

Introduction to Latex

Introduction

- TeX is essentially a Markup Language (like HTML, XML and RTF)
- TeX written by Donald Knuth in 70's
 - A revolution in typesetting
- Latex is an extension of TeX
 - Macro packages to make TeX easier to use

Latex vs. Word Processors

- High typeset quality
- Easy to include math formulas
- Source file format is not bounded to a particular OS or platform
- Latex implementations exists for all platforms (DOS, Windows, Unices,..)
- Latex is free

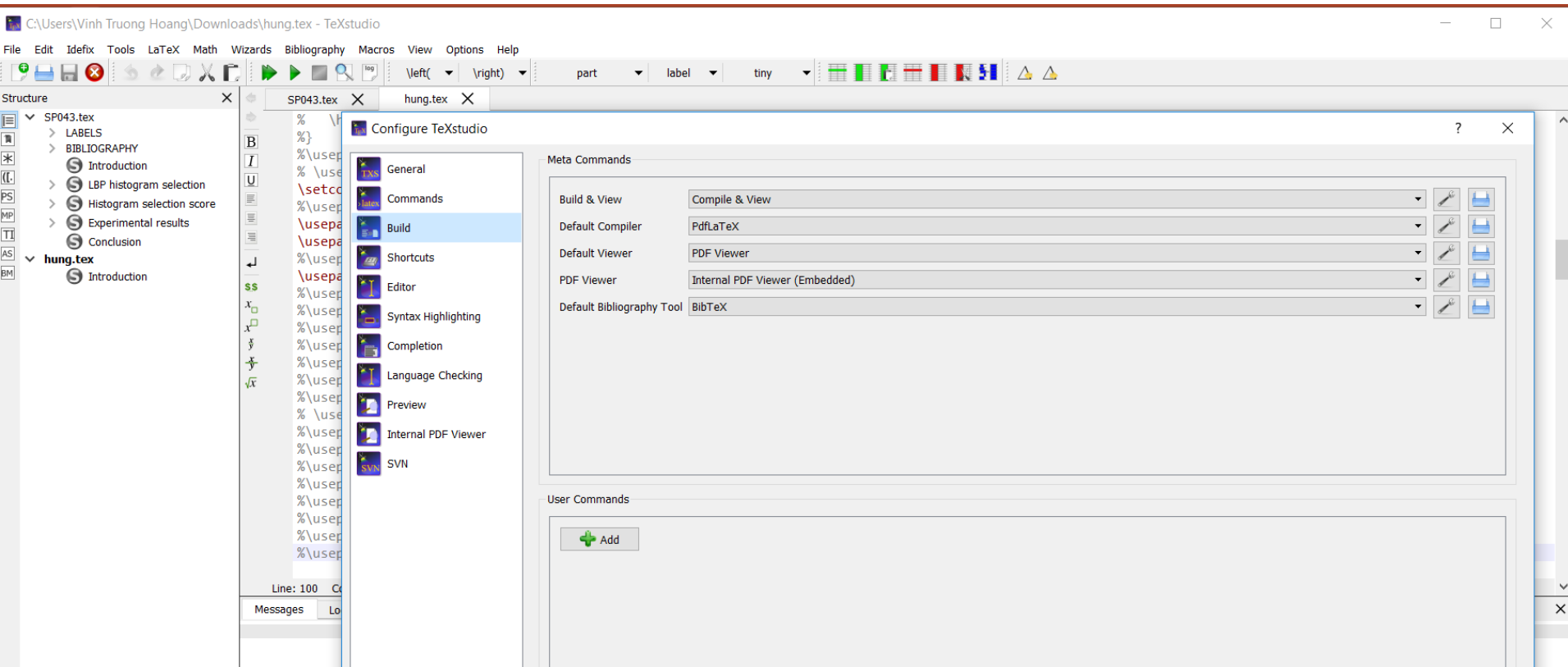
Latex vs. Word Processors

- Standard for scientific publishing
- Very few bugs
- Good for large documents
- Can run on all systems
- Not very easy to learn

Tools

- Ghostview
- Ghostscript
- Sumatra PDF, Adobe Reader, PDF Exchange
- TexLive
- Texstudio

