

The regstats package

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Abstract

This L^AT_EX package allows to count the number of used registers (counter, dimen, skip, muskip, box, token, input, output, math families, languages, insertions) and compare these to the maximum available number of such registers. The time needed for a compilation run can be announced.

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1 Introduction

This L^AT_EX package allows to count the number of used registers (counter, dimen, skip, muskip, box, token, input, output, math families, languages, insertions). Therefore the according `\count` is read. While `\count10` should be the number of the counters, `\count11` the one of the dimens, and so on, if there is enough room for another register of that type, then a new one of that register is used and looked at `\the\allocationnumber`. The result for each register is compared to the maximum available number of the respective register.

With option `left` additionally the number of remaining registers of each type is given, and with option `timer` the time needed for the compilation run (when either LuaL^AT_EX with `\directlua{starttime = os.clock()}` before `\documentclass` or `pdf(1a)tex` is used).

2 Usage

Just load the package placing

```
\usepackage[<options>]{regstats}
```

at the end of the preamble of your L^AT_EX 2_ε source file. When you load packages `\AtBeginDocument`, `regstats` should be the last one of those packages. The resulting message will be presented at the end of the compilation messages at the screen and in the `log` file.

The examplefile provides (commented out) `\stressCounter`, `\stressDimen`, `...`, and `\stressInsert` to try out how many counters, dimens, `...`, and inserts your system can handle.

2.1 Options

`options` The `regstats` package takes the following options:

2.1.1 `left`

`left` When option `left` (or `left=true`) is chosen, also the number of remaining registers of each type is given. The default is `left=false`.

2.1.2 `timer`

`timer` When option `timer` (or `timer=true`) is chosen, also the time needed for the compilation run is given. The default is `timer=false`. The used `\pdfelapsedtime` is not available, when Lua \LaTeX is used instead of `pdf(1a)tex` to compile the document. In that case at the very beginning of your `tex` file say `\directlua{starttime = os.clock()}` (even before `\documentclass!`), and then the `timer` option can also be used with Lua \LaTeX . When neither Lua \LaTeX nor pdf \LaTeX is used to compile the document, the `timer(-option)` does not work.

2.1.3 `proof`

`proof` Option `proof` is **obsolete** and should no longer be used.

3 Alternatives

- `regcount`, 1999/08/03, v1.0, by JEAN-PIERRE F. DRUCBERT (+), provides the command `\rgcounts`, which can write the numbers of used registers into the `log` file anywhere (not only at the end) and does this automatically `\AtBeginDocument` and `\AtEndDocument`. The given number of allocated insertions is *wrong*, because these are not numbered 0, 1, 2 . . . , but start at a high number, which is then decreased (and additionally there are jumps, see p. 16). The package is compatible with the `regstats` package (i. e. you can use both packages at the same time in one document) and available at <https://ctan.org/pkg/regcount>.
- One can manually search for the last appearance of `\count`, `\dimen`, `\skip`, `\muskip`, `\box`, `\toks`, `\read` (input), `\write` (output), `\mathgroup` (math family), and `\language`, and find the according number there. This does not provide any information about the number of remaining registers, of course. And it does not work for `\insert`, see p. 16).

You programmed or found another alternative, which is available at <https://www.CTAN.org/>? OK, send an e-mail to me with the name, location at CTAN, and a short notice, and I will probably include it in the list above.

4 Example

```
1 \langle *example\rangle
2 %% When compiling with LuaLaTeX (and wanting to use option timer=true),
3 %% the following line must be uncommented (i.e. remove the "% " ).
4 %% \directlua{starttime = os.clock()}
5 \documentclass[british]{article}
6 \usepackage[left=true,timer=true]{regstats}[2023/04/04]% v1.1a Counting used registers (HMM)
7 \ifpdf\ifluatex\else
8 \pdfinfo{
9   /Author (H.-Martin Muench)
10  /Title (regstats package example)
11  /Subject (Example for the regstats package)
12  /Keywords (LaTeX;registers;read;write;language;box;dimen;count;toks;muskip;skip;counter;regstats)
13 }
14 \fi\fi
15 %% If you use the hyperref package, use the options of that package
16 %% to set the pdf information.
17 %% Do NOT use \pdfinfo AND the hyperref package!
18
19 %%\usepackage{etex}
20 %%\usepackage{morewrites}
21
22 \makeatletter
23 \newcommand{\stressCounter}[1]{%
24   \ifnum\the\count10<#1\relax\else\message{Already \the\count10 \space counters used.} \fi%
25   \@tempcnta=0\relax%
26   \@whilenum\the\count10<#1\do%
27     {\advance\@tempcnta +1\relax%
28       \newcounter{TestCounter\the\@tempcnta} \message{counter \the\allocationnumber ^^J}%
29     }%
30 }
31
32 \newcommand{\stressDimen}[1]{%
33   \ifnum\the\count11<#1\relax\else\message{Already \the\count11 \space dimens used.} \fi%
34   \@tempcnta=0\relax%
35   \@whilenum\the\count11<#1\do%
36     {\advance\@tempcnta +1\relax%
37       \expandafter\newdimen\csname TestDimen\the\@tempcnta\endcsname \message{dimen \the\allocationnumber ^^J}%
38     }%
39 }
40
41 \newcommand{\stressSkip}[1]{%
42   \ifnum\the\count12<#1\relax\else\message{Already \the\count11 \space skips used.} \fi%
43   \@tempcnta=0\relax%
44   \@whilenum\the\count12<#1\do%
```

```

45     {\advance\tempcnta +1\relax%
46     \expandafter\newskip\csname TestSkip\the\@tempcnta\endcsname \message{skip \the\allocationnumber ^^J}%
47     }%
48   }
49
50 \newcommand{\stressMuskip}[1]{%
51   \ifnum\the\count13<#1\relax\else\message{Already \the\count11 \space muskips used.} \fi%
52   \@tempcnta=0\relax%
53   \@whilenum\the\count13<#1\do%
54     {\advance\tempcnta +1\relax%
55     \expandafter\newmuskip\csname TestMuskip\the\@tempcnta\endcsname \message{muskip \the\allocationnumber ^^J}%
56     }%
57   }
58
59 \newcommand{\stressBox}[1]{%
60   \ifnum\the\count14<#1\relax\else\message{Already \the\count11 \space boxes used.} \fi%
61   \@tempcnta=0\relax%
62   \@whilenum\the\count14<#1\do%
63     {\advance\tempcnta +1\relax%
64     \expandafter\newbox\csname TestBox\the\@tempcnta\endcsname \message{box \the\allocationnumber ^^J}%
65     }%
66   }
67
68 \newcommand{\stressToks}[1]{%
69   \ifnum\the\count15<#1\relax\else\message{Already \the\count11 \space toks used.} \fi%
70   \@tempcnta=0\relax%
71   \@whilenum\the\count15<#1\do%
72     {\advance\tempcnta +1\relax%
73     \expandafter\newtoks\csname TestToks\the\@tempcnta\endcsname \message{toks \the\allocationnumber ^^J}%
74     }%
75   }
76
77 \newcommand{\stressRead}[1]{%
78   \ifnum\the\count16<#1\relax\else\message{Already \the\count11 \space reads used.} \fi%
79   \@tempcnta=0\relax%
80   \@whilenum\the\count16<#1\do%
81     {\advance\tempcnta +1\relax%
82     \expandafter\newread\csname TestRead\the\@tempcnta\endcsname \message{read \the\allocationnumber ^^J}%
83     }%
84   }
85
86 \newcommand{\stressWrite}[1]{%
87   \ifnum\the\count17<#1\relax\else\message{Already \the\count11 \space writes used.} \fi%
88   \@tempcnta=0\relax%
89   \@whilenum\the\count17<#1\do%
90     {\advance\tempcnta +1\relax%

