Take Control of Running Windows on a Mac *Tiger Edition*

by Joe Kissell

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Welcome to *Take Control of Running Windows on a Mac,* version 1.0.1.

Apple's new Intel-based Macs offer several excellent options for running Windows alongside, or even instead of, Mac OS X. Take control of Windows on your Mac with this detailed guide that covers Apple's dual-boot software, Boot Camp, as well as third-party virtualization software such as Parallels Desktop and Q. This ebook was written by Joe Kissell, edited by Caroline Rose, and published by TidBITS Electronic Publishing.

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Basics

In reading this ebook, you may get stuck if you don't know certain basic facts about Mac OS X or if you don't understand Take Control syntax for things like working with menus or finding items in the Finder. Please note the following:

- **Path syntax:** This ebook occasionally uses a *path* to show the location of a file or folder in your file system. Path text is in bold type. For example, Mac OS X 10.4 Tiger stores most utilities, such as Calculator, in the Utilities folder. The path to Calculator is: **`/Applications/Utilities/Calculator`**.

  The slash at the start of the path tells you to start from the root level of the disk. You will also encounter paths that begin with **`~`** (tilde), which is a shortcut for any user's home directory. For example, if a person with the user name **`joe`** wants to install fonts that only he can access, he would install the fonts in his **`~/Library/Fonts`** folder, which is just another way of writing **`/Users/joe/Library/Fonts`**.

- **Menus:** When I describe choosing a command from a menu in the menu bar, I use an abbreviated description. For example, the abbreviated description for the menu command that provides information about a file in the Finder is "File > Get Info."

What's New in Version 1.0.1

Version 1.0.1 is a minor release that includes corrected and expanded information on renaming Windows volumes (see the tip Rename Your Windows Volume, on page 46), as well as a few small typographical corrections.

If you printed version 1.0 and wish to re-print the changed pages, you should re-print and swap in these pages: 4, 19, 46, and 64.

Introduction

Anyone who knows me will tell you I'm a Mac fan through and through. As I type this, I can see six Macs within a radius of 10 feet in my home office (and that doesn't count the Xserve I have sitting in a rack at a data center). I've written oodles of articles, books, and ebooks about Mac software, and for the past dozen years or so most of my income has resulted, in one way or another, from my work with Macs. If I had a nickel for every time someone referred to me as "the Mac guy," I could retire today.

And yet, although I've always been candid about my preference for Macs, I'm well versed in Windows, too; for years, I was deeply involved in developing and testing software for both platforms. Whether it's performing an exorcism on someone's virus-infected PC or walking a friend through a fiddly troubleshooting procedure over the phone, I know my stuff. Partly because I understand Windows so well, I'd always opt for a Mac if given the choice. But the reality is that I don't always have that choice. Like it or not, some things I want to do with my computer still require Windows. Even when working on something platform-neutral, such as a Web site, I have to be sure things look and work correctly on Windows, since the majority of my site's visitors will probably be Windows users.

On those occasions when I've needed Windows over the past few years, I've tried everything from running Virtual PC to visiting a library or cybercafé—everything, in other words, short of buying a Windows PC. That was the one step I hoped never to take, but other solutions were frequently awkward, slow, or otherwise annoying. Now, thanks to the Intel Mac sitting on my desk, I can have my cake and eat it too. I get the Mac OS X environment I love, plus a *fast,* fully featured Windows installation, all in one box. I can even share files and network connections between operating systems seamlessly. And it wasn't even expensive. (Although this ebook focuses mainly on running Windows on an Intel-based Mac, you can also get Windows to run on a Mac with a PowerPC processor; see Appendix A: Windows on a PowerPC Mac.)

Achieving this state of computing bliss did require overcoming some time-consuming hurdles, however. For example, I had to figure out the pros and cons to using Apple's Boot Camp software versus third-

party products such as Parallels Desktop and Q. I had to find a way to create a Windows CD that had Service Pack 2 already integrated, even though my boxed retail copy of Windows was manufactured long before SP2 existed. I had to determine why my Mac mini refused to use a feature built into its processor that was designed to enhance the performance of virtual machines (software environments in which one operating system runs within another). And I had to make educated guesses about numerous configuration options that were documented poorly (or not at all). In all, the process involved a lot more time, confusion, and anxiety than I would have liked.

Having wrestled with all these issues and more, I'd like to save you all that effort and offer you a set of easy-to-follow instructions. In this ebook, I tell you everything you need to know about your options for running Windows on a Mac, how to get around common annoyances, and what you should do to protect yourself from the big, bad world of Windows malware.

One thing I spend very little time on here is how to use Windows itself; I assume a basic familiarity with such features as the Start menu and Windows Explorer. If you've never used Windows before, you're bound to be somewhat disoriented, and in that case I recommend picking up one of the books listed in the Learn More section.

As I write this, Intel Macs have been shipping for just a few months. Apple's Boot Camp software is still in beta testing and Parallels Desktop has not yet reached its final release stage. Pundits are making all sorts of predictions about new options for running Windows that might appear in Mac OS X 10.5 Leopard. And Microsoft is still claiming that they'll ship their new Windows Vista operating system at some point in this century. In short, the whole Windows-on-Mac situation is still in a state of flux. The story may be very different weeks or months down the road. As the facts change, I'll update this ebook with the latest information. You can stay on top of recent developments by clicking the Check for Updates button on this ebook's cover.

Quick Start

You need not read this ebook straight through; most people will pick one method for running Windows and just read the relevant sections. But be sure not to skip Decide How to Run Windows, which provides important background information.

Make initial preparations:

- Find out if adding Windows to your Mac is for you: Read Why Bother? for guidance.
- Determine whether the best approach is to install Boot Camp or Virtualization Software in Decide How to Run Windows.
- Regardless of which method you choose, Collect the Ingredients you'll need to install and use Windows.

If you decide to go with Boot Camp:

- Learn how to Install and Use Boot Camp.
- Overcome common annoyances with mice and keyboards. Read Solve Input Device Problems.

If you choose virtualization software:

- Read Install and Use Parallels Desktop or Install and Use Q.

Solve irritating problems:

- If you have a pre–Service Pack 2 Windows CD, bring it up to date without breaking the bank. Read Create a Slipstream Installer Disc.
- Regardless of how you install Windows, you'll want to keep it safe from viruses, spyware, and other malicious software. See Protect Your Windows Setup from Malware.

Go further:

- Discover additional resources about Windows in Learn More.
- Find out how to run Windows (sort of) on a Mac *without* an Intel chip in Appendix A: Windows on a PowerPC Mac.

Why Bother?

Most of the people reading this ebook are probably Mac users who nevertheless have a need or desire to use Windows in some circumstances. However, you may also be a Windows user who's been tempted by the Mac but wants to know how hard it will be to use both operating systems on the same computer. You already know why you want to use Windows, and the question is what you gain by running it on a Mac.

If you're a Mac user already, you presumably feel that a Mac can meet the majority of your computing needs. And of course millions of people—including serious computer geeks, such as yours truly—get by quite happily without having a Windows machine on their desks. So you may be wondering: why would an otherwise sane person choose to run Windows on a Mac? Never mind that it's possible, or even easy; is it something you *should* do?

For years, Mac users have had to face the frequently voiced complaint that "Windows has far more software available." To some extent, that claim is misleading; sure, there are more individual Windows programs than Mac OS X programs (especially if you count viruses!), but that doesn't mean there are more *useful* or *necessary* Windows programs. (Does it really matter that Windows may have 27 different niche word processors or 305 versions of Breakout?) There are Mac equivalents of almost every major Windows application, including the big programs from developers like Microsoft, Adobe, Quark, and FileMaker. Apple and third-party developers make lots of fantastic programs for Mac OS X that have no Windows analogs. And Mac users have access to a vast array of software written for Unix. So in truth, there are very few things you can do on Windows that you can't do (and maybe even do more easily) on a Mac.

And yet, a few annoying exceptions remain. Here are some of the top reasons you might need to resort to Windows after all:

- **Games:** I've been told that many people enjoy playing games on their computers. I must try this one day. Rumor has it that some of the more popular games run only under Windows.

- **Interactive DVDs:** I have at least half a dozen DVD movies that feature enhanced content that requires a computer, and the labels explicitly state that these features don't work on Macintosh computers. But I can use them on my Intel Mac running Windows.
- **Windows Web Browsers:** Every once in a while, you may run across a Web site that was designed expressly to require a Windows browser, usually Internet Explorer. Sometimes you can get these sites to work on a Mac by switching to a different browser or tweaking hidden settings to fool the site into thinking you're using a Windows machine, but these tricks won't get you into every site, especially not those that use ActiveX to provide important functionality. And if you design Web sites yourself, you may want to preview your site in Windows browsers, which sometimes display pages much differently than Mac browsers.
- **Microsoft Outlook:** Even though Entourage and Mail can communicate with Microsoft Exchange servers, they don't offer the full range of features in Microsoft Outlook, and in some corporate environments, using Outlook for email and scheduling is mandatory.
- **Microsoft Access:** This database application has no Mac equivalent. If you don't want to go to the effort of reworking your databases in FileMaker Pro or another Mac database, you'll appreciate having access to Access.
- **Microsoft Project:** Several excellent project management applications exist on the Mac, most of which can seamlessly read and write Project files. But in some cases, simply running Project under Windows may be the path of least resistance.
- **Dragon Naturally Speaking:** One area in which the Mac still falls way behind Windows is speech recognition. Dragon Naturally Speaking is far more accurate and powerful than any tool currently available for Mac OS X, and if you need to dictate large volumes of text to your computer, you'll appreciate being able to run this software.
- **QuickBooks:** Intuit does sell a Mac version of this small-business accounting package, but it's widely regarded as inferior to the Windows version, especially when it comes to payroll processing.

- **Quicken online banking:** For personal accounting, Quicken also comes in versions for both Windows and Mac OS X. But a few banks prevent the Mac version of Quicken from accessing account data online. If you have an account with such a bank, it may be easier to run Quicken under Windows than switch to another institution or application.
- **FrameMaker:** Often considered the best publishing tool for long or complex documents, FrameMaker is currently available for Windows or Unix—but not Mac OS X. (Adobe did sell a Mac OS 9 version for years, but that's been discontinued.)
- **ExamSoft:** Some educational institutions (notably law schools) require students to use this software for taking exams. It runs only on Windows, and the company has stated unequivocally that there will never be a Mac version.
- **Grants.gov:** If you're applying for a U.S. government grant online, you may have trouble doing so from a Macintosh. Although the site has limited workarounds in place for Mac users and is reportedly working on a better long-term solution, you'll still have a much quicker and less frustrating experience if you use Windows—at least for the time being.
- **Library catalog software:** People who work in a library and want to access its online catalog system may need to run a Windows-based client.
- **Internal corporate software:** Numerous companies develop special applications for internal use only, and if the company has standardized on Windows, chances are the software will be Windows-only.
- **PDA software:** Whether you have a Palm- or Windows Mobile–based PDA or smartphone, you may find synchronization support to be much better under Windows than under Mac OS X, even if you add a third-party product such as The Missing Sync (http://www.markspace.com/). In addition, installers for some PDA applications are packaged as Windows executable files.

Sad though it may be, I could go on and on with other examples of software that currently excludes Mac users. In an ideal world (or at least a nearly ideal world that still contains Windows!), all software would be cross-platform, but that day, if it ever comes, is far in the future.

In the meantime, if you need to run Windows for reasons such as these, you may well ask, "Why not just buy a Windows PC instead?" You may be asking a similar question if you're a Windows user considering switching to the Mac.

I can think of many reasons to opt for a Mac, but the biggest is that an Intel-based Mac gives you the best of both worlds. You can use Mac OS X most of the time, benefiting from its stability, security, and ease of use (not to mention Apple's fantastic industrial design and all that great Mac-only software, such as iLife and iWork) and still have access to Windows-only capabilities when you truly need them. The cost of adding Windows to an Intel Mac is less than that of buying a reasonably powerful stand-alone Windows PC. With Windows running on your Mac, you'll save desk space, reduce power consumption, and be able to share files between platforms more easily.

Once you've made the decision to put Windows on your Mac, the next thing to figure out is which of several methods you should use to do so. Each approach has its pros and cons. I explore your options in the next section.

Decide How to Run Windows

Broadly speaking, you can use either of two approaches to run Windows on an Intel Mac: dual-boot (using Apple's Boot Camp software) or virtualization (using third-party software such as Parallels Desktop or Q). In this section I describe these two approaches and help you choose which path to take; I also describe the two major virtualization options in some detail.

Boot Camp

Apple's Boot Camp software (http://www.apple.com/macosx/bootcamp/, currently in public beta testing) enables you to divide the hard disk of an Intel Mac into a Mac OS X partition and a Windows partition, install Windows XP onto the Windows partition, and choose either partition as your computer's startup volume. Then, after choosing the Windows partition, you can run Windows XP on the Mac just as if you were running it on a PC.

The main thing to keep in mind about Boot Camp is that when you use it, you have to make a choice: at any given time, your Mac is running either Mac OS X or Windows, but not both. Depending on which options you choose, you may or may not be able to see your Mac's files when running under Windows (and vice versa). But while running Windows you won't be able to use any of your Mac software, and while running Mac OS X you won't be able to use any Windows software.

Boot Camp offers some benefits over virtualization software:

- With Boot Camp, Windows has access to all the RAM installed in your computer—more than it would if Mac OS X were also running.
- The performance of Windows, and particularly of graphics, is somewhat higher; the difference is especially noticeable in games.
- Boot Camp was designed and tested by Apple for use on their computers, and is likely to be well supported in future versions of Mac OS X.
- It's free. (In the future, it may be available only as part of Mac OS X 10.5 Leopard, but for now, if you already have Tiger, it's free.)

On the other hand, although the situation may change with later versions of Boot Camp (or with Leopard), Boot Camp also imposes some limitations, including these:

- Unlike virtualization systems, Boot Camp does not currently support installation of any version of Windows other than Windows XP, SP2; you can't, for example, use Windows 98 or Windows 2000. (You can, with some hacking, install certain distributions of Linux, but this ebook is only about Windows.)
- Some peripherals won't work, including iSight cameras, Apple Remotes, Bluetooth keyboards and mice, and Apple USB Modems.
- Even if you plug in headphones or external speakers, all sound will come through your Mac's built-in speaker(s).
- Using an Apple keyboard, you may not be able to enter certain characters, such as the euro (€) symbol, or perform a Print Screen command, without special procedures (see Type special characters and Take screen captures, later).

In addition, the process for installing Boot Camp can be somewhat cumbersome, and more so if you have a Windows CD without SP2. (I get into these details later in Install and Use Boot Camp.)

All things considered—especially keeping in mind that Boot Camp is still incomplete—these are not serious trade-offs. The most significant factors you should think about when deciding whether to use Boot Camp are whether you need every last ounce of performance possible while running Windows, how quickly you'll want to switch between operating systems, and the extent to which you'll use files from one OS while working in the other. (See Joe's Recommendations, ahead, for more information.)

Virtualization Software

If you've been a Mac user for any period of time, you've probably heard of a product called Virtual PC (once published by Connectix, and now owned by Microsoft). With this software installed on your Mac, you can install Windows (or another operating system) and run it inside a window on your (PowerPC-based) Mac.

Any program that provides a way for one operating system to work within another can be called *virtualization software*. When virtualization software is running, the environment it creates for another operating system is called a *virtual machine*, and an operating system that runs inside that virtual machine is called a *guest* operating system (to distinguish it from the main OS the computer is running, called the *host* operating system).

But Virtual PC is also an *emulator*—that is, software that simulates specific hardware so that a CPU can run a different OS than the one it was designed for. Because the Mac's CPU has to do its own work while also mimicking a completely different type of processor, Windows running within Virtual PC on a PowerPC Mac is invariably quite slow.

Intel Macs have the same type of CPU as PCs, so processor emulation is no longer necessary. However, to run Windows within Mac OS X, you still need a virtual machine. One reason is that apart from the CPU, there are still other hardware differences between Macs and PCs and thus other hardware components that must be emulated. Another reason is that Windows expects to have direct access to your hardware, but the host OS (Mac OS X in this case) controls the hardware. A virtual machine tricks the guest OS into believing it has direct access to the machine's CPU and other hardware, and it emulates any physical devices (such as sound cards) that might be different between platforms.

When Apple announced the transition to Intel chips, conventional wisdom held that Microsoft would quickly adapt Virtual PC to provide virtual machines for Windows on Intel Macs. After all, it should be easier than what they had to do before, since the emulation problem is gone. However, for reasons known only to Microsoft, no version of Virtual PC for Intel Macs exists yet. (Microsoft does still sell Virtual PC for PowerPC Macs; see Appendix A: Windows on a PowerPC Mac.) Luckily, other developers have taken on the challenge, and you can now choose from two virtualization tools that enable you to run Windows within Mac OS X on an Intel Mac: Parallels Desktop and Q.

