The atveryend package

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Abstract

This LaTeX package provides two hooks for `\end{document}` that are executed after the hook of `\AtEndDocument`. `\AfterLastShipout` can be used for code that is to be executed right after the last `\clearpage` before the `.aux` file is closed. `\AtVeryEndDocument` is used for code after closing and final reading of the `.aux` file.

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*Please report any issues at https://github.com/ho-tex/oberdiek/issues

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1 Documentation

There are packages (e.g. hyperref [4], lastpage [6]) that want to call code after the typesetting is done, for example to remember the last page number. LaTeX provides the hook `\AtEndDocument` (clsguide [1]). There are packages that use this hook to do their job for typesetting pages (e.g. endfloat emits the floats here [2]). Also a user might provide additional code in `\AtEndDocument`. Therefore packages have to call `\clearpage` in `\AtEndDocument` to get after the last shipout page. But this is not too reliable, because the right timing is important between packages that want or have to do things before the last page is output and packages that only work properly if they can reach the point after the last shipout.

Therefore the task of this package is to provide additional hooks for `\end{document}`. All hooks are called after the hook of `\AtEndDocument`.

`\BeforeClearDocument` {⟨*code*⟩}

The code is called before the final `\clearpage` in `\enddocument`. However it is unknown, whether the last page is already shipped out or if this will be triggered by the final `\clearpage`.

`\AfterLastShipout` {⟨*code*⟩}

The code is called after the final `\clearpage` of `\enddocument` before the main `.aux` file is closed. This is the right place to remember the last page in the `.aux` file, for instance.

`\AtVeryEndDocument` {⟨*code*⟩}

The code is called after the `.aux` file is closed and read in again. It is the place for final checks, rerun hints, final messages.

`\AtEndAfterFileList` {⟨*code*⟩}

After the `.aux` file closing and reading LaTeX prints the file list if requested by `\listfiles`. Then this hook is executed.

`\AtVeryVeryEnd` {⟨*code*⟩}

This code is called right before the final `\@@end`.

1.1 Related work

Package scrfile: Markus Kohm has written package scrlfile (part of KOMA-Script [5]) that provides hooks `\BeforeClosingMainAux` and after `\AfterReadingMainAux`. They have the same function as the hooks of this package. In fact this package uses them, if they are available.

Class revtex4-1: This class calls `\clear@document` in `\enddocument` that wraps the final call of `\clearpage`. Thus it can be used as hook to call stuff after that `\clearpage`. This is also done by this package.

Package etoolbox: It provides `\AfterEndDocument`, a hook right before `\deadcycles` or `\@@end` [3].

This package tries to combine as many approaches as possible:

- It looks for a known `\enddocument` and redefines it.
- Hooks that are provided by others are used (package scrlfile or class revtex4-1.
- It redefines `\@checkend` and `\@dofilelist` to insert the hooks similar to package scrlfile.
- The hook execution is wrapped in a macro that is redefined by its first call to prevent calling the hook more than once.

2 Implementation

```
1  ⟨*package⟩
2  \begingroup\catcode61\catcode48\catcode32=10\relax%
3    \catcode13=5 % ^^M
4    \endlinechar=13 %
5    \catcode123=1 % {
6    \catcode125=2 % }
7    \catcode64=11 % @
8    \def\x{\endgroup
9      \expandafter\edef\csname AtVeryEnd@AtEnd\endcsname{%
10       \endlinechar=\the\endlinechar\relax
11       \catcode13=\the\catcode13\relax
12       \catcode32=\the\catcode32\relax
13       \catcode35=\the\catcode35\relax
14       \catcode61=\the\catcode61\relax
15       \catcode64=\the\catcode64\relax
16       \catcode123=\the\catcode123\relax
17       \catcode125=\the\catcode125\relax
18     }%
19   }%
```

```
\x\catcode61\catcode48\catcode32=10\relax%
\catcode13=5 % ^^M
\endlinechar=13 %
\catcode35=6 % #
\catcode64=11 % @
\catcode123=1 % {
\catcode125=2 % }
\def\TMP@EnsureCode#1#2{%
  \edef\AtVeryEnd@AtEnd{%
    \AtVeryEnd@AtEnd
    \catcode#1=\the\catcode#1\relax
  }%
  \catcode#1=#2\relax
}
\TMP@EnsureCode{9}{10}% (tab)
\TMP@EnsureCode{39}{12}% '
\TMP@EnsureCode{40}{12}% (
\TMP@EnsureCode{41}{12}% )
\TMP@EnsureCode{42}{12}% *
\TMP@EnsureCode{45}{12}% -
\TMP@EnsureCode{46}{12}% .
\TMP@EnsureCode{47}{12}% /
\TMP@EnsureCode{62}{12}% >
\TMP@EnsureCode{91}{12}% [
\TMP@EnsureCode{93}{12}% ]
\TMP@EnsureCode{96}{12}% `
\edef\AtVeryEnd@AtEnd{\AtVeryEnd@AtEnd\noexpand\endinput}
```

Package identification.