```

```

91 \expandafter\newwrite\csname TestWrite\the\@tempcnta\endcsname \message{write \the\allocationnumber ^^J}%
92 }%
93 }
94
95 \newcommand{\stressFam}[1]{%
96 \ifnum\the\count18<#1\relax\else\message{Already \the\count11 \space fams used.} \fi%
97 \@tempcnta=0\relax%
98 \@whilenum\the\count18<#1\do%
99 {\advance\@tempcnta +1\relax%
100 \expandafter\newfam\csname TestFam\the\@tempcnta\endcsname \message{fam \the\allocationnumber ^^J}%
101 }%
102 }
103
104 \newcommand{\stressLanguage}[1]{%
105 \ifnum\the\count19<#1\relax\else\message{Already \the\count11 \space languages used.} \fi%
106 \@tempcnta=0\relax%
107 \@whilenum\the\count19<#1\do%
108 {\advance\@tempcnta +1\relax%
109 \expandafter\newlanguage\csname TestLanguage\the\@tempcnta\endcsname \message{language \the\allocationnumber ^^J}%
110 }%
111 }
112
113 \newcommand{\stressInsert}[1]{%
114 \message{Declaring #1\space ADDITIONAL inserts:}%
115 \@tempcnta=0\relax%
116 \@whilenum\the\@tempcnta<#1\do%
117 {\advance\@tempcnta +1\relax%
118 \expandafter\newinsert\csname TestInsert\the\@tempcnta\endcsname%
119 \message{insert \the\@tempcnta: \the\allocationnumber^^J}%
120 }%
121 }
122 \makeatother
123
124 \listfiles
125 \begin{document}
126 \pagenumbering{arabic}
127 \section*{Example for regstats}
128
129 This example demonstrates the use of package\newline
130 \textsf{regstats}, v1.1a as of 2023-04-04.\newline
131 The used options were \texttt{left=true,timer=true}.\par
132 \texttt{left=false,timer=false} would be the defaults.\newline
133
134 Regarding the use of
135 \makeatletter%
136 \ \ifundefined{eTeX}{\hbox{\m@th \varepsilon $-\TeX}}{\eTeX}, %

```

```
137 \makeatother%
138 the \texttt{morewrite} package, the reservation of \texttt{insert}s,
139 and using more \texttt{math families} please see the documentation!\newline
140
141 For the resulting message, please compile \texttt{regstats-example.tex}
142 and have a look at the end of its \texttt{.log}-file.\newline
143
144 Because the compilation time for this example is usually quite short,
145 option \texttt{timer} is not demonstrated very spectacular.\newline
146
147 To test a register type for the number of available registers,
148 uncomment the respective line below and set the number to an interesting value.
149
150
151 \makeatletter
152 %%\stressCounter{233}
153 %%\stressDimen{233}
154 %%\stressSkip{233}
155 %%\stressMuskip{255}
156 %%\stressBox{233}
157 %%\stressToks{255}
158 %%\stressRead{15}
159 %%\stressWrite{14}
160 %%\stressFam{15}
161 %%\stressLanguage{255}
162 %%\stressInsert{20}
163 \makeatother
164
165 \end{document}
166 \</example>
```

5 The implementation

We start off by checking that we are loading into L^AT_EX 2_ε and announcing the name and version of this package.

```
167 <*package>
168 \NeedsTeXFormat{LaTeX2e}
169 \ProvidesPackage{regstats}[2023/04/04 v1.1a Counting used registers (HMM)]
170
```

A short description of the regstats package:

```
171 %% Allows to count the number of used registers
172 %% (counter, dimen, skip, muskip, box, token, input, output,
173 %% math families, languages, insertions)
174 %% and compare these to the maximum available number of such registers.
175
```

We need the kvoptions package:

```
176 \RequirePackage{kvoptions}% Key value format for package options (HO)
177
```

