

# A Installation

*T<sub>E</sub>X*Live installs on all modern desktop, laptop, and server platforms. You can get a copy of the TUG DVD from your local T<sub>E</sub>X user group or another TUG member; or you can download the platform distribution you need from the TUG web site at [tug.org](http://tug.org); or you can download the ISO image at [tug.org/texlive/acquire-iso.html](http://tug.org/texlive/acquire-iso.html) and burn your own DVD. All the individual platform distributions are available from CTAN in [www.ctan.org/tex-archive/systems/](http://www.ctan.org/tex-archive/systems/).

This course is based on using one of the following distributions of T<sub>E</sub>X:

**T<sub>E</sub>X Live:** for all Unix & GNU/Linux systems including Apple Macintosh OS X, and for Microsoft Windows;

T<sub>E</sub>X Live is also available specially packaged for installation on Linux systems through the Linux repositories for each system.

**MiK<sub>T</sub>E<sub>X</sub>t:** for Microsoft Windows by Christian Schenk, which includes the *T<sub>E</sub>X*Studio editor, *Ghostscript*, and *GSview*;

**MacT<sub>E</sub>X:** for Apple Macs running OS X. *MacT<sub>E</sub>X* includes the *T<sub>E</sub>X*shop editor.

L<sup>A</sup>T<sub>E</sub>X is included with all distributions of T<sub>E</sub>X.

The T<sub>E</sub>X Collection DVD is issued annually by TUG in conjunction with many of the local T<sub>E</sub>X user groups around the world (see [www.tug.org/lugs.html](http://www.tug.org/lugs.html) for addresses), and edited by Karl Berry (T<sub>E</sub>X Live), Richard Koch (MacT<sub>E</sub>X), Manfred Lotz (CTAN), and Christian Schenk (MiK<sub>T</sub>E<sub>X</sub>). These people give an enormous amount of their personal time and energy to building and distributing these systems, and they deserve the thanks and support of the user community for all they do. A special debt is owed to the dedication of the late Sebastian Rahtz, one of the prime movers in TUG, the T<sub>E</sub>X Collection, and the support of T<sub>E</sub>X and L<sup>A</sup>T<sub>E</sub>X for many decades.

There was also a selection of commercial distributions you could buy, as described in ‘Commercial implementations’ on page xxxviii, and while they are no longer available for sale, many are still in widespread use: they all process L<sup>A</sup>T<sub>E</sub>X identically, but there are some differences in size, speed, packaging, installation, support, and extra software provided.

## A.1 Size and space

A full installation of T<sub>E</sub>X Live (eg the TUG CD image or the texlive-full Linux package) is just over 7.5GB, but there are two much smaller but more limited variants, ‘scheme-basic’ and ‘scheme-small’. These contain the programs, fonts, and a small subset of classes and packages, but you can download anything else you need from CTAN.

**Scheme-full:** At 7.5GB, this includes all the programs, classes, packages, support and ancillary files, 500+ typeface families, and support for hundreds of languages including Chinese, Japanese, and Korean (CJK), Hebrew, Arabic, and many others — enough to support typesetting any document in (more or less) any script anywhere in the world.

**Scheme-small:** If all you want to do is typeset a math papers, you can use *scheme-small* (BasicT<sub>E</sub>X) which is about 550MB. Admittedly still not tiny, but plausible nowadays even on fairly small machines.

**Scheme-basic:** The most minimal scheme including L<sup>A</sup>T<sub>E</sub>X is *scheme-basic*, some 265MB. Perfectly capable of typesetting straightforward documents, but of course lacks almost all add-on packages, say, *revtex*, which is included in *scheme-small*.

You can select the scheme on the command line invocation of *install-tl* by typing one of the scheme (*-s*) options:

```
install-tl -s small
install-tl -s basic
```

This can be more convenient than doing it via the menus.

If you cannot install T<sub>E</sub>X at all (for example, your computer is corporate issue and locked down to prevent software being installed), there are several interactive online systems available such as [Overleaf](#) (formerly known as *ShareL<sup>A</sup>T<sub>E</sub>X*), [Papeeria](#), and [Authorea](#). These systems have an edit window and a PDF window, just like an installed system, and they all run L<sup>A</sup>T<sub>E</sub>X exactly as if it was installed on your desktop.

One final thing before we start: always check to see if there is a more recent version of the installation program online. See the list item ‘Use the latest versions’ section A.5 on page 280 for more details.

## A.2 Installing the software

### A.2.1 Unix and GNU/Linux

Users of modern GNU/Linux systems may not even need the T<sub>E</sub>X Collection DVD, as T<sub>E</sub>X installation packages are available online, built into the package manager for your system (see the Note on p. xxxvdvdordeb).>

If your system has a graphical package manager (eg *Synaptic* or *Software*, see above), run it and install *texlive-full* (Ubuntu etc) or *texlive-scheme-full* (Red Hat etc), *ghostscript*, *gv*, *okular*, *biber*, *kile* (or *texstudio* or *emacs*), and *jabref*. Some of them may already be installed on your system. Go

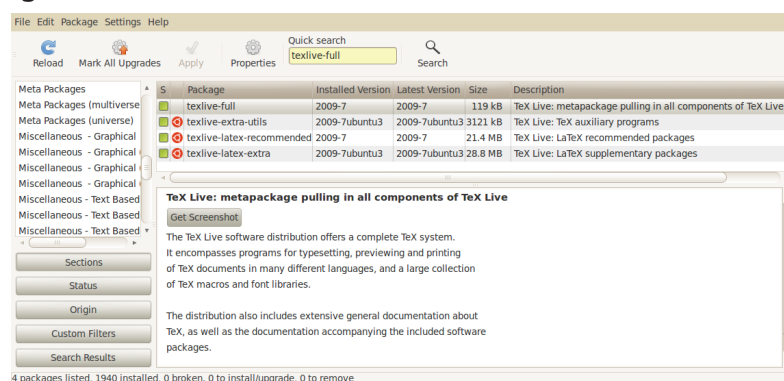
## Package managers

If you pick the 'full' option when you installed  $\text{\TeX}$ , you will have pretty much everything there is already installed.

Some distributions of  $\text{\LaTeX}$  like MiK $\text{\TeX}$  (Windows) can recognise when you try to use a new or updated class or package in your document that isn't installed, and automatically download and install it for you right there and then, and carry on compiling your document.

Others like  $\text{\TeX Live}$  and Mac $\text{\TeX}$  have a separate package manager (*tlmgr*) which can be used to add classes and packages if you find you need them.

**Figure A.1** – Installing  $\text{\TeX Live}$  from *Synaptic*, an *Ubuntu* package manager



and have a cup of coffee while they automatically install all the necessary components.

The *Ubuntu Software Centre* only allows one package to be installed at a time, so you may prefer to use a typed command in a console window (other Linux users may prefer this approach anyway). The command name varies from distribution to distribution; but two common ones are *apt* (Ubuntu) and *dnf* (Red Hat):



```
sudo apt install texlive-full biber ghostscript gv \
  okular biber kile texstudio emacs jabref

sudo dnf install texlive-scheme-full biber ghostscript gv \
  okular biber kile texstudio emacs jabref
```

Unfortunately, the *Okular* and *Evince* PDF/DVI viewers have cumbersome interfaces: *Okular* prematurely replaced two older and much better-designed viewers, *kdvi* and *kpdf*; but you could install *qpdfview* instead, which is faster and lighter.

## Unix and GNU/Linux installers

I strongly recommend this method for most GNU/Linux users. You should only need to install from the T<sub>E</sub>X Collection DVD if you are using an older, hand-built, or commercial Unix system which has no package manager, or where the version provided by the package manager is seriously out of date.

The date of the version can be a drawback: the Linux repository versions of T<sub>E</sub>X Live can be up to a year out of date, because of the enormous volunteer effort required to put them together. For new users this should not be a concern, as most updates do not seriously affect core facilities. If there are very recently-updated packages you badly need, you can install them separately, using the instructions in section 3.2 on page 70.

If you do decide to switch to the T<sub>E</sub>X Live DVD or download, make sure you *completely* uninstall and purge the `texlive-full` or `texlive-scheme-full` package first, otherwise your system will get hopelessly confused. This will leave your system in a conflicted state, because to preserve dependencies it will want to uninstall all the packages above that depend on T<sub>E</sub>X. The solution is a 'shim' Debian package that pretends that the Debian distribution of T<sub>E</sub>X Live is still installed, while actually using the DVD-installed version.

After installation, run *texconfig* (see below) in a terminal window to adjust your local settings. This is a console utility, so type `texconfig` just to adjust your own personal settings, or

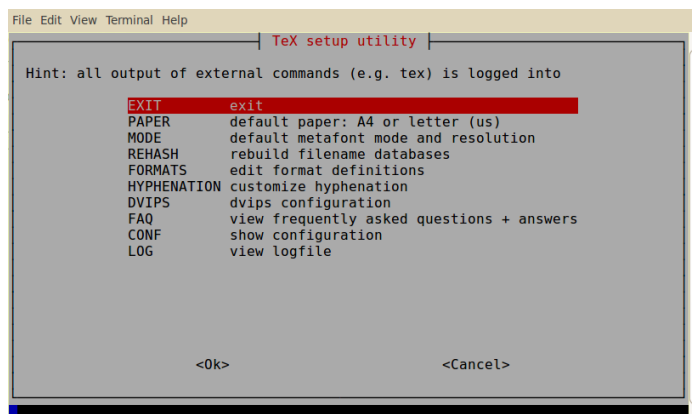
`sudo texconfig` to adjust them system-wide (for all users). In the utility, use the arrow keys to go up and down the options, and the `TAB` key to jump to (and switch between) the `OK`, `Cancel`, and other 'buttons' at the foot of the screen. The spacebar or the `↵` key selects a menu item or button. Most settings are correct as installed, but you might want to change one of the following:

- ☐ the first option, *DEST*, lets you specify whether you normally want to print straight onto the printer, or 'print' into a file (to attach to email or upload somewhere);
- ☐ the default paper size (the *PAPER* option), if the installed size is not your most common one (A4 or Letter);
- ☐ the printer resolution (the *MODE* option), where you can adjust your printer settings; this allows you to fine-tune it for, say, a typesetter that you want to send output to instead of your own printer;
- ☐ in the *DVIPS* option you can adjust your printer *OFFSET* (left and top margins), which is useful for older, less accurate printers.