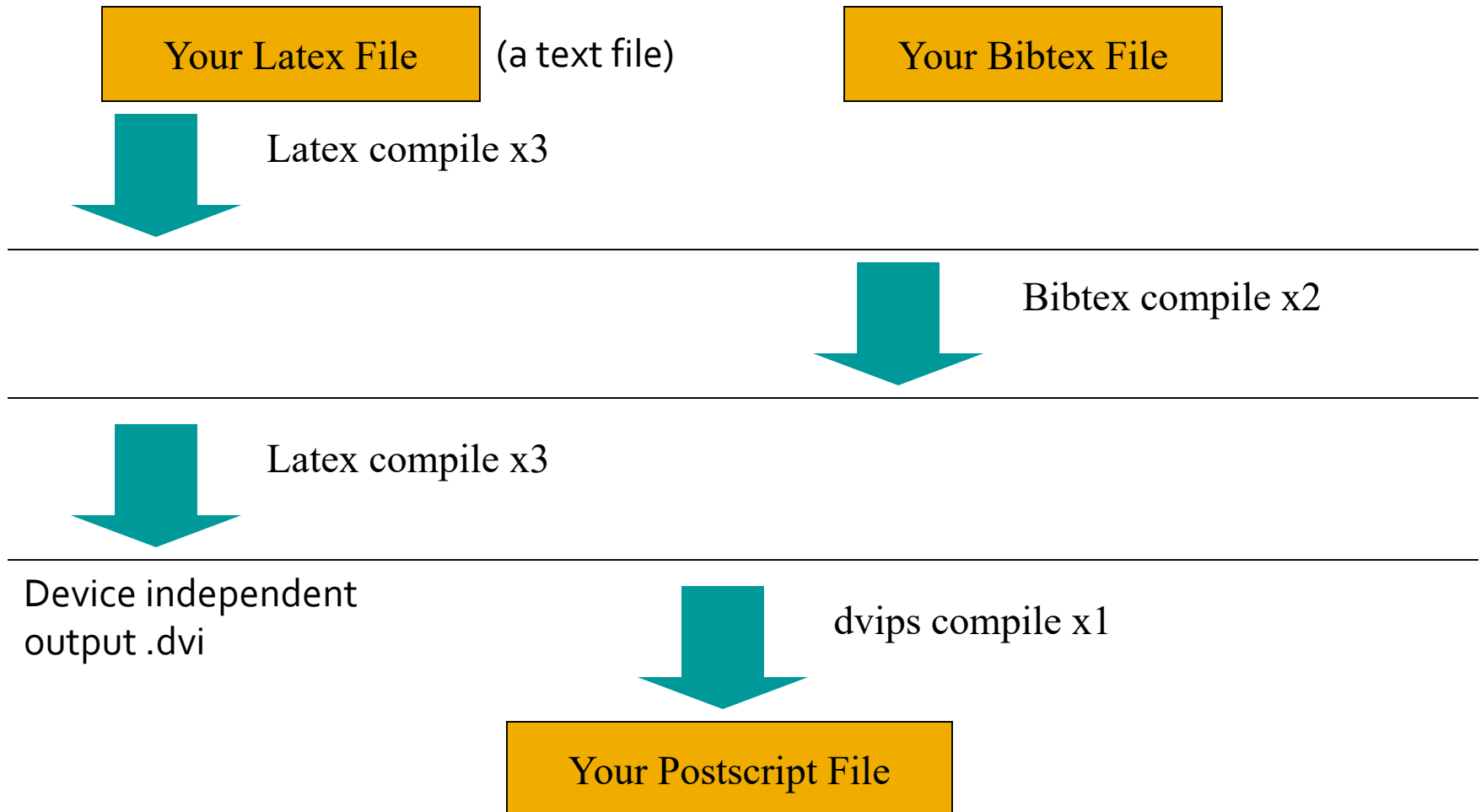
Configuration



Example of Latex document

```
\documentclass{article}  
\title{Paper}  
\author{Vinh Truong}  
\date{December 2018}  
\begin{document}  
\maketitle  
Hello world!  
\end{document}
```

Creating Latex Files



Latex File Structure

- Document Class

Predefined Formats (article, report, book,..).

- Packages used

Added Functionality (graphics, reference style,...).

- Main Body

Text and Bibliography References.

The Basics

■ Document Class

```
\documentclass[options]{class}
```

options = a4paper, 11pt, 12pt, 10pt, twocolumn, landscape,...

class = article, report, book,...

■ Packages

```
\usepackage{package name}
```

epsfig = insert PS pictures into the document

fancyhdr = easy definition of footer and header

Body of Text

- Start with `\begin{document}`
- End with `\end{document}`
- Typesetting Text
 - `\\` or `\newline` and `\newpage`
 - Quotations
 - Bold `\textbf{.....}` or `\bf`
 - Italics `\emph{.....}` or `\textit{.....}` or `\it`
 - Underline `\underline{.....}` or `\ul`

Body of Text cont...

- Including Multiple Files
 - `\input{filename.tex}`

Format

■ Sections

- `\section{...}` = 1. Latex is Great
- `\subsection{...}` = 1.1 Why Latex is Great
- `\subsubsection{...}` = 1.1.1 Reason One
- `\appendix` - changes numbering scheme
- `\chapter{...}` - To be used with book and report document classes

■ Titles, Authors and others

- `\title{...}` `\author{...}`
- `\footnote{...}`

Format Contd.