We process the options:

```
178 \SetupKeyvalOptions{family=regstats,prefix=regstats@}
179 \DeclareBoolOption{left}% \regstats@left
180 \DeclareBoolOption{timer}
181 \DeclareBoolOption{proof}% OBSOLETE
182
183 \ProcessKeyvalOptions*
184
```

Option proof is **obsolete**:

```
185 \ifregstats@proof
186   \PackageWarningNoLine{regstats}{Option proof is obsolete. Please do not use it\MessageBreak%
187     when loading the regstats package}
188 \else
189   \PackageInfo{regstats}{Option proof is obsolete.\MessageBreak%
190     If you used proof=false, please remove this\@gobble}
191 \fi
192
```

We need the iftex package (or its predecessors ifpdf, ifetex, and ifluatex):

```
193 \IfFileExists{iftex.sty}{\RequirePackage{iftex}}{
194   \RequirePackage{ifpdf}
195   \RequirePackage{ifetex}
196   \RequirePackage{ifluatex}
197 }
198
```

```

199 \ifundefined{ifluatex}{\newif\ifluatex \luatexfalse}{\relax}
200 \ifundefined{ifetex}{\newif\ifetex \etexfalse}{\relax}
201

```

Yes, if Lua \LaTeX is used without defining `\ifluatex`, then we fail safe with assuming Lua \LaTeX is not used. Otherwise everything (`\elses` and `\fis`) gets mixed up, but Lua \LaTeX without `\ifluatex` is really broken. Also if `\ifetex` is unknown, we assume that there is no $\varepsilon\text{-TeX}$ available.

Option timer requires some condition:

```

202 \ifregstats@timer
203   \ifpdf \RequirePackage{intcalc}
204   \else \PackageError{regstats}{Option timer only works with pdf(la)tex\MessageBreak%
205         and with lua(la)tex}{Neither appears to be used here.}
206         \regstats@timerfalse
207   \fi
208 \fi
209

```

The timer:

```

210 \newcommand{\regst@ts@timer}{\message{^^J}}%
211 \@tempcnta=0%

```

For Lua \LaTeX :

```

212 \ifluatex%
213   \@tempcnta=%
214   \directlua{
215     if starttime then
216       tex.sprint((os.clock()-starttime)*65536)
217     else
218       tex.sprint(0)
219     end
220   }\relax%

```

and for pdf \LaTeX :

```

221 \else \ifpdf \@tempcnta=\the\pdfelapsedtime\relax\fi%
222 \fi%

```

Checking the result:

```

223 \ifnum \the\@tempcnta = 0%
224   \ifluatex%
225     \PackageError{regstats}{Did you forget to start the timer?}{%
226       Before \string\documentclass\space you need to say\MessageBreak%
227       \string\directlua{starttime = os.clock()}}%
228   \fi%
229   \PackageError{regstats}{Could not determine the time used for compilation}{Reason is unknown.}%
230 \else%

```

It worked!

```

231 \xdef\regstatselapsedtime{\the\@tempcnta}%
232 \divide \@tempcnta by 65536% scaled-seconds -> seconds
233 \xdef\regstatsseconds{\the\@tempcnta}%
234 \ifnum \regstatsseconds > 59%
235 \xdef\regstatsseconds{\intcalcmMod{\the\@tempcnta}{60}}%
236 \divide \@tempcnta by 60% seconds -> minutes
237 \else%
238 \@tempcnta=0% minutes = 0
239 \fi%
240 \ifnum \regstatsseconds < 10%
241 \message{Time elapsed for the last compiler run:^^J%
242 about \the\@tempcnta:\regstatsseconds\space%
243 (m:ss; \regstatselapsedtime /65536 s).^^J}%
244 \else%
245 \message{Time elapsed for the last compiler run:^^J%
246 about \the\@tempcnta:\regstatsseconds \space%
247 (m:ss; \regstatselapsedtime /65536 s).^^J}%
248 \fi%
249 \fi%
250 }
251

```

If the timer-option was not used, we do not use the timer:

```

252 \ifregstats@timer\else\renewcommand{\regst@ts@timer}{\relax}\fi
253

```

Initialisation of some commands:

```

254 \long\def\regstats@firstofone#1{#1}
255
256 \providecommand\IfFormatAtLeastTF{\@ifl@t@r\fmtversion}
257
258 \let\regst@tsNoeTeX\relax
259
260 \xdef\regstats@lft{}
261

```

L^AT_EX 2_ε 2011-06-27 changed the `\enddocument` command and thus broke the `atveryend` package, which was then fixed. If new L^AT_EX 2_ε and old `atveryend` are combined, `\AtVeryVeryEnd` will never be called. L^AT_EX 2_ε 2020-10-01 introduced a new hook management. For L^AT_EX 2_ε-format 2022-11-01 and newer we use hooks instead of loading the `atveryend` package.

```

262 \IfFormatAtLeastTF{2022/11/01}{
263 \let\regst@ts@statistics\regstats@firstofone% We do not use \AtVeryVeryEnd.
264 \newcommand{\regst@ts@st@tistics}[1]{\AddToHook{begindocument}{%

```

The `morewrites` package allows for more writes (see p. 15):

```

265 \AddToHook{begindocument/end}{\IfPackageLoadedTF{morewrites}{\def\regs@tsmw{65250}}{%
266 \ifluatex\def\regs@tsmw{124}\else\def\regs@tsmw{16}\fi}%

```

```

267 \AddToHook{enddocument}{\AddToHook{enddocument/afterlastpage}{\AddToHook{enddocument/afteraux}{%
268 \AddToHook{enddocument/info}{\AddToHook{enddocument/end}{#1}}}}}}
269 }{\RequirePackage{atveryend}
270 \let\regst@ts@statistics\AtVeryVeryEnd
271 \IfFormatAtLeastTF{2011/06/27}{
272 \ifpackage@later{atveryend}{2011/06/29}{% 2011/06/30, v1.8, or even more recent: OK
273 }{% else: older package version, no \AtVeryVeryEnd
274 \let\regst@ts@statistics\regstats@firstofone
275 }
276 }{% else: older fmtversion: also OK
277 }
278 \newcommand{\regst@ts@st@tistics}[1]{\AtBeginDocument{\AtEndDocument{\AfterLastShipout{\AtVeryEndDocument{%
279 \AtEndAfterFileList{#1}}}}}