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{atveryend}%
  [2016/05/16 v1.9 Hooks at the very end of document (HO)]
```

2.1 Tools

\AtVeryEnd@ifundefined

```
\def\AtVeryEnd@ifundefined#1{%
  \begingroup\expandafter\expandafter\expandafter\endgroup
  \expandafter\ifx\csname #1\endcsname\relax
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi
}
```

2.2 Hooks

VeryEnd@BeforeClearDocumentHook

```
\let\AtVeryEnd@BeforeClearDocumentHook\@empty
```

\AtVeryEnd@AfterLastShipoutHook

```
\let\AtVeryEnd@AfterLastShipoutHook\@empty
```

tVeryEnd@AtVeryEndDocumentHook

```
\let\AtVeryEnd@AtVeryEndDocumentHook\@empty
```

tVeryEnd@AtEndAfterFileListHook

```
\let\AtVeryEnd@AtEndAfterFileListHook\@empty
```

```
\AtVeryEnd@AtVeryVeryEndHook
                                62 \let\AtVeryEnd@AtVeryVeryEndHook\@empty
        \BeforeClearDocument
                                63 \newcommand*{\BeforeClearDocument}{%
                                64   \g@addto@macro\AtVeryEnd@BeforeClearDocumentHook
                                65 }
          \AfterLastShipout
                                66 \newcommand*{\AfterLastShipout}{%
                                67   \g@addto@macro\AtVeryEnd@AfterLastShipoutHook
                                68 }
         \AtVeryEndDocument
                                69 \newcommand*{\AtVeryEndDocument}{%
                                70   \g@addto@macro\AtVeryEnd@AtVeryEndDocumentHook
                                71 }
        \AtEndAfterFileList
                                72 \newcommand*{\AtEndAfterFileList}{%
                                73   \g@addto@macro\AtVeryEnd@AtEndAfterFileListHook
                                74 }
            \AtVeryVeryEnd
                                75 \newcommand*{\AtVeryVeryEnd}{%
                                76   \g@addto@macro\AtVeryEnd@AtVeryVeryEndHook
                                77 }
   \Call@BeforeClearDocument
                                78 \newcommand*{\Call@BeforeClearDocument}{%
                                79   \let\BeforeClearDocument\@firstofone
                                80   \ifx\AtVeryEnd@BeforeClearDocumentHook\@empty
                                81     \PackageInfo{atveryend}{Empty hook `BeforeClearDocument'}%
                                82   \else
                                83     \PackageInfo{atveryend}{Executing hook `BeforeClearDocument'}%
                                84     \AtVeryEnd@BeforeClearDocumentHook
                                85   \fi
                                86   \global\let\AtVeryEnd@BeforeClearDocumentHook\@undefined
                                87   \global\let\Call@BeforeClearDocument\relax
                                88 }
     \Call@AfterLastShipout
                                89 \newcommand*{\Call@AfterLastShipout}{%
                                90   \let\AfterLastShipout\@firstofone
                                91   \ifx\AtVeryEnd@AfterLastShipoutHook\@empty
                                92     \PackageInfo{atveryend}{Empty hook `AfterLastShipout'}%
                                93   \else
                                94     \PackageInfo{atveryend}{Executing hook `AfterLastShipout'}%
                                95     \AtVeryEnd@AfterLastShipoutHook
                                96   \fi
                                97   \global\let\AtVeryEnd@AfterLastShipoutHook\@undefined
                                98   \global\let\Call@AfterLastShipout\relax
                                99 }
    \Call@AtVeryEndDocument
                               100 \newcommand*{\Call@AtVeryEndDocument}{%
                               101   \let\AtVeryEndDocument\@firstofone
```

```
  \ifx\AtVeryEnd@AtVeryEndDocumentHook\@empty
    \PackageInfo{atveryend}{Empty hook ‘AtVeryEndDocument’}%
  \else
    \PackageInfo{atveryend}{Executing hook ‘AtVeryEndDocument’}%
    \AtVeryEnd@AtVeryEndDocumentHook
  \fi
  \global\let\AtVeryEnd@AtVeryEndDocumentHook\@undefined
  \global\let\Call@AtVeryEndDocument\relax
}
```

`\Call@AtEndAfterFileList`

```
\newcommand*{\Call@AtEndAfterFileList}{%
  \Call@AtVeryEndDocument
  \let\AtEndAfterFileList\@firstofone
  \ifx\AtVeryEnd@AtEndAfterFileListHook\@empty
    \PackageInfo{atveryend}{Empty hook ‘AtEndAfterFileList’}%
  \else
    \PackageInfo{atveryend}{Executing hook ‘AtEndAfterFileList’}%
    \AtVeryEnd@AtEndAfterFileListHook
  \fi
  \global\let\AtVeryEnd@AtEndAfterFileListHook\@undefined
  \global\let\Call@AtEndAfterFileList\relax
}
```

`\Call@AtVeryVeryEnd`