You may also need the *REHASH* option later on. It is used to update T<sub>E</sub>X's fast-find database (see step 4. on page 77) on multiuser shared systems after adding new or updated packages.

If your printer is a conventional home or office ink-jet or laser printer, and is not shown, the LaserJet5 setting (600dpi) is probably a good bet. While still in the utility, you can test the margin settings in another window by running the `testpage.tex` document through L<sup>A</sup>T<sub>E</sub>X (by typing `latex testpage` and responding to the questions about paper size and double-sided printing). Print the resulting `.dvi` file with the command `dvips -f testpage | lpr` and adjust the margins in `texconfig` if necessary. These adjustments are not usually needed with PDF output.

**Figure A.2** – Running the post-installation program *texconfig*



## A.2.2 Apple Mac OSX

Double-click the `MacTeX-yyyy-DVD.mpkg` package in the `mactex` folder of the `TEX` Collection DVD (replace the `yyyy` with the year of your distribution as shown on the DVD sleeve). Install the package in the normal Mac way by dragging the package icon onto the hard disk icon.

If you don't have the DVD, download the `MacTeX.pkg` package from [tug.org/mactex/mactex-download.html](http://tug.org/mactex/mactex-download.html) and click it in your Downloads to start the installation.

Depending on how your Mac is set up, you may be asked to download and install the developer tools during the `TEX` installation. Do so.

When it's all finished, open your Applications folder in the Finder and go to the `TEX` subfolder and drag *T<sub>E</sub>Xshop* out onto your Dock. *T<sub>E</sub>Xshop* is the editor supplied with *MacT<sub>E</sub>X* which you use for writing your documents.

If you are going to use *Adobe Acrobat Reader* instead of *Preview*, make sure you clear the font cache and set the resolution to the system default (112dpi) otherwise you may get very weird displays.

If you are using the *El Capitan* version of the operating system, it is possible that *T<sub>E</sub>Xshop* will not recognise the folder where *MacT<sub>E</sub>X* installed the system. If you get an error claiming your

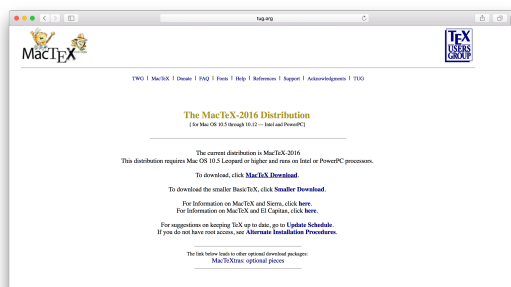
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preferred  $\text{\LaTeX}$  engine does not exist in `/usr/texbin`, then use the  $\text{\TeX}$ shop Preferences Engine menu to change the first **Path Setting** to `/Library/TeX/texbin`.

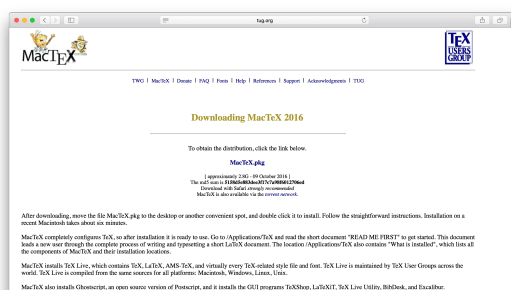
If you are unused to installing Mac software, here's a click-by-click guide:

### A.2.2.1 Download the Mac $\text{\TeX}$ installer

1. In the  $\text{\TeX}$  Users Group web page for Mac $\text{\TeX}$  at [tug.org/mactex](http://tug.org/mactex), click on Mac $\text{\TeX}$  Download



2. Click on the [MacTeX.pkg](#) link to download the installer



3. The installer will be downloaded into your Downloads area



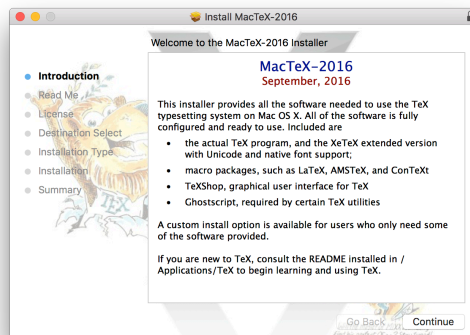
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### A.2.2.2 Running the installer

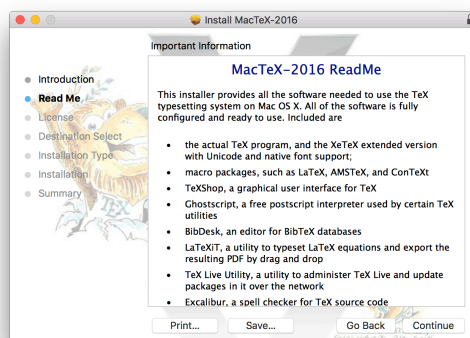
1. Click on the Downloads icon to see the package and click on it to start installation



2. The Introduction screen explains what to do

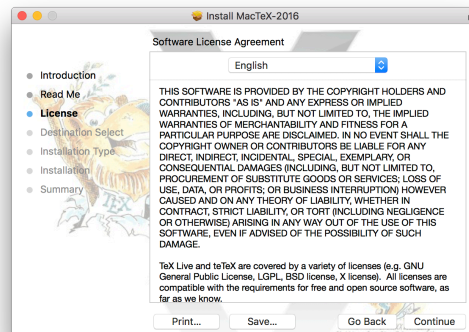


3. The ReadMe screen lists what will be installed

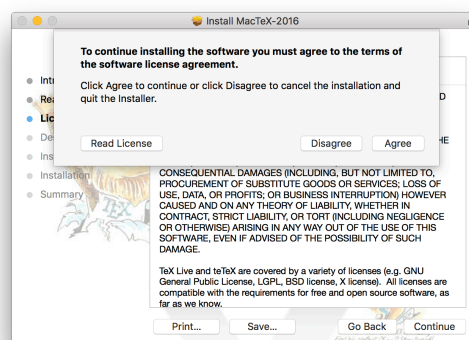


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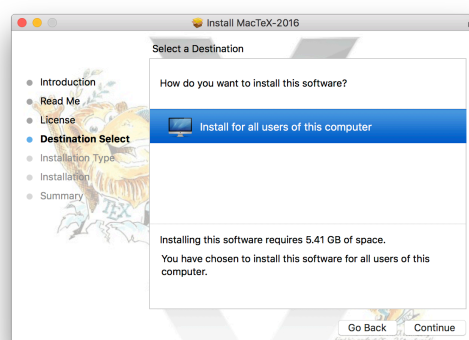
4. The License screen explains your rights: read it



5. Click Agree to continue

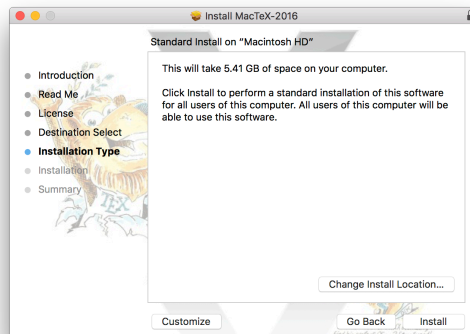


6. The Destination screen lets you choose where to install. Normally you want to install for all users, even if you are the only user on the machine

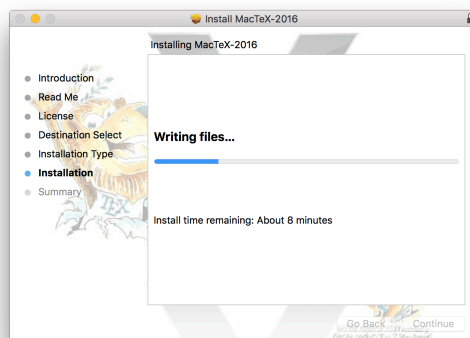


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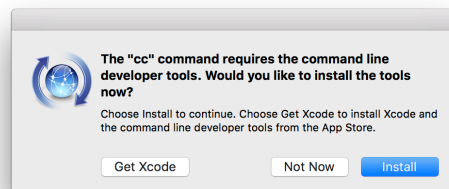
### 7. Pick the Standard Installation



