TeX and LaTeX

Worcester Linux Users Group

March 25 2004

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The “open source triad”

TeX and LaTeX

Linux GNUstuff

“Hello World”

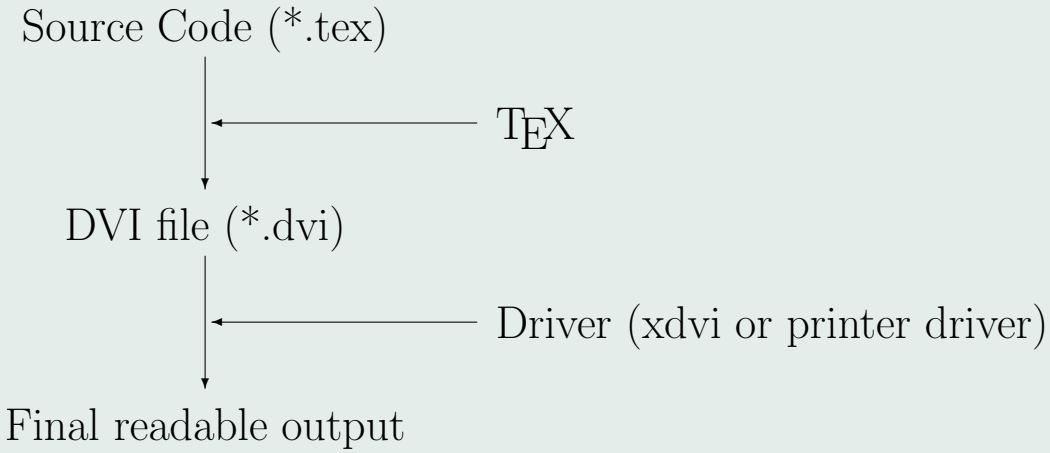
The code

```
Hello World
\end
```

gives

Hello World

The basic ritual



Some Math

Here we just have a few math examples. First here is some "Inline Math", $x \times y = z^3$ and $f^*x \cap f_*(y)$. In contrast we also have "Display Math" such as

$$a_0 + 1 \cfrac{}{a_1 + \cfrac{1}{a_2 + \cfrac{1}{a_3}}},$$

$$A = \begin{pmatrix} x - \lambda & 1 & 0 \\ 0 & x - \delta & 1 \\ 11 & 0 & x - \theta \end{pmatrix},$$

and

$$y(\tau) = \int_0^\tau f(t)g(t - \tau)dt.$$

Metafont

TEX has a sibling Metafont which was deveoped by Knuth to complement TEX. In the process of deciphering how page layout worked as a background to TEX, he became interested in typeface design and created the Metafont system to produce computer generatedX1 fonts. He then created a whole family, the Computer Modern Fonts.

Basically, Metafont allows one to design the characters with the use of higher level properties (hence the "meta") which can then be changed to create a whole new family with a different "look and feel".

The end result from Metafont is a set of .tfm files and .pk files. The tfm files (TEX font metric) tell TEX the dimensions of each character. TEX then lines up empty boxes of these prescribed sizes to fill the page. The resulting output, the dvi file is then passed to a viewer or print drive which then uses the .pk files (which contain the actual bitmaps) to produce the final output.

Pros and Cons

Pros

- ASCII
- Open Source, Free
- Stable
- Powerful
- #1 for Math
- Line/Page breaking
- Fits well with Linux
- Emacs knows about it

Cons

- Not WYSIWYG
- Complex
- Hardly user friendly
- Long learning curve
- Unaware of PDF
- Metafont is bitmap


LaTeX

The code

```
\documentclass{article}
\begin{document}
 Hello World
\end{document}
```

gives

Hello World

Environments

We can replace the

`Hello World`

in the preceding example with

```
\begin{enumerate}
  \item Cats
  \item Dogs
  \item Pigs
\end{enumerate}
```

to get

1. Cats
2. Dogs
3. Pigs

Note the difference from raw TeX. With LaTeX one uses "environments" such as that **enumerate** environment which enclose code designed to do a specific task. As another example, one might have

```
\begin{tabular}{lrc}
  dogs&woof&wag\\
  cats&meow&sleep\\
  cows&moo&milk\\
\end{tabular}
```

to get

dogs	woof	wag
cats	meow	sleep
cows	moo	milk

Packages

At a higher level, one can use "Packages", code which someone has provided to solve a particular problem. Some packages can be trivial (but still convenient!) while others can be very complex. As with Linux, there is a large international community of TeX/LaTeX users who contribute, update, and maintain these packages.
Use is simple. You simply put something like

```
\usepacage{graphicx}
```

in the preamble (the space between the

```
\documentclass
```

and the

```
\begin{document}
```

of your LaTeX file) and now you have the toys that package makes available.

This modularity is reminiscent of the use of kernal modules in Linux. You load what you need beyond the basic stuff.

Package example

With

```
\usepackage{color}
```

in the preamble, one can then write

```
\begin{center}
\color{red}
This will be in red\\
\color{green}
This will be in green
\end{center}
```

to get

This will be in red
This will be in green

Where the **center** environment is illustrated as well (and there is also a hidden **verbatim** to show the code).

Part III: pdfTeX/LaTeX

In the last few years Adobe's PDF format has become the *de facto* standard for presentations, superceding its sibling Postscript by adding navigation aids like URLs, and putting more emphasis on a screen for output (as in this presentation).

The TeX/LaTeX community has kept up by developing a PDF version of TeX called pdfTeXwhich, in turn, makes possible a pdfLaTeX. This PDF world is accompanied by a package **hyperref** which adds both references to other documents and URL management to LaTeX's own internal reference mechanism (already available for indexes, table of contents and bibliography citations).

Literature

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