

# The `luatex` package

Heiko Oberdiek  
<oberdiek@uni-freiburg.de>

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## Abstract

This package manages the new and extended features and resources that `LUATEX` provides. Examples are attributes and catcode tables.

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# 1 Documentation

## 1.1 Introduction

$\text{\TeX}$  provides global resources such as registers. But it does not provide an interface for managing these resources. For example, two packages want to use a counter register. If they take the same register number, then the use of both packages will conflict and they cannot be used together. Therefore formats such as plain- $\text{\TeX}$  or  $\text{\LaTeX}$  implement an allocation scheme for registers. A package reserves with `\newcount` an unused register number for its own exclusive use.

Nowadays  $\text{\TeX}$  is not alone anymore:  $\varepsilon\text{-}\text{\TeX}$ , pdf $\text{\TeX}$  and other compilers for  $\text{\TeX}$  are developed that extend and add new features and resources.

Now  $\text{\LaTeX}$  has reached beta state. It inherits most of pdf $\text{\TeX}$ 's features including  $\varepsilon\text{-}\text{\TeX}$ . Also it implements new concepts such as attributes or catcode tables.

### 1.1.1 $\text{\LaTeX}$

$\text{\LaTeX} 2_{\varepsilon}$  is frozen and therefore refuses to even notice the new  $\text{\TeX}$  variants. Not even the old  $\varepsilon\text{-}\text{\TeX}$  is supported by its kernel. At least there is a third party package `etex` that manages the new  $\varepsilon\text{-}\text{\TeX}$  resources.

This package tries to do the same for  $\text{\LaTeX}$  and starts to support at least a few of the new features.

### 1.1.2 plain- $\text{\TeX}$

$\text{\LaTeX}$  has inherited its resource handling from plain- $\text{\TeX}$ . The interface is basically the same: `\newcount`, ... Therefore this package tries to follow this tradition by providing compatibility to plain- $\text{\TeX}$ . It can be loaded with plain- $\text{\TeX}$  and defines at least some of the features that this packages provides for  $\text{\LaTeX}$ .

## 1.2 Register allocation

### 1.2.1 Register with 16 bit

Because L<sup>A</sup>T<sub>E</sub>X is a super set of  $\varepsilon$ -T<sub>E</sub>X regarding registers, the register allocation scheme should not conflict with package `etex`. Therefore this package is loaded to inherit its allocation scheme. The only change is currently that the limit is increased to 65536 registers for the following register classes:

- `count`
- `dimen`
- `skip`
- `muskip`
- `marks`
- `toks`
- `box`

This affects the number of global and local registers. Because it is done in a package and not in the kernel, it is possible that someone loads package `etex` before uses the local allocation variants. This will prevent the extension for this register class. If more registers are needed, just load package `luatex` earlier.

### 1.2.2 Insertions

Insertions need four registers `\count`, `\dimen`, `\skip`, and `\box` with the same number. Usually they are allocated downwards from 254, 253, ... Also `\newcount`, `\newdimen`, ... fill up these register numbers from below before switching to higher register numbers by package `etex`. When this occurs, no insertions can be allocated anymore.

Therefore `\newcount`, `\newdimen`, `\newskip`, and `\newbox` are replaced by their global variants (`\globcount`, ...) that use the higher numbers immediately, leaving the room for insertions. There should not be an efficiency penalty because L<sup>A</sup>T<sub>E</sub>X stores the registers of a class in the same Lua table unlike  $\varepsilon$ -T<sub>E</sub>X, where registers below 256 are stored in an array and higher numbers are put in a tree structure.

## 1.3 Lua states

`\newluastate {⟨cmd⟩}`

Macro `\newluastate` reserves a new Lua state and stores the number in `\cmd`.

## 1.4 Attributes

Nodes can have custom attributes in L<sup>A</sup>T<sub>E</sub>X. These attributes are organized by a new register class. As the other registers up to  $2^{16}$  attributes are supported. An attribute value can be negative that means the attribute is not set. Otherwise T<sub>E</sub>X's range of non-negative integers up to  $2^{31}$  are available.

`\newattribute {⟨cmd⟩}`

Macro `\newattribute` defines command `⟨cmd⟩` using `\attributedef` using an new attribute number. The new attribute is initially unset.

`\setattribute {⟨cmd⟩} {⟨value⟩}`

Macro `\setattribute` locally sets attribute command `⟨cmd⟩` to the number `⟨value⟩`. Valid values range from  $-1$  until  $2^{31}$  (the upper limit is the same as for other T<sub>E</sub>X integer numbers).

`\unsetAttribute {⟨cmd⟩}`

Macro `\unsetAttribute` clears the attribute command `⟨cmd⟩`.

## 1.5 Catcode tables

L<sup>A</sup>T<sub>E</sub>X introduces catcode tables as new feature, see documentation. There is need for discussion, how to deal best:

- `\initcatcodetable` and `\setcatcodetable` act globally.
- `\catcodetable` causes an error if used with an uninitialized catcode table.
- Large catcode table numbers should be avoided because of performance breakdown.
- Use case L<sup>A</sup>T<sub>E</sub>X package: The package must not be surprised by changed catcodes and must not surprise by changing catcodes accidentally. Catcode tables could offer a solution. At the begin a catcode regime with standard catcodes is established and the old one is restored afterwards.
- Use case: L<sup>A</sup>T<sub>E</sub>X's `tex.print` might be used with a catcode table number, for example a table where all entries have catcode “other”.
- Readonly catcode tables.
- Is there is a need for local allocations? (Package `etex`'s `\loc` variants are not used in T<sub>E</sub>X Live 2007.)

