The `MacTeX` Install Package for OS X

Richard Koch

Abstract

`MacTeX` installs everything needed to run TeX on a Macintosh, with a single click of the mouse. I'll discuss the history of this package — Wendy's conspiratorial lunch and Jonathan Kew's all night coding session — modifications over the years, and important changes in the 2012 version.

1   A Demo

`MacTeX` is a flat file available as a free download from `http://tug.org/mactex`. It is a very large download, about 2.15 GB, but smaller versions are available for users with slow download links.

On the desktop, the file inherits an icon from Apple's Installer program.

Figure 1: `MacTeX`-2012

Double clicking this icon starts the installation process and the window at the top of the next page appears.

This window is entirely familiar to Mac users because the same window appears when they install other packages, and until recently when they installed system updates. The installation process is summarized by the list of items on the left; this list is fixed by Apple and cannot be changed. Notice that the dialog background is a merging of the OS X logo with a Duane Beebe drawing of both the TEX Lion and Donald Knuth. The idea of a TEX-related illustration goes back to Jonathan Kew's initial version of the package; this particular form was provided by Bob Kerstetter.

At the extreme top right of the window you'll notice a small padlock. It brings up a window listing the Developer ID Certificate issued by Apple to validate this package. On Apple's upcoming Mountain Lion system, this certificate plays a more important role: depending on user settings in Preferences, the system will refuse to install packages which lack an official Apple signature. An Apple engineer contacted me in May to make sure `MacTeX` would have this signature, so Apple knows about TEX!

When the user pushes Continue, a Read Me document is displayed on the right side listing items to be installed and their install locations. The dialog also tells new users how to get started with TEX, and explains that additional style files can be added to TEX by placing them in appropriate folders inside ~/Library/texmf/.

We can safely ignore the contents of this document because experience shows that nobody actually reads it. Instead they click Continue to go to the next stage of installation.

This time the panel on the right displays a License pane listing the various licenses governing various installed programs, and containing standard disclaimers. This dialog is shown on the next page. When the user pushes Continue, a dialog appears on top of the license giving users the options of Agreeing or Disagreeing with the License. It is not a good idea to push Disagree, because it immediately quits the installer.

(The abstract to this paper says that `MacTeX` installs TEX with a single button click. Are you counting clicks? By my count, we are up to four, not counting the double click which started the process.)

The next dialog appears during what Apple calls the "Installation Type" portion of the process. This portion allows users to select the disk where the installation will appear, and sometimes select the location on that disk where new files will appear. `MacTeX` always installs on the system disk in standard spots, so this dialog merely explains how much space will be taken by the installation.

A button at extreme left leads to a Custom installation. The resulting dialog is shown below the Installation Type dialog. Note that `MacTeX` is separated into pieces: TeX-Live, GUI Applications, Ghostscript, Convert, the Latin-Modern Fonts, and the TeX-Gyre Fonts. Most users will install TeX Live, but users with a favorite editor may skip GUI Applications, and users who compile Ghostscript and ImageMagick themselves or obtain them as part of Fink or MacPorts will skip those packages. We provide two optional font packages; these packages install duplicates of certain TeX fonts in Apple's Font Directory, making them available to standard Macintosh programs like Adobe Illustrator.

