
\fi
\{/trace\}
\else
\fl@trace\{sent to addtotopbot \{addtonextcol\}\}%
\{/trace\}
\@addtotopbot
\fi
\{/trace\}
\else
\fl@trace\{Fail---no room: fl box ht: \the\@currbox\}
\{/trace\}
\fi
\fi
\fi
\if@insert
\{/trace\}
\else
\fl@trace\{put back on deferlist \{addtonextcol\}\}%
\{/trace\}
\@cons\@deferlist\@currbox
\{/trace\}
\else
\fl@trace\{***Start addtonextcol\}%
\{/trace\}
\@insertfalse
\{/trace\}
\@setfloattypecounts
\{/trace\}
\ifnum\@fpstype=8
\{/trace\}
\fl@trace\{fpstype not curcol: \the\@fpstype\}%
\{/trace\}
\fi
\{/trace\}
\fl@trace\{End of addtonextcol -- locally counts\}%
\{/trace\}
\fl@trace\{col: \the\@colnum. top: \the\@topnum. bot: \the\@botnum.\}%
\{/trace\}
\{endgroup\}
\{/trace\}
\fl@trace\{End of addtonextcol -- globally counts\}%
\{/trace\}
\fl@trace\{col: \the\@colnum. top: \the\@topnum. bot: \the\@botnum.\}%
\{/trace\}
\end{verbatim}
 Lots of changes.

\@addtodblcol  Lots of changes.

\begingroup
\@insertfalse
\@setfloattypecounts
\@getfpsbit \tw@
\@flsetnum \@dbltopnum
\ifnum \@dbltopnum>\z@
\@tempswafalse
\ifdim \@dbltoproom>\ht\@currbox
\@tempswatrue
\@find \@dbltoproom \@ht \@currbox
\@tempswafalse
\@find \@dbltoproom \@ht \@currbox
\fi
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\@find \@dbltoproom \@ht \@currbox
\@tempswafalse
\@find \@dbltoproom \@ht \@currbox
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\file{ltoutput.dtx} Date: 2022/04/03 Version v1.4i 976
\[
\begin{align*}
\langle /\text{trace} \rangle \\
\text{\texttt{else}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{fl@trace}{fpstype: \texttt{\the@fpstype (addtodblcol)}}}% \\
\langle /\text{trace} \rangle \\
\text{\texttt{ifnum \the@fpstype}<\texttt{\sixt@@n}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{fl@trace}{BANG float ignoring \texttt{\@dbltoproom}}}% \\
\text{\texttt{fl@trace}{\@spaces \texttt{\@dbltoproom} = \texttt{\the\@dbltoproom}.}} \\
\text{\texttt{Ht float: \texttt{\the\ht\@currbox-BANG}}}% \\
\langle /\text{trace} \rangle \\
\text{Need to check that there is room on the page, using the local value of \texttt{@textmin} to make the necessary adjustment to \texttt{@dbltoproom}.} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\advance \@dbltoproom \@textmin}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\@tempswatrue}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\fl@trace}{Local value of texmin: \texttt{\the@textmin}}}% \\
\text{\texttt{\fl@trace}{\@spaces space on page = \texttt{\the\@dbltoproom}.}} \\
\text{\texttt{Ht float: \texttt{\the\ht\@currbox-BANG}}}% \\
\langle /\text{trace} \rangle \\
\text{\texttt{\ifdim \@dbltoproom>\ht\@currbox}}% \\
\langle /\text{trace} \rangle \\
\text{\texttt{Space OK BANG: \texttt{\the\@dbltoproom} > \texttt{\the\ht\@currbox}}}% \\
\langle /\text{trace} \rangle \\
\text{\texttt{\else}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\fl@trace}{fpstype: \texttt{\the@fpstype}}}% \\
\text{\texttt{\fl@trace}{\texttt{\@spaces\@dbltoproom} = \texttt{\the\@dbltoproom}.}} \\
\text{\texttt{Ht float: \texttt{\the\ht\@currbox-BANG}}}% \\
\langle /\text{trace} \rangle \\
\text{\texttt{\fi}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\advance \@dbltoproom \@textmin}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\else}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\fl@trace}{fpstype: \texttt{\the@fpstype}}}% \\
\text{\texttt{\fl@trace}{\texttt{\@spaces\@dbltoproom} = \texttt{\the\@dbltoproom}.}} \\
\text{\texttt{Ht float: \texttt{\the\ht\@currbox}}}% \\
\langle /\text{trace} \rangle \\
\text{\texttt{\fi}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\if@tempswaw}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\@bitor \@currtype \@deferlist}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\fl@trace{(dbl)deferlist: \@deferlist: (before)}}}% \\
\langle /\text{trace} \rangle \\
\text{not in fixfloats?} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\@testwrongwidth\@currbox}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\if@test}} \\
\langle /\text{trace} \rangle \\
\text{\texttt{\fl@trace{type already on list: (dbl)defer}}}% \\
\end{align*}
\]
\else
  \@tempdima -\ht\@currbox
  \advance\@tempdima -\ifx \@dbltoplist\@empty \dbltextfloatsep \else
    \dblfloatsep \fi
  \global \advance \@dbltoproom \@tempdima
  \global \advance \@colht \@tempdima
  \@cons \@dbltoplist \@currbox
\fi
\fi
\fi
\fi
\fi
\@inserttrue
\fi
\fi
\fl@trace{dbltopnum (after) = \the \@dbltopnum}\
\fl@trace{***Success: dbltop}\
\fi
\fi
\fi
\fi
\fi
\@inserttrue
\fi
\fi
\fl@trace{Fail: dbltopnum = \the \@dbltopnum: fpstype \the \@fpstype=ORD?}\n\ifnum \@fpstype<\sixt@@n
  \fl@trace{ERROR: !t float not successful (addtodblcol)}\
\fi
\fi
\fi
\fi
\fi
\@inserttrue
\fi
\fi
\fl@trace{put on deferlist}\
\fi
\fi
\fl@trace{(dbl)deferlist: \@deferlist: (after)}\
\endgroup
\fl@trace{End of addtodblcol -- locally count:}\
\fl@trace{ dbltop: \the \@dbltopnum.}\
\endgroup
\fl@trace{End of addtodblcol -- globally count:}\
\fl@trace{dbltop: \the \@dbltopnum.}\
\endgroup

Need to check that there is room on the page, using the local value of \textmin to make the necessary adjustment to \dbltoproom.

\advance \dbltoproom \textmin
\fi

File Y: \texttt{ltoutput.dtx} Date: 2022/04/03 Version v1.4i
\def\@addmarginpar{
\@next\@marbox\@currlist{\@cons\@freelist\@marbox
\@cons\@freelist\@currbox}\@latexbug\@tempcnta\@ne
\if@twocolumn
  \if@firstcolumn \@tempcnta\m@ne \fi
\else
  \if@parswitch
    \ifodd\c@page \else\@tempcnta\m@ne \fi
  \fi
\fi
\if@reversemargin \@tempcnta -\@tempcnta \fi
\fi
\ifnum\@tempcnta <\z@ \global\setbox\@marbox\box\@currbox \fi
\@tempdima\@mparbottom
\advance\@tempdima -\@pageht
\advance\@tempdima\ht\@marbox
\ifdim\@tempdima >\z@ \global\latex@warning@no@line {Marginpar on page \thepage\space moved}\%\else
  \@tempdima\z@
\fi
\global\@mparbottom\@pageht
\global\advance\@mparbottom\@tempdima
\global\advance\@mparbottom\dp\@marbox
\global\advance\@mparbottom\marginparpush
\advance\@tempdima -\ht\@marbox

Putting box movement inside the ‘marbox’:
\global\setbox\@marbox
  \vbox{\vskip\@tempdima
    \box\@marbox}\%
Sticking (rather than gluing:-) the ‘marbox’ to the line above, changed vskip to kern:
\kern -\@pagedp
\nointerlineskip
\hbox{\vrule \@height\z@ \@width\z@ \@depth\@pagedp}}
(End definition for \@addmarginpar.)

1.1.1 Kludgeins

This part of the file is part of the implementation of the following two new commands for \LaTeX2e.
\enlargethispage{<dim>}
Adds <dim> to the height of the current column only. On the printed page the bottom of this column is extended downwards by exactly <dim> without having any effect on the placement of the footer; this may result in an overprinting.
\enlargethispage*{<dim>}
Similar to \enlargethispage but it tries to squeeze the column to be printed in as small a space as possible, ie it uses any shrinkability in the column. If the column was not explicitly broken (e.g. with \pagebreak) this may result in an overfull box message but except for this it will come out as expected (if you know what to expect).

The star form of this command is dedicated to Leslie Lamport, the other we need for ourselves (FMi, CAR).

These commands may well have unwanted effects if used soon before a \clearpage; please give keep them clear of such places.
\@kludgeins The insert which makes \TeX do a lot of the necessary work. All we need to put into it is the amount by which the pagegoal should be changed.
\newinsert \@kludgeins
\global\dimen\@kludgeins \maxdimen
\global\count\@kludgeins 1000
(End definition for \@kludgeins.)
The user command.\enlargethispage
\enlargethispage*
\gdef \enlargethispage {\%\eight\ifstar
\%\langle∗\trace\rangle\fl@trace{Enlarging page height * }\%
\langle/trace\rangle
\@enlargepage{\hbox{\kern\p@}}\%
\%\langle∗\trace\rangle\fl@trace{Enlarging page height exactly---}\%
\langle/trace\rangle
\@enlargepage\@empty\%
}

(End definition for \enlargethispage and \enlargethispage*.)
\enlargepage
This actually inserts the insert, after checking for extreme values of the change.
\gdef\enlargepage#1#2{\%\eight\langle∗\trace\rangle\fl@trace{\@spaces\@spaces by #2}\%
\langle/trace\rangle
\@tempskipa#2\relax
\ifdim \@tempskipa>.5\maxdimen
\@latex@error{Suggested extra height \the\@tempskipa dangerously large}\@eha
\else
\ifdim \vsize<.5\maxdimen
\langle∗\trace\rangle\fl@trace {Kludgeins added--pagegoal before: \the\pagegoal}\%
\langle/trace\rangle
\@bsphack
\insert\@kludgeins{#1\vskip\@tempskipa}%
\@esphack
This next bit is for tracing only:
\langle∗\trace\rangle\ifvmode \par
\fl@trace {Kludgeins added--pagegoal after: \the \pagegoal}\%
\fi
\langle/trace\rangle
\else
\@latex@error{Page height already too large}\@eha
\fi
\fi
}

(End definition for \enlargepage.)
\ShowFloat
This command provides some information about the content of a float register. Float registers have internal names of the form \bx@⟨Uppercase-letter(s)-or numbers⟩ and you specify just this letter or letters as the argument, e.g., \ShowFloat{A}. (There is not much error recovery if you specify something that isn’t a float.)
1.1.2 Float control

This part implements controllable floats and other changes to the float mechanism.

It provides, at the document level, the following command for inclusion in \LaTeX{}.

\SuppressFloats

This suppresses all further floats on the current page.

With an optional argument it suppresses only floats only in certain positions on the current page.

[\texttt{t}] suppresses only floats at the top of the page [\texttt{b}] suppresses only floats at the bottom of the page.

It also enables the use of an extra specifier, \texttt{!}, in the location optional argument of a float. If this is present then, just for this particular float, whenever it is processed by the float mechanism the following are ignored:
• all restrictions on the number of floats which can appear;
• all explicit restrictions on the amount of space which should (not) be occupied by 
  floats and/or text.

The mechanism will still attempt to ensure that pages are not overfull.
These specifiers override, for the single float, the suppression commands described 
above.

In its current form, it also supplies a reasonably exhaustive, and somewhat baroque, 
means of tracing some aspects of the float mechanism.

More tracing.

\begin{verbatim}
\fl@trace 
\tracefloatsoff 
\tracefloats 
\fl@traceval 
\fl@tracemessage
\end{verbatim}

Set-up tracing for floats independent of other tracing as it produces mega-output. Default 
is no tracing.

\begin{verbatim}
def \fl@tracemessage #1{{\let\@elt\@empty\typeout{LaTeX2e: #1}}} 
def \tracefloats{\let \fl@trace \fl@tracemessage} 
def \tracefloatsoff {\let \fl@trace \@gobble} 
def \fl@traceval #1{\fl@trace{\string #1 = \the #1}} 
\IncludeInRelease{2015/01/01}{\tracefloatvals}{}{trace float vals} 
def \tracefloatvals{}
\end{verbatim}

As \@dblfloatplacement sets \f@depth it needs to be run inside a group, otherwise the 
float placement will test for the wrong value.\footnote{This is a somewhat questionable design.}

\begin{verbatim}
\begingroup 
\end{verbatim}

When the user requests \tracefloatvals then they should show regardless of the tracing 
state, so locally we make sure that it is activated.

\begin{verbatim}
\tracefloats 
\@floatplacement 
\fl@trace{***Float placement parameters:}%% 
\fl@traceval\@colnum 
\fl@traceval\@colroom 
\fl@traceval\@topnum 
\fl@traceval\@toproom 
\fl@traceval\@botnum 
\fl@traceval\@botroom 
\fl@traceval\@fpmin 
\fl@trace{\string\textfraction = \textfraction}%% 
\fl@traceval\@dbltopnum 
\fl@traceval\@dbltoproom 
\fl@trace{\string\textfraction = \textfraction}%% 
\fl@trace{toplist: \@toplist}%% 
\fl@trace{botlist: \@botlist}%% 
\fl@trace{midlist: \@midlist}%% 
\fl@trace{deferlist: \@deferlist}%% 
\fl@trace{dbltoplist: \@dbltoplist}%% %FMi \fl@trace{dbldeferlist: \@dbldeferlist}%% 
\endgroup
\end{verbatim}
We need to make sure that \texttt{fltrace} comes before \texttt{flafter} to make the tracing work.

\@ifpackageloaded{flafter}
\PackageWarningNoLine{fltrace}{Load 'fltrace' before 'flafter'
MessageBreak
Attempting to recover by reloading 'flafter'}

Hide the fact that \texttt{flafter} was already loaded and then request it anew.

\expandafter\let\csname ver@flafter.sty\endcsname\relax
\providecommand\fl@trace[1]{}
\expandafter\let\csname \string#1+flafter+IIR\endcsname\relax
\reserved@a\@addtocurcol
\reserved@a\@addtonextcol
\RequirePackage{flafter}{}
\endgroup

As the code for \texttt{flafter} will contain tracing calls so that it works in conjunction with \texttt{fltrace} we need to provide a dummy definition for \texttt{\fl@trace} in that package.

\end{includeinrelease}
\end{includeinrelease}
\def \tracefloatvals{%
\begingroup
\tracefloats
\@dblfloatplacement
\@floatplacement
\fl@trace{***Float placement parameters:}%
\fl@traceval@colnum
\fl@traceval@colroom
\fl@traceval@topnum
\fl@traceval@toproom
\fl@traceval@botnum
\fl@traceval@botroom
\fl@traceval@fpmin
\fl@trace{\string\textfraction = \textfraction}%
\fl@traceval@dbltopnum
\fl@traceval@dbltoproom
\fl@trace{\string\textfraction = \textfraction}%
\fl@trace{\toplist: \@toplist}%
\fl@trace{\botlist: \@botlist}%
\fl@trace{\midlist: \@midlist}%
\fl@trace{\deferlist: \@deferlist}%
\fl@trace{\dbltoplist: \@dbltoplist}%
% next line only in old releases
\fl@trace{\dbldeferlist: \@dbldeferlist}%
\endgroup
\end{includeinrelease}
\suppressfloats \@flstop

Float suppression commands: these set the relevant counter globally to zero. Thus they are overridden for a particular float by an ! specifier.

\def \suppressfloats {%
  \@ifnextchar [%
    \@flstop
    \{\global \@colnum \z@\%
  }
}

Maybe this should be a loop over \#1?

\def \@flstop [#1]{%
  \if t#1%
    \global \@topnum \z@
  \fi
  \if b#1%
    \global \@botnum \z@
  \fi
}

(End definition for \suppressfloats and \@flstop.)

Manipulation of float placement and type; both their strings and the corresponding count registers.

\@fpstype \@reqcolroom \@textfloatsheight

First a new count register to go with \@currtype.

Then a new skip register, for information needed to remove the \@maxsep conservatism: it is possible that this could use a temporary register.

Finally a dimension register to hold the total height of in-text floats on the current page. This is needed to implement a major change in the functionality of \@addtocurcol which is, nevertheless, a bug fix. It is not local and therefore cannot be a temporary register.

\newcount \@fpstype
\newdimen \@reqcolroom
\newdimen \@textfloatsheight

(End definition for \@fpstype, \@reqcolroom, and \@textfloatsheight.)

\@fpsadddefault

Adds the default placement to what is already there.

Should not need to change this, but could do it as follows:

def \@fpsadddefault {%
  \@temptokena \expandafter\expandafter\expandafter{\csname fps\@captype \endcsname}\
  \edef \reserved@a {\the\@temptokena}\
  \@onelevel\@sanitize \reserved@a
  \edef \@fps {\@fps\reserved@a}\
}

(End \@fpsadddefault.)
\@setfloattypecounts Sets counters \@fpstype and \@currtype.
BANG == bit4 of \count\@currbox = 0.
\def \@setfloattypecounts {\
\@currtype \count\@currbox
\@fpstype \count\@currbox
\divide\@currtype\@xxxii \multiply\@currtype\@xxxii
\advance \@fpstype -\@currtype
\langle\star trace\rangle
\fl@trace{(mod 32) fpstype: \the \@fpstype}\
\fl@trace{(mult of 32) currtype: \the \@currtype}\
% Tracing only: but some should be changed into real errors/warnings?
\ifnum \@fpstype<\sixt@@n
\ifnum \@fpstype=\z@\fl@trace{ERROR: no PLACEMENT, fpstype = \the \@fpstype = 0?}\fi
\fi
\ifnum \@fpstype=\@ne\fl@trace{WARNING: only h, fpstype = \the \@fpstype = 1?}\fi
\fi
\fl@trace{BANG float}\fi
\else
\ifnum \@fpstype=\sixt@@n\fl@trace{ERROR: no PLACEMENT, fpstype = \the \@fpstype = 16?}\fi
\fi
\ifnum \@fpstype=17\fl@trace{WARNING: only h, fpstype = \the \@fpstype = 17?}\fi
\fi
\fl@trace{ORD float}\fi
\fi
\langle/trace\rangle
\langle/f\text{kernel}|f\text{trace}\rangle
(End definition for \@setfloattypecounts.)
Macros for getting, testing and setting bits of the fps.
\@getfpsbit Sets \@tempcnta to required bit of \count\@currbox.
\def \@getfpsbit {\@boxfpsbit \@currbox
\langle/\text{kernel}\rangle
\def \@getfpsbit {\@boxfpsbit \@currbox
\{\@boxfpsbit \@currbox
\langle/\text{kernel}\rangle
\end{document}
\testfp New definition of the float page test.

