

The `luatex` package

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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

\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- \TeX or \LaTeX implement an allocation scheme for registers. A package reserves with `\newcount` an unused register number for its own exclusive use.

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

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

1.1.1 \LaTeX

$\text{\LaTeX} 2_{\varepsilon}$ is frozen and therefore refuses to even notice the new \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 Lua \TeX and starts to support at least a few of the new features.

1.1.2 plain- \TeX

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

1.2 Register allocation

1.2.1 Register with 16 bit

Because LuaTeX is a super set of ε -TeX 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 LuaTeX stores the registers of a class in the same Lua table unlike ε -TeX, where registers below 256 are stored in an array and higher numbers are put in a tree structure.

1.3 Attributes

Nodes can have custom attributes in LuaTeX. 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 TeX's range of non-negative integers up to 2^{31} are available.

`\newattribute {⟨cmd⟩}`

Macro `\newattribute` defines command `⟨cmd⟩` using `\attributedef` using a 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 TeX integer numbers).

`\unsetattribute {⟨cmd⟩}`

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

1.4 Catcode tables

LuaTeX 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^AT_EX 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: LuaTeX'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_EX Live 2007.)

1.4.1 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_EX's catcodes.

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

These are catcode tables and must not be changed. `\CatcodeTableIniTeX` contains the catcode settings of ini-T_EX. `\CatcodeTableString` follows T_EX'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^AT_EX 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.

<code>\PushCatcodeTableNumStack</code> <code>\PopCatcodeTableNumStack</code>

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.

<code>\BeginCatcodeRegime {<i><catcodetable></i>}</code> <code>\EndCatcodeRegime</code>
--

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

```

\PushCatcodeTableNumStack
\catcodetable<catcodetable> \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 \LaTeX 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.

<code>\SetCatcodeRange {<i><from></i>} {<i><to></i>} {<i><catcode></i>}</code>
--

The catcodes of characters in range from *<from>* to inclusive *<to>* are set to *<catcode>*.

1.5 Lua module loading

Currently Lua \TeX (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 *<module>* by

```
kpse.find_file("<module>.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.

1.5.1 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^AT_EX are supported.

2 Implementation

```
1 (*package)
```

2.1 Reload check and package identification

Reload check, especially if the package is not used with L^AT_EX.

```
2 \begingroup
3 \catcode44 12 % ,
4 \catcode45 12 % -
5 \catcode46 12 % .
6 \catcode58 12 % :
7 \catcode64 11 % @
8 \catcode123 1 % {
9 \catcode125 2 % }
10 \expandafter\let\expandafter\x\csname ver@luatex.sty\endcsname
11 \ifx\x\relax % plain-TeX, first loading
12 \else
13 \def\empty{}%
14 \ifx\x\empty % LaTeX, first loading,
15 % variable is initialized, but \ProvidesPackage not yet seen
16 \else
17 \catcode35 6 % #
18 \expandafter\ifx\csname PackageInfo\endcsname\relax
19 \def\x#1#2{%
20 \immediate\write-1{Package #1 Info: #2.}%
21 }%
22 \else
23 \def\x#1#2{\PackageInfo{#1}{#2, stopped}}%
24 \fi
25 \x{luatex}{The package is already loaded}%
26 \aftergroup\endinput
27 \fi
28 \fi
29 \endgroup
```

Package identification:

```
30 \begingroup
31 \catcode35 6 % #
32 \catcode40 12 % (
33 \catcode41 12 % )
34 \catcode44 12 % ,
35 \catcode45 12 % -
36 \catcode46 12 % .
37 \catcode47 12 % /
38 \catcode58 12 % :
39 \catcode64 11 % @
```

```

40 \catcode91 12 % [
41 \catcode93 12 % ]
42 \catcode123 1 % {
43 \catcode125 2 % }
44 \expandafter\ifx\csname ProvidesPackage\endcsname\relax
45   \def\x#1#2#3[#4]{\endgroup
46     \immediate\write-1{Package: #3 #4}%
47     \xdef#1{#4}%
48   }%
49 \else
50   \def\x#1#2[#3]{\endgroup
51     #2[{#3}]%
52     \ifx#1@undefined
53       \xdef#1{#3}%
54     \fi
55     \ifx#1\relax
56       \xdef#1{#3}%
57     \fi
58   }%
59 \fi
60 \expandafter\x\csname ver@luatex.sty\endcsname
61 \ProvidesPackage{luatex}%
62 [2010/03/09 v0.4 LuaTeX basic definition package (H0)]

