LaTeX3 News

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Introduction

There has been quite a gap since the last *LaTeX3 News* (Issue 11, February 2018), and so there is quite a bit to cover here. Luckily, one of the things there *is* to cover is that we are using a more formalised approach for logging changes, so writing up what has happened is a bit easier. (By mistake LaTeX3 News 11 itself did not get *published* when written, but is now available: we have kept the information it contains separate as it is a good summary of the work that had happened in 2017.)

Work has continued apace across the LaTeX3 codebase in the last (nearly) two years. A lot of this is ultimately focussed on making the core of expl3 even more stable: *squeezing* out more experimental ideas, refining ones we have and making it a serious option for core LaTeX programming.

As a result of these activities, the LaTeX3 programming layer will be available as part of the kernel of LaTeX 2_ε from 2020-02-02 onwards, i.e., can be used without explicitly loading expl3. See *LaTeX News 31* [2] for more details on this.

New features in expl3

A new argument specifier: e-type

During 2018, the team worked with the TeX Live, XeTeX and (u)pTeX developers to add the `\expanded` primitive to pdfTeX, XeTeX and (u)pTeX. This primitive was originally suggested for pdfTeX v1.50 (never released), and was present in LuaTeX from the start of that project.

Adding `\expanded` lets us create a new argument specifier: e-type expansion. This is *almost* the same as x-type, but is itself expandable. (It also doesn't need doubled `#` tokens.) That's incredibly useful for creating function-like macros: you can ensure that *everything* is expanded in an argument before you go near it, with not an `\expandafter` in sight.

New functions

New programming tools have appeared in various places across expl3. The highlights are

- Shuffling of sequences to allow randomization
- Arrays of integers and floating point values; these have constant-time access
- Functions to return values after system shell usage
- Expandable access to file information, including file size, MD5 hash and modification date

For the latter, we have revised handling of file names considerably. There is now support for finding files in expansion contexts (by using the `\(pdf)filesize` primitive). Spaces and quotes in file names are now fully normalised, in a similar manner to the approach used by the latest LaTeX 2_ε kernel.

String conversion moves to expl3

In addition to entirely new functions, the team have moved the l3str-convert module from the l3experimental bundle into the expl3 core. This module is essential for dealing with the need to produce UTF-16 and UTF-32 strings in some contexts, and also offers built-in escape for url and PDF strings.

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Case changing of text

Within expl3, the team have renamed and reworked the ideas from `\tl_upper_case:n` and so on, creating a new module l3text. This is a "final" home for functions to manipulate *text*; token lists that can reasonably be expected to expand to plain text plus limited markup, for example emphasis and labels/references. Moving these functions, we have also made a small number of changes in other modules to give consistent names to functions: see the change log for full details.

Over time, we anticipate that functions for other textual manipulation will be added to this module.

Notable fixes and changes

File name parsing

The functions for parsing file names have been entirely rewritten, partly as this is required for the expandable access to file information mentioned above. The new code correctly deals with spaces and quote marks in file names and splits the path/name/extension.

Message formatting

The format of messages in expl3 was originally quite text-heavy, the idea being that they would stand out in the `.log` file. However, this made them hard to find by a regular expression search, and was very different from the LaTeX 2_ε message approach. The formatting of expl3 messages has been aligned with that from the LaTeX 2_ε kernel, such that IDE scripts and similar will be able to find and extract them directly.

Key inheritance

A number of changes have been made to the inheritance code for keys, to allow inheritance to work "as expected" in (almost) all cases.

Floating point juxtaposition

Implicit multiplication by juxtaposition, such as `2pi`, is now handled separately from parenthetic values. Thus for example `1in/1cm` is treated as equal to `(1in)/(1cm)` and thus yields `2.54`, and `1/2(pi+pi)` is equal to `pi`.

Changing box dimensions

TeX's handling of boxes is subtly different from other registers, and this shows up in particular when you want to resize a box. To bring treatment of boxes, or rather the grouping behavior of boxes, into line with other registers, we have made some internal changes to how functions such as `\box_set_wd:N` are implemented. This will be transparent for "well-behaved" use cases of these functions.

More functions moved to stable

A large number of functions which were introduced as candidates have been evaluated and moved to stable status. The team hopes to move all functions in expl3 to stable status, or move them out of the core, over the coming months.

Deprecations

There have been two notable sets of deprecations over the past 18 months. First, we have rationalised all of the "raw" primitive names to the form `\tex_<name>:D`. This means that the older names, starting `\pdftex_...`, `\xetex_...`, etc., have been removed.

Secondly, the use of integer constants, which dates back to the earliest days of expl3, is today more likely to make the code harder to read than anything else. Speed improvements in engines mean that the tiny enhancements in reading such constants are no longer required. Thus for example `\c_two` is deprecated in favour of simply using `2`.