### 8. Wait while the files are installed

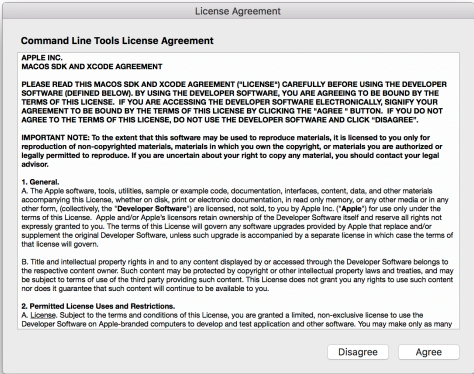


### 9. Install the developer tools (this step will not occur if you have them already installed)

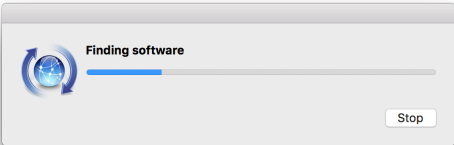


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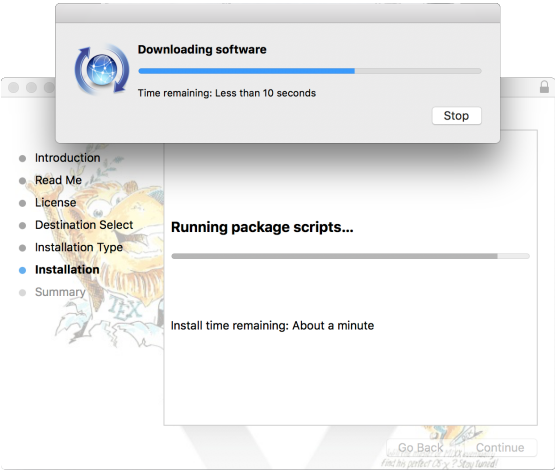
10. Agree to the developer tools license



11. The installer will check the location of the developer tools



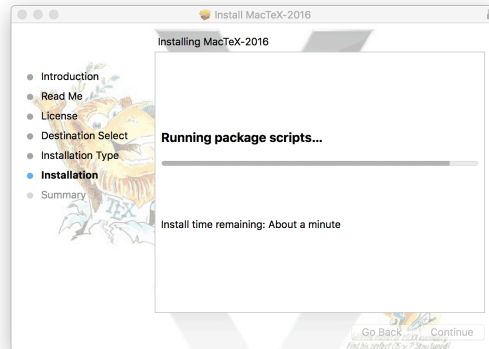
12. The developer software will be installed



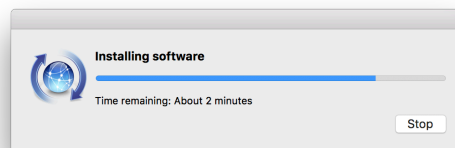


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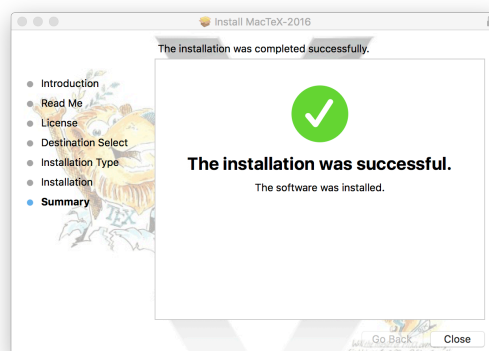
- 13.** The MacTeX installation scripts will be run



- 14.** The developer software installation will continue

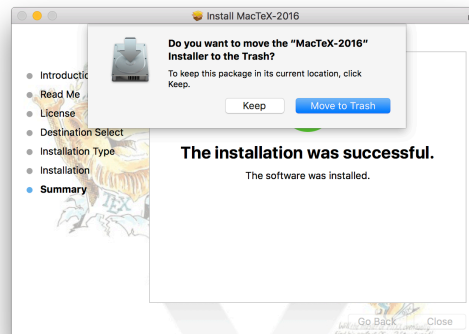


- 15.** The MacTeX installer will complete



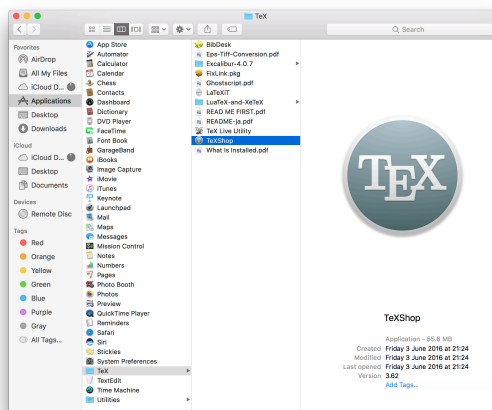
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16. You can now dispose of the installer package



### A.2.2.3 Move the TeXShop editor into the Dock

1. Open the Finder and locate the TeX folder in Applications. In it is the *TeXShop* application



2. Drag and drop the *TeXShop* application into your Dock

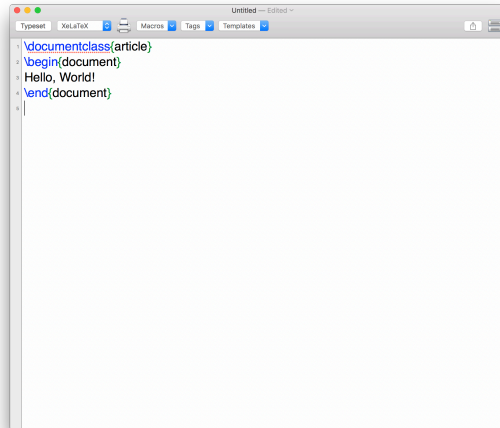


### A.2.2.4 Testing MacTeX

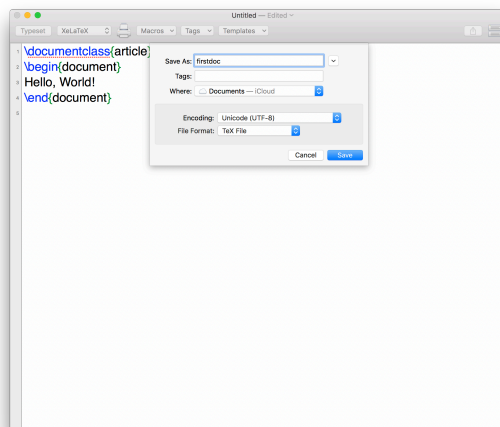
```
\documentclass{article}
\begin{document}
Hello, World!
\end{document}
```

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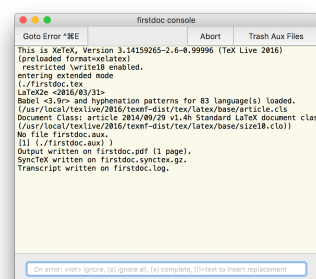
1. Click  $\TeX$ Shop in the Dock to open it. Type the 4-line document as shown above



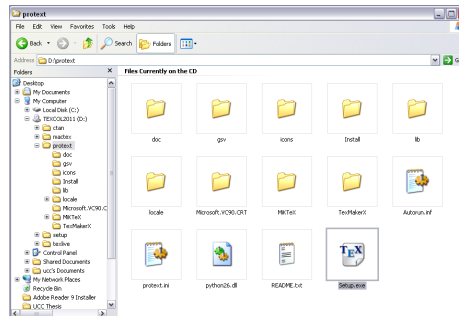
2. Set the  $\LaTeX$  processor to  $\text{XeLaTeX}$  in the drop-down menu and click **Typeset**. You will be asked to name and save the document: type a name, check the Encoding is set to **UTF-8**, and click **Save**



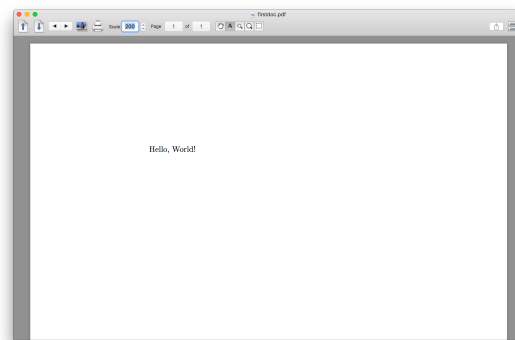
3. The processing log will record what  $\LaTeX$  does (this is also where any error messages get shown)



**Figure A.3** – The ProT<sub>E</sub>Xt setup program on the T<sub>E</sub>X Collection DVD



4. The typeset document is shown in a Preview window



### A.2.3 Microsoft Windows

You can install MiK<sub>T</sub><sub>E</sub>X from the T<sub>E</sub>X Collection DVD or by download from the MiK<sub>T</sub><sub>E</sub>X web site.

#### A.2.3.1 Installing from the DVD with Autorun turned on

If your system has auto-run enabled, inserting the T<sub>E</sub>X Collection DVD should start the setup program automatically. Click on the **Open proT<sub>E</sub>Xt** button to start. Continue from below below.

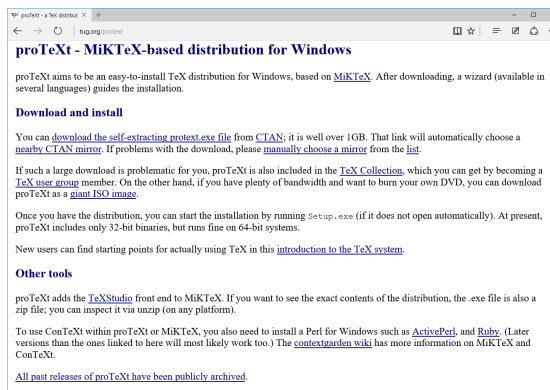
If your system has auto-run turned off, insert the DVD, go to the **protext** folder, and double-click on the **Setup.exe** program as shown in below. Continue from below below.