### 1.5.1 Interface proposal

The idea: `\newcatcodetable` allocates odd numbered catcode tables. Even numbered tables are managed as stack. Also some catcode tables are defined. These must not be changed.

`\newcatcodetable {⟨cmd⟩}`

Macro `\newcatcodetable` reserves a new catcode table and remembers its number in `⟨cmd⟩`. The catcode table is initialized with ini-T<sub>E</sub>X's catcodes.

`\CatcodeTableIniTeX`  
`\CatcodeTableString`  
`\CatcodeTableOther`  
`\CatcodeTableLaTeX`

These are catcode tables and must not be changed. `\CatcodeTableIniTeX` contains the catcode settings of ini-T<sub>E</sub>X. `\CatcodeTableString` follows T<sub>E</sub>X's convention of `\string`, `\meaning` and friends. The space gets catcode 10 (space), the other characters have catcode 12 (other). In `\CatcodeTableOther` all entries have catcode 12 (other). `\CatcodeTableLaTeX` contains the setting of a pure L<sup>A</sup>T<sub>E</sub>X format ('at' is other).

`\CatcodeTableStack`  
`\IncCatcodeTableStack`  
`\DecCatcodeTableStack`

`\CatcodeTableStack` is the stack pointer. Initially it is catcode table zero. `\IncCatcodeTableStack` and `\DecCatcodeTableStack` increments and decrements the stack pointer. Currently `\IncCatcodeTableStack` does not initialize a

new catcode table. Both increment and decrement operations do not set a catcode table.

`\PushCatcodeTableNumStack`  
`\PopCatcodeTableNumStack`

It can be handy to have a global stack for catcode table numbers to deal with the global assignment property of `\initcatcodetable` and `\savecatcodetable`. `\PushCatcodeTableNumStack` pushes the current catcode table on the stack. `\PopCatcodeTableNumStack` pops the topmost number off the number stack to set the current catcode table. Catcode table zero is used in case of an empty stack.

`\BeginCatcodeRegime { $\langle catcodetable \rangle$ }`  
`\EndCatcodeRegime`

`\BeginCatcodeRegime` remembers the current catcode table number. Then it creates and uses a fresh catcode table on the stack that is initialized by  $\langle catcodetable \rangle$ :

```
\PushCatcodeTableNumStack
\catcodetable $\langle catcodetable \rangle$  \IncCatcodeTableStack
\savecatcodetable\CatcodeTableStack
\catcodetable\CatcodeTableStack
```

`\EndCatcodeRegime` drops the catcode table, created by `\BeginCatcodeRegime` and sets the catcode table that was active before:

```
\DecCatcodeTableStack
\PopCatcodeTableNumStack
```

These macros solve the use case, described earlier for a L<sup>A</sup>T<sub>E</sub>X package:

```
% package foobar.sty
\BeginCatcodeRegime\CatcodeTableLaTeX
\makeatletter
% ... package contents ...
\EndCatcodeRegime
% end of package
```

If the package wants to change catcodes after its loading, `\AtBeginDocument` or `\AtEndOfPackage` can be used.

`\SetCatcodeRange { $\langle from \rangle$ } { $\langle to \rangle$ } { $\langle catcode \rangle$ }`

The catcodes of characters in range from  $\langle from \rangle$  to inclusive  $\langle to \rangle$  are set to  $\langle catcode \rangle$ .

## 1.6 Lua module loading

Currently L<sup>A</sup>T<sub>E</sub>X (version 0.20) does not support Lua script files inside TDS:scripts//, because Lua's mechanism for module loading does not use the kpathsea library. Therefore this packages appends a kpse loader to the list of Lua's module loaders. It finds the module  $\langle module \rangle$  by

```
kpse.find_file(" $\langle module \rangle$ .lua", "texmfscripts")
```

Unhappily kpathsea does not support directory components in a file name. Therefore the Lua convention is not followed to replace dots in the module name by the directory separator.

Example: A Lua script of a package foobar wants the following modules:

```
require("foobar.hello.world")
require("org.somewhere.xyz")
```

Then they can be find in:

```
TDS:scripts/foobar/foobar.hello.world.lua
TDS:scripts/foobar/org.somewhere.xyz.lua
```

I would have preferred the following locations, following lua conventions, e.g.:

```
TDS:scripts/foobar/hello/world.lua
TDS:scripts/foobar/org/somewhere/xyz.lua
```

But I do not know, how to achieve this in a reliable way using kpathsea.

### 1.6.1 Package luatex-loader

If someone do not need or want package luatex but it's extension for module loading, then he can use package luatex-loader. Both plain-TeX and L<sup>A</sup>T<sub>E</sub>X are supported.

## 2 Implementation

```
1 <package>
```

### 2.1 Reload check and package identification

Reload check, especially if the package is not used with L<sup>A</sup>T<sub>E</sub>X.

```
2 \begingroup
3 \catcode44 12 % ,
4 \catcode45 12 % -
5 \catcode46 12 % .
6 \catcode58 12 % :
7 \catcode64 11 % @
8 \expandafter\let\expandafter\x\csname ver@luatex.sty\endcsname
9 \ifcase 0%
10 \ifx\x\relax % plain
11 \else
12 \ifx\x\empty % LaTeX
13 \else
14 1%
15 \fi
16 \fi
17 \else
18 \catcode35 6 % #
19 \catcode123 1 % {
20 \catcode125 2 % }
21 \expandafter\ifx\csname PackageInfo\endcsname\relax
22 \def\x#1#2{%
23 \immediate\write-1{Package #1 Info: #2.}%
24 }%
25 \else
26 \def\x#1#2{\PackageInfo{#1}{#2, stopped}}%
27 \fi
28 \x{luatex}{The package is already loaded}%
29 \endgroup
30 \expandafter\endinput
31 \fi
32 \endgroup
```