- `\maketitle` - Display Title and Author
- `\tableofcontents` - generates TOC
- `\listoftables` - generates LOT
- `\listoffigures` - generates LOF
- Labels
 - `\label{marker}` - Marker in document.
 - `\pageref{marker}` - Displays page no. of marker.
 - `\ref{marker}` - Displays section location of marker.
- Itemize
 - Use either *enumerate*, *itemize* or *description*.
 - *see handout for example.*

Lists

■ Source

- `\begin{itemize}`
- `\item Apple`
- `\item Orange`
- `\end{itemize}`

■ Result

- Apple
- Orange

Lists

- `Enumerate` instead of `itemize` gives a numbered list
- Lists can be recursive

Environment

- Something between
 - `\begin{name}`
 - `\end{name}`
- Many command, for example `\bf` affect the text until the end of environment
- Environments can be recursive
- Examples:
 - `itemize`, `center`, `abstract`

Group

- Group is some text between { and }
- Many commands work until the end of the group
- Code
 - put {one word \bf in bold} here
- Result
 - put one word **in bold** here

Alignment

- Environments `center`, `flushleft`, `flushright`

- Example

- `\begin{flushright}`
- Right aligned
- `\end{flushright}`

- Result

Right aligned

Font size

`\tiny \scriptsize \footnotesize`

`\small \normalsize`

`\large \Large`

`\LARGE \huge`

`\Huge`

Tabular

■ Columns

- `\begin{tabular}{|...|...|}`
- `\end{tabular}`

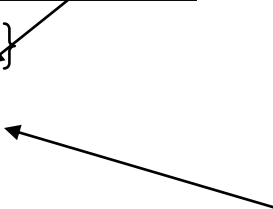
Two Columns



■ Rows

- `&` - Split text into columns
- `\\` - End a row
- `\hline` - Draw line under row
- e.g. `123123 & 34.00\\ \hline`

l = automatically adjust
size, left justify
r = automatically adjust
size, right justify
p = set size
e.g `p{4.7cm}`
c = centre text



Example of table

```
\begin{tabular}{|l|r|c|} \hline
Date & Price & Size \\ \hline
Yesterday & 5 & big \\ \hline
Today & 3 & small \\ \hline
\end{tabular}
```

Date	Price	Size
Yesterday	5	Big
Today	3	Small

Floating Objects

- Floating objects can stop splitting of tables and images over pages.

```
\begin{figure} [options]
```

```
\end{figure}
```

```
\begin{table} [options]
```

```
\end{table}
```

- They will now appear in the
 - List of Figures (LOF) and
 - List of Tables (LOT).

Options (recommendations)


h = place table here

t = place at top of page

b = place at bottom of page

Example of floating figure

```
\begin{figure}[ht]  
\centering\epsfig{file=uni.ps, width=5cm}  
\caption{University of Helsinki}  
\label{uni}  
\end{figure}
```



Figure~\ref{uni}
shows...

Images

- Use epsfig package
- `\usepackage{epsfig}`
- Including images in main body
- `\epsfig{file=filename.eps, width=10cm, height=9cm, angle=90}`
- Creating EPS - Use xv and/or xfig.
- MS Power Point, save as GIF and convert to EPS.

Bibliography by hand

```
\begin{thebibliography}{}  
\bibitem[Come95]{Come95} Comer,  
D. E., {\it Internetworking with TCP/IP:  
Principles, Protocols and Architecture},  
volume 1, 3rd edition. Prentice-Hall,  
1995.  
\end{thebibliography}
```

Bibliography using Bibtex

- Bibliography information is stored in a *.bib file, in Bibtex format.
- Include chicago package
 - `\usepackage{chicago}`
- Set referencing style
 - `\bibliographystyle{chicago}`
- Create reference section by
 - `\bibliography{bibfile with no extension}`

Bibliography using Bibtex

```
@book{Come95,  
author="D. E. Comer",  
title={Internetworking with TCP/IP: Principles,  
    Protocols and Architecture},  
publisher="Prentice-Hall",  
year=1995,  
volume=1,  
edition="Third"}
```

Bibliography contd.

- Citing references in text
 - `\cite{cuc98}` = (Cuce 1998)
 - `\citeN{cru98}` = Crud (1998)
 - `\shortcite{tom98}` = (Tom, et. al. 1998)
- Creating Bibtex Files
 - Use Emacs with extensions.
 - or copy Bibtex entries from bibliography database.

Some Math

```

\begin{center}
{\large

$$y = \frac{a^3 + 2c_x}{1 + \sqrt{b_x}}$$

}
\vspace{0.2in}

$$Q = \sum_{i=1}^j \int_{\mu}^{\infty} f(x_j) dx$$

\vspace{0.2in}

$$\Psi = \oint_{-\infty}^{\infty} f_{xy} \left( \frac{\partial Q_x}{\partial Q_y} \right) \mathfrak{A}_\pi$$

}

```

$$y = \frac{a^3 + 2c_x}{1 + \sqrt{b_x}}$$

$$Q = \sum_{i=1}^j \int_{\mu}^{\infty} f(x_j) dx$$

$$\Psi = \oint_{-\infty}^{\infty} f_{xy} \left(\frac{\partial Q_x}{\partial Q_y} \right) \mathfrak{A}_\pi$$

Conclusions

- Latex is optimal for master and phd thesis?
- Mathematical formula are easy.
- Use bibtex search engines
- Consider converting Postscript files to PDF (more widespread in Windows world) and to conserve space.