```

2.2 Catcodes

```

63 \begingroup
64 \catcode123 1 % {
65 \catcode125 2 % }
66 \def\x{\endgroup
67   \expandafter\edef\csname LuT@AtEnd\endcsname{%
68     \catcode35 \the\catcode35\relax
69     \catcode64 \the\catcode64\relax
70     \catcode123 \the\catcode123\relax
71     \catcode125 \the\catcode125\relax
72   }%
73 }%
74 \x
75 \catcode35 6 % #
76 \catcode64 11 % @
77 \catcode123 1 % {
78 \catcode125 2 % }
79 \def\TMP@EnsureCode#1#2{%
80   \edef\LuT@AtEnd{%
81     \LuT@AtEnd
82     \catcode#1 \the\catcode#1\relax
83   }%
84   \catcode#1 #2\relax
85 }
86 \TMP@EnsureCode{10}{12}% ^^J
87 \TMP@EnsureCode{34}{12}% "
88 \TMP@EnsureCode{36}{3}% $
89 \TMP@EnsureCode{39}{12}% '
90 \TMP@EnsureCode{40}{12}% (
91 \TMP@EnsureCode{41}{12}% )
92 \TMP@EnsureCode{42}{12}% *
93 \TMP@EnsureCode{43}{12}% +
94 \TMP@EnsureCode{44}{12}% ,
95 \TMP@EnsureCode{45}{12}% -
96 \TMP@EnsureCode{46}{12}% .
97 \TMP@EnsureCode{47}{12}% /
98 \TMP@EnsureCode{60}{12}% <

```

```

99 \TMP@EnsureCode{61}{12}% =
100 \TMP@EnsureCode{62}{12}% >
101 \TMP@EnsureCode{95}{12}% _ (other!)
102 \TMP@EnsureCode{96}{12}% '

```

2.3 Check for LuaTeX

Without LuaTeX there is no point in using this package.

```

103 \begingroup\expandafter\expandafter\expandafter\endgroup
104 \expandafter\ifx\csname RequirePackage\endcsname\relax
105   \input infwarerr.sty\relax
106   \input ifluatex.sty\relax
107 \else
108   \RequirePackage{infwarerr}[2007/09/09]%
109   \RequirePackage{ifluatex}[2009/04/10]%
110 \fi

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

```

2.4 Provide LuaTeX primitives

```

119 \ifnum\luatexversion<36 %
120   \def\LuT@MakePrimitive#1{%
121     \expandafter\let\csname luatex#1\expandafter\endcsname
122     \csname #1\endcsname
123   }%
124 \else
125   \def\LuT@MakeLuatexPrimitive#1{%
126     \begingroup\expandafter\expandafter\expandafter\endgroup
127     \expandafter\ifx\csname luatex#1\endcsname\relax
128       \begingroup\expandafter\expandafter\expandafter\endgroup
129       \expandafter\ifx\csname #1\endcsname\relax
130         \else
131           \expandafter\let
132           \csname luatex#1\expandafter\endcsname
133           \csname #1\endcsname
134         \fi
135       \fi
136     \begingroup\expandafter\expandafter\expandafter\endgroup
137     \expandafter\ifx\csname luatex#1\endcsname\relax
138       \begingroup
139         \expandafter\let\csname luatex#1\endcsname\@undefined
140         \ifnum0%
141           \directlua{%
142             if tex.enableprimitives then %
143               tex.enableprimitives('luatex',{#1'})%
144               tex.print('1')%
145             end%
146           }%
147         \expandafter\ifx\csname luatex#1\endcsname\relax\else1\fi
148       =11 %
149       \global\expandafter\let
150       \csname luatex#1\expandafter\endcsname
151       \csname luatex#1\endcsname
152     \else
153       \@PackageError{luatex}{%

```



```

154         tex.enableprimitives failed for '#1'%
155     }\@ehc
156 \fi
157 \endgroup
158 \fi
159 }%
160 \def\LuT@MakePrimitive#1{%
161     \begingroup\expandafter\expandafter\expandafter\endgroup
162     \expandafter\ifx\csname#1\endcsname\relax
163         \begingroup
164             \expandafter\let\csname#1\endcsname\@undefined
165             \ifnum0%
166                 \directlua{%
167                     if tex.enableprimitives then %
168                         tex.enableprimitives('',{ '#1'})%
169                         tex.print('1')%
170                     end%
171                 }%
172             \expandafter\ifx\csname#1\endcsname\relax\else1\fi
173             =11 %
174             \global\expandafter\let
175             \csname#1\expandafter\endcsname
176             \csname#1\endcsname
177         \else
178             \@PackageError{luatex}{%
179                 tex.enableprimitives failed for '#1'%
180             }\@ehc
181         \fi
182     \endgroup
183 \fi
184 }%
185 \fi
186 \LuT@MakeLuatexPrimitive{attribute}
187 \LuT@MakeLuatexPrimitive{attributedef}
188 \LuT@MakeLuatexPrimitive{catcodetable}
189 \LuT@MakeLuatexPrimitive{initcatcodetable}
190 \LuT@MakeLuatexPrimitive{luaescapestring}
191 \LuT@MakeLuatexPrimitive{savecatcodetable}
192 \LuT@MakePrimitive{numexpr}