Package identification:

```
33 \begingroup
34 \catcode35 6 % #
```

```

35 \catcode40 12 % (
36 \catcode41 12 % )
37 \catcode44 12 % ,
38 \catcode45 12 % -
39 \catcode46 12 % .
40 \catcode47 12 % /
41 \catcode58 12 % :
42 \catcode64 11 % @
43 \catcode123 1 % {
44 \catcode125 2 % }
45 \expandafter\ifx\csname ProvidesPackage\endcsname\relax
46   \def\x#1#2#3[#4]{\endgroup
47     \immediate\write-1{Package: #3 #4}%
48     \xdef#1{#4}%
49   }%
50 \else
51   \def\x#1#2[#3]{\endgroup
52     #2[{#3}]%
53     \ifx#1\relax
54       \xdef#1{#3}%
55     \fi
56   }%
57 \fi
58 \expandafter\x\csname ver@luatex.sty\endcsname
59 \ProvidesPackage{luatex}%
60 [2007/12/12 v0.1 LuaTeX basic definition package (HO)]

```

## 2.2 Catcodes

```

61 \begingroup
62 \catcode123 1 % {
63 \catcode125 2 % }
64 \def\x{\endgroup
65   \expandafter\edef\csname LuT@AtEnd\endcsname{%
66     \catcode35 \the\catcode35\relax
67     \catcode64 \the\catcode64\relax
68     \catcode123 \the\catcode123\relax
69     \catcode125 \the\catcode125\relax
70   }%
71 }%
72 \x
73 \catcode35 6 % #
74 \catcode64 11 % @
75 \catcode123 1 % {
76 \catcode125 2 % }
77 \def\TMP@EnsureCode#1#2{%
78   \edef\LuT@AtEnd{%
79     \LuT@AtEnd
80     \catcode#1 \the\catcode#1\relax
81   }%
82   \catcode#1 #2\relax
83 }
84 \TMP@EnsureCode{10}{12}% ^^J
85 \TMP@EnsureCode{34}{12}% "
86 \TMP@EnsureCode{36}{3}% $
87 \TMP@EnsureCode{39}{12}% '
88 \TMP@EnsureCode{40}{12}% (
89 \TMP@EnsureCode{41}{12}% )
90 \TMP@EnsureCode{42}{12}% *
91 \TMP@EnsureCode{43}{12}% +
92 \TMP@EnsureCode{44}{12}% ,
93 \TMP@EnsureCode{45}{12}% -

```

```

94 \TMP@EnsureCode{46}{12}% .
95 \TMP@EnsureCode{47}{12}% /
96 \TMP@EnsureCode{60}{12}% <
97 \TMP@EnsureCode{61}{12}% =
98 \TMP@EnsureCode{62}{12}% >
99 \TMP@EnsureCode{95}{12}% _ (other!)
100 \TMP@EnsureCode{96}{12}% '

```

## 2.3 Check for LuaTeX

Without LuaTeX there is no point in using this package.

```

101 \begingroup\expandafter\expandafter\expandafter\endgroup
102 \expandafter\ifx\csname RequirePackage\endcsname\relax
103   \input infwarerr.sty\relax
104   \input ifluatex.sty\relax
105 \else
106   \RequirePackage{infwarerr}[2007/09/09]%
107   \RequirePackage{ifluatex}[2007/12/12]%
108 \fi

109 \ifluatex
110 \else
111   \@PackageError{luatex}{%
112     This package may only be run using LuaTeX%
113   }\@ehc
114   \LuT@AtEnd
115   \expandafter\endinput
116 \fi

```

## 2.4 Inherit support for $\epsilon$ -TeX

Package etex is not compatible for plain-TeX. But it could be present if a format is used that is based on etex.src. Therefore we only load the package in case of LaTeX and tests its presence independently of the format by looking for \et@xins.

```

117 \begingroup\expandafter\expandafter\expandafter\endgroup
118 \expandafter\ifx\csname et@xins\endcsname\relax
119 \else
120   \RequirePackage{etex}[1998/03/26]%
121 \fi

```

## 2.5 Adaption of $\epsilon$ -TeX's register allocation

$\epsilon$ -TeX has increased the number of TeX registers from  $2^8$  (256) to  $2^{15}$  (32768) for a register class. LuaTeX extends the limit further to  $2^{16}$  (65536). The allocation scheme of package etex is not changed. But this can be subject for discussion.

If a register class hasn't registered any local registers yet, then the limit can safely be pushed to 65536.

```

122 \begingroup\expandafter\expandafter\expandafter\endgroup
123 \expandafter\ifx\csname et@xins\endcsname\relax
124   \@PackageWarningNoLine{luatex}{%
125     Support for eTeX is not loaded (etex.src)%
126   }%
127 \else
128   \def\LuT@temp#1{%
129     \ifnum\count27#1=32768 %
130       \count27#1=65536 %
131     \fi
132   }%
133   \LuT@temp0%
134   \LuT@temp1%
135   \LuT@temp2%
136   \LuT@temp3%

```



```

137 \LuT@temp4%
138 \LuT@temp5%
139 \LuT@temp6%

```

$\varepsilon$ -TEX uses an array for the first 256 registers and then a tree structure. L<sup>A</sup>T<sub>E</sub>X stores all registers of a class in one Lua table. There shouldn't be large performance differences. This allows starting immediately in the extended area, leaving room for insertions.

```

140 \let\newcount\globcount
141 \let\newdimen\globdimen
142 \let\newskip\globskip
143 \let\newbox\globbox
144 \fi