\def \testfp #1{%
    \@boxfpsbit #18\relax % Really '#1 8' for human readers!
    \ifodd \@tempcnta
    \else
    \@testtrue
    \fi
    \fi
} (End definition for \testfp.)

\setfpsbit Sets required bit of \@tempcnta (to 1).

\def \setfpsbit #1{%
    \@tempcntb \@tempcnta
    \divide \@tempcntb #1\relax
    \ifodd \@tempcntb
    \else
    \advance \@tempcnta #1\relax
    \fi
} ⟨/2ekernel⟩ (End definition for \setfpsbit.)

\resethfps Globally adds t as a possible location for an h or !h only placement: this must be done using the count.

Although it will leave \fpstype set to 17 even if it was originally 1, this does not matter since it is the last thing in \addtocurcol.

\def \resethfps {%
    \let\reserved@a\@empty
    \ifnum \fpstype=\@ne
    \def \reserved@a {!}%
    \fi
    \ifnum \fpstype=17
    \global \advance \count\@currbox \tw@
    \@latex@warning@no@line {\reserved@a h' float specifier changed to \reserved@a ht'}%
    \fi
} ⟨∗2ekernel|fltrace⟩ \fl@trace{‘t' added to \reserved@a h'—new Count: \the \count\@currbox}% ⟨/trace⟩ ⟨/2ekernel⟩ (End definition for \resethfps.)

Special stuff for BANG floats.
\@flsetnum Ignores any zero float counter value in case BANG.

It uses a local assignment to the normally global counter: a bit naughty, perhaps?

These assignments are safe so long as the counter involved is only consulted once (i.e. only for the ‘bang float’) with the changed value. This is the case within \@addtocurcol because it is used only once within a call of the output routine (which forms a group).

For \@addtonextcol this is achieved by putting a group around its code; this is needed because it is called (by \@startcolumn) for each float which was on the deferlist. Almost identical considerations pertain to \@addtodbicol. There may be more efficient ways to handle this, but the group seems to be the simplest.

\def \@flsetnum #1{\%\begin{verbatim}
\langle∗ trace \rangle
\fl@trace{fpstype: \the \@fpstype (flsetnum \string#1)}\%
\langle/trace\rangle
\ifnum \@fpstype<\sixt@@n\%
\langle∗ trace \rangle
\fl@trace{BANG float resetting \string#1 to 1}\%
\langle/trace\rangle
\ifnum #1=\z@\%
\langle∗ trace \rangle
\fl@trace{BANG float resetting \string#1 to 1}\%
\langle/trace\rangle
\fi\%
\fi\%
\langle∗ trace \rangle
\fl@trace{#1 (before) = \the #1}\%
\langle/trace\rangle
\end{verbatim}\%
\def \@flsettextmin {\%\begin{verbatim}
\langle∗ trace \rangle
\fl@trace{fpstype: \the \@fpstype (flsettextmin)}\%
\langle/trace\rangle
\ifnum \@fpstype<\sixt@@n\%
\langle∗ trace \rangle
\fl@trace{BANG ignoring textmin}\%
\langle/trace\rangle
\@textmin \z@\%
\else\%
\@textmin \textfraction\@colht\%
\fi\%
\end{verbatim}\%
\def \@flcheckspace #1#2{\%\begin{verbatim}
\def \@flcheckspace #1\%
\end{verbatim}\%
\advance \@reqcolroom
\ifx #2\@empty \textfloatsep \else \floatsep \fi
(*trace)
\fl@trace{colroom = \the \@colroom}
\fl@trace{reqcolroom = \the \@reqcolroom}
\ifdim \@colroom>\@reqcolroom
\@tempswatrue
(*trace)
\fl@trace{Space OK: #1 = \the #1 > \the \ht \@currbox}
\fl@trace{Space OK: #1 = \the #1 > \the \ht \@currbox}
\else
(*trace)
\fl@trace{fpstype: \the \@fpstype}
\ifnum \@fpstype<\sixt@@n
(*trace)
\fl@trace{BANG float ignoring #1}
\fl@trace{\@spaces #1 = \the #1. Ht float: \the \ht \@currbox}
\fl@trace{\@spaces #1 = \the #1. Ht float: \the \ht \@currbox}
\@tempswatrue
(*trace)
\else
(*trace)
\fi
\fi
(*trace)
\def \@flupdates #1#2#3{%
\global \advance #1\m@ne
\global \advance \@colnum \m@ne
\@tempdima -\ht\@currbox
\@flupdates This updates everything when a float is placed.
(End definition for \@flcheckspace.)
(*2ekernel)
Interesting facts about float mechanisms past and present, together with a summary of various features, some unresolved:

1. The value \textfraction does not affect the processing of doublecol floats: this seems sensible, but should be documented.

2. \twocolumn floatplacement was wrong: dbl not needed, ord needed.

3. \@floatplacement was not called after \@startdblcol or \@topnewpage. This has been changed; it is clearly a bug fix.

4. The use \@topnewpage when \dblfigrule is non-trivial produced a rule in the wrong place. This has been fixed by not using \dblfigrule when processing the ‘float’ from \@topnewpage.

5. If the specifier was just h and the float could not be put here, it went on the deferlist and stayed there until a clearpage. It now gets changed to a ‘th’: this is only an error-recovery action, putting just h or !h should be deprecated.

6. \@dblmaxsep was ‘the maximum of \dblfloatsep and \dbltexfloatsep’. But it was never used! Now gone completely, like \@maxsep.

7. After an h float is put on a page, it was counted as text when applying the \textfraction test; this is possibly too big a change although it is a bug fix?

8. Two consecutive h floats are separated by twice \intextsep: this could be changed to one by use of \addvspace, OK? Note that it would also mean that less space is put in if an h float immediately follows other spaces. This is also possibly too big a change, at least for compatibility mode? Or it may be simply wrong! It has not been changed.

9. Now \@addtocurcol checks first for just p fps. I think that this is an increase in efficiency, but maybe the coding should be made even more efficient.

10. \@tryfcolumn now tests if the list is empty first, otherwise lots of wasted time! Thus this test has been removed from \@startcolumn. As Frank pointed out, this makes \@startcolumn less efficient. But it is now the same as \@startdblcolumn: I can see no reason why they should be different, but which is best?

11. Why is \@colroom set in \@doclearpage?

12. Footnotes. Check what \clearpage does when footnotes are left over. Footnotes are not put on float pages and, also, \@addtonextcol ignores the existence of held-over footnotes in deciding what floats can go on the page. Not changed.

13. \clearpage can still lose non-boxes, at least when floats are involved. It also moves some to the ‘wrong page’, but this may be a coding problem.
14. The ! option makes it necessary to check in \output that there is enough room
left on the page after adding a float. (This would have been necessary anyway if
anyone set \@textmin too close to zero! A similar danger existed also if the text
in a \twocolumn[text] entity gets too large.) The current implementation of this
also makes the normal case a little less efficient, OK? Not enough room means, at
present, less than \baselineskip, with a warning: is this OK? Should it be made
generic (another parameter)?

15. There are four possibilities for supporting this:
\twocolumn[\maketitle more text]

One is to change \maketitle slightly to allow this. Another is to change
\@topnewpage so that more than one \twocolumn[] command is allowed; in this
case \maketitle\twocolumn[more text] will work. The former is more robust
from the user’s viewpoint, but makes the code for \maketitle rather ad hoc
(maybe it is already?). Another is to misuse the global twocolumn flag locally
within \@topnewpage. Yet another is to move the column count register from the
multicol package into the kernel. This has been done.

16. Where should the reinserts be put to maximise the probability that footnotes come
out on the correct page? Or should we go for as much compatibility as possible
(but see next item)?

17. Should we continue to support (as much as possible) \samepage? Some of its
intended functionality is now advertised as being provided by \enlargethispage.
Use of either is likely to result in wrongly placed footnotes, marginals, etc. Which
should have priority: obeying the pagination instructions, or correct placement of
notes/marginalia?

18. Is the adjustment of space to cause shrinking in the kludge-* case correct? Should
it be limited to 0pt?

19. Is the setting of \boxmaxdepth in makecol and friends needed? It only has any
effect if \@textbottom ends with a box or rule, in which case the vskip to allow for
its depth should also be added. If it is kept, it should probably be the last thing in
the box. It has now been removed.

It would perhaps be better to document that \@textbottom and \@texttop must
have natural height 0pt.

20. I cannot see why the vskip adjustment for the depth is needed if boxmaxdepth is
used to ensure that there is never a too deep box.

21. The value of \boxmaxdepth should be explicitly set whenever necessary: it is too
risky to assume that it has any particular value. Care is needed in deciding what
to set it to.

It is interesting to note that the value of \boxmaxdepth is unique in being read
before the local settings for the box group are reset; all other parameter settings
which affect the box construction use their values outside the box group.

22. Should \@maxdepth store the setting of \maxdepth from lplain? Or should we
provide a proper interface to class files for setting these?
An analysis of various other macros.
\@opcol should do \@floatplacement, but where? Right at the end, since it always occurs at the start of a column.

\def\@opcol{%
    % Why is this done first?
    \global \@mparbottom \z@
    \if@twocolumn
        \@outputdblcol
    \else
        \@outputpage
        % This is not needed since it is done at the end of % \@outputpage:
        \global \@colht \textheight
    \fi
}

Only tracing has been added to these.

\includetrace{negative height floats}{2017/01/01}
\excludefrom{negative height floats}{0000/00/00}
This will line up the last baselines in the two columns provided they are constructed in the normal way: i.e. ending in a skip of minus the original depth, with \textbottom adding nothing.

Thus again it is essential for \textbottom to have depth 0pt.

This is just a change to the single command \outputdblcol so that it saves mark information for the first column and restores it in the second column.

\def\outputdblcol{%
  \if@firstcolumn
    \global\firstcolumnfalse
    \setbox\@leftcolumn\copy\@outputbox
    \fl@trace{PAGE: first column boxed}%
    \splitmaxdepth\maxdimen
    \vbadness\maxdimen
  \else
    \global\@firstcolumntrue
    \setbox\@outputbox\vbox{\unvbox\@outputbox\unskip}%
    \setbox\@outputbox\vsplit\@outputbox to\maxdimen
  \fi
}

One minor difference from the current fixmarks package, pass the marks through a token register to stop any # tokens causing an error in a \def.

\toks0\expandafter{\topmark}%
\dedef\firstcoltopmark{\the\toks0}%
\toks0\expandafter{\splitfirstmark}%
\dedef\firstcolfirstmark{\the\toks0}%
\ifx\firstcolfirstmark\@empty
  \global\let\setmarks\relax
\else
  \gdef\setmarks{%
    \let\firstmark\firstcolfirstmark
    \let\topmark\firstcoltopmark
  }%
\fi

End of change
The color of the \vrule should be \normalcolor as to not inherit the color from the column.

\hfil

Override current first and top with those of first column if necessary
\@setmarks

End of change
This loop could be replaced by an \expandafter\tail recursion in \@startdblcolumn.
\% 

1.1.3 Float placement parameters

The main purpose of this section is to ensure that all the float-placement parameters which need to be set in a class file or package have been declared. It also describes their use and sets values for them which are reasonable for typical documents using US letter or A4 sized paper.

Limits for the placement of floating objects

\c@topnumber This counter holds the maximum number of floats that can appear at the top of a text page or column.
\% 
\newcount\c@topnumber \setcounter{topnumber}{2} \%
(End definition for \c@topnumber.)

\topfraction This macro holds the maximum proportion (as a decimal number) of a text page or column that can be occupied by floats at the top.
\% 
\newcommand\topfraction{.7} \%
(End definition for \topfraction.)

\c@bottomnumber This counter holds the maximum number of floats that can appear at the bottom of a text page or column.
\% 
\newcount\c@bottomnumber \setcounter{bottomnumber}{1} \%
(End definition for \c@bottomnumber.)

\bottomfraction This macro holds the maximum proportion (as a decimal number) of a text page or column that can be occupied by floats at the bottom.
\% 
\newcommand\bottomfraction{.3}
This counter holds the maximum number of floats that can appear on any text page or column.
\newcount\c@totalnumber\setcounter{totalnumber}{3}
(End definition for \c@totalnumber.)

This macro holds the minimum proportion (as a decimal number) of a text page or column that must be occupied by text.
\newcommand\textfraction{.2}
(End definition for \textfraction.)

This macro holds the minimum proportion (as a decimal number) of a page or column that must be occupied by floating objects before a ‘float page’ is produced.
\newcommand\floatpagefraction{.5}
(End definition for \floatpagefraction.)

This counter holds the maximum number of double-column floats that can appear on the top of a two-column text page.
\newcount\c@dbltopnumber\setcounter{dbltopnumber}{2}
(End definition for \c@dbltopnumber.)

This macro holds the maximum proportion (as a decimal number) of a two-column text page that can be occupied by double-column floats at the top.
\newcommand\dbltopfraction{.7}
(End definition for \dbltopfraction.)

This macro holds the minimum proportion (as a decimal number) of a page that must be occupied by double-column floating objects before a ‘double-column float page’ is produced.
\newcommand\dblfloatpagefraction{.5}
(End definition for \dblfloatpagefraction.)
Floats on a text page

\texttt{\floatsep} When a floating object is placed on a page with text, these parameters control the separation between the float and the other objects on the page. These parameters are used for both one-column mode and single-column floats in two-column mode. They are all rubber lengths.

\texttt{\textfloatsep} is the space between adjacent floats that are placed at the top or bottom of the text page or column.

\texttt{\intextsep} is the space between the main text and floats at the top or bottom of the page or column.

\texttt{\intextsep} is the space between in-text floats and the text.

\texttt{\dblfloatsep} and \texttt{\dbltextfloatsep} When double-column floats (floating objects that span the whole \textwidth) are placed at the top of a text page in two-column mode, the separation between the float and the text is controlled by \texttt{\dblfloatsep} and \texttt{\dbltextfloatsep}. They are rubber lengths.

\texttt{\dblfloatsep} is the space between adjacent double-column floats placed at the top of the text page.

\texttt{\dbltextfloatsep} is the space between the main text and double-column floats at the top of the page.

\texttt{\dbltextfloatsep} is the space between the main text and double-column floats at the top of the page.

\texttt{\fptop} When floating objects are placed on a separate page or column, called a ‘float page’, the layout of the page is controlled by these parameters, which are rubber lengths.

At the top of the page \texttt{\fptop} is inserted; typically this supplies some stretchable whitespace. At the bottom of the page \texttt{\fpbot} is inserted. Between adjacent floats \texttt{\fpsep} is inserted.

These parameters are used for all floating objects on a ‘float page’ in one-column mode, and for single-column floats in two-column mode.

Note that at least one of the two parameters \texttt{\fptop} and \texttt{\fpbot} should contain a \texttt{\plus ...fil} so as to fill the remaining empty space.
Double-column ‘float pages’ in two-column mode use similar parameters.

\newskip\@dblfptop
\newskip\@dblfpsep
\newskip\@dblfpbot
\setlength\@dblfptop{0\p@ \@plus 1fil}
\setlength\@dblfpsep{8\p@ \@plus 2fil}
\setlength\@dblfpbot{0\p@ \@plus 1fil}

(End definition for \@dblfptop, \@dblfpsep, and \@dblfpbot.)

The macros can be used to put in rules between floats and text; whatever they insert should be vertical mode material which takes up zero space.

\let\topfigrule=\relax
\let\botfigrule=\relax
\let\dblfigrule=\relax
(End definition for \topfigrule, \botfigrule, and \dblfigrule.)
This file contains the code for loading hyphenation patterns into \LaTeX. Most of this will end up in a file called \texttt{hyphen.ltx}. If you wish to customize your \LaTeX system in respect of hyphenation patterns, write a file \texttt{hyphen.cfg}. If this file exists, it will be loaded instead of \texttt{hyphen.ltx}. See the comments below for additional information.

To produce the printed version of this file the following code is used. It can be extracted with the \texttt{docstrip} program, or one can run this file directly through \LaTeX2\epsilon.

\begin{verbatim}
\langle∗driver⟩
\documentclass{ltxdoc}
\begin{document}
\DocInput{lthyphen.dtx}
\end{document}
\langle/\driver⟩
\end{verbatim}

The default file \texttt{hyphen.ltx} loads hyphenation patterns for US English. If you want to load additional or other hyphenation patterns, you should create a file \texttt{hyphen.cfg}. This is best done by starting from \texttt{hyphen.ltx}.

For backward compatibility, the default file, \texttt{hyphen.ltx}, first tries to load the file \texttt{hyphen.tex}. If this file exists, an information message is issued and the appropriate defaults for \TeX’s internal parameters are set: \texttt{\language} is initialized to 0, and \texttt{\lefthyphenmin} and \texttt{\righthyphenmin} to 2 and 3, respectively, to disallow x- or -xx breaks.

\begin{verbatim}
\langle∗default⟩
\InputIfFileExists{hyphen.tex}%%
\{\message{Loading hyphenation patterns for US english.}%%
\language=0
\lefthyphenmin=2 \righthyphenmin=3 }%%
\\end{verbatim}

Otherwise, since we cannot do anything without any hyphenation patterns, an error message is printed and the \IniT\TeX run is terminated by invoking \texttt{\@@end} (which is the \LaTeX2\epsilon name for \TeX’s \texttt{\end} primitive).

\begin{verbatim}
\langle/\default⟩
\end{verbatim}

The following example describes the possible contents of a file \texttt{hyphen.cfg} that will load both US English and German hyphenation patterns, making the former the default. It sets \texttt{\language} to 0 for the US patterns and to 1 for the German patterns. Then \texttt{\language} is set to 0 to make this the default and the default values of \texttt{\lefthyphenmin} and \texttt{\righthyphenmin} are set.