```

With the seminar class or the slidesec package `\AtVeryVeryEnd` must not be used:

```

280 \AtBeginDocument{%
281 \ifclassloaded{seminar}{% no \AtVeryVeryEnd
282 \let\regst@ts@statistics\regstats@firstofone}{\relax}
283 \ifpackage@loaded{slidesec}{% no \AtVeryVeryEnd
284 \let\regst@ts@statistics\regstats@firstofone}{\relax}

```

The `morewrites` package allows for more writes (see p. 15):

```

285 \ifpackage@loaded{morewrites}{\def\regs@tsmw{32767}}{\ifluatex\def\regs@tsmw{124}\else\def\regs@tsmw{15}\fi}%

```

If neither ϵ -TeX is available nor the `etex` package loaded, the number of available registers is drastically reduced:

```

286 \ifetex\else%
287 \ifpackage@loaded{etex}{\relax}{% else
288 \gdef\regst@tsNoeTeX{%
289 \PackageWarning{regstats}{Neither eTeX nor the e-TeX-package found.\MessageBreak%
290 That can mean that e-TeX was disabled or\MessageBreak%
291 that your distribution of TeX does not contain e-TeX\MessageBreak%
292 or that you simply forgot to say \string\usepackage{etex}\MessageBreak%
293 in the preamble of \jobname.tex.\MessageBreak%
294 The number of available counter, dimen, skip,\MessageBreak%
295 muskip, box, and toks registers as well as the\MessageBreak%
296 number of insertions would be larger when using\MessageBreak%
297 eTeX or the e-TeX-package;%
298 }%
299 }%
300 }%
301 \fi%
302 }
303 }
304

```

```

305 \regstats@statistics{%
306 \regstats@statistics{%
307 \xdef\regstats@message{\relax}%

```

`\regstats@regstatA` uses three arguments: 1. the used number of registers of some type, 2. the “regular” number of available registers of that type, 3. that number in case of extended register range (ε -TeX). Maximum available minus used registers gives the number of free/currently available registers.

```

308 \newcommand{\regstats@regstatA}[3]{%
309 \ifx\regst@tsNoeTeX\relax \xdef\regstats@max{#3}\else\xdef\regstats@max{#2}\fi%
310 \@tempcnta=\regstats@max \relax%
311 \advance\@tempcnta by -#1\relax%
312 \xdef\regstats@free{\the\@tempcnta}%
313 }%

```

`\regstats@regstatB` gives the singular (2nd argument) or plural (3rd argument) of the name of that register type (1st argument):

```

314 \newcommand{\regstats@regstatB}[3]{%
315 \@tempcnta=\regstats@max\relax%
316 \advance\@tempcnta by -#1\relax%
317 \xdef\regstats@free{\the\@tempcnta}%
318 \@tempcnta=#1\relax%
319 \ifnum \the\@tempcnta = 0%
320 \@tempcnta=2\relax% zero: same as plural
321 \fi%
322 \ifnum \the\@tempcnta > 1%
323 \gdef\regstats@pl{#3}% plural
324 \else%
325 \gdef\regstats@pl{#2}% singular
326 \fi%

```

The number of used registers is given as per cent of the available registers of that type:

```

327 \@tempcnta=#1\relax%
328 \multiply\@tempcnta by 100\relax%
329 \@tempcntb=\regstats@max\relax%
330 \divide\@tempcnta by\@tempcntb\relax%
331 \xdef\regstats@used{\space(\the\@tempcnta\@percentchar\space used)}%

```

If option `left` was chosen, the number of remaining registers of that type is announced:

```

332 \ifregstats@left%
333 \ifnum \regstats@free > 0\relax%
334 \xdef\regstats@lft{, left: \regstats@free}%
335 \else%
336 \ifnum \regstats@free = 0\relax%
337 \xdef\regstats@lft{, left: \regstats@free !!!}%
338 \else% \regstats@free < 0
339 \xdef\regstats@lft{, left: \regstats@free ??? *****}%
340 \fi%

```

```

341   \fi%
342   \fi%
343 }%

```

We now just take the current numbers of the various counts:

```

344 \xdef\regstats@counter{\the\count10}%
345 \xdef\regstats@dimen{\the\count11}%
346 \xdef\regstats@skip{\the\count12}%
347 \xdef\regstats@muskip{\the\count13}%
348 \xdef\regstats@box{\the\count14}%
349 \xdef\regstats@toks{\the\count15}%
350 \xdef\regstats@read{\the\count16}%
351 \xdef\regstats@write{\the\count17}%
352 \xdef\regstats@fam{\the\count18}%
353 \xdef\regstats@language{\the\count19}%
354 \xdef\regstats@insert{\the\count20}%

```

`\countdef\insc@unt=20` is a synonym for the insertion counter.

`\countdef\allocationnumber=21` is a synonym for the allocation counter `\count21`, which contains the most recently allocated number. For example, if `\newdimen{\regstatsdimen}` allocated a new dimen, and that dimen uses the 48th dimen register, then `\count21` contains the 48.

`\count22` contains `-1`.

We build the `\regstats@message`:

```

355 \xdef\regstats@message{\regstats@message\message{^^J}}%
356 \xdef\regstats@message{\regstats@message\message{Here is how much of TeX's registers you used^^J}}%
357 \xdef\regstats@message{\regstats@message\message{\space (numbers of available registers are estimated!):^^J}}%

```

While `\xdef\regstats@...{\the\count...}` was used above, if ε -TeX is available we use another register of that type and look at the register number it received.