Both tools share several basic features: you can install and run multiple operating systems (even at the same time); you can run a guest OS in its own window or in full-screen mode; you can share files between the host OS and the guest OS; much of the hardware attached to the computer is available to the guest OS; you can pause (or "suspend") a guest OS, saving its state so that you can quit the virtualization application but then retrieve it quickly with everything just as you left it (somewhat like putting a Mac to sleep and waking it up); and you can move the disk image containing your entire Windows environment to another Intel Mac if necessary and run it there without modification. Beyond these superficial similarities, though, the two programs differ in several important respects.

Parallels Desktop

This commercial application costs a mere $50 (and you can save $10 by using the coupon at the end of this ebook); you can find it at http://www.parallels.com/en/download/desktop/. After installing it, you can set up a virtual machine for Windows (or the OS of your choice) in a matter of minutes. You can then install Windows within the virtual machine just as though you were installing it on a PC. Parallels Desktop offers a variety of settings that enable you to tailor its performance and options to your liking. Even though the Mac version of this product is new, Parallels Desktop has a polished feel and is generally robust. Better yet, it's *fast*. Running Windows XP within a Parallels Desktop virtual machine is almost as fast as booting directly into Windows XP using Boot Camp, and the performance is certainly zippy enough to make it comfortable to use for most day-to-day tasks. I have yet to encounter any Windows software that would not run acceptably in a Parallels virtual machine.

Nevertheless, the software is still incomplete as I write this; it has some bugs, and some features are not yet available. For example, Parallels Desktop does not yet support burning CDs or DVDs; FireWire devices do not work; and some USB devices do not work (or do not work at full speed). In addition, the software does not currently emulate a 3D graphics card, so if you want to run a game or other graphics-intensive application that requires hardware 3D support, Parallels is out for the time being. But given the rapid development progress I've seen, I expect most or all of those difficulties to evaporate soon.

Q

Unlike Parallels Desktop, Q (http://www.kberg.ch/q/) is a free, open-source application, based on an emulation program called QEMU. One interesting aspect of Q is that it also works on PowerPC-based Macs (though *very* slowly); see Appendix A: Windows on a PowerPC Mac. And, of course, the price is right. Basic installation, setup, and usage are nearly as easy with Q as with Parallels Desktop.

Like Parallels, Q hasn't yet reached its final release stage—in fact, it's further behind in development (currently in the "alpha" stage) and has greater limitations. For example, Q currently offers no way to transfer the contents of a Clipboard between guest and host operating systems, networking options are more limited, and fewer USB devices work correctly. Worse, in my testing, I found that Windows XP under Q runs roughly half as fast as it does under Parallels; I'd call it usable for basic tasks, but barely so. Q's user interface, documentation, and operation show many rough edges.

On the other hand, Q does offer several different choices of video and sound card emulations, and it has two other particularly intriguing features: it can import Virtual PC disk images, potentially saving a great deal of setup time, and it can download and install prebuilt disk images for numerous other open-source operating systems (mostly Linux variants).

Joe's Recommendations

Having used both Boot Camp and virtualization software, my feeling is that there's no contest at all: virtualization is the way to go, and between Parallels Desktop and Q, the former is significantly superior in almost every way—well worth the $50 it costs ($40 with the coupon). Bear in mind that I say this as a non-gamer, and as someone who needs to switch rapidly and seamlessly between Mac OS X and Windows. But I found the performance of Windows under Parallels Desktop to be plenty fast for all my needs (and close enough to its performance under Boot Camp that I couldn't tell the difference, at least for non-graphics-intensive applications, without running benchmarking software). The convenience of being able to switch into Windows in a matter of seconds, easily transfer files between systems in real time, and use all my standard peripherals makes the experience of running Windows as pleasant as possible.

Still, you might choose Boot Camp if you run Windows primarily for games (and I don't mean Solitaire!), if you intend to use Windows for discrete tasks or projects that require no interaction with Mac OS X or your Mac files, if you need features not yet available in Parallels Desktop (such as CD/DVD burning), if you need to use hardware for which only Windows drivers are available, or if you have some important reason to keep your Windows and Mac environments strictly segregated from each other. One obvious reason to keep them separate is to protect your Mac files from Windows malware. (Even though you will undoubtedly follow all the advice in Protect Your Windows Setup from Malware, you can never be too careful.)

As free software, Q obviously has the edge in pricing over Parallels Desktop. And, since Q is open-source software, it's somewhat less susceptible to the vicissitudes of the market that can affect commercial applications. I would not be at all surprised to see Q's performance and feature set improve dramatically in the coming months, in which case it may become the ideal choice. But for now, I find it hard to make a good case for choosing Q over Parallels Desktop.

NOTE In an ideal world, you could run both Boot Camp *and* virtualization software using a single Windows installation, switching to whichever environment is best at any given time. Currently, however, this is not possible, and though Parallels claims to be investigating a way to do this in the future, using one copy of Windows in two different environments—even though they're part of the same physical machine—may violate Microsoft's End User License Agreement. However, nothing prevents you from installing two separate, individually licensed versions of Windows on a computer: one using Boot Camp and the other using virtualization software.

Collect the Ingredients

Before you can begin setting up Windows on your Mac, be sure you have the necessary hardware, software, and other materials.

An Intel Mac (Preferably)

If you have a Mac with an Intel processor (in other words, any new model introduced in 2006 or later), you have several great options for running Windows at (virtually) full speed, and I spend the bulk of this ebook describing those options. If you have an older, PowerPC-based Mac, you can still choose from among at least three different methods of running Windows (see Appendix A: Windows on a PowerPC Mac), but I can't recommend any of them earnestly. The performance of Windows running on an Intel Mac is generally superb, nearly matching (and in some cases surpassing) the performance on a PC with equivalent processor speed. On a PowerPC Mac, however, the performance of Windows ranges from sluggish (at best) to almost unusably glacial (at worst). If at all possible, therefore, obtain an Intel-based Mac; you can find a Mac mini for as little as $600, and in my opinion it's money well spent.

> **Note** If you regularly use software that is not yet available as a Universal Binary (so that it runs natively on an Intel Mac), you might want to keep your old Mac around for a while. Although Intel Macs are generally faster than PowerPC Macs, some older, non-Universal programs still run faster on a PowerPC processor.

Not sure whether your Mac has an Intel chip or a PowerPC chip? Choose About This Mac from the Apple menu. In the window that appears, next to the word "Processor" (see **Figure 1**), you'll see the speed and type of processor (either Intel or PowerPC).

Figure 1

The About This Mac window as it appears on a PowerPC Mac (left) and an Intel Mac (right).

Disk Space

All the Windows environments for Macs require a substantial amount of empty disk space, although the amount varies considerably depending on which software you're using, which version of Windows you have, how many Windows applications you intend to install, and other factors. Apple requires at least 10 GB free for Boot Camp; for virtualization software, 5 GB of free space is a bare minimum (and more is better).

NOTE Under Boot Camp, whatever size you make your Windows partition, that's the size you're stuck with. But with Parallels Desktop and Q, the disk images you create can grow dynamically. So be sure you have more disk space available than the size of the virtual disk you start with.

RAM

If you're planning to use Boot Camp, Windows will have access to all the RAM installed in your computer. Since no Intel Mac ships with less than 512 MB of RAM, that should be plenty.

However, if you're going to be using Windows in a virtualization environment, you must have enough RAM for Mac OS X as well as Windows, since both will be running at the same time. Microsoft recommends a minimum of 128 MB of RAM for Windows XP, but it runs better and faster with more; I'd suggest 256 MB as a more realistic minimum. Likewise, Mac OS X 10.4 Tiger requires a minimum of 256 MB, but again, you'll find performance much better with 512 MB or more. In short, if your computer has only 512 MB of RAM in total, both Mac OS X and Windows will be a bit squeezed. Upgrading your computer to 1 GB or more will give you more breathing room for both operating systems.

A Windows CD

Neither Boot Camp nor Parallels Desktop includes a copy of Windows; these applications merely provide an environment in which you can install and run Windows. So you'll need a Windows CD.

NOTE Boot Camp works with Windows XP (Home or Professional; see http://www.microsoft.com/windowsxp/home/howtobuy/choosing2.mspx for a list of differences between the two editions). The virtualization environments I discuss here work with other versions of Windows as well, in addition to Linux and numerous other operating systems. Unless otherwise noted, assume that all instructions here refer to Windows XP and that they apply equally to the Home and Professional editions.

The easiest way to obtain a copy of Windows is to visit your favorite (online or brick-and-mortar) computer store and pick up a retail box. Expect to pay $200 for Windows XP Home or $300 for Windows XP Professional. Web searching may turn up some discounts, but be aware that quite a few shady characters are selling unofficial versions of Windows online, and you do *not* want to incur Microsoft's wrath just to save a bit of money.

I'm speaking in particular of so-called *OEM* distributions of Windows, which you can find all over the Web at tempting prices. Microsoft provides Windows CDs (without a box or manual) to original equipment manufacturers (OEMs) for inclusion with new computers. But the license for this sort of CD explicitly states that it can be sold *only* with a complete computer, so any vendor that sells it separately is violating Microsoft's policies. You should avoid OEM CDs, however attractive they may appear.

NOTE Purchasing an OEM CD could work if you buy it with a complete computer system *in pieces* from a retailer or even from a friend who sells parts out of her garage. In these cases, you can effectively become your own OEM, although you have to comply with a different license: the System Builder agreement (http://www.microsoft.com/oem/sblicense/default.mspx). Newegg.com (http://www.newegg.com/), for instance, sells this OEM license, for a bit less than half of the full retail price for a single-user license of either Windows XP Home or Windows XP Professional. A reporter colleague of mine confirmed with Microsoft that Newegg.com and other firms legitimately sell these System Builder–licensed OEM copies, but they are supposed to sell them *only with a complete system*. The System Builder license requires the purchaser to install the OEM copy only on a new computer, and to provide technical support (among other requirements).

Purchasing a System Builder–licensed OEM copy by itself is clearly against Microsoft's stated licensing policies; Microsoft could deem the license invalid and use their activation system to disable your copy if they chose to do so. Thus, all things considered, I still recommend strongly against purchasing OEM copies of Windows.

On the other hand, if you work for an employer enrolled in the Microsoft Software Assurance program, you may be able to purchase a full, legal copy of Windows XP through your company at a substantially reduced rate. Likewise, if you're a student or teacher, you can probably get an academic version of Windows XP at a discount by providing a dealer with your credentials. It doesn't hurt to explore options like these, but I urge you to avoid any way of obtaining Windows that seems suspicious.

NOTE Be sure you're buying a full copy of Windows XP and not merely an upgrade package for owners of earlier versions of Windows—unless you have an installation CD for an earlier version and are willing to go through the installation and upgrade process under virtualization software.

Speaking of which, you may be tempted to reuse a copy of Windows that came with an old PC. Before you do, carefully read the license agreement that came with that copy of Windows. In general, copies of Windows shipped with computers are licensed only for those computers and may not be installed on other machines. Microsoft offers a variety of licenses for Windows. Some (typically, corporate volume licenses) expressly permit installation on multiple machines, but most don't.

Similarly, if you have a copy of Windows that came with Virtual PC, look carefully at the license agreement included with it. It likely says that the copy of Windows included with Virtual PC may be used *only* under Virtual PC, and not in any other context. (Depending on when and how you obtained Virtual PC, it may not even have a separate Windows installation disc; Microsoft uses this strategy partly to discourage unauthorized use of the software.)

Technical limitations also come into play if you try to circumvent the terms of your Windows license or use an illegitimate copy. Unlike Mac OS X, Windows XP requires not only a serial number (called a Product Key) but also an online activation process that ties your Product Key to one particular hardware configuration. These two steps together enable Microsoft to reduce piracy, and if your copy of Windows has already been installed and activated on one computer, you may be unable to use it on a second machine even if you were disposed to ignore the terms of the license.

NOTE If you buy a new copy of Windows XP today, it will almost certainly include Service Pack 2 (SP2). However, if you're using an older copy of Windows XP, you'll have to create a new CD with SP2 integrated before you can install it under Boot Camp. See Create a Slipstream Installer Disc for instructions.

Install and Use Boot Camp

Apple offers a 17-page PDF guide to setting up Boot Camp (http://images.apple.com/macosx/bootcamp/pdf/Boot_Camp_Beta_Setup_Guide.pdf), which, interestingly, contains considerably more detail than they provide for installing or upgrading Mac OS X. The setup guide (which is included with the Boot Camp Assistant software and is also downloadable separately) is reasonably complete, accurate, and well written. Much of what follows in this section reiterates Apple's recommended steps; however, I've also included some notes, warnings, and clarifications about issues I found confusing as I worked through several Boot Camp installations myself.

Important: *Make sure you've set aside enough time for the entire process before starting. I recommend allowing at least 2 hours, of which one will be spent mostly waiting for Windows Setup to install all its files.*

Assemble Your Tools

If you followed the instructions earlier in Collect the Ingredients, you already have an Intel Mac (a necessity for Boot Camp) with adequate RAM and disk space, as well as a Windows XP SP2 disc (see Create a Slipstream Installer Disc if you have an earlier version). In addition, for Boot Camp, you'll need the following:

- A copy of the Boot Camp Assistant software. Download this from http://www.apple.com/macosx/bootcamp/publicbeta.html.
- A blank recordable CD or DVD (in addition to the slipstream CD you may have burned earlier). You'll use this to create a Macintosh Drivers disc, which will enable Windows to use certain Apple hardware components (see Install Mac Drivers for Windows).
- A keyboard and mouse (or other pointing device) that do *not* use Bluetooth. If you're installing Boot Camp on a MacBook Pro, the built-in keyboard and trackpad will work; for a desktop Mac, use a *wired* USB keyboard and mouse. (Even though Boot Camp supports some kinds of Bluetooth devices, keyboard support is limited and mouse support is nonexistent. You can *install* Boot Camp using Bluetooth input devices, but once you restart from the Windows CD, you'll be stuck.)

Prepare Your Mac

Before installing Windows XP, you must make sure your hard disk is properly configured and that the Mac has the necessary firmware, operating system, and software available. Follow these steps:

1. **Back up your computer:** Because you're about to run software that will alter both your firmware and the structure of your hard disk, you run a risk of losing data if an error occurs (or if, say, the power goes out halfway through the process). So, unless you're starting with a brand new Mac that has none of your own files and software on it, stop right now and do a full backup. In this case, the best type of backup is a bootable duplicate, in which you copy the entire contents of your disk onto an external hard drive. If you need guidance in creating a duplicate, see my ebook *Take Control of Mac OS X Backups*.
   http://www.takecontrolbooks.com/backup-macosx.html

2. **Check your hard disk for errors and proper configuration:**

   a. Insert your Mac OS X Install DVD.

   b. Restart your computer, holding down the C key to force it to boot from the optical drive.

   c. After your computer restarts, click through the language selection screen.

   d. When the installer window appears, choose Utilities > Disk Utility.

   e. In the list on the left side of the window, select your main startup volume.

   f. On the First Aid tab, click Repair Disk.

   g. With your startup volume still selected, look for the Enable Journaling button on the toolbar. If the button is not dimmed, click it to enable journaling.

   h. Quit Disk Utility and allow your Mac to restart normally from its hard drive.

3. **Verify that your Mac is running Mac OS X 10.4.6 or later:** Choose About This Mac from the Apple menu; the version number appears just below the words "Mac OS X." If you have an earlier version of Tiger installed, choose Software Update from the Apple menu, select the latest version of Mac OS X, and click Install.

> **TIP** If you have a slow Internet connection and need to download the 10.4.6 update (or, for that matter, the Windows XP SP2 update), consider visiting a cybercafé or library, downloading the updates there, and burning them onto a CD or copying them to a USB flash drive.

4. **Update your computer's firmware:** (As of late May 2006, Apple had released firmware updates for the Intel iMac, MacBook Pro, and Mac mini models.)

   a. Go to http://www.apple.com/support/downloads/ and, in the Search field, enter the Mac model you have and the word **`firmware`** (for example, **`iMac firmware`**). Click the magnifying glass button to search.

   b. Download the latest firmware update for your computer.

   Special note: *Your computer may have more than one firmware update available, and if so, you should download and install them all. In some cases, later firmware updates do not incorporate all the changes of earlier ones. For example, in May 2006 Apple released System Management Control (SMC) firmware updates for the MacBook Pro, iMac, and Mac mini; these updates do not include the fixes found in the firmware updates released a month earlier, and are not sufficient, by themselves, to enable Boot Camp to run.*

c. Run the installer and follow the instructions that appear. The exact procedure may vary slightly depending on which model you have, but in general, you first run an installer that places the firmware updater on your computer; when you quit that installer, the updater itself runs automatically. In the updater, you click a Shut Down button in the installer and then, after your computer is off, you press and hold its power button for several seconds until the power light flashes. The update then begins; a status bar shows the progress. After the update is finished, your Mac restarts normally.