\texttt{language=0 input hyphen \% (or \input ushyphen1 if the file has been renamed)}
\texttt{language=1 input ghyph31}
Another possibility is to use the package babel, by Johannes Braams. That package is distributed with a suitable hyphen.cfg file.
1 Final settings

This section contains the final settings for \LaTeX. It initializes some debugging and typesetting parameters, sets the default \texttt{\catcodes} and \texttt{uc/lc} codes, and inputs the hyphenation file.

1.1 Debugging

By default, \LaTeX shows statistics:
\begin{verbatim}
\tracingstats1
\end{verbatim}

1.2 Typesetting parameters

\begin{verbatim}
\newcount\@lowpenalty
\newcount\@medpenalty
\newcount\@highpenalty
\end{verbatim}

These are penalties used internally.

\begin{verbatim}
\newmarks
\end{verbatim}

Allocate extended marks types if \texttt{etex} is active. Placed here at the end of the format to increase compatibility with count allocations in earlier releases.

\begin{verbatim}
\ifx\marks\@undefined\else
\def\newmarks{%
\e@alloc\marks \e@alloc@chardef{\count256}\m@ne\e@alloc@top}
\fi
\end{verbatim}

Allocate 3 mark classes to be used in \texttt{\markboth} and \texttt{\markright}. Should be done earlier but for that definition of \texttt{\newmarks} needs moving (which it should I guess).

\begin{verbatim}
\NewMarkClass {2e-left}
\end{verbatim}

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No rollback really, the marks will remain.

Allocate \texttt{\newXeTeXintercharclass} types if \texttt{xetex} is active. previously defined in \texttt{xetex.ini}. Classes allocated 1 to 4094 (or 254 on older \texttt{xetex}) (In earlier XeLaTeX versions 1, 2 and 3 were pre-set for CJK).
trace\string_stack\string_levels  Now define the Lua function to emulate \tracingstacklevels and install it in the \input_level_string callback.

\directlua{local function trace_stack_levels (input_ptr)
  local tracingstacklevels = tex.count.tracingstacklevels
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if tex.tracingmacros > 0 or input_ptr < tracingstacklevels then
  if tracingstacklevels > 0 then
    if input_ptr < tracingstacklevels then
      return "\string\n\string~" .. string.rep(".", input_ptr)
    else
      return "\string~\string~"
    end
  else
    return "\string\n"
  end
else
  return ""
end
⟨latexrelease⟩
if luatexbase.callbacktypes[’input_level_string’] then
  luatexbase.add_to_callback(’input_level_string’,
  trace_stack_levels,’tracingstacklevels’)
⟨latexrelease⟩
end
⟩%
⟨/2ekernel⟩
⟨latexrelease⟩
\if\latexrelease\EndIncludeInRelease
⟨latexrelease⟩
\EndIncludeInRelease
⟨latexrelease⟩

Then for the full rollback, just do nothing, since the function was already taken out of
the rollback above.
⟨latexrelease⟩
\IncludeInRelease{0000/00/00}{trace_stack_levels}⟨latexrelease⟩(End definition for trace\string_stack\string_levels.)

The default values of the picture and \fbox parameters:

\unitlength = 1pt
\fboxsep = 3pt
\fboxrule = .4pt

The saved value of \TeX’s \maxdepth:

\@maxdepth = \maxdepth
\vsize initialized because a \clearpage with \vsize < \topskip causes trouble. \@colroom and \@colht also initialized because \vsize may be set to them if a
\clearpage is done before the \begin{document}
\vsize = 1000pt
\@colroom = \vsize
\@colht = \vsize

Initialise \textheight \textwidth and page style, to avoid internal errors if they are
not set by the class.
\textwidth=.5\maxdimen
\textwidth=\textheight
\ps@empty
1.3 Lccodes for hyphenation

For 7- and 8-bit engines the assumption of T1 encodings is the basis for the hyphenation patterns. That’s not the case for the Unicode engines, where the assumption is engine-native working. The common loader system provides access to data from the Unicode Consortium covering not only \lccode but also other related data. The \lccode part of that at least needs to be loaded before hyphenation is tackled: Xe\TeX follows the standard \TeX route of building patterns into the format. Lua\TeX doesn’t require this data be loaded here but it does need to be loaded somewhere. Rather than test for the Unicode engines by name, the approach here is to look for the extended math mode handling both provide: any other engine developed in this area will presumably also provide \Umathcode.

\begin{verbatim}
\ifnum 0\ifx\Umathcode\@undefined\else 1\fi\ifx\XeTeXmathcode\@undefined\else 1\fi >\z@
 outlook{ Unicode character data,}
\input{load-unicode-data}
\end{verbatim}

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There is one over-ride that makes sense here (see below for the same for 8-bit engines): setting the lccode for \- to itself.

\lccode\- = \- % default hyphen char

The alternative is that a “traditional” engine is in use.

\else

We set things up so that hyphenation files can assume that the default (T1) lccodes are in use (at present this also sets up the uccodes). We temporarily define \reserved@a to apply \reserved@c to all the numbers in the range of its arguments.

\def\reserved@a#1#2{%
  \@tempcnta#1\relax
  \@tempcntb#2\relax
  \reserved@b
}

\def\reserved@b{%
  \ifnum\@tempcnta>\@tempcntb\else
    \reserved@c\@tempcnta
  \fi
}

Depending on the \TeX{} version, we might not be allowed to do this for non-ASCII characters.

\def\reserved@c#1{%
  \count@=#1\advance\count@ by -"20
  \uccode#1=\count@
  \lccode#1=#1
}

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The upper case characters need their \uccode and \lccode values set, and their \sfcode set to 999.

\def\reserved@c#1{%
  \count@=#1\advance\count@ by "20
  \uccode#1=#1
  \lccode#1=\count@
  \sfcode#1=999
}

Well, it would be nice if that were correct, but unfortunately, the Cork encoding contains some odd slots whose uccode or lccode isn’t quite what you’d expect.

Finally here is one that helps hyphenation in the OT1 encoding.

\lccode'\^[='\^[ % oe in OT1

And we also set the \lccode of \- and \textcompwordmark so that they do not prevent hyphenation in the remainder of the word (as suggested by Lars Helström).

End of the conditional to select either Unicode or T1 encoding defaults.

\fi

At this stage, we can install any last-minute expl3 set-up.

\@expl@finalise@setup@@
\def\@expl@finalise@setup@@{}

This is as good a place as any to active a few Xe\TeX-specific settings

\ifx\XeTeXuseglyphmetrics\@undefined
  \XeTeXuseglyphmetrics=1 %
  \XeTeXdashbreakstate=1 %
\fi

\section*{1.4 Hyphenation}

The following code will be compiled into the format file. It checks for the existence of hyphen.cfg in inputs that file if found. Otherwise it inputs hyphen.ltx. Note that these are loaded in \before the \catcodes are set, so local hyphenation files can use 8-bit input.

We try to load the customized hyphenation description file.
\InputIfFileExists{hyphen.cfg}
\typeout{===========================================\linebreak %
Local configuration file hyphen.cfg used\linebreak %
===========================================}%
\def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
\input{hyphen.ltx}
\let\@addtofilelist\@gobble
\l@nohyphenation
\ifx\l@nohyphenation \@undefined
\newlanguage\l@nohyphenation
\fi
(End definition for \l@nohyphenation.)
\document@default@language
Default document language. -1 acts as language 0, but used as a flag in \document to see if it has been set in the preamble.
\let\document@default@language\m@ne
\l@nohyphenation
\ifx\l@nohyphenation \@undefined
\newlanguage\l@nohyphenation
\fi
(End definition for \document@default@language.)
\section{1.5 Font loading}
Fonts loaded during the formatting process might already have changed the \font@submax from 0pt to something higher. If so, we put out a bold warning.
\ifdim \font@submax >\z@ 
\font@warning{Size substitutions with differences
up to \font@submax\space have occurred.\MessageBreak
Please check the transcript file carefull\MessageBreak
and redo the format generation if necessary!
\gobbletwo}%
\errhelp{Only stopped, to give you time to
read the above message.}
\errmessage{}
\def\font@submax{0pt}
\fi

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For pdflTeX preload and enable automatic glyph to Unicode mapping for more reliable copy and paste support.

When rolling back we can’t unload the glyphtounicode mappings, but we can reset \pdfgentounicode to ensure that they aren’t used.

1.6 Input encoding

Starting with the 2018 \LaTeX{} release default the inputencoding to UTF-8. Unless the format is being used with luatex, xetex, enctex or mltx.

This is done in a way largely compatible with older releases: utf8.def is input just as if \usepackage[utf8]{inputenc} had been used, however rather than input the whole package a minimal core part just enough to support loading the UTF-8 encoding files is defined here.

If a document re-specifies UTF-8 this is silently ignored.
Check that a classic 8-bit tex engine is being used (LaTeX or PDFLaTeX).

\latexrelease\IncludeInRelease{2018/04/01}{}{\UTFviii@invalid}{UTF-8 default}%

Skip this section in Unicode TeX, or if MLTeX and EncTeX are enabled.

\ifnum0%
  \ifx\Umathcode\@undefined else 1 \fi
  \ifx\mubyte\@undefined else 1 \fi
  \ifx\charsubdef\@undefined else 1 \fi
  =\z@
\def\saved@space@atcode{10}
\let\inpenc@test\relax
\def\IeC{%
  \ifx\protect\@typeset@protect
    \expandafter\@firstofone
  \else
    \noexpand\IeC
  \fi
}
\MakeCharactersActiveForUTF8InputFormats
\UseRawInputEncoding

\UseRawInputEncoding

Reset 8 bit characters to catcode 12 so the input encoding matches the “Raw” font encoding. Useful for special behaviours, or for compatibility with older \TeX{} formats.

\def\UseRawInputEncoding{%
  \let\inputencodingname\@undefined % revert
  \let\DeclareFontEncoding@\DeclareFontEncoding@saved % revert
  \let\DeclareUnicodeCharacter\@undefined % revert
  \@tempcnta=1
\loop
  \catcode\@tempcnta=13  %
  \advance\@tempcnta\@ne  %
  \ifnum\@tempcnta<32  %
  \repeat  %
  \catcode0=15  % null
  \catcode9=10  % tab
  \catcode10=12  % ctrl J
  \catcode12=13  % ctrl L
  \catcode13=5  % newline
  \@tempcnta=128
\loop
  \catcode\@tempcnta=13
  \advance\@tempcnta\@ne
  \ifnum\@tempcnta<256
  \repeat
\def\UseRawInputEncoding{\}

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\DeclareFontEncoding@saved
\let\DeclareFontEncoding@saved\DeclareFontEncoding@
\edef\inputencodingname{utf8}\
\input{utf8.def}
\let\UTFviii@undefined@err@@\UTFviii@undefined@err
\let\UTFviii@invalid@err@@\UTFviii@invalid@err
\let\UTFviii@two@octets@@\UTFviii@two@octets
\let\UTFviii@three@octets@@\UTFviii@three@octets
\let\UTFviii@four@octets@@\UTFviii@four@octets
\let\UTFviii@undefined@err#1{\@gobble#1}\
\let\UTFviii@invalid@err\string\UTFviii@two@octets\string\UTFviii@three@octets\string\UTFviii@four@octets
\let\@inpenc@test\@undefined
\let\saved@space@catcode\@undefined
\let\UTFviii@undefined@err\UTFviii@undefined@err@@
\let\UTFviii@invalid@err\UTFviii@invalid@err@@
\let\UTFviii@two@octets\UTFviii@two@octets@@
\let\UTFviii@three@octets\UTFviii@three@octets@@
\let\UTFviii@four@octets\UTFviii@four@octets@@
\let\everyjob\expandafter\the\everyjob
\let\UTFviii@undefined\undefined
\let\saved@space@catcode\@undefined
\let\UTFviii@undefined@err\UTFviii@undefined@err@@
\let\UTFviii@invalid@err\UTFviii@invalid@err@@
\let\UTFviii@two@octets\UTFviii@two@octets@@
\let\UTFviii@three@octets\UTFviii@three@octets@@
\let\UTFviii@four@octets\UTFviii@four@octets@@

For formats not set up for UTF-8 default, set the C0 controls to catcode 15.

\else
\@tempcnta=0
\loop
\catcode\@tempcnta=15 
\advance\@tempcnta\@ne 
\ifnum\@tempcnta<32 
\repeat 
\catcode0=15 % null
\catcode9=10 % tab
\catcode10=12 % ctrl J
\catcode12=13 % ctrl L
\catcode13=5 % newline
\let\UseRawInputEncoding\relax

\endinput
This ends the skipped code in Unicode engines:

\fi

\end{includeinrelease}

\begin{includeinrelease}{0000/00/00}\
{\UTFviii@invalid}{UTF-8 default}\

The first block of commands got only introduced in 2019 but we revert all of Unicode support in one go not jump to the intermediate version.

\let\UTFviii@two@octets@combine\@undefined
\let\UTFviii@three@octets@combine\@undefined
\let\UTFviii@four@octets@combine\@undefined
\let\UTFviii@two@octets@string\@undefined
\let\UTFviii@three@octets@string\@undefined
\let\UTFviii@four@octets@string\@undefined
\let\UTFviii@two@octets@noexpand\@undefined
\let\UTFviii@three@octets@noexpand\@undefined
\let\UTFviii@four@octets@noexpand\@undefined
\@tempcnta=0
\loop
\catcode\@tempcnta=15
\advance\@tempcnta\@ne
\ifnum\@tempcnta<32
\repeat
\catcode9=10 % tab
\catcode10=12 % ctrl J
\catcode12=13 % ctrl L
\catcode13=5 % newline
\@tempcnta=128
\loop
\catcode\@tempcnta=12
\advance\@tempcnta\@ne
\ifnum\@tempcnta<256
\repeat
\let\IeC\@undefined
\def\DeclareFontEncoding@#1#2#3{\expandafter\ifx\csname T@#1\endcsname\relax
\def\cdp@elt{\noexpand\cdp@elt}\
\xdef\cdp@list{\cdp@list\cdp@elt{#1}\
{\default@family}{\default@series}\
{\default@shape}}\
\expandafter\let\csname#1-cmd\endcsname\@changed@cmd
\else
\@font@info{Redeclaring font encoding #1}\
\global\@namedef{T@#1}{#2}\
\global\@namedef{M@#1}{\default@M#3}\
\xdef\LastDeclaredEncoding{#1}\
\expandafter\let\csname#1-cmd\endcsname\changed@cmd
\else
\@font@info{Redeclaring font encoding #1}\
\global\@namedef{T@#1}{#2}\
\global\@namedef{M@#1}{\default@M#3}\
\xdef\LastDeclaredEncoding{#1}\
\fi
\expandafter\let\csname#1-cmd\endcsname\changed@cmd
}\end{includeinrelease}
\begin{macrocode}
\def\reserved@c#1{\catcode#1=12\relax}
\reserved@c{\!}
\reserved@c{\"}
\reserved@a{\'}{\?}
\reserved@c{\\}[}
\reserved@c{\\]}
\reserved@c{\'}
\reserved@c{\|}
\end{macrocode}

Set the special catcodes (although some of these are useless, since an error will have occurred if the catcodes have changed). Note that \verb|^J\ has catcode `other' for use in warning messages.
\begin{verbatim}
\catcode`\ =10
\catcode`\#=6
\catcode`\$=3
\catcode`%=14
\catcode`\&=4
\catcode`\\=0
\catcode`\^=7
\catcode`\_=8
\catcode`\{=1
\catcode`\}=2
\catcode`\~=13
\catcode`\@=11
\catcode`\^^I=10
\catcode`\^^J=12
\catcode`\^^L=13
\catcode`\^^M=5
\end{verbatim}
Set the `other' catcodes.
\begin{verbatim}
\def\reserved@cc#1{\catcode#1=12\relax}
\reserved@cc{\!}
\reserved@cc{\"}
\reserved@cc{'}{\?}
\reserved@cc{\[]}
\reserved@cc{\} }
\end{verbatim}

Set the `letter' catcodes.
\begin{verbatim}
\def\reserved@cc#1{\catcode#1=11\relax}
\reserved@cc{\A}{'\Z}
\reserved@cc{\a}{'\z}
\end{verbatim}

All the characters in the range 0–31 and 127–255 are illegal, except \verb|^I\, \verb|^J\, \verb|^L\ and \verb|^M\.
1.7 Lccodes and uccodes

We now again set up the default (T1) uc/lccodes. The lower case characters need their \uccode and \lccode values set. Some of this is a repeat of the set-up before loading hyphenation files. Depending on the \TeX version, we might not be allowed to do this for non-ASCII characters. For the Unicode engines (Xe\TeX and Lua\TeX) there is no need to do any of this: they use hyphenation data which does not alter any of the set up and so this entire block is skipped.

\ifnum 0%
\ifx\Umathcode\@undefined\else 1\fi
\ifx\XeTeXmathcode\@undefined\else 1\fi
>\z@
\else
\def\reserved@c#1{\count@=#1\advance\count@ by -"20\uccode#1=\count@\lccode#1=#1}
\reserved@a{\a}{\z}
\reserved@a{\A}{\Z}
\reserved@a{\80}{\9C}
\reserved@a{\C0}{\DF}
\fi % End of reset block for 8-bit engines

The upper case characters need their \uccode and \lccode values set, and their \sfcode set to 999.

\ifnum 0%
\count@=#1\advance\count@ by "20\uccode#1=\count@\lccode#1=#1\sfcode#1=999\}
\reserved@a{\A}{\Z}
\reserved@a{\80}{\9C}
\reserved@a{\C0}{\DF}
\fi

Well, it would be nice if that were correct, but unfortunately, the Cork encoding contains some odd slots whose uccode or lccode isn’t quite what you’d expect.