```

2.5 Inherit support for ε -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`.

```

193 \begingroup\expandafter\expandafter\expandafter\endgroup
194 \expandafter\ifx\csname RequirePackage\endcsname\relax
195 \else
196     \RequirePackage{etex}[1998/03/26]%
197 \fi

```

2.6 Adaption of ε -TeX's register allocation

ε -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.

```

198 \begingroup\expandafter\expandafter\expandafter\endgroup
199 \expandafter\ifx\csname et@xins\endcsname\relax
200     \@PackageWarningNoLine{luatex}{%
201         Support for eTeX is not loaded (etex.src)%

```

```

202 }%
203 \else
204   \def\LuT@temp#1{%
205     \ifnum\count27#1=32768 %
206       \count27#1=65536 %
207     \fi
208   }%
209   \LuT@temp0%
210   \LuT@temp1%
211   \LuT@temp2%
212   \LuT@temp3%
213   \LuT@temp4%
214   \LuT@temp5%
215   \LuT@temp6%

```

ε -TeX uses an array for the first 256 registers and then a tree structure. LuaTeX 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.

```

216 \let\newcount\globcount
217 \let\newdimen\globdimen
218 \let\newskip\globskip
219 \let\newbox\globbox
220 \fi

```

2.7 plain-TeX compatibility

\@empty

```

221 \expandafter\ifx\csname @empty\endcsname\relax
222   \def\@empty{}%
223 \fi

```

\@gobble

```

224 \expandafter\ifx\csname @gobble\endcsname\relax
225   \long\def\@gobble#1{}%
226 \fi

```

\@firstofone

```

227 \expandafter\ifx\csname @firstofone\endcsname\relax
228   \long\def\@firstofone#1{#1}%
229 \fi

```

\@firstoftwo

```

230 \expandafter\ifx\csname @firstoftwo\endcsname\relax
231   \long\def\@firstoftwo#1#2{#1}%
232 \fi

```

\@car

```

233 \expandafter\ifx\csname @car\endcsname\relax
234   \def\@car#1#2\@nil{#1}%
235 \fi

```

\@cdr

```

236 \expandafter\ifx\csname @cdr\endcsname\relax
237   \def\@cdr#1#2\@nil{#2}%
238 \fi

```

\@ifstar

```

239 \expandafter\ifx\csname @ifstar\endcsname\relax
240   \def\@ifstar#1{%
241     \@ifnextchar*{\@firstoftwo{#1}}%
242   }%

```

```

\@ifnextchar
243 \long\def\@ifnextchar#1#2#3{%
244 \let\reserved@d=#1%
245 \def\reserved@a{#2}%
246 \def\reserved@b{#3}%
247 \futurelet\@let@token\@ifnch
248 }%

\@ifnch
249 \def\@ifnch{%
250 \ifx\@let@token\@sptoken
251 \let\reserved@c\@xifnch
252 \else
253 \ifx\@let@token\reserved@d
254 \let\reserved@c\reserved@a
255 \else
256 \let\reserved@c\reserved@b
257 \fi
258 \fi
259 \reserved@c
260 }%

\@sptoken
261 \let\LuT@temp\:%
262 \def\:{\let\@sptoken= }%
263 \: % explicit space

\@xifnch
264 \def\:{\@xifnch}%
265 \expandafter\def\:{ {%
266 \futurelet\@let@token\@ifnch
267 }%
268 \let\:\LuT@temp
269 \fi

\@tempcnta
270 \expandafter\ifx\csname @tempcnta\endcsname\relax
271 \csname newcount\endcsname\@tempcnta
272 \fi

\@tempcntb
273 \expandafter\ifx\csname @tempcntb\endcsname\relax
274 \csname newcount\endcsname\@tempcntb
275 \fi

\LuT@newcommand
276 \begingroup\expandafter\expandafter\expandafter\endgroup
277 \expandafter\ifx\csname newcommand\endcsname\relax
278 \def\LuT@newcommand#1[#2]#3{%
279 \ifx#1\@undefined
280 \let#1\relax
281 \else
282 \ifx#1\relax
283 \else
284 \@PackageError{luatex}{%
285 \string#1 is already defined.\MessageBreak
286 Redefinition is skipped%
287 }\@ehc
288 \fi
289 \fi
290 \ifx#1\relax