NOTE Apple provides no easy way to tell whether your computer already has the latest firmware; the Boot ROM Version shown in System Profiler follows a completely different numbering scheme from the downloadable updates. If in doubt, simply follow this procedure and attempt to update it. If your computer already has the version of firmware contained in the update, a message will appear that says "This computer does not need this update."

5. **Make sure your hard disk has just one partition:** All Macs ship with their hard disks configured as a single volume, but you can split it into two or more volumes, called *partitions,* using Disk Utility or third-party utilities. In fact, the Boot Camp software itself divides your disk into a Mac partition and a Windows partition. However, the Boot Camp software won't work if your disk is already partitioned. If you've already partitioned your disk, you must back it up, erase it, reformat it as a single partition, and then restore the files from your backup. For detailed instructions, see http://docs.info.apple.com/article.html?artnum=303597.

Take note: *When Boot Camp adds a Windows partition to your drive, it does so without erasing your existing files (normally, repartitioning requires erasing the entire disk). That's not to say you shouldn't take the precaution of backing up first, though.*

6. **Run the Boot Camp Assistant installer:** Double-click the BootCampAssistant file in the disk image you downloaded and follow the instructions. This installer places an application called Boot Camp Assistant in **`/Applications/Utilities`**; you'll use it in the next section to prepare your computer for its Windows installation.

Your computer is now ready for Boot Camp to be configured, after which you can install Windows XP.

Run Boot Camp Assistant

Now you'll run Boot Camp Assistant, which performs several tasks:

- It enables you to burn a CD containing drivers you'll need after you install Windows.
- It divides your disk into two partitions, one of which will hold Windows.
- It launches Windows Setup.

To begin the process, follow these steps:

1. Quit all applications.
2. If any other users are logged in at the moment, switch to each account in turn and log out.
3. Double-click the Boot Camp Assistant application located in **`/Applications/Utilities`**. A notice appears reminding you that this is preview software and that you shouldn't trust any critical data to it. Read this and click OK.
4. In the Introduction window, read the explanation of what Boot Camp Assistant does, and click Continue.
5. In the next window (**Figure 2**), with Burn a Macintosh Drivers CD Now selected, click Continue.

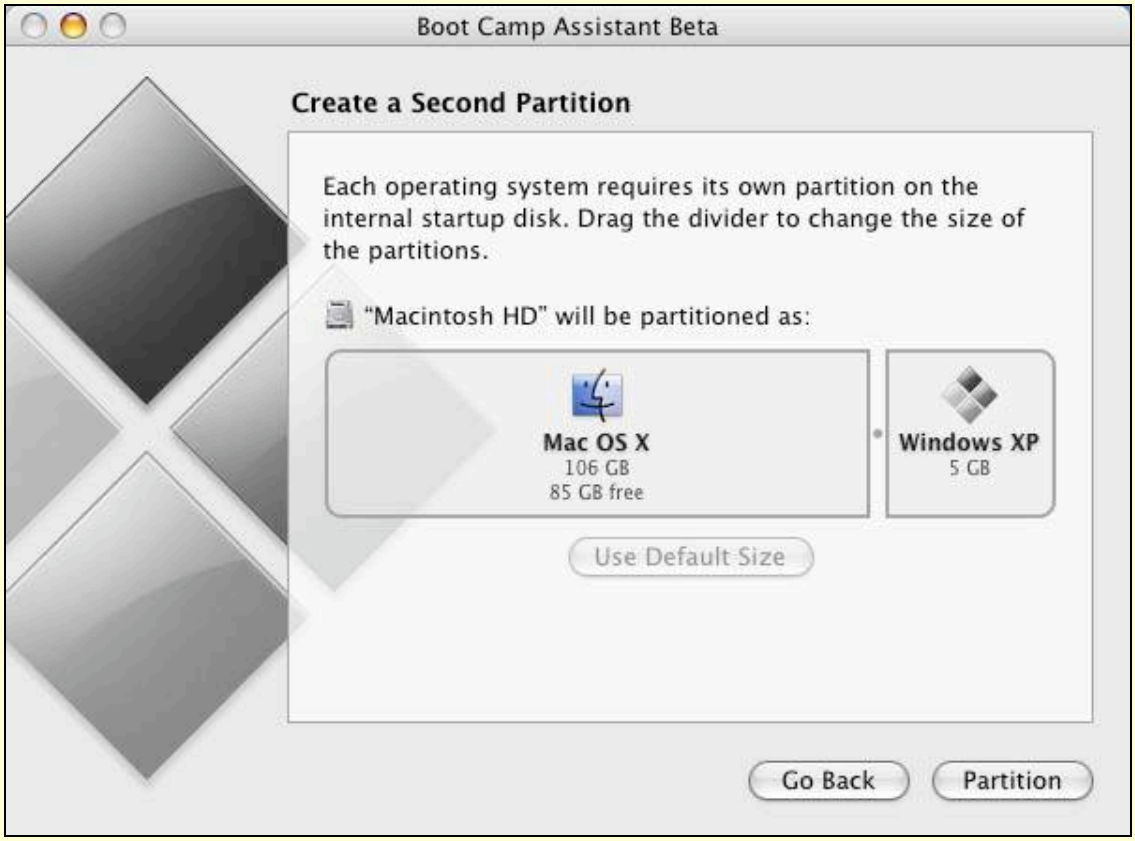
Figure 2

Boot Camp Assistant offers to burn a CD containing crucial drivers.

6. Insert the blank recordable CD (or DVD) you set aside earlier and click Burn. When the CD is ready, Boot Camp Assistant ejects it automatically. Label the CD and keep it handy; you'll need it in about an hour.

7. In the next window (**Figure 3**), you tell Boot Camp how much space to set aside for the Windows partition. You can either stick with the default size of 5 GB or drag the divider left or right to change the amount. The minimum size is 5 GB and the maximum is 5 GB less than the amount of free space currently on your disk. (For more guidance on choosing a partition size, see the sidebar Partition Sizes just ahead.) Click Partition.

Figure 3



Drag the divider between the two partitions to determine how much disk space Boot Camp allots to Windows.

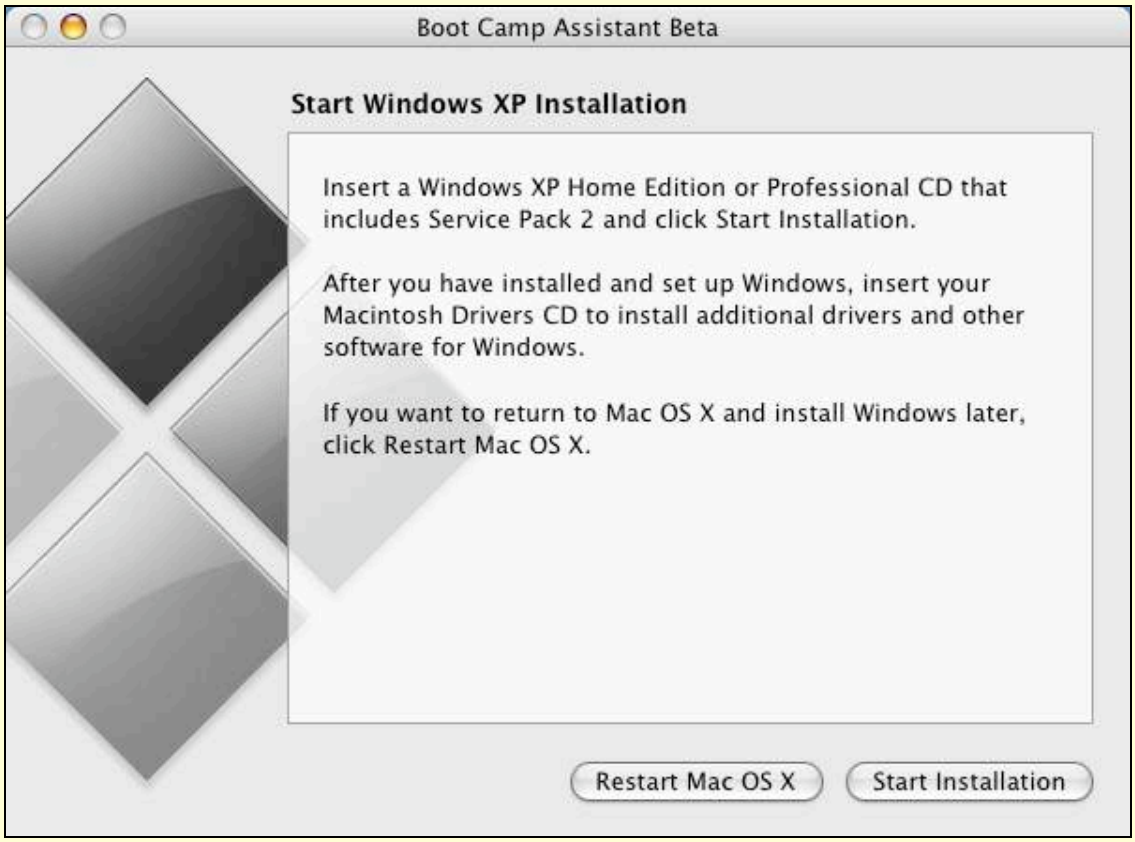
Partition Sizes

How large should your Windows partition be? The answer depends primarily on how much Windows software you intend to install, because this partition must hold all your Windows programs. If you already know what software you'll be using, consult the system requirements for each application and add up how much space they need; add at least 1.5 GB for Windows itself. Also consider how much space you'll want for documents you save in Windows (including media, such as photos and music files), and include that in your total as well. (If you're still unsure, I suggest from 6 to 10 GB; with the default setting of 5 GB, you may not have enough space for common tasks such as burning CDs.)

Be aware that although you may be able to access your Windows files while running Mac OS X (see Access Windows Files from Mac OS X), the reverse is *not* true; Boot Camp does not let you access files on your Mac partition while running Windows. (Some workarounds exist, though; see Access Mac OS X Files from Windows.)

8. The final window in Boot Camp Assistant (**Figure 4**) is labeled Start Windows XP Installation. When you get to this window, insert your Windows installer CD and click Start Installation. Your Mac restarts from the Windows CD, and Windows Setup runs.

Figure 4



Click Start Installation to restart your Mac and run Windows Setup.

Read on for more details about the Windows installation process.

Install Windows XP

If you've ever installed Windows before, you'll find the setup program to be the same as on any other PC. Most of the options are self-explanatory. However, a few steps in the Windows installation process require some explanation. Follow these steps:

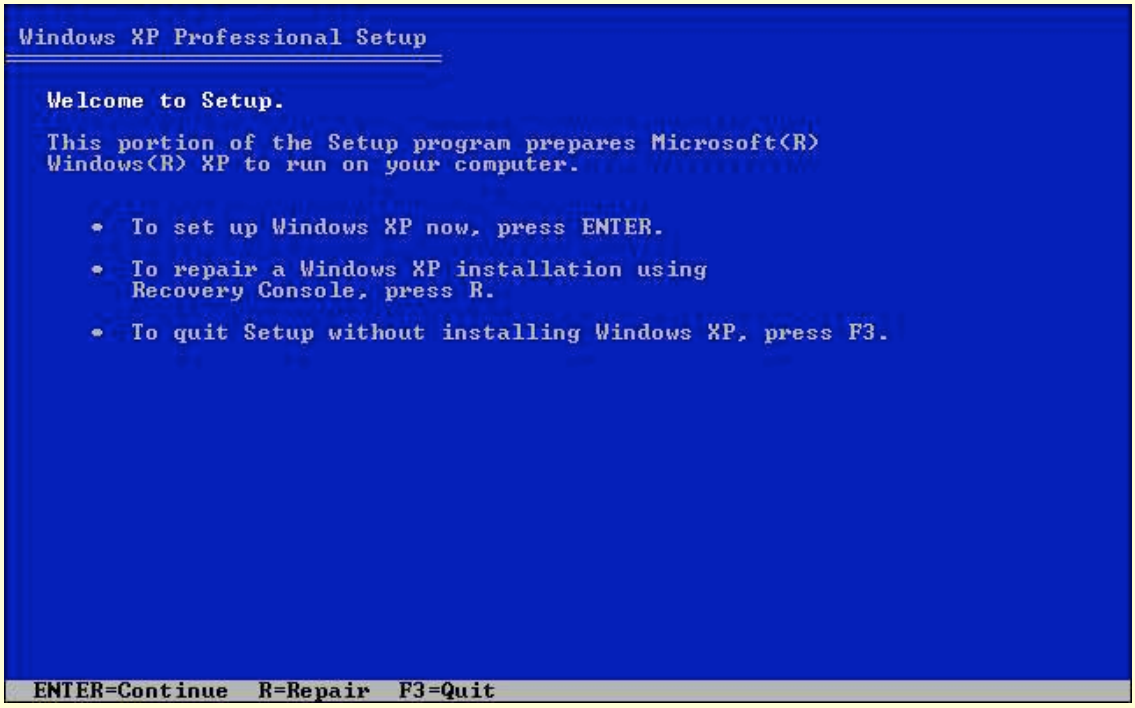
1. After restarting from the Windows CD and waiting for few minutes while it goes through some preliminary steps, you'll see a screen like that shown in **Figure 5**. Press Return to begin the installation process.

NOTE RETURN VS. ENTER

Mac and Windows keyboards differ in how they label the "carriage return" key—the key you press to confirm something or (like returning a typewriter's carriage to its starting position) to move to a new line. If you're using a Mac keyboard, this key is labeled Return. There may also be a key on the numeric keypad labeled Enter; Mac OS X considers these two different keys. On a Windows keyboard, however, the carriage return key is labeled Enter, and the Enter key on the numeric keypad performs the same function.

When Windows (or Windows Setup) asks you to press the Enter key, you must press the Return key—not the Enter key—if you're using a Mac keyboard; the Enter key will typically do nothing. If, however, you have a Windows keyboard attached, you should press the Enter key as instructed.

Figure 5



The slick, colorful, and modern interface of Windows Setup walks you through the process in plain (text) English.

2. To agree to the End User License Agreement, press F8.
3. On the next screen (**Figure 6**), the installer asks you to choose which partition to install Windows onto. Using the arrow keys to move up or down, highlight drive **`C:`** and press Return.

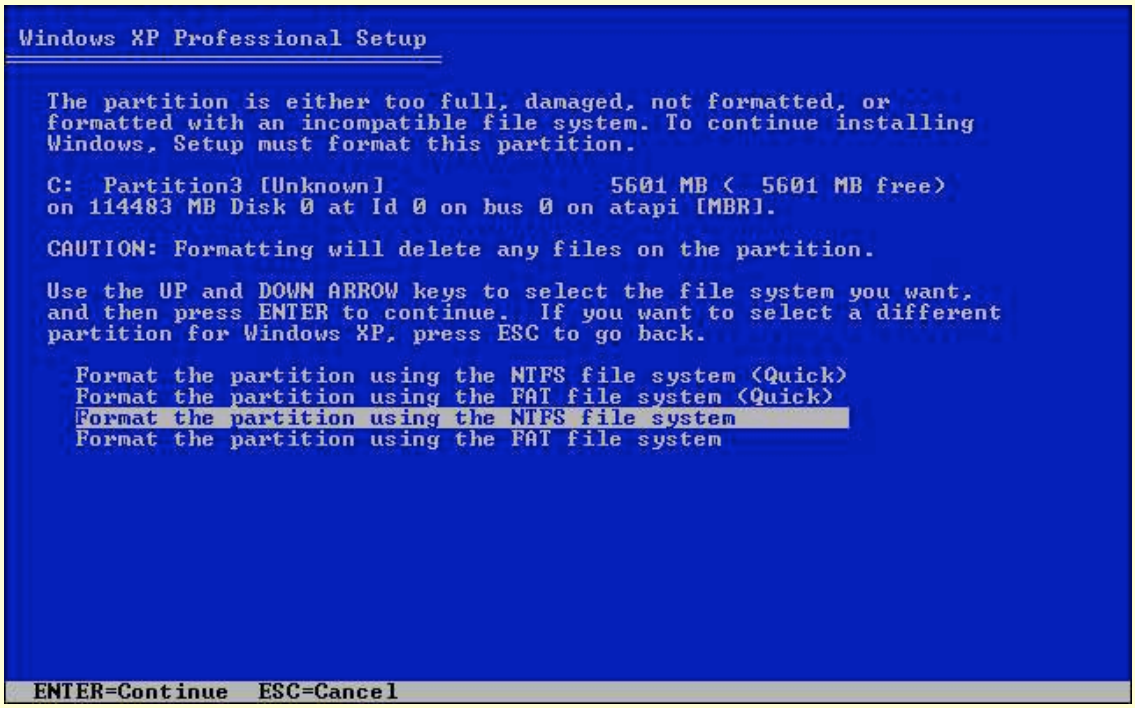
Warning! *Choosing anything other than **`C:`** on this screen may erase all or part of your Mac OS X partition. Also, resist the temptation to delete that mysterious **`E:`** partition, which is necessary for proper operation of your computer.*

Figure 6

When installing Windows under Boot Camp, choose the C: partition.