#### A.2.3.2 Downloading the ProT<sub>E</sub>Xt installation program

Skip this if you have the T<sub>E</sub>X Collection DVD and go straight to section A.2.3.5 on page 260

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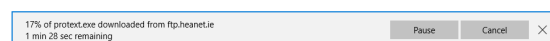
1. In the  $\text{\TeX}$  Users Group web page for pro $\text{\TeX}$ t at [tug.org/protext/](http://tug.org/protext/), click on download the self-extracting protext.exe file



2. Click on the [protext.exe](#) link to download the installer

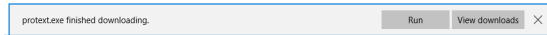


3. The installer will be downloaded into your Downloads area



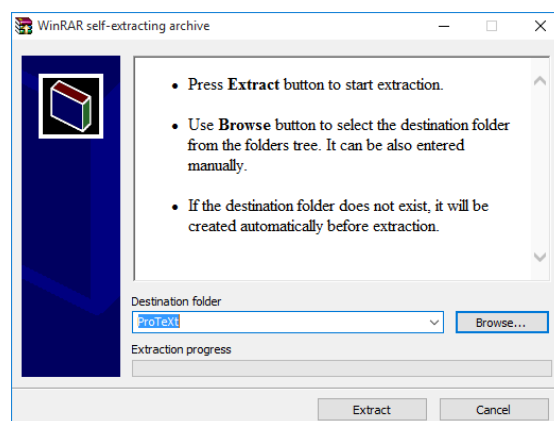
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4. When it has finished downloading, wait while it is checked for malware. When the **Run** button appears, click it to start installation. You may be challenged by Windows Security asking if it is OK to run this program. Answer **Yes**



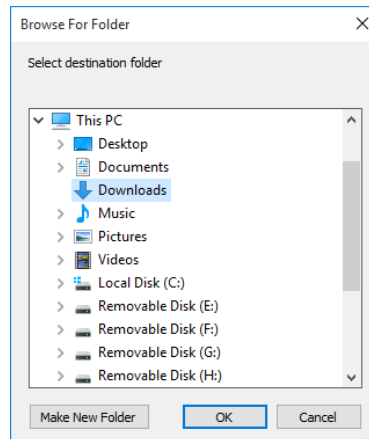
### A.2.3.3 Extracting the installation files

1. The first thing is to extract the installation files. Click on **Browse** to pick a folder

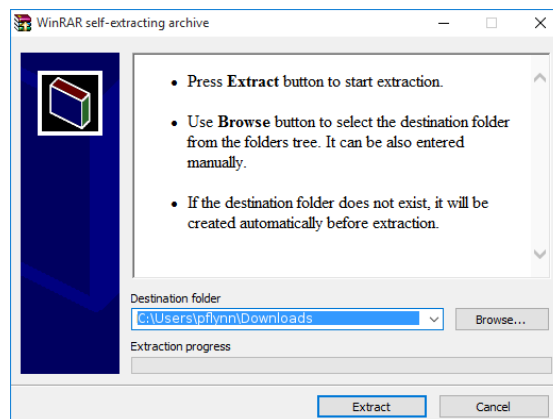


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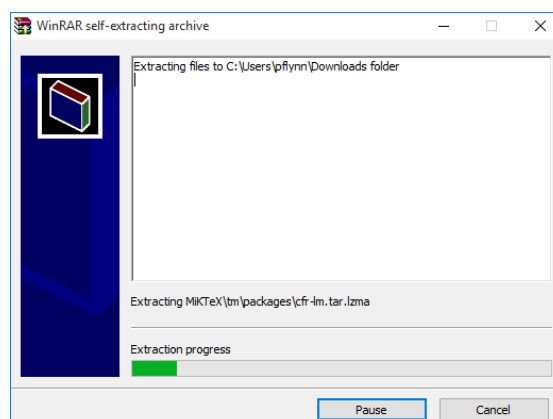
2. Choose your Downloads folder and click **OK**



3. Click **Extract** to start extracting the installation files



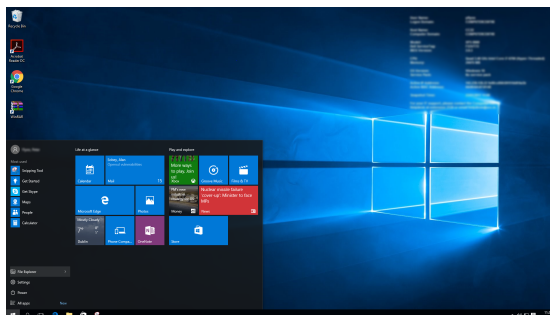
4. The installation files will be unpacked to the folder you chose



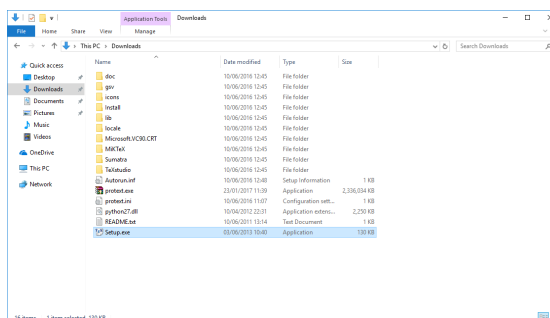
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### A.2.3.4 Locating your unpacked installation files

1. When unpacking has finished, run your File Explorer. In older versions of Windows, this was called *My Computer* or just *Computer*



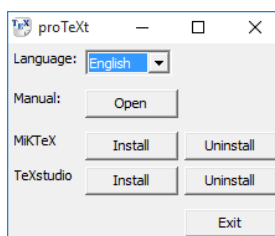
2. Go to the folder where you unpacked the installation files and double-click on **Setup.exe**



### A.2.3.5 Installing proTeXt

By now you should be able to double-click the **Setup.exe** program in the **proTeXt** folder.

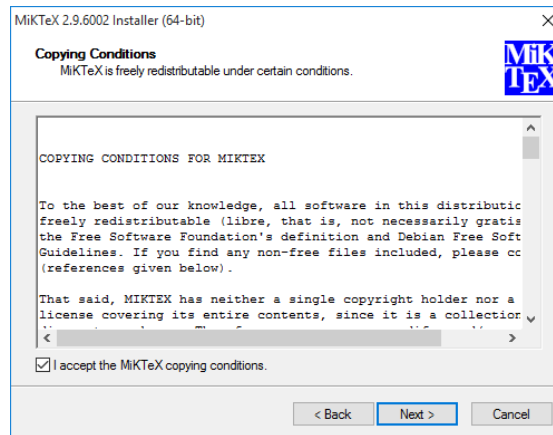
1. In the ProTeXt setup window, select your language and click on the **MiKTeX** **Install** button



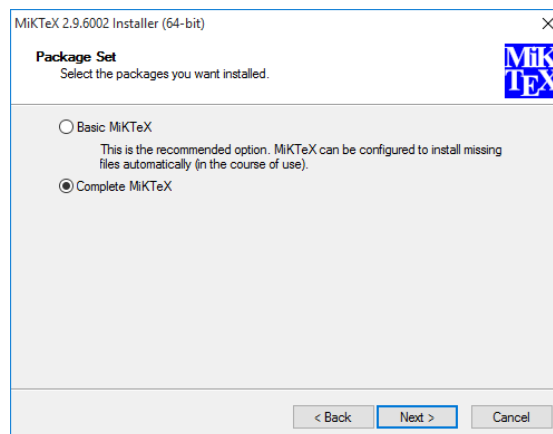


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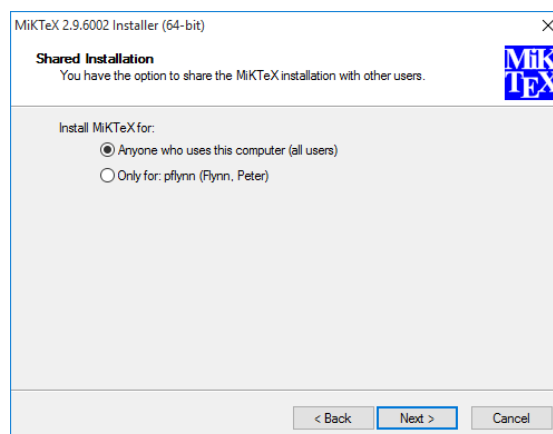
2. Click in the box to accept the MiKTeX licence and click **Next** to continue



3. Make sure the **Complete MiKTeX** option is selected and click **Next** to continue

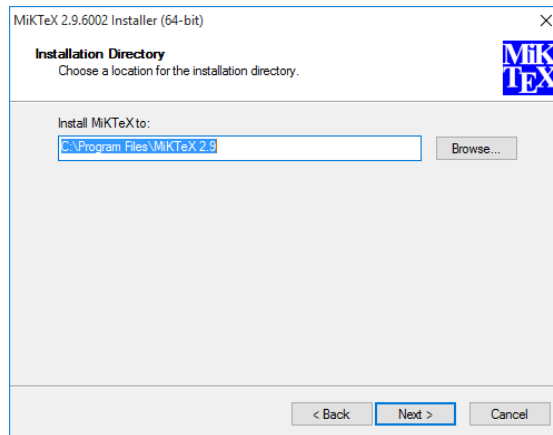


4. Choose a private installation or one that everyone who uses your computer can use, and click **Next** to continue

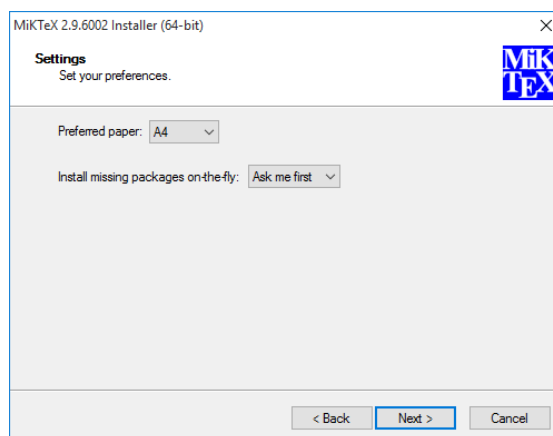


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5. Accept the installation folder that MiKTeX suggests (unless you are an expert or have a special disk setup) and click **Next** to continue