Classic TeX has $2^8 = 256$ registers, ε -TeX and XeTeX have $2^{15} = 32\,768$ registers, and LuaLaTeX has even $2^{15} = 65\,536$ registers (for `\count`, `\dimen`, `\skip`, `\muskip`, `\box`, and `\toks`). There are only 16 `\reads` available. `\writes` and `\fams` were traditionally also 16, see page 15 (write) and page 15 (families) about using more. `\langs` are only 256 available. `\inserts` are complicated (see p. 16). – Each `\newlength` needs a skip register.

The counter registers:

```

358 \regstats@regstatA{\regstats@counter}{255}{32767}%
359 \ifetex\newcounter{regstatscount}\xdef\regstats@counter{\the\allocationnumber}\fi%
360 \regstats@regstatB{\regstats@counter}{s}%
361 \xdef\regstats@message{\regstats@message\message{ \regstats@counter\space counter register\regstats@pl\space%
362   out of \regstats@max\regstats@used\regstats@lft ^^J}}%
363 %

```

The dimen registers:

```
364 \regstats@regstatA{\regstats@dimen}{255}{32767}%
365 \ifetex\newdimen{\regstatsdimen}\xdef\regstats@dimen{\the\allocationnumber}\fi%
366 \regstats@regstatB{\regstats@dimen}{s}%
367 \xdef\regstats@message{\regstats@message\message{ \regstats@dimen\space dimen register\regstats@pl\space%
368 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
369 %
```

The skip registers:

```
370 \regstats@regstatA{\regstats@skip}{255}{32767}%
371 \ifetex\newskip\regstatsskip\xdef\regstats@skip{\the\allocationnumber}\fi%
372 \regstats@regstatB{\regstats@skip}{s}%
373 \xdef\regstats@message{\regstats@message\message{ \regstats@skip\space skip register\regstats@pl\space%
374 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
375 %
```

The muskip registers:

```
376 \regstats@regstatA{\regstats@muskip}{255}{32767}%
377 \ifetex\newmuskip\regstatmuskip\xdef\regstats@muskip{\the\allocationnumber}\fi%
378 \regstats@regstatB{\regstats@muskip}{s}%
379 \xdef\regstats@message{\regstats@message\message{ \regstats@muskip\space muskip register\regstats@pl\space%
380 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
381 %
```

The box registers:

```
382 \regstats@regstatA{\regstats@box}{255}{32767}%
383 \ifetex\newbox\regstatsbox\xdef\regstats@box{\the\allocationnumber}\fi%
384 \regstats@regstatB{\regstats@box}{s}%
385 \xdef\regstats@message{\regstats@message\message{ \regstats@box\space box register\regstats@pl\space%
386 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
387 %
```

The toks registers:

```
388 \regstats@regstatA{\regstats@toks}{255}{32767}%
389 \ifetex\newtoks\regstatstoks\xdef\regstats@toks{\the\allocationnumber}\fi%
390 \regstats@regstatB{\regstats@toks}{s}%
391 \xdef\regstats@message{\regstats@message\message{ \regstats@toks\space toks register\regstats@pl\space%
392 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
393 %
```

The “read registers”, i. e. input streams:

```
394 \regstats@regstatA{\regstats@read}{15}{15}%
395 \ifnum \regstats@free > 0\relax\newread\regstatsread\xdef\regstats@read{\the\allocationnumber}\fi%
396 \regstats@regstatB{\regstats@read}{s}%
397 \xdef\regstats@message{\regstats@message\message{ \regstats@read\space input stream\regstats@pl\space (read) %
398 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
399 %
```

The “write registers”, i. e. output streams:

Traditionally, there are 16 available output streams. Lua \TeX increases this to 124, and the `morewrites` package even to 65 250 for \LaTeX , but not for Lua \LaTeX . After write 32 749th write on `\write32767`, `morewrites` additionally uses one count register for each new write. And after the 65 250th write uses `\count32766`, there is no room for another `\count`, and therefore opening further writes fails.

```
400 \regstats@regstatA{\regstats@write}{15}{\regs@tsmw}%
401 \ifnum \regstats@free > 0\relax\newwrite\regstatswrite\xdef\regstats@write{\the\allocationnumber}\fi%
402 \regstats@regstatB{\regstats@write}{s}%
403 \xdef\regstats@message{\regstats@message\message{ \regstats@write\space output stream\regstats@pl\space (write) %
404 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
405 %
```

The “fam registers”, i. e. math families:

Traditionally, there are 16 available math families. Lua \LaTeX and X \LaTeX increase this to 256 (at least since the 2015 release of $\LaTeX 2\epsilon$).

\TeX , or more exactly the 8-bit versions of \TeX , such as pdf \TeX , have a hard limit of 16 on the number of different math font groups (`\fam` or `\mathgroup`) that can be used in a single formula. For each symbol font declared (by a package or in the preamble) an extra math group is allocated, and the same happens for each math alphabet, (such as `\mathbf`) once it gets used anywhere in the document. Up to now, these math alphabet allocations were permanent, even if they were used only once; the result was that in complex documents you could easily run out of available math font groups. The only remedy for this was to define your own math version, which is a complicated and cumbersome process.

This situation has now been improved by the introduction of a new counter `localmathalphabets`: this counter governs how many of the math group slots are assigned locally when a new math alphabet (and a new math group) is needed.

Once the current formula is finished, every such further (local) allocation is undone, giving you a fighting chance of being able to use different new math alphabets in the next formula.

The default value of `localmathalphabets` is 2, but if you need more local alphabets because of the complexity of your document, you can set this to a higher value such as 4 or 5. Setting it even higher is possible, but this would seldom be useful because many group slots will be taken up by symbol fonts and such slots are always permanently allocated, whether used or not.

(Undo math alphabet allocations if necessary, in: \LaTeX News, Issue 34, 2021-11-15)

So the number of math family groups should have become less relevant.

