

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.

Contents

1	Documentation	2
1.1	Introduction	2
1.1.1	LaTeX	2
1.1.2	plain TeX	2
1.2	Register allocation	3
1.2.1	Register with 16 bit	3
1.2.2	Insertions	3
1.3	Attributes	3
1.4	Catcode tables	4
1.4.1	Interface proposal	4
1.5	Lua module loading	5
1.5.1	Package <code>luatex-loader</code>	6
2	Implementation	6
2.1	Reload check and package identification	6
2.2	Catcodes	7
2.3	Check for LuaTeX	8
2.4	Provide LuaTeX primitives	8
2.5	Inherit support for ϵ -TeX	9
2.6	Adaption of ϵ -TeX's register allocation	10
2.7	plain TeX compatibility	10
2.8	Attributes	12
2.8.1	Allocation	12
2.8.2	Interface	12
2.9	Catcode tables	13
2.9.1	Allocation	13
2.9.2	<code>\SetCatcodeRange</code>	13
2.9.3	Predefined catcode tables	14
2.9.4	Number stack	14
2.9.5	Catcode regime macros	15
2.10	Lua module loader	15
2.11	Lua script	17

3	Test	18
3.1	Catcode checks for loading	18
3.2	Catcode tables	20
3.2.1	Predefined catcode tables	20
3.2.2	Catcode table number stack	20
3.2.3	Catcode table stack	21
3.2.4	Catcode regime macros	21
3.3	Attribute allocation	22
3.4	Short test for plain T _E X	22
4	Installation	22
4.1	Download	22
4.2	Bundle installation	23
4.3	Package installation	23
4.4	Refresh file name databases	23
4.5	Some details for the interested	24
5	History	24
[2007/12/12 v0.1]	24
[2009/04/10 v0.2]	24
[2009/12/02 v0.3]	24
[2010/03/09 v0.4]	24
6	Index	25

1 Documentation

1.1 Introduction

T_EX 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 T_EX or L^AT_EX implement an allocation scheme for registers. A package reserves with `\newcount` an unused register number for its own exclusive use.

Nowadays T_EX is not alone anymore: ε -T_EX, pdfT_EX and other compilers for T_EX are developed that extend and add new features and resources.

Now LuaT_EX has reached beta state. It inherits most of pdfT_EX's features including ε -T_EX. Also it implements new concepts such as attributes or catcode tables.

1.1.1 L^AT_EX

L^AT_EX 2 _{ε} is frozen and therefore refuses to even notice the new T_EX variants. Not even the old ε -T_EX is supported by its kernel. At least there is a third party package `etex` that manages the new ε -T_EX resources.

This package tries to do the same for LuaT_EX and starts to support at least a few of the new features.

1.1.2 plain T_EX

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

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.

```
\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 {⟨catcodetable⟩}
\EndCatcodeRegime
```

`\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.

```
\SetCatcodeRange {⟨from⟩} {⟨to⟩} {⟨catcode⟩}
```

The catcodes of characters in range from `⟨from⟩` to inclusive `⟨to⟩` are set to `⟨catcode⟩`.

1.5 Lua module loading

Currently \LuaTeX (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 T_EX 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\catcode61\catcode48\catcode32=10\relax%
3 \catcode13=5 % ^~M
4 \endlinechar=13 %
5 \catcode35=6 % #
6 \catcode39=12 % '
7 \catcode44=12 % ,
8 \catcode45=12 % -
9 \catcode46=12 % .
10 \catcode58=12 % :
11 \catcode64=11 % @
12 \catcode123=1 % {
13 \catcode125=2 % }
14 \expandafter\let\expandafter\x\csname ver@luatex.sty\endcsname
15 \ifx\x\relax % plain-TeX, first loading
16 \else
17 \def\empty{}%
18 \ifx\x\empty % LaTeX, first loading,
19 % variable is initialized, but \ProvidesPackage not yet seen
20 \else
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 \aftergroup\endinput
30 \fi
31 \fi
32 \endgroup%
```

Package identification:

```
33 \begingroup\catcode61\catcode48\catcode32=10\relax%
34 \catcode13=5 % ^~M
35 \endlinechar=13 %
36 \catcode35=6 % #
37 \catcode39=12 % '
38 \catcode40=12 % (
39 \catcode41=12 % )
```

```

40 \catcode44=12 % ,
41 \catcode45=12 % -
42 \catcode46=12 % .
43 \catcode47=12 % /
44 \catcode58=12 % :
45 \catcode64=11 % @
46 \catcode91=12 % [
47 \catcode93=12 % ]
48 \catcode123=1 % {
49 \catcode125=2 % }
50 \expandafter\ifx\csname ProvidesPackage\endcsname\relax
51   \def\x#1#2#3[#4]{\endgroup
52     \immediate\write-1{Package: #3 #4}%
53     \xdef#1{#4}%
54   }%
55 \else
56   \def\x#1#2[#3]{\endgroup
57     #2[#{#3}]%
58     \ifx#1@undefined
59       \xdef#1{#3}%
60     \fi
61     \ifx#1\relax
62       \xdef#1{#3}%
63     \fi
64   }%
65 \fi
66 \expandafter\x\csname ver@luatex.sty\endcsname
67 \ProvidesPackage{luatex}%
68 [2010/03/09 v0.4 LuaTeX basic definition package (HO)]%

```

2.2 Catcodes

```

69 \begingroup\catcode61\catcode48\catcode32=10\relax%
70 \catcode13=5 % ^^M
71 \endlinechar=13 %
72 \catcode123=1 % {
73 \catcode125=2 % }
74 \catcode64=11 % @
75 \def\x{\endgroup
76   \expandafter\edef\csname LuT@AtEnd\endcsname{%
77     \endlinechar=\the\endlinechar\relax
78     \catcode13=\the\catcode13\relax
79     \catcode32=\the\catcode32\relax
80     \catcode35=\the\catcode35\relax
81     \catcode61=\the\catcode61\relax
82     \catcode64=\the\catcode64\relax
83     \catcode123=\the\catcode123\relax
84     \catcode125=\the\catcode125\relax
85   }%
86 }%
87 \x\catcode61\catcode48\catcode32=10\relax%
88 \catcode13=5 % ^^M
89 \endlinechar=13 %
90 \catcode35=6 % #
91 \catcode64=11 % @
92 \catcode123=1 % {
93 \catcode125=2 % }
94 \def\TMP@EnsureCode#1#2{%
95   \edef\LuT@AtEnd{%
96     \LuT@AtEnd
97     \catcode#1=\the\catcode#1\relax
98   }%

```