In parallel with this, a number of older `.sty` files have been removed. These older files provided legacy stubs for files which have now been integrated in the expl3 core. They have now had sufficient time to allow users to update their code.

Internal improvements

Cross-module functions

The team introduced the idea of internal module functions some time ago. Within the kernel, there are places where functions need to be used in multiple modules. To make the nature of the kernel interactions clearer, we have worked on several aspects

- Reducing as far as possible cross-module functions
- Making more generally-useful functions public, for example scan marks
- Creating an explicit cross-kernel naming convention for functions which are internal but are essential to use in multiple kernel modules

The backend

Creating graphics, working with color, setting up hyperlinks and so on require backend-specific code. Here, backends are for example `dvips`, `xdvipdfmx` and the direct PDF mode in pdfTeX and LuaTeX. These functions are needed across the LaTeX3 codebase and have to be updated separately from the expl3 core. To facilitate that, we have split those sources into a separate bundle, which can be updated as required.

At the same time, the code these files contain is very low-level and is best described as internal. We have re-structured how the entire set of functions are referred to such that they are now internal for the area they implement, for example image inclusion, box affine transformations, etc.

Better support for (u)pTeX

The developers behind (u)pTeX (Japanese TeX) have recently enhanced their English documentation (see

https://github.com/texjporg/ptex-manual). Using this new information, we have been able to make internal adjustments to expl3 to better support these engines.

Options

A new option undo-recent-deprecations is now available for cases where a document (or package) requires some expl3 functions that have been formally removed after deprecation. This is to allow *temporary* work-arounds for documents to be compiled whilst code is begin updated.

The "classical" options for selecting backends (dvips, pdftex, etc.) are now recognised in addition to the native key–value versions. This should make it much easier to use the expl3 image and color support as it is brought up to fully-workable standards.

Engine requirements

The minimum engine versions needed to use expl3 have been incremented a little:

- pdfTeX v1.40
- XeTeX v0.99992
- LuaTeX v0.95
- ε-(u)pTeX mid-2012

The team have also worked with the XeTeX and (u)pTeX developers to standardise the set of post-ε-TeX utility primitives that are available: the so-called "pdfTeX utilities". These are now available in all supported engines, and in time will all be *required*. This primarily impacts XeTeX, which gained most of these primitives in the 2019 TeX Live cycle. (Examples are the random number primitives and expandable file data provision.) See *LaTeX News 31* [2] for more.

Documentation

News

The *LaTeX3 News* files were until recently only used to create PDF files on the team website [1]. We have now integrated those into the l3kernel (expl3 core) bundle. The news files cover all of LaTeX3 files, as the core files are always available.

ChangeLog

Since the start of 2018, the team have commenced a comprehensive change log for each of the bundles which make up the LaTeX3 code. These are simple Markdown text files, which means that they can be displayed formatted in web views.

Changes in xparse

A number of new features have been added to xparse. To allow handling of the fact that skipping spaces may be required only in some cases when searching for optional arguments, a new modifier ! is available in argument specifiers. This causes xparse to *require* that an optional argument follows immediately with no intervening spaces.

There is a new argument type purely for environments: b-type for collecting a \begin...\end pair, i.e., collecting the body of an environment. This is similar in concept to the environ package, but is integrated directly into xparse.

Finally, it is now possible to refer to one argument as the default for another optional one, for example

```
\NewDocumentCommand{\caption}{O{#2} m} ...
```

New experimental modules

A number of new experimental modules have been added within the l3experimental bundle:

l3benchmark Performance-testing system using the timing function in modern TeX engines

l3cctab Category code tables for all engines, not just LuaTeX

l3color Color support, similar in interface to xcolor

l3draw Creation of drawings, inspired by pgf, but using the LaTeX3 FPU for calculations

l3pdf Support for PDF features such as compression, hyperlinks, etc.

l3sys-shell Shell escape functions for file manipulation

l3build changes

The l3build tool for testing and releasing TeX packages has seen a number of incremental improvements. It is now available directly as a script in TeX Live and MiKTeX, meaning you can call it simply as

```
l3build target
```

Accompanying this, we have added support for installing scripts and script man files.

There is a new upload target that can take a zip file and send it to CTAN: you just have to fill in release information for *this* upload at the prompts.

Testing using PDF files rather than logs has been heavily revised: this is vital for work on PDF tagging.

There is also better support for complex directory structures, including the ability to manually specify TDS location for all installed files. This is particularly targeted at packages with both generic and format-specific files to install.

References

[1] *LaTeX Project Website.* https://latex-project.org/

[2] *LaTeX 2ε release newsletters on the LaTeX Project Website.* https://latex-project.org/news/latex2e-news/