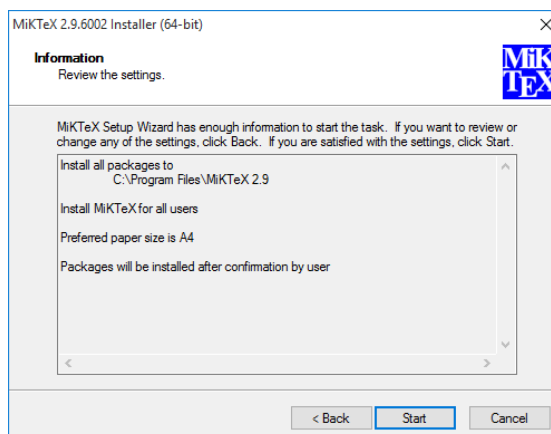


6. In the Options screen, select your paper size (A4 or US Letter), and whether or not you want extra packages to be downloaded and installed automatically (Yes or No) — on a laptop where a network connection is not always present, choose 'Ask first' instead, then click **Next** to continue

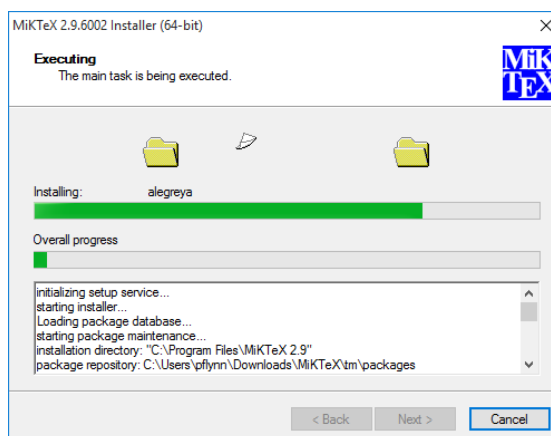


## A.2. INSTALLING THE SOFTWARE

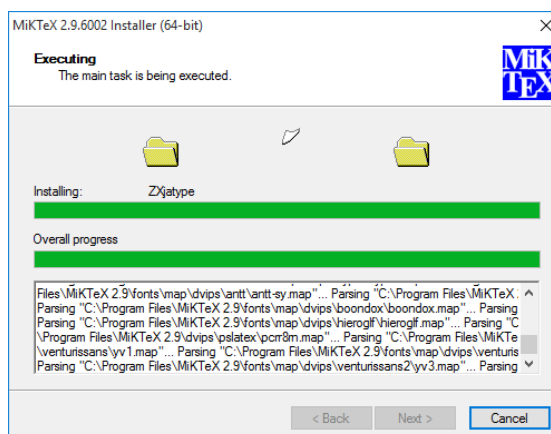
7. Finally, accept the settings as shown (or change them by clicking **Back**), and then click **Start** to start the installation process



8. During installation, MiKTeX will list the files it is installing and show a progress bar

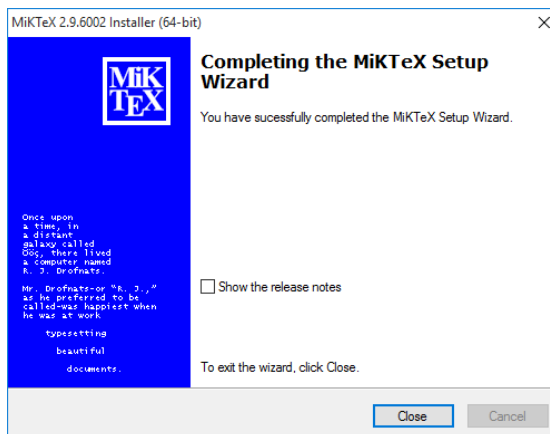


9. When it is all done, wait while it indexes your fonts, then click **Finish**



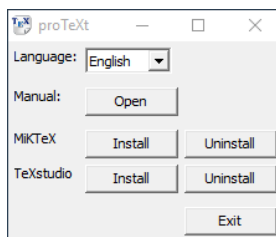
## APPENDIX A. INSTALLATION

- Click **Close** to finish the installation of MiKTeX

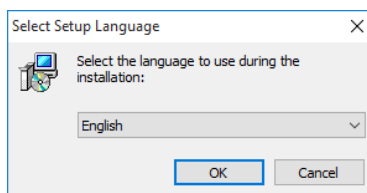


### A.2.3.6 Installing T<sub>E</sub>XStudio

- Go back to the *ProT<sub>E</sub>Xt* setup window and click on the *T<sub>E</sub>XStudio* **Install** button

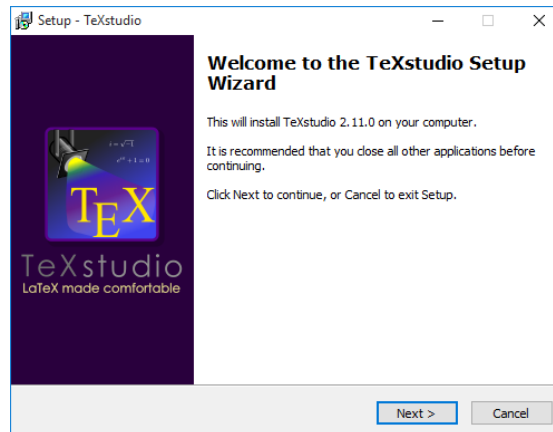


- The *T<sub>E</sub>XStudio* installation program will start and ask you to select the language to use during installation and click **OK** to continue

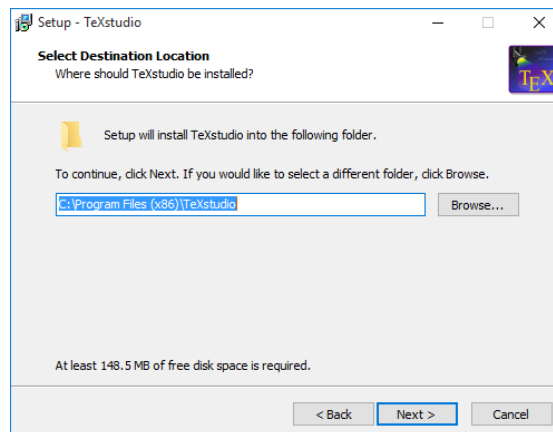


## A.2. INSTALLING THE SOFTWARE

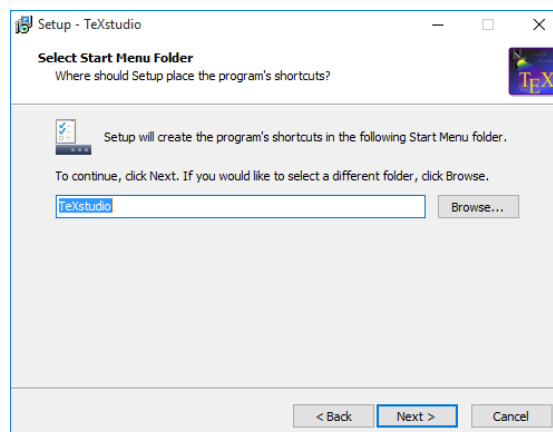
3. Click **Next** in the following screen to continue



4. Accept the installation folder that *TeXstudio* suggests (unless you are an expert or have a special disk setup) and click **Next** to continue

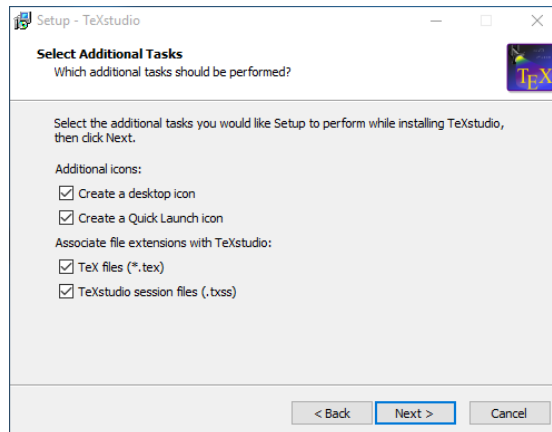


5. Also accept the suggested location for the *TeXstudio* shortcut and click **Next** to continue

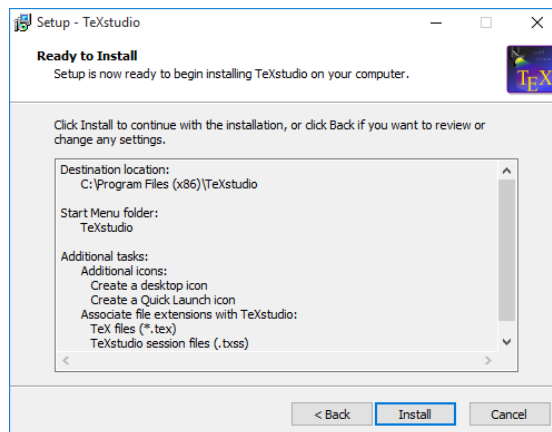


APPENDIX A. INSTALLATION

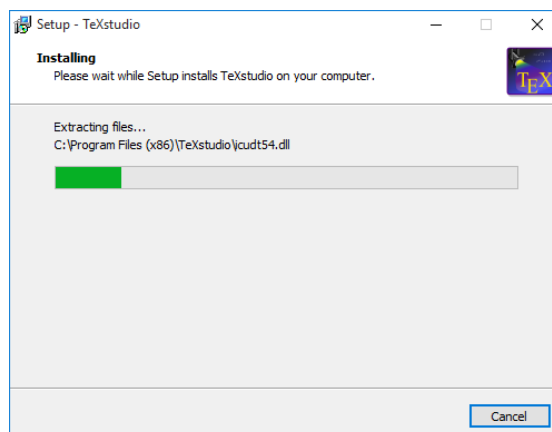
6. Add icons to your desktop and Quick Launch bar by selecting the boxes, then click **Next** to continue