```

99   \catcode#1=#2\relax
100 }
101 \TMP@EnsureCode{10}{12}% ^^J
102 \TMP@EnsureCode{34}{12}% "
103 \TMP@EnsureCode{36}{3}% $
104 \TMP@EnsureCode{39}{12}% '
105 \TMP@EnsureCode{40}{12}% (
106 \TMP@EnsureCode{41}{12}% )
107 \TMP@EnsureCode{42}{12}% *
108 \TMP@EnsureCode{43}{12}% +
109 \TMP@EnsureCode{44}{12}% ,
110 \TMP@EnsureCode{45}{12}% -
111 \TMP@EnsureCode{46}{12}% .
112 \TMP@EnsureCode{47}{12}% /
113 \TMP@EnsureCode{60}{12}% <
114 \TMP@EnsureCode{62}{12}% >
115 \TMP@EnsureCode{91}{12}% [
116 \TMP@EnsureCode{93}{12}% ]
117 \TMP@EnsureCode{95}{12}% _ (other!)
118 \TMP@EnsureCode{96}{12}% `
119 \edef\LuT@AtEnd{\LuT@AtEnd\noexpand\endinput}

```

2.3 Check for LuaTeX

Without LuaTeX there is no point in using this package.

```

120 \begingroup\expandafter\expandafter\expandafter\endgroup
121 \expandafter\ifx\csname RequirePackage\endcsname\relax
122   \input infwarerr.sty\relax
123   \input ifluatex.sty\relax
124 \else
125   \RequirePackage{infwarerr}[2007/09/09]%
126   \RequirePackage{ifluatex}[2009/04/10]%
127 \fi
128 \ifluatex
129 \else
130   \@PackageError{luatex}{%
131     This package may only be run using LuaTeX%
132   }\@ehc
133   \expandafter\LuT@AtEnd
134 \fi%

```

2.4 Provide LuaTeX primitives

```

135 \ifnum\luatexversion<36 %
136   \def\LuT@MakePrimitive#1{%
137     \expandafter\let\csname luatex#1\expandafter\endcsname
138     \csname #1\endcsname
139   }%
140 \else
141   \def\LuT@MakeLuatexPrimitive#1{%
142     \begingroup\expandafter\expandafter\expandafter\endgroup
143     \expandafter\ifx\csname luatex#1\endcsname\relax
144       \begingroup\expandafter\expandafter\expandafter\endgroup
145       \expandafter\ifx\csname #1\endcsname\relax
146       \else
147         \expandafter\let
148         \csname luatex#1\expandafter\endcsname
149         \csname #1\endcsname
150       \fi
151     \fi
152     \begingroup\expandafter\expandafter\expandafter\endgroup
153     \expandafter\ifx\csname luatex#1\endcsname\relax

```



```

154 \begingroup
155 \expandafter\let\csname luatex#1\endcsname\@undefined
156 \ifnum0%
157 \directlua{%
158 if tex.enableprimitives then %
159 tex.enableprimitives('luatex',{ '#1'})%
160 tex.print('1')%
161 end%
162 }%
163 \expandafter\ifx\csname luatex#1\endcsname\relax\else1\fi
164 =11 %
165 \global\expandafter\let
166 \csname luatex#1\expandafter\endcsname
167 \csname luatex#1\endcsname
168 \else
169 \@PackageError{luatex}{%
170 tex.enableprimitives failed for '#1'%
171 }\@ehc
172 \fi
173 \endgroup
174 \fi
175 }%
176 \def\LuT@MakePrimitive#1{%
177 \begingroup\expandafter\expandafter\expandafter\endgroup
178 \expandafter\ifx\csname#1\endcsname\relax
179 \begingroup
180 \expandafter\let\csname#1\endcsname\@undefined
181 \ifnum0%
182 \directlua{%
183 if tex.enableprimitives then %
184 tex.enableprimitives('',{ '#1'})%
185 tex.print('1')%
186 end%
187 }%
188 \expandafter\ifx\csname#1\endcsname\relax\else1\fi
189 =11 %
190 \global\expandafter\let
191 \csname#1\expandafter\endcsname
192 \csname#1\endcsname
193 \else
194 \@PackageError{luatex}{%
195 tex.enableprimitives failed for '#1'%
196 }\@ehc
197 \fi
198 \endgroup
199 \fi
200 }%
201 \fi
202 \LuT@MakeLuatexPrimitive{attribute}
203 \LuT@MakeLuatexPrimitive{attributedef}
204 \LuT@MakeLuatexPrimitive{catcodetable}
205 \LuT@MakeLuatexPrimitive{initcatcodetable}
206 \LuT@MakeLuatexPrimitive{luaescapestring}
207 \LuT@MakeLuatexPrimitive{savecatcodetable}
208 \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 L^AT_EX and tests its presence independently of the format by looking for `\et@xins`.

```

209 \begingroup\expandafter\expandafter\expandafter\endgroup
210 \expandafter\ifx\csname RequirePackage\endcsname\relax

```

```

211 \else
212   \RequirePackage{etex}[1998/03/26]%
213 \fi

```

2.6 Adaption of ϵ -T_EX's register allocation

ϵ -T_EX has increased the number of T_EX registers from 2^8 (256) to 2^{15} (32768) for a register class. LuaT_EX 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.

```

214 \begingroup\expandafter\expandafter\expandafter\endgroup
215 \expandafter\ifx\csname et@xins\endcsname\relax
216   \PackageWarningNoLine{luatex}{%
217     Support for eTeX is not loaded (etex.src)%
218   }%
219 \else
220   \def\LuT@temp#1{%
221     \ifnum\count27#1=32768 %
222       \count27#1=65536 %
223     \fi
224   }%
225   \LuT@temp0%
226   \LuT@temp1%
227   \LuT@temp2%
228   \LuT@temp3%
229   \LuT@temp4%
230   \LuT@temp5%
231   \LuT@temp6%