\uccode'\^^Y'=\I % dotless i
\lccode'\^^Y'=\^^Y % dotless i
\uccode'\^^Z'=\J % dotless j, ae in OT1
\lccode'\^^Z'=\^^Z % dotless j, ae in OT1
\uccode'\^^9d'=\i % dotted I
\lccode'\^^9d'=\^^9d % dotted I
\lccode'\^^9e'=\^^9e % d-bar
\uccode'\^^9e'=\^^9d % d-bar
\lccode'\^^9d'=\^^9d % d-bar
\fi % End of reset block for 8-bit engines

Finally here is one that helps hyphenation in the OT1 encoding.

\lccode'\^^9d'=\^^9d % oe in OT1
\fi % End of reset block for 8-bit engines

And whilst we’re doing things with uc/lc tables, here are two commands to upper- and lower-case a string.

\MakeUppercase
\MakeUppercase
\NoCaseChange
\ucclist
\expl@text@lowercase@@n
\expl@text@uppercase@@n
\ucclist

\Note that this implementation is subject to change! At the moment we’re not providing any way to extend the list of uc/lc commands, since finding a good interface is difficult. These commands have some nasty features, such as uppercasing mathematics,
environment names, labels, etc. A much better long-term solution is to use all-caps fonts, but these aren’t generally available.

Two wrappers around the \textcase changing functions. \textprotect to make them mostly safe as replacements for \upper and \lower.

\textprotect\def\@expl@text@uppercase@@n{\text_uppercase:n}
\textprotect\def\@expl@text@lowercase@@n{\text_lowercase:n}
\textNoCaseChange protects its argument from the case change functions.
\texttl_put_right:Nn \l_text_case_exclude_arg_tl { \textNoCaseChange }
\textcs_new_protected:Npn \NoCaseChange #1 {#1}
\textExplSyntaxOff
\textDeclareRobustCommand{\MakeUppercase}[1]{%\textdef{i}(I)\textdef{j}(J)%\textdef{reserved@a#1#2}{\let#2#1\textdef{reserved@a}}%\textexpandafter\textdef{reserved@a@uc@clist}{\textdef{reserved@b}@gobble}%Tell UTF-8 processing to process chars even though we are in an \textprotected\textedef.\textprotect\textedef{reserved@0a}{\textexpl\textdef{uppercase@0n}{\textnoexpand\textexpanded{#1}}}%\textreserved@0a
}\textDeclareRobustCommand{\MakeLowercase}[1]{%\textdef{reserved@a#1#2}{\let#2#1\textdef{reserved@a}}%\textexpandafter\textdef{reserved@a@uc@clist}{\textdef{reserved@b}@gobble}%\textprotected\textedef{reserved@0a}{\textexpl\textdef{lowercase@0n}{\textnoexpand\textexpanded{#1}}}%\textreserved@0a
}\textdef{uc@clist}{\oe\OE\o\O\ae\AE\dh\DH\dj\DJ\l\L\ng\NG\ss\SS\ij\IJ\th\TH}
The above code works, but has the nasty side-effect that if you say something like:
\textmarkboth{\textMakeUppercase\textcontentsname}{\textMakeUppercase\textcontentsname}
then the uppercasing is only done to the first letter of the contents name, since the mark expands out to:
\textmark{\textprotect\textMakeUppercase\textcontentsname}
{\textprotect\textMakeUppercase\textcontentsname}
In order to get round this, we redefine \textMakeUppercase and \textMakeLowercase to grab their argument and brace it. This is a very low-level hack, and is not recommended practice! This is an instance of a general problem that makes it unsafe to grab arguments unbraced, and probably needs a more general solution. For the moment though, this hack will do:
\textprotected\textedef{\textMakeUppercase@#1}{\textMakeUppercase{#1}}
\textprotected\textedef{\textMakeLowercase@#1}{\textMakeLowercase{#1}}
(End definition for \textMakeUppercase and others.)
1.8 Applying Patch files

Between major releases, small patches will be distributed in files `ltpatch.ltx` which must be added at this point.

Patch file code removed.

```latex
% \IfFileExists{ltpatch.ltx}
% {% \typeout{=================================^^J%
% Applying patch file ltpatch.ltx^^J%
% =================================}
% \def\fmtversion@topatch{unknown}
% \input{ltpatch.ltx}
% \ifx\fmtversion\fmtversion@topatch
% \def\fmtversion@topatch{0}%
% \ifx\fmtversion@topatch\patch@level\else
% \def\reserved@a\typeout##1##2\reserved@a{%
% \typeout{##1 patch level \patch@level}##2}
% \everyjob\expandafter\expandafter\expandafter{%
% \expandafter\reserved@a\the\everyjob\reserved@a}
% \let\reserved@a\relax
% \the\everyjob
% }{}
% \else
% \typeout{^^J^^J^^J%
% !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J%
% !! Patch file 'ltpatch.ltx' not suitable for this^^J%
% !! version of \LaTeX.^^J^^J%
% !! Please check if initex found an old patch file:^^J%
% !! --- if so, rename it or delete it, and redo the^^J%
% !! initex run.^^J%
% !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J}%
% \batchmode \@end
% \fi
% \else
% \typeout{^^J^^J^^J%
% !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J%
% !! Patch file 'ltpatch.ltx' (for version <\fmtversion@topatch>)^^J%
% !! is not suitable for version <\fmtversion> of \LaTeX.^^J^^J%
% !! Please check if initex found an old patch file:^^J%
% !! --- if so, rename it or delete it, and redo the^^J%
% !! initex run.^^J%
% !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J}%
% \batchmode \@end
% \fi
% \let\fmtversion@topatch\relax
% }
```

The code below adds the ‘patch level’ string to the first `\typeout` in the startup banner.

The `\reserved@a` and `\reserved@b` macros are reserved for use in the kernel. Do not use them as general scratch macros.

1.9 Freeing Memory

And just to make sure nobody relies on those definitions of `\reserved@b` and friends. These macros are reserved for use in the kernel.
\let\reserved@a\@filelist
\let\reserved@b=\@undefined
\let\reserved@c=\@undefined
\let\reserved@d=\@undefined
\let\reserved@e=\@undefined
\let\reserved@f=\@undefined

(End definition for \reserved@a and \reserved@b.)

\toks
\toks0{}
\toks2{}
\toks4{}
\toks6{}
\toks8{}

(End definition for \toks.)

\errhelp
Empty the error help message, which may have some rubbish:
\errhelp{}

(End definition for \errhelp.)

1.10 Initialise file list

\@providesfile
Initialise for use in the document. During initex a modified version has been used which
leaves debugging information for latexbug.tex.
\def\@providesfile#1[#2]{%
  \wlog{File: #1 #2}%
  \expandafter\xdef\csname ver@#1\endcsname{#2}%
  \endgroup}

(End definition for \@providesfile.)

\@filelist
\@addtofilelist
Reset \@filelist so files input while making the format are not listed. The list built up
so far may take up a lot of memory and so it is moved to \reserved@a where it will be
overwritten as soon as almost any \LaTeX command is issued in a class file. However the
latexbug.tex program will be able to access this information and insert it into a bug
report.
\let\@filelist\@gobble
\def\@addtofilelist#1{\xdef\@filelist{\@filelist,#1}}%

(End definition for \@filelist and \@addtofilelist.)

1.11 Preparation for supporting PDF in backends

At the current point in time, basic support for PDF in backends is not part of \LaTeX
core; it is provided by external packages. At some time in the future that work will be
placed into the kernel but for now it is separate and has to be explicitly loaded in the
document.

In that code there is a command \IfPDFManagementActiveTF which can be used by
packages in order to execute different code depending on the whether this basic backend
support is loaded.
To make this also work properly when this external package is not loaded at all, we here add this command already in the kernel (with a trivial definition); thus any package can query this loading state in all circumstances. Once this basic PDF backend support gets moved to the kernel, this definition will vanish again from here or, rather, it will be replaced by a real test.

\texttt{\textbackslash{}IfPDFManagementActiveTF} So long as the code for the basic backend support for PDF is not loaded, the test that is implicit here will always return the false branch. Once this code is loaded, this definition will get replaced by a real test (as it is then possible that the management code is either activated or not activated).

\texttt{\textbackslash{}let \textbackslash{}IfPDFManagementActiveTF \textbackslash{}@secondoftwo}

(End definition for \texttt{\textbackslash{}IfPDFManagementActiveTF}.)

1.12 Do some temporary work for pre-release

This is a good place to load code that hasn’t yet been integrated into the other files . . .

1.13 Some last minute initializations . . .

Load the first aid set of definitions for external packages that await updates.

\texttt{\textbackslash{}input{latex2e-first-aid-for-external-files.ltx}}

1.14 Dumping the format

Finally we make @ into a letter, ensure the format will be in the ‘normal’ error mode, and dump everything into the format file.

\texttt{\makeatother}
\texttt{\errorstopmode}
\texttt{\dump}
\texttt{(\textbackslash{}2e\textbackslash{}kernel)}
Change History

1985-11-04 ltmath.dtx LaTeX2.09
General: produce warning message if line extends into margin. Doesn’t warn about formula overprinting equation number. .................. 648

1989-04-10 ltfssbas.dtx v1.0a
General: Starting with version numbers! \ifmmode \math@group \else \endcsname \fi added in \math@group \mathversion: Test if version defined added. .................. 421

1989-04-10 ltfssbas.dtx v1.0b
General: \preload@sizes added. \wrong@fontshape changed to define substitution font/shape macro. ................. 410

1989-04-10 ltfssini.dtx v1.0a
General: Starting with version numbers \newif for \tempswa added since this switch is unknown at the time when this file is read in. (latex.tex is loaded later.) \math@famname changed to \mathversion. ............. 518

1989-04-14 ltfssbas.dtx v1.0c
General: More documentation added. 410

1989-04-15 ltfssini.dtx v1.0b
General: \mathfontset renamed to \mathversion. .................. 518

1989-04-19 ltfssbas.dtx v1.0d
General: Even more doc. .................. 410

1989-04-21 ltfssbas.dtx v1.0e
General: Documentation is fun!
Parameters of \define@mathalphabet changed. .................. 410

1989-04-21 ltfssini.dtx v1.0c
General: Changed to conform to fam.tex. .......................... 518

1989-04-23 ltfssbas.dtx v1.0f
General: % in \getanddefinefonts added. .................. 410

1989-04-26 ltfssini.dtx v1.0d
General: \xpt added. .......................... 518

1989-04-27 ltfssbas.dtx v1.0g
General: Documentation revised. .................. 410

1989-04-27 ltfssini.dtx v1.0e
General: Definitions of \LaTeX\ symbols corrected. .................. 518

1989-04-29 ltfssbas.dtx v1.0h
General: Documented problem with \halign, and \noalign ........... 410

1989-04-29 ltfssini.dtx v1.0i
General: Removed the \halign \noalign correction (wasn’t bugfree) .................. 410

1989-04-29 ltfssini.dtx v1.0j
General: Corrections to \LaTeX\ tabular env. added. .................. 518

1989-05-01 ltfssbas.dtx v1.0j
General: Default for \baselinestretch added. ........... 410

1989-05-22 ltfssbas.dtx v1.0k
General: Lines longer than 72 characters folded. .................. 410

1989-05-22 ltfssini.dtx v1.0g
General: Lines shortened to 72 characters .................. 518

1989-09-14 ltfssbas.dtx v1.0m
General: Global replacement: \group to \mathgroup .................. 410

1989-11-07 ltfssini.dtx v1.0i
General: All family, series, and shape names abbreviated. .................. 518

1989-11-08 ltfssbas.dtx v1.0o
General: First parameter of \define@mathalphabet and \define@mathgroup changed from string to control sequence. .................. 410

1989-11-14 ltfssbas.dtx v1.0p
\mathversion: Math version prefix \mv@ added. .................. 421

1989-11-19 ltfssbas.dtx v1.0q
\define@newfont: Group added. .................. 423
\wrong@fontshape: Instead of calling \family, \default@family, etc. we set \f@family, etc. .................. 428

1989-11-22 ltfssbas.dtx v1.0r
\mathversion: \def \to \edef for \mathversion .................. 421

1989-11-25 ltfssbas.dtx v1.0s
General: All \edef\font@name changed to \edef\font@name. Necessary after introduction of \begingroup/\endgroup in v1.0q. ........... 410
extra// \to + in \extra@def. ....... 410
1989-11-26 ltfssbas.dtx v1.0t
  \select@group: \vgroup/\egroup
called to
  \begin{group}/\end{group} to avoid
empty Ord atom on math list. . . 430
1989-12-02 ltfssini.dtx v1.1b
  General: \\rmmath
renamed to
  \\mathrm. . . . . . . . . . . . . . . . . . 518
1989-12-03 ltfssini.dtx v1.1c
  General: Some internal macros
renamed to make them
inaccessible. . . . . . . . . . . . . . . . 518
1989-12-05 ltfssbas.dtx v1.0u
  \addto@hook: \addto@hook added. . 435
1989-12-05 ltfsstrc.dtx v1.0u fam.dtx
  \every@math@size: Hook \every@size
added. . . . . . . . . . . . . . . . . . . . 467
1989-12-13 ltfsstrc.dtx v1.0f
  \use@mathgroup: \expandafter
added before final \fi. . . . . . . . . . . . 470
1989-12-16 ltfssbas.dtx v1.1a
  \select@group: \relax in front
added. . . . . . . . . . . . . . . . . . . . 430
  Now four arguments. . . . . . . . . . . 430
  Redefinition of alphabet now
simpler. . . . . . . . . . . . . . . . . . . 431
  Usage of ‘=’ macro added. . . . . . 431
1989-12-16 ltfstrc.dtx v1.0f
  \use@mathgroup: \expandafter
changed to have one
arg. . . . . . . . . . . . . . . . . . . . . . 433
1990-01-18 ltfssbas.dtx v1.2a
  \math@egroup: Def. placed in this
file. . . . . . . . . . . . . . . . . . . . . . 433
  \math@egroup: Def. placed in this
file. . . . . . . . . . . . . . . . . . . . . . 433
  \select@group: Def for alph id
changed. . . . . . . . . . . . . . . . . . . 431
1990-01-21 ltfssbas.dtx v1.2b
  \select@group: Code moved to
  \use@mathgroup. . . . . . . . . . . . . . . 431
1990-01-21 ltfsstrc.dtx v1.2b
  \use@mathgroup: Macro added to
allow cleaner interface. . . . . . . . . 469
1990-01-23 ltfssbas.dtx v1.2c
  General: \no@version@warning
renamed to \no@alphabet@error. . . . . . 410
  Macro \no@alphabet@error added
  \no@alphabet@error: Changed to
error call. . . . . . . . . . . . . . . . . . . . 410
1990-01-25 ltfsssini.dtx v1.1e
  \nfs@text: Macro added. . . . . . . . . . 541
1990-01-27 ltfssbas.dtx v1.2d
  \DeclarePreloadSizes: Font identifier
set to \relax. . . . . . . . . . . . . . . . . . . 416
1990-01-28 ltfssbas.dtx v1.2e
  \mathgroup: \newfam let to
  \new@mathgroup. . . . . . . . . . . . . . . 410
1990-01-28 ltfssbas.dtx v1.2f
  \define@newfont: Added call to
  \curr@fontshape macro to allow
substitution. . . . . . . . . . . . . . . . . . . 423
1990-01-28 ltfsssini.dtx v1.2g
  \em: Call to \@nomath added. . . . . . 538
1990-02-08 ltfsssini.dtx v1.1g
  General: Protected the commands
  \family, \series, \shape, \size,
selectfont, and \mathversion. . . . . . . . . 518
1990-02-16 ltfssbas.dtx v1.2g
  \baselineskip: \@nomath added
without changing
the size. . . . . . . . . . . . . . . . . . . . . . 410
1990-02-18 ltfsstrc.dtx v1.0j
  \selectfont: Redefine unprotected
version \p@selectfont instead of
  \selectfont. . . . . . . . . . . . . . . . . . . 462
1990-03-14 ltfsstrc.dtx v1.0k
  General: Added code for TeX3. . . . . 458
  \extract@font: Added code for
  TeX3. . . . . . . . . . . . . . . . . . . . . . . 461
1990-03-30 ltfssbas.dtx v1.2h
  \math@egroup: Changed to have one
arg. . . . . . . . . . . . . . . . . . . . . . . 433
1990-03-30 ltfssini.dtx v1.2h
  \use@mathgroup: Third argument
removed (see \math@egroup). . . . . . . . . 469
1990-04-01 ltfssbas.dtx v1.2i
  General: Code added from
  tracefnt.dtx. . . . . . . . . . . . . . . . . . 410
  Support for TeX3. . . . . . . . . . . . . . . 410
1990-04-01 ltfsstrc.dtx v1.0l
  General: Part of code moved to
  fam.dtx. . . . . . . . . . . . . . . . . . . . . 458
  \tracingfonts: Check if
  \tracingfonts already defined. . . . . 459
1990-04-01 ltfsstrc.dtx v1.0o
  \tracingfonts: Check if
  \tracingfonts defined removed
again. . . . . . . . . . . . . . . . . . . . . . . 459
1990-04-02 ltfssini.dtx v1.1i
   General: \input of files now handled by docstrip. ............... 518
1990-04-05 ltfstrc.dtx v1.0m
   \selectfont: Call \tracingonly if \tracingfonts greater than 3. 462
1990-05-05 ltfstrc.dtx v1.0n
   \selectfont: \tracingon with new syntax. ......................... 462
1990-06-23 ltfssini.dtx v1.1k
   \fss@text: Changed to \mbox. .................. 541
1990-06-24 ltfssbas.dtx v1.2j
   \DeclarePreloadSizes: Missing percent added. ............... 416
1990-06-24 ltfstrc.dtx v1.0o
   \baselinestretch: Moved to tracefnt.dtx. .................. 467
   \getanddefine@fonts: Adding tracing code. .................. 471
   \Macro moved from fam.dtx. .................. 470
   \use@mathgroup: Tracing code added. .................. 470
1990-06-30 ltfssbas.dtx v1.2l
   \showhyphens: Macro added. .......... 433
1990-06-30 ltfstrc.dtx v1.0p
   \use@mathgroup: Added \relax after math group number. ....... 470
1991-03-28 ltfssini.dtx v1.1m
   \copyright: Extra braces added. ................. 541
1991-03-30 ltfssini.dtx v1.2g
   \newfont: Definition added. ................. 540
   \symbol: Definition added. .................. 540
1991-07-24 ltmiscen.dtx LaTeX2.09
   \verbatim: Added \penalty\interlinepenalty to definition of \par so that \nametag page works. ............... 633
1991-08-14 ltmath.dtx LaTeX2.09
   \cases: (RmS) inserted extra braces around entry for NFSS ....... 643
1991-08-27 ltpictur.dtx LaTeX2.09
   \selectfont: Moved \tracingfonts after \itshape to make it work with NFSS 746
1991-08-27 ltfssini.dtx v1.1n
   \reset@font: Macro introduced. .................. 541
1991-08-27 ltmiscen.dtx LaTeX2.09
   \verbatim: Added \@@par added. .................. 633
1991-08-27 ltpictur.dtx LaTeX2.09
   \endpicture: (RmS & FMi) extra boxing level around \picbox to guard against unboxing in math mode (proposed by John Hobby) 714
1991-08-27 ltplain.dtx LaTeX2.09
   \tracingall: Added \errorcontextlines=\maxdimen, suggested by J. Schrod ............... 35
1991-09-29 ltboxes.dtx LaTeX2.09
   \reset@font: Macro introduced. ................. 541
1991-09-29 ltmiscen.dtx LaTeX2.09
   \verbatim: Added \@@par added. ............... 633
1991-09-29 ltpictur.dtx LaTeX2.09
   \endpicture: (RmS) \reset@font added. ............... 779
1991-09-29 ltfloat.dtx LaTeX2.09
   \reset@font: (RmS) \reset@font added. ............... 779
1991-09-29 ltmath.dtx LaTeX2.09
   \reset@font: Added \reset@font for page number .......... 758
1991-09-29 ltmiscen.dtx LaTeX2.09
   \verbatim: Added \ @@par added. ............... 633
1991-09-29 ltsect.dtx LaTeX2.09
   \reset@font: (RmS) \reset@font added. ............... 779
1991-10-01 ltfloat.dtx LaTeX2.09
   \verbatim: Added \reset@font, suggested by Bernd Raichle. ............... 788
1991-10-04 ltftools.dtx LaTeX2.09
   \verbatim: Added \reset@font, suggested by Bernd Raichle. ............... 788
1991-10-04 ltbibl.dtx LaTeX2.09
   \verbatim: Added \reset@font, suggested by Bernd Raichle. ............... 788
1991-11-01 ltfloat.dtx LaTeX2.09
   \verbatim: Added \reset@font, suggested by Bernd Raichle. ............... 788
1991-11-04 ltbibl.dtx LaTeX2.09
   \verbatim: Added \reset@font, suggested by Bernd Raichle. ............... 788
1991-11-06 ltbibl.dtx LaTeX2.09
   \verbatim: Added \reset@font, suggested by Bernd Raichle. ............... 788
\@bibitem: Changed counter enumi to enumiv, as it says in the comment above ........................................ 787
1991-11-22 ltfssini.dtx v1.2c
\reset@font: Added extra braces for robustness. ..................... 541
Changed to protected version of macro. ..................... 541
1991-11-22 ltfloat.dtx LaTeX2.09
\footnote: (RmS) Added \let\protect\noexpand in \@xfootnote, \@xfootnotemark, and \@xfootnotetext ............. 779
1991-11-22 lhtlists.dtx LaTeX2.09
\@item: (RmS) Changed second call to \makelabel to \unhbox@tempboxa. Avoids problems with side effects in \makelabel and is more efficient. 667
1991-11-27 ltfssbas.dtx v1.3c
extract@alph@from@version: Macro added. .......................... 432
\select@group: Added call to \extract@alph@from@version. 431
1992-03-18 ltdefns.dtx LaTeX209
General: (RMS) changed input channel from 0 to \@inputcheck to avoid conflicts with other channels allocated by \newread .......... 80
1992-03-18 ltfloat.dtx LaTeX2.09
\@xympar: (RmS) added \global@ignorefalse 774
\end@float: (RmS) changed \@esphack to \@Esphack 768
1992-03-18 lhtlists.dtx 0.0
\trivlist: RmS: added \@mbblistfalse ......... 663
1992-03-18 lttsect.dtx 0.0
\@xsect: (RmS) corrected bug: stretch and shrink in argument to \hskip 788
1992-07-26 ltfsstrc.dtx v2.0b
\s@fct@: . . . . . . . . . . . . . . . . . . . . 479
\s@fct@sub: documentation fixes 480
\selectfont: ........................................... 463
\try@simple@size: ........................................... 473
\try@size@range: ........................................... 477
\use@mathgroup: ........................................... 470
1992-08-14 ltbibl.dtx LaTeX2.09
\@citex: added missing argument braces around \ hbox, found by Ed Santer ................. 788
1992-08-14 lttboxes.dtx LaTeX209
\endminipage: (RmS) replaced \hskip\lastskip by \textbf \hskip (proposed by FMi) ............. 681
1992-08-17 ltbibl.dtx LaTeX2.09
\@citex: simplified code for removing leading blanks in citation key (proposed by Frank Jensen and Kresten Krab Thorup) ........ 788
1992-08-19 lttsect.dtx 0.0
\@xsect: (RmS) corrected bug: stretch and shrink in argument to \textbf\hskip
Change History