7. Finally, accept the settings as shown (or change them by clicking **Back**), and then click **Install** to start the installation process



8. Wait a few moments while *TeXstudio* installs

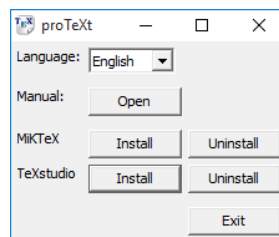


## A.2. INSTALLING THE SOFTWARE

9. When it is all done, click **Finish** and *TeXStudio* will start

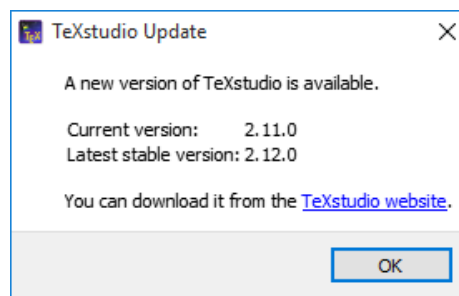


10. Close down the installer



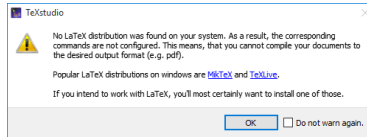
### A.2.3.7 Verifying the version of TeXStudio

1. If there is a new version available, you will be notified. You download it from the *TeXStudio* web site at [texstudio.org/](https://texstudio.org/) as described below

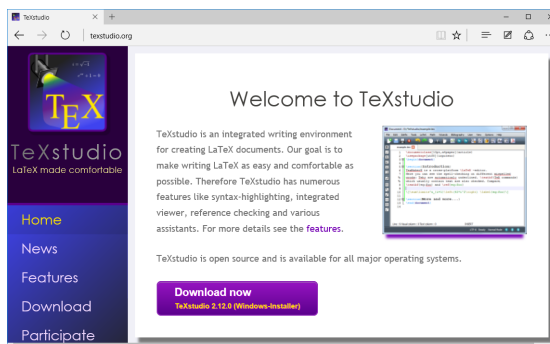


## APPENDIX A. INSTALLATION

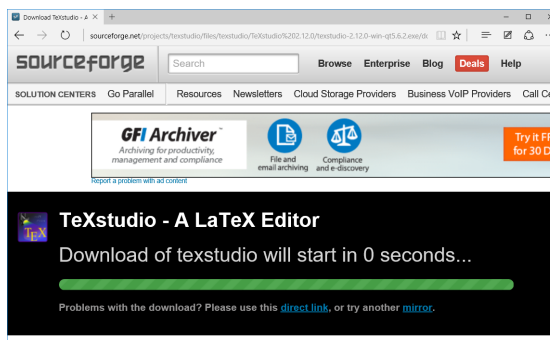
2. If  $T_{\text{E}}X$ Studio claims it cannot find the installation of  $\text{\LaTeX}$ , it is out of date and should be replaced by an updated version from their web site as described here



3. Download a new version from the  $T_{\text{E}}X$ Studio web site at [texstudio.org/](https://texstudio.org/). Click on [Download now](#) to get the latest version



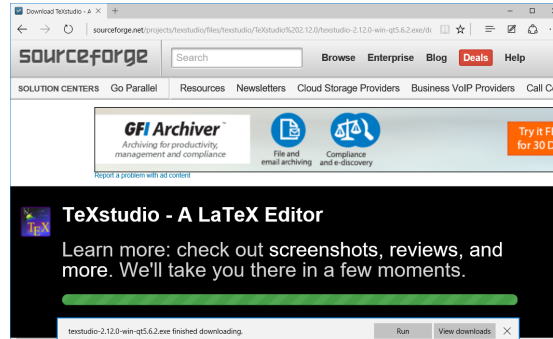
4. Downloading a new version of  $T_{\text{E}}X$ Studio





## A.2. INSTALLING THE SOFTWARE

- When the download has finished, click **Run**

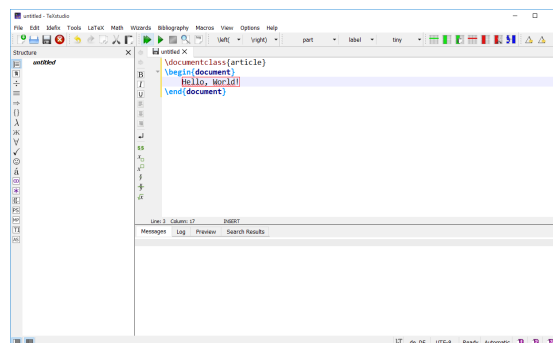


Continue the procedure from step 2. on page 264.

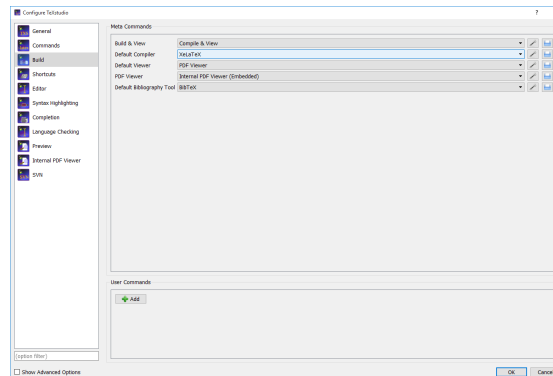
### A.2.3.8 Testing $\text{\TeX}$ Studio

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

- When  $\text{\TeX}$ Studio runs, click **File** **New** and type the 4-line document as shown above

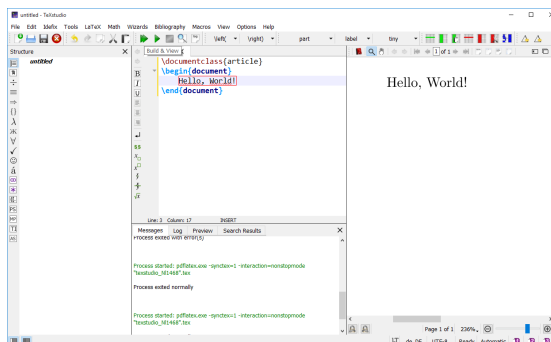


- Click the **Options** menu and set the processor (Default Compiler) to  $\text{\LaTeX}$

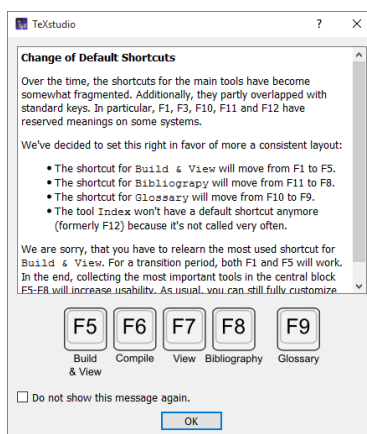


## APPENDIX A. INSTALLATION

- Typeset the document by clicking on the green double-arrow icon (Build & View)



- Shortcuts make life simpler



One last thing to do: add a **Personal T<sub>E</sub>X Directory** for extra downloads such as additional fonts.

## MiK<sub>T</sub>E<sub>X</sub> and T<sub>E</sub>XnicCenter

If you plan on using the *T<sub>E</sub>XnicCenter* editor instead of *T<sub>E</sub>Xstudio*, you must make sure when you install *MiK<sub>T</sub>E<sub>X</sub>*, that you *make a careful note of the folder you install MiK<sub>T</sub>E<sub>X</sub> into* because you will need that later, when you run *T<sub>E</sub>XnicCenter* for the first time after installation. It should be something like `C:\Program Files\MiKTeX 2.9\miktex\bin` (or a later version number, if this has moved on since the time of writing). *You need to know this*, because *T<sub>E</sub>XnicCenter* won't guess it for you.

## A.3 Your Personal T<sub>E</sub>X Directory

There are always new packages coming out, and others being updated. There are also times when you may want to add a new or uncommon class or package by hand — perhaps a private one from a company or organisation (so L<sup>A</sup>T<sub>E</sub>X and CTAN won't know about it), or even one you are writing yourself.

To do this, you need a place to put the files where they won't get mixed up with your documents or with T<sub>E</sub>X's own files. This is the 'The Right Place' to put files mentioned in step 3. on page 76, and it's known as your **Personal T<sub>E</sub>X Directory (PTD)** or **Personal T<sub>E</sub>X Folder (PTF)**.

L<sup>A</sup>T<sub>E</sub>X will automatically check this place first for classes and packages, so anything you put in your **Personal T<sub>E</sub>X Directory** will be found *before* any file of the same name in your main T<sub>E</sub>X installation. This is why it's important for manual updates, and for special or private classes, packages, styles, and fonts.

The folder is called **texmf** (short for T<sub>E</sub>X and METAFONT), and it goes in your home or login directory. On Unix & GNU/Linux systems, including Apple Macintosh OS X, and on T<sub>E</sub>X Live systems on Microsoft Windows, you just need to create the folder. In MiK<sub>T</sub>E<sub>X</sub> and ProT<sub>E</sub>Xt you need to tell MiK<sub>T</sub>E<sub>X</sub> where it is (see section A.3 on page 274).

### Creating a Personal T<sub>E</sub>X Directory


**Unix and GNU/Linux:** You can either use the terminal or the file manager:

**Either:** open a terminal (console) window and type

```
mkdir ~/texmf
```

**Or:** use a file-manager:

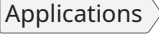

1. Open a file-manager window (eg *Thunar*, *Nautilus*, *Dolphin*, etc) on your Home directory;
2. Right-click in an empty area of your Home directory so the menu dialog appears;
3. Click Create New Folder;

4. Type the new folder name `texmf`;
5. Press the  key;
6. Close the file-manager.

**Now create the TDS subdirectory structure:** At the barest minimum, you **MUST** create the directory and sub-directory `tex/latex` inside your new Personal  $\text{\TeX}$  Directory (PTD).