```

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

```

232 \let\newcount\globcount
233 \let\newdimen\globdimen
234 \let\newskip\globskip
235 \let\newbox\globbox
236 \fi

```

2.7 plain T_EX compatibility

```

\@empty
237 \expandafter\ifx\csname @empty\endcsname\relax
238   \def\@empty{}%
239 \fi

```

```

\@gobble
240 \expandafter\ifx\csname @gobble\endcsname\relax
241   \long\def\@gobble#1{}%
242 \fi

```

```

\@firstofone
243 \expandafter\ifx\csname @firstofone\endcsname\relax
244   \long\def\@firstofone#1{#1}%
245 \fi

```

```

\@firstoftwo
246 \expandafter\ifx\csname @firstoftwo\endcsname\relax
247   \long\def\@firstoftwo#1#2{#1}%
248 \fi

```

```

\@car
249 \expandafter\ifx\csname @car\endcsname\relax
250 \def\@car#1#2\@nil{#1}%
251 \fi

\@cdr
252 \expandafter\ifx\csname @cdr\endcsname\relax
253 \def\@cdr#1#2\@nil{#2}%
254 \fi

\@ifstar
255 \expandafter\ifx\csname @ifstar\endcsname\relax
256 \def\@ifstar#1{%
257 \ifnextchar*\@firstoftwo{#1}}%
258 }%

\@ifnextchar
259 \long\def\@ifnextchar#1#2#3{%
260 \let\reserved@d=#1%
261 \def\reserved@a{#2}%
262 \def\reserved@b{#3}%
263 \futurelet\@let@token\@ifnch
264 }%

\@ifnch
265 \def\@ifnch{%
266 \ifx\@let@token\@sptoken
267 \let\reserved@c\@xifnch
268 \else
269 \ifx\@let@token\reserved@d
270 \let\reserved@c\reserved@a
271 \else
272 \let\reserved@c\reserved@b
273 \fi
274 \fi
275 \reserved@c
276 }%

\@sptoken
277 \let\LuT@temp\:%
278 \def\:{\let\@sptoken= }%
279 \: % explicit space

\@xifnch
280 \def\:\@xifnch}%
281 \expandafter\def\:{%
282 \futurelet\@let@token\@ifnch
283 }%
284 \let\:\LuT@temp
285 \fi

\@tempcnta
286 \expandafter\ifx\csname @tempcnta\endcsname\relax
287 \csname newcount\endcsname\@tempcnta
288 \fi

\@tempcntb
289 \expandafter\ifx\csname @tempcntb\endcsname\relax
290 \csname newcount\endcsname\@tempcntb
291 \fi

```

`\LuT@newcommand`

```

292 \begingroup\expandafter\expandafter\expandafter\endgroup
293 \expandafter\ifx\csname newcommand\endcsname\relax
294   \def\LuT@newcommand#1[#2]#3{%
295     \ifx#1\undefined
296       \let#1\relax
297     \else
298       \ifx#1\relax
299       \else
300         \@PackageError{luatex}{%
301           \string#1 is already defined.\MessageBreak
302           Redefinition is skipped%
303         }\@ehc
304       \fi
305     \fi
306     \ifx#1\relax
307       \ifcase#2 %
308         \def#1{#3}%
309       \or
310         \def#1##1{#3}%
311       \or
312         \def#1##1##2{#3}%
313       \or
314         \def#1##1##2##3{#3}%
315       \or
316         \@INTERNAL@ERROR
317       \fi
318     \fi
319   }%
320 \else
321   \def\LuT@newcommand{\newcommand*}%
322 \fi

```

2.8 Attributes

2.8.1 Allocation

`\LuT@AllocAttribute`

```

323 \newcount\LuT@AllocAttribute
324 \LuT@AllocAttribute=\m@ne

```

`\newattribute`

```

325 \LuT@newcommand\newattribute[1]{%
326   \ifnum\LuT@AllocAttribute<65535 %
327     \global\advance\LuT@AllocAttribute\@ne
328     \allocationnumber\LuT@AllocAttribute
329     \global\luatexattributedef#1=\allocationnumber
330     \unsetattribute{#1}%
331     \wlog{\string#1=\string\attribute\the\allocationnumber}%
332   \else
333     \errmessage{No room for a new \string\attribute}%
334   \fi
335 }

```

2.8.2 Interface

`\setattribute`

```

336 \LuT@newcommand\setattribute[2]{%
337   #1=\numexpr#2\relax
338 }

```

`\unsetattribute`

```
339 \ifnum\luatexversion<37
340   \LuT@newcommand\LuT@UnsetAttributeValue[0]{}%
341   \let\LuT@UnsetAttributeValue\m@ne
342 \else
343   \LuT@newcommand\LuT@UnsetAttributeValue[0]{-2147483647 }%
344 \fi
345 \LuT@newcommand\unsetattribute[1]{%
346   #1=\LuT@UnsetAttributeValue
347 }
```

2.9 Catcode tables

2.9.1 Allocation

`\LuT@AllocCatcodeTable`

```
348 \newcount\LuT@AllocCatcodeTable
349 \LuT@AllocCatcodeTable=\m@ne
350 \newcount\CatcodeTableStack
351 \CatcodeTableStack=\z@
```

`\newcatcodetable`

```
352 \LuT@newcommand\newcatcodetable[1]{%
353   \ifnum\LuT@AllocCatcodeTable<1114110 % 0x10FFFF is maximal \chardef
354     % or < 268435455 % 228 - 1
355     \global\advance\LuT@AllocCatcodeTable by\tw@
356     \allocationnumber=\LuT@AllocCatcodeTable
357     \global\chardef#1=\allocationnumber
358     \wlog{%
359       \string#1=\string\catcodetable\the\allocationnumber
360     }%
361   \else
362     \errmessage{No room for a new \string\catcodetable}%
363   \fi
364 }
```

`\IncCatcodeTableStack`

```
365 \LuT@newcommand\IncCatcodeTableStack[0]{%
366   \ifnum\CatcodeTableStack<268435454 %
367     \global\advance\CatcodeTableStack by\tw@
368   \else
369     \@PackageError{luatex}{%
370       Catcode table stack overflow%
371     }\@ehd
372   \fi
373 }
```