`\setcounter{localmathalphabets}{ something larger than 2 }` might help in case of issues. (`\stressFam` in the example file still does not find more than 15 (or 255 with Lua \LaTeX) `\fams` available, because it (intentionally) does not use anything local.

```
406 \regstats@regstatA{\regstats@fam}{15}{\ifluatex 255 \else 15\fi}%
407 \ifnum \regstats@free > 0\relax\newfam\regstatsfam\xdef\regstats@fam{\the\allocationnumber}\fi%
408 \regstats@regstatB{\regstats@fam}{y}{ies}%
409 \xdef\regstats@message{\regstats@message\message{ \regstats@fam\space math famil\regstats@pl\space (fam) %
410 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
411 %
```

The “language registers”, i. e. language codes:

```
412 \regstats@regstatA{\regstats@language}{255}{255}%
413 \ifnum \regstats@free > 0\relax\newlanguage\regstatslanguage\xdef\regstats@language{\the\allocationnumber}\fi%
414 \regstats@regstatB{\regstats@language}{s}%
415 \xdef\regstats@message{\regstats@message\message{ \regstats@language\space language code\regstats@pl\space%
416 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
417 %
```

The “insert registers”, i. e. insertions:

“Inserts are given numbers 254, 253, etc., since they require a `\count`, `\dimen`, `\skip`, and `\box` all with the same number” (source2e.pdf, File b: lplain.dtx Date: 2022-01-25 Version v2.3h, has bugs, are fixed in dev 2023-04-04 v2.3h (i?)).

Because counter, dimen, skip, and box registers are also used independently from inserts, it can be expected to have no room for a new insert long before the 255 inserts are used.

When testing, the first `\newinsert` registered into `\insert199`, followed by `\insert198`, ..., `\insert194`, and then apparently some `\count`, `\dimen`, `\skip`, or `\box` register was not available for `\insert193`. Therefore the `\newinsert` registered into `\insert252`, followed by `\insert251`, ..., `\insert201`, and then the already used insert registers were reached and there was ! No room for a new `\insert`.

With Lua^LTeX after `\insert192` the next `\newinsert` registered into `\insert252`, followed by `\insert251`, ..., `\insert201`, and then the next `\newinsert` registered into `\insert65534`, followed by `\insert65533`, ..., `\insert244`, and then there was ! No room for a new `\count` – mark it: `\count`, not `insert`. The inserts `\insert252` to `\insert244` seem to have been use twice and the inserts `\insert243ff`. not used twice only because no `\count` was available for them.

Historic versions of L^AT_EX were limited to less registers, therefore it was possible to `\usepackage{etex} \reserveinserts{17}`, in order to reserve room for up to 17 (or another number given) additional insertion classes, that will not be taken away by `\newcount`, `\newdimen`, `\newskip`, or `\newbox`. For resent L^AT_EX-versions this is neither necessary nor recommendable: do not use the `etex`-package.

When the inserts are needed for floats, the `morefloats` package can be used to “increased the number of inserts available to the float mechanism” (<https://texfaq.org/FAQ-noroom> at 2023-04-02). At the last given url “No room for a new »thing«” is treated.

```
418 \ifx\regst@tsNoeTeX\relax%
419 \newinsert\regstatsinsert%
420 \xdef\regstats@insert{\the\allocationnumber}%
421 \xdef\regstats@max{200}%
422 \ifnum \regstats@insert < \regstats@max\relax%
423 \xdef\regstats@free{\regstats@insert}%
424 \@tempcnta=200\relax%
425 \advance\@tempcnta by -\regstats@insert\relax%
426 \xdef\regstats@insert{\the\@tempcnta}%
427 \regstats@regstatB{\regstats@insert}{s}%
428 \xdef\regstats@message{\regstats@message\message{ \regstats@insert\space insertion\regstats@pl\space%
429 out of \regstats@max\regstats@used\regstats@lft ^^J}}%
430 \else%
431 \ifnum \regstats@insert = 200\relax%
432 \xdef\regstats@message{\regstats@message\message{Number of insertions could not be calculated. ^^J}}%
433 \else%
```

```

434 \ifnum % \regstats@insert > 200 AND %
435 \regstats@insert < 253\relax%
436 \@tempcnta=253\relax%
437 \advance\@tempcnta by -\regstats@insert\relax%
438 \@tempcntb=-200\relax%
439 \advance\@tempcntb by \regstats@insert\relax%
440 \ifluatex%
441 \@tempcntb=-65534\relax%
442 \advance\@tempcntb by \regstats@insert\relax%
443 \xdef\regstats@message{\regstats@message\message{at least \the\@tempcnta\space insertions out of 253 used, %
444 about 65 000 left ^^J}}%
445 \else%
446 \xdef\regstats@message{\regstats@message\message{at least \the\@tempcnta\space insertions out of 253 used, %
447 maybe \the\@tempcntb\space left ^^J}}%
448 \fi%
449 \else% \regstats@insert > 252, LuaTeX
450 \@tempcntb=65534\relax%
451 \advance\@tempcntb by -\regstats@insert\relax%
452 \advance\@tempcntb by -253\relax%
453 \xdef\regstats@message{\regstats@message\message{a lot of insertions out of 65 534 used, %
454 about \the\@tempcntb\space left ^^J}}%
455 \fi%
456 \fi%
457 \fi%
458 \else%
459 \xdef\regstats@max{101}%
460 \@tempcnta=\regstats@max\relax%
461 \advance\@tempcnta by -\regstats@insert\relax%
462 \xdef\regstats@insert{\the\@tempcnta}%
463 \@tempcnta=\regstats@max\relax%
464 \advance\@tempcnta by -\regstats@insert\relax%
465 \xdef\regstats@free{\the\@tempcnta}%
466 \regstats@regstatB{\regstats@insert}{s}%
467 \xdef\regstats@message{\regstats@message\message{ \regstats@insert\space insertion\regstats@pl\space out of %
468 \regstats@max\regstats@used\regstats@lft ^^J}}%
469 \xdef\regstats@message{\regstats@message\message{* The number of available inserts might be increased by using %
470 \string\reserveinserts .^^J}}%
471 \fi%