4. Next, the installer asks you to choose which file system to use when formatting the Windows partition (**Figure 7**). Your choices are NTFS or FAT, and for each one you can choose either a standard or "Quick" option. In most cases, the option I recommend is **`Format the partition using the FAT file system (Quick)`**, partly because you can easily convert from FAT to NTFS—but not the other way around—later on. But read the sidebar just ahead, Choosing a File System, for more information. After making your selection, press Return; on the confirmation screen that appears next, press Return again.

Figure 7



Choose a file system on this screen. FAT (Quick) is a good initial choice for most users; you can convert it to NTFS later.

5. The Windows installer formats the partition and then spends several minutes (or more) copying files from the CD to the hard disk. When it's finished copying, your computer restarts again from the hard disk to complete the setup process.

Choosing a File System

A file system is simply a method for storing data on disk. Mac OS X normally uses a file system called HFS+ (also known as Mac OS Extended), and Windows normally uses either NTFS or FAT (which comes in several varieties, including FAT16 and FAT32; Boot Camp uses FAT32, but don't worry about that distinction).

Apple's Boot Camp documentation says that NTFS "provides better reliability and security," while FAT "provides better compatibility" and enables you to read and write files on the Windows partition when running Mac OS X. Which is better?

FAT (File Allocation Table) is an older standard. NTFS (NT—as in Windows NT—File System) is more modern, and includes support for journaling, security features such as encryption and access control lists (which can help to protect Windows from viruses), and file-level compression. (Many users don't take advantage of all those features, but they're available.) For stand-alone Windows machines, NTFS is almost always the most logical choice.

However, since you're installing Windows on a machine that also runs Mac OS X, FAT may be a better option. Mac OS X can mount a FAT partition and provide read and write access to files on that volume, whereas with NTFS, Mac OS X can read but not write files, making file sharing more awkward. Also, although you can easily convert a volume from FAT to NTFS, you can't convert from NTFS to FAT without erasing the volume. So if in doubt, FAT gives you more initial flexibility. One limitation is that although FAT volumes can be larger than 32 GB, the Windows installer supports formatting FAT drives up to only 32 GB. So if you need a larger Windows partition on your Mac, NTFS is your only choice.

What about the "Quick" option? As the name suggests, it's faster than the standard method. The standard method checks the volume for bad sectors during formatting and can eliminate certain kinds problems caused by disk errors; the Quick option skips that check. New Boot Camp partitions should be error-free already, so save a bit of time and go with the Quick option.

For more information about the differences between FAT and NTFS (and instructions on upgrading from FAT to NTFS), see http://www.microsoft.com/windowsxp/using/setup/expert/russel_october01.mspx.

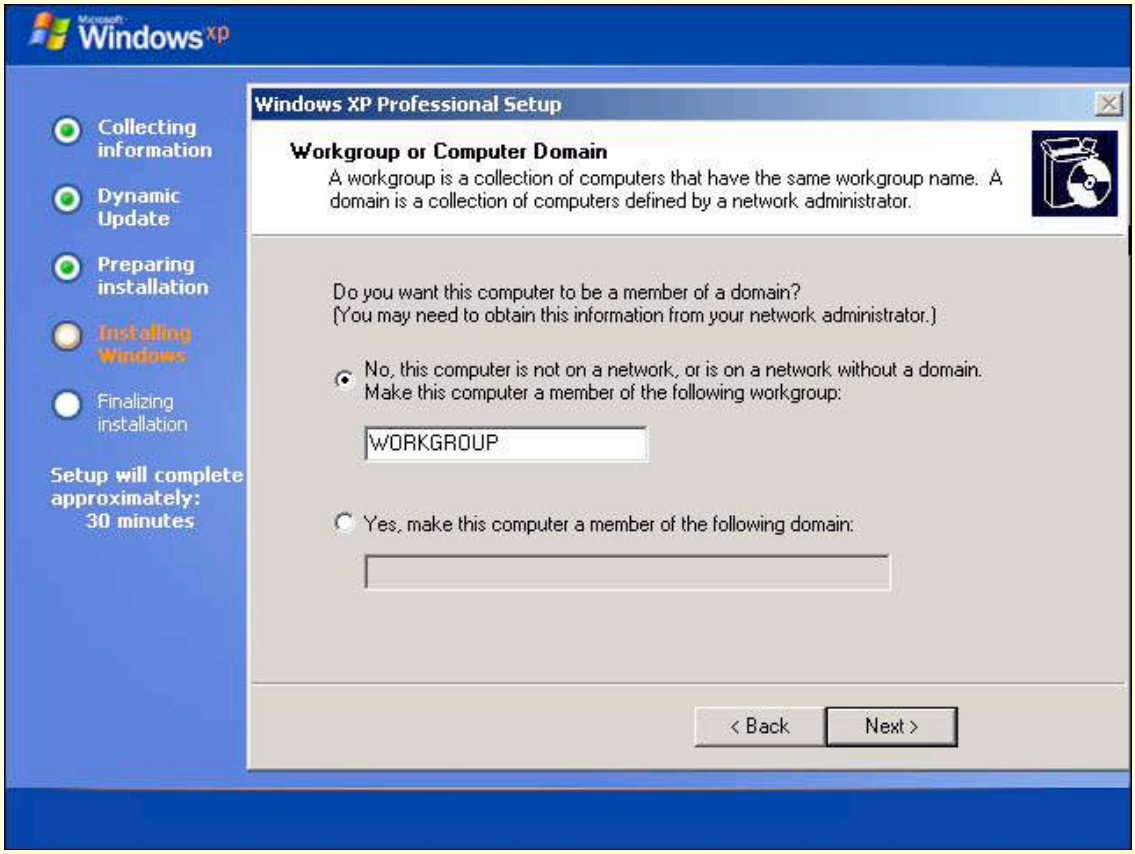
6. The final phase of Windows installation is generally lengthy; depending on the speed of your computer and hard drive, you may have to wait an hour or more for it to finish (see **Figure 8**).

Figure 8

If you have nothing to do for the next 39 minutes (give or take), sit and read all these marketing blurbs. Or just go for a jog.

7. In the course of installation, you'll have to enter information on several screens (including the password you want to use, your time zone, and which sort of network you have). Most of these questions are self-explanatory (and similar to questions you answered when installing Mac OS X). As always, choose a good password that isn't found in a dictionary and would be difficult to guess. One setting that may be confusing if you're not a regular Windows user is the Workgroup or Computer Domain (see **Figure 9**). If you're using Windows on just one computer in your home or office, the default choice (No, with workgroup name WORKGROUP for Windows XP Professional or MSHOME for Windows XP Home) is fine. If you're connected to a network with other Windows computers, ask your system administrator what to enter here. And don't worry, you can always change this later if you enter the wrong thing now.

Figure 9



If you're installing Windows on a stand-alone computer, stick with the first option, and don't worry about which workgroup you enter here.

8. When the installation is finished, your computer restarts. Ignore the message informing you that you can press any key to start from the CD, and it will disappear after a few seconds.

   Warning! *I really mean it: Ignore that message! Do* not *press any key! If you do, you'll get into a loop of attempting to start from a CD, when what you want to do at this point is start from the hard disk.*

9. Depending on your display, you may see a message stating that Windows will automatically adjust your screen resolution. Click OK, and then click OK again to confirm the change (you can change the resolution settings again later).

10. Windows asks a couple more setup questions, such as whether to turn on Automatic Updates (I suggest yes) and a request for your name. Work your way through these, and you're done.

When the setup is finished, the Windows Desktop and Start menu appear, and you're off and running. But before you get carried away, be sure to follow the instructions in the next section for installing Macintosh drivers.

Take note: *At this point in the process, your screen resolution* may *still be wrong; you may have a fairly small image stretched unnaturally to fit your larger display. Don't worry about this; when you install the Macintosh drivers, next, this problem will go away.*

Install Mac Drivers for Windows

A driver is a piece of software that tells an operating system how to communicate with some sort of hardware. Every part of your computer, and every peripheral, has a driver; that includes your video card, hard drive, keyboard, mouse, printer, audio interface, and many other components. Windows, like Mac OS X, includes built-in drivers for a wide range of common devices.

However, a basic installation of Windows does not contain drivers for some components of your Mac, which means that those devices may work only partially or not at all. The Macintosh Drivers CD you burned earlier adds these drivers to Windows, so that while running Windows you can use your Mac's built-in graphics card, Ethernet and AirPort networking, audio input and output, the brightness controls on iMacs and notebooks, the Eject key on your keyboard, and (some) Bluetooth peripherals.

To install the Mac drivers, follow these steps:

1. If the Windows XP CD is still in your computer's optical drive, eject it. Since you haven't yet installed the driver for the Eject key on your keyboard, you have to do this the old-fashioned way:
   a. Choose Start > My Computer.
   b. Click the icon for the CD/DVD Drive (**D:**) once to select it.
   c. Choose File > Eject.
2. Insert your Macintosh Drivers CD. The installer runs automatically.
3. Select your language and click OK.

4. When the Welcome screen appears, click Next.
5. Click Yes to agree with the license agreement.
6. As the installer runs, numerous windows may appear and disappear. Don't touch anything (and especially don't click the Cancel button!), even if there appear to be delays lasting several seconds or more; let the process continue until the InstallShield Wizard Complete window appears. Then, with Yes, I Want to Restart My Computer Now selected, click Finish. Windows restarts.

   Take note: *Depending on which Mac model you have, during the installation process you may see warnings that some software has not passed Windows Logo Testing. Since Boot Camp is still beta software, that's to be expected, and it's nothing to worry about. (In fact, even in final software releases, some companies opt not to perform Windows Logo Testing because it's an expensive and time-consuming process.) If you see such a message, click Continue Anyway.*

7. After the restart, your screen resolution should automatically be set correctly. You may (or may not) see the Windows Found New Hardware Wizard. If you do, follow the instructions to set up the newly discovered devices.

   Take note: *Depending on your Mac model, you may see additional windows at this point.*

   If you see an ATI Registration dialog box, select Never Remind Me Again and click Continue (since you don't need to register your computer's video card separately).

   If you see a DeskTop Help window with the text "Using TV Display" in it, uncheck the Show Window at Start Up when TV Display Is Enabled checkbox and click the close box in the upper-right corner of the window. (Do not bother attempting to disable the TV display; that procedure likely won't work on your Mac.)

Solve Input Device Problems

Under Boot Camp, the keyboard and mouse, trackpad, or trackball that function perfectly in Mac OS X may not work correctly in Windows. Users of notebook computers and Bluetooth input devices have additional problems. But you can solve them with a few easy steps.

TIP If you customarily use the numeric keypad on your keyboard for entering numerals, remember that in Windows the keypad's default setting is such that it functions as directional keys. To use it for entering numerals, you must first press the Clear key on the keypad, which functions as Num Lock.

Right-click with a one-button mouse

If you're using a Mighty Mouse or a third-party mouse or trackball that has two or more buttons, you can skip this section. If you're using a one-button Apple mouse, however, you may run into frustrations, since many actions in Windows require right-clicking. In Mac OS X, you can press Control while clicking to display a contextual menu (the Mac equivalent of a Windows right-click menu), but this trick doesn't work under Boot Camp. You can, however, install a free third-party tool to get the same behavior. Follow these steps:

1. Go to http://www.geocities.com/pronto4u/applemouse.html and download the Apple Mouse Utility.
2. Unzip the downloaded file.
3. Double-click the **applemou** program, and click OK.

Now, to emulate a right click, hold down Control while clicking. This feature lasts only until you restart the computer. To avoid having to relaunch the program every time you restart, follow these steps:

1. Right-click (that is, Control-click) the Start button and choose Properties.
2. Select Classic Start Menu and click Customize.
3. Click Advanced. A window opens displaying a Programs folder.
4. Double-click the Programs folder to open it.
5. Move the **applemou** program (or a shortcut to it) into the Startup folder in this window. To create a shortcut (similar to an alias in Mac OS X, right-click (or Control-click) and drag the icon to its destination; when you release the mouse button, choose Create Shortcuts Here.

The **applemou** program loads each time you log on.

NOTE Not that it matters much, but in Mac OS X, you *log in* and *log out*, whereas in Windows, you *log on* and *log off*. I've tried to use the preferred terminology in this ebook for whichever OS I'm discussing at the moment.

Use Bluetooth input devices

Curiously, although the Macintosh Drivers CD contains a driver for your Mac's built-in Bluetooth transceiver, it does not support Apple Bluetooth keyboards and mice. However, all is not lost. To enable support, follow these steps:

1. Download a small application prepared by Stephen Cattaneo: http://www.stephenjc.com/onmac/btinstall.zip. (Note that this application makes several registry changes, among other things; use at your own risk.)
2. After unzipping the downloaded file, double-click the file **`install.cmd`**.
3. Allow the Found New Hardware Wizard to connect to Windows Update and install the new software automatically. (You may have to do this more than once).
4. Double-click the Bluetooth icon in the Windows notification area (in the lower-right corner of the screen). If the icon doesn't appear there, choose Start > Control Panel; make sure you're in Classic view (if not, click the Switch to Classic View link), and then double-click the Bluetooth Devices icon.
5. On the Devices tab, click Add.
6. Select My Device Is Set Up and Ready to Be Found.
7. For an Apple Wireless Mouse, turn it off, and then (holding it upside down) turn it back on again. For an Apple Wireless Keyboard, turn it off and back on. Then click Next.
8. Select a Bluetooth device (mouse or keyboard) in the list and click Next.
9. Select Don't Use a Passkey and click Next. After the device is paired, click Finish.

Your Bluetooth input device should now work correctly; if necessary, repeat steps 5 through 9 with additional devices.

NOTE Sometimes, after restarting under Boot Camp, Windows XP will not respond to your Bluetooth keyboard, even though the Bluetooth Devices control panel lists it as connected. If this happens to you, try turning the keyboard off and back on and waiting about 10 seconds. If that doesn't work, you may have to remove and re-add the keyboard in the Bluetooth Devices control panel.

Press Control-Alt-Delete without a Delete key

In Windows XP, the key combination Control-Alt-Delete is important. In some configurations, it displays the logon prompt, without which you can't log on! It also displays the Task Manger, which (among other things) enables you to quit stubborn programs, much like Mac OS X's Force Quit feature (accessed via Command-Option-Esc) does. If you're using an Apple keyboard under Windows XP, the Option key functions as the Alt key, but Delete is more complicated. Most external keyboards have two Delete keys: one just to the right of the = key, which normally behaves as a backspace, and the other above the arrow keys, which sometimes has the symbol ⌦ and is technically a Forward Delete key (pressing it deletes the character to the *right* of the insertion point). Of these two, only the Forward Delete key works in conjunction with Control and Alt to display the Task Manager.

This is no big deal if you're using an external keyboard, but if you're using the built-in keyboard on a Mac notebook, you have no separate Forward Delete key. To solve this problem, follow these steps:

1. Download Microsoft's **`rktools`** package from http://www.microsoft.com/downloads/details.aspx?FamilyID=9D467A69-57FF-4AE7-96EE-B18C4790CFFD&displaylang=en.
2. Run the **`rktools`** installer.
3. Choose Start > Run.
4. Type **`remapkey`** and click OK. The RemapKey window appears.

5. In the *top* keyboard diagram, find the Del (Forward Delete) key and drag it onto a key in the *bottom* keyboard diagram; the key you choose will function as Forward Delete. You could choose the ⇦ (Delete) key, although you'd lose the backspace function. Instead, consider mapping Del onto the Right Windows key two spaces to the right of the spacebar; this corresponds to the Command key on your keyboard immediately to the right of the spacebar.
6. Click the Save and Exit button (leftmost on the toolbar).
7. In the alert that appears, warning that you'll lose the Right Windows key, click OK. Then click Yes to restart your computer.

The right Command key now functions as Forward Delete and can be used to enter the Control-Alt-Delete sequence.

Type special characters

If you're using an Apple keyboard (or a third-party keyboard designed for Macs), you'll be unable to enter certain special characters, such as the euro (€) symbol. But you can work around this problem easily. Follow these steps:

1. Choose Start > Control Panel.
2. If "Pick a category" is displayed, click Date, Time, Language, and Regional Options and then click Regional and Language Options; otherwise, double-click Regional and Language Options.
3. Click the Languages tab, and then click Details.
4. Click the Add button.
5. From the bottom drop-down menu, choose United States-International and click OK.
6. Click OK to close the Text Services and Input Languages window, and then click OK again to close the Regional and Language Options window.