`\DecCatcodeTableStack`

```
374 \LuT@newcommand\DecCatcodeTableStack[0]{%
375   \ifnum\CatcodeTableStack>\z@
376     \global\advance\CatcodeTableStack by-2 %
377   \else
378     \@PackageError{luatex}{%
379       Catcode table stack is empty%
380     }\@ehd
381   \fi
382 }
```

2.9.2 \SetCatcodeRange

`\SetCatcodeRange`

```

383 \LuT@newcommand\SetCatcodeRange[3]{%
384   \edef\LuT@temp{%
385     \noexpand\@tempcnta=\the\@tempcnta
386     \noexpand\@tempcntb=\the\@tempcntb
387     \noexpand\count@=\the\count@
388     \relax
389   }%
390   \@tempcnta=\numexpr#1\relax
391   \@tempcntb=\numexpr#2\relax
392   \count@=\numexpr#3\relax
393   \loop
394     \unless\ifnum\@tempcnta>\@tempcntb
395       \catcode\@tempcnta=\count@
396       \advance\@tempcnta by \@ne
397     \repeat
398   \LuT@temp
399 }

```

2.9.3 Predefined catcode tables

```

400 \newcatcodetable\CatcodeTableIniTeX
401 \newcatcodetable\CatcodeTableString
402 \newcatcodetable\CatcodeTableOther
403 \newcatcodetable\CatcodeTableLaTeX

404 \luatexinitcatcodetable\CatcodeTableIniTeX
405 \begingroup
406   \def\@makeoother#1{\catcode#1=12\relax}%
407   \@firstofone{%
408     \luatexcatcodetable\CatcodeTableIniTeX
409     \begingroup
410       \SetCatcodeRange{0}{8}{15}%
411       \catcode9=10 % tab
412       \catcode11=15 %
413       \catcode12=13 % form feed
414       \SetCatcodeRange{14}{31}{15}%
415       \catcode35=6 % hash
416       \catcode36=3 % dollar
417       \catcode38=4 % ampersand
418       \catcode94=7 % circumflex
419       \catcode95=8 % underscore
420       \catcode123=1 % brace left
421       \catcode125=2 % brace right
422       \catcode126=13 % tilde
423       \catcode127=15 %
424     \luatexsavecatcodetable\CatcodeTableLaTeX
425   \endgroup
426   \@makeoother{0}% nul
427   \@makeoother{13}% carriage return
428   \@makeoother{37}% percent
429   \@makeoother{92}% backslash
430   \@makeoother{127}%
431   \SetCatcodeRange{65}{90}{12}% A-Z
432   \SetCatcodeRange{97}{122}{12}% a-z
433   \luatexsavecatcodetable\CatcodeTableString
434   \@makeoother{32}% space
435   \luatexsavecatcodetable\CatcodeTableOther
436 \endgroup
437 }%

```

2.9.4 Number stack

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

```

438 \def\LuT@NumStackEmpty{0}

```

`\LuT@NumStack`

```
439 \let\LuT@NumStack\LuT@NumStackEmpty
```

`\PushCatcodeTableNumStack`

```
440 \LuT@newcommand\PushCatcodeTableNumStack[0]{%
441   \xdef\LuT@NumStack{%
442     {\the\luatexcatcodetable}\LuT@NumStack
443   }%
444 }
```

`\PopCatcodeTableNumStack`

```
445 \LuT@newcommand\PopCatcodeTableNumStack[0]{%
446   \ifx\LuT@NumStack\LuT@NumStackEmpty
447     \@PackageWarning{luatex}{Empty catcode table number stack}%
448     \luatexcatcodetable\z@
449   \else
450     \luatexcatcodetable=\expandafter\@car\LuT@NumStack\@nil\relax
451     \xdef\LuT@NumStack{%
452       \expandafter\@cdr\LuT@NumStack\@nil
453     }%
454   \fi
455 }
```

2.9.5 Catcode regime macros

`\BeginCatcodeRegime`

```
456 \LuT@newcommand\BeginCatcodeRegime[1]{%
457   \PushCatcodeTableNumStack
458   \luatexcatcodetable=\numexpr#1\relax
459   \IncCatcodeTableStack
460   \luatexsavecatcodetable\CatcodeTableStack
461   \luatexcatcodetable\CatcodeTableStack
462 }
```

`\EndCatcodeRegime`

```
463 \LuT@newcommand\EndCatcodeRegime[0]{%
464   \DecCatcodeTableStack
465   \PopCatcodeTableNumStack
466 }
```

2.10 Lua module loader

```
467 \begingroup\expandafter\expandafter\expandafter\endgroup
468 \expandafter\ifx\csname RequirePackage\endcsname\relax
469   \input luatex-loader.sty\relax
470 \else
471   \RequirePackage{luatex-loader}[2010/03/09]%
472 \fi
473 \LuT@AtEnd%
474 </package>
475 <*/loader>
```

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

```
476 \begingroup\catcode61\catcode48\catcode32=10\relax%
477   \catcode13=5 % ^~M
478   \endlinechar=13 %
479   \catcode35=6 % #
480   \catcode39=12 % '
481   \catcode44=12 % ,
482   \catcode45=12 % -
```

```

483 \catcode46=12 % .
484 \catcode58=12 % :
485 \catcode64=11 % @
486 \catcode123=1 % {
487 \catcode125=2 % }
488 \expandafter\let\expandafter\x\csname ver@luatex-loader.sty\endcsname
489 \ifx\x\relax % plain-TeX, first loading
490 \else
491   \def\empty{%
492     \ifx\x\empty % LaTeX, first loading,
493       % variable is initialized, but \ProvidesPackage not yet seen
494     \else
495       \expandafter\ifx\csname PackageInfo\endcsname\relax
496         \def\x#1#2{%
497           \immediate\write-1{Package #1 Info: #2.}%
498         }%
499       \else
500         \def\x#1#2{\PackageInfo{#1}{#2, stopped}}%
501       \fi
502       \x{luatex-loader}{The package is already loaded}%
503     \aftergroup\endinput
504   \fi
505 \fi
506 \endgroup%

