

# Writing in LaTeX under Windows or Linux

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## 1 Abstract

Here are some notes I wrote after setting up Linux (Fedora Core 5) on a Dell Optiplex Gs240 PC (krondor) and then installing a Latex distribution (TeXLive2007) and an IDE for Latex (Texmaker). The subjects are as follows:

1. Abstract
2. Advantages of L<sup>A</sup>T<sub>E</sub>X
3. Linux. Obtaining and installing a Linux Distribution (Fedora Core 5, also 8)
4. Unix. Basic information on Unix (Linux) file system.
5. L<sup>A</sup>T<sub>E</sub>X. Obtaining and Installing a L<sup>A</sup>T<sub>E</sub>X distribution (TeXLive here, but MikTeX is possible). TeXLive has several collections of the Latex files on one CD or DVD, and can be installed to (has binaries for) a Windows (win32) platform, linux on several types of computer (intel x86 PCs, i386 and x86\_64 are common as of 2007) and MacOS.
6. Texmaker. An IDE ('Integrated Design Environment') for producing the input files of the form 'article.tex' that will then be converted to 'article.pdf' or 'article.ps.' Such IDEs include Texmaker (Win32 and Linux), Kile (Linux), and Emacs (multiple platforms).
7. Some notes on the use of L<sup>A</sup>T<sub>E</sub>X

## 2 TeX and LaTeX. Contents of a modern distribution.

TeX is a compiler that reads a plain text input file, for example `this-guide.tex`, and converts it to a printable page or another standard output such as `this-guide.pdf`. The author must write into the input file all of the formatting that is intended for the final page. But there are a vast number of default options so that headings and other environments such as captions will automatically be set in a fixed style. This saves the author from manually setting every paragraph to have the correct number of free lines following it, etc.

TeX is not a WYSIWIG interface - not a word processor that displays the page in real-time as it will be printed. TeX produces formatted documents from an input file of plain text - a 'recipe.' So the obvious disadvantage is that you have to compile the document each time you want to see a visual update of the printed page. The advantage is that the computer need not hold the entire document in memory and juggle an arbitrary amount of typesetting after every word. Hence TeX can be stable when handling large documents. Since TeX handles choices of font size (etc.) it sets out documents in a very uniform style, which can save a lot of user effort in setting section spacings and title styles.

TeX is a compiler. It is implemented on many different platforms: one would use a `tex.exe` on a Win32 platform (98-XP), and on Linux the executable would probably be called just `tex` (Linux is a Unix system and will handle files without extensions).

### 2.1 Difference between LaTeX and TeX

TeX is an extremely stable compiler for converting a descriptive input file that you have written (eg `article.tex`) into a neatly formatted document (eg. `article.pdf`). TeX is essentially a program that interprets text and instructions in a typographically correct way, then breaks down the process of typesetting into a task of shuffling boxes of text around a page.

LaTeX is another compiler, which incorporates the core TeX program but also allows additional program modules to be called. Technically LaTeX is a Turing-complete programming language (can perform any programming function) although it is for typesetting. Documents can be typeset in TeX, but they may as well be typeset under LaTeX for extra functionality. For example LaTeX will construct a Table of Contents from your section or chapter headings (etc.) and then get TeX to typeset that at the beginning of the document (or elsewhere).

## 2.2 Advantages of L<sup>A</sup>T<sub>E</sub>X over word processors

Since the L<sup>A</sup>T<sub>E</sub>X compiler only has to skim through the text input file once, converting it to typeset pages as it goes, it does not need to bear the entire document in memory. Therefore it is stable when handling larger documents. Cross-referencing is also much easier for this sort of program. I suggest the benefits of L<sup>A</sup>T<sub>E</sub>X are:

- Freely available
- Exists for many platforms, including: Win32, Linux in various chipsets, MacOS. LiveTeX now supports all of these from 1 DVD.
- Stable for large documents
- Forces a standard format across entire document (spacing between sections, font size for environments such as titles, subtitles, captions, etc.)
- Supports graphics (preferably in .eps format) and can accurately place these objects
- Most document formats already have stylesheets to support them (journal articles, theses...)
- Cross references figure caption and other sections using tags
- Bibtex can manage citations automatically
- Many plug-in modules exist on CTAN. Extra modules provide functions including: line-numbering, figures with text flowing around them (a bit unstable), typesetting of chess boards...

## 3 Installing Linux - Fedora Core 5

Modern PCs should be able to boot from the CD or DVD drive. Hence the installation discs for modern distributions of Linux are typically sets of 5 CDs, or 1 DVD. A basic recipe for installing linux is:

1. You will need a PC that is suitable for conversion to linux. It is possible to partition the hard drive to boot in a choice of operating systems, but simpler to put down a single linux partition.