A keyboard icon () appears in the notification area in the lower-right corner of the screen. When you want to enter special characters, click this icon and choose United States-International from the pop-up menu (see **Figure 10**). Then press the key combination or key sequence you need. For example, to type the € symbol, hold down the

right Option key and press 5; to type *ñ*, press right Option-N; to type *é*, type an apostrophe (') followed by an *e*. To return to your normal keyboard layout, choose English (United States) from the pop-up keyboard menu. You can find a complete list of special characters available in this keyboard layout and the shortcuts to enter them at http://support.microsoft.com/default.aspx?scid=kb;en-us;306560.

Figure 10

When you want to type special characters, choose United States-International from this pop-up menu in the notification area.

Take screen captures

Mac users can take a snapshot of whatever's on the screen at the moment and save it as a file by pressing Command-Shift-3. This trick doesn't work when running Boot Camp, though, and if you have an Apple keyboard without a Print Screen (or Prt Scr) key, you'll be unable to use the closest Windows equivalent. Pressing this key by itself normally places a copy of the frontmost window on the Clipboard, from which you can paste it into a graphics program such as Paint to save it as a file; pressing it together with Alt (Option) captures the entire screen. Unfortunately, the **`remapkey`** program I described earlier doesn't remap the Print Screen key.

Never fear, though; you have several alternatives for performing this action under Boot Camp:

- **Use the On-Screen Keyboard:** Choose Start > All Programs > Accessories > Accessibility > On-Screen Keyboard. In the keyboard that appears, click the psc button (to the right of F12) and click a window to put a copy of it on the Clipboard. To capture the entire screen, hold down Shift while clicking psc. But bear in mind that doing so captures the On-Screen Keyboard as well!
- **Use a third-party utility:** Numerous excellent screen-capture programs exist for Windows, including SnagIt and MWSnap. http://www.techsmith.com/ ($40) http://www.mirekw.com/winfreeware/mwsnap.html (free)

- **Use Input Remapper:** If you have a MacBook Pro, you can download and install a utility called Input Remapper that gives you a Print Screen capability as well as numerous other handy shortcuts. The only problem is that at present it works *only* with the MacBook Pro.
  http://www.olofsson.info/ (free)

Switch between Mac OS X and Windows

Under Mac OS X, you can switch from one startup disk to another by using the Startup Disk pane of System Preferences. The same procedure applies to switching from Mac OS X to Windows, and Apple even included with the Macintosh Drivers installation a version of the Startup Disk preference pane for Windows.

To switch from Windows to Mac OS X:

1. Choose Start > Control Panel.
2. If the window says "Pick a category," click Performance and Maintenance.
3. Double-click the Startup Disk icon.
4. Select your Mac OS X volume and click Restart.

To switch from Mac OS X to Windows:

1. Open System Preferences.
2. Click the Startup Disk icon.
3. Select your Windows volume and click Restart.

Regardless of the volume you select using Startup Disk, you can also choose either operating system when you turn on or restart your computer. To do so, hold down the Option key while restarting. Select the icon for the volume you want to use, and then click the arrow icon beneath it.

Share Files across Platforms

When you're running Windows on your Mac, you may want access to files on the Macintosh partition; when you're running Mac OS X, you may want access to files created under Windows. You can use any of several approaches to share files between the two platforms.

Access Windows files from Mac OS X

When running Mac OS X, you can access files on your Windows partition simply by double-clicking the icon on your Desktop (or single-clicking the icon in the sidebar of a Finder window) that represents the Windows volume. (By default, this volume is called either NO NAME or Untitled; see the tip Rename Your Windows Volume, just ahead.) Your level of access to this volume depends on which partition format you chose.

Hint: *The first place to look on the Windows volume for files you created there is* **`Documents and Settings/your-user-name`**. *Within that folder, look in the* **`My Documents`** *folder or the* **`Desktop`** *folder*.

If you formatted your Windows partition as a FAT volume, you can copy files to or from this volume just as you would with any other Mac volume; you can even open files using compatible Mac OS X applications without moving them at all. However, keep the following in mind:

- Some Macintosh files store formatting, image previews, or other information in a portion of the file called the *resource fork*; these files may not appear correctly under Windows.
- You can do serious damage by moving, deleting, or renaming any of the files that Windows needs to run. So stay away from anything outside the Documents and Settings folder—and within that folder, be sure you know what you're doing before deleting or modifying anything.

If you formatted your Windows partition as an NTFS volume, you can read files on the Windows partition or copy them to the Mac partition, but you cannot add new files to the Windows partition, nor can you modify or delete existing files.

Take note: *Even though you can see Windows files from within Mac OS X, you can't run Windows programs without restarting into Windows*.

TIP RENAME YOUR WINDOWS VOLUME

When you restart your computer in Mac OS X after installing Windows, you'll notice that your new Windows partition is named either NO NAME (if you chose FAT) or Untitled (if you chose NTFS); in Windows, it shows the default name Local Disk. You can change this name to anything you like; the new name then appears in both Windows and Mac OS X. To change the name within Mac OS X (for FAT partitions only), click the disk's name, press Enter, and type a new name. To change the name within Windows (FAT or NTFS), choose Start > My Computer, select the disk, choose File > Rename, and type a new name. But be aware that for FAT partitions, the disk name must be all uppercase.

Access Mac OS X files from Windows

Getting at files on your Macintosh partition while running Windows is trickier; the Macintosh partition doesn't appear when you're running Windows, because Windows doesn't understand the type of file system Macs normally use. However, you can work around this problem in any of the following ways.

Buy MacDrive

The easiest solution, by far, is to purchase Mediafour's MacDrive (http://www.mediafour.com/products/macdrive6/), a $50 application that enables Windows to mount Mac volumes and read and write files on them seamlessly, just as though they were Windows volumes.

Use an external drive

If you plug in an external USB or FireWire hard drive (or even one of the many keychain-sized flash drives) and use Disk Utility to format it as a FAT volume, both Mac OS X and Windows have full access to files stored on it.

Use optical media

Within Mac OS X, you can burn a CD or DVD containing files you want to use in Windows, and then copy the files from the optical disc onto your Windows partition after restarting in Windows.

Use your iDisk

If you're a .Mac member, you can mount your iDisk in both Mac OS X and Windows and use it to store any files you want to access from both platforms.

Under Mac OS X, if you entered your .Mac user name and password on the Account tab of .Mac System Preferences, your iDisk should already appear in the sidebar of Finder windows. (If not, choose Go > iDisk > My iDisk, enter your information, and click Connect.) Click the iDisk icon in the sidebar to see the folders and files on it. I suggest putting shared files in the **`Documents`** folder.

Under Windows XP, the easiest way to access your iDisk is to download and install the iDisk Utility for Windows from Apple (http://www.mac.com/1/learningcenter/Modules/dmStoringFiles_t3.html). Run the application, enter your user name and password, and click Mount iDisk.

Use a server

If you have another computer (Mac or PC) on your local network, you can turn on Windows Sharing on that computer. Then, when running Mac OS X, mount that server's volume and copy to it any files you want to use in Windows; when you restart in Windows, do the same thing to access the server's files.

To turn on Windows Sharing in Mac OS X so that a Mac can function as a server:

1. Open the Sharing pane of System Preferences and go to the Services tab.
2. Select the Windows Sharing checkbox.
3. Click Accounts and select the checkbox for at least one account name. Click Done.
4. Make a note (preferably on paper) of the address shown near the bottom of System Preferences, at which Windows users can access your computer.

To mount a shared volume (such as the one you just set up) using another Mac:

1. In the Finder, choose Go > Connect to Server.
2. Click Browse.
3. If the window is in Columns view, select the server and click Connect; if it's in Icons or List view, double-click the server icon.

4. Enter your user name and password and click Connect.

To mount a shared Mac volume in Windows:

1. Choose Start > My Computer.
2. Choose Tools > Map Network Drive.
3. In the Folder field, enter the address you made a note of earlier (in Step 4 under "To turn on Windows Sharing in Mac OS X"). Click Finish.
4. Enter the user name and password for the account and click OK.

A window showing the shared items opens. In addition, a new icon representing the volume appears in the Network Drives section of the My Computer window.

Get Rid of Your Windows Partition

If at some point you decide you've had enough of Boot Camp (perhaps because you want to use virtualization software instead), you can remove the entire Windows partition from your disk. But don't use Disk Utility to do this; use Boot Camp Assistant. To remove your Windows partition, follow these steps:

1. Make sure you've backed up any information from the Windows partition that you want to keep, either by copying it onto the Mac partition while running Mac OS X or by putting it on a CD, DVD, external hard drive, or other media.
2. Back up the Mac OS X partition of your drive. As I suggested when you set up Boot Camp initially, a complete, bootable duplicate onto an external hard drive is your safest bet. If something should go wrong during the repartitioning process, you could lose your valuable data, and a backup provides insurance.
3. Launch Boot Camp Assistant (in **`/Applications/Utilities`**).
4. In the first window that appears (**Figure 11**), select Restore the Startup Disk to a Single Volume and click Continue.

Figure 11

The bottom option on this screen lets you delete the Windows partition from your Mac.

5. Read the warning that your Windows XP volume will be completely erased, and then click Restore. Boot Camp Assistant prompts you for an Administrator password, and then removes the Windows partition and returns your disk to its original, single-volume state.
6. Click Restart.

Your Mac is now back to having a single, Mac OS X volume.

Install and Use Parallels Desktop

The second way of getting your Intel Mac to run Windows is to install virtualization software. You'll get slightly slower performance and lose access to some hardware devices that you can use in Boot Camp, but in exchange you get the convenience of running Windows and Mac OS X at the same time. Switching between them is as easy as switching applications, because that's exactly what you're doing!

In this section, I describe in detail the process of setting up and using Parallels Desktop, currently the best virtualization environment for Mac OS X by far. To learn about Q, skip ahead to Install and Use Q.

Note If you've already installed Boot Camp, you may be wondering whether you can use that very same Windows installation under a virtualization environment. The answer is no—for now. Parallels says they're looking into the possibility of adding that capability in the future. But even if they succeed, using Windows this way may violate the terms of your Windows End User License Agreement (particularly if you have a single-user retail license).

There are no technical reasons why you can't install Windows twice (or more) on the same machine—once in Boot Camp and once in Parallels, for example. But again, be sure to read your Windows license agreement carefully; it may require separate licenses for each instance of Windows.

Parallels Desktop is easy to use, but a few steps you may have to take are not obvious. The basic process involves four main steps: install the Parallels Desktop application; set up a new virtual machine; install Windows in that virtual machine; and install the Parallels Tools within Windows.

Important: *Make sure you've set aside enough time for the entire process before starting. I recommend allowing at least 2 hours, of which one will be spent mostly waiting for Windows Setup to install all its files. However, also keep in mind that unlike with Boot Camp, you can continue using your Mac for other tasks while Windows is installing under Parallels Desktop.*

Install Parallels Desktop

To install Parallels Desktop, follow these steps:

1. Download the software from http://www.parallels.com/en/download/desktop/. You can purchase it for $50 (save $10 with this coupon), or use it for 30 days as a free trial.
2. If you choose the free trial, you must also follow the link on the download page to register and receive a trial activation key. (If you purchased the software, you should have received an activation key by email.) Without this key, the software will not run.
3. After mounting the downloaded disk image, double-click the Parallels installer icon and follow the instructions to install the software.

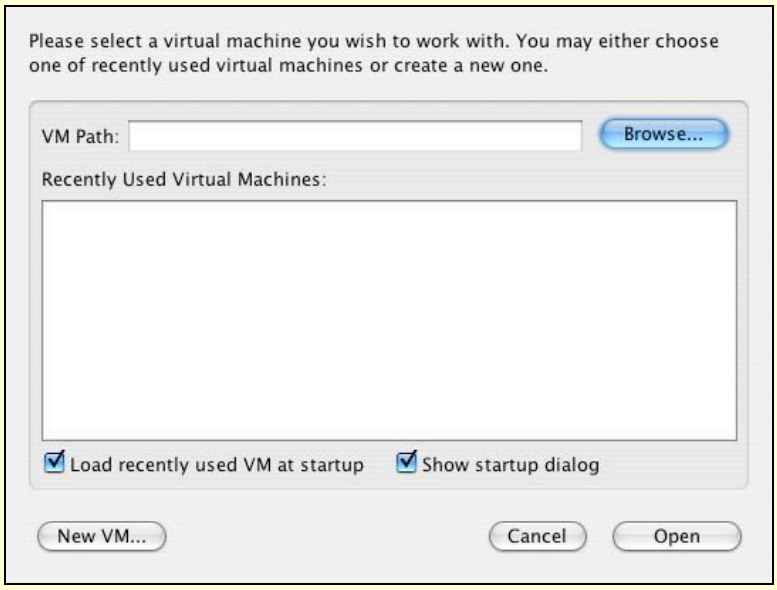
Parallels is now ready to run.

Set Up a New Virtual Machine in Parallels Desktop

Each operating system you install requires its own virtual machine. (You can, if you wish, install several different operating systems or several instances of the same operating system.) To create a new virtual machine for Windows XP, follow these steps:

1. Launch Parallels (in **`/Applications/Parallels`**). In the Startup Options dialog (**Figure 12**), click New VM.

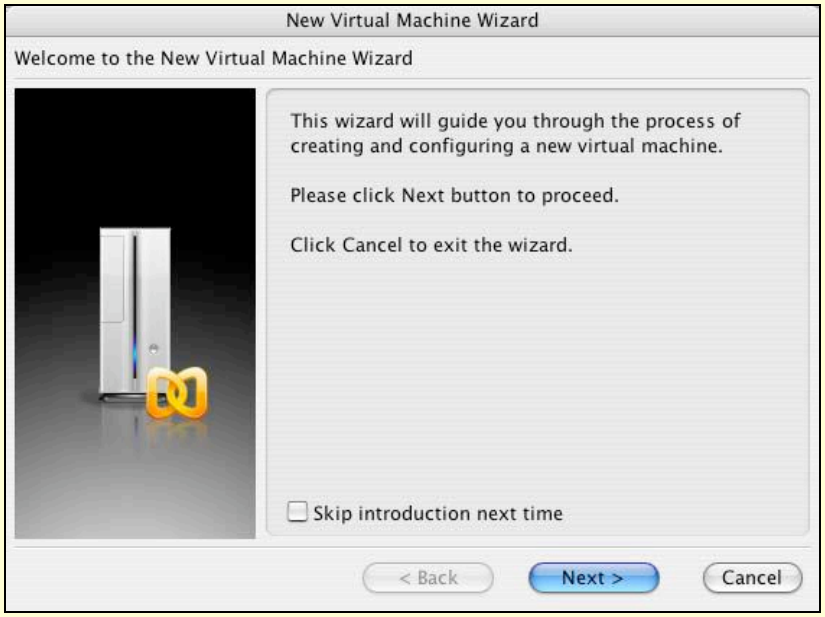
Figure 12



Parallels Desktop's Startup Options window begins the process of creating a new virtual machine.

2. The New Virtual Machine Wizard (**Figure 13**) appears. Click Next.

Figure 13



The New Virtual Machine Wizard welcomes you.

3. On the next screen (**Figure 14**), with Create a Typical VM selected, click Next.

Figure 14

You *could* try to figure out a lot of custom options here, but the default VM settings work well for most users.

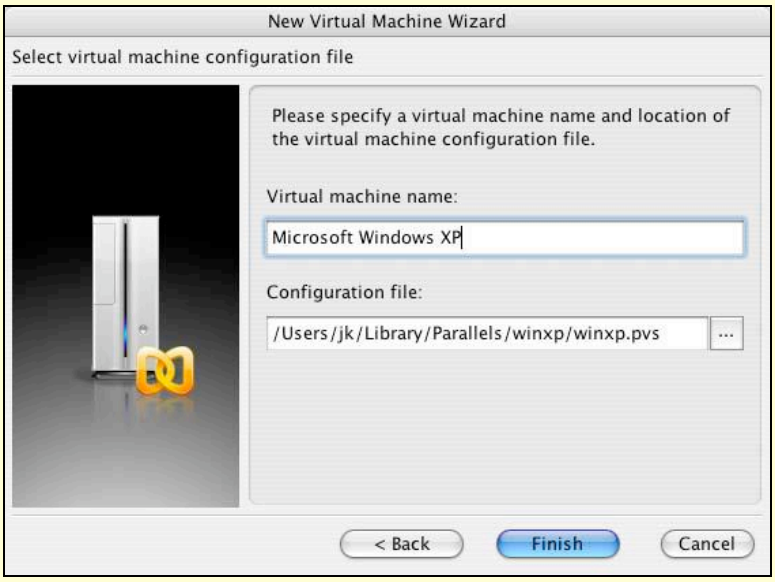
4. On the Select Guest OS screen (**Figure 15**), with Windows chosen as the default from the Guest OS Type pop-up menu, choose Windows XP from the Guest OS Version pop-up menu. Click Next.

Figure 15

Choose your OS type and version on this screen.

5. On the Select Virtual Machine Configuration File screen (**Figure 16**), I recommend that you keep the default settings. However, if you wish, you can change the name of the virtual machine or the location of the configuration file. Click Finish.

