## Production notes

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We publish a "complete" PDF with each issue of *TUGboat*, as the file tb⟨*nnn*⟩complete.pdf. These complete.pdf files start with the back cover table of contents, then the inside front cover, then all the interior pages of the issue, and end with the inside back cover, the "contents by difficulty". The printed front cover is omitted, since it may include large images that would greatly increase the file size.

For several years (since vol. 38, no. 3, in 2017), the page numbers on both tables of contents have been internal links to the given article within the issue, for easy navigation to a particular article. (Thanks to Frank Mittelbach for prodding us to implement that.) With that feature, however, the external hyperlinks (to web pages, etc.) within the document have been lost within the complete.pdfs.

This is because the complete.pdf is necessarily created by concatenating various PDF files. (We cannot create it in a single TeX run because different articles require different engines, among other reasons.) Essentially any PDF tool will do the concatenation, but they all lose the links within the included file. I tried pdfTeX itself, Ghostscript, qpdf, mupdf, and plenty more.

This is not surprising, since links as such are not a basic concept of the PDF format: external links are so-called annotations that define an action for a rectangular area on a page, and internal links go to objects within the PDF file. Normally, it does not make sense to preserve either of these when including one PDF in another.

The newpax package by Ulrike Fischer (ctan.org/pkg/newpax), updating Heiko Oberdiek's pax, can preserve links by use of external code (written in Lua for newpax and Java for pax). The problem for me was that the associated newpax.sty requires LaTeX, and all of *TUGboat*'s table of contents processing is written in plain TeX. (The original *TUGboat* code was written before LaTeX existed, and we are still using it, largely unchanged.) I was not enthused about rewriting the entire process in LaTeX.

So I asked on the development mailing list, ntg-pdftex. Taco Hoekwater (thanks Taco) pointed out that ConTeXt supported keeping "interaction" elements, such as links, when including a PDF. This was a step forward, but unfortunately the internal links from the table of contents were still lost.

Ultimately, Hans Hagen came to the rescue, implementing the exact feature needed, in his LMTX engine and ConTeXt. Thanks so much, Hans! The invocation looks like:

```
context --extra=copy --template tbcomplete.lua
mv context-extra.pdf tbNNNcomplete.pdf
```

where the Lua "template" file looks approximately like this (for *TUGboat* 44:2):

```
return { list = {
  {
    filename    = "toclinks.pdf",
    first       = 1,  --cover1
    last        = 2,  --cover2
    interaction = "all", pageoffset  = 0,
  },
  {
    filename    = "issue.pdf",
    first       = 1,    --interior of issue
    last        = 176,
    interaction = "all", pageoffset  = 0,
  },
  {
    filename    = "toclinks.pdf",
    first       = 179,  --cover3, first page
    last        = 180,  --cover3, second page
    interaction = "all", pageoffset  = 0,
  },
}}
```

Here, toclinks.pdf is the PDF made with the interior toc links and issue.pdf is the full issue (176 pages in this case) with active external links. This issue was so long that the contents by difficulty printed on the inside back cover ("cover3") spilled over to an additional page. (The pageoffset parameter allows for skipping pages, which we don't need here. There is plenty of other functionality, too.)

With this new functionality available, I have remade the complete.pdf files back to vol. 40, no. 2, so they now contain both tables of contents internal links and external hyperlinks within the issue. (Before that, the issue pages did not contain (m)any hyperlinks, so there's little benefit.)

I also took the opportunity to extend the internal links to also be active on the author names and titles, as well as the starting page numbers, as of issue vol. 44, no. 2.

Examples of the source code are available in the *TUGboat* source repository at tug.org/svn/tugboat/trunk/covers (or its mirror at github.com/TeXUsersGroup/tugboat). The main files are tbcomplete.lua for the Lua template file above, and tbcomplete.tex for the plain TeX that adds the links to the tocs. Although the code is not directly runnable in other environments, it might serve as a basis for those interested.

Thanks again Hans!

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   github.com/TeXUsersGroup