A final click leads to a standard dialog asking the user to supply an Administrator Password. This password is required because TeX Live will be installed in /usr/local, which is owned by root. On the Macintosh, standard users are Administrators and the Administrator Password is their own password rather than an actual root password. Accounts on school lab machines will not have administrator privileges and users cannot install `MacTeX` on them.
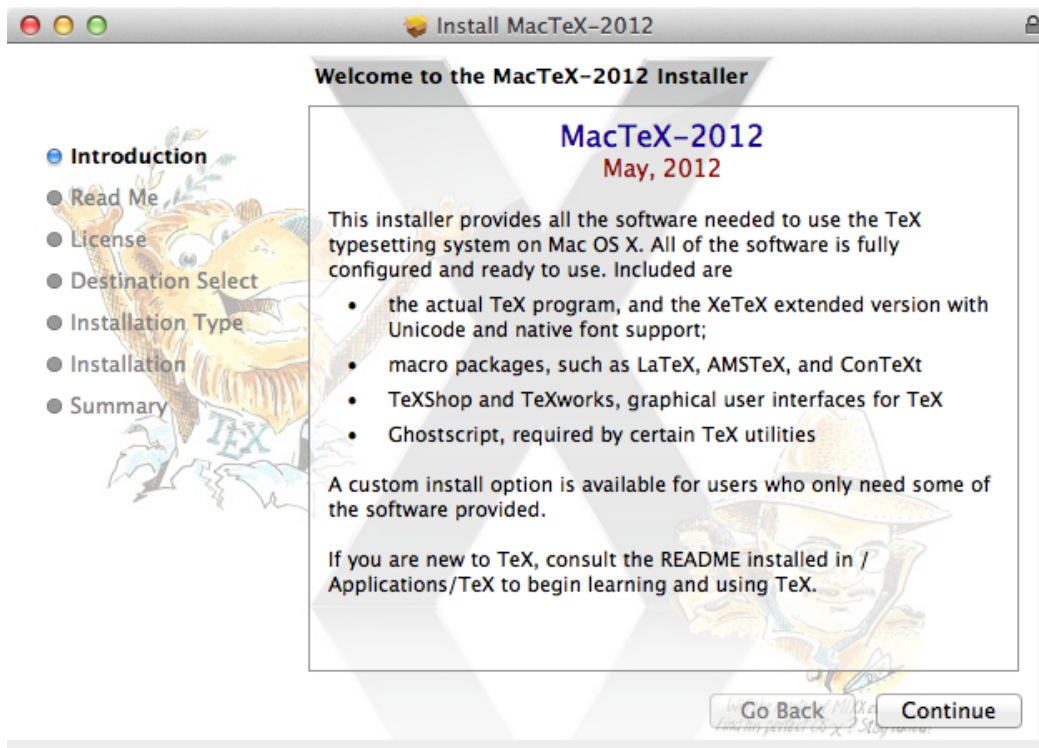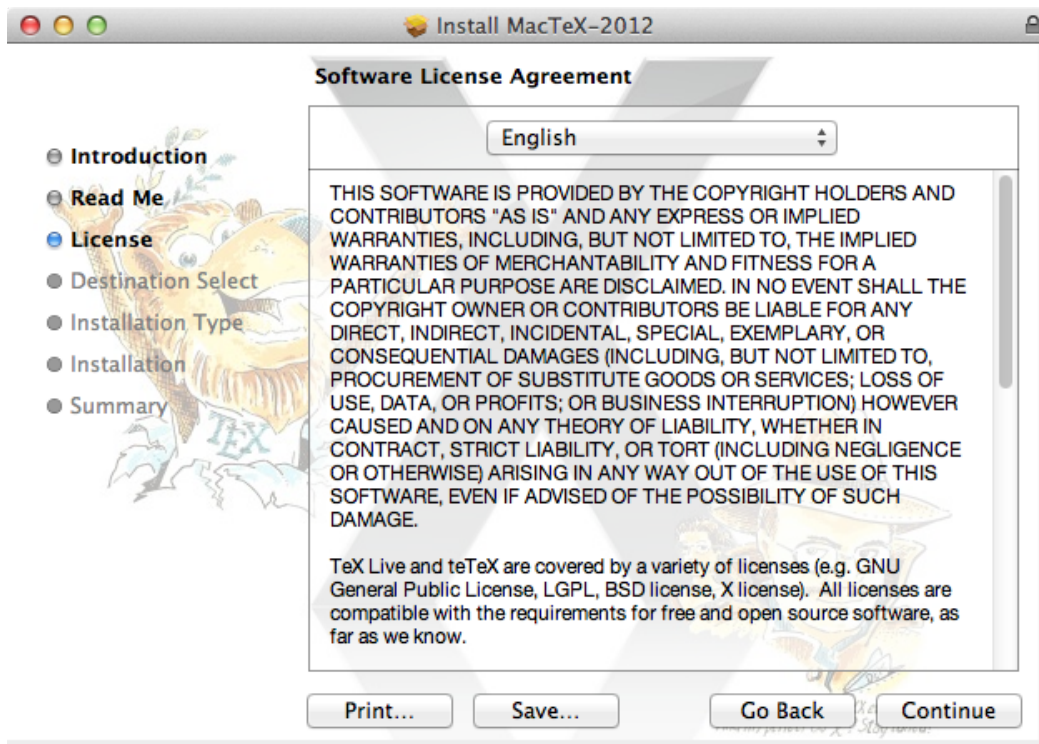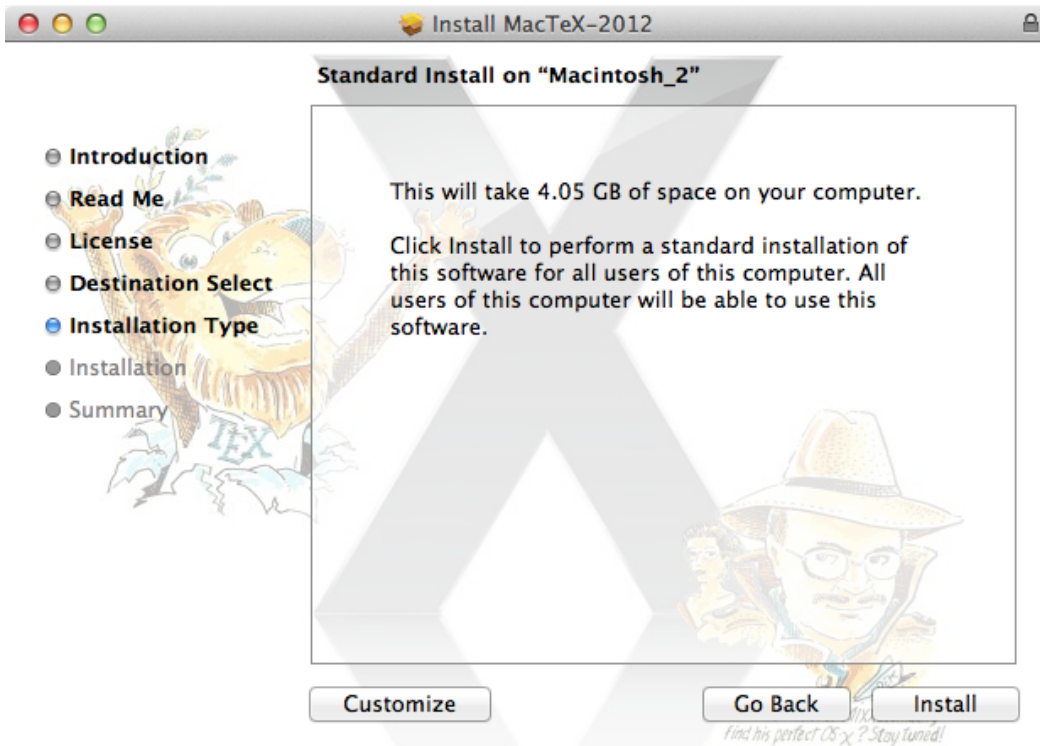
Figure 2: Initial Dialog