```
\newcommand*{\Call@AtVeryVeryEnd}{%
  \Call@AtEndAfterFileList
  \let\AtVeryVeryEnd\@firstofone
  \ifx\AtVeryEnd@AtVeryVeryEndHook\@empty
    \PackageInfo{atveryend}{Empty hook ‘AtVeryVeryEnd’}%
  \else
    \PackageInfo{atveryend}{Executing hook ‘AtVeryVeryEnd’}%
    \AtVeryEnd@AtVeryVeryEndHook
  \fi
  \global\let\AtVeryEnd@AtVeryVeryEndHook\@undefined
  \global\let\Call@AtVeryVeryEnd\relax
}
```

2.3 Redefining `\enddocument`

This approach looks for known versions of `\enddocument` and redefines it. Class seminar and package slidesec are not checked, because there would be too much combinations to check.

2.3.1 LaTeX kernel

`\AtVeryEnd@test@standard`

```
\def\AtVeryEnd@test@standard{%
  \let\AtEndDocument\@firstofone
  \@enddocumenthook
  \@checkend{document}%
  \clearpage
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \let\@setckpt\@gobbletwo
      \let\@newl@bel\@testdef
```

```
      \@tempswafalse
      \makeatletter
      \input\jobname.aux %
    \fi
    \@dofilelist
    \ifdim \font@submax >\fontsubfuzz\relax
      \@font@warning{Size substitutions with differences\MessageBreak
                  up to \font@submax\space have occurred.\@gobbletwo}%
    \fi
    \@defaultsubs
    \@refundefined
    \if@filesw
      \ifx \@multiplelabels \relax
        \if@tempswa
          \@latex@warning@no@line{Label(s) may have changed. %
              Rerun to get cross-references right}%
        \fi
      \else
        \@multiplelabels
      \fi
    \fi
  \endgroup
  \deadcycles\z@
  \@@end
}
```

\AtVeryEnd@enddocument@standard

```
\def\AtVeryEnd@enddocument@standard{%
  \let\AtEndDocument\@firstofone
  \@enddocumenthook
  \@checkend{document}%
  \Call@BeforeClearDocument
  \clearpage
  \Call@AfterLastShipout
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \let\@setckpt\@gobbletwo
      \let\@newl@bel\@testdef
      \@tempswafalse
      \makeatletter
      \input\jobname.aux %
    \fi
    \Call@AtVeryEndDocument
    \@dofilelist
    \Call@AtEndAfterFileList
    \ifdim \font@submax >\fontsubfuzz\relax
      \@font@warning{Size substitutions with differences\MessageBreak
                  up to \font@submax\space have occurred.\@gobbletwo}%
    \fi
    \@defaultsubs
    \@refundefined
    \if@filesw
      \ifx \@multiplelabels \relax
        \if@tempswa
          \@latex@warning@no@line{Label(s) may have changed. %
              Rerun to get cross-references right}%
        \fi
```

```
      \else
        \@multiplelabels
      \fi
    \fi
  \endgroup
  \deadcycles\z@
  \Call@AtVeryVeryEnd
  \@@end
}
```

2.3.2 LaTeX kernel 2011/06/27

The LaTeX 2_ε release 2011/06/27 has changed `\enddocument` (`\input` is replaced by `\@@input`).

tVeryEnd@test@standard20110627

```
\expandafter\def\csname AtVeryEnd@test@standard20110627\endcsname{%
  \let\AtEndDocument\@firstofone
  \@enddocumenthook
  \@checkend{document}%
  \clearpage
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \let\@setckpt\@gobbletwo
      \let\@newl@bel\@testdef
      \@tempswafalse
      \makeatletter
      \@@input\jobname.aux %
    \fi
    \@dofilelist
    \ifdim \font@submax >\fontsubfuzz\relax
      \@font@warning{Size substitutions with differences\MessageBreak
                  up to \font@submax\space have occurred.\@gobbletwo}%
    \fi
    \@defaultsubs
    \@refundefined
    \if@filesw
      \ifx \@multiplelabels \relax
        \if@tempswa
          \@latex@warning@no@line{Label(s) may have changed. %
              Rerun to get cross-references right}%
        \fi
      \else
        \@multiplelabels
      \fi
    \fi
  \endgroup
  \deadcycles\z@
  \@@end
}
```

nd@enddocument@standard20110627

```
\expandafter\def\csname AtVeryEnd@enddocument@standard20110627\endcsname{%
  \let\AtEndDocument\@firstofone
  \@enddocumenthook
  \@checkend{document}%
  \Call@BeforeClearDocument
```

```
  \clearpage
  \Call@AfterLastShipout
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \let\@setckpt\@gobbletwo
      \let\@newl@bel\@testdef
      \@tempswafalse
      \makeatletter
      \@@input\jobname.aux %
    \fi
    \Call@AtVeryEndDocument
    \@dofilelist
    \Call@AtEndAfterFileList
    \ifdim \font@submax >\fontsubfuzz\relax
      \@font@warning{Size substitutions with differences\MessageBreak
                  up to \font@submax\space have occurred.\@gobbletwo}%
    \fi
    \@defaultsubs
    \@refundefined
    \if@filesw
      \ifx \@multiplelabels \relax
        \if@tempswa
          \@latex@warning@no@line{Label(s) may have changed. %
              Rerun to get cross-references right}%
        \fi
      \else
        \@multiplelabels
      \fi
    \fi
  \endgroup
  \deadcycles\z@
  \Call@AtVeryVeryEnd
  \@@end
}
```

2.3.3 Package **booklet**, file **2up.tex**

\AtVeryEnd@test@booklet