2. Obtain Installation CDs. The UK academic mirror page is now supplied instead by the university of Kent (since July 2007). The University Cambridge Unix Support page has a mirror server with many linux distributions:

`http://www.mirror.ac.uk`  
`http://www.cam.ac.uk/cs`

Seeking “linux fedora” should be sufficient to find a distribution. Burn the CD images to CD (do not copy the images as data, but burn the image – double clicking on the image.iso file in XP should be sufficient to get CD-burning software to understand this). Optionally confirm the .iso files are error free by comparing the checksum of the image file with the published value that should be advertised by the mirror.

3. For Fedora Core 5 (and higher), feed the first installation CD into the CD drive of the PC. Press F12 to bring up the boot menu from the BIOS (the startup screen may specify another F-key to bring up the boot menu). Tell it to boot from CD (or DVD). This should be sufficient to begin ‘Anaconda.’ the installation interface for linux. Anaconda has a graphical interface that you can select by hitting enter when it instructs you to do so. Anaconda can also install via a command line interface, suitable for installing by remote over a network – to use this, type ‘linux-text’ and hit enter. Verify the integrity of the CD media before their first use, by following on-screen instructions.
4. Follow Anaconda’s instructions. You will need to choose a password for the ‘root user’ of the machine. Also select the applications you want installed with the operating system. Options include the KDE desktop environment instead of Gnome, and programming tools such as Eclipse.

### 3.1 Partitioning the hard disc

As an advanced option, Anaconda will let you ignore the default layout on the hard disc and specify partitions. The basic partitions on a hard disc (example size 80 GB) are:

/boot	physical	0.1	GB
LVM	physical	79.9	GB

the LVM (logical volume management) partition, native to linux,

is logically split into

/	LogVol100	79.4	GB
swap	LogVol101	512	MB

The ‘/’ partition is the root partition. It may be sensible to have a separate ‘/home’ and ‘/’ partition. Upgrading the operating system is then easier, as a new OS may be written onto ‘/’ without affecting personal data stored in ‘/home’

## 3.2 Keyboards etc

When Anaconda requests a keyboard type, the UK english keyboard has:

" on Shift+2  
@ on Shift+'  
A pound sign, Â£

# 4 The UNIX Directory Structure

Linux implements the same file system as Unix (obviously, since Linux is essentially a modern implementation of Unix, Posix-compliant etc.). So the file system spreads out from the root with various directories, of which some important ones are:

/

- /bin
- /etc
- /home
- /media
- /root
- /usr
- /usr/local

## 4.1 bin

Low-level, fundamental binaries are stored in the bin. Awk, grep, and cat are examples of these.

## 4.2 etc

Higher level than the bin. Etc includes such files as “profile,” an initialisation file read as part of the startup of any shell called by users other than root. So

editing this allows extra PATHs to be specified from which other executables may be called. But this can ruin a system if done wrong (Nov 2007). To repair a broken system, boot from a rescue CD, and try replacing the edited file with its former self (produced automatically by linux):

```
>cd /mnt/sysfiles/etc
>mv profile~ profile
or
>rm profile
>cp profile~ profile
```

### **4.3 home**

The preferred location for the personal files of each user

### **4.4 media**

A more modern directory. CDs and USB memory sticks may be automatically mounted in “media.”

### **4.5 mnt**

Extra file systems may be mounted here, for read and write access. In less automated systems, a CD might have to be mounted explicitly by the user, and this is where it would typically be attached to the filesystem.

### **4.6 root**

The home directory of the root user. Does not necessarily contain anything.

### **4.7 usr**

Programs and applications are stored here.

### **4.8 usr/local**

New packages (such as texlive) are normally installed to this directory.

## 5 Obtaining and Installing a L<sup>A</sup>T<sub>E</sub>X distribution

TeXLive is probably the best distribution of a LaTeX package. Information on TeXLive can be found at:

<http://www.tug.org/texlive/>

To get the disc, either copy someone's TeXLive DVD or CD, or download the zipped DVD image – named something like:

`texlive2007-live-20070212.iso.zip`

Unzip and burn to DVD. The DVD is preferred since it is not compressed can be run 'live' from the DVD drive without installing, can also be directly installed, and has support for more system architectures. However the CD (which is compressed and can only be used to install the tex distribution, not run live from the DVD drive) is needed for machines with an old drive that can't read DVDs. Beware full installation on XP takes 3 h+ (probably translating file format) but only 10 min on Linux (FC 5+).

For Windows, the installer should autoplay and run a graphical install interface.

For Linux go to the top folder on the DVD, for example:

```
>cd /media/cdrom0    or
>cd /media/TeXLive
>more README.EN
>sh install-tl.sh
>i
```

If the installer does not suggest the correct install type automatically, run other options before entering 'i'. The readme file will be previewed when you type the "more" command, and explains most options. 'l' may be of use to restrict the excessive number of languages that are supported by default.