previously not negated ........... 752
1992-08-19 lthm.dtx LaTeX2.09
\@othm: (RmS) Changed error message
to complain about undefined
counter .......................... 745
1992-08-20 lttfssini.dtx v1.4b
\@setsiz: Added \@currsize. .... 540
1992-08-24 ldefns.dtx LaTeX209
\@ifnextchar: (RmS) Changed error message
to complain about undefined
counter .......................... 745
1992-08-24 lfgssini.dtx v1.4b
\@setsize: Added \@currsize. 540
1992-08-24 ltmiscen.dtx LaTeX2.09
\begin: Added code to \begin to
remember line number. Used by
\@badend to display position of
non-matching \begin. ............ 625
\verb: Changed \verb and \@sverb to
work correctly in math mode .... 638
1992-08-25 ltsect.dtx LaTeX2.09
\@sect: (FMi) replaced explicit setting
of \@svsec by call to
\@seccntformat .................. 751
1992-09-18 ltlists.dtx LaTeX2.09
\item: (RmS) Added warning if \item
is used in math mode ......... 665
1992-09-18 lttab.dtx LaTeX2.09
\@array: Changed \par to \@empty to
avoid starting new row e.g. after
\line ............................. 699
1992-09-19 ltlists.dtx LaTeX2.09
\try@simple@size: .................. 473
1992-09-21 ldefns.dtx v1.4d
\notmath@alphabet: Macro defined. 539
1992-09-22 ldefns.dtx v1.91a
General: Introduced \@f@size for
math size. .............. 410
1992-09-22 ldefns.dtx v2.0c
\getanddefine@fonts: Introduced
\@f@size for math size. ........ 471
1992-10-11 ldefns.dtx v?
\hexnumberB: Made expandable. .... 541
1992-11-23 lspace.dtx \textbf{LaTeX}2.09
\@stepcounter: Replaced {} in
\@stepcounter by \begingroup
\@endgroup to avoid adding an
empty ord in math mode ......... 402
1992-11-26 lspace.dtx LaTeX2.09
\@mpfootnotetext: (RmS) added
protection for \edef ............ 682
1992-11-26 lspace.dtx LaTeX2.09
\@footnotetext: (RmS) added
protection for \edef ................ 779
\footnote: (RmS) Changed all to
‘def’protect’noexpand’protect’noexpand
........................................ 779
1992-12-03 lttfssini.dtx v?
\hexnumberB: Make it accept
counters. .......................... 541
1993-03-08 preload.dtx v2.0b
General: Added 12pt preloads .... 567
1993-03-18 ldefns.dtx v2.0c
General: Changed all \@tempdima in
\@tempdimb to avoid killing
\@numberline .......................... 410
1993-03-18 ldefns.dtx v2.1b
General: Changed all \@tempdima in
\@tempdimb to avoid killing
\@numberline .......................... 458
Changed all \@tempdima in
\@tempdimb to avoid killing
\@numberline .......................... 458
1993-03-18 ldefns.dtx v2.1c
\DeclareSizeFunction: Added all
args to avoid blanks problems . 476
1993-04-09 lterror.dtx v1.0e
\laterr: Mention The
Companion .......................... 287
1993-04-11 lterror.dtx v1.0f
\laterr: Remove setting of
errorcontextlines .......................... 287
1993-05-05 lthfntcmd.dtx v2.0b
General: Removed all \LaTeX related
cmds .......................... 570
1993-05-16 ldefns.dtx v2.0e
\showhyphens: Use \reset@font . 433
1993-07-16 ldefns.dtx v2.1h
General: Changed layout of info
messages .......................... 458
1993-07-17 loutenc.dtx 1.0d
General: changed \catcoding @ .... 357
1993-08-03 lthfntcmd.dtx \LaTeX\textbf{X}2.09
\enddocument: Changed redefinition of
\global to redefinition of
\@setckpt. .......................... 619
1993-08-05 ltpictur.dtx LaTeX2.09
\circle: (RMS) Added error message
if \circle is used in math mode. 736
1993-08-05 lsecct.dtx \LaTeX\textbf{X}2.09
\@sect: (RmS) Made sure that
\protect works correctly in expansion of the \textbf{counter} ....... 751
1993-08-05 lspace.dtx \LaTeX\textbf{X}2e
\@hskip: (RmS) Removed
superfluous \leavevmode in
\@hskip and \@hspace, as
suggested by CAR. .............. 329
Change History

1993-08-05 lttab.dtx latex2e
   \tabular*: Replaced \expandafter\def by \\namedef. 698
1993-08-06 ltbibl.dtx LaTeX2.09
   \\cite{t}: Replaced \expandafter\def by \@namedef. 698
1993-08-06 preload.dtx v2.0c
   General: Added \relax at end of font names. ............... 568
1993-08-13 ltoutenc.dtx 1.0f
   General: Protected against active @ sign. .................. 357
1993-08-13 ltfsstrc.dtx v2.0e
   \new@mathversion: Exchanged names of encodings in warning message of \SetSymbolFont. ......................... 499
1993-08-16 ltoutenc.dtx 1.0g
   General: Needs space after \string. 357
1993-09-02 ltfsstrc.dtx v2.1i
   \verb*: Corrected name of sgen size function. ............ 458
1993-09-03 ltmiscen.dtx LaTeX2.09
   \verbatim@nolig@list: Replaced \@noligs by extensible list. .. 638
1993-09-07 ltmiscen.dtx LaTeX2.09
   \verb@balance@group: (RmS) Changed definition of \verb so that it detects a missing second delimiter. .................. 637
1993-09-09 lintabenc.dtx LaTeX2.09
   \enddocument: Added warning in case of undefined references. ... 619
1993-09-15 ltfsbas.dtx v2.0g
   \DeclareFontEncoding: Corrected: \default@T to \default@M. .... 414
1993-09-15 ltfsstr.dtx v2.1j
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1993-09-19 lterror.dtx LaTeX2.09
   \@invalidchar: (RmS) Error message for invalid input characters. .... 291
1993-11-01 ltmath.dtx LaTeX2.09
   General: RmS: Corrected description of \eqn, moved \eqn accordingly and removed extra \tabskip assignment. ............. 648
1993-11-03 ltmath.dtx LaTeX2.09
   General: RmS: Initialized \everycr to \emptyskip assignment. .... 648
1993-11-03 ltpictur.dtx LaTeX2.09
   General: (RmS) changed \align to \align to initialize \tabskip and \everycr. ......................... 716
1993-11-11 ltfsini.dtx v2.1a
   \normalfont: Macro added. 541
1993-11-11 ltfsstr.dtx v2.2a
   General: Option concept added for LaTeX2e. ................ 458
1993-11-14 ltclass.dtx v0.2a
   \\current*: Name changed from \\reset@ptions to \\reset@ption. 823
1993-11-14 ltfsstr.dtx v2.1a
   \\current*: Macro added. 849
1993-11-14 ltfsstr.dtx v2.2a
   \AtEndDocument: Included extension in the generated macro name for package and class hooks. 850
1993-11-14 ltclass.dtx v0.2a
   \\documentstyle: Added \RequirePackage \\mused@ptionlist stuff. 838
1993-11-14 ltclass.dtx v0.2b
   \load@onefilewithoptions: Moved resetting of \default@ds, \ds and \declared@ptions here, from the end of \ProcessOptions. 843
1993-11-14 ltclass.dtx v0.2c
   \\NeedsTeXFormat: made more robust for alternative syntax for other formats. 840
1993-11-14 ltclass.dtx v0.2d
   \\ProcessOptions*: Optimize ‘empty option’ code. 835
1993-11-14 ltclass.dtx v0.2e
   \Stop adding the global option list inside class files. 835
1993-11-15 ltclass.dtx v0.2f
   \\documentstyle: Modified to match \\ProcessOption* ........ 838
1993-11-15 ltclass.dtx v0.2g
   \\ProcessOptions*: Star form added. 835
1993-11-17 ltclass.dtx v0.2c
   \\@files@with@ptions: Macro added 849
1993-11-17 ltclass.dtx v0.2c
   \\@badrequireerror: Macro added 851
1993-11-17 ltclass.dtx v0.2c
   \\@twoloadclasserror: Macro added 851
1993-11-17 ltclass.dtx v0.2c
   \\Current@ption: Name changed from \currext to \current. 823
1993-11-17 ltclass.dtx v0.2c
   \\Declare@options*: Error checking added. 833
1993-11-17 ltclass.dtx v0.2d
   \\load@one@with@options: Added trap for two \LoadClass commands. 845
1993-11-17 ltclass.dtx v0.2d
   \\NeedsTeXFormat: Name changed from \NeedsFormat 840
1993-11-18 ltclass.dtx v0.2d
   \\ProcessEvent*: restoring \\files@with@ptions added. 835
1993-11-18 ltclass.dtx v0.2d
   \\documentstyle: Modified \\RequirePackage stuff. 838
1993-11-18 ltclass.dtx v0.2d
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\NeedsTeXFormat{\fmtname}{\fmtversion}{\@missingfileerror}
\verbatim: Use \verbatim@font instead of \tt
\verb: Use \verbatim@font instead of \tt
\verbatim@font: Macro added
\fileswithoptions: Made the default \[] not \[\unknownversion\]
\ifl@ter: Added //00 so parsing never produces a runaway argument.
\unknownversion removed
\loadonefilewithoptions: Made the initial version \[] not \[\unknownversion\]
\settodim: Macro added
\settopoint: Macro added
\settodepth: Macro added
\settoheight: Macro added
\LaTeXe: Macro added
\maybe@ic@: Use \t@st@ic
\t@st@ic: Macro added
\xpt stuff removed
\LaTeX: Macro changed
\twoclasseserror: Macro added
\twodigits: Macro added
\renewenvironment: Macro reimplemented and extended
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Change History