```
\expandafter\def\expandafter\AtVeryEnd@test@booklet\expandafter{%
  \expandafter\twoupclearpage
  \AtVeryEnd@test@standard
}
```

\AtVeryEnd@enddocument@booklet

```
\expandafter\def\expandafter\AtVeryEnd@enddocument@booklet\expandafter{%
  \expandafter\twoclearpage
  \AtVeryEnd@enddocument@standard
}
```

2.3.4 Class **dinbrief**

\AtVeryEnd@test@dinbrief

```
\def\AtVeryEnd@test@dinbrief{%
  \@checkend{document} %
  \newpage
  \begingroup
    \if@filesw
```

```
      \ifnum\c@labelgen>0 %
        \immediate\closeout\@mainlbl
        \makeatletter
        \input \jobname@lbl\relax
        \clearpage
      \fi
      \immediate\closeout\@mainaux
    \fi
  \endgroup
  \deadcycles\z@
  \@@end
}
```

\AtVeryEnd@enddocument@dinbrief

```
\def\AtVeryEnd@enddocument@dinbrief{%
  \@checkend{document}%
  \Call@BeforeClearDocument
  \newpage
  \Call@AfterLastShipout
  \begingroup
    \if@filesw
      \ifnum\c@labelgen>\z@
        \immediate\closeout\@mainlbl
        \makeatletter
        \input \jobname@lbl\relax
        \clearpage
      \fi
      \immediate\closeout\@mainaux
    \fi
    \Call@AtVeryEndDocument
    \csname @dofilelist\endcsname
    \Call@AtEndAfterFileList
  \endgroup
  \deadcycles\z@
  \Call@AtVeryVeryEnd
  \@@end
}
```

2.3.5 Class combine

\AtVeryEnd@test@combine

```
\def\AtVeryEnd@test@combine{%
  \@enddocumenthook
  \@checkend{document}%
  \clearpage
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \immediate\closeout\@partaux
      \let\@setckpt\@gobbletwo
      \let\@newl@bel\@testdef
      \@tempswafalse
      \makeatletter \input\c@lmainauxfile  %% change here
    \fi
    \c@lenddoca                            %% a replacement
    \@refundefined
  \endgroup
  \deadcycles\z@
```

```
  \@@end
}
```

\AtVeryEnd@enddocument@combine

```
\def\AtVeryEnd@enddocument@combine{%
  \@enddocumenthook
  \@checkend{document}%
  \Call@BeforeClearDocument
  \clearpage
  \Call@AfterLastShipout
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \immediate\closeout\@partaux
      \let\@setckpt\@gobbletwo
      \let\@newl@bel\@testdef
      \@tempswafalse
      \makeatletter \input\c@lmainauxfile  %% change here
    \fi
    \Call@AtVeryEndDocument
    \c@lenddoca                            %% a replacement
    \@refundefined
  \endgroup
  \deadcycles\z@
  \Call@AtVeryVeryEnd
  \@@end
}
```

\AtVeryEnd@test@c@lenddoca

```
\long\def\AtVeryEnd@test@c@lenddoca{%
  \@dofilelist
  \ifdim\font@submax>\fontsubfuzz\relax
    \@font@warning{%
      Size substitutions with differences\MessageBreak
      up to \font@submax\space have occured.\@gobbletwo
    }%
  \fi
  \@defaultsubs
  \if@filesw
    \ifx\@multiplelabels\relax
      \if@tempswa
        \@latex@warning@no@line{%
          Label(s) may have changed. %
          Rerun to get cross-references right%
        }%
      \fi
    \else
      \@multiplelabels
    \fi
  \fi
}
```

\c@lenddoca

```
\ifx\AtVeryEnd@c@lenddoca\c@lenddoca
  \def\c@lenddoca{%
    \@dofilelist
    \Call@AtEndAfterFileList
    \ifdim\font@submax>\fontsubfuzz\relax
```

```
      \@font@warning{%
        Size substitutions with differences\MessageBreak
        up to \font@submax\space have occured.\@gobbletwo
      }%
    \fi
    \@defaultsubs
    \if@filesw
      \ifx\@multiplelabels\relax
        \if@tempswa
          \@latex@warning@no@line{%
            Label(s) may have changed. %
            Rerun to get cross-references right%
          }%
        \fi
      \else
        \@multiplelabels
      \fi
    \fi
  }%
\fi
```

2.3.6 Class jpsj2

\AtVeryEnd@test@jpsj

```
\def\AtVeryEnd@test@jpsj{%
  \if@lastpagebalancing
    \global\let\@outputdblcol=\balancing@outputdblcol
  \fi
  \@checkend{document}%
  \clearpage
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \def\global\@namedef##1##2{}%
      \def\newlabel{\@testdef r}%
      \def\bibcite{\@testdef b}%
      \@tempswafalse
      \makeatletter
      \input \jobname.aux %
      \if@tempswa
        \@warning{%
          Label(s) may have changed. %
          Rerun to get cross-references right%
        }%
      \fi
    \fi
  \endgroup
  \deadcycles\z@
  \@@end
}
```

\AtVeryEnd@enddocument@jpsj