```

## 2.6 plain-T<sub>E</sub>X compatibility

`\@empty`

```

145 \expandafter\ifx\csname @empty\endcsname\relax
146 \def\@empty{}%
147 \fi

```

`\@gobble`

```

148 \expandafter\ifx\csname @gobble\endcsname\relax
149 \long\def\@gobble#1{}%
150 \fi

```

`\@firstofone`

```

151 \expandafter\ifx\csname @firstofone\endcsname\relax
152 \long\def\@firstofone#1{#1}%
153 \fi

```

`\@firstoftwo`

```

154 \expandafter\ifx\csname @firstoftwo\endcsname\relax
155 \long\def\@firstoftwo#1#2{#1}%
156 \fi

```

`\@car`

```

157 \expandafter\ifx\csname @car\endcsname\relax
158 \def\@car#1#2\@nil{#1}%
159 \fi

```

`\@cdr`

```

160 \expandafter\ifx\csname @cdr\endcsname\relax
161 \def\@cdr#1#2\@nil{#2}%
162 \fi

```

`\@ifstar`

```

163 \expandafter\ifx\csname @ifstar\endcsname\relax
164 \def\@ifstar#1{%
165 \ifnextchar*\@firstoftwo{#1}}%
166 }%

```

`\@ifnextchar`

```

167 \long\def\@ifnextchar#1#2#3{%
168 \let\reserved@d=#1%
169 \def\reserved@a{#2}%
170 \def\reserved@b{#3}%
171 \futurelet\@let@token\@ifnch
172 }%

```

```

\@ifnch
173 \def\@ifnch{%
174 \ifx\@let@token\@sptoken
175 \let\reserved@c\@xifnch
176 \else
177 \ifx\@let@token\reserved@d
178 \let\reserved@c\reserved@a
179 \else
180 \let\reserved@c\reserved@b
181 \fi
182 \fi
183 \reserved@c
184 }%

\@sptoken
185 \let\LuT@temp\:%
186 \def\:{\let\@sptoken= }%
187 \: % explicit space

\@xifnch
188 \def\:{\@xifnch}%
189 \expandafter\def\: {%
190 \futurelet\@let@token\@ifnch
191 }%
192 \let\:\LuT@temp
193 \fi

\@tempcnta
194 \expandafter\ifx\csname @tempcnta\endcsname\relax
195 \csname newcount\endcsname\@tempcnta
196 \fi

\@tempcntb
197 \expandafter\ifx\csname @tempcntb\endcsname\relax
198 \csname newcount\endcsname\@tempcntb
199 \fi

\LuT@newcommand
200 \begingroup\expandafter\expandafter\expandafter\endgroup
201 \expandafter\ifx\csname newcommand\endcsname\relax
202 \def\LuT@newcommand#1[#2]#3{%
203 \ifx#1\@undefined
204 \let#1\relax
205 \else
206 \ifx#1\relax
207 \else
208 \@PackageError{luatex}{%
209 \string#1 is already defined.\MessageBreak
210 Redefinition is skipped%
211 }\@ehc
212 \fi
213 \fi
214 \ifx#1\relax
215 \ifcase#2 %
216 \def#1{#3}%
217 \or
218 \def#1##1{#3}%
219 \or
220 \def#1##1##2{#3}%
221 \or
222 \def#1##1##2##3{#3}%

```

```

223     \or
224     \@INTERNAL@ERROR
225     \fi
226     \fi
227 }%
228 \else
229 \def\LuT@newcommand{\newcommand*}%
230 \fi

```

## 2.7 Lua states

\LuT@AllocLuaState

```

231 \newcount\LuT@AllocLuaState
232 \LuT@AllocLuaState=\z@

```

\newluastate

```

233 \LuT@newcommand\newluastate[1]{%
234   \ifnum\LuT@AllocLuaState<65535 %
235     \global\advance\LuT@AllocLuaState\@ne
236     \allocationnumber\LuT@AllocLuaState
237     \global\chardef#1=\allocationnumber
238     \wlog{\string#1=\string\luastate\the\allocationnumber}%
239   \else
240     \errmessage{No room for a new \string\luastate}%
241   \fi
242 }

```

## 2.8 Attributes

### 2.8.1 Allocation

\LuT@AllocAttribute

```

243 \newcount\LuT@AllocAttribute
244 \LuT@AllocAttribute=\m@ne

```

\newattribute

```

245 \LuT@newcommand\newattribute[1]{%
246   \ifnum\LuT@AllocAttribute<65535 %
247     \global\advance\LuT@AllocAttribute\@ne
248     \allocationnumber\LuT@AllocAttribute
249     \global\attributedef#1=\allocationnumber
250     \unsetattribute{#1}%
251     \wlog{\string#1=\string\attribute\the\allocationnumber}%
252   \else
253     \errmessage{No room for a new \string\attribute}%
254   \fi
255 }

```

### 2.8.2 Interface

\setattribute

```

256 \LuT@newcommand\setattribute[2]{%
257   #1=\numexpr#2\relax
258 }

```

\unsetattribute

```

259 \LuT@newcommand\unsetattribute[1]{%
260   #1=\m@ne
261 }

```

## 2.9 Catcode tables

### 2.9.1 Allocation

`\LuT@AllocCatcodeTable`

```
262 \newcount\LuT@AllocCatcodeTable
263 \LuT@AllocCatcodeTable=\m@ne
264 \newcount\CatcodeTableStack
265 \CatcodeTableStack=\z@
```

