TEX@2011

TEX in the 21st Century – where are we and what is up

Martin Schröder  Herbert Voß

EuroBachoTEX 2011
Motivation

Three types of booth visitors

1. Does not know \TeX

2. Has used \TeX{} some years or decades ago to typeset a larger document and is astonished that it still exists – and wants to know what is new. 
   \textit{This talk is for you}

3. Currently typesets a larger document with \TeX{} and needs help
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Where we have been

1978  \TeX{}78
1982  \TeX{}82
1982  METAFONT
1986  Computers & Typesetting (\TeX{}book etc.)
1986  \LaTeX{}
1990  \TeX{}90
1994  METAPOST
1994  \LaTeX{} 2\epsilon
1994–2006  te\TeX{}
1996  \TeX{}live
1996  Con\TeX{}t
1997  pdf\TeX{}
2004  X\TeX{}
2007  Lua\TeX{}
2007  Con\TeX{}t MKiV
Problems we are working on: Unicode input

\TeX\textsuperscript{82} is 7-Bit, \TeX\textsuperscript{90} can do 8 Bit. Then there was Omega, but the real breakthrough came with \LaTeXX und Lua\TeX. Now the work focuses on Unicode Math – it works with \LaTeXX and Lua\TeX, but we need more free fonts.
Problems we are working on: Fonts

\TeX\ does not handle fonts itself but reads only metric information (tfm files) and leaves the usage of font files to the output drivers. Originally these worked only with METAFONT fonts but nearly nobody outside of the \TeX\ world created them.

The rest of the world instead developed PostScript (1984), TrueType (1991) and lately OpenType (1996). These fonts can be used with troubles (by experts) with \TeX\ and pdf\TeX, but then the special features of OpenType are ignored.

Today we have \Xe\TeX\ and \Lua\TeX\ which make the usage of OpenType fonts very simple.
Problems we are working on: PDF

\TeX{} as designed by Knuth writes a device independent output format (DVI). Today the standard is PDF (1993). For that we made output drivers and finally pdf\TeX{} (1997), which can write PDF directly.

pdf\TeX{} is now the default engine of the \TeX{} world. \LaTeX{} and Lua\TeX{} can also write PDF.

The problem now is tagged PDF – that works with Lua\TeX{} and Con\TeX{}t since 2010, but not yet with \LaTeX{}. 

r1577, 2011-04-30T21:22:56Z, Martin Schröder, martin@oneiros.de, CC BY-NC-SA
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A short overview: \LaTeX\ workflow

The structure of a \TeX\ system with \pdf\LaTeX\ as compiler which can generate an output as PDF or in the driver independent DVI format.
The engines

\( \TeX \) the original by Donald Knuth
\( \varepsilon \-\TeX \) small evolutionary extensions
\( \text{pdf}\TeX \) can create PDF and offers microtypographical extensions
\( \LaTeX \) handles Unicode input and OpenType fonts; uses operating system specific libraries for font handling
\( \text{Lua}\TeX \) can create PDF and offers microtypographical extensions, handles Unicode input and OpenType fonts; integrates Lua as a programming language, but is still compatible to \( \TeX \); integrates METAPOST. Currently in beta; stable 1.0 planned for 2012.
Much has changed since \LaTeX 2.09 (1989):

- \LaTeX\textsubscript{2ε}: Planned as an intermediate version (ε) between \LaTeX\textsubscript{2.09} and \LaTeX\textsubscript{3}; very stable since 1994
- KOMA script: An alternative to the standard classes adapted to the typographical conventions of Europe which offers many extensions
- hyperref: Adds support for hyperlinks, forms and other capabilities of PDF (e.g. metadata)
- \LaTeX\textsubscript{3}: Develops slowly but now offers a good foundation for developers of classes and packages which is used by many new packages (e.g. for X\LaTeX and Lua\LaTeX)
Xe\LaTeX\ and \Lua\LaTeX\n
To use the extensions of Xe\LaTeX\ and \Lua\LaTeX\ with \LaTeX\ some packages have been developed which can be used with the commands xelatex and lualatex:

- fontspec: Font handling
- polyglossia: Multilingual documents; an alternative to babel
- lualatex: Loads all packages needed for \Lua\LaTeX\
Presentations with \LaTeX

Presentations are one of the most popular uses of \TeX. \LaTeX\ 2\epsilon offers only the obsolete \texttt{slides} class. Therefore alternatives have been developed of which two are still relevant:

- beamer: Used for this talk, offers an excellent support of PDF
- powerdot: Uses PSTricks and therefore needs dvips or \Xe\TeX
Con\TeX t

Con\TeX t is an alternative to \LaTeX that now (with version Mk IV) makes extensive use of Lua\TeX and PDF to offer features that are hard or impossible with \LaTeX, e.g.:

- Multicolumn typsetting
- Integrated use of \texttt{METAPOST} (also possible with Lua\LaTeX)
- Handling of XML
- Support of layers
- Typesetting on a grid
- Creation of tagged PDF
Images

- Inclusion of images: pdfTEX, X\TeX and Lua\TeX can handle JPEG, PNG and PDF when creating PDF; pdfTEX and Lua\TeX can also handle JBIG2. EPS must be converted which is now done automagically
- METAPOST: An extension of METAFONT which can create PostScript and SVG. It can be used for diagrams and is integrated into Lua\TeX
- PGF/TikZ: A macro package for \LaTeX and ConTEXt for creating very nice diagrams very easily
- PSTricks: A macro package for \LaTeX which uses PostScript for the creation of diagrams and graphics
- Asymptote: Creates vector graphics like METAPOST, but the programming is more like C++
Bibliographies

One of the strengths of \LaTeX{} is the handling of bibliographies with \BibTeX{}

- \BibTeX{}: Can only handle 7 Bit and is difficult to program
- \BibTeX{}8: Can only handle 8 Bit and is difficult to program
- Biber: A replacement of \BibTeX{} used by \BibLATEX{}; XML support is planned. The style files are programmed in \TeX{}
- \BibLATEX{} is the future (for \LaTeX{})
Indexes

Good scientific books have indexes, so their creation also had to be automated

- MakelIndex: The standard solution since 1986; handles only 7 bit

- Xindy: Handles any language, sorting can be adapted, can handle arbitrary “page numbers” (e.g. “Genesis 1:31”), the markup can be configured

- Every generated index can be manipulated as needed by external programs
Fonts

It is not enough to have programs that can handle OpenType fonts, we also need good free OpenType fonts:

- **Latin Modern**: An extended and improved version of Computer Modern, which supports all “roman” languages
- **TeX Gyre**: Extended and improved versions of the GhostScript PostScript default fonts
- **Many polish fonts** (Antykwa Toruńska, Kurier and Iwona, Cyklop)
Math fonts

\TeX{} of course needs math fonts and for decades has been the reference implementation for math typesetting, so math fonts (very few) were designed for \TeX{}. With the advent of OpenType MicroSoft designed OpenType math and created a math font (Cambria Math) for use with Office. Work is ongoing and mostly finished to extend the \TeX{} engines (X\TeX{} and Lua\TeX{}) to handle OpenType math and to create free OpenType math fonts:

- Latin Modern and \TeX{} Gyre: Work is ongoing on OpenType math
- Asana math: Free math font designed to complement Palatino. Beta.
- STIX/XITS: Free math fonts designed to complement Times. STIX is designed to handle all mathematical symbols included in Unicode; XITS is the OpenType version.
TEX distributions

Since the installation of \TeX was a real problem in the olden days (in the last millenium...), free and operating system independent \TeX distributions were developed of which these two are still active:

\TeXlive\ For Unix, MacOS and Windows. Has its own package management and offers online updates. All moden Unix distributions get their \TeX from \TeXlive. With TLContrib there is an additional package repository

Mik\TeX\ For Windows with a package management and online updates

Both would be impossible without CTAN (the Comprehensive \TeX Archive Network), a network of FTP serves which offer software related to \TeX
Books

There are a lot of books on \LaTeX{} and new ones are still published, but some deserve special attention

\LaTeX{} Companion  The \LaTeX{}3 projects sole income is from the sale of the \LaTeX{} Companion, the follow-up to the \LaTeX{} manual by Leslie Lamport

DANTE books  Since there were some books on \LaTeX{} missing and publishers are not always interested (the german translation of Lamport’s book is unavailable for some years) DANTE (the german \TeX{} user group) has published some books on its own (e.g. on KOMA script and PSTricks)
The community

The \TeX{} community is quite active:

**User groups** There are a number of national (and one international: TUG) user groups, of which DANTE (for german speakers) is the largest with more then 2000 members.

**Own conferences** DANTE organises two conferences every year and there are conferences by other user groups (of these the polish one is highly recommended), one european and one on Con\TeX{}t

**Conferences by others** For some years we also participate in conferences by others (e.g. the Linuxtag or OpenRheinRuhr) with booths and presentations.

**Funding** The development of \TeX{} et. al. is not funded by companies but mainly by the user groups (from their membership fees and contributions).
Summary

Although \TeX is now more than 32 years old, it is still actively developed. The main topics are Unicode input and the use of OpenType fonts. The programs developed today are \Xe\TeX and \Lua\TeX; both can and should be used (but one needs an up-to-date installation of \TeX).

\La\TeX is still the standard and is being adapted to the new programs; Con\TeXt is a very interesting “newcomer” which develops very fast.