```

Package identification:

```

507 \begingroup\catcode61\catcode48\catcode32=10\relax%
508 \catcode13=5 % ^^M
509 \endlinechar=13 %
510 \catcode35=6 % #
511 \catcode39=12 % '
512 \catcode40=12 % (
513 \catcode41=12 % )
514 \catcode44=12 % ,
515 \catcode45=12 % -
516 \catcode46=12 % .
517 \catcode47=12 % /
518 \catcode58=12 % :
519 \catcode64=11 % @
520 \catcode91=12 % [
521 \catcode93=12 % ]
522 \catcode123=1 % {
523 \catcode125=2 % }
524 \expandafter\ifx\csname ProvidesPackage\endcsname\relax
525   \def\x#1#2#3[#4]{\endgroup
526     \immediate\write-1{Package: #3 #4}%
527     \xdef#1{#4}%
528   }%
529 \else
530   \def\x#1#2[#3]{\endgroup
531     #2[#{#3}]%
532     \ifx#1\@undefined
533       \xdef#1{#3}%
534     \fi
535     \ifx#1\relax
536       \xdef#1{#3}%
537     \fi
538   }%
539 \fi
540 \expandafter\x\csname ver@luatex-loader.sty\endcsname
541 \ProvidesPackage{luatex-loader}%
542 [2010/03/09 v0.4 Lua module loader (H0)]%
543 \begingroup\catcode61\catcode48\catcode32=10\relax%

```



```

544 \catcode13=5\endlinechar=13\relax%
545 \catcode10=12 % ^^J
546 \catcode34=12 % "
547 \catcode39=12 % '
548 \catcode40=12 % (
549 \catcode41=12 % )
550 \catcode44=12 % ,
551 \catcode46=12 % .
552 \catcode60=12 % <
553 \catcode61=12 % =
554 \catcode95=12 % _ (other!)
555 \catcode96=12 % `
556 \catcode123=1 % {
557 \catcode125=2 % }
558 \endlinechar=10 %
559 \ifnum\luatexversion<36 %
560   \directlua0%
561 \else %
562   \expandafter\directlua %
563 \fi %
564 {%
565   do
566     local script = "oberdiek.luatex.lua"
567     local file = kpse.find_file(script, "texmfscripts")
568     if file then
569       texio.write_nl("(" .. file .. ")")
570       dofile(file)
571     else
572       error("File `" .. script .. "` not found")
573     end
574   end
575 }%
576 \endgroup\endinput%
577 </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`.

```

578 <*lua>

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

580 function kpse_module_loader(module)
581   local script = module .. ".lua"
582   local file = kpse.find_file(script, "texmfscripts")
583   if file then
584     local loader, error = loadfile(file)
585     if loader then
586       texio.write_nl("(" .. file .. ")")
587       return loader
588     end
589     return "\n\t[oberdiek.luatex.kpse_module_loader] Loading error:\n\t"
590       .. error
591   end
592   return "\n\t[oberdiek.luatex.kpse_module_loader] Search failed"

```

```

593 end
594 table.insert(package.loaders, kpse_module_loader)
595 

```

3 Test

```

596 <*test2>
597 \documentclass{article}
598 \def\LoadCommand{%
599   \RequirePackage{luatex}[2010/03/09]%
600 }
601 </test2>

602 <*test3>
603 \documentclass{article}
604 \def\LoadCommand{%
605   \RequirePackage{luatex-loader}[2010/03/09]%
606 }
607 </test3>

```

3.1 Catcode checks for loading

```

608 <*test1>
609 \catcode'\{=1 %
610 \catcode'\}=2 %
611 \catcode'\#=6 %
612 \catcode'\@=11 %
613 \expandafter\ifx\csname count@\endcsname\relax
614   \countdef\count@=255 %
615 \fi
616 \expandafter\ifx\csname @gobble\endcsname\relax
617   \long\def\@gobble#1{}%
618 \fi
619 \expandafter\ifx\csname @firstofone\endcsname\relax
620   \long\def\@firstofone#1{#1}%
621 \fi
622 \expandafter\ifx\csname loop\endcsname\relax
623   \expandafter\@firstofone
624 \else
625   \expandafter\@gobble
626 \fi
627 {%
628   \def\loop#1\repeat{%
629     \def\body{#1}%
630     \iterate
631   }%
632   \def\iterate{%
633     \body
634     \let\next\iterate
635   \else
636     \let\next\relax
637   \fi
638   \next
639 }%
640 \let\repeat=\fi
641 }%
642 \def\RestoreCatcodes{}
643 \count@=0 %
644 \loop
645   \edef\RestoreCatcodes{%
646     \RestoreCatcodes
647     \catcode\the\count@=\the\catcode\count@\relax

```

```

648 }%
649 \ifnum\count@<255 %
650   \advance\count@ 1 %
651 \repeat
652
653 \def\RangeCatcodeInvalid#1#2{%
654   \count@=#1\relax
655   \loop
656     \catcode\count@=15 %
657   \ifnum\count@<#2\relax
658     \advance\count@ 1 %
659   \repeat
660 }
661 \def\RangeCatcodeCheck#1#2#3{%
662   \count@=#1\relax
663   \loop
664     \ifnum#3=\catcode\count@
665     \else
666       \errmessage{%
667         Character \the\count@\space
668         with wrong catcode \the\catcode\count@\space
669         instead of \number#3%
670       }%
671     \fi
672   \ifnum\count@<#2\relax
673     \advance\count@ 1 %
674   \repeat
675 }
676 \def\space{ }
677 \expandafter\ifx\csname LoadCommand\endcsname\relax
678   \def\LoadCommand{\input luatex.sty\relax}%
679 \fi
680 \def\Test{%
681   \RangeCatcodeInvalid{0}{47}%
682   \RangeCatcodeInvalid{58}{64}%
683   \RangeCatcodeInvalid{91}{96}%
684   \RangeCatcodeInvalid{123}{255}%
685   \catcode'\@=12 %
686   \catcode'\=0 %
687   \catcode'\%=14 %
688   \LoadCommand
689   \RangeCatcodeCheck{0}{36}{15}%
690   \RangeCatcodeCheck{37}{37}{14}%
691   \RangeCatcodeCheck{38}{47}{15}%
692   \RangeCatcodeCheck{48}{57}{12}%
693   \RangeCatcodeCheck{58}{63}{15}%
694   \RangeCatcodeCheck{64}{64}{12}%
695   \RangeCatcodeCheck{65}{90}{11}%
696   \RangeCatcodeCheck{91}{91}{15}%
697   \RangeCatcodeCheck{92}{92}{0}%
698   \RangeCatcodeCheck{93}{96}{15}%
699   \RangeCatcodeCheck{97}{122}{11}%
700   \RangeCatcodeCheck{123}{255}{15}%
701   \RestoreCatcodes
702 }
703 \Test
704 \csname @@end\endcsname
705 \end
706 </test1>

```

3.2 Catcode tables

3.2.1 Predefined catcode tables