`\newcatcodetable`

```
266 \LuT@newcommand\newcatcodetable[1]{%
267   \ifnum\LuT@AllocCatcodeTable<1114110 % 0x10FFF is maximal \chardef
268     % or < 268435455 % 228 - 1
269   \global\advance\LuT@AllocCatcodeTable by\tw@
270   \allocationnumber=\LuT@AllocCatcodeTable
271   \global\chardef#1=\allocationnumber
272   \wlog{%
273     \string#1=\string\catcodetable\the\allocationnumber
274   }%
275   \else
276     \errmessage{No room for a new \string\catcodetable}%
277   \fi
278 }%
```

`\IncCatcodeTableStack`

```
279 \LuT@newcommand\IncCatcodeTableStack[0]{%
280   \ifnum\CatcodeTableStack<268435454 %
281     \global\advance\CatcodeTableStack by\tw@
282   \else
283     \@PackageError{luatex}{%
284       Catcode table stack overflow%
285     }\@ehd
286   \fi
287 }
```

`\DecCatcodeTableStack`

```
288 \LuT@newcommand\DecCatcodeTableStack[0]{%
289   \ifnum\CatcodeTableStack>\z@
290     \global\advance\CatcodeTableStack by-2 %
291   \else
292     \@PackageError{luatex}{%
293       Catcode table stack is empty%
294     }\@ehd
295   \fi
296 }
```

### 2.9.2 \SetCatcodeRange

`\SetCatcodeRange`

```
297 \LuT@newcommand\SetCatcodeRange[3]{%
298   \edef\LuT@temp{%
299     \noexpand\@tempcnta=\the\@tempcnta
300     \noexpand\@tempcntb=\the\@tempcntb
301     \noexpand\count@=\the\count@
302     \relax
303   }%
304   \@tempcnta=\numexpr#1\relax
305   \@tempcntb=\numexpr#2\relax
306   \count@=\numexpr#3\relax
307   \loop
308     \unless\ifnum\@tempcnta>\@tempcntb
```

```

309     \catcode\@tempcnta=\count@
310     \advance\@tempcnta by \@ne
311     \repeat
312     \LuT@temp
313 }

```

### 2.9.3 Predefined catcode tables

```

314 \newcatcodetable\CatcodeTableIniTeX
315 \newcatcodetable\CatcodeTableString
316 \newcatcodetable\CatcodeTableOther
317 \newcatcodetable\CatcodeTableLaTeX

318 \initcatcodetable\CatcodeTableIniTeX
319 \begingroup
320   \def\@makeoother#1{\catcode#1=12\relax}%
321   \@firstofone{%
322     \catcodetable\CatcodeTableIniTeX
323     \begingroup
324       \SetCatcodeRange{0}{8}{15}%
325       \catcode9=10 % tab
326       \catcode11=15 %
327       \catcode12=13 % form feed
328       \SetCatcodeRange{14}{31}{15}%
329       \catcode35=6 % hash
330       \catcode36=3 % dollar
331       \catcode38=4 % ampersand
332       \catcode94=7 % circumflex
333       \catcode95=8 % underscore
334       \catcode123=1 % brace left
335       \catcode125=2 % brace right
336       \catcode126=13 % tilde
337       \catcode127=15 %
338       \savecatcodetable\CatcodeTableLaTeX
339     \endgroup
340     \@makeoother{0}% nul
341     \@makeoother{13}% carriage return
342     \@makeoother{37}% percent
343     \@makeoother{92}% backslash
344     \@makeoother{127}%
345     \SetCatcodeRange{65}{90}{12}% A-Z
346     \SetCatcodeRange{97}{122}{12}% a-z
347     \savecatcodetable\CatcodeTableString
348     \@makeoother{32}% space
349     \savecatcodetable\CatcodeTableOther
350   \endgroup
351 }%

```

### 2.9.4 Number stack

`\LuT@NumStackEmpty` A special empty stack value because of `\@cdr`'s brace removal.

```

352 \def\LuT@NumStackEmpty{0}

```

`\LuT@NumStack`

```

353 \let\LuT@NumStack\LuT@NumStackEmpty

```

`\PushCatcodeTableNumStack`

```

354 \LuT@newcommand\PushCatcodeTableNumStack[0]{%
355   \xdef\LuT@NumStack{%
356     {\the\catcodetable}\LuT@NumStack
357   }%
358 }

```

\PopCatcodeTableNumStack

```

359 \LuT@newcommand\PopCatcodeTableNumStack[0]{%
360   \ifx\LuT@NumStack\LuT@NumStackEmpty
361     \@PackageWarning{luatex}{Empty catcode table number stack}%
362     \catcodetable\z@
363   \else
364     \catcodetable=\expandafter\@car\LuT@NumStack\@nil\relax
365     \xdef\LuT@NumStack{%
366       \expandafter\@cdr\LuT@NumStack\@nil
367     }%
368   \fi
369 }

```

## 2.9.5 Catcode regime macros

\BeginCatcodeRegime

```

370 \LuT@newcommand\BeginCatcodeRegime[1]{%
371   \PushCatcodeTableNumStack
372   \catcodetable=\numexpr#1\relax
373   \IncCatcodeTableStack
374   \savecatcodetable\CatcodeTableStack
375   \catcodetable\CatcodeTableStack
376 }

```

\EndCatcodeRegime

```

377 \LuT@newcommand\EndCatcodeRegime[0]{%
378   \DecCatcodeTableStack
379   \PopCatcodeTableNumStack
380 }