```

The construction of the message is now finished, the message is delivered:

```

472 \regstats@message%

```

A note about morewrites:

```
473 \ifluatex%
474 \else%
475   \def\regs@wmst{16}%
476   \ifx\regs@tsmw\regs@wmst\relax%
477     \message{The morewrites package was not loaded.^^J}%
478     \message{\space With recent LaTeX and morewrites about 32 766 output streams would be available.^^J}%
479   \fi%
480 \fi%
```

If neither ε -TeX nor the e-TeX-package was found, the respective warning is given:

```
481 \regst@tsNoeTeX%
```

When option `timer` (or `timer=true`) was used, the `regstats` package additionally gives the time, which was needed for the (last) compilation (run). When more than one compilation run is necessary to compile the document, the individual times have to be added up manually. If `\pdfelapsedtime` was reset by another package, the result is not correct, of course, but unfortunately it is not possible to check for this. You could say `\def\pdfresettimer{\relax}` immediately after `\documentclass[...]{...}` to prevent this. Better use

```
\long\def\pdfresettimer{%
\PackageError{regstats}{\string\pdfresettimer\space used}}
```

to be notified thereof. This redefinition could be implemented in this `regstats` package, but this would have no effect for the use of `\pdfresettimer` before this package is called. Because this package should be called as late as immediately before `\begin{document}`, this would mean that resetting would be possible during the whole loading of all packages.

`\pdfelapsedtime` is not available when `lua(la)tex` is used instead of `pdf(la)tex` to compile the document. In that case at the very beginning of your `tex` file say

```
\directlua{starttime = os.clock()}
```

(even before `\documentclass!`), and the `timer` option can also be used with `LuaLaTeX`. When neither `lualatex` nor `pdfplatex` is used to compile the document, the `timer(-option)` does not work.

```
482 \regst@ts@timer%
483 }%
484 }
485 </package>
```

6 Installation

6.1 Downloads

Everything is available at <https://ctan.org>, but may need additional packages themselves.

`regstats.dtx` For unpacking the `regstats.dtx` file and constructing the documentation it is required:

- T_EX-Format L^AT_EX 2_ε: <https://www.CTAN.org/>
- document class `ltxdoc`, 2022/06/22, v2.1i, <https://ctan.org/pkg/ltxdoc>
- package `geometry`, 2020/01/02, v5.9, <https://ctan.org/pkg/geometry>
- package `holtxdoc`, 2019/12/09, v0.30, <https://ctan.org/pkg/holtxdoc>
- package `fontenc`, 2021/04/29, v2.0v, <https://ctan.org/pkg/fontenc>

`regstats.sty` The `regstats.sty` for L^AT_EX 2_ε (i. e. each document using the `regstats` package) requires:

- T_EXFormat L^AT_EX 2_ε, <https://www.CTAN.org/>
- package `kvoptions`, 2010/12/23, v3.10, <http://ctan.org/pkg/kvoptions>
- package `iftex`, <https://ctan.org/pkg/iftex>, or, if that is not available,
 - + package `ifpdf`, <http://ctan.org/pkg/ifpdf>
 - + package `ifetex`, <http://ctan.org/pkg/ifetex>
 - + package `ifluatex`, <http://ctan.org/pkg/ifluatex>
- only for old L^AT_EX-formats the `atveryend` package is used, <https://ctan.org/pkg/atveryend>, otherwise that package is not loaded but the new hook management is used.
- package `regstats`, 2023-03-03, v1.1a, <https://ctan.org/pkg/regstats>
(Because you are reading the documentation for the `pagecolor` package, it can be assumed that you already have some version of it – is it the current one?)

When option `timer` is used, additionally

- package `intcalc`, <https://ctan.org/pkg/intcalc>

is needed.

`regstats-example.tex` The `regstats-example.tex` requires the same files as all documents using the `regstats` package (see preceding paragraph `regstats.sty`) and additionally:

- class `article`, 2022/07/02, v1.4n, from classes: <https://ctan.org/pkg/classes>

Alternative As possible alternative in section 3 there is listed
regcount

- package `regcount`, 1999/08/03, v1.0, <https://ctan.org/pkg/regcount>, which gives the wrong number for insertions, because it uses `\the\count20`, but insertions are *not* allocated from 0 upwards but starting at a higher number moving downward (and having some jumps to other number ranges, see p. 16).

`Oberdiek` All packages of the ‘oberdiek’ bundle (especially `holtxdoc` and `kvoptions`) are also available in a TDS compliant ZIP archive:
`holtxdoc` <https://mirror.ctan.org/install/macros/latex/contrib/oberdiek.tds.zip>. It is probably best to download and use this, because `kvoptions` cause the packages in there are quite probably both recent and compatible among themselves.
`hyperref` `hyperref` is not included in that bundle and needs to be downloaded separately,
<https://mirror.ctan.org/install/macros/latex/contrib/hyperref.tds.zip>.
`atveryend` `atveryend` is only loaded for and used with old L^AT_EX-formats, otherwise that package is not loaded but the new hook management is used. The `atveryend` package is available from <https://mirrors.ctan.org/macros/latex/contrib/atveryend.zip>
`intcalc` `intcalc` is available from <https://mirrors.ctan.org/install/macros/latex/contrib/intcalc.tds.zip>.
`iftex` `iftex` is available from <https://mirrors.ctan.org/install/macros/generic/iftex.tds.zip>, its predecessors `ifetex`, `ifluatex`, and `ifetex` `ifpdf` are no longer officially available for separate download.
`ifluatex`
`ifpdf`
`Münch` A hyperlinked list of my (other) packages can be found at <https://ctan.org/author/muench-hm>.

6.2 Package, unpacking TDS

Package. This package is available on <https://www.CTAN.org>.