```
707 (*test4)
708 \NeedsTeXFormat{LaTeX2e}

Remember LATEX's initial catcodes in count registers starting at \TestLaTeX.
709 \count0=0 %
710 \chardef\TestLaTeX=1000 %
711 \chardef\TestMax=300 %
712 \loop
713   \count\numexpr\TestLaTeX+\count0\relax=\catcode\count0 %
714   \ifnum\count0<\TestMax
715     \advance\count0 by 1 %
716   \repeat
717 \documentclass{minimal}
718 \usepackage{luatex}[2010/03/09]
719 \usepackage{qstest}
720 \IncludeTests{*}
721 \LogTests{log}{*}{*}
722 \makeatletter
723 \def\Check#1{%
724   \Expect*{\the\count@=\the\catcode\count@}%
725   *{\the\count@=#1}%
726 }
727 \newcount\scratch
728 \def\Test#1#2{%
729   \begin{qstest}{CatcodeTable#1}{CatcodeTable#1}%
730     \luatexcatcodetable\cname CatcodeTable#1\endcsname
731     \count@=\z@
732     \loop
733       \scratch=#2\relax
734       \Expect*{\the\count@=\the\catcode\count@}%
735       *{\the\count@=\the\scratch}%
736       \ifnum\count@<\TestMax
737         \advance\count@\@ne
738       \repeat
739   \end{qstest}%
740 }
741 \begingroup
742   % luatex-unicode-letters.tex makes some slots to letters
743   \def\TestMax{169}%
744   \Test{LaTeX}{\the\count\numexpr\TestLaTeX+\count@}%
745 \endgroup
746 \Test{String}{\ifnum\count@=32 10\else 12\fi}
747 \Test{Other}{12}
748 \luatexinitcatcodetable99 %
749 \Test{IniTeX}{%
750   0\relax
751   \begingroup
752     \luatexcatcodetable99 %
753     \global\scratch=\the\catcode\count@
754   \endgroup
755 }
```

3.2.2 Catcode table number stack

```
756 \begin{qstest}{CatcodeTableNumStack}{CatcodeTableNumStack}
757   \def\TestStack#1{%
758     \Expect*{\LuT@NumStack}{#1}%
759   }%
760   \TestStack{0}%
761   \PushCatcodeTableNumStack
762   \TestStack{{0}0}%

```

```

763 \@firstofone{%
764   \begingroup
765     \luatexinitcatcodetable12 %
766     \luatexcatcodetable12 %
767     \PushCatcodeTableNumStack
768     \TestStack{{12}{0}}%
769     \PopCatcodeTableNumStack
770     \TestStack{{0}0}%
771     \PopCatcodeTableNumStack
772     \TestStack{0}%
773     \def\TestWarning{Missing empty stack warning}%
774     \def\@PackageWarning#1#2{\def\TestWarning{empty stack}}%
775     \PopCatcodeTableNumStack
776     \TestStack{0}%
777     \Expect*{\TestWarning}{empty stack}%
778   \endgroup
779 }%
780 \end{qstest}

```

3.2.3 Catcode table stack

```

781 \begin{qstest}{CatcodeTableStack}{CatcodeTableStack}
782 \def\TestStack#1{%
783   \Expect*{\the\CatcodeTableStack}{#1}%
784 }%
785 \TestStack{0}%
786 \IncCatcodeTableStack
787 \TestStack{2}%
788 \IncCatcodeTableStack
789 \TestStack{4}%
790 \begingroup
791   \IncCatcodeTableStack
792   \TestStack{6}%
793 \endgroup
794 \TestStack{6}%
795 \begingroup
796   \DecCatcodeTableStack
797   \TestStack{4}%
798 \endgroup
799 \TestStack{4}%
800 \DecCatcodeTableStack
801 \TestStack{2}%
802 \DecCatcodeTableStack
803 \TestStack{0}%
804 \begingroup
805   \def\TestError{Missing error}%
806   \def\@PackageError#1#2#3{%
807     \def\TestError{Empty stack}%
808   }%
809   \DecCatcodeTableStack
810   \TestStack{0}%
811   \Expect*{\TestError}{Empty stack}%
812 \endgroup
813 \end{qstest}

```

3.2.4 Catcode regime macros

```

814 \begin{qstest}{CatcodeRegime}{CatcodeRegime}
815 \def\TestStacks#1#2#3{%
816   \Expect*{\the\luatexcatcodetable}{#1}%
817   \Expect*{\the\CatcodeTableStack}{#2}%
818   \Expect*{\LuT@NumStack}{#3}%
819 }%
820 \TestStacks{0}{0}{0}%
821 \catcode'\|=7 %

```

```

822 \BeginCatcodeRegime\CatcodeTableLaTeX
823 \TestStacks{2}{2}{0}%
824 \Expect*{\the\catcode'\}{12}%
825 \EndCatcodeRegime
826 \TestStacks{0}{0}{0}%
827 \Expect*{\the\catcode'\}{7}%
828 \end{qstest}

```

3.3 Attribute allocation

```

829 \begin{qstest}{Attributes}{Attributes}
830 \newattribute\TestAttr
831 \Expect*{\meaning\TestAttr}%
832      *{\string\attribute\number\allocationnumber}%
833 \Expect*{\the\allocationnumber}{0}%
834 \begingroup
835   \newattribute\TestAttr
836   \Expect*{\the\allocationnumber}{1}%
837 \endgroup
838 \Expect*{\the\allocationnumber}{0}%
839 \Expect*{\meaning\TestAttr}*{\string\attribute1}%
840 \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
841 \def\Test#1{%
842   \setattribute\TestAttr{#1}%
843   \Expect*{\the\TestAttr}{#1}%
844 }%
845 \Test{0}%
846 \Test{1}%
847 \Test{-1}%
848 \Test{123}%
849 \unsetattribute\TestAttr
850 \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
851 \begingroup
852   \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
853   \Test{1234}%
854 \endgroup
855 \Expect*{\the\TestAttr}*{\number\LuT@UnsetAttributeValue}%
856 \end{qstest}