Set the PATH, so Linux can invoke tex commands. Either type this at the terminal, or add it to /etc/profile (for all users except root). In Fedora 8, I successfully appended this to the end of /etc/bashrc. Bashrc seems less general than profile, but still allows programs (texmaker) to call the command "latex" (for example) without using the entire path.

```
# Ejr tries to append the path to texlive
PATH=/usr/local/texlive/2007/bin/i386-linux:\$PATH; export PATH
```

The comment following `#` above should not strictly be necessary.

The following PATH instruction, when appended to `/etc/profile`, worked once in Fedora 5, but caused critical damage to Fedora 8. Some implicit looking in the `bin` directory must have been caused at some stage, perhaps by a terminal command during installation that I did not understand. Do NOT append it to `profile`, and do not use it - just note the risk!

DO NOT USE:

```
PATH=/usr/local/texlive/2007/i386-linux:\$PATH; export PATH
```

After setting the PATH, linux can call the executables in the specified directory from anywhere. You should immediately use one of these executables, `texconfig`, to ensure the paper size (A4 etc.) is set to your satisfaction. At a terminal type:

```
>texconfig
```

## 6 Obtaining, Installing, and Configuring Texmaker

Go to:

```
http://www.xmlmath.net/texmaker/download.html
```

For windows, get the installer executable which can then be run directly (double click) to install the texmaker program.

```
texmakerwin32_install.exe
```

For Linux, grab the `texmaker_linux_installer` (this is currently for common i386 32 bit chipset PCs).

- Copy this file to the linux PC, probably to `/usr/local`
- Run the installer as root, using the command:

```
>./texmaker_linux_installer
```

- “You may have to make the program executable before running it.” I found this cryptic clue on the website I grabbed the Texmaker Installer from. It may mean that you should add `‘.sh’` as a file extension to the file, but I was able to run it from the terminal without doing this.



The texmaker installer should launch its own graphic installer, which is extremely quick.

In Fedora, Texmaker is added to ‘Office’ in the main menu. It can also be found at:

```
/usr/share/texmaker/texmaker.desktop  
and in  
/usr/share/applications
```

## 6.1 Configuring Texmaker for windows

Start the texmaker program. Go to

Options: Configure Texmaker.

The executable files for each of the 12 commands (LaTeX, dvips, etc.) must have their location specified in the field next to their name, so that Texmaker can call for the executables to run. The executables are likely to be in a location like:

```
C:\texlive\2007\bin\win32
```

Some functions are required to get useful output (latex, dvips and gsvie, or pdfplatex and pdfread). bibtex is basically vital if bibliographies are used. In an older MikTeX distribution, I found that bibtex8.exe works but bibtex.exe does not.

Ghostscript may have to be installed to read postscript files, and I have not yet found gsvie in the texlive distribution, so some sort of ps reader might have to be found. Alternatively you could compile to pdf and read those instead.

## 6.2 Configuring Texmaker for Linux

Again go to:

Options: Configure Texmaker

As long as you have correctly added the directory, within TeXLive that contains the linux executables, to the PATH, then it should just work if you have the names of the functions typed into the fields. As long as they are on the path, these executables can be called from a terminal regardless of current directory and they can also be called by programs such as texmaker.

The following files are found in the texlive/2007 directory we added above:

```
latex
dvips
bibtex
makeindex
xdvi
pdflatex
dvipdfm
mpost
```

The following file from texlive/2007/bin/i386-linux is not named correctly according to the default name in texmaker (which calls it ps2pdf):

```
pstopdf
```

The following programs are available directly on Fedora 5 and 8 (probably needing the K desktop environment for kpdf):

```
gs
kpdf
```

## 7 Writing Documents in L<sup>A</sup>T<sub>E</sub>X

Some notes that are not obviously available in the “Short Introduction to L<sup>A</sup>T<sub>E</sub>X.”

### 7.1 Special Characters

The special printing characters that control the L<sup>A</sup>T<sub>E</sub>X markup are: backslash (command words), hash (?), dollar (maths mode), percent (comments), ampersand (?), tilde, underscore (math subscript), hat (math superscript), and swirly brackets (envelopes commands). They are mostly typeset using \backslash, \\$ and so on, although the verbatim environment allows them to be spooled directly from the source to the target page. To avoid a space after the character, in plain text try:

```
\_{}next word
\LaTeX{} space as brackets conclude function
```

@ in bibtex. Bibtex uses the strong delimiter @ with the consequence that you can never write a normal email address in bibtex, not even in a comment (@comment). The @ symbol would be assumed to start a new bibliographical entry (which would surely be misformatted if you carried on

writing regardless). The use of a strong delimiter means that bibtex will recover from this mistake once it reaches the next entry, but it loses the current entry.