```

```

291     \ifcase#2 %
292     \def#1{#3}%
293     \or
294     \def#1##1{#3}%
295     \or
296     \def#1##1##2{#3}%
297     \or
298     \def#1##1##2##3{#3}%
299     \or
300     \@INTERNAL@ERROR
301     \fi
302 \fi
303 }%
304 \else
305 \def\LuT@newcommand{\newcommand*}%
306 \fi

```

2.8 Attributes

2.8.1 Allocation

\LuT@AllocAttribute

```

307 \newcount\LuT@AllocAttribute
308 \LuT@AllocAttribute=\m@ne

```

\newattribute

```

309 \LuT@newcommand\newattribute[1]{%
310 \ifnum\LuT@AllocAttribute<65535 %
311 \global\advance\LuT@AllocAttribute\@ne
312 \allocationnumber\LuT@AllocAttribute
313 \global\luatexattributedef#1=\allocationnumber
314 \unsetattribute{#1}%
315 \wlog{\string#1=\string\attribute\the\allocationnumber}%
316 \else
317 \errmessage{No room for a new \string\attribute}%
318 \fi
319 }

```

2.8.2 Interface

\setattribute

```

320 \LuT@newcommand\setattribute[2]{%
321 #1=\numexpr#2\relax
322 }

```

\unsetattribute

```

323 \ifnum\luatexversion<37
324 \LuT@newcommand\LuT@UnsetAttributeValue[0]{}%
325 \let\LuT@UnsetAttributeValue\m@ne
326 \else
327 \LuT@newcommand\LuT@UnsetAttributeValue[0]{-2147483647}%
328 \fi
329 \LuT@newcommand\unsetattribute[1]{%
330 #1=\LuT@UnsetAttributeValue
331 }

```

2.9 Catcode tables

2.9.1 Allocation

\LuT@AllocCatcodeTable

```

332 \newcount\LuT@AllocCatcodeTable
333 \LuT@AllocCatcodeTable=\m@ne
334 \newcount\CatcodeTableStack
335 \CatcodeTableStack=\z@

\newcatcodetable

336 \LuT@newcommand\newcatcodetable[1]{%
337   \ifnum\LuT@AllocCatcodeTable<1114110 % 0x10FFFF is maximal \chardef
338     % or < 268435455 %  $2^{28} - 1$ 
339   \global\advance\LuT@AllocCatcodeTable by\tw@
340   \allocationnumber=\LuT@AllocCatcodeTable
341   \global\chardef#1=\allocationnumber
342   \wlog{%
343     \string#1=\string\catcodetable\the\allocationnumber
344   }%
345   \else
346     \errmessage{No room for a new \string\catcodetable}%
347   \fi
348 }%
```

\IncCatcodeTableStack

```

349 \LuT@newcommand\IncCatcodeTableStack[0]{%
350   \ifnum\CatcodeTableStack<268435454 %
351   \global\advance\CatcodeTableStack by\tw@
352   \else
353     \@PackageError{luatex}{%
354       Catcode table stack overflow%
355     }\@ehd
356   \fi
357 }
```

\DecCatcodeTableStack

```

358 \LuT@newcommand\DecCatcodeTableStack[0]{%
359   \ifnum\CatcodeTableStack>\z@
360   \global\advance\CatcodeTableStack by-2 %
361   \else
362     \@PackageError{luatex}{%
363       Catcode table stack is empty%
364     }\@ehd
365   \fi
366 }
```

2.9.2 \SetCatcodeRange

\SetCatcodeRange

```

367 \LuT@newcommand\SetCatcodeRange[3]{%
368   \edef\LuT@temp{%
369     \noexpand\@tempcnta=\the\@tempcnta
370     \noexpand\@tempcntb=\the\@tempcntb
371     \noexpand\count@=\the\count@
372     \relax
373   }%
374   \@tempcnta=\numexpr#1\relax
375   \@tempcntb=\numexpr#2\relax
376   \count@=\numexpr#3\relax
377   \loop
378     \unless\ifnum\@tempcnta>\@tempcntb
379     \catcode\@tempcnta=\count@
380     \advance\@tempcnta by \@ne
381   \repeat
382   \LuT@temp
383 }
```