```
\def\AtVeryEnd@enddocument@jpsj{%
  \if@lastpagebalancing
    \global\let\@outputdblcol=\balancing@outputdblcol
  \fi
  \@checkend{document}%
  \Call@BeforeClearDocument
```

```
  \clearpage
  \Call@AfterLastShipout
  \begingroup
    \if@filesw
      \immediate\closeout\@mainaux
      \def\global\@namedef##1##2{}%
      \def\newlabel{\@testdef r}%
      \def\bibcite{\@testdef b}%
      \@tempswafalse
      \makeatletter
      \input \jobname.aux %
      \if@tempswa
        \@warning{%
          Label(s) may have changed. %
          Rerun to get cross-references right%
        }%
      \fi
    \fi
    \Call@AtVeryEndDocument
    \csname @dofilelist\endcsname
    \Call@AtEndAfterFileList
  \endgroup
  \deadcycles\z@
  \Call@AtVeryVeryEnd
  \@@end
}
```

2.3.7 Testing and redefining

\AtVeryEnd@Test

```
\def\AtVeryEnd@Test#1#2{%
  \expandafter\ifx\csname AtVeryEnd@test@#2\endcsname#1%
    \expandafter\let\expandafter#1%
    \csname AtVeryEnd@enddocument@#2\endcsname
    \begingroup
      \let\on@line\@empty
      \PackageInfo{atveryend}{%
        \string#1 detected (#2)%
      }%
    \endgroup
    \expandafter\AtVeryEnd@SkipToNil
  \fi
}
```

\AtVeryEnd@SkipToNil

```
\def\AtVeryEnd@SkipToNil#1\@nil{}
```

\AtVeryEnd@RedefEndDocument

```
\def\AtVeryEnd@RedefEndDocument#1{%
  \ifx#1\@undefined
  \else
    \AtVeryEnd@Test#1{standard20110627}%
    \AtVeryEnd@Test#1{standard}%
    \AtVeryEnd@Test#1{booklet}%
    \AtVeryEnd@Test#1{dinbrief}%
    \AtVeryEnd@Test#1{combine}%
    \AtVeryEnd@Test#1{jpsj}%
    \AtVeryEnd@SkipToNil
```

```
    \@nil
  \fi
}

\AtVeryEnd@RedefEndDocument\enddocument
\AtVeryEnd@RedefEndDocument\AP@enddocument % afterpage.sty
\AtVeryEnd@RedefEndDocument\hyper@back@cite@enddocument % htx-bc.sty
\AtVeryEnd@RedefEndDocument\hyper@enddocument % hyper.sty
\AtVeryEnd@RedefEndDocument\hyper@fn@enddocument % hyper.sty
\AtVeryEnd@RedefEndDocument\cweb@save@enddocument % cweb.cls
\AtVeryEnd@RedefEndDocument\prev@enddocument % flushend.sty
\AtVeryEnd@RedefEndDocument\endorigdocument % gaceta.cls
\AtVeryEnd@RedefEndDocument\keependdoc % aguplus.sty
\AtVeryEnd@RedefEndDocument\EMenddocument % t-angles.sty
\AtVeryEnd@RedefEndDocument\docmute@enddocument % docmute.sty
\AtVeryEnd@RedefEndDocument\a@enddocument % alatex.sty
\AtVeryEnd@RedefEndDocument\enddocumentasusual % frenchle.sty
\AtVeryEnd@RedefEndDocument\old@enddocument % uwthesis.cls
```

2.4 Hack into \enddocument

```
\def\AtVeryEnd@document{document}%
\def\AtVeryEnd@RedefCheckEnd{%
  \expandafter\def\expandafter\@checkend
  \expandafter##\expandafter1\expandafter{%
    \@checkend{##1}%
    \def\AtVeryEnd@temp{##1}%
    \ifx\AtVeryEnd@temp\AtVeryEnd@document
      \let\AtVeryEnd@OrgClearpage\clearpage
      \def\clearpage{%
        \let\clearpage\AtVeryEnd@OrgClearpage
        \Call@BeforeClearDocument
        \clearpage
        \Call@AfterLastShipout
      }%
    \fi
  }%
  \aftergroup\AtVeryEnd@RedefCheckEnd
}%
\AtBeginDocument{%
  \AtEndDocument{%
    \AtVeryEnd@RedefCheckEnd
  }%
}

\AtEndDocument{%
  \@ifundefined{@dofilelist}{%
    \gdef\@dofilelist{%
      \Call@AtVeryEndDocument
      \Call@AtEndAfterFileList
    }%
  }{%
    \begingroup
      \toks@\expandafter{\@dofilelist}%
      \xdef\@dofilelist{%
        \noexpand\Call@AtVeryEndDocument
        \the\toks@
        \noexpand\Call@AtEndAfterFileList
      }%
```

```
    \endgroup
  }%
}
```

2.5 Using hooks of other packages

2.5.1 Package scrlfile