1993-12-03 lclass.dtx v0.2i
\@cls@pkg: Name changed to avoid clash with output routine. 850
General: \@onlypreamble: Many commands declined. 822
Removed obsolete
\documentclass 822
1993-12-03 lterror.dtx v1.0b
\ExecuteOptions: Preserve \CurrentOption 837
1993-12-03 lterror.dtx v1.0f
\@specialoutput: Unboxing of 255 added to rescue writes 943
1993-12-06 lclass.dtx v0.2k
\ExecuteOptions: Preserve \CurrentOption 837
1993-12-06 lclass.dtx v0.2l
\ProvidesFile: Macro added 832
1993-12-07 lclass.dtx v0.2m
\load@onefilewithoptions: Reset \CurrentOption 843
1993-12-07 lclass.dtx v1.0g
\begin@tempboxa: macro added 672
\end@tempboxa: macro added 672
\@irsbox: redefined to support \height 684
\@makebox: default changed from x to c 671
\begin@tempboxa: macro added 672
\@irsbox: redefined to support \height 684
\@makepicbox: macro modified 673
\@irsbox: redefined to support \height 684
\@isavebox: color support 675
\@isavepicbox: extra group 675
\@makebox: default changed from x to c 672
\@makepicbox: macro modified 673
\@savebox: default c not x 675
\bm@b: macros added 672
\endlrbox: macro added 676
\fbox: extra group 676
\lrbox: color support 675
\parbox: Redefined to support extra optional arguments 678
\begin@tempboxa: macro added 672
\@input: Macro reimplemented 349
\@input: Macro reimplemented 350
\IfFileExists@: Macro added 347
\input: Macro reimplemented 349
1993-12-05 lfloat.dtx LaTeX2e
\@dbliftplacement: Command changed 770
\@xfloat: Command changed 764
1993-12-05 loutput.dtx v1.0f
\@addtobot: Command changed ... 964
\@addtocurcol: Command changed 966
\@addtdblcol: Command changed 976
\@addtonextcol: Command changed 973
\@addtotoporbot: Command changed 965
\@boxfpbit: Command added 988
\@checkspace: Command added 990
\@floatnum: Command added 990
\@floatingtextmin: Command added 990
\@floatop: Commands added ... 987
\@flupdates: Command added 991
\@fpadddefault: Command added 987
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\@opcol: Command changed 949
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\@outputpage: Command changed 953
\@resethfps: Command added ... 989
\@setfloptypecounts: Command added ... 988
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\@topnewpage: Commands changed 941
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\@textfloatsheight: Commands added ... 987
\@topnewpage: Commands changed 941
\@tryfcolumn: Command changed ... 960
\@writepage: \@startpagehook added ... 953
\\@output: Command changed ... 943
1993-12-06 lclass.dtx v0.2i
\@class@pkg: Name changed to avoid clash with output routine. 850
General: \@onlypreamble: Many commands declined. 822
Removed obsolete
\documentclass 822
1993-12-03 ltssini.dtx v2.1a
\begin@begin@tempboxa: macro added ... 672
1993-12-04 lfloat.dtx v0.9b
\unqu@tefilef@und: Macro added 885
1993-12-04 lfiles.dtx v0.9b
\@input: Macro reimplemented ... 349
\@input: Macro reimplemented ... 350
\IfFileExists@: Macro added 347
\input: Macro reimplemented 349
1993-12-03 ltclass.dtx v0.2i
\@begin@tempboxa: macro added ... 672
1993-12-03 lterror.dtx v1.0b
\@latexerr: Set \c@errorcontextlines to -1 287
1993-12-03 ltssini.dtx v2.1a
General: update for LaTeX2e 518
1993-12-04 lfilehook.dtx v0.9b
\unqu@tefilef@und: Macro added 885
1993-12-04 lfiles.dtx v0.9b
\@input: Macro reimplemented ... 349
\@input: Macro reimplemented ... 350
\IfFileExists@: Macro added 347
\input: Macro reimplemented 349
1993-12-05 lfloat.dtx LaTeX2e
\@dbliftplacement: Command changed 770
\@xfloat: Command changed 764
1993-12-05 loutput.dtx v1.0f
\@addtobot: Command changed ... 964
\@addtocurcol: Command changed 966
\@addtdblcol: Command changed 976
\@addtonextcol: Command changed 973
\@addtotoporbot: Command changed 965
\@boxfpbit: Command added 988
\@checkspace: Command added 990
\@floatnum: Command added 990
\@floatingtextmin: Command added 990
\@floatop: Commands added ... 987
\@flupdates: Command added 991
\@fpadddefault: Command added 987
\@getfpbit: Command added ... 988
\@opcol: Command changed 949
\Hook added 949
\@outputpage: Command changed 953
\@resethfps: Command added ... 989
\@setfloptypecounts: Command added ... 988
\@setfloattypecounts: Command added ... 988
\@topnewpage: Commands changed 941
\@tryfcolumn: Command changed ... 960
\@writepage: \@startpagehook added ... 953
\\@output: Command changed ... 943
1993-12-06 lclass.dtx v0.2k
\ExecuteOptions: Preserve \CurrentOption 837
1993-12-06 loutput.dtx v1.0f
\@specialoutput: Unboxing of 255 added to rescue writes 943
1993-12-06 loutput.dtx v1.0g
\@topnewpage: \@floatplacement placement bug fixed 941
1993-12-07 lclass.dtx v0.2i
\ProvidesFile: Macro added 832
1993-12-07 lclass.dtx v0.2m
\load@onefilewithoptions: Reset \CurrentOption 843
1993-12-07 loutenc.dtx 1.1
General: Protected all special characters with \string 357
1993-12-07 ltoutenc.dtx v1.1
   General: Made all character numbers decimal. 354
   Removed a lot of equal signs and the like. 354
1993-12-08 ltboxes.dtx v0.1b
   \begin{tempboxa}: Extra braces for color support (braces removed from other macros) 672
   \irsbox: fix typo 684
   \parboxto: \endgraf added due to extra group in \begin{tempboxa} 679
   \lrbox: move \endpefalse out of the inner group 675
1993-12-08 ltfntcmd.dtx v2.1b
   General: Macros \rm, \bf and \sf moved to classes.dtx 578
1993-12-08 ltlists.dtx LaTeX2e
   \item: use \boxa to support colour 666
1993-12-08 ltspace.dtx LaTeX2e
   \bsphack: Command reimplemented; late birthday present for Chris 319
   \vbsphack: Command added 322
1993-12-09 ltboxes.dtx v0.1c
   \irsbox: fix another typo 684
1993-12-09 ltclass.dtx v0.2n
   \documentstyle: input 209 compatibility file 838
1993-12-09 ltfiles.dtx v0.9e
   \document: Hook added 334
1993-12-09 ltmiscen.dtx v0.9h
   \noligs: Readded 638
   \verbatim: Readded \noligs 634
   \item: Removed optional argument 631
1993-12-10 ltoutput.dtx v1.0h
   \cflb: boxmaxdepth setting moved 958
   \csname boxmaxdepth\endcsname: changed to \let 958
   \doclearpage: changed to \let before \let \doclearpage 948, 949
   \makecol: changed to \let \makecol 950
   \resetfps: Warnings added: minimal 989
   \startdoublecolumn: changed to \let \startdoublecolumn 959, 960
   \topnewpage: braces removed 941
   \trycolumn: changed to \let \trycolumn 961
   \frame: \tracemessage: Commands changed 985
1993-12-11 ltmath.dtx v0.9g
   General: Added a group around the first argument of \frac to prevent changes (for example font changes) from modifying the contents of the second argument. 648
1993-12-11 ltoutenc.dtx v1.2a
   General: Corrected for t1enc, math. 354
1993-12-11 ltsect.dtx LaTeX2e
   \author: Added default 747
   \title: Added default 747
1993-12-11 ltref.dtx LaTeX2e
   \ref: Macro added 614
   \pageref: Macro reimplemented 614
   \docref: Macro reimplemented 614
1993-12-12 ltoutput.dtx v1.0h
   \cflb: boxmaxdepth setting moved 958
   \csname boxmaxdepth\endcsname: changed to \let 958
   \doclearpage: changed to \let before \let \doclearpage 948, 949
   \makecol: changed to \let \makecol 950
   \resetfps: Warnings added: minimal 989
   \startdoublecolumn: changed to \let \startdoublecolumn 959, 960
   \topnewpage: braces removed 941
   \trycolumn: changed to \let \trycolumn 961
   \frame: \tracemessage: Commands changed 985
1993-12-13 ltclass.dtx v0.2o
   General: Removed setting \errorcontextlines (now in latex.tex) 822
   \documentstyle: compatibility file now latex209.sty. 838
   \usepackage: Fixed error handling 840
1993-12-13 ltdirchk.dtx v0.2a
   General: on the ‘docstrip’ pass, do not check openin path 10
   \ifFileExists: Removed interactive prompting for current directory syntax 10
   \strip@prefix: modified, name changed from \stripmeaning 5
1993-12-13 ltlists.dtx latex2e
   \trivlist: Initialised \itemlabel 663
1993-12-13 ltmiscen.dtx v0.9h
   \noligs: Readded \noligs 638
   \verbatim: Readded \noligs 634
   \item: Removed optional argument 633
   \center: Removed optional argument of \item 631
flushleft: Removed optional argument of \item \hspace{0in} \hfill 632
flushright: Removed optional argument of \item \hspace{0in} \hfill 632

1993-12-13 ltoutenc.dtx v1.2b
General: Corrected file name in driver code. \hspace{0in} \hfill 354

1993-12-14 ltboxes.dtx v0.1d
@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
@iparbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678
\minipage: Changed default from 'c' to 's' \hspace{0in} \hfill 680
extra space removed \hspace{0in} \hfill 680
\parbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678

1993-12-15 ltclass.dtx v0.2p
@documentclasshook: Macro added \hspace{0in} \hfill 822
@fileswithoptions: Add \hspace{0in} \hfill 822
@compatibility hook \hspace{0in} \hfill 841
@documentstyle: Match Alan’s new code. \hspace{0in} \hfill 838

1993-12-17 ltclass.dtx v0.2q
@documentclasshook: Macro added \hspace{0in} \hfill 822
@fileswithoptions: Add \hspace{0in} \hfill 822
@compatibility hook \hspace{0in} \hfill 841
@documentstyle: Match Alan’s new code. \hspace{0in} \hfill 838

1993-12-17 ltoutenc.dtx v1.3
General: Added this section \hspace{0in} \hfill 358
Removed all the hackery for use in \DeclareFontEncoding, and redid everything using \DeclareTextFont. \hspace{0in} \hfill 370, 372

1993-12-17 ltboxes.dtx v0.1d
@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
@iparbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678
\minipage: Changed default from 'c' to 's' \hspace{0in} \hfill 680
extra space removed \hspace{0in} \hfill 680
\parbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678

1993-12-16 ltoutput.dtx v1.0j
@opcol: Hook removed \hspace{0in} \hfill 949
@specialoutput: Page room test added \hspace{0in} \hfill 944
@topnewpage: test for vsize too small added \hspace{0in} \hfill 941
@topnewpage: check for vsize too small added \hspace{0in} \hfill 943
@writesetup: --and then removed \hspace{0in} \hfill 953
@fl@tracemessage: traced floatvals made a document command \hspace{0in} \hfill 985

1993-12-17 ltpage.dtx LaTeX2e
@mark: Removed init \mark at begin document, since it doesn’t work. \hspace{0in} \hfill 816
\rightmark: Stopgap solution to mark \hspace{0in} \hfill 816
\leftmark: use \rightmark and \leftmark work without initializing mark until the problem is solved. \hspace{0in} \hfill 816

1993-12-14 ltoutenc.dtx 1.3b
General: Fixed typos with \NeedsTeXFormat lines. Added the \NeedsTeXFormat line. Added the last argument to \DeclareEncoding. Moved the use of the encodings to after their declaration. \hspace{0in} \hfill 357
Replaced the missing last argument to \DeclareFontEncoding. \hspace{0in} \hfill 370, 372

1993-12-18 ltboxes.dtx v0.1d
@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
@iparbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678
\minipage: Changed default from 'c' to 's' \hspace{0in} \hfill 680
extra space removed \hspace{0in} \hfill 680
\parbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678

1993-12-17 ltoutput.dtx v1.3
General: Added \EncodingSpecificAccent, \EncodingSpecificAccentedLetter and \EncodingSpecificCommand. \hspace{0in} \hfill 354
Made Rokicki’s encoding a proper encoding scheme rather than a variant of OT2. \hspace{0in} \hfill 354

1993-12-17 ltoutput.dtx v1.0i
@operators: Hook removed \hspace{0in} \hfill 949
@specialoutput: Page room test added \hspace{0in} \hfill 944
@topnewpage: check for vsize too small added \hspace{0in} \hfill 943
@topnewpage: --and then removed \hspace{0in} \hfill 953
@fl@tracemessage: traced floatvals made a document command \hspace{0in} \hfill 985

1993-12-17 ltpage.dtx LaTeX2e
@mark: Removed init \mark at begin document, since it doesn’t work. \hspace{0in} \hfill 816
\rightmark: Stopgap solution to mark \hspace{0in} \hfill 816
\leftmark: use \rightmark and \leftmark work without initializing mark until the problem is solved. \hspace{0in} \hfill 816

1993-12-16 ltboxes.dtx v0.1d
@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
@iparbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678
\minipage: Changed default from 'c' to 's' \hspace{0in} \hfill 680
extra space removed \hspace{0in} \hfill 680
\parbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678

1993-12-16 ltboxes.dtx v0.1d
@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
@iparbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678
\minipage: Changed default from 'c' to 's' \hspace{0in} \hfill 680
extra space removed \hspace{0in} \hfill 680
\parbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678

1993-12-15 ltboxes.dtx v0.1d
@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
@iparbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678
\minipage: Changed default from 'c' to 's' \hspace{0in} \hfill 680
extra space removed \hspace{0in} \hfill 680
\parbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678

1993-12-15 ltboxes.dtx v0.1d
@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
@iparbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678
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@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
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@iminipage: Changed default from 'c' to 's' \hspace{0in} \hfill 681
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extra space removed \hspace{0in} \hfill 680
\parbox: Changed default from 'c' to 's' \hspace{0in} \hfill 678

1993-12-18 loutenc.dtx v1.3c
General: A new syntax, separating accent-definitions from encoding-specific definitions, and allowing encoding-specific \chardef, \let, etc. ........ 354
Rewrote for the new syntax of \EncodingSpecific. ........ 354

1993-12-18 loutenc.dtx v1.3d
General: Some T1 stuff had drifted into the OT1 file. ........ 354

1993-12-18 lpage.dtx LaTeX2e \sloppy: Added \emergencystretch 816

1993-12-19 ltclass.dtx v0.2r \endfilecontents: Different message when ignoring a file ........ 851

1993-12-19 lfnctcmd.dtx v3.0b General: \@pdef command added .... 570
Made \newfontswitch produce an error if command already exists, and added \dreenewfontswitch, ASAJ .... 570
Other tidying .................... 570
Some more tidying done .... 570
Untidying added, so this is now a TEMPORARY version. .... 570
Wording changes by CAR. .... 578
\DeclareOldFontCommand: Corrected and tidied .................. 577
\DeclareTextFontCommand: Corrected and tidied .................. 572

1993-12-19 lspace.dtx LaTeX2e \@bsphack: There seem to be problems with selfmade birthday presents .... 320

1993-12-20 ltdefn.dtx LaTeX2e \@reargdef: Kept old version of \dreardef, for array.sty .... 83

1993-12-20 lfiles.dtx LaTeX2e \@obsoletefile: Added this command, removed @oldfilenamewarning ........ 352

1994-01-05 fontdef.dtx v2.1d General: Removed nf prefix from file names. ................ 548

1994-01-13 lmmath.dtx v0.9o \@@eqncr: correcting 0.9i .... 650
General: correcting 0.9i .... 648

1994-01-14 ldirch.dtx v0.2d \IFFileExists: Close the texsys.aux output stream ........ 10

1994-01-15 lfiles.dtx v0.9o \document: move \@preamblecmds after document hook ........ 336

1994-01-17 ltclass.dtx v0.2s \@fileswithoptions: Modify to reduce parameter stack usage .... 841
General: Added many more \onlypreamble commands .... 822
Wrapped long lines to column 72 .... 822
\loadonefilewithoptions: Modify to reduce parameter stack usage .... 846

1994-01-17 lfiles.dtx LaTeX2e \@listfiles: New Version, adds ‘.tex’ if needed, and lines up columns .... 352

1994-01-17 lfsbsas.dtx v2.1a \@mathversion: New math font setup ...... 421
\notmathalphabet: Message changed .......................... 539

1994-01-17 lfsstrc.dtx v2.1e \notmathalphabet: Message corrected .................. 539

1994-01-17 ltfssini.dtx v2.1f \notmathalphabet: Message corrected .................. 539

1994-01-17 ltbibl.dtx LaTeX2e \bibliography: Use \input@ so include files are listed. .... 788

1994-01-18 ltclass.dtx v0.2t \@pkgetension: Fix typo .... 827

1994-01-18 lfiles.dtx v0.9p \@input@: do not use a different definition for \input@path .... 350
\input@: Macro added .......... 348
\input: do not use a different definition for \input@path .... 350
\includeonly: Use \input@so include files are listed. .... 340
\notmathalphabet: Message corrected .......................... 539

1994-01-18 lttutenc.dtx v2.1f \notmathalphabet: Message corrected .......................... 539

1994-01-18 lttutenc.dtx v3.0b \@verbatim: Add \global\@inlabelfalse .......... 633

1994-01-18 lttutenc.dtx v0.7e \@fileswithoptions: Modify to reduce parameter stack usage .... 841
General: Added many more \onlypreamble commands .... 822
Wrapped long lines to column 72 .... 822
\loadonefilewithoptions: Modify to reduce parameter stack usage .... 846
Only add `\penalty` if in hmode. 633
1994-01-19 fontdef.dtx v2.1e
   General: Added missing setting for symbols in bold version. 553
1994-01-19 ltdirchk.dtx v0.2e
   `\IfFileExists`: name changed from `\test` 9
1994-01-19 ltdirchk.dtx v0.2e
   `\input@path`: No longer check that an empty group is in the path 11
1994-01-19 ltdirchk.dtx v0.2e
   `\strip@prefix`: name changed from `\strip@meaning`, to match NFSS. 5
1994-01-19 ltdmath.dtx v1.0n classes
   `\mathindent`: Deferred setting of 651
1994-01-20 ltdirchk.dtx v0.2f
   General: `\@copytexsys` and the `texsys.new` file removed 9
   Modify all of ltxcheck 14
1994-01-20 ltdirchk.dtx v0.2f
   `\IfFileExists`: `\@copytexsys` removed 10
1994-01-21 ltclass.dtx v0.2u
   `\documentstyle`: compatibility file now latex209.def. 838
1994-01-21 ltdirchk.dtx v0.2g
   General: Improve documentation, reorganize docstrip module 1
   `\filename@parse`: Minor changes, and add Mac version (;) 11
   `\today`: Name changed from `\stamp` to save memory 9
1994-01-21 ltfloat.dtx LaTeX2e
   `\@xfloat`: Added missing percent characters. 764
1994-01-21 ltmiscen.dtx v0.9s
   `\verbatim@font`: Removed unnecessary category code hackery. 634
1994-01-24 ltdirchk.dtx v0.2h
   `\IfFileExists`: Stop testing once `texsys.aux` has been found 10
1994-01-24 ltpage.dtx LaTeX2e
   `\pagemode`: (DPC) Complain if pagemode is undefined. 813
1994-01-25 ltdirchk.dtx v0.2i
   General: Protect against looping on `\@input` and `\@end`. 3
1994-01-25 ltfssbas.dtx v2.1b
   `\math@version`: Corrections for math setup. 421
1994-01-25 ltmath.dtx LaTeX2e
   `\bordermatrix`: Removed `\@renwd`. 643
1994-01-26 ltfssbas.dtx v2.3c
   `\check@mathfonts`: Correct trace info placement. 468
   `\restglobalsettings`: Correct trace info placement. 469
   `\nocorrlist`: Only `, used as default for cm fonts. 577
1994-01-29 lltclass.dtx v0.2v
   `\unprocessedoptions`: Macro added. 851
   `\load@onefile@with@options`: All options raise error if no `\ProcessOptions` appears 847
1994-01-31 ltddefs.dtx v0.2w
   `\@addtomacro`: Use toks register to avoid ‘hash’ problems. 107
   `\document`: set `\@normalsize` or `\normalsize` if necessary 335
1994-01-31 ltftxt.dtx v3.1b
   General: `\@normalsize` no longer defined. 570
1994-02-01 ltpage.dtx LaTeX2e
   `\pagemode`: (DPC) Modify to get nicer error message. 813
   `\thispagemode`: (DPC) Modify to get nicer error message 814
1994-02-02 lltclass.dtx v0.2x
   `\load@onefile@with@options`: Only run the hook and options check if the file was loaded. 847
1994-02-03 lttex.dtx LaTeX2e
   `\maketitle`: correct mistakes in the documentation. 952
1994-02-07 ltclass.dtx v0.2y
   `\files@with@options`: Run `\compatibility` on the first class to start (not the first to finish). 841
1994-02-07 lttex.dtx LaTeX2e
   `\DeclareFontEncoding`: revert catcode settings earlier. 414
1994-02-07 lttex.dtx LaTeX2e
   `\DeclareFontShape`: revert catcode settings earlier. 411
1994-02-08 ltoutput.dtx v1.0k
   `\makespecialcolbox`: boxmaxdepth setting added. 952
   boxmaxdepth setting removed. 951
   General: Documentation and tasks tidied. 926
<table>
<thead>
<tr>
<th>Date</th>
<th>File</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994-02-10</td>
<td>ltclass.dtx v0.2z</td>
<td>Changed name from \compatibility to \documentclasshook, and added the check for whether @normalsize has been defined. \ASAJ. 822</td>
</tr>
<tr>
<td>1994-02-10</td>
<td>ltfiles.dtx v0.1a</td>
<td>General: Add code from the old dump.dtx</td>
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<tr>
<td>1994-02-10</td>
<td>ltfiles.dtx v0.1b</td>
<td>General: Initial version, split from \latex.dtx</td>
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<tr>
<td>1994-02-10</td>
<td>ltfiles.dtx v0.1c</td>
<td>General: Old comments removed</td>
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<tr>
<td>1994-02-10</td>
<td>ltfiles.dtx v0.1d</td>
<td>General: Use \InputIfFileExists not \IfFileExists.</td>
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<tr>
<td>1994-02-22</td>
<td>ltfiles.dtx v2.1a</td>
<td>General: Long lines wrapped to 72 columns</td>
</tr>
<tr>
<td>1994-03-01</td>
<td>ltdirchk.dtx v0.2a</td>
<td>General: Add unstripped module, so that dircheck.dtx may be used with \initex.</td>
</tr>
<tr>
<td>1994-03-09</td>
<td>ltdirchk.dtx v0.2b</td>
<td>General: Move the 2ekernel code to \ltfinal.dtx</td>
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<td>1994-07-07</td>
<td>ltboxes.dtx v0.1a</td>
<td>@mpfootnotetext: Extra group for color.</td>
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<tr>
<td>1994-07-07</td>
<td>ltboxes.dtx v0.1b</td>
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<td>ltboxes.dtx v0.1c</td>
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</table>
Change History