<https://mirror.ctan.org/macros/latex/contrib/regstats/regstats.dtx> The source file.

<https://mirror.ctan.org/macros/latex/contrib/regstats/regstats.pdf> The documentation.

<https://mirror.ctan.org/macros/latex/contrib/regstats/regstats-example.pdf> The compiled example file.

<https://mirror.ctan.org/macros/latex/contrib/regstats/regstats-example.log> A log file for the example.

<https://mirror.ctan.org/macros/latex/contrib/regstats/README> The README file.

There is also a `regstats.tds.zip` available:

<https://mirror.ctan.org/install/macros/latex/contrib/regstats.tds.zip> Everything in TDS compliant, compiled format.

which additionally contains

<code>regstats.ins</code>	The installation file.
<code>regstats.drv</code>	The driver to generate the documentation.
<code>regstats.sty</code>	The <code>.style</code> file.
<code>regstats-example.tex</code>	The example file.
<code>regstats-example.log</code>	A log file for the example.

For required other packages please see the preceding subsection.

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

```
tex regstats.dtx
```

About generating the documentation see paragraph 6.4 below.

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

```
regstats.sty      → tex/latex/regstats/regstats.sty
regstats.pdf      → doc/latex/regstats/regstats.pdf
regstats-example.tex → doc/latex/regstats/regstats-example.tex
regstats-example.pdf → doc/latex/regstats/regstats-example.pdf
regstats-example.log → doc/latex/regstats/regstats-example.log
regstats.dtx      → source/latex/regstats/regstats.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`.

6.3 Refresh file name databases

If your \TeX distribution (\TeX Live, $\text{MiK}\TeX$, ...) relies on file name databases, you must refresh these. For example, \TeX Live users run `texhash` or `mktexlsr`.

6.4 Some details for the interested

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 auto-detect routine about your intention:

```
latex \let\install=y\input{regstats.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 a configuration file `ltxdoc.cfg`. For instance, put the following 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 regstats.dtx
makeindex -s gind.ist regstats.idx
pdflatex regstats.dtx
makeindex -s gind.ist regstats.idx
pdflatex regstats.dtx
```

6.5 Compiling the example

The example file, `regstats-example.tex`, can be compiled via

`(pdf)luatex regstats-example.tex`

or (after removing the `%%` before `\directlua{starttime = os.clock()}` in the line before `\documentclass...`) via

`luatex regstats-example.tex`.

7 Acknowledgements

I would like to thank HEIKO OBERDIEK for providing a lot of useful packages (from which I also got everything I know about creating a file in `.dtx` format, OK, say it: copying), JEAN-PIERRE F. DRUCBERT (†) for his `regcount` package, ROBIN FAIRBAIRNS for pointing me to the `regcount` package.

8 History

[2011/05/14 v1.0a]

- Upload to CTAN.

[2011/05/16 v1.0b]

- Fixed a name clash with `regcount` package.
- `regcount` package listed as possible alternative.
- Bug: `skip` and `muskip` mixed up, fixed.
- Counting of skips, math families, and insertions added.
- Bug fix: insertions are numbered high to low.
- Option `proof` added [obsolete now].

[2011/06/08 v1.0c]

- Bug Fix: Number of available `\skip` registers with ε - \TeX .
- Change in ε - \TeX -detection.
- New option `left`.

[2011/06/18 v1.0d]

- Bug Fix: Information about used registers/counters fixed.
- New option `timer`.

[2011/08/22 v1.0e]

- The information about the used registers is now presented even later.
- Quite some details in the documentation.
- Hot fix: \TeX 2011/06/27 has changed `\enddocument` and thus broken the `\AtVeryVeryEnd` command/hooks of `atveryend` package as of 2011/04/23, v1.7. Until it is fixed, `\AtEndAfterFileList` *was* used.

[2011/08/23 v1.0f]

- The `atveryend` package was fixed (2011/06/30, v.1.8). Now `regstats` differentiates according to \TeX format and `atveryend` package version. 2011/06/30, v.1.8 should become available at CTAN soon. `regstats` also works with the old version, the information is just presented a little bit earlier during compilation, thus theoretically there could be missed some register use after that information, which would be obvious in the `log`-file. – [`atveryend` is no longer used after v1.0i of `regstats`, when a recent \LaTeX -format with hook-management is used.]

[2012/01/01 v1.0g]

- Now supports (but does not require) `Lua \LaTeX` for option `timer`.
- Bug fix: wrong path given in the documentation, fixed.
- Due to the use of temporary counters, no longer a new counter is used (except when option `proof=true` is chosen, of course). [deprecated now]
- Circumvention of the incompatibility of the `atveryend` package with `seminar` class and `slidesec` package introduced.
- Quite some additional changes in the `dtx` and `README` files.

[2012/01/07 v1.0h]

- Bug fix: `\ifluatex` undefined without `ifluatex` leads to wrong association of `\else... \fi`. Fixed by moving `\ifregstats@timer`.

[2012/04/01 v1.0i]

- Bug fix: removed `.` before `on line`.
- Bug fix: removed a `\pagebreak` after the first line of a page from the documentation.
- Bug fix: added a lot of `%`-signs at the end of lines in the code.

- This version has been archived at <https://web.archive.org/web/20170107053910/https://mirrors.ctan.org/install/macros/latex/contrib/regstats.tds.zip>.

[2023-04-04 v1.1a]

- No longer uses the atveryend package for new L^AT_EX-format but its hook-management.
- No longer uses the ltxcmds package (but it is still loaded by the kvoptions package).
- No longer uses the deprecated `\BeforeClearDocument`.
- Option `proof` is now deprecated.
- Converted to UTF-8.
- Added `\stress...` commands to the example.
- Updates to documentation and README.

When you find a mistake or have a suggestion for an improvement of this package, please send an e-mail to the maintainer, thanks!
(Please see BUG REPORTS in the README.)

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