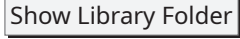


If you want to recreate the entire subdirectory tree, there are instructions in [section 3.2.3 on page 80](#).

**Apple Mac OSX:** You can either use the terminal or the file manager:

**Either:** open a Terminal window (find *Terminal* in   or type **Terminal** into *Spotlight*) and type

```
mkdir ~/Library/texmf
```

**Or:** use the Finder:

1. Open the Finder on your Home folder;
2. Click on  ;
3. Click on   and in the Options dialog which appears, make sure that  is checked, then close the dialog window and select Library in the list of folders;
4. Click  ;
5. Name the new folder `texmf`;
6. Close the Finder.

**Now create the TDS subdirectory structure:** At the barest minimum, you **MUST** create the directory and sub-directory `tex/latex` inside your new Personal  $\text{\TeX}$  Directory (PTD).

If you want to recreate the entire subdirectory tree, there are instructions in [section 3.2.3 on page 80](#).

**Microsoft Windows:** You can either use the terminal or the file manager:

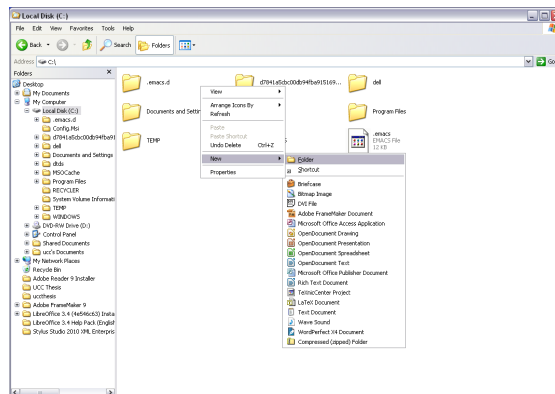
All Programs) and type


```
cd %USERPROFILE%
md texmf
```

On older Windows systems (7/8/95/XP/ME) use %HOME% instead of %USERPROFILE%.

**Or:** use the directory manager:

1. Open *My Computer* (just called *Computer* in older Windows systems);
2. Create a new subfolder called `texmf`
  - ☐ in the **C:** drive (older Windows).
  - ☐ in `Computer\System\Users\your name\texmf` (Win 7/8).
  - ☐ in `C:\Users\your name\texmf` (Win 10 and up).



3. Type in the new folder name `texmf` (make sure it is called `texmf` in all lowercase) and press the  key. If Windows makes the `T` capital, change it to lowercase `t`.

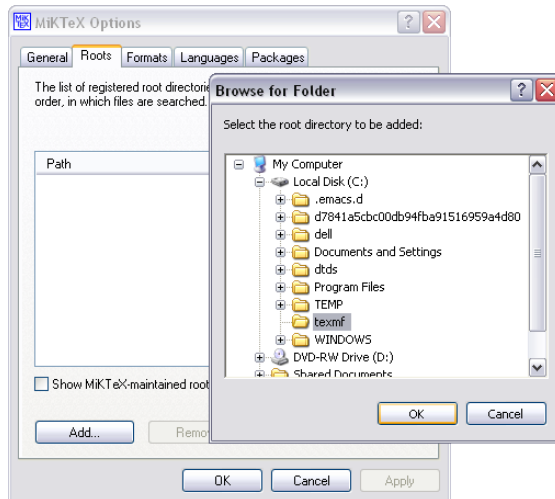
**Now create the TDS subfolder structure:** At the barest minimum, you MUST create the folder and subfolder `tex/latex` inside your new **Personal T<sub>E</sub>X Directory (PTD)**.

If you want to recreate the entire subdirectory tree, there are instructions in [section 3.2.3](#) on page 80 which can be adapted for Windows systems.

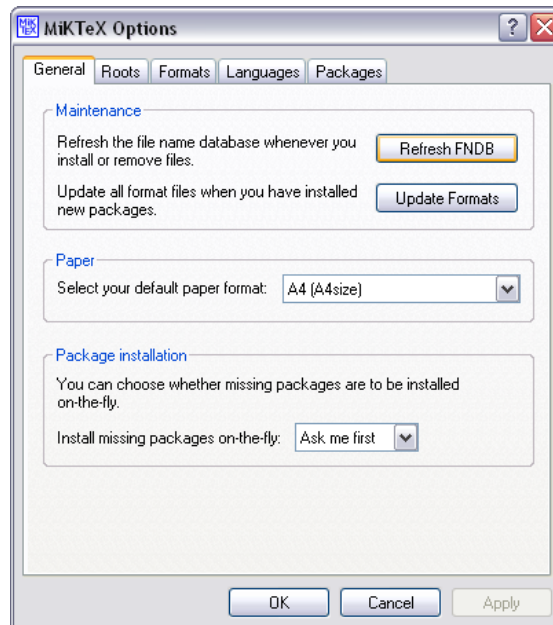
### Finally...if you use MiKTeX or ProTeXt

If you use MiKTeX or ProTeXt you MUST now tell MiKTeX to add this folder to its [File Name Database \(FNDB\)](#). This step is compulsory: without it, nothing will work.

1. Click the **Start** or **Windows** button and run the MiKTeX Options (maintenance) program (it should be shown among your recent programs).
2. Click the **Roots** tab and the **Add** button, and navigate in the window to the place where you created the [texmf](#) folder above



3. Click on the **General** tab and tell MiKTeX to update its [FNDB](#) along with its other folders by clicking the **Refresh FNDB** button ( below)



### Warning

In MiKTeX you MUST click on the **Refresh FNDB** button any time you make changes to the contents of your **Personal T<sub>E</sub>X Directory** (the **texmf** folder), otherwise MiKTeX will not be able to find the files.

## A.4 Installing new fonts

Fonts come in a variety of formats. The earlier *PostScript* Type 3 (METAFONT) and Type 1 (PS) fonts are now being superseded by fonts in TrueType (**.ttf**) and OpenType (**.otf**) formats. How you install them and where they go depends on how and where you installed L<sup>A</sup>T<sub>E</sub>X: all I can deal with here are the standard locations within the T<sub>E</sub>X Directory Structure (TDS).

**TrueType and OpenType typefaces:** These are a single `.ttf` or `.otf` file per font (so there may be many for a whole typeface or font family).

**METAFONT typefaces:** These are normally used only with older distributions of L<sup>A</sup>T<sub>E</sub>X but there are still some fonts which are not yet available in OpenType or TrueType format.

They have a number of `.mf` source (outline) files and possibly also some `.fd` (font definition) files. There may be `.tfm` (T<sub>E</sub>X Font Metric) files but these are not needed at installation, as they get generated from the outlines automatically the first time you use the font.

**PostScript typefaces:** They are normally used only with *pdf<sub>l</sub>atex* and are no longer covered in this book.

They come as a pair of files per font (so there may be many for a whole typeface): a `.pfb` (PostScript font *binary*) outline, and an `.afm` (Adobe Font Metric) file.

A `.sty` file (if present) SHOULD be used in a `\usepackage` command to tell L<sup>A</sup>T<sub>E</sub>X what font features are available, and there is often a PDF showing examples and describing how to use the font or family.

The use of Type 1 and METAFONT typefaces assumes the use of the **New Font Selection Scheme** (NFSS) used in L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>. If you are running the obsolete L<sup>A</sup>T<sub>E</sub>X 2.09, you MUST upgrade it now, because none of this will work.

#### A.4.1 TrueType and OpenType fonts

These types of font are already recognised by your computer, so you just install them in the normal way for your computer system (usually double-click or right-click on the font file and select Install from the menu).

On Windows and Apple Macintosh OS X systems, the fonts are then available immediately.

On Unix & GNU/Linux systems you must run the *FontConfig* utility *fc-cache* to give L<sup>A</sup>T<sub>E</sub>X fast-loading access to all the fonts you have installed. Run the program like this:



```
fc-cache -fv
```

It can take several minutes, especially if you have a lot of fonts. Once it has finished, you can search the font database with the `fc-list` utility and then use the `grep` command to refine the search for the font name or part, eg:

```
$ fc-list|grep -i comic|sort
/home/peter/texmf/fonts/truetype/
  windows/comicbd.ttf: Comic Sans MS:style=Bold
  windows/comici.ttf: Comic Sans MS:style=Italic
  windows/comic.ttf: Comic Sans MS:style=Regular
  windows/comicz.ttf: Comic Sans MS:style=BoldItalic
```

You can then see the exact font name to use in your documents, eg

```
\usepackage{fontspec}
\setsansfont{Comic Sans MS}
```

#### A.4.1.1 Font management

If you want to keep your additional fonts in several different locations, you will need to tell *FontConfig* where to look. You may install fonts *a)* in your *Personal T<sub>E</sub>X Directory*; *b)* in the system's shared folder; or *c)* in your T<sub>E</sub>X distribution's shared tree. You should *never* install fonts in your T<sub>E</sub>X distribution's master tree, as this will get overwritten when you upgrade, whereas the shared tree is not touched.

On Unix & GNU/Linux systems there are already `.conf` font configuration files in `/etc/fonts/conf.avail/` for the fonts that come with the installation. You can create one or more configuration files for the installation locations you have used. Some examples are shown in section 6.2.1.1 on page 170.

#### A.4.2 Installing METAFONT fonts

This is the simplest installation. When you download METAFONT fonts from CTAN, you'll usually find a number of outline files (`.mf` files) and maybe some other types as well (see below).