```

## 2.10 Lua module loader

```

381 \begingroup\expandafter\expandafter\expandafter\endgroup
382 \expandafter\ifx\csname RequirePackage\endcsname\relax
383   \input luatex-loader.sty\relax
384 \else
385   \RequirePackage{luatex-loader}[2007/12/12]%
386 \fi

387 \LuT@AtEnd
388 </package>

389 <*loader>

```

Reload check, especially if the package is not used with L<sup>A</sup>T<sub>E</sub>X.

```

390 \begingroup
391   \catcode44 12 % ,
392   \catcode45 12 % -
393   \catcode46 12 % .
394   \catcode58 12 % :
395   \catcode64 11 % @
396   \expandafter\let\expandafter\x\csname ver@luatex-loader.sty\endcsname
397   \ifcase 0%
398     \ifx\x\relax % plain
399     \else
400       \ifx\x\empty % LaTeX
401       \else
402         1%
403       \fi
404     \fi
405   \else
406     \catcode35 6 % #
407     \catcode123 1 % {

```

```

408 \catcode125 2 % }
409 \expandafter\ifx\csname PackageInfo\endcsname\relax
410 \def\x#1#2{%
411 \immediate\write-1{Package #1 Info: #2.}%
412 }%
413 \else
414 \def\x#1#2{\PackageInfo{#1}{#2, stopped}}%
415 \fi
416 \x{luatex-loader}{The package is already loaded}%
417 \endgroup
418 \expandafter\endinput
419 \fi
420 \endgroup
Package identification:
421 \begingroup
422 \catcode35 6 % #
423 \catcode40 12 % (
424 \catcode41 12 % )
425 \catcode44 12 % ,
426 \catcode45 12 % -
427 \catcode46 12 % .
428 \catcode47 12 % /
429 \catcode58 12 % :
430 \catcode64 11 % @
431 \catcode123 1 % {
432 \catcode125 2 % }
433 \expandafter\ifx\csname ProvidesPackage\endcsname\relax
434 \def\x#1#2#3[#4]{\endgroup
435 \immediate\write-1{Package: #3 #4}%
436 \xdef#1{#4}%
437 }%
438 \else
439 \def\x#1#2[#3]{\endgroup
440 #2[{#3}]%
441 \ifx#1\relax
442 \xdef#1{#3}%
443 \fi
444 }%
445 \fi
446 \expandafter\x\csname ver@luatex-loader.sty\endcsname
447 \ProvidesPackage{luatex-loader}%
448 [2007/12/12 v0.1 Lua module loader (HO)]
449 \begingroup
450 \catcode10 12 % ^^J
451 \catcode34 12 % "
452 \catcode39 12 % '
453 \catcode40 12 % (
454 \catcode41 12 % )
455 \catcode44 12 % ,
456 \catcode46 12 % .
457 \catcode61 12 % =
458 \catcode95 12 % _ (other!)
459 \catcode96 12 % '
460 \endlinechar=10 %
461 \directlua0{%
462 do
463 local script = "oberdiek.luatex.lua"
464 local file = kpse.find_file(script, "texmfscripts")
465 if file then
466 texio.write_nl("(" .. file .. ")")
467 dofile(file)
468 else

```

```

469         error("File '" .. script .. "' not found")
470     end
471 end
472 }%
473 \endgroup%
474 </loader>

```

## 2.11 Lua script

Currently L<sup>A</sup>T<sub>E</sub>X does not use KPSE when searching for module files. The following Lua script implements a workaround. It extends `package.loader` by another search method. Modules are found by the module name with extension `..lua` similar to

```
kpsewhich --format=texmfscripts <module>.lua
```

Unhappily `kpsewhich` does not support directory components in the file name. Therefore a module `a.b.c` cannot be installed as `a/b/c.lua`. The script must be named `a.b.c.lua`.

```

475 <lua>

476 module("oberdiek.luatex", package.seeall)

477 function kpse_module_loader(module)
478     local script = module .. ".lua"
479     local file = kpse.find_file(script, "texmfscripts")
480     if file then
481         local loader, error = loadfile(file)
482         if loader then
483             texio.write_nl("(" .. file .. ")")
484             return loader
485         end
486         return "\n\t[oberdiek.luatex.kpse_module_loader] Loading error:\n\t"
487             .. error
488     end
489     return "\n\t[oberdiek.luatex.kpse_module_loader] Search failed"
490 end
491 table.insert(package.loaders, kpse_module_loader)
492 </lua>

```

## 3 Test

```

493 <test2>
494 \documentclass{article}
495 \def\LoadCommand{%
496     \RequirePackage{luatex}[2007/12/12]%
497 }
498 </test2>

499 <test3>
500 \documentclass{article}
501 \def\LoadCommand{%
502     \RequirePackage{luatex-loader}[2007/12/12]%
503 }
504 </test3>

```

### 3.1 Catcode checks for loading

```

505 <test1>
506 \catcode'\{=1 %
507 \catcode'\}=2 %
508 \catcode'\#=6 %
509 \catcode'\@=11 %