```
\AtBeginDocument{%
  \@ifpackageloaded{scrlfile}{%
    \AtVeryEnd@ifundefined{BeforeClosingMainAux}{}{%
      \BeforeClosingMainAux{\Call@AfterLastShipout}%
    }%
    \AtVeryEnd@ifundefined{AfterReadingMainAux}{}{%
      \AfterReadingMainAux{\Call@AtVeryEndDocument}%
    }%
  }{}%
```

2.5.2 Package etoolbox

```
  \@ifpackageloaded{etoolbox}{%
    \AtVeryEnd@ifundefined{AfterEndDocument}{}{%
      \AfterEndDocument{\Call@AtVeryEndDocument}%
    }%
  }{}%
}
```

2.6 Class letter

The class letter and some similar classes insert material (`\@startlabels`) at the end of the document. However, this method violates a precondition of this package that the `\clearpage` in `\enddocument` is the final call with no material at later times. Therefore we move the label making from the `.aux` file to `\AtEndDocument`.

```
\def\AtVeryEnd@temp{%
  \AtBeginDocument{%
    \let\@startlabels\startlabels
    \let\@mlabel\mlabel
    \if@filesw
      \immediate\write\@mainaux{\string\@startlabels}%
    \fi
  }%
  \AtEndDocument{%
    \if@filesw
      \immediate\write\@mainaux{\string\clearpage}%
    \fi
  }%
}
\ifx\makelabels\AtVeryEnd@temp
\else
  \expandafter\AtVeryEnd@AtEnd
\fi%
\let\AtVeryEnd@PatchLetter=N%
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname endletter\endcsname\relax
\else
  \long\def\AtVeryEnd@TestEndLetter#1\@auxout#2#3\AtVeryEnd@Nil{%
    \def\AtVeryEnd@temp{#2}%
    \ifx\AtVeryEnd@temp\@empty
    \else
      \@onelevel@sanitize\AtVeryEnd@temp
```

```
      \edef\AtVeryEnd@StringMlabel{%
        \string\string
        \string\@mlabel
        \expandafter\@gobble\string\{%
      }%
      \def\AtVeryEnd@CatchFirst##1##2##3##4##5##6##7##8{%
        ##1##2##3##4##5##6##7##8\AtVeryEnd@CatchSecond
      }%
      \def\AtVeryEnd@CatchSecond##1##2##3##4##5##6##7##8##9\@nil{%
        ##1##2##3##4##5##6##7##8%
      }%
      \edef\AtVeryEnd@temp{%
        \expandafter\AtVeryEnd@CatchFirst\AtVeryEnd@temp
        {}{}{}{}{}{}{}{}%
        {}{}{}{}{}{}{}{}%
        \@nil
      }%
      \ifx\AtVeryEnd@temp\AtVeryEnd@StringMlabel
        \expandafter\def\expandafter\endletter\expandafter{%
          \endletter
          \begingroup
            \let\\=\relax
            \let\protect\@unexpandable@protect
            \let\@mlabel=\relax
            \edef\x{\endgroup
              \noexpand\AtEndDocument{%
                \@gobble#2%
              }%
            }%
            \x
        }%
        \let\AtVeryEnd@PatchLetter=Y%
      \fi
    \fi
  }%
  \expandafter\AtVeryEnd@TestEndLetter\endletter
    \@auxout{}\AtVeryEnd@Nil
\fi
\ifx\AtVeryEnd@PatchLetter Y%
  \begingroup
    \let\on@line\@empty
    \PackageInfo{atveryend}{%
      \@backslashchar makelabels detected. %
      Moving labels\MessageBreak
      from `.aux' file to \@backslashchar AtEndDocument%
    }%
  \endgroup
  \def\makelabels{%
    \AtBeginDocument{%
      \let\@startlabels\startlabels
      \let\@mlabel\mlabel
    }%
  }%
  \AtEndDocument{%
    \AtVeryEnd@ifundefined{@startlabels}{%
    }{%
      \clearpage
      \@startlabels
```

```
    }%
  }%
  \AfterLastShipout{%
    \let\@startlabels\relax
    \let\@mlabel\@gobbletwo
  }%
\else
  \PackageWarningNoLine{atveryend}{%
    \@backslashchar makelabels detected, but labels cannot\MessageBreak
    be moved to \@backslashchar AtEndDocument, because\MessageBreak
    \@backslashchar endletter is not in expected form%
  }%
\fi
\AtVeryEnd@AtEnd%
```
⟨/package⟩

3 Test

3.1 Catcode checks for loading

⟨*test1⟩

```
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\catcode`\@=11 %
\expandafter\ifx\csname count@\endcsname\relax
  \countdef\count@=255 %
\fi
\expandafter\ifx\csname @gobble\endcsname\relax
  \long\def\@gobble#1{}%
\fi
\expandafter\ifx\csname @firstofone\endcsname\relax
  \long\def\@firstofone#1{#1}%
\fi
\expandafter\ifx\csname loop\endcsname\relax
  \expandafter\@firstofone
\else
  \expandafter\@gobble
\fi
{%
  \def\loop#1\repeat{%
    \def\body{#1}%
    \iterate
  }%
  \def\iterate{%
    \body
      \let\next\iterate
    \else
      \let\next\relax
    \fi
    \next
  }%
  \let\repeat=\fi
}%
\def\RestoreCatcodes{}
\count@=0 %
\loop
```