Figure 3: License Dialog

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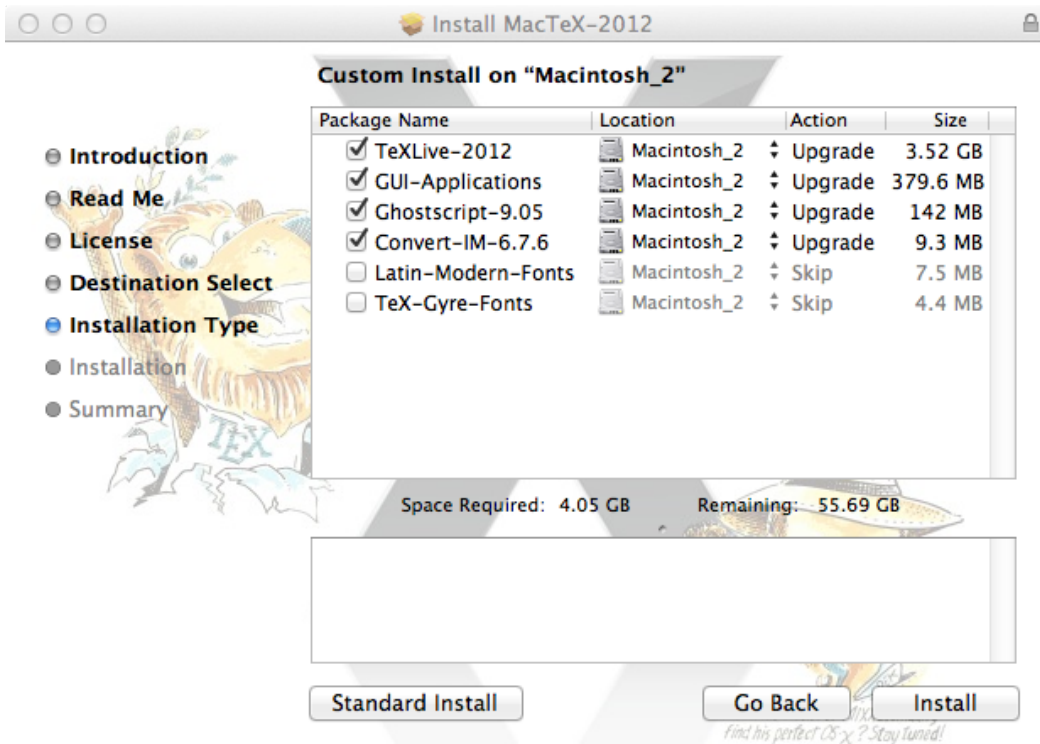**Figure 4**: Installation Type Dialog