```



```

510 \expandafter\ifx\csname count@\endcsname\relax
511   \countdef\count@=255 %
512 \fi
513 \expandafter\ifx\csname @gobble\endcsname\relax
514   \long\def\@gobble#1{}%
515 \fi
516 \expandafter\ifx\csname @firstofone\endcsname\relax
517   \long\def\@firstofone#1{#1}%
518 \fi
519 \expandafter\ifx\csname loop\endcsname\relax
520   \expandafter\@firstofone
521 \else
522   \expandafter\@gobble
523 \fi
524 {%
525   \def\loop#1\repeat{%
526     \def\body{#1}%
527     \iterate
528   }%
529   \def\iterate{%
530     \body
531     \let\next\iterate
532   \else
533     \let\next\relax
534   \fi
535   \next
536 }%
537 \let\repeat=\fi
538 }%
539 \def\RestoreCatcodes{}
540 \count@=0 %
541 \loop
542   \edef\RestoreCatcodes{%
543     \RestoreCatcodes
544     \catcode\the\count@=\the\catcode\count@\relax
545   }%
546 \ifnum\count@<255 %
547   \advance\count@ 1 %
548 \repeat
549
550 \def\RangeCatcodeInvalid#1#2{%
551   \count@=#1\relax
552   \loop
553     \catcode\count@=15 %
554   \ifnum\count@<#2\relax
555     \advance\count@ 1 %
556   \repeat
557 }
558 \expandafter\ifx\csname LoadCommand\endcsname\relax
559   \def\LoadCommand{\input luatex.sty\relax}%
560 \fi
561 \def\Test{%
562   \RangeCatcodeInvalid{0}{47}%
563   \RangeCatcodeInvalid{58}{64}%
564   \RangeCatcodeInvalid{91}{96}%
565   \RangeCatcodeInvalid{123}{255}%
566   \catcode'\@=12 %
567   \catcode'\=0 %
568   \catcode'\{=1 %
569   \catcode'\}=2 %
570   \catcode'\#=6 %
571   \catcode'\[=12 %

```

```

572 \catcode'\]=12 %
573 \catcode'\%=14 %
574 \catcode'\ =10 %
575 \catcode13=5 %
576 \LoadCommand
577 \RestoreCatcodes
578 }
579 \Test
580 \csname @@end\endcsname
581 \end
582 </test1>

```

## 3.2 Catcode tables

### 3.2.1 Predefined catcode tables

```

583 <*test4>
584 \NeedsTeXFormat{LaTeX2e}

```

Remember L<sup>A</sup>T<sub>E</sub>X's initial catcodes in count registers starting at \TestLaTeX.

```

585 \count0=0 %
586 \chardef\TestLaTeX=1000 %
587 \chardef\TestMax=300 %
588 \loop
589 \count\numexpr\TestLaTeX+\count0\relax=\catcode\count0 %
590 \ifnum\count0<\TestMax
591 \advance\count0 by 1 %
592 \repeat
593 \documentclass{minimal}
594 \usepackage{luatex}[2007/12/12]
595 \usepackage{qstest}
596 \IncludeTests{*}
597 \LogTests{log}{*}{*}
598 \makeatletter
599 \def\Check#1{%
600 \Expect*{\the\count@=\the\catcode\count@}%
601 *{\the\count@=#1}%
602 }
603 \newcount\scratch
604 \def\Test#1#2{%
605 \begin{qstest}{CatcodeTable#1}{CatcodeTable#1}%
606 \catcodetable\csname CatcodeTable#1\endcsname
607 \count@=\z@
608 \loop
609 \scratch=#2\relax
610 \Expect*{\the\count@=\the\catcode\count@}%
611 *{\the\count@=\the\scratch}%
612 \ifnum\count@<\TestMax
613 \advance\count@\@ne
614 \repeat
615 \end{qstest}%
616 }
617 \Test{LaTeX}{\the\count\numexpr\TestLaTeX+\count@}
618 \Test{String}{\ifnum\count@=32 10\else 12\fi}
619 \Test{Other}{12}
620 \initcatcodetable99 %
621 \Test{IniTeX}{%
622 0\relax
623 \begingroup
624 \catcodetable99 %
625 \global\scratch=\the\catcode\count@
626 \endgroup
627 }

```

### 3.2.2 Catcode table number stack

```

628 \begin{qstest}{CatcodeTableNumStack}{CatcodeTableNumStack}
629   \def\TestStack#1{%
630     \Expect*{\LuT@NumStack}{#1}%
631   }%
632   \TestStack{0}%
633   \PushCatcodeTableNumStack
634   \TestStack{{0}0}%
635   \@firstofone{%
636     \begingroup
637       \initcatcodetable12 %
638       \catcodetable12 %
639       \PushCatcodeTableNumStack
640       \TestStack{{12}{0}0}%
641       \PopCatcodeTableNumStack
642       \TestStack{{0}0}%
643       \PopCatcodeTableNumStack
644       \TestStack{0}%
645       \def\TestWarning{Missing empty stack warning}%
646       \def\@PackageWarning#1#2{\def\TestWarning{empty stack}}%
647       \PopCatcodeTableNumStack
648       \TestStack{0}%
649       \Expect*{\TestWarning}{empty stack}%
650     \endgroup
651   }%
652 \end{qstest}

```

### 3.2.3 Catcode table stack

```

653 \begin{qstest}{CatcodeTableStack}{CatcodeTableStack}
654   \def\TestStack#1{%
655     \Expect*{\the\CatcodeTableStack}{#1}%
656   }%
657   \TestStack{0}%
658   \IncCatcodeTableStack
659   \TestStack{2}%
660   \IncCatcodeTableStack
661   \TestStack{4}%
662   \begingroup
663     \IncCatcodeTableStack
664     \TestStack{6}%
665   \endgroup
666   \TestStack{6}%
667   \begingroup
668     \DecCatcodeTableStack
669     \TestStack{4}%
670   \endgroup
671   \TestStack{4}%
672   \DecCatcodeTableStack
673   \TestStack{2}%
674   \DecCatcodeTableStack
675   \TestStack{0}%
676   \begingroup
677     \def\TestError{Missing error}%
678     \def\@PackageError#1#2#3{%
679       \def\TestError{Empty stack}%
680     }%
681     \DecCatcodeTableStack
682     \TestStack{0}%
683     \Expect*{\TestError}{Empty stack}%
684   \endgroup
685 \end{qstest}