```
  \edef\RestoreCatcodes{%
    \RestoreCatcodes
    \catcode\the\count@=\the\catcode\count@\relax
  }%
\ifnum\count@<255 %
  \advance\count@ 1 %
\repeat

\def\RangeCatcodeInvalid#1#2{%
  \count@=#1\relax
  \loop
    \catcode\count@=15 %
  \ifnum\count@<#2\relax
    \advance\count@ 1 %
  \repeat
}
\def\RangeCatcodeCheck#1#2#3{%
  \count@=#1\relax
  \loop
    \ifnum#3=\catcode\count@
    \else
      \errmessage{%
        Character \the\count@\space
        with wrong catcode \the\catcode\count@\space
        instead of \number#3%
      }%
    \fi
  \ifnum\count@<#2\relax
    \advance\count@ 1 %
  \repeat
}
\def\space{ }
\expandafter\ifx\csname LoadCommand\endcsname\relax
  \def\LoadCommand{\input atveryend.sty\relax}%
\fi
\def\Test{%
  \RangeCatcodeInvalid{0}{47}%
  \RangeCatcodeInvalid{58}{64}%
  \RangeCatcodeInvalid{91}{96}%
  \RangeCatcodeInvalid{123}{255}%
  \catcode`\@=12 %
  \catcode`\\=0 %
  \catcode`\%=14 %
  \LoadCommand
  \RangeCatcodeCheck{0}{36}{15}%
  \RangeCatcodeCheck{37}{37}{14}%
  \RangeCatcodeCheck{38}{47}{15}%
  \RangeCatcodeCheck{48}{57}{12}%
  \RangeCatcodeCheck{58}{63}{15}%
  \RangeCatcodeCheck{64}{64}{12}%
  \RangeCatcodeCheck{65}{90}{11}%
  \RangeCatcodeCheck{91}{91}{15}%
  \RangeCatcodeCheck{92}{92}{0}%
  \RangeCatcodeCheck{93}{96}{15}%
  \RangeCatcodeCheck{97}{122}{11}%
  \RangeCatcodeCheck{123}{255}{15}%
  \RestoreCatcodes
}
```

```
\Test
\csname @@end\endcsname
\end
```
⟨/test1⟩

4 Installation

4.1 Download

Package. This package is available on CTAN[1]:

CTAN:macros/latex/contrib/oberdiek/atveryend.dtx The source file.

CTAN:macros/latex/contrib/oberdiek/atveryend.pdf Documentation.

Bundle. All the packages of the bundle 'oberdiek' are also available in a TDS compliant ZIP archive. There the packages are already unpacked and the documentation files are generated. The files and directories obey the TDS standard.

CTAN:install/macros/latex/contrib/oberdiek.tds.zip

TDS refers to the standard "A Directory Structure for TEX Files" (CTAN:tds/tds.pdf). Directories with `texmf` in their name are usually organized this way.

4.2 Bundle installation

Unpacking. Unpack the `oberdiek.tds.zip` in the TDS tree (also known as `texmf` tree) of your choice. Example (linux):

```
unzip oberdiek.tds.zip -d ~/texmf
```

Script installation. Check the directory `TDS:scripts/oberdiek/` for scripts that need further installation steps. Package attachfile2 comes with the Perl script `pdfatfi.pl` that should be installed in such a way that it can be called as `pdfatfi`. Example (linux):

```
chmod +x scripts/oberdiek/pdfatfi.pl
cp scripts/oberdiek/pdfatfi.pl /usr/local/bin/
```

4.3 Package installation

Unpacking. The `.dtx` file is a self-extracting docstrip archive. The files are extracted by running the `.dtx` through plain TEX:

```
tex atveryend.dtx
```

TDS. Now the different files must be moved into the different directories in your installation TDS tree (also known as `texmf` tree):

```
atveryend.sty            → tex/latex/oberdiek/atveryend.sty
atveryend.pdf            → doc/latex/oberdiek/atveryend.pdf
test/atveryend-test1.tex → doc/latex/oberdiek/test/atveryend-test1.tex
atveryend.dtx            → source/latex/oberdiek/atveryend.dtx
```

If you have a `docstrip.cfg` that configures and enables docstrip's TDS installing feature, then some files can already be in the right place, see the documentation of docstrip.

[1] http://ctan.org/pkg/atveryend

4.4 Refresh file name databases

If your TEX distribution (teTEX, mikTEX, ...) relies on file name databases, you must refresh these. For example, teTEX users run `texhash` or `mktexlsr`.

4.5 Some details for the interested

Attached source. The PDF documentation on CTAN also includes the `.dtx` source file. It can be extracted by AcrobatReader 6 or higher. Another option is pdftk, e.g. unpack the file into the current directory:

```
pdftk atveryend.pdf unpack_files output .
```

Unpacking with LATEX. The `.dtx` chooses its action depending on the format:

plain TEX: Run docstrip and extract the files.

LATEX: Generate the documentation.

If you insist on using LATEX for docstrip (really, docstrip does not need LATEX), then inform the autodetect routine about your intention:

```
latex \let\install=y\input{atveryend.dtx}
```

Do not forget to quote the argument according to the demands of your shell.

Generating the documentation. You can use both the `.dtx` or the `.drv` to generate the documentation. The process can be configured by the configuration file `ltxdoc.cfg`. For instance, put this line into this file, if you want to have A4 as paper format:

```
\PassOptionsToClass{a4paper}{article}
```

An example follows how to generate the documentation with pdfLATEX:

```
pdflatex atveryend.dtx
makeindex -s gind.ist atveryend.idx
pdflatex atveryend.dtx
makeindex -s gind.ist atveryend.idx
pdflatex atveryend.dtx
```

5 Catalogue

The following XML file can be used as source for the TEX Catalogue. The elements `caption` and `description` are imported from the original XML file from the Catalogue. The name of the XML file in the Catalogue is `atveryend.xml`.

```
⟨*catalogue⟩
<?xml version='1.0' encoding='us-ascii'?>
<!DOCTYPE entry SYSTEM 'catalogue.dtd'>
<entry datestamp='$Date$' modifier='$Author$' id='atveryend'>
  <name>atveryend</name>
  <caption>Hooks at the very end of a document.</caption>
  <authorref id='auth:oberdiek'/>
  <copyright owner='Heiko Oberdiek' year='2009-2011'/>
  <license type='lppl1.3'/>
  <version number='1.9'/>
  <description>
    This LaTeX packages provides two hooks for <tt>\end{document}</tt>
```

```
    that are executed after the hook of <tt>\AtEndDocument</tt>:
    <tt>\AfterLastShipout</tt> can be used for code that is to be executed
    right after the last <tt>\clearpage</tt> before the '<tt>.aux</tt>' file
    is closed. <tt>\AtVeryEndDocument</tt> is used for code after closing
    and final reading of the '<tt>.aux</tt>' file.
    <p/>
    The package is part of the <xref refid='oberdiek'>oberdiek</xref> bundle.
  </description>
  <documentation details='Package documentation'
      href='ctan:/macros/latex/contrib/oberdiek/atveryend.pdf'/>
  <ctan file='true' path='/macros/latex/contrib/oberdiek/atveryend.dtx'/>
  <miktex location='oberdiek'/>
  <texlive location='oberdiek'/>
  <install path='/macros/latex/contrib/oberdiek/oberdiek.tds.zip'/>
</entry>
⟨/catalogue⟩
```

6 Acknowledgement

Arthur Ogawa: He proposed the new API with `\AfterLastShipout` and gave me much feedback, comprehensive class/package lists, many suggestions and comments.

7 References

[1] The LaTeX3 Project: *LaTeX2e for class and package writers* 2006/02/15; CTAN:macros/latex/doc/clsguide.pdf.

[2] James Darrell McCauley, Jeff Goldberg: *The endfloat package*; 1995/10/11 v2.4i; CTAN:macros/latex/contrib/endfloat/endfloat.pdf.

[3] Philipp Lehmann: *The etoolbox package*; 2009/08/06 v1.8; CTAN:macros/latex/contrib/etoolbox/etoolbox.pdf.

[4] Sebastian Rahtz, Heiko Oberdiek: *The hyperref package*; 2009/12/05 v6.79l; CTAN:macros/latex/contrib/hyperref/.

[5] Markus Kohm: *KOMA-Script*; 2009/07/24 v3.04a; http://www.komascript.de/.

[6] Jeff Goldberg: *The lastpage package*; 1994/07/20 v0.1b; CTAN:macros/latex/contrib/lastpage/lastpage.pdf.

[7] APS, AIP, Arthur Orgawa; ReVTeX 4.1; 2009/10/13 v4.1; http://authors.aps.org/revtex4/.

8 History

[2009/12/06 v1.0]

- The first version.

[2009/12/07 v1.1]

- Bug fixes.

[2009/12/09 v1.2]

- Additional support of classes and packages.

[2009/12/11 v1.3]

- Patch for letter like classes that puts label into the '.aux' file.
- Hook `\BeforeClearDocument` added (request from Arthur Ogawa).
- Patch of `\clear@document` removed (Arthur Ogawa).
- A nested `\AtBeginDocument` removed.

[2010/01/25 v1.4]

- Moved from `TDS:*/generic/*` to `TDS:*/latex/*`.

[2010/03/24 v1.5]

- `\Call@BeforeClearDocument` fixed (Ahmed Musa).

[2011/04/15 v1.6]

- `\Call@AtEndAfterFileList` and `\Call@AtVeryVeryEnd` added.

[2011/04/23 v1.7]

- Some fix for `\AtVeryEnd@RedefCheckEnd` to avoid error because of undefined control sequence in some circumstances (thanks to D.P. Story for bug report).

[2011/06/30 v1.8]

- Support of changed `\enddocument` of LaTeX 2$_\varepsilon$ 2011/06/27.

[2016/05/16 v1.9]

- Documentation updates.

9 Index

Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; plain numbers refer to the code lines where the entry is used.

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