Figure 5: Custom Install Dialog
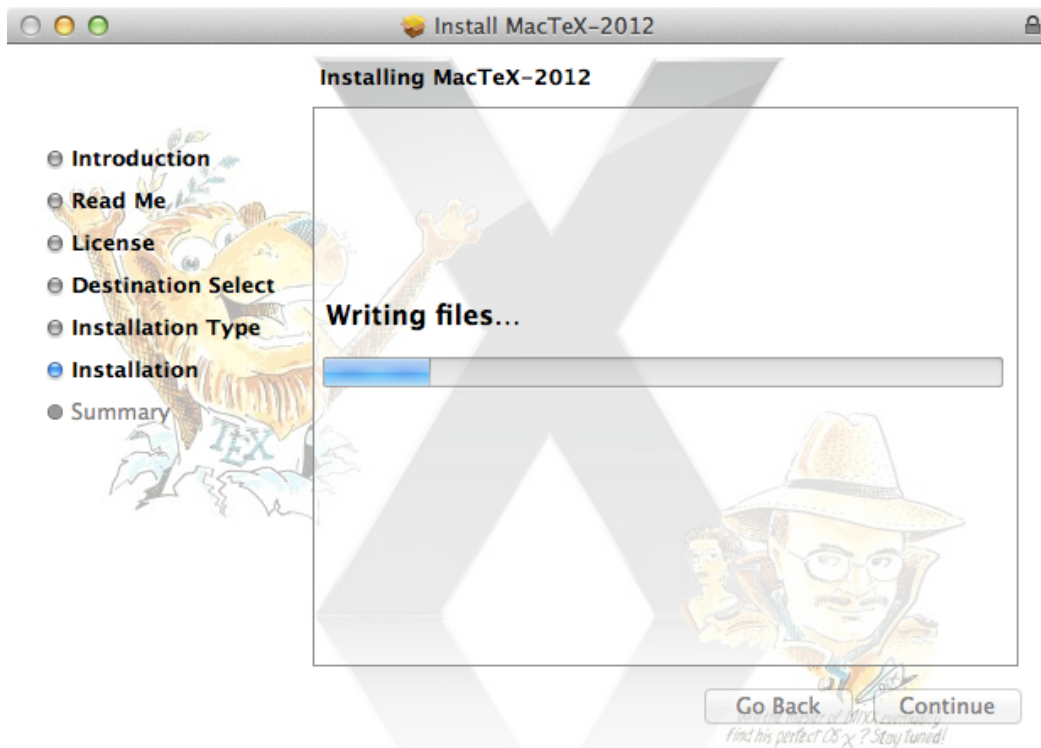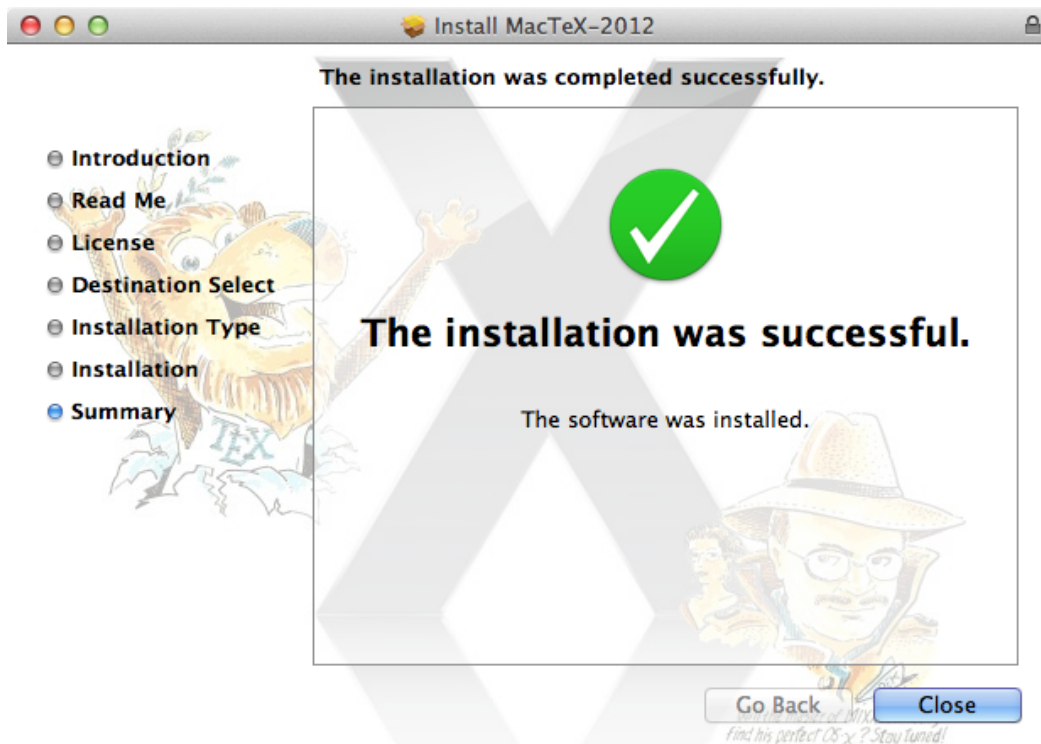
Figure 6: Actual Installation