```

### 3.2.4 Catcode regime macros

```

686 \begin{qstest}{CatcodeRegime}{CatcodeRegime}
687   \def\TestStacks#1#2#3{%
688     \Expect*{\the\catcodetable}{#1}%
689     \Expect*{\the\CatcodeTableStack}{#2}%
690     \Expect*{\LuT@NumStack}{#3}%
691   }%
692   \TestStacks{0}{0}{0}%
693   \catcode'\|=7 %
694   \BeginCatcodeRegime\CatcodeTableLaTeX
695     \TestStacks{2}{2}{00}%
696     \Expect*{\the\catcode'\|}{12}%
697   \EndCatcodeRegime
698   \TestStacks{0}{0}{0}%
699   \Expect*{\the\catcode'\|}{7}%
700 \end{qstest}

```

### 3.3 Attribute allocation

```

701 \begin{qstest}{Attributes}{Attributes}
702   \newattribute\TestAttr
703   \Expect*{\meaning\TestAttr}%
704     *{\string\attribute\number\allocationnumber}%
705   \Expect*{\the\allocationnumber}{0}%
706   \begingroup
707     \newattribute\TestAttr
708     \Expect*{\the\allocationnumber}{1}%
709   \endgroup
710   \Expect*{\the\allocationnumber}{0}%
711   \Expect*{\meaning\TestAttr}*{\string\attribute1}%
712   \Expect*{\the\TestAttr}{-1}%
713   \def\Test#1{%
714     \setattribute\TestAttr{#1}%
715     \Expect*{\the\TestAttr}{#1}%
716   }%
717   \Test{0}%
718   \Test{1}%
719   \Test{-1}%
720   \Test{123}%
721   \unsetattribute\TestAttr
722   \Expect*{\the\TestAttr}{-1}%
723   \begingroup
724     \Expect*{\the\TestAttr}{-1}%
725     \Test{1234}%
726   \endgroup
727   \Expect*{\the\TestAttr}{-1}%
728 \end{qstest}

```

### 3.4 Lua states

```

729 \begin{qstest}{LuaState}{LuaState}
730   \newluastate\TestLuaState
731   \Expect*{\number\TestLuaState}{1}%
732   \newluastate\TestLuaState
733   \Expect*{\number\TestLuaState}{2}%
734 \end{qstest}

735 \@@end
736 \end{test4}

```

### 3.5 Short test for plain-TeX

```

737 (*test5)
738 \input luatex.sty\relax
739 \newluastate\TestLuaState

```

```

740 \newattribute\TestAttr
741 \setattribute\TestAttr{10}
742 \unsetattribute\TestAttr
743 \newcatcodetable\TestCTa
744 \begingroup
745   \SetCatcodeRange{'A'}{'Z'}{12}%
746 \endgroup
747 \BeginCatcodeRegime\CatcodeTableLaTeX
748 \EndCatcodeRegime
749 \end
750 </test5>

```

## 4 Installation

### 4.1 Download

**Package.** This package is available on CTAN<sup>1</sup>:

[CTAN:macros/latex/contrib/oberdiek/luatex.dtx](#) The source file.

[CTAN:macros/latex/contrib/oberdiek/luatex.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 T<sub>E</sub>X 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-T<sub>E</sub>X:

```
tex luatex.dtx
```

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

---

<sup>1</sup><http://ftp.ctan.org/tex-archive/>

```

luatex.sty          → tex/generic/oberdiek/luatex.sty
luatex-loader.sty   → tex/generic/oberdiek/luatex-loader.sty
oberdiek.luatex.lua  → scripts/oberdiek/oberdiek.luatex.lua
luatex.pdf          → doc/latex/oberdiek/luatex.pdf
test/luatex-test1.tex → doc/latex/oberdiek/test/luatex-test1.tex
test/luatex-test2.tex → doc/latex/oberdiek/test/luatex-test2.tex
test/luatex-test3.tex → doc/latex/oberdiek/test/luatex-test3.tex
test/luatex-test4.tex → doc/latex/oberdiek/test/luatex-test4.tex
test/luatex-test5.tex → doc/latex/oberdiek/test/luatex-test5.tex
luatex.dtx          → source/latex/oberdiek/luatex.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`.

## 4.4 Refresh file name databases

If your  $\text{T}_{\text{E}}\text{X}$  distribution (te $\text{T}_{\text{E}}\text{X}$ , mik $\text{T}_{\text{E}}\text{X}$ , ...) relies on file name databases, you must refresh these. For example, te $\text{T}_{\text{E}}\text{X}$  users run `texhash` or `mktextlsr`.

## 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 luatex.pdf unpack_files output .
```

**Unpacking with  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ .** The `.dtx` chooses its action depending on the format:

**plain- $\text{T}_{\text{E}}\text{X}$ :** Run `docstrip` and extract the files.

**$\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ :** Generate the documentation.

If you insist on using  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$  for `docstrip` (really, `docstrip` does not need  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ ), then inform the autodetect routine about your intention:

```
latex \let\install=y\input{luatex.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 pdf $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ :

```

pdflatex luatex.dtx
makeindex -s gind.ist luatex.idx
pdflatex luatex.dtx
makeindex -s gind.ist luatex.idx
pdflatex luatex.dtx

```

## 5 History

[2007/12/12 v0.1]

- First public version.

## 6 Index

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