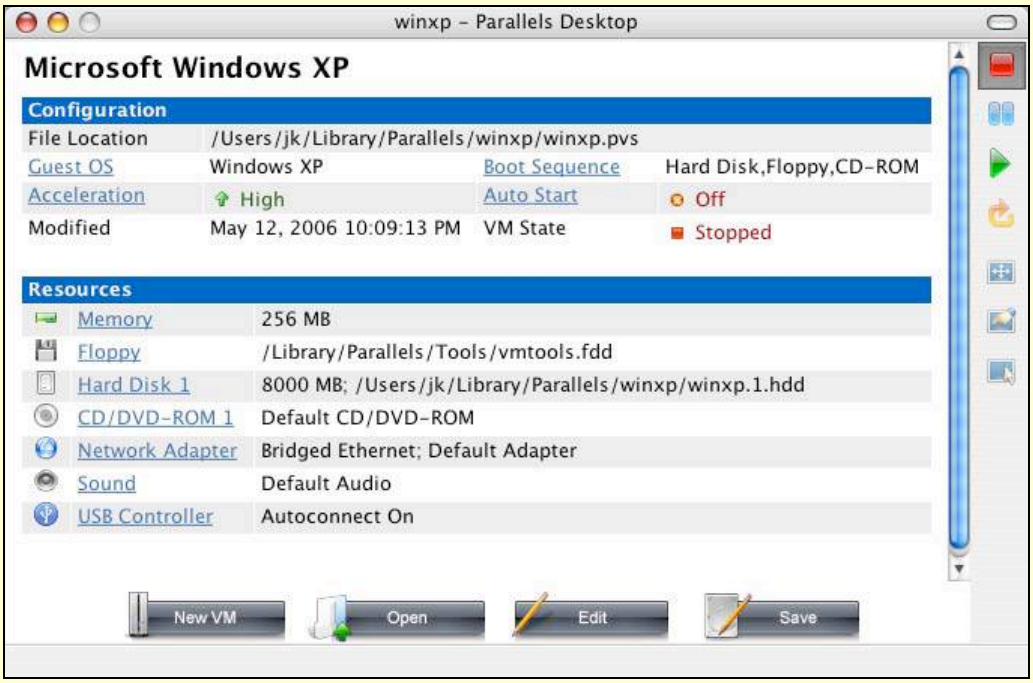
Figure 16



Keep the defaults here, or choose a different name and location for your virtual machine.

6. If an alert appears asking whether Parallels should automatically create a new directory, click Yes. The Property Page View (**Figure 17**) appears.

Figure 17



The Parallels Property Page View gives you an overview of the settings for a virtual machine.

7. If you haven't already done so, activate Parallels Desktop using the code you obtained earlier. To do this:

   a. Choose Help > Activate Product.

   b. In the fields provided, enter the activation key, your name, and (optionally) your company name.

   c. Click Activate. When the thank-you message appears, click OK.

Your virtual machine is now ready for installation of Windows.

NOTE VIRTUAL DISKS

When you set up a new virtual machine, Parallels also creates a special disk image file. When you run Windows, it will see this file as a separate disk. All your Windows files are installed in this virtual disk, but when you're running Mac OS X you won't see the individual files inside; it looks and acts like a single file.

By default, Parallels gives the virtual disk an 8 GB capacity initially (although the disk image file itself starts out much smaller); it can grow as needed to accommodate more files (up to the amount of free space on your real disk).

Bridged vs. Host-Only Networking

Parallels Desktop offers two networking modes, which affect how (if at all) Windows can communicate with other computers, both locally and over the Internet:

- **Bridged Ethernet:** In Bridged mode (the default setting), the virtual machine appears as a separate computer on the network. This means that Windows will have its own IP address, separate from that of your Mac. If your network has a router or AirPort base station that uses DHCP to distribute IP addresses (as most do), this is generally the best and most convenient option, as it gives Windows direct access to the Internet.
- **Host-only networking:** In Host-only mode, Parallels simulates a network within your computer, meaning that Windows can use networking services to communicate with the Mac it's running on but does not have direct access to the outside world, including the Internet.

Depending on your network's configuration and your individual needs, one of these modes may suit you better than the other. For example, if you're using a virtual private network (VPN) or logging into a commercial wireless network while on the road, Bridged Ethernet may not play nicely with the host network. In such cases, you may be able to work around the problem by using Host-only networking, and then turning on Internet Sharing in Mac OS X's Sharing Preference Pane so that Windows can see the Internet indirectly. However, since Parallels is still in development and the networking features are in a state of flux, I can't yet offer you reliable advice on how to solve such problems. If Bridged Ethernet networking doesn't work for you, look for advice in the Parallels forums at http://forums.parallels.com/.

To switch between networking modes, click the Network Adapter link in the Property Page View. Then select either Bridged Ethernet or Host-Only Networking and click OK.

Install Windows XP in Parallels Desktop

To install Windows, follow these steps:

1. Click the green triangle on the right side of the window to start the virtual machine.

Warning! *If you have a Windows CD that includes Service Pack 2 (SP2), you can proceed with Step 2. But if your CD has an earlier version of Windows, which lacks some important built-in safeguards against viruses and other malware, your computer could be infected between the time you finish installing Windows and the time you install Service Pack 2 (yes, even if that's only a few minutes!). Therefore, before you do anything else, follow these steps:*

a. *Make sure you have a copy of SP2 handy, either on CD or as a downloaded file on your Mac. (To learn how to get a copy, see Prepare Your Computer, later in this ebook.)*

b. *Disconnect your computer completely from the Internet. If you have a wired connection, unplug your Ethernet cable. If you use a wireless connection, choose Turn AirPort Off from the menu. (Alternatively, if you know you won't need Internet access at all in Windows, you can choose Host-Only networking; see the sidebar Bridged vs. Host-Only Networking on the previous page.)*

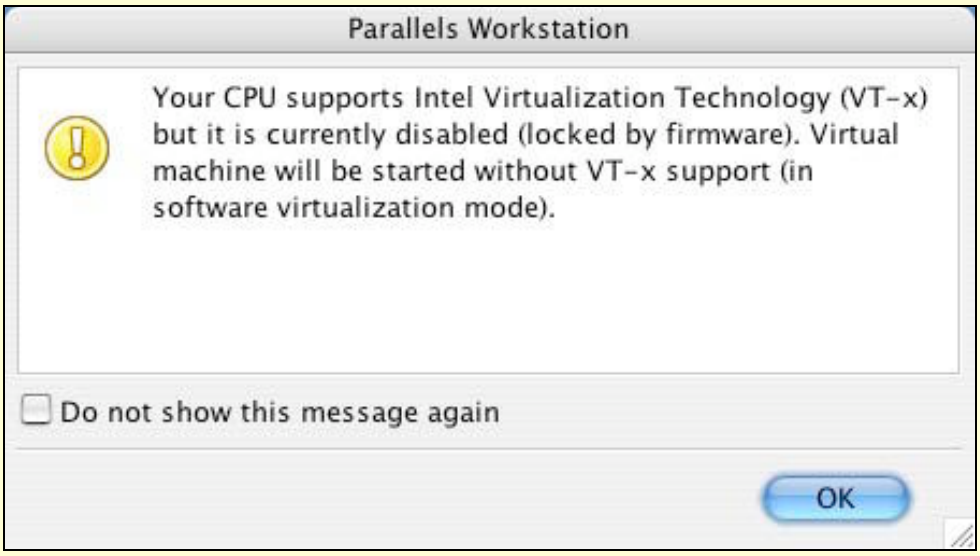
c. *Proceed with the remaining steps in this section. Note that you will see several warnings to the effect that there is a problem with the network adapter. You can safely ignore these warnings.*

d. *Run the SP2 installer. If you downloaded the file, the easiest way to do this is to move the file into your shared folder (see Share Files between Windows XP and Mac OS X, ahead) and then double-click it within Windows.*

e. *After SP2 is installed and the virtual machine restarts, you can reconnect your Ethernet cable or turn AirPort back on. Then move on to Install Parallels Tools.*

2. If you're using a Mac mini, you *may* encounter the error message shown in **Figure 18**. If you do, don't panic; click OK, proceed with the rest of the installation, and then follow the steps in Correct the VT-x Error on a Mac mini. (You may have to dismiss this message multiple times unless you select the Do Not Show This Message Again checkbox.) If you don't see this error message, smile and move on.

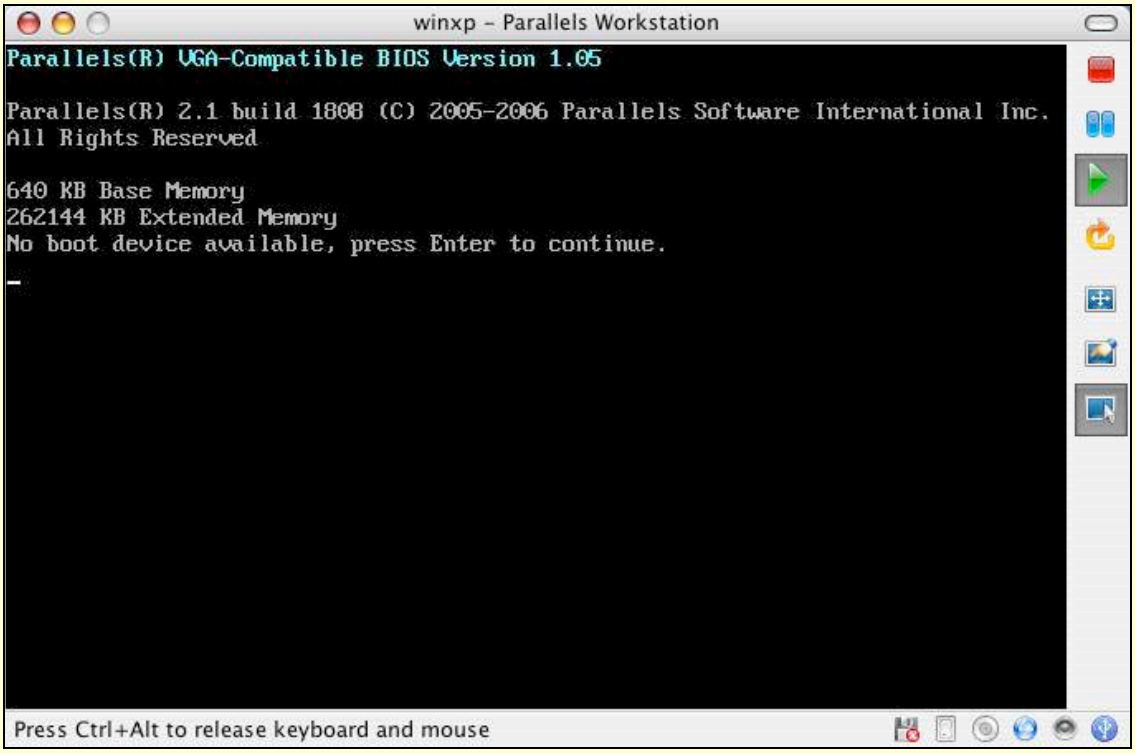
Figure 18



Don't worry about this warning. Really. But if you can't stop worrying, read on for a solution.

3. The screen shown in **Figure 19** appears. Insert your Windows XP CD and wait 30 seconds or so while it spins up. Then click anywhere inside the black portion of the window and press the Return key on your keyboard.

Figure 19



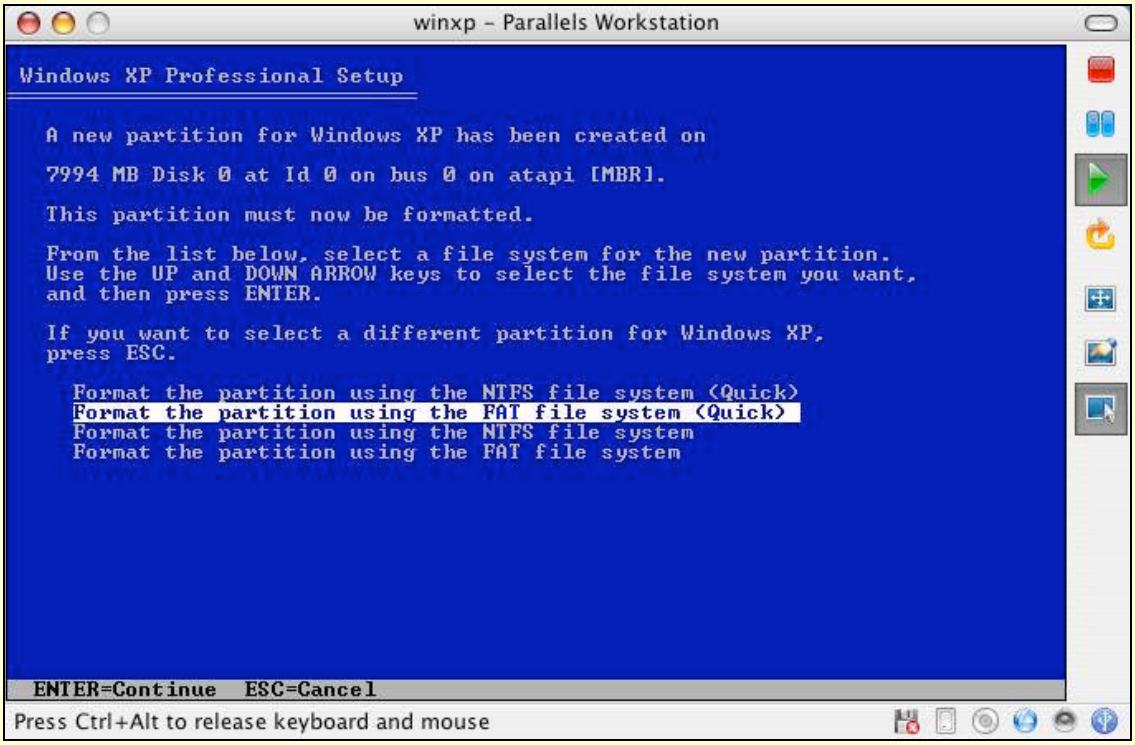
When this screen appears, insert your Windows CD and press Return.

4. Windows Setup runs. Press Return to begin the installation process.

5. To agree to the End User License Agreement, press F8.

6. On the next screen, the installer asks you to choose which file system to use when formatting the Windows partition (see **Figure 20**). Although I recommended using the FAT file system in Boot Camp, within Parallels Desktop your best choice is probably **`Format the partition using the NTFS file system (Quick)`**; it's more secure, and FAT isn't needed for file sharing. For more information about the file system options read the sidebar Choosing a File System, earlier. After making your selection, press Return.

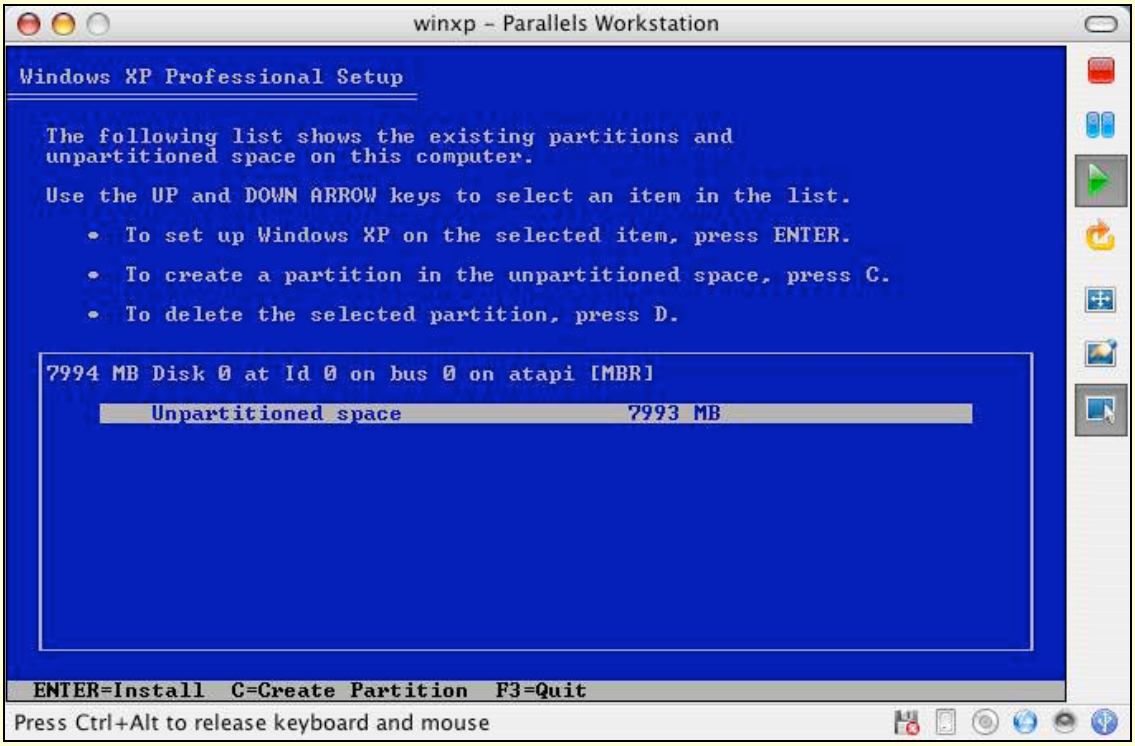
Figure 20



Pick a file system. Unlike in Boot Camp, NTFS (Quick) is generally the best choice here.