Figure 7: Success Dialog

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Then installation occurs, with a progress dialog as shown, followed by a final success dialog. Not counting custom installation, the process requires six clicks and one password.

2 GUI Applications

TeX is installed in /usr/local/texlive, a location not shown by Apple's Finder. Consequently, the only files commonly seen by users are those installed in /Applications/TeX. We install two editors, TeXShop and TeXworks, and we install LaTeXit, a graphical application which allows users to type equations in TeX, convert them to pdf form, and paste the pdf into standard Macintosh programs using drag-and-drop operations. We install the Excalibur spell checker, but we do not install the more commonly used cocoAspell by Anton Leuski because it has a special installer and extra dictionaries available from Leuski's web site. Our documentation directs users there, `http://cocoaspell.leuski.net/`.

Finally, we install Adam Maxwell's wonderful TeX Live Utility, a program which puts a standard Macintosh interface on the TeX Live tlmgr, allowing users to keep TeX Live packages up to date, search for new packages, and configure paper size.

3 Configuring TeX Live and GUI Apps

In a word, nothing is needed. The installer predicts the user's desired paper size from Mac printer settings. It adds the TeX binary location to the PATH variable, and makes TeX man pages readable. All supplied GUI apps are already configured to find TeX.

4 Getting Started with TeX

There is no standard spot for user documentation on the Macintosh, so we install a short READ ME FIRST document in /Applications/TeX. This document starts with a two page introduction to TeX for a first time user, leading the user through the process of writing and typesetting a short document with TeXShop. Since both pages contain half page illustrations, the introduction is very short with only essential steps to get the job done. At the end, the user is directed to a movie in the TeXShop help menu illustrating the typesetting job.

After that, the READ ME document lists links to information about other editors and GUI front ends on the Macintosh, to important TeX information at TUG and elsewhere, to online tutorials about TeX and TeX Live with links that immediately bring up the information, and to the TUG web page on books about TeX.

5 TeXDist

`MacTeX` installs the TeX Distribution data structure and Preference Pane by Gerben Wierda and Jérôme Laurens which makes it easy to use multiple TeX distributions on Mac OS X. This structure is described in detail in my article *Support for multiple TeX distributions in i-Installer and `MacTeX`*, TUGboat, Volume 28 (2007), No. 3.