### Installation of METAFONT fonts

1. In your **Personal T<sub>E</sub>X** directory, create a new subdirectory called `fonts/source/public/name` named after the typeface you're installing<sup>1</sup>
2. Copy all the `.mf` files to this directory;
3. Copy any `.fd` file[s] to your `tex/latex/mfnfss` subdirectory (create it if it doesn't already exist);
4. Copy any `.sty` (style) files to a subdirectory (create it too), named after the typeface, eg `tex/latex/name`;
5. If you are using MiK<sub>T</sub><sub>E</sub>X, run your T<sub>E</sub>X indexer program (see step 4. on page 77).  
Unix & GNU/Linux systems, including Apple Macintosh OS X, don't need this last step.

That's it. Unlike *PostScript* fonts, METAFONT fonts generate their own font metric files (`.tfm` files) automatically on-the-fly the first time the font is used, so there is normally nothing else to install.

Now you can put a `\usepackage` command in your Preamble with whatever name the `.sty` file was called, and read the documentation to see what commands it gives to use the font (refer to item 1 on page 73 and step 2. on page 75).

If the font came *without* `.fd` or `.sty` files, you'll need to find someone who can make them for you.

## A.5 Installation problems

It's always annoying when a program that's supposed to install painlessly causes trouble, and none the more so when everyone else seems to have been able to install it without problems. I've

---

<sup>1</sup> On Unix & GNU/Linux systems, including Apple Macintosh OS X, the easiest way to do this is in a Terminal window, in your **Personal T<sub>E</sub>X** Directory, using the command `mkdir -p fonts/source/public/whatever`, as this creates any intervening subdirectories for you. Under Windows, you have to create each subsubdirectory individually.

installed T<sub>E</sub>X hundreds of times and very rarely had any difficulties, but these are a few of the occasions when I did.

**Bad hard disks:** If you are using Microsoft Windows, you should run a scan and defragmentation of your hard disk[s] before you start. It should take under an hour on a modern machine unless you have a very large disk, but it may need overnight on an older machine. Clean your DVD drive if it has been in heavy use. T<sub>E</sub>X is made up of a very large number of very small files, so there is a lot of disk activity during an installation. Microsoft Windows runs very slowly when installing a lot of small files, so be patient.

On any system, if you are installing a new hard disk for your typesetting work, you have the chance to reformat it beforehand. Pick the smallest granularity (cluster size) possible, usually 1024 bytes (1Kb). This minimises the space needed for systems with a very large number of very small files like T<sub>E</sub>X has, and may help improve the speed and reliability of the system.

**Windows Registry errors:** This only affects Microsoft Windows users. The Registry is where Microsoft wants software companies to store details of all the programs you install. Unfortunately the Registry is grossly abused by marketing departments to try and foist undesirable links on you, the user. You will see this with many commercial programs, where a particular type of file you've been able to double-click on for years suddenly runs a different program. Some programs install obsolete or broken copies of program libraries (DLL files), overwriting ones which were working perfectly. Worse, the viruses, trojans, and worms which typically infect unprotected Windows systems can leave unwanted links to web pages, or change some of the ways in which Windows operates. The overall effect can be that the whole machine slows down, or that files which are expected to do one thing do another. The best solution is a thorough Registry clean-out, using one of the many free or commercial programs available for the purpose.

**Use the latest versions:** Before installing, check the CTAN web site at [www.ctan.org/](http://www.ctan.org/) for the latest version of ProT<sub>E</sub>Xt (Windows), MacT<sub>E</sub>X (Macs), or T<sub>E</sub>X Live (all platforms) for the latest copy of the installation program. Just occasionally a bug slips through onto the production DVD, and although it's always fixed and notified on [comp.text.tex](http://comp.text.tex), that's a high-volume newsgroup and even the sharpest eyes may miss an announcement.

Unix and GNU/Linux users will always get the latest repository copy from their system's package manager, but this may not be the absolute latest copy of T<sub>E</sub>X (see the Note on p. 245t1c for why). If you are installing on Unix manually from the T<sub>E</sub>X Collection DVD instead, check on CTAN for an updated version of the file [install-tl.sh](#).

**Stick to the defaults:** Unless you're a computer scientist or a software engineer, I *very strongly* suggest you never change or fiddle with the default directories for installation. I know some of them look odd, but they're that way for a purpose, especially when it comes to avoiding folder names with spaces in them, like the notorious C:\Program Files. Although most modern systems cope happily with spaces in filenames and directory names when using a graphical user interface, they are *always* A Bad Idea, especially for programs which can be run from scripts (T<sub>E</sub>X is one). Spaces and other non-alphanumeric characters should therefore be avoided like the plague (they are forbidden in web addresses [URIs] for the same very good reason: the people who designed them knew the pitfalls). It may look snazzier to put the installation in My Cute \$tuff, but please *don't*: you'll just make it harder to find, harder to fix problems, and more embarrassing if you have to explain it to someone else trying to help you.

**64-bit Windows:** The MiK<sub>T</sub><sub>E</sub>X distribution for Windows is a 64-bit system. Support for the earlier 32-bit distribution was ended in 2022.

**Locked systems:** If you want to install *ProT<sub>E</sub>Xt* on a computer in a lab or other group environment where the disk storage is locked down, and where the Administrator is unwilling or unavailable to install it for you, there are a couple of choices:

- ☐ Install it on a **Universal Serial Bus (USB)** stick that you can unplug and carry with you. That way your L<sup>A</sup>T<sub>E</sub>X installation is always with you. If you use it on another computer where the USB device mounts as a different disk letter, you will need to configure it so that it can 'see' where it is in the directory system.
- ☐ If you cannot install it at all, because the Windows Registry is also locked, and the Administrator is unwilling or unable to install it for you, you may be able to install it in a virtual container (eg Windows **eXPerience (XP)** as a virtual image inside Windows 7). It will be slow, and it may be missing some facilities like alternate character sets, but it will execute.

Bear in mind that shared systems in large companies, universities, and similar organisations do usually prohibit software being installed by the user (you) because of security issues over viruses, support, maintenance, and other factors. If you feel your institution needs a network installation of L<sup>A</sup>T<sub>E</sub>X, ask your Administrator or IT Centre to contact the T<sub>E</sub>X Users Group or any local use group (see Appendix 3 starting on page 297), who may be able to help.

## A.6 Configuring T<sub>E</sub>X search paths

T<sub>E</sub>X systems run on a huge variety of platforms, and are typically made up of a very large number of very small files in several separate 'trees' of directories (folders). This allows users to update parts of the system without having to update all of it, and to maintain their own tree of preferred files without having to have administrative rights on the computer.

To make sure T<sub>E</sub>X finds the right file, it uses a technique borrowed from the Unix world, based on a simple 'hash index'

for each directory tree they need to look in. This is known as the ls-R database, from the Unix command (`ls -R`) which creates it. The program which does this for T<sub>E</sub>X is actually called after this command: *mktextsr*, although it may be aliased as *texhash* or something else on your system. This is the program referred to in step 4. on page 77.

However, to know where to make these indexes, and thus where to search, T<sub>E</sub>X needs to be told about them. You don't normally need to change the configuration, but sometimes you might want to move directories between disks to free up space or use faster equipment, which would mean changing the configuration.

In a standard T<sub>E</sub>X installation this information is in the main (*not* the local) installation directory, in `texmf/web2c/texmf.cnf`. The file is similar to a Unix shell script, but the only lines of significance for the search paths are the following (this is how they appear in the default Unix installation, omitting the comments):

```
TEXMFMAIN = /usr/share/texmf
TEXMFLOCAL = /usr/local/share/texmf
HOMETEXMF = $HOME/texmf
TEXMF = {$HOMETEXMF,!!$TEXMFLOCAL,!!$TEXMFMAIN}
SYSTEMMF = $TEXMF
VARTEXFONTS = /var/lib/texmf
TEXMFDDBS = $TEXMF;$VARTEXFONTS
```

This defines where the main T<sub>E</sub>X/METAFONT (`texmf`) directory is, where the local one is, and where the user's personal (home) one is. It then defines the order in which they are searched, and makes this the system-wide list. A temporary directory for bitmap fonts is set up, and added to the list, defining the places in which *texhash* or *mktextsr* creates its databases.

In some installations, the local directory may be set up in a slightly different directory to the one given in the example. Under Microsoft Windows, the names will be full paths such as `C:\Program Files\TeXLive\texmf` (for T<sub>E</sub>X Live) or `C:\Program Files\MikTeX 2.9\tex` (for MiK<sub>T</sub>E<sub>X</sub>). On an Apple Mac, it is `~/Library/texmf` for each user.

## Finding out where L<sup>A</sup>T<sub>E</sub>X looks for stuff

There is a program distributed in all L<sup>A</sup>T<sub>E</sub>X installations called *kpsewhich*, a T<sub>E</sub>X-specific variant of the standard Unix *which* (1) command. If you type the command followed by a filename, it will tell you whereabouts in your T<sub>E</sub>X installation it is.

```
$ kpsewhich article.cls
/usr/share/texmf-texlive/tex/latex/base/article.cls
```

Better, there is an option to tell you where your main, local, system, and personal trees (directories) are installed, and even where L<sup>A</sup>T<sub>E</sub>X puts its map files and format files (internal setups), and where shared B<sub>I</sub>B<sub>T</sub>E<sub>X</sub> files can be stored:

```
$ kpsewhich -var-value TEXMFMAIN
$ kpsewhich -var-value TEXMFLOCAL
$ kpsewhich -var-value TEXMFSYSVAR
$ kpsewhich -var-value TEXMFHOME
$ kpsewhich -var-value BIBINPUTS
```

So if you forget where to put something you are installing, \$TEXMFHOME is where it should go on a single-user system, and \$TEXMFLOCAL on a multi-user system.