7. The installer asks which partition to use (**Figure 21**). Since you have only one option ("Unpartitioned space"), simply press Return.

Figure 21



Press Return on this screen and move along.

8. The Windows installer formats the partition and then spends several minutes (or more) copying files from the CD to the hard disk. When it's finished copying, the virtual machine restarts to complete the setup process.

Take note: *At this point in the installation process, you may see an alert that says "Unable to open device/file* ***Default CD/DVD-ROM****." If this happens, click OK. Press Control-Option to return control of the mouse to Mac OS X. Then choose Devices > CD/DVD-ROM 1 > Connect.*

9. The final phase of Windows installation is generally lengthy; depending on the speed of your computer and hard drive, you may have to wait an hour or more for it to finish.

10. In the course of installation, you'll have to enter information on several screens (including the password you want to use, your time zone, and which sort of network you have). Most of these questions

are self-explanatory (and similar to questions you answered when installing Mac OS X). As always, choose a good password that isn't found in a dictionary and would be difficult to guess. One setting that may be confusing if you're not a regular Windows user is the Workgroup or Computer Domain (**Figure 22**). If you're using Windows on just one computer in your home or office, the default choice (No, with workgroup name WORKGROUP for Windows XP Professional or MSHOME for Windows XP Home) is fine. If you're connected to a network with other Windows computers, ask your system administrator which domain (if any) to enter here. And don't worry, you can always change this later if you enter the wrong thing now.

Figure 22

Unless your system administrator tells you otherwise, go with the default setting here.

11. When the installation finishes, the virtual machine restarts again. Ignore the message informing you that you can press any key to start from the CD, and it will disappear after a few seconds.

12. You may see a message stating that Windows will automatically adjust your screen resolution. Click OK, and then click OK again to confirm the change (you can always change the resolution settings again later).

13. Windows asks a few more setup questions, such as requests for your name and network settings. Work your way through these, and you're done.

When the setup is finished, the Windows Desktop and Start menu appear. But before you do anything else, be sure to follow the instructions in the next section for installing Parallels Tools.

Important: *In fact, before you even do that, if the copy of Windows you just installed doesn't already contain Service Pack 2, apply the update to SP2.*

*If you need to eject the Windows CD in order to insert an SP2 CD, choose Start > My Computer. Click the icon for the CD/DVD Drive (**D:**) once to select it, and then choose File > Eject.*

Install Parallels Tools

When you first install Windows, you may notice a few annoying things. For example, mouse tracking will probably be slow and jerky, your options for video settings will be limited, and sound and network access may not work correctly. You can solve these and many other problems by installing Parallels Tools, a set of drivers that enables Windows XP to work better in its virtual environment. (As I noted in the Boot Camp section earlier, Parallels Tools are similar to Boot Camp's Macintosh Drivers.)

NOTE Before you install Parallels Tools, your mouse pointer must be under the control of either Mac OS X or Windows at any given time. As soon as you click anywhere within the virtual machine window, Windows "owns" your pointer, which means you can't move it outside that window (as you'll need to do to choose menu commands in Parallels). To return control of the mouse to Mac OS X, press Control-Option. Then, to hand control back to Windows, click inside the virtual machine window again.

To install Parallels Tools, follow these steps:

1. Make sure Windows XP is already running and that you're logged in. (This will be the case if you've just installed Windows XP without changing any settings or logging out.)
2. Press Control-Option to return control of the mouse to Mac OS X.
3. Choose VM > Install Parallels Tools. Click OK when the alert message appears.
4. Click once inside the virtual machine window to give control of the mouse back to Windows. When the Parallels Tools Setup Wizard appears, click Next.
5. On the Setup Type screen, with the Complete option selected, click Next.
6. Click your way through the rest of the installer, accepting all the default settings. When the installation is done, click Finish.

The virtual machine restarts and the Parallels Tools become active. From now on, you can move the mouse smoothly into and out of the virtual machine window just as though it were any other window.

TIP Before you begin installing additional Windows software and making other changes, consider backing up the disk image that holds your Windows XP virtual machine. That way, if anything goes seriously wrong with your Windows system in the future, you can return to this point—without having to go through all the tedious installation steps—simply by opening the backup disk image. To back up the disk image, make a copy of everything in `~/Library/Parallels/` in another location, preferably on a different volume.

Correct the VT-x Error on a Mac mini

On some Mac mini models, you may encounter an error message about Intel Virtualization Technology (VT-x) being disabled. I'd like to take a moment to explain what this means, why you need not worry about it, and how to fix the problem if you're worried anyway!

As you know by now, virtualization software such as Parallels Desktop does not need to emulate a different CPU in order to run Windows; it can feed most instructions straight through to (and from) the processor. However, newer Intel chips include technology called VT-x that optionally facilitates parts of the virtualization process that are ordinarily handled by software. If this feature is present on the CPU, enabled on the computer, and used by the virtualization software, the result is snappier performance in the virtual machine with less load on the CPU. So, while Parallels does not *need* VT-x, it can perform better with it than without.

VT-x is built into all the CPUs that appear in Intel Macs and is enabled correctly on most of them. However, on some Mac mini models an incorrect firmware setting disables access to VT-x. (Apple considers this a bug, but it was not fixed in Firmware Update 1.0.1 for the Mac mini, released in April 2006.) It's a tiny error: a matter of a certain variable being 0 when it should be 1. But it results in the annoying error message you see in Parallels.

This error appears to exist only on certain Core Duo Mac mini models, though no clear pattern is apparent (such as a certain range of serial numbers or manufacturing dates). Furthermore, numerous users have found that the error message comes and goes—sometimes disappearing after waking the machine from sleep, and sometimes appearing and disappearing randomly.

If you have such a machine, one valid approach is not to worry about it at all. Parallels Desktop, and Windows XP, will run acceptably without it. I've run benchmarking software on a Mac mini with VT-x enabled and disabled, and found the speed difference to be truly slight. So you could opt to select the Do Not Show This Message Again checkbox the next time you see the error message and be done with it.

On the other hand, if that small difference in speed is important to you, or if you're simply bothered by the notion that a useful capability in your processor is disabled for no apparent reason, you can change this firmware setting by performing a bit of black magic. It should enable VT-x support for good, give you a slight speed boost, and eliminate those error messages.

Warning! *The procedure I describe here is potentially dangerous. If something goes wrong in the process, it could theoretically lead to damage that would require a trip to the repair shop—and that won't be covered by Apple's warranty. Although I believe the possibility of problems is vanishingly small, I feel obligated to point out that neither Apple nor I can assume any responsibility for problems this may cause; proceed at your own risk. Having said that, I should add that I performed this procedure on my own new Mac mini, and it worked perfectly well for me.*

To enable VT-x support on your Mac mini, follow these steps:

1. Download this disk image: http://www.takecontrolbooks.com/resources/0034/rEFIt-with-vmx.dmg.

NOTE The disk image contains rEFIt (http://refit.sourceforge.net/), an open-source tool for modifying an Intel Mac's EFI, and a pair of tiny programs, **`vmx-var-set.efi`** and **`vmx-var-reset.efi`**, written by Joshua LeVasseur (http://i30www.ira.uka.de/~joshua/)—one to change this single setting, and the other to change it back.

2. Open Disk Utility (in **`/Applications/Utilities`**).
3. Choose Images > Burn, navigate to the disk image you downloaded in Step 1, and click Burn.
4. Insert a blank, recordable CD and click Burn. Disk Utility burns the CD and ejects it when it's finished.
5. Reinsert this CD in your Mac mini, and choose Restart from the Apple menu. *Immediately* hold down the Option key, and keep holding it until you see the startup manager (**Figure 23**).

Figure 23

The startup manager, as it appears on Intel Macs, enables you to choose a startup volume when you restart and hold down the Option key. In this case, click the rEFIt icon.

NOTE The volumes you see here and on the following screens may vary depending on whether you have Boot Camp installed and whether your computer has any other bootable volumes (such as external hard disks) available.

6. Click the rEFIt icon and then click the arrow icon beneath it.
7. In the rEFIt menu that appears (**Figure 24**), immediately press the Down arrow key (possibly more than once) to select Start EFI Shell. Then press Return.

Figure 24

After you choose rEFIt, you'll see a screen similar to that shown on the left here, and you'll have just 15 seconds to select the EFI Shell (as shown on the right) using the arrow keys. Do nothing in that time, and your Mac restarts from its hard disk as usual.

8. A command shell appears (similar to what you see in Terminal); wait a few seconds until the text stops flowing. Then, when the **`shell>`** prompt appears, type **`fs0:`** and press Return. (That last character is a zero.)

   Special note: *Step 8 selects your optical drive, which* usually *has the designation* ***`fs0:`****. If that doesn't work, try* ***`fs1:`*** *(and keep increasing the number at the end until it works).*

9. Type **`cd vmx`** and press Return.
10. Type **`vmx-var-set.efi`** and press Return.
11. Type **`exit`** and press Return. The rEFIt menu appears again.
12. Do *not* choose the Boot Mac OS X option! Instead, press and hold down the power button on your computer until it turns off. Then *unplug your computer*. (If you're using a MacBook or MacBook Pro, also remove the battery.)
13. Wait 10 seconds. Then plug your computer back in (and replace the battery if necessary) and turn it on.

VT-x support is now enabled. The next time you run Parallels, you should no longer see the error message.

If at any point you want to return the VT-x setting to its original, disabled state, repeat Steps 5 through 13, but in Step 10 enter **`vmx-var-reset.efi`** instead.

Work with Windows XP in a Virtual Machine

For the most part, Windows within a Parallels virtual machine just works; no special procedures are required. However, the following few tips could come in handy.

Right-clicking

If you have a Mighty Mouse or a third-party mouse or trackball with two or more buttons, the right button should work as a right click (producing a contextual menu) within Windows just as you'd expect. However, if you have a one-button Apple mouse, you can simulate a right click by holding down Control and Shift while clicking.

Special note: *Beta versions of Parallels used the shortcut Control-click (without the Shift key) for contextual menus because this is analogous to the behavior of Control-clicking in Mac OS X; however, this changed shortly before the final release, because Control-clicking (without the Shift key) normally enables you to select multiple noncontiguous items in Windows.*

Using the optical drive

A CD or DVD in your computer's optical drive cannot be used by both Windows and Mac OS X at the same time. If a disc is mounted on the Mac OS X Desktop, Windows can't see it; if it's mounted in Windows, it disappears from the Mac Desktop. Sometimes you'll find that a disc is controlled by the wrong operating system.

If a disc is mounted on the Mac Desktop and you want Windows to take over control of it, choose Devices > CD/DVD-ROM 1 > Connect.

If a disc is mounted in Windows and you want to relinquish control of it to Mac OS X, choose Devices > CD/DVD-ROM 1 > Disconnect.

Adjusting screen resolution

To change the size of your Windows XP screen (and thus the size of the window in Parallels in which it is displayed):

1. Choose Start > Control Panel.
2. If "Pick a category" is displayed, click Appearance and Themes and then click Change the Screen Resolution. If not, double-click Display and then click Settings.
3. Move the Screen Resolution slider left or right to the desired setting. Click Apply.
4. A confirmation dialog box appears. If you like the new setting, click Yes. If not, click No. If you don't see the dialog box, your screen's resolution will revert automatically to its previous setting in 15 seconds.

Independent of screen resolution, you can switch between windowed mode (the entire Windows environment is inside a window) and full-screen mode (Windows takes up your entire display, just like Mac OS X usually does). When you do this—assuming your screen resolution was previously smaller than your physical display—Parallels stretches the image to fit your display. Because that distorts the image, you may want to adjust the screen resolution (following the immediately preceding steps) to equal that of your display after switching to full-screen mode.

To switch to full-screen mode, click the Fullscreen Mode button on the right side of the Parallels window or choose View > Fullscreen.

To switch back from full-screen mode to windowed mode, press Option-Return.

Shutting down, starting up, pausing, suspending, and resuming

In Windows, as in Mac OS X, you should not turn off the computer without telling the operating system to shut down; doing so prevents Windows from properly closing files and performing certain cleanup tasks. However, in lieu of shutting down, you can choose to suspend Windows, saving its state (even if you quit Parallels Desktop) so that you can return to exactly where you were in your next session quickly—without waiting for Windows to boot. You can also (without suspending Windows or quitting Parallels) pause the virtual machine, which reduces the CPU usage of Parallels Desktop to a trickle—handy if you momentarily need all your processor's power for other tasks.

Table 1, on the next page, lists the procedures for controlling Windows in Parallels Desktop.

Table 1: Controlling Windows in Parallels Desktop	
To Do This…	**Follow These Steps…**
Shut down Windows	1. Choose Start > Turn Off Computer. 2. Click Turn Off, and wait until the Parallels Property Page View reappears. (This may take up to a minute.) After shutting down, you may quit Parallels Desktop.
Start up Windows	Click the green triangle on the right side of the Parallels Property Page View or choose VM > Power On.
Pause a virtual machine	Choose VM > Pause.
Resume a paused virtual machine	Click the green triangle or choose VM > Continue.
Suspend Windows	Click the pause button or choose VM > Suspend. When the Parallels Property Page View reappears, you can quit Parallels Desktop.
Resume Windows after suspending it	Click the green triangle or choose VM > Power On, just as you would when starting Windows from scratch.

Compacting the virtual disk

As you use Windows, the virtual disk on which it stores its files may grow, but deleting files doesn't automatically cause the image to shrink. To compact the virtual disk, follow these steps:

1. Double-click the Parallels Tools Center icon () in the notification area (the lower-right corner of the Windows portion of the window).
2. In the list on the left, select Disk Compacting Tool.
3. Make sure your virtual disk is selected in the list on the right (as it should be by default).
4. Select the Execute All Stages at Once checkbox.
5. Click Start; click Yes to confirm.
6. A progress bar appears within Windows. After it fills, the virtual machine pauses and a second progress bar appears in Parallels Desktop. A message appears when the process is complete; click OK to return to Windows.

TIP For smaller virtual disks (and more flexible compression options), download a separate tool called Parallels VM Compressor. http://www.parallels.com/en/products/compressor/

Share Files between Windows XP and Mac OS X

Although sharing files between Windows and Mac OS X under Boot Camp is sometimes challenging, under Parallels it's easy. But again, you can use more than one approach.