Installing `MacTeX` does not erase distributions from past years. The TeX Dist Pref Pane by Jérôme Laurens is added to the standard Apple System Preferences by `MacTeX`. It lists all TeX distribution on the Mac, and lets the user select the active one with a single button click. This click automatically reconfigures all GUI editors and utilities, and modifies PATH and MANPATH in shells. It isn't even necessary to restart these applications. You can typeset with TeX Live 2011, keep your editor active, switch to TeX Live 2012 with the Pref Pane, and typeset again with TeX Live 2012.

`MacTeX` installs a link named /usr/texbin which points (indirectly) to the active TeX distribution. Any GUI app configured to find TeX at /usr/texbin can share in the advanages of the TeX Dist structure.

6 The Special Version of TeX Live Installed by `MacTeX`

The key message of this section is that *there is NO special version of TeX Live for the Mac!* We have always strictly followed the rule that we install the full TeX Live, completely unmodified.

On Unix machines, TeX Live is often installed by running the install-tl script from a shell. The TeX Live portion of `MacTeX` is constructed by removing /usr/local from the machine creating it, installing TeX Live to /usr/local on that machine with the TeX Live install script, pointing Apple's Package-Maker software to the install location, and asking it to construct an install package. Later when `MacTeX` installs this package on a user machine, it runs a postinstall script to configure paper size and do a few other things, but this script does not modify files in TeX Live.

The install-tl script has a header section which allows users to change a very small number of configuration options. We change just three of these options:

- TEXMFVAR = /Library/texlive/2012/texmf-var
- TEXMFCONFIG = /Library/texlive/2012/texmf-config
- TEXMFHome = /Library/texmf

On Unix machines, these three variables point to hidden locations in the user's home directory. On the Macintosh, there is a special folder named Library for a user's configuration information, and the three listed folders become visible in this special folder.

In Apple's latest operating systems Lion and Mountain Lion, the Library folder is itself hidden. But by holding down the Option Key while pushing the Finder's Go menu, the user can be taken to this folder.

7   Smaller Install Packages

`MacTeX` is a gigantic download. That is why we supply the much smaller install package `BasicTeX`, of size 66 megabytes. This package installs most files needed for ordinary typesetting using TeX, LaTeX, or XeTeX. It contains the computer modern fonts and more recent Latin Modern Fonts. Many users report that all their documents typeset fine with this installation.

A new user can easily produce TeX documents using only TeXShop or another GUI front end and `BasicTeX`.

In 2012, the subset of TeX Live installed by `BasicTeX` became one of the install schemes for TeX Live. `BasicTeX` is exactly the result of installing the *medium scheme* with that install script.

`BasicTeX` used to contain ConTeXt, but later Mojca Miklavec and others introduced a standalone ConTeXt distribution. Since ConTeXt is upgraded more often than once a year, and since this distribution can coexist with TeX Live, it makes sense for ConTeXt users to install it. See `http://wiki.contextgarden.net/ConTeXt_Standalone`.

We also produce `MacTeX-Additions`, an install package containing everything in `MacTeX` except TeX Live: `http://www.tug.org/mactex/morepackages.html`.

8   A Defective Install on the NeXT Machine

I am one of the few people who bought a NeXt computer. Software for this machine was not — let us say – abundant. So owners bought more or less everything released for the machine.

Early in the life of the NeXt, I bought software which came on a CD and was installed by the NeXt version of Apple's Installer program. As installation proceeded, icons in the dock began changing to large question marks, and by the end only a couple of icons remained. Puzzled, I clicked on one of the question marks, but nothing happened. With some concern, I started the Terminal program to run a shell, but Terminal had become a question mark.

Eventually I logged into the machine remotely and discovered that the entire Applications folder had vanished. Luckily, the NeXT could reinstall the operating system without erasing the hard disk.

A few hours later, the company selling the CD issued a profound apology and explained that the NeXt installer didn't anticipate symbolic links in the Application directory, or maybe didn't anticipate hard links, or maybe it had nothing to do with link, but at any rate it didn't anticipate *something unusual*. I don't know the details, but I learned a lesson: installers are dangerous.

The memory of that event colors my life to this day. Every so often, users ask for a feature in `MacTeX` which is not provided by Apple's PackageMaker utility. When I explain the problem, users often sketch a way to construct the package directly without using Apple's utility. I will *never* do that. There are a half dozen Apple engineers who know everything about pax files, compression algorithms, soft links, hard links, dangerous links, secret links, and everything else that could go wrong with an install package. The thought that they'd lose their jobs if something went wrong is strangely reassuring.