1994-03-08 ltdirchk.dtx v1.0a
   General: Reorganize driver module into 'new style' .......................... 1

1994-03-08 lplain.dtx v1.0a
   General: Remove need for a driver file. 15

1994-03-10 lfsbas.dtx v2.2f
   \math@egroup: Changed \begingroup/\endgroup to \bgroup/\egroup. .......... 433

1994-03-11 lfscl.dtx v2.1b
   \DeclareSymbolFontAlphabet@: Added check against use of alphabet switch outside of math
type. ........................................ 516
   \SetMathAlphabet@: Changed parameter template in temporary macro to catch check add below. 505

1994-03-12 ltclass.dtx v0.3c
   General: Change name from docclass to ltclass ......................... 822
   \ProvidesFile: Add \wlog .................................. 832
   \ProvidesPackage: Add \wlog ................................ 830
   use \@gtempa .................................. 830

1994-03-12 ldefns.dtx v1.0b
   \@reargdef: New defn, in terms of \@yargdef ............................... 83
   \@yargd@f: Name changed from \XXX@argdef ....................................... 83

1994-03-12 ltdirchk.dtx v1.0b
   General: Change name from dircheck.dtx to ltcheck .................. 1
   Minor edits to the typeouts in ltcheck .................................. 1

1994-03-12 lfloat.dtx v1.0b
   \@savemarbox: (DPC) Extra group for \color .................................. 773
   \@ympar: (DPC) Extra bgroup for \color ................................ 774

1994-03-12 lfpbox.dtx v1.0b
   General: Name changed from lplplain.dtx ............................... The end of an era 15

1994-03-13 lftfilehook.dtx v0.3b
   \unq@efielf@und: Use new cmd \addtofilelist ................................ 885

1994-03-13 lftfile.dtx LaTeX2e
   \listfiles: Reset \addtofilelist
   at begin document ........................................ 353

1994-03-13 lfsbld.dtx v1.4g
   General: Add 2ekernel module to omit repeated code ....................... 410

1994-03-13 lfscl.dtx v2.1c
   General: Add 2ekernel module to omit repeated code ........................ 488

1994-03-14 lbox.dtx v1.0c
   \@xfloat: (DPC) Use \color@begingroup .................................. 765

1994-03-14 lftfile.dtx v1.0c
   \@endfloatbox: (DPC) Use \color@endgroup .................................. 769
   \@footnotetext: (DPC) Use \color@begingroup, add \endgraf ..................... 779
   \@savemarbox: (DPC) Use \color@begingroup .................................. 773
   \@xfloat: (DPC) Use \color@begingroup .................................. 765

1994-03-15 lftfiles.dtx LaTeX2e
   \@missingfileeerror: Quit on x or X just like a real error .................. 350

1994-03-15 lftfntcmd.dtx v3.2a
   General: Adapted to mass formatting ....................................... 570
   Changed /\ to \@italiccorr .................................. 570
   Removed \@renewfontswitch ........................................ 570
   Removed defns of short-forms and all sizes except \normalize ......... 570

1994-03-15 lftoutput.dtx v1.0l
   \@addtocurcol: Changed \addvspace to \vskip .................................. 968, 971
   \@combinedblfloats: Removed boxmaxdepth setting ....................... 959
   \@makecol: \maxdepth changed to \@maxdepth .................................. 950
   Removed boxmaxdepth setting ............................................... 951
   \@makespecialcolbox: Removed boxmaxdepth setting ....................... 952
   \@topnewpage: Corrected and amended warning message .................... 942
   Warning added: it should be improved .................................. 943
Change History

General: Added some warnings when page gets full of top floats. 926
Driver added and further tidying. 926
Removed duplicated code and corrected docstrip options. 926
Some boxmaxdepth settings removed. 926
1994-03-16 ltclass.dtx v0.3f
General: Add pkgindoc package 867
1994-03-16 ltfiles.dtx v1.0c
\verbatim: Move this code directly into \document. 353
1994-03-16 ltfiles.dtx v1.0d
\document: (DPC) directly add file list settings. 336
1994-03-16 ltmiscen.dtx v1.0b
\@verbatim: Remove \global\@inlabelfalse again. 633
1994-03-28 ltalloc.dtx v1.0d
General: Redefinition of ‘new’ allocations removed. 275
1994-03-28 ltdirchk.dtx v1.0d
General: Improve documentation. 1
1994-03-28 lterror.dtx v1.0d
\@invalidchar: (DPC) Comment out (use catcode15 instead) 291
General: Remove test for \inputlineno undefined. 287
1994-03-28 ltfiles.dtx v1.0d
\document: (DPC) Use \normalsize not \@normalsize. 335
\document: (DPC) remove \@normalsize check. 335
\document: (DPC) Use \normalsize not \@normalsize. 763
General: Split further from lthrest.dtx. 760
1994-03-28 lthlists.dtx v1.0b
\@caption: Use \normalsize not \@normalsize. 654
General: Improve documentation. 618
1994-03-28 lthplain.dtx v1.0c
newlanguage: Remove some \outer declarations. 18
1994-03-28 lthsect.dtx v1.0b
General: Split further from lthrest.dtx. 747
1994-03-28 lthtab.dtx v1.0b
General: Improve documentation. 686
1994-03-28 lththm.dtx v1.0a
General: Initial version, split from latex.dtx. 743
1994-03-29 ltcounts.dtx v1.0c
General: Create file from parts of ltmiscen and lthrest. 400
1994-03-29 ltlength.dtx v1.0c
General: Create file ltcntlen from parts of ltmiscen and lthrest. 408
1994-03-29 ltmiscen.dtx v1.0d
General: Remove counter macros to ltcntlen. 611
1994-03-29 lttxref.dtx v1.0c
General: Create file ltcntlen from parts of ltmiscen and lthrest. 612
1994-03-31 ltbibl.dtx v1.0a
General: Initial version of ltidxbib.dtx, split from lthrest.dtx. 786
1994-03-31 ltitxglo.dtx v1.0a
General: Initial version of ltidxbib.dtx, split from lthrest.dtx. 783
1994-04-09 ltcounts.dtx v1.0d
\@newctr: \@nocnterr now has counter name argument. 401
\addtocounter: \@nocnterr now has counter name argument. 401
\setcounter: \@nocnterr now has counter name argument. 401
\stepcounter: Use \addtocounter to have name checked. 402
1994-04-09 lththm.dtx v1.0d
\@othm: Use standard counter error message (FMi). 745
1994-04-11 ltclass.dtx v0.3g
\endfilecontents: Add star form, don't write \endinput at the end of the file. 851
\ProvidesFile: Protect against weird catcodes. 832
1994-04-11 ltcsbas.dtx v2.1h
General: Added \defaultscriptratio and \defaultscriptsctratio. 410
\defaultscriptratio: Macro added 433
\defaultscriptsctratio: Macro added 433
1994-04-12 ltxboxes.dtx v1.0c
General: Remove \acci, now defined in lthplain.dtx. 679
Remove \dischyph, now defined in ltitxglo.dtx. 679
1994-04-12 ltxdefines.dtx v1.0g
\dischyph: Define \dischyph, was previously in ltxboxes.dtx. 105
1994-04-12 ltplain.dtx v1.0d
General: Define \@acci .......................... 34
1994-04-12 livers.dtx v1.0b
General: Have version info generated automatically. ....................... 39
1994-04-14 lftntcmd.dtx v3.2b
General: Macros renamed to non-private forms, JB ......................... 570
\DeclareOldFontCommand: Renamed from \@newfontswitch ..................... 577
1994-04-15 ltfntcmd.dtx v3.2b
\DeclareOldFontCommand: Renamed from \@newfontswitch ..................... 577
1994-04-15 ltboxes.dtx v1.0d
\@isavebox: Added missing percent character. .......................... 675
1994-04-17 ltcounts.dtx v1.0e
\@newctr: Use \@nocnterr instead of \@nocounterr ......................... 401
\addtocounter: Use \@nocnterr instead of \@nocounterr ......................... 401
\setcounter: Use \@nocnterr instead of \@nocounterr ......................... 401
1994-04-17 lterror.dtx v1.0h
\@nocounterr: New name for error message, old error message (without arg) kept. 288
1994-04-17 ltthm.dtx v1.0c
\@othm: Use new std counter error message (FMi). ......................... 745
1994-04-18 ltfinal.dtx v0.1c
General: initialised \textheight, \textwidth and page style ............... 1006
1994-04-18 ltboxes.dtx v1.0d
\@footnotetext: (DPC) Remove Colour support .......................... 779
\@savemarbox: (DPC) Remove Colour support .......................... 773
1994-04-18 lfsbas.dtx v2.1i
General: Macro \no@alphabet@help removed again .......................... 410
\calculate@math@sizes: Changed message to log only ......................... 433
\no@alphabet@error: Use std LaTeX error macro .......................... 410
1994-04-18 lfsdcl.dtx ???
\DeclareMathAlphabet: Pass correct arg (2 not 3) .......................... 503
1994-04-18 lfsdcl.dtx v2.1d
General: Removed surplus \no@alphabet@error (see fam.dtx) ................. 488
1994-04-18 ltfsstr.dtx v2.3d
General: Changed to new error/warning scheme .......................... 458
\font@submax: Changed dimen to macro .......................... 477
\fontsubfuzz: Changed dimen to macro .......................... 477
\sub@size: \font@submax and \fontsubfuzz now macros .......................... 478
1994-04-19 ltboxes.dtx v1.0b
General: improved documentation .................................................. 813
1994-04-20 lftntcmd.dtx v3.3a
General: Documentation up-dated .................................................. 570
\check@nocorr: Macros added .................................................. 574
\maybe@dict: \nocorr etc removed from list of tokens to check, leaving only punctuation characters .................................................. 575
1994-04-20 lfmiscen.dtx v1.0e
\@iiminipage: Extra \\group for color .................................................. 681
\@mpfootnotetext: Extra \\endgraf for color .................................................. 682
\\endminipage: Extra \\egroup for color .................................................. 681
1994-04-21 lfinally.dtx v0.1c
General: Added comments, set the catcodes of 128–255 .......................... 1003
1994-04-22 lffssini.dtx v2.1g
\not@math@alphabet: Message changed again .................................................. 539
1994-04-23 lfinally.dtx v0.1d
General: Check that \font@submax is still zero .................................................. 1003
1994-04-24 ltoutput.dtx v1.0m
\@resethfps: Number 2 changed to \tw@ .................................................. 989
\@specialoutput: Message changed to give more info and ‘top’ removed .................................................. 944
\@topnewpage: Message changed to give more info .................................................. 943
Warning message removed as it will be generated later .................................................. 942
General: Changed \@normalsize to \normalsize .................................................. 926
Corrected unverbed commands in documentation .................................................. 926
Removal of some long lines and other aesthetic changes .................................................. 926
Warning messages changed/corrected .................................................. 926
1994-04-24 ltoutput.dtx v0.1b
General: Removed surplus spaces after \hbox to in several cases .................................................. 711
Change History

1994-04-25 ltclass.dtx v0.3h
General: Removed spurious extra ‘.’s at
the end of error messages . . . . . 822
1994-04-25 ltfloat.dtx v1.0e
\@largefloatcheck: Changed warning
message to give more info . . . . . 769
Command added . . . . . . . . . . . . 769
General: Changed warning messages 760
Removed obsolete tracing code . . 760
1994-04-27 ltfsstrc.dtx v2.3e
General: Corrected item that was
forgotten in last change. . . . . . . 458
1994-04-28 lterror.dtx v1.0j
\@inmatherr: Macro added . . . . . . 290
1994-04-28 lterror.dtx v1.1c
\@inmatherr: Replaced \noexpand
with \protect. . . . . . . . . . . . . . 290
1994-04-28 ltfssdcl.dtx v2.1e
General: Removed all \uppercase in
hex num parsing macros . . . . . . 488
1994-04-28 ltlists.dtx v1.0c
\item: Replaced \@ltxnomath by
\@inmatherr . . . . . . . . . . . . . . . 665
1994-04-28 ltpictur.dtx v0.1c
\@multiput: (DPC) Macro added . . 715
General: bezier curves added . . . . . 738
\multiput: (DPC) Ignore spaces
between )( . . . . . . . . . . . . . . . . 714
\picture: (DPC) Ignore spaces before
( . . . . . . . . . . . . . . . . . . . . . . . 713
1994-04-28 ltplain.dtx v1.0g
General: Turn off overfull box tracing
in log . . . . . . . . . . . . . . . . . . . . . 27
1994-04-29 ltclass.dtx v1.0a
General: Change version number to 1
(no other change) . . . . . . . . . . . 822
1994-04-29 ltmiscen.dtx v1.0f
\@verbatim: \leavevmode added . . 634
Change to \everypar added . . . . 634
1994-04-29 ltoutenc.dtx 1.4a
General: Removed
\EncodingSpecific. Renamed all
the commands. Added
\DeclareTextGlyph and
\UndeclareTextCommand. . . . . . . 358
Removed Rokicki’s OT1 variant
encoding. Moved the driver to the
top. . . . . . . . . . . . . . . . . . . . . . 357
1994-04-30 ltfntcmd.dtx v3.3b
General: Documentation up-dated and
tidied . . . . . . . . . . . . . . . . . . . . 570
Prefix frag@ changed to frag in
\@protecteddef . . . . . . . . . . . . 570
Title changed . . . . . . . . . . . . . . 570

1037

Warning changed to info message in
\@protecteddef . . . . . . . . . . . . 570
1994-04-30 ltoutput.dtx v1.0n
\@activechar@info:
\@activechar@warning changed to
\@activechar@info . . . . . . . . . 953
\@combinedblfloats: Removed rule in
topnewpage case . . . . . . . . . . . . 959
\@emptycol: Empty column action
added: \@emptycol . . . . . . . . . . 941
\@flsetnum: Rogue space removed . 990
\@specialoutput: Cut-off point
changed to 2\baselineskip . . . . 944
Empty column action added:
\@emptycol . . . . . . . . . . . . . . . 944
Extra empty column added for
twocolumn case . . . . . . . . . . . . 944
Extra empty column added for
twocolumn case (wrong, see
below) . . . . . . . . . . . . . . . . . . . 944
\@topnewpage: Added setting of
\col@number . . . . . . . . . . . 941, 942
Cut-off point changed to
3\baselineskip . . . . . . . . . . . . 943
Empty column action added:
\@emptycol . . . . . . . . . . . . . . . 943
Message changed for Frank . . . . . 943
General: \@activechar@warning
changed to an info message. . . . . 926
Added \col@number. . . . . . . . . . 926
Documentation tidied. . . . . . . . . 926
Empty column action added. . . . 926
Fixed bug from \dblfigrule with
\@topnewpage. . . . . . . . . . . . . . 926
Full of floats action improved. . . . 926
\col@number: Added \col@number . 938
\onecolumn: Added setting of
\col@number . . . . . . . . . . . . . . . 940
1994-05-01 lterror.dtx v1.0k
\@latexerr: (CAR) Added draft
\@latexinfo. . . . . . . . . . . . . . . 287
1994-05-01 ltoutenc.dtx 1.4a
General: Added the \a command. . . 366
Added the \SaveAtCatcode and
\RestoreAtCatcode commands. . 370
Removed the uc/lc table settings,
since the T1 uc/lc table is now the
default. . . . . . . . . . . . . . . . . . . 378
Rewrote for the new syntax. . 370, 372
1994-05-01 ltoutenc.dtx v1.4a
General: Removed Rokicki’s
encoding. . . . . . . . . . . . . . . . . . 354
Renamed the commands, removed
the \EncodingSpecific command.


Turned all slots into decimal.