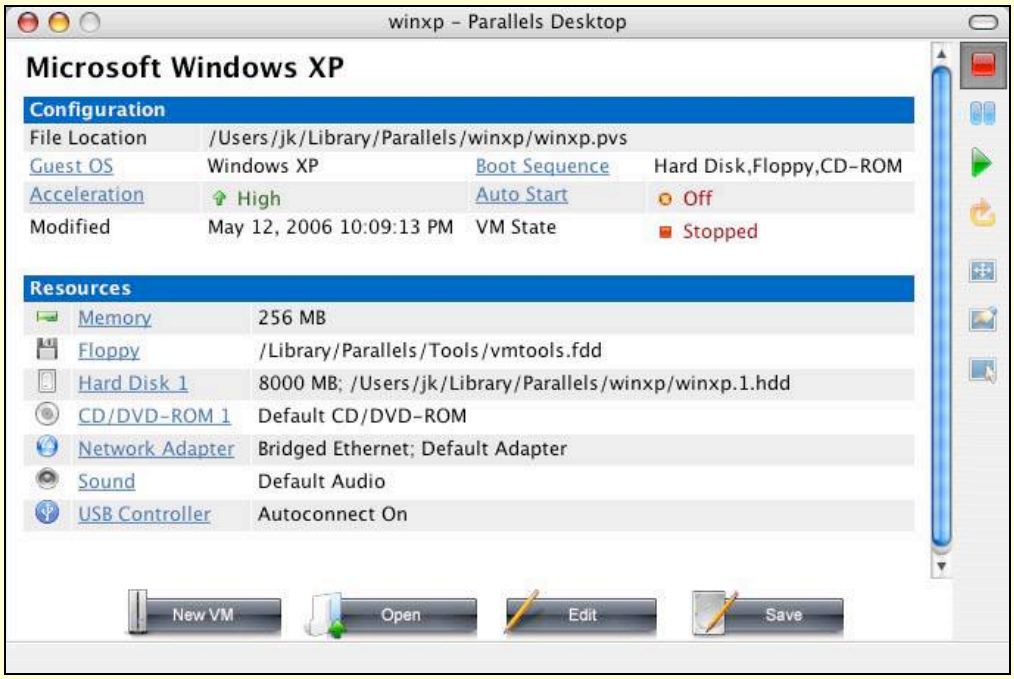
Use Parallels shared folders

When you installed Parallels Tools, you added support to Windows XP for sharing folders with Mac OS X. (The Parallels shared folder feature is a breeze to set up, but you may find it to be slow; I cover another approach, Use Windows Sharing, ahead.) Before you can use this feature, you must turn it on and configure it:

1. If the Windows XP virtual machine is currently running, choose Start > Turn Off Computer and click Turn Off.

2. In the Parallels Property Page View (**Figure 25**), click Edit.

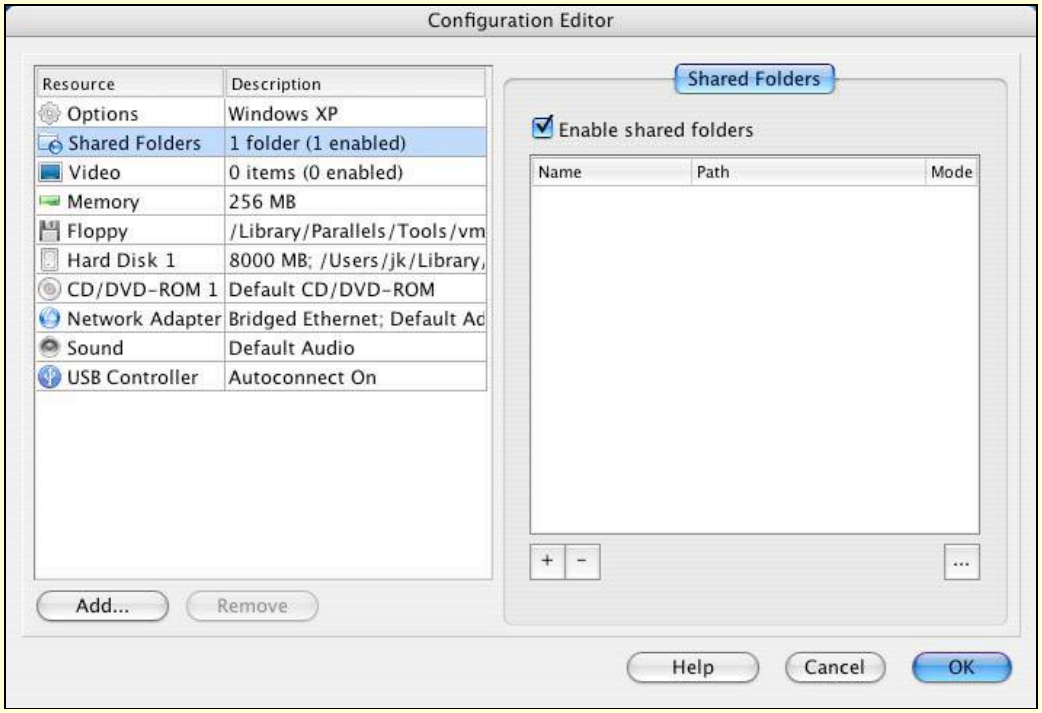
Figure 25



In this window, you can see an overview of your virtual machine's settings and change several aspects of its operation.

3. In the Configuration Editor window, select Shared Folders in the list on the left (**Figure 26**).

Figure 26

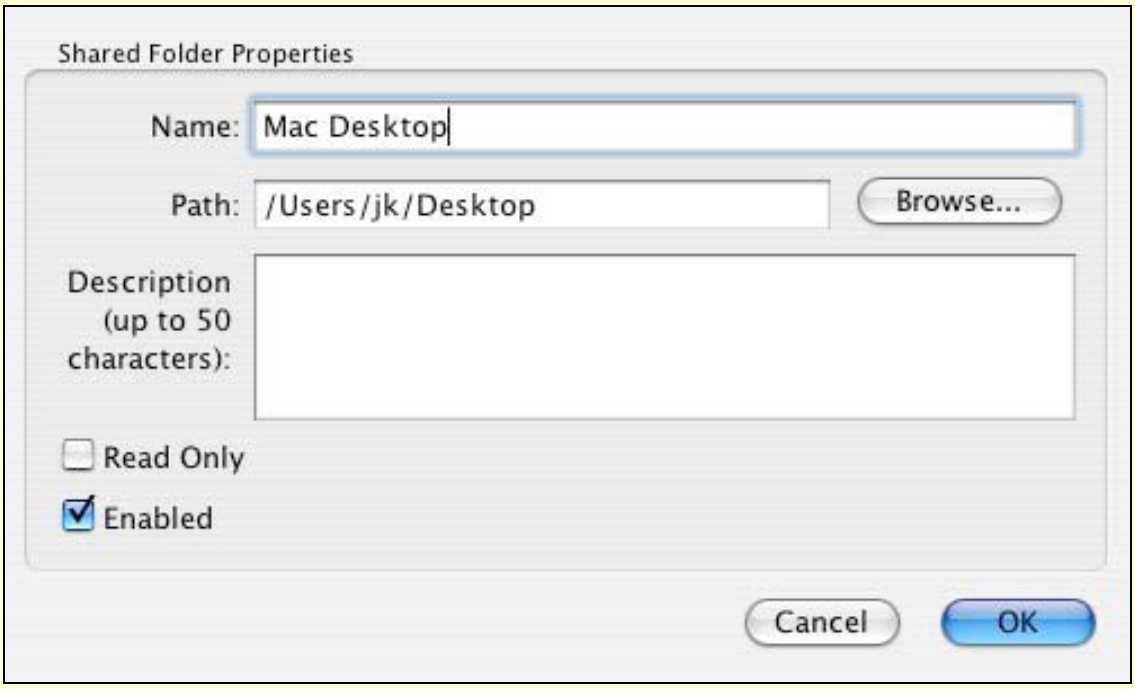


Click + to set up a new shared folder, which will be visible to both Windows and Mac OS X.

4. Make sure Enable Shared Folders is selected.

5. Click the + button. The Shared Folder Properties dialog (**Figure 27**) appears. In this window, you can designate any Mac OS X folder to be shared with Windows. In this example, I use my Desktop folder, but you can choose another folder (or create a folder exclusively for this purpose).

Figure 27



Enter the path to your shared folder here, along with the name you want it to have in Windows.

6. In the Path field, enter the path to the folder (or, if you prefer, click Browse, locate the folder, and click Choose).
7. In the Name field, enter a name for the shared folder; this is the name with which the folder will be labeled in Windows. Click OK.
8. To designate other shared folders, repeat Steps 5 through 7. When you're finished, click OK.
9. Click the green triangle to restart the virtual machine.

Your shared folders are now available. When Windows restarts, double-click the Parallels Shared Folders icon on your Windows Desktop to display a window containing all the shared folders you specified. You can drag files into and out of these folders just like any other folder. Likewise, any items you place in these folders while using Mac OS X immediately become available to Windows.

TIP With Parallels Tools installed, you can copy and paste text between Mac OS X and Windows. (Support for copying graphics is present but limited.) But if you use keyboard shortcuts, don't forget that you have to switch from *Command*-C/X/V to *Control*-C/X/V within Windows!

Use Windows Sharing

If the performance of Parallels shared folders seems too slow to you, you can try a different approach: turn on Windows Sharing under Mac OS X and then, in Windows, mount the shared volume. Even though you're using just one computer, Windows will treat your Mac as though it were another computer on the network.

To turn on Windows Sharing in Mac OS X:

1. Open the Sharing pane of System Preferences and go to the Services tab.
2. Select the Windows Sharing checkbox.
3. Click Accounts and select the checkbox for at least one account name. Click Done.
4. Make a note (preferably on paper) of the address shown in System Preferences at which Windows users can access your computer.

To mount a shared Mac volume in Windows:

1. Choose Start > My Computer.
2. Choose Tools > Map Network Drive.
3. In the Folder field, enter the address you made a note of earlier (in Step 4 under "To turn on Windows Sharing in Mac OS X" above). Click Finish.
4. Enter the user name and password for the account and click OK.

A window showing the shared volume opens. In addition, a new icon representing the volume appears in the Network Drives section of the My Computer window.

Install and Use Q

The second virtualization package for Intel Macs, Q, is currently well behind Parallels Desktop in functionality and speed. But because it's free and open-source, I'm sure some users will prefer it. In the next few pages, I want to offer a brief introduction to Q. In a future update of this ebook, after Q has matured somewhat, I may provide a more detailed exposition.

As with Parallels, using Q involves four main steps: install the Q application; set up a new virtual machine; install Windows in that virtual machine; and install the Q drivers within Windows.

Install Q

To install Q, follow these steps:

1. Download the software from http://www.kberg.ch/q/. You'll find two links at the bottom of the page, one to the latest stable build and the other to the latest unstable build. Despite the slightly scary-sounding name, choose the unstable build, which will be more recent, and will likely have both more features and better speed, than the stable build. (If it doesn't work well, you can always go back and fetch the stable build later.)
2. After the download completes, the disk image should mount automatically. If not, double-click the disk image file to mount it.
3. Drag the Q application into your Applications folder.

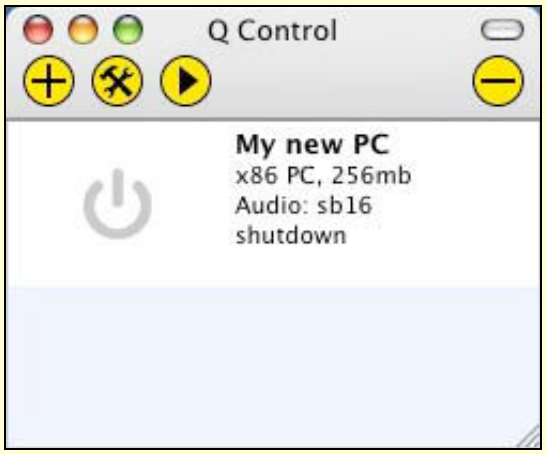
That's it; installation is complete.

Set Up a New Virtual Machine in Q

Each operating system you install requires its own virtual machine. (You can, if you wish, install several different operating systems or several instances of the same operating system.) To create a new virtual machine for Windows XP, follow these steps:

1. Launch Q (in **`/Applications`**). The Q Control window (**Figure 28**) appears.

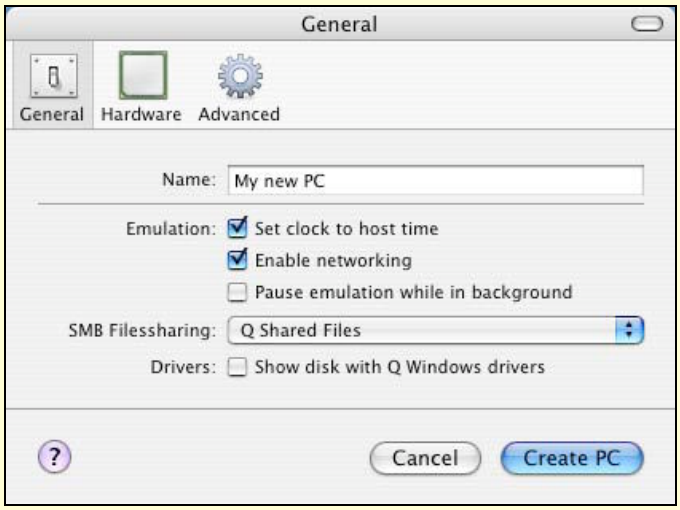
Figure 28



The Q Control window lists all the virtual machines you've created. When you launch Q for the first time, the window will be empty.

2. Click the + button to display the setup window for the new virtual machine (**Figure 29**).

Figure 29



Set basic options for a virtual machine here. One important change from the defaults: select the checkbox for the Q Windows drivers.

3. In the General pane, enter a name for the machine, such as **`Windows XP`**. Also select the Show Disk with Q Windows Drivers checkbox; leave the other options in this pane set as they are.

4. In the Hardware pane (**Figure 30**), leave all the options set at their defaults except:

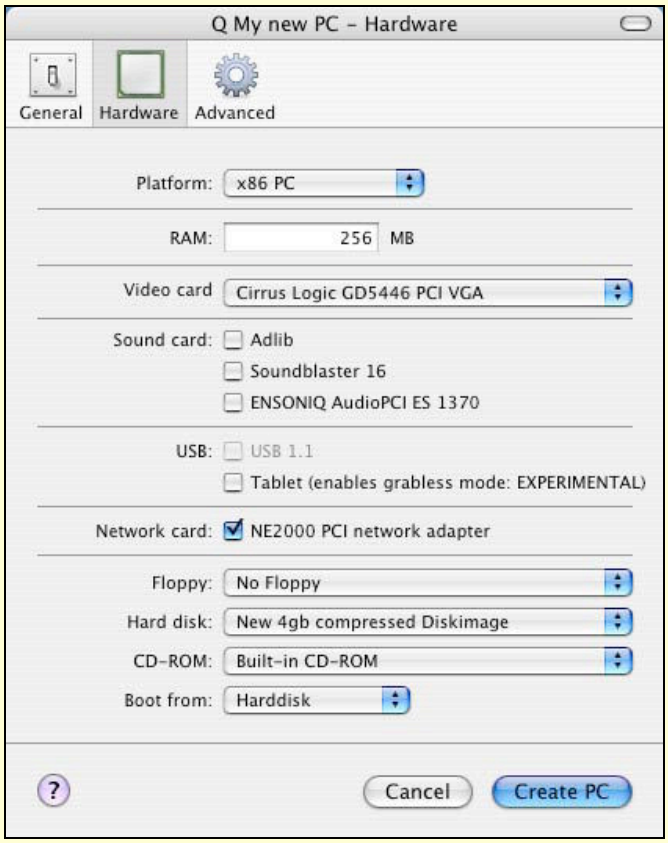
   a. For Sound Card, select Soundblaster 16.

   b. For Boot From, choose CD-ROM.

5. Click Create PC.

Q adds your new virtual machine to the Q Control list.

Figure 30



Set the hardware configuration for your virtual machine here. Most important: choose CD-ROM from the Boot From pop-up menu.

Install Windows XP in Q

To install Windows, follow these steps:

1. Insert your Windows CD into your optical drive, and wait until it mounts on the Desktop.
2. Select your new virtual machine in the Q Control list.
3. Click the triangular Start PC button on the toolbar.

Windows Setup runs. The process from here on is virtually the same as that for Parallels Desktop; refer to Install Windows XP in Parallels Desktop for instructions. But be aware that even the installation process is considerably slower than in Parallels.

Important: *When asked to choose which partition to use, be sure to choose "Unpartitioned space" and not* `C:`*, which contains the Q drivers.*

Install Q Drivers

Like Boot Camp and Parallels Desktop, Q includes its own drivers that greatly improve several features, especially video performance.

To install the Q drivers, follow these steps:

1. Choose Start > My Computer.
2. Double-click the **`C:`** drive, which should be labeled QDRIVERS.
3. Double-click the Q Driver Installer for Windows XP (which may have a name like **`Q_win_2kxp_drivers-1_0_1.exe`**).
4. Follow the prompts to install the drivers; click Finish when the installation is complete.

You're now ready to use Windows XP.

> **TIP** Because video options are so limited prior to the installation of the Q drivers, your next likely step will be to change your video settings. See Adjusting screen resolution in Q, ahead.

Work with Windows XP in a Q Virtual Machine

While running Windows, be aware of some peculiarities of the Q virtual machine.

Changing mouse control

Even after installing the Q Drivers, your mouse pointer must be under the control of either Mac OS X or Windows at any given time. As soon as you click anywhere within the virtual machine window, Windows "owns" your pointer, which means you can't move it outside that window. To return control of the mouse to Mac OS X, press Control-Option. Then, to hand control back to Windows, click inside the virtual machine window again.

Choosing a boot volume

In Q, you must explicitly decide, before starting Windows, whether to boot it from the virtual disk (which it considers a hard drive) or the CD-ROM drive. If you choose a volume that doesn't currently contain a valid Windows installation, the startup process can hang; you must then close the window without saving the PC, change the boot volume, and try again.

To change the boot volume:

1. Shut down Windows if it's running.
2. Select the virtual machine in the Q Control list and click the Edit button on the toolbar.
3. In the Hardware pane, choose the desired boot volume (Harddisk or CD-ROM) from the Boot From pop-up menu.

Adjusting screen resolution in Q

To change the size of your Windows XP screen (and thus the size of the window in Q in which it's displayed):

1. Choose Start > Control Panel.
2. If "Pick a category" is displayed, click Appearance and Themes and then click Change the Screen Resolution. If not, double-click Display and then click Settings.
3. Move the Screen Resolution slider left or right to the desired setting. Click Apply.
4. A confirmation dialog box appears. If you like the new setting, click Yes. If not, click No. If you don't see the dialog box, your screen's resolution will revert automatically to its previous setting in 15 seconds.

NOTE Even after you install