9   Gerben Wierda's i-Installer

My first TUG conference was TUG 2001 in Delaware, where I met Han The Thanh, the author of pdfTeX. Since pdfTeX outputs pdf files and the graphic system of OS X is based on pdf, his software made creating an interface to TeX a breeze.

TUG 2001 occurred only a few months after the first release of Mac OS X, version 10.0, in March 24, 2001. I talked about TeXShop, which had been running on early beta version of the system, and about i-Installer, a program by Gerben Wierda which installed TeX, Ghostscript, ImageMagick, various font utilities, and other Unix software. Gerben's software worked over the internet, downloading packages from servers as needed. The current web page at `http://ii2.sourceforge.net/` doesn't seem to contain an initial release date, but it must have been early in the beta period for Mac OS X. Gerben ceased supporting i-Installer in 2007, but Google searches lead to users who report trying to install TeX with it as late as April of 2011.

During advance preparation for my 2001 talk, I noticed a situation when the Finder could become confused. Sure enough, I ran into that problem during the talk and I had to restart the Finder before proceeding. Afterward, someone came up to me and said "I couldn't care less about TeXShop, but I was

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very impressed when you restarted the Finder without rebooting the Macintosh."

10 Wendy's Lunch

In Delaware, I also met Wendy McKay — a Mac fanatic with twice my enthusiasm and five times my energy. `MacTeX` is really Wendy's invention.

Gerben's i-Installer was an ambitious project, able to install not just TeX packages, but also more general Unix open source code. It had to deal with network issues like choosing an appropriate server, dealing with timeouts, and security matters. That made for a program with an industrial look which could be intimidating for new users. Wendy began lobbying for a "one button TeX installer." This lobbying extended over several TUG conferences.

Everything came to a head in North Carolina at Practical TeX 2005. By then, Wendy was lugging suitcases full of electronic equipment to conferences, and had set up a long distance meeting of Mac folks on Thursday afternoon, in which Europeans not at the conference could participate remotely.

To prepare for the meeting, Wendy asked Mac folks to share the same table for Wednesday lunch. She soon began discussing a one button installer, said something like "who's going to volunteer to make one," and suddenly turned to Jonathan Kew and said "it looks like you Jonathan." Done. The sweetest maneuver I've ever witnessed.

11 Jonathan Kew

Jonathan had to leave the conference early on Friday. We wished him safe travels after the Thursday meeting, expecting an installer in a couple of months.

TUG conferences are fun, but information tends to come so fast that I'm exhausted after a couple of days. In North Carolina, I went to bed as soon as I could Thursday evening. When I got up the next morning, I read my email. There was one from Wendy. "Jonathan just finished the installer."

Jonathan programmed all night. And he didn't have just a rough draft of an installer. He had a package which installed everything: TeX (in those years we used teTeX), Ghostscript, ImageMagick, Font Utilities. His installer displayed a custom Mac OS X image. It was constructed with elaborate shell scripts, so the entire process was automated. The installer contained postinstall scripts to set the user's PATH and MANPATH variables, using code which Jonathan found hidden inside i-Installer.

I could hardly believe it.

That morning at breakfast, Jonathan had a final surprise. He willed the project to me. I said "but I don't even understand shell scripts" and he said "read what I have; it is self explanatory." And it was. When I need a shell script today seven years later, I look up Jonathan's scripts and carefully copy the syntax.

12 Herbert Schulz and MacTeXtras

The next year, we put the install package on the TUG DVD. The DVD contains extensive extra material curated by Herbert Schulz. This extra material includes the front ends Aquamacs, iTeXMac, LyX, and TeXMaker. Information is provided about BBEdit, TextMate, and TextWrangler. It contains the Skim previewer, the CocoAspell spell checker, other useful utilities, and Documentation and Demos.

The extra material is also available on the MacTeX web site in a package named MacTeXtras.

For several years now, Herbert and I have been jointly responsible for the Macintosh portion of the DVD. Herb is an expert on features of TeX Live I ignore: installing extra fonts, running updmap and updmap-sys, issues with restricted shell escape. As you'll see in this conference, Herb is also an expert on several features of TeXShop which I consequently ignore.