1994-05-02 ltcntrl.dtx v1.0l
\@break@tfor: Macro added (from ltfiles.dtx) 280

1994-05-02 ltdefs.dtx v1.1f
\renewcommand: Removed surplus \space in error 84
\renewenvironment: Removed surplus \space in error 85

1994-05-02 ltfiles.dtx v1.0f
@ifileonpath: \@break@loop renamed to \@break@tfor 348
@obsoletefile: Make \@onlypreamble 352

1994-05-02 ltfinal.dtx v0.1e
General: Added setting the ‘letter’ catcodes 1015
Added setting the ‘other’ catcodes 1015
Added setting the special catcodes 1015
Set all the catcodes 1003

1994-05-02 ltfinal.dtx v0.1f
General: Set the catcode of control-J to be ‘other’, for use in messages. 1003

1994-05-02 ltmiscen.dtx v1.0g
General: Changed 91 to 1991 and moved some bits 618

1994-05-02 ltoutput.dtx v1.0o
\@resethfps: Code shortened 989
General: Code of \@resethfps shortened. 926

1994-05-03 lbibl.dtx v1.0b
\nocite: Make \nocite issue a warning for an undefined citation key. 789

1994-05-03 ltfinal.dtx v0.1f
General: Set the catcode of control-J to be ‘other’, for use in messages. 1003

1994-05-03 ltfloat.dtx v1.0f
General: (CAR) Added \@largefloatcheck 760
Removed unnecessary braces from arguments of \@ifnextchar 760
\end@dbfloat: \@largefloatcheck added 768
\end@iffloat: (CAR) Added \@largefloatcheck 767

1994-05-03 ltfssdcl.dtx v2.1f
General: Renamed \@@DeclareMathDelimiter to \DeclareMathDelimiter 488
\makeatother: Added \makeatletter
and \makeatletter ASAJ. ........ 105
1994-05-10 ltaccess.dtx v1.0n
\@latexerr: (ASAJ) Added extra
blank lines to \@latexerr ........ 287
1994-05-10 ltmiscen.dtx v1.0j
\@verb: Slight change in error
message text. .................... 636
1994-05-11 ltermisc.dtx v1.0f
\begin{tempboxa}: Use new
\color@setgroup concept. ........ 672
\@iiiminipage: Use new
\color@setgroup concept. ........ 681
\@mpfootnotetext: Use new
\color@setgroup concept. ........ 682
Use new \normalcolor and
\@finalstrut. ...................... 682
General: Superfluous braces removed
from several commands ............ 671
\color@setgroup: macro added for
color support ........................ 674
\endminipage: Use new
\color@setgroup concept. ........ 681
1994-05-11 ltboxes.dtx v1.0g
\@finalstrut: macro added ....... 685
\fbox: New definition, merged with
\framebox .......................... 676
\framebox: Merged \fbox and
\framebox ............................ 677
\normalcolor: macro added for color
support .............................. 674
1994-05-11 ltdasts.dtx v1.0p
General: (ASAJ) Fixed a bug with
\relax which was using \@gobble
before defining it. ................. 78
Fixed a bug with \relax which
was using \@gobble before defining
it ................................... 87
1994-05-12 ltfsbas.dtx v2.1j
General: New baselinestretch concept 410
Replaced hand-protected commands
by \DeclareRobustCommand 410
\f@linespread: New macro ........ 420
\fontencoding: Use
\DeclareRobustCommand ............ 418
\fontfamily: Use
\DeclareRobustCommand ............. 419
\fontseries: Use
\DeclareRobustCommand ............. 419
\fontshape: Use
\DeclareRobustCommand .............. 419
\fontsize: Redefined to use
\set@fontsize ........................ 420
\linespread: New macro ............ 420
\mathversion: Use
\DeclareRobustCommand ............. 421
1994-05-12 ltfslsdcl.dtx v2.1g
General: Allow \relax as undefined
command .............................. 488
Allow \texttt{\relax}ed cmds to be
declared ............................. 488
1994-05-12 ltfslni.dtx v2.1l
General: Moved \fontencoding to
\fam.dtx ............................. 518
Moved \fontfamily to \fam.dtx 518
Moved \fontseries to \fam.dtx 518
Moved \fontshape to \fam.dtx 518
Moved \fontsize to \fam.dtx 518
Moved \mathversion to \fam.dtx 518
Moved \selectfont to tracefnt.dtx 518

General: Made T1 and OT1 generate
packages rather than def files.
Renamed the ‘package’ module to
‘teststy’ ................................ 357
1994-05-11 loutenc.dtx v1.5a
\@filescontent: Add checks for
form feed and tab .................. 851
1994-05-11 ltermi.dtx v1.0e
General: Add \ProvidesFile as used
in \fd files. .......................... 4
1994-05-11 ltaccess.dtx v1.0g
\@latexerr: (ASAJ) Removed one of
the extra blank lines to
\@latexerr ........................... 287
1994-05-11 lttdefn.dtx v1.0o
\LaTeX: Use
\DeclareRobustCommand ........................ ASAJ. ............ 331
\LaTeX: Use
\DeclareRobustCommand ........................ ASAJ. ............ 331
1994-05-11 ltains.dtx v1.5a
General: Made T1 and OT1 generate
packages rather than def files.
Renamed the ‘package’ module to
‘teststy’ ................................ 357
1994-05-11 loutenc.dtx v1.5a
General: Reimplemented
\DeclareTextCommand using
\changed6cmd and
\DeclareProtectedCommand ........................ ... 358
Renamed the commands again.
Made the encoding part of the
command syntax. Added the
\DeclareTextCommand interface.
Change History

1994-05-12 ltfsstrc.dtx v2.3f
\selectfont
1994-05-12 loutenc.dtx 1.5a
General: Removed the \SaveAtCatcode and \RestoreAtCatcode commands. 370
Rewrote for the new syntax. 370, 372
1994-05-12 loutput.dtx v1.0p
\writesetup: \normalcolor added 953
General: added in various places (DPC). 926
1994-05-13 ltboxes.dtx v1.0h
\@arrayparboxrestore: New accent system, use \let not \def 680
1994-05-13 lcounts.dtx v1.0f
\@Ialph: Removed \@ialph. 405
1994-05-13 ltdefns.dtx v1.0q
General: (ASAJ) Renamed \DeclareProtectedCommand to \DeclareRobustCommand.
Removed \@if@short@command. 78
(ASAJ) Replaces \space by ' ' in \csname. 78
Renamed \DeclareProtectedCommand to \DeclareRobustCommand.
Removed \@if@short@command. 87
Moved to after the definition of \@gobble. 87
1994-05-13 ltdefs.dtx v1.0r
General: (ASAJ) Added logging message to \DeclareProtectedCommand. 78
Added logging message to \DeclareProtectedCommand. 87
1994-05-13 ltdefs.dtx v1.0s
General: (ASAJ) Added \backslash#char. 78
(ASAJ) Coded \@ifdefinable more efficiently. 78
Coded more efficiently, thanks to FMi. 84
1994-05-13 lfiles.dtx LaTeX2e
\listfiles: Stop \listfiles being run twice. 352
1994-05-13 lfiles.dtx v1.0g
\document: Added execution of \every@size. 335
1994-05-13 lfinal.dtx v0.1h
General: Added package ot1enc, and defined \@acci, \@accii and \@acciii. 1003
1994-05-13 lftfinal.dtx v1.0h
General: Added output enc stuff. 1017
1994-05-13 lftfloat.dtx v1.0g
\footnotetext: (DPC) Add new style colour support: \normalcolor. 779
(DPC) Use \@finalstrut. 779
\@xfloat: (DPC) Use \normalcolor 765
1994-05-13 lftfntcmd.dtx v3.3g
General: Replaced \@protecteddef by \DeclareRobustCommand 570
1994-05-13 lftssbas.dtx v2.1k
General: Remove File identification 'typeout' 410
1994-05-13 lftssbas.dtx v2.1l
\DeclareFontEncoding: Init encoding change command 414
\define@newfont: Use \@input@ for fd files 424
1994-05-13 lftssdcl.dtx v2.1h
General: Removed file identification typeout 488
1994-05-13 lftssini.dtx v2.1j
General: Removed file identification typeout 518
1994-05-13 lftssstrc.dtx v2.3g
General: Removed typeouts as \ProvidesPackage writes to log. 458
1994-05-13 ltpictur.dtx v0.1d
General: Removed surplus braces from \@if.. constructions 711
1994-05-14 fontdef.dtx v2.1f
\contfield: Colour support 692
\startfield: Colour support 692
\stopfield: Colour support 692
\@: moved to loutenc 690
1994-05-14 fontdef.dtx v2.1f
\contfield: Colour support 692
\startfield: Colour support 692
\stopfield: Colour support 692
\@: moved to loutenc 690
1994-05-14 fontdef.dtx v2.1f
General: Removed .def files. 548
1994-05-14 lftssbas.dtx v2.1m
\enc@update: Macro added 419
1994-05-14 lftssbas.dtx v2.1n
General: Set defaults for all \f@... 420
\DeclareErrorFont: Don't set \f@encoding 427
\DeclareFontEncoding: Log if encoding is redeclared 414
Only init enc change cmd when new encoding 414
1994-05-14 ltfsini.dtx v2.1k
General: Init error font just before checking for fontdef.cfg . . . . . 543
\reset@font: Remove surplus braces 541
1994-05-14 ltfsstrc.dtx v2.3h
\selectfont: Added \enc@update . 464
1994-05-14 ltoutenc.dtx 1.5d
General: Moved the driver to the top. 357
1994-05-14 ltoutenc.dtx v1.5c
General: Added the fontenc package. . . . . 357
Moved fontsmpl to its own dtx file. 354
1994-05-14 ltoutenc.dtx v1.5d
General: Rewrote \DeclareTextCommand to define its argument to use the current encoding by default, rather than the encoding provided to \DeclareTextCommand. . . . 354, 358
Tidied up the documentation. . . . . 354
1994-05-14 ltoutenc.dtx v1.5e
General: Replaced \ENC@cmd by \ENC-cmd . . . . . . . . . . . . . . . . . . 354
1994-05-16 ltfssbas.dtx v2.1o
General: encoding cmds changed to enc-cmd . . . . . . . . . . . . . . . . . . 410
1994-05-16 fontdef.dtx v2.1g
General: Removed \DeclareFontEncoding for ot1 and t1 and input .def files instead . . . 548
1994-05-16 ltalloc.dtx v1.1a
General: (ASAJ) Split from ltinit.dtx. 275
1994-05-16 lctntrl.dtx v1.0a
General: (ASAJ) Split from ltinit.dtx. 277
1994-05-16 ldfuns.dtx v1.1a
General: (ASAJ) Split from ltinit.dtx. 78
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1994-11-26 ltfloat.dtx v1.1b
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\listfiles: Use \@dofilelist
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1994-11-28 ltcntrl.dtx v1.0c
General: Documentation improvements

1994-11-30 ltfiles.dtx v1.0o
\@dofilelist: Macro added
\listfiles: Use \@dofilelist
\nofiles: There is no \@gobblethree...

1994-11-30 ltfssbas.dtx v2.1y
\fontshape: Use \@current@cmd in \@@enc@update. ASAJ

1994-11-30 ltmath.dtx 1.0q
General: ASAJ: \DeclareMathOperator moved to AMS\TeX.

1994-11-30 ltmiscen.dtx v1.0w
\enddocument@kernel@warnings: (DPC) Do warnings even for \nofiles
\enddocument: (DPC) Use \@dofilelist

1994-11-30 ltoutenc.dtx v1.0w
\enddocument@kernel@warnings: (DPC) Do warnings even for \nofiles
\enddocument: (DPC) Use \@dofilelist

1994-11-30 ltoutenc.dtx 1.7b
General: Redefined \a properly.

1994-12-01 ltfinal.dtx v1.0p
General: Renamed lthyphen.* to hyphen.*

1994-12-01 lthyphen.dtx v1.0g
General: Rename lthyphen.ltx/cfg to hyphen.ltx/cfg

1994-12-01 ltplain.dtx v1.1g
General: (DPC) More doc changes.

1994-12-02 fontdef.dtx v2.2i
General: Commented out \ldots. ASAJ

1994-12-02 ltfssini.dtx v2.2c
\copyright: \copyright is now in ltoutenc. ASAJ

1994-12-02 ltlists.dtx v1.0e
\@trivlist: RmS: Added check for looping

1994-12-02 ltoutenc.dtx 1.7b
General: Redefined \a properly.

1994-12-02 ltoutenc.dtx v1.7b
General: Fixed a bug with \a.

1994-12-04 lthyphen.dtx v1.0h
General: Documentation edits for /1989

1994-12-05 ltoutenc.dtx v1.7c
General: Added \textcircled
\null and \sh@ft to \b and \d.

1994-12-08 lttab.dtx v1.0k
\@array: Add \tabularnewline
\tabularnewline: (DPC) Made it \relax

1994-12-09 ltbibl.dtx v1.1d
\bibliographystyle: (DPC) Allow use in preamble.

1994-12-10 ltfloat.dtx v1.1g
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<td>ltoutput.ax.dtx v1.1w</td>
<td>@writeisetup: Added @parboxrestore and made consequent deletions: wait for the howls of protest</td>
</tr>
<tr>
<td>1996-09-29</td>
<td>ltsect.ax.dtx 1.0w</td>
<td>@item: @nobreak... moved into the \everypar and not executed unconditionally, see above \kern... changed to \setbox... Added setting of \clubpenalty and set \nobreakfalse only when necessary</td>
</tr>
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<td>1996-10-04</td>
<td>ltcass.ax.dtx v1.0v</td>
<td>\RequirePackageWithOptions: Reset \unprocessedoptions for /2269 839</td>
</tr>
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<td>1996-10-05</td>
<td>ltfiles.dtx v1.1h</td>
<td>@clubpenaltytrue: Added documentation</td>
</tr>
<tr>
<td>1996-10-08</td>
<td>lftntcmd.ax.dtx v3.3u</td>
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</tr>
<tr>
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<td>lttab.ax.dtx v1.1i</td>
<td>@array: Use \settypeofset\protect 699 General: Moved the code associated with @mkpream into the group provided by the box, for robustness (latex/2183) \multicolumn: Make \multicolumn long (latex/2180) \tabbing: Moved the \everypar so that the \everypar can remove it when necessary; this is needed because the code for items in lists has changed (see pr/22111)</td>
</tr>
<tr>
<td>1996-10-25</td>
<td>ltxberax.dtx v1.0m</td>
<td>@item: @nobreak... moved into the \everypar and not executed unconditionally, see above \kern... changed to \setbox... Added setting of \clubpenalty and set \nobreakfalse only when necessary</td>
</tr>
<tr>
<td>1996-10-24</td>
<td>ltfloatax.dtx v1.1p</td>
<td>@floatboxreset: Added local settings of flags: dangerous! @xfloat: Added @nodocument to trap floats in the preamble @xsect: Replaced \hskip... with \setbox... as used in @afterheading @xsect: Replaced \hskip... with \setbox... as used in @afterheading</td>
</tr>
<tr>
<td>1996-10-24</td>
<td>ltboxes.ax.dtx v1.1a</td>
<td>@arrayparboxrestore: Added local settings of flags: dangerous! @liiminipage: Use it or lose it (@setminpage): dangerous!</td>
</tr>
<tr>
<td>1996-10-24</td>
<td>ltoutput.ax.dtx v1.1z</td>
<td>@arrayparboxrestore: Added local settings of flags: dangerous! @liiminipage: Use it or lose it (@setminpage): Frank will want to lose it</td>
</tr>
<tr>
<td>1996-10-24</td>
<td>lttab.ax.dtx v1.1l</td>
<td>@addtocurcol: Added \nodocument, etc as appropriate \特种output: Added @nobreak as appropriate @topnewpage: Added @nodocument to trap floats in the preamble @newpage: Better checks for noskipsec and inlabel added, plus nobreak</td>
</tr>
<tr>
<td>1996-10-25</td>
<td>lttabsax.dtx v1.0n</td>
<td>@addtocurcol: Added \nodocument, etc as appropriate @specialoutput: Added @nobreak as appropriate @topnewpage: Added @nodocument to trap \twocolumn in the preamble @newpage: Better checks for noskipsec and inlabel added, plus nobreak</td>
</tr>
<tr>
<td>1996-10-25</td>
<td>ltoutput.ax.dtx v1.2a</td>
<td>@newpage: Reset all flags explicitly</td>
</tr>
<tr>
<td>1996-10-25</td>
<td>lttab.ax.dtx v1.1a</td>
<td>@array: Use \settypeofset\protect 699 General: Moved the code associated with @mkpream into the group provided by the box, for robustness (latex/2183) \multicolumn: Make \multicolumn long (latex/2180) \tabbing: Moved the \everypar so that the \everypar can remove it when necessary; this is needed because the code for items in lists has changed (see pr/22111)</td>
</tr>
<tr>
<td>1996-10-23</td>
<td>lttab.ax.dtx v1.1l</td>
<td>@array: Use \settypeofset\protect 699 General: Moved the code associated with @mkpream into the group provided by the box, for robustness (latex/2183) \multicolumn: Make \multicolumn long (latex/2180) \tabbing: Moved the \everypar so that the \everypar can remove it when necessary; this is needed because the code for items in lists has changed (see pr/22111)</td>
</tr>
<tr>
<td>1996-10-23</td>
<td>lttab.ax.dtx v1.1l</td>
<td>@array: Use \settypeofset\protect 699 General: Moved the code associated with @mkpream into the group provided by the box, for robustness (latex/2183) \multicolumn: Make \multicolumn long (latex/2180) \tabbing: Moved the \everypar so that the \everypar can remove it when necessary; this is needed because the code for items in lists has changed (see pr/22111)</td>
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f=1tdefns.dtx, g=1tcmd.dtx, h=1tbooks.dtx, i=1tcmhooks.dtx, j=1talloc.dtx, k=1tctrl1.dtx,
l=1terror.dtx, m=1tpar.dtx, n=1tpara.dtx, o=1tmeta.dtx, p=1tspacex.dtx, q=1tllogos.dtx,
r=1tfil.dat, s=1touenc.dtx, t=1tcounts.dtx, u=1tlength.dtx, v=1tfssbas.dtx,
w=1tffasaxes.dtx, x=1tfasstrc.dtx, y=1tffascmpl.dtx, z=1tfasdecl.dtx, A=1tffasini.dtx,
B=1textcomp.dtx, C=1tfrak.dtx, D=1tfrakgen.dtx, E=1tfrakgen.dtx, F=1tfrakgen.dtx,
G=1txref.dtx, H=1tinsen.dtx, I=1text.dtx, J=1tlists.dtx, K=1tboxes.dtx, L=1ttab.dat,
M=1tpictur.dtx, N=1thm.dtx, O=1sect.dtx, P=1float.dtx, Q=1tlendifx.dtx, R=1tbiib.dtx,
S=1tmarks.dtx, T=1page.dtx, U=1ctclass.dtx, V=1tkeys.dtx, W=1tfilehook.dtx,
X=1tshipout.dtx, Y=1toutput.dtx, Z=1thyphen.dtx, aa=1tfinal.dtx