2.9.3 Predefined catcode tables

```

384 \newcatcodetable\CatcodeTableIniTeX
385 \newcatcodetable\CatcodeTableString
386 \newcatcodetable\CatcodeTableOther
387 \newcatcodetable\CatcodeTableLaTeX

388 \luatexinitcatcodetable\CatcodeTableIniTeX
389 \begingroup
390   \def\@makeother#1{\catcode#1=12\relax}%
391   \@firstofone{%
392     \luatexcatcodetable\CatcodeTableIniTeX
393     \begingroup
394       \SetCatcodeRange{0}{8}{15}%
395       \catcode9=10 % tab
396       \catcode11=15 %
397       \catcode12=13 % form feed
398       \SetCatcodeRange{14}{31}{15}%
399       \catcode35=6 % hash
400       \catcode36=3 % dollar
401       \catcode38=4 % ampersand
402       \catcode94=7 % circumflex
403       \catcode95=8 % underscore
404       \catcode123=1 % brace left
405       \catcode125=2 % brace right
406       \catcode126=13 % tilde
407       \catcode127=15 %
408       \luatexsavecatcodetable\CatcodeTableLaTeX
409     \endgroup
410     \@makeother{0}% nul
411     \@makeother{13}% carriage return
412     \@makeother{37}% percent
413     \@makeother{92}% backslash
414     \@makeother{127}%
415     \SetCatcodeRange{65}{90}{12}% A-Z
416     \SetCatcodeRange{97}{122}{12}% a-z
417     \luatexsavecatcodetable\CatcodeTableString
418     \@makeother{32}% space
419     \luatexsavecatcodetable\CatcodeTableOther
420   \endgroup
421 }%
```

2.9.4 Number stack

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

```
422 \def\LuT@NumStackEmpty{0}
```

`\LuT@NumStack`

```
423 \let\LuT@NumStack\LuT@NumStackEmpty
```

`\PushCatcodeTableNumStack`

```

424 \LuT@newcommand\PushCatcodeTableNumStack[0]{%
425   \xdef\LuT@NumStack{%
426     {\the\luatexcatcodetable}\LuT@NumStack
427   }%
428 }
```

`\PopCatcodeTableNumStack`

```

429 \LuT@newcommand\PopCatcodeTableNumStack[0]{%
430   \ifx\LuT@NumStack\LuT@NumStackEmpty
431     \@PackageWarning{luatex}{Empty catcode table number stack}%
432     \luatexcatcodetable\z@
433   \else
```

```

434 \luatexcatcodetable=\expandafter\@car\LuT@NumStack\@nil\relax
435 \xdef\LuT@NumStack{%
436 \expandafter\@cdr\LuT@NumStack\@nil
437 }%
438 \fi
439 }

```

2.9.5 Catcode regime macros

`\BeginCatcodeRegime`

```

440 \LuT@newcommand\BeginCatcodeRegime[1]{%
441 \PushCatcodeTableNumStack
442 \luatexcatcodetable=numexpr#1\relax
443 \IncCatcodeTableStack
444 \luatexsavecatcodetable\CatcodeTableStack
445 \luatexcatcodetable\CatcodeTableStack
446 }

```

`\EndCatcodeRegime`

```

447 \LuT@newcommand\EndCatcodeRegime[0]{%
448 \DecCatcodeTableStack
449 \PopCatcodeTableNumStack
450 }

```

2.10 Lua module loader

```

451 \begingroup\expandafter\expandafter\expandafter\endgroup
452 \expandafter\ifx\csname RequirePackage\endcsname\relax
453 \input luatex-loader.sty\relax
454 \else
455 \RequirePackage{luatex-loader}[2010/03/09]%
456 \fi

457 \LuT@AtEnd
458 </package>

459 <*loader>

```

Reload check, especially if the package is not used with L^AT_EX.

```

460 \begingroup
461 \catcode44 12 % ,
462 \catcode45 12 % -
463 \catcode46 12 % .
464 \catcode58 12 % :
465 \catcode64 11 % @
466 \catcode123 1 % {
467 \catcode125 2 % }
468 \expandafter\let\expandafter\x\csname ver@luatex-loader.sty\endcsname
469 \ifx\x\relax % plain-TeX, first loading
470 \else
471 \def\empty{%
472 \ifx\x\empty % LaTeX, first loading,
473 % variable is initialized, but \ProvidesPackage not yet seen
474 \else
475 \catcode35 6 % #
476 \expandafter\ifx\csname PackageInfo\endcsname\relax
477 \def\x#1#2{%
478 \immediate\write-1{Package #1 Info: #2.}%
479 }%
480 \else
481 \def\x#1#2{\PackageInfo{#1}{#2, stopped}}%
482 \fi
483 \x{luatex-loader}{The package is already loaded}%