857 \@@@end
858 \end{test4}

```

3.4 Short test for plain T_EX

```

859 (*test5)
860 \input luatex.sty\relax
861 \newattribute\TestAttr
862 \setattribute\TestAttr{10}
863 \unsetattribute\TestAttr
864 \newcatcodetable\TestCTa
865 \begingroup
866   \SetCatcodeRange{'A'}{'Z'}{12}%
867 \endgroup
868 \BeginCatcodeRegime\CatcodeTableLaTeX
869 \EndCatcodeRegime
870 \end
871 \end{test5}

```

4 Installation

4.1 Download

Package. This package is available on CTAN¹:

¹<http://ftp.ctan.org/tex-archive/>

[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`.

4.4 Refresh file name databases

If your T_EX distribution (teT_EX, miK_TE_X, ...) relies on file name databases, you must refresh these. For example, teT_EX 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 \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 \LuaTeX 0.36.

[2009/12/02 v0.3]

- Unsetting of attributes updated for \LuaTeX 0.37.

[2010/03/09 v0.4]

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

6 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.

Symbols	
<code>\#</code>	611
<code>\%</code>	687
<code>\:</code>	277, 278, 279, 280, 281, 284
<code>\@</code>	612, 685
<code>\@end</code>	857
<code>\@INTERNAL@ERROR</code>	316
<code>\@PackageError</code>	130, 169, 194, 300, 369, 378, 806
<code>\@PackageWarning</code>	447, 774
<code>\@PackageWarningNoLine</code>	216
<code>\@car</code>	249, 450
<code>\@cdr</code>	252, 452
<code>\@ehc</code>	132, 171, 196, 303
<code>\@ehd</code>	371, 380
<code>\@empty</code>	237
<code>\@firstofone</code> ..	243, 407, 620, 623, 763
<code>\@firstoftwo</code>	246, 257
<code>\@gobble</code>	240, 617, 625
<code>\@ifnch</code>	263, 265, 282
<code>\@ifnextchar</code>	257, 259
<code>\@ifstar</code>	255
<code>\@let@token</code>	263, 266, 269, 282
<code>\@makeoother</code>	406, 426, 427, 428, 429, 430, 434
<code>\@ne</code>	327, 396, 737
<code>\@nil</code>	250, 253, 450, 452
<code>\@sptoken</code>	266, 277
<code>\@tempcnta</code>	286, 385, 390, 394, 395, 396
<code>\@tempcntb</code>	289, 386, 391, 394
<code>\@undefined</code>	58, 155, 180, 295, 532
<code>\@xifnch</code>	267, 280
<code>\@</code>	686
<code>\{</code>	609
<code>\}</code>	610
<code>\ </code>	821, 824, 827
<code>\advance</code>	327, 355, 367, 376, 396, 650, 658, 673, 715, 737
<code>\aftergroup</code>	29, 503
<code>\allocationnumber</code> ..	328, 329, 331, 356, 357, 359, 832, 833, 836, 838
<code>\attribute</code>	331, 333, 832, 839
A	
<code>\begin</code>	729, 756, 781, 814, 829
<code>\BeginCatcodeRegime</code> ..	5, 456, 822, 868
<code>\body</code>	629, 633
B	
<code>\catcode</code>	2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 69, 70, 72, 73, 74, 78, 79, 80, 81, 82, 83, 84, 87, 88, 90, 91, 92, 93, 97, 99, 395,
C	
<code>\catcodetable</code>	359, 362
<code>\CatcodeTableIniTeX</code> ..	4, 400, 404, 408
<code>\CatcodeTableLaTeX</code> ..	403, 424, 822, 868
<code>\CatcodeTableOther</code>	402, 435
<code>\CatcodeTableStack</code> ..	4, 350, 351, 366, 367, 375, 376, 460, 461, 783, 817
<code>\CatcodeTableString</code>	401, 433
<code>\chardef</code>	353, 357, 710, 711
<code>\check</code>	723
<code>\count</code>	221, 222, 709, 713, 714, 715, 744
<code>\count@</code>	387, 392, 395, 614, 643, 647, 649, 650, 654, 656, 657, 658, 662, 664, 667, 668, 672, 673, 724, 725, 731, 734, 735, 736, 737, 744, 746, 753
<code>\countdef</code>	614
<code>\csname</code>	14, 21, 50, 66, 76, 121, 137, 138, 143, 145, 148, 149, 153, 155, 163, 166, 167, 178, 180, 188, 191, 192, 210, 215, 237, 240, 243, 246, 249, 252, 255, 286, 287, 289, 290, 293, 468, 488, 495, 524, 540, 613, 616, 619, 622, 677, 704, 730
D	
<code>\DecCatcodeTableStack</code>	374, 464, 796, 800, 802, 809
<code>\directlua</code>	157, 182, 560, 562
<code>\documentclass</code>	597, 603, 717
E	
<code>\empty</code>	17, 18, 491, 492
<code>\end</code> ..	705, 739, 780, 813, 828, 856, 870
<code>\EndCatcodeRegime</code>	463, 825, 869
<code>\endcsname</code>	14, 21, 50, 66, 76, 121, 137, 138, 143, 145, 148, 149, 153, 155, 163, 166, 167, 178, 180, 188, 191, 192, 210, 215, 237, 240, 243, 246, 249, 252, 255, 286, 287, 289, 290, 293, 468, 488, 495, 524, 540, 613, 616, 619, 622, 677, 704, 730
<code>\endinput</code>	29, 119, 503, 576

<code>\endlinechar</code>	4, 35, 71, 77, 89, 478, 509, 544, 558	<code>\LuT@UnsetAttributeValue</code> . . .	340, 341, 343, 346, 840, 850, 852, 855
<code>\errmessage</code>	333, 362, 666	M	