13 Gerben's Surprise

The `MacTeX` installer Jonathan wrote depended heavily on Gerben Wierda to do the heavy lifting. To create `MacTeX`, a developer erased /usr/local on the development machine, installed teTeX, Ghostscript, ImageMagick, and Font Utilities with i-Installer, and then asked Apple's PackageMaker to create an install package from this material.

In May of 2006, Thomas Esser announced that teTeX would no longer be upgraded, and suggested that users migrate to the TeX Live project. Gerben began issuing warning messages to the TeX on OS X mailing list which most of us ignored; after all, he had provided TeX reliably since the beta days of Mac OS X.

After some grumbling, Gerben developed a new TeX distribution based on TeX Live rather than teTeX, called gwTeX. He told us it would be officially released at TUG 2006 in Marrakesh, which started on November 9th, and to expect a surprise announcement there.

There was a surprise alright. See `www.tug.org/twg/mactex/award/2007/gerben/aboutgwtex.html` for a picture taken at this event, which shows Gerben holding up a large sign with the text "I Quit." To my knowledge, this is the first time the announcement of a piece of software has been accompanied by

the announcement that support for it will end in two months.

The previous web page contains a wonderful drawing by Duane Beebe showing Gerben cooking up i-Installer as his wife and children look on. Gerben was given the original at a later TUG meeting.

Gerben's announcement caused some fast footwork on the `MacTeX` front, and after several months of indecision we switched to providing an unmodified full TeX Live in the package.

14 `MacTeX` Changes over the Years

We provide `MacTeX` to a small group of beta testers before releasing it to the internet creating the DVD. I need to mention the most important beta tester, Bruno Voisin, who is at this conference. Bruno is a stronger Mac fanatic than Wendy, and he will complain bitterly if an interface behaves in a non-Mac fashion. The hidden files in TeX Live are visible files in ∼/Library due to Bruno. The discovery that Apple has a sips graphic convert built in is due to Bruno. Removing shell-escape from GUI app configuration was painful, but methods to make that palatable –all Bruno. Thanks.

There have been a few significant changes in `MacTeX` over the years. The first occurred when we added optional install packages, so that, for example, a user could install only TeX Live, skipping other packages. This change was made to accommodate users who obtain Ghostscript and ImageMagick through MacPorts or Fink, or compile them directly from source. But it also made `MacTeX` easier to maintain, since the various pieces can be created independently.

Originally we installed several libraries from ImageMagick and various font utilities to /usr/local/lib. A concerted effort has been made recently to get rid of these libraries; today we install *no libraries* in /usr/local/lib. This is a deliberate choice which will not change; it makes the lives of developers easier because they do not need to contend with foreign libraries on their machines.

When MacTeX was first provided on the TUG DVD, it contained an entirely separate copy of TeX Live which was uncompressed during installation. TeX Live is enormous, so putting two separate copies on the DVD rapidly become untenable. Nowadays, we provide a special version of `MacTeX` for the DVD; this special version doesn't install the TeX Live by uncompressing an internal copy, but instead calls the install-tl script on the disk in the postinstall phase to install the compressed packages of TeX Live elsewhere on the DVD, so only one copy of these packages is required.

At the time of this change, TUG was also changing the format of install packages. The first test versions of `MacTeX`-DVD produced so much disk activity that the entire Mac shook and the DVD player seemed likely to be destroyed at any moment. By the time this software appeared on a production DVD, this problem had been solved.

The most recent change occurred in 2012. Apple's coming Mountain Lion system requires that install packages be signed by a registered Apple Developer. Until this year we created `MacTeX` using the original Package Maker, which created install packages which were actually folders in disguise. Such packages cannot be signed. So with some pain we switched to Apple's newest PackageMaker, which creates flat files. To a user, there is no change. The latest `MacTeX` has been tested on beta versions of Mountain Lion and installs without complaint.

15 User Problems

Because `MacTeX` is a large download, we get the expected messages about defective downloads which will not install, or downloads which cease prematurely. There is little we can do except point users to the md5 sum of our packages to convince them that their download is bad, and ask that they download again.

But in 2011 and 2012, a new problem surfaced. Since `MacTeX` was actually a folder, it had to be zipped for the internet. Some users were downloading with third party browsers rather than Safari, and these browsers came with third party unzipping software. Unfortunately, these third party programs did not preserve line feed conventions, so they produced postinstall scripts which refused to run.

This problem will now go away, because `MacTeX` in 2012 is a flat file which can be uploaded without zipping and downloaded without unzipping.

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