```

```

484     \aftergroup\endinput
485     \fi
486     \fi
487 \endgroup
Package identification:
488 \begingroup
489   \catcode35 6 % #
490   \catcode40 12 % (
491   \catcode41 12 % )
492   \catcode44 12 % ,
493   \catcode45 12 % -
494   \catcode46 12 % .
495   \catcode47 12 % /
496   \catcode58 12 % :
497   \catcode64 11 % @
498   \catcode91 12 % [
499   \catcode93 12 % ]
500   \catcode123 1 % {
501   \catcode125 2 % }
502   \expandafter\ifx\csname ProvidesPackage\endcsname\relax
503     \def\x#1#2#3[#4]{\endgroup
504       \immediate\write-1{Package: #3 #4}%
505       \xdef#1{#4}%
506     }%
507   \else
508     \def\x#1#2[#3]{\endgroup
509       #2[#3]}%
510     \ifx#1@undefined
511       \xdef#1{#3}%
512     \fi
513     \ifx#1\relax
514       \xdef#1{#3}%
515     \fi
516   }%
517 \fi
518 \expandafter\x\csname ver@luatex-loader.sty\endcsname
519 \ProvidesPackage{luatex-loader}%
520 [2010/03/09 v0.4 Lua module loader (H0)]
521 \begingroup
522   \catcode10 12 % ^^J
523   \catcode34 12 % "
524   \catcode39 12 % '
525   \catcode40 12 % (
526   \catcode41 12 % )
527   \catcode44 12 % ,
528   \catcode46 12 % .
529   \catcode60 12 % <
530   \catcode61 12 % =
531   \catcode95 12 % _ (other!)
532   \catcode96 12 % `
533   \endlinechar=10 %
534   \ifnum\luatexversion<36 %
535     \directlua0%
536   \else %
537     \expandafter\directlua %
538   \fi %
539   {%
540     do
541       local script = "oberdiek.luatex.lua"
542       local file = kpse.find_file(script, "texmfscripts")
543       if file then
544         texio.write_nl("(" .. file .. ")")

```



```

545         dofile(file)
546     else
547         error("File '" .. script .. "' not found")
548     end
549 end
550 }%
551 \endgroup%
552 </loader>

```

2.11 Lua script

Currently LuaTeX 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`.

```

553 <*lua>

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

555 function kpse_module_loader(module)
556     local script = module .. ".lua"
557     local file = kpse.find_file(script, "texmfscripts")
558     if file then
559         local loader, error = loadfile(file)
560         if loader then
561             texio.write_nl("(" .. file .. ")")
562             return loader
563         end
564         return "\n\t[oberdiek.luatex.kpse_module_loader] Loading error:\n\t"
565             .. error
566     end
567     return "\n\t[oberdiek.luatex.kpse_module_loader] Search failed"
568 end
569 table.insert(package.loaders, kpse_module_loader)
570 </lua>

```

3 Test

```

571 <*test2>
572 \documentclass{article}
573 \def\LoadCommand{%
574     \RequirePackage{luatex}[2010/03/09]%
575 }
576 </test2>

577 <*test3>
578 \documentclass{article}
579 \def\LoadCommand{%
580     \RequirePackage{luatex-loader}[2010/03/09]%
581 }
582 </test3>

```

3.1 Catcode checks for loading

```

583 <*test1>

584 \catcode'\{=1 %
585 \catcode'\}=2 %

```

```

586 \catcode'\#=6 %
587 \catcode'\@=11 %
588 \expandafter\ifx\csname count@\endcsname\relax
589 \countdef\count@=255 %
590 \fi
591 \expandafter\ifx\csname @gobble\endcsname\relax
592 \long\def\@gobble#1{%
593 \fi
594 \expandafter\ifx\csname @firstofone\endcsname\relax
595 \long\def\@firstofone#1{#1}%
596 \fi
597 \expandafter\ifx\csname loop\endcsname\relax
598 \expandafter\@firstofone
599 \else
600 \expandafter\@gobble
601 \fi
602 {%
603 \def\loop#1\repeat{%
604 \def\body{#1}%
605 \iterate
606 }%
607 \def\iterate{%
608 \body
609 \let\next\iterate
610 \else
611 \let\next\relax
612 \fi
613 \next
614 }%
615 \let\repeat=\fi
616 }%
617 \def\RestoreCatcodes{
618 \count@=0 %
619 \loop
620 \edef\RestoreCatcodes{%
621 \RestoreCatcodes
622 \catcode\the\count@=\the\catcode\count@\relax
623 }%
624 \ifnum\count@<255 %
625 \advance\count@ 1 %
626 \repeat
627
628 \def\RangeCatcodeInvalid#1#2{%
629 \count@=#1\relax
630 \loop
631 \catcode\count@=15 %
632 \ifnum\count@<#2\relax
633 \advance\count@ 1 %
634 \repeat
635 }
636 \expandafter\ifx\csname LoadCommand\endcsname\relax
637 \def\LoadCommand{\input luatex.sty\relax}%
638 \fi
639 \def\Test{%
640 \RangeCatcodeInvalid{0}{47}%
641 \RangeCatcodeInvalid{58}{64}%
642 \RangeCatcodeInvalid{91}{96}%
643 \RangeCatcodeInvalid{123}{255}%
644 \catcode'\@=12 %
645 \catcode'\=0 %
646 \catcode'\{=1 %
647 \catcode'\}=2 %

```

```

648 \catcode'\#=6 %
649 \catcode'\[=12 %
650 \catcode'\]=12 %
651 \catcode'\%=14 %
652 \catcode'\ =10 %
653 \catcode13=5 %
654 \LoadCommand
655 \RestoreCatcodes
656 }
657 \Test
658 \csname @@end\endcsname
659 \end
660 </test1>

```

3.2 Catcode tables

3.2.1 Predefined catcode tables

```

661 <*test4>
662 \NeedsTeXFormat{LaTeX2e}

```

Remember L^AT_EX's initial catcodes in count registers starting at \TestLaTeX.

```

663 \count0=0 %
664 \chardef\TestLaTeX=1000 %
665 \chardef\TestMax=300 %
666 \loop
667   \count\numexpr\TestLaTeX+\count0\relax=\catcode\count0 %
668   \ifnum\count0<\TestMax
669     \advance\count0 by 1 %
670   \repeat
671 \documentclass{minimal}
672 \usepackage{luatex}[2010/03/09]
673 \usepackage{qstest}
674 \IncludeTests{*}
675 \LogTests{log}{*}{*}
676 \makeatletter
677 \def\Check#1{%
678   \Expect*{\the\count@=\the\catcode\count@}%
679   *{\the\count@=#1}%
680 }
681 \newcount\scratch
682 \def\Test#1#2{%
683   \begin{qstest}{CatcodeTable#1}{CatcodeTable#1}%
684     \luatexcatcodetable\csname CatcodeTable#1\endcsname
685     \count@=\z@
686     \loop
687       \scratch=#2\relax
688       \Expect*{\the\count@=\the\catcode\count@}%
689       *{\the\count@=\the\scratch}%
690       \ifnum\count@<\TestMax
691         \advance\count@\@ne
692       \repeat
693   \end{qstest}%
694 }
695 \Test{LaTeX}{\the\count\numexpr\TestLaTeX+\count@}
696 \Test{String}{\ifnum\count@=32 10\else 12\fi}
697 \Test{Other}{12}
698 \luatexinitcatcodetable99 %
699 \Test{IniTeX}{%
700   0\relax
701   \begingroup
702     \luatexcatcodetable99 %
703     \global\scratch=\the\catcode\count@
704   \endgroup

```

705 }

3.2.2 Catcode table number stack

```
706 \begin{qstest}{CatcodeTableNumStack}{CatcodeTableNumStack}
707   \def\TestStack#1{%
708     \Expect*{\LuT@NumStack}{#1}%
709   }%
710   \TestStack{0}%
711   \PushCatcodeTableNumStack
712   \TestStack{{0}0}%
713   \@firstofone{%
714     \begin{group}
715       \luatexinitcatcodetable12 %
716       \luatexcatcodetable12 %
717       \PushCatcodeTableNumStack
718       \TestStack{{12}{0}0}%
719       \PopCatcodeTableNumStack
720       \TestStack{{0}0}%
721       \PopCatcodeTableNumStack
722       \TestStack{0}%
723       \def\TestWarning{Missing empty stack warning}%
724       \def\@PackageWarning#1#2{\def\TestWarning{empty stack}}%
725       \PopCatcodeTableNumStack
726       \TestStack{0}%
727       \Expect*{\TestWarning}{empty stack}%
728     \end{group}
729   }%
730 \end{qstest}
```

3.2.3 Catcode table stack

```
731 \begin{qstest}{CatcodeTableStack}{CatcodeTableStack}
732   \def\TestStack#1{%
733     \Expect*{\the\CatcodeTableStack}{#1}%
734   }%
735   \TestStack{0}%
736   \IncCatcodeTableStack
737   \TestStack{2}%
738   \IncCatcodeTableStack
739   \TestStack{4}%
740   \begin{group}
741     \IncCatcodeTableStack
742     \TestStack{6}%
743   \end{group}
744   \TestStack{6}%
745   \begin{group}
746     \DecCatcodeTableStack
747     \TestStack{4}%
748   \end{group}
749   \TestStack{4}%
750   \DecCatcodeTableStack
751   \TestStack{2}%
752   \DecCatcodeTableStack
753   \TestStack{0}%
754   \begin{group}
755     \def\TestError{Missing error}%
756     \def\@PackageError#1#2#3{%
757       \def\TestError{Empty stack}%
758     }%
759     \DecCatcodeTableStack
760     \TestStack{0}%
761     \Expect*{\TestError}{Empty stack}%
762   \end{group}
763 \end{qstest}
```

3.2.4 Catcode regime macros

```

764 \begin{qstest}{CatcodeRegime}{CatcodeRegime}
765   \def\TestStacks#1#2#3{%
766     \Expect*{\the\luatexcatcodetable}{#1}%
767     \Expect*{\the\CatcodeTableStack}{#2}%
768     \Expect*{\LuT@NumStack}{#3}%
769   }%
770   \TestStacks{0}{0}{0}%
771   \catcode'\|=7 %
772   \BeginCatcodeRegime\CatcodeTableLaTeX
773     \TestStacks{2}{2}{00}%
774     \Expect*{\the\catcode'\|}{12}%
775   \EndCatcodeRegime
776   \TestStacks{0}{0}{0}%
777   \Expect*{\the\catcode'\|}{7}%
778 \end{qstest}

```

3.3 Attribute allocation

```

779 \begin{qstest}{Attributes}{Attributes}
780   \newattribute\TestAttr
781   \Expect*{\meaning\TestAttr}%
782     *{\string\attribute\number\allocationnumber}%
783   \Expect*{\the\allocationnumber}{0}%
784   \begingroup
785     \newattribute\TestAttr
786     \Expect*{\the\allocationnumber}{1}%
787   \endgroup
788   \Expect*{\the\allocationnumber}{0}%
789   \Expect*{\meaning\TestAttr}*{\string\attribute1}%
790   \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
791   \def\Test#1{%
792     \setattribute\TestAttr{#1}%
793     \Expect*{\the\TestAttr}{#1}%
794   }%
795   \Test{0}%
796   \Test{1}%
797   \Test{-1}%
798   \Test{123}%
799   \unsetattribute\TestAttr
800   \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
801   \begingroup
802     \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
803     \Test{1234}%
804   \endgroup
805   \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
806 \end{qstest}

807 \@@end
808 </test4>

```

3.4 Short test for plain-TeX

```

809 <*test5>
810 \input luatex.sty\relax
811 \newattribute\TestAttr
812 \setattribute\TestAttr{10}
813 \unsetattribute\TestAttr
814 \newcatcodetable\TestCTa
815 \begingroup
816   \SetCatcodeRange{'A'}{'Z'}{12}%
817 \endgroup
818 \BeginCatcodeRegime\CatcodeTableLaTeX
819 \EndCatcodeRegime

```

```
820 \end
821 </test5>
```

4 Installation

4.1 Download

Package. This package is available on CTAN¹:

[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_EX 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_EX:

```
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):

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

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://ftp.ctan.org/tex-archive/>

4.4 Refresh file name databases

If your \TeX distribution (te \TeX , mik \TeX , ...) relies on file name databases, you must refresh these. For example, te \TeX 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 luatex.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{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 \LaTeX` :

```
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.

[2009/04/10 v0.2]

- Requires package `ifluatex` in version 2.0 to ensure `\luatexversion`.
- Updates the call of `\directlua`, the syntax has changed in Lua \TeX 0.36.

[2009/12/02 v0.3]

- Unsetting of attributes updated for Lua \TeX 0.37.

[2010/03/09 v0.4]

- Support for lua states removed.
- Calling `tex.enableprimitives` for used primitives.

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