TeX Engines and Formats

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Introduction

What is "TEX"

$$\text{T\kern-.1667em\lower.5ex\hbox{E}\kern-.125emX} = \text{pdf\kern-.1em\raise.35ex\hbox{\small A}\kern-.15em T\kern-.1667em\lower.5ex\hbox{E}\kern-.125emX}$$

What is "TEX"

$$\TeX \neq pdf\LaTeX$$

Engines

Engines

An engine is *machine code* that you run.

T_EX78 (1978)

The original version of T_EX

impossible to run now

T_EX82 (1983)

The current version of T$_E$X

Multiple equivalent implementations 📃

pdfTEX (1996)

Adds native PDF output

Adds support for microtypography

X⅃TEX (2005)

Direct support for Unicode

Can load unmodified OTF/TTF fonts

LuaTEX (2006)

Direct support for Unicode

includes an embedded Lua interpreter

LuaMetaTeX (2019)

Many new features, many removals

Formats

Formats

A format is a large collection of *T_EX code*

Plain (1983)

The original format

Intended as a base, not a complete set of macros 🗨

LaTeX 2.09 (1985)

Original version of LaTeX

Very similar to modern LaTeX

Obsolete for nearly 30 years

L^A_TE_X 2_ε (1994)

The current version of L^A_TE_X

Intended as a short-term release before L^A_TE_X3 📒

ConTEXt (1995)

Superficially similar to LATEX 2

Monolithic and uniform 🗒

OpT_EX (2020)

An extended Plain, with Lua

File Names

Documents

Documents are named "⟨*name*⟩.tex"

Plain TEX

"Macros"

tex/plain/⟨*name*⟩/⟨*name*⟩.tex

tex/generic/⟨*name*⟩/⟨*name*⟩.tex

LᴬTᴇX

"Package"

tex/latex/⟨*name*⟩/⟨*name*⟩.sty

"Class"

tex/latex/⟨*name*⟩/⟨*name*⟩.cls

ConTEXt

"Module"

tex/context/third/⟨*name*⟩/t-⟨*name*⟩.mkiv

tex/context/third/⟨*name*⟩/t-⟨*name*⟩.mkxl

OpTEX

"Macro Packages"

`tex/optex/⟨name⟩/⟨name⟩.opm`

Lua

"Module"

`tex/luatex/`⟨*name*⟩`/`⟨*name*⟩`.lua`

`scripts/`⟨*name*⟩`/`⟨*name*⟩`.lua`

"Standard" Documents

Plain

```
% Set the document style
\input personal-style % Optional

% Load Packages
\input some-package

Document contents.
```

Plain

```
% End the document
\bye
```

L^AT_EX 2.09

```latex
% Set the document style and load packages
\documentstyle[package-a, package-b]
    {article} % Mandatory!

% Start the document
\begin{document}

Document Contents
```

L^AT_EX 2.09

```latex
% End the document
\end{document}
```

$\text{L\!^{A}\!T\!_{E}\!X}\,2_{\varepsilon}$

```latex
% Set the document style
\documentclass{article} % Mandatory!

% Load packages
\usepackage{package-a, package-b}

% Start the document
\begin{document}
```

LATEX 2ε

Document Contents

```
% End the document
\end{document}
```

ConTEXt

```
% Set the document style
\environment personal-style % Optional

% Load packages
\usemodule[some-package]

% Start the document
\starttext % or \startdocument
```

Document contents

```
% End the document
\stoptext % or \stopdocument
```

OpTEX

```
% Set the document style
\input personal-style % Optional
\fontfam[LMfonts]      % Recommended

% Load packages
\load[some-package]

Document contents
```

OpTEX

```
% End the document
\bye
```

Font Switching

TEX78

```
% Defining
\:a=cmr10
\:b=cmb10
% Switching
\:a Regular
\:b Bold
```

T_EX78

Regular

Bold

T_EX82

```
% Defining
\font\tenrm=cmr10
\font\tenbf=cmb10
\font\faketwentyrm=cmb10 at 20pt
% Switching
\tenrm Regular
\tenbf Bold
\faketwentyrm Bigger
```

T_EX82

Regular

Bold

Bigger

pdfTEX

Adds map files (not particularly interesting…)

X⅂TEX

```
% Defining
\font\tenrm="[lmroman10-regular]"
\font\stixbf="STIX Two Text Bold:+c2sc"
% Switching
\tenrm Regular
\stixbf Bold Text
```
📝

X$_{Ǝ}$T$_E$X

Regular

Bold Text

LuaTEX

No changes from pdfTEX

LuaTEX

```
% Load luaotfload:
\input luaotfload.sty
% Defining
\font\tenrm="[lmroman10-regular]"
\font\stixbf="STIX Two Text Bold:+c2sc"
\font\pagella={name:TeX Gyre Pagella}
\font\heros=file:texgyreheros-bold.otf

% Switching
```

```
\tenrm Regular
\stixbf Bold Text
\pagella Pagella
\heros Heros
```

LuaTEX

Regular

Bold Text

Pagella

Heros

Plain

`\rm` Regular

`\bf` Bold

`\it` Italic

`\fiverm` Small

`\fivebf` Small Bold

Plain

Regular

Bold

Italic

Small

Small Bold

LATEX 2.09

```
\rm Regular
\bf Bold
\it Italic
\vpt\rm Small
\bf Small Bold
```

LᴬTᴇX 2.09

Regular

Bold

Italic

Small

Small Bold

LATEX 2_ε

Regular
\textbf{Bold}
\textit{Italic}
\tiny Small
\textbf{Small Bold}

$\text{\LaTeX}\,2_\varepsilon$

Regular

Bold

Italic

Small

Small Bold

ConTEXt

Regular
`\bf` Bold
`\it` Italic
`\tfxx` Small
`\bf` Small Bold

ConTEXt

Regular

Bold

Italic

<small>Small</small>

<small>**Small Bold**</small>

OpTEX

```
Regular
\bf Bold
\it Italic
\typosize[5/] Small
\bf Small Bold
```

OpT_EX

Regular

Bold

Italic

Small

Small Bold

More Fonts

$\text{L\!\!^A\!T\!E\!X}\,2_\varepsilon$

```latex
% Changing families
\usepackage{tgschola}
% Changing sizes
\fontsize{21.5pt}{24pt}\selectfont
% Bold + Italic
\textbf{\textit{Bold Italic}}
% Small Caps
\textsc{Small Caps}
```

Bold Italic

Small Caps

X͟ǝL͟A͟T͟E͟X/LuaL͟A͟T͟E͟X

```
\usepackage{fontspec}

% Changing families
\setmainfont{TeX Gyre Schola}
```

📝

ConT_EXt

```
% Changing families
\switchtobodyfont[schola]
% Changing sizes
\switchtobodyfont[21.5pt]
% Bold + Italic
\bold{\italic{Bold Italic}}
% Small Caps
\smallcaps{Small Caps}
```

Bold Italic

Small Caps

OpTEX

```
% Changing families
\fontfam[Schola]
% Changing sizes
\typosize[21.5/]
% Bold + Italic
{\bf \em Bold Italic}
% Small Caps
{\caps\rm Small Caps}
```

Bold Italic

Small Caps

Questions?