<code>\Expect</code>	724, 734, 758, 777, 783, 811, 816, 817, 818, 824, 827, 831, 833, 836, 838, 839, 840, 843, 850, 852, 855	<code>\m@ne</code>	324, 341, 349
F		<code>\makeatletter</code>	722
<code>\futurelet</code>	263, 282	<code>\meaning</code>	831, 839
G		<code>\MessageBreak</code>	301
<code>\globbox</code>	235	N	
<code>\globcount</code>	232	<code>\n</code>	589, 592
<code>\globdimen</code>	233	<code>\NeedsTeXFormat</code>	708
<code>\globskip</code>	234	<code>\newattribute</code> . . .	3, 325, 830, 835, 861
I		<code>\newbox</code>	235
<code>\ifcase</code>	307	<code>\newcatcodetable</code>	4, 352, 400, 401, 402, 403, 864
<code>\ifluatex</code>	128	<code>\newcommand</code>	321
<code>\ifnum</code>	135, 156, 181, 221, 326, 339, 353, 366, 375, 394, 559, 649, 657, 664, 672, 714, 736, 746	<code>\newcount</code>	232, 323, 348, 350, 727
<code>\ifx</code>	15, 18, 21, 50, 58, 61, 121, 143, 145, 153, 163, 178, 188, 210, 215, 237, 240, 243, 246, 249, 252, 255, 266, 269, 286, 289, 293, 295, 298, 306, 446, 468, 489, 492, 495, 524, 532, 535, 613, 616, 619, 622, 677	<code>\newdimen</code>	233
<code>\immediate</code>	23, 52, 497, 526	<code>\newskip</code>	234
<code>\IncCatcodeTableStack</code>	365, 459, 786, 788, 791	<code>\next</code>	634, 636, 638
<code>\IncludeTests</code>	720	<code>\number</code> . . .	669, 832, 840, 850, 852, 855
<code>\input</code>	122, 123, 469, 678, 860	<code>\numexpr</code> 337, 390, 391, 392, 458, 713, 744	
<code>\iterate</code>	630, 632, 634	P	
L		<code>\PackageInfo</code>	26, 500
<code>\LoadCommand</code>	598, 604, 678, 688	<code>\PopCatcodeTableNumStack</code>	445, 465, 769, 771, 775
<code>\LogTests</code>	721	<code>\ProvidesPackage</code>	19, 67, 493, 541
<code>\loop</code> .	393, 628, 644, 655, 663, 712, 732	<code>\PushCatcodeTableNumStack</code>	5, 440, 457, 761, 767
<code>\luatexattributedef</code>	329	R	
<code>\luatexcatcodetable</code>	408, 442, 448, 450, 458, 461, 730, 752, 766, 816	<code>\RangeCatcodeCheck</code>	661, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700
<code>\luatexinitcatcodetable</code>	404, 748, 765	<code>\RangeCatcodeInvalid</code>	653, 681, 682, 683, 684
<code>\luatexsavecatcodetable</code>	424, 433, 435, 460	<code>\repeat</code>	397, 628, 640, 651, 659, 674, 716, 738
<code>\luatexversion</code>	135, 339, 559	<code>\RequirePackage</code>	125, 126, 212, 471, 599, 605
<code>\LuT@AllocAttribute</code>	323, 326, 327, 328	<code>\reserved@a</code>	261, 270
<code>\LuT@AllocCatcodeTable</code>	348, 353, 355, 356	<code>\reserved@b</code>	262, 272
<code>\LuT@AtEnd</code>	95, 96, 119, 133, 473	<code>\reserved@c</code>	267, 270, 272, 275
<code>\LuT@MakeLuatexPrimitive</code>	141, 202, 203, 204, 205, 206, 207	<code>\reserved@d</code>	260, 269
<code>\LuT@MakePrimitive</code>	136, 176, 208	<code>\RestoreCatcodes</code> . .	642, 645, 646, 701
<code>\LuT@newcommand</code>	292, 325, 336, 340, 343, 345, 352, 365, 374, 383, 440, 445, 456, 463	S	
<code>\LuT@NumStack</code>	439, 441, 442, 446, 450, 451, 452, 758, 818	<code>\scratch</code>	727, 733, 735, 753
<code>\LuT@NumStackEmpty</code>	438, 439, 446	<code>\setattribute</code>	3, 336, 842, 862
<code>\LuT@temp</code> .	220, 225, 226, 227, 228, 229, 230, 231, 277, 284, 384, 398	<code>\SetCatcodeRange</code>	5, 383, 410, 414, 431, 432, 866
		<code>\space</code>	667, 668, 676
		T	
		<code>\t</code>	589, 592
		<code>\Test</code> . .	680, 703, 728, 744, 746, 747, 749, 841, 845, 846, 847, 848, 853
		<code>\TestAttr</code>	830, 831, 835, 839, 840, 842, 843, 849, 850, 852, 855, 861, 862, 863
		<code>\TestCTa</code>	864

<code>\TestError</code>	805, 807, 811	<code>\tw@</code>	355, 367
<code>\TestLaTeX</code>	710, 713, 744		
<code>\TestMax</code>	711, 714, 736, 743	U	
<code>\TestStack</code>	757, 760, 762, 768, 770, 772, 776, 782, 785, 787, 789, 792, 794, 797, 799, 801, 803, 810	<code>\unless</code>	394
<code>\TestStacks</code>	815, 820, 823, 826	<code>\unsetattribute</code>	3, 330, 339, 849, 863
<code>\TestWarning</code>	773, 774, 777	<code>\usepackage</code>	718, 719
<code>\the</code>	77, 78, 79, 80, 81, 82, 83, 84, 97, 331, 359, 385, 386, 387, 442, 647, 667, 668, 724, 725, 734, 735, 744, 753, 783, 816, 817, 824, 827, 833, 836, 838, 840, 843, 850, 852, 855	W	
<code>\TMP@EnsureCode</code>	94, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118	<code>\wlog</code>	331, 358
		<code>\write</code>	23, 52, 497, 526
		X	
		<code>\x</code>	14, 15, 18, 22, 26, 28, 51, 56, 66, 75, 87, 488, 489, 492, 496, 500, 502, 525, 530, 540
		Z	
		<code>\z@</code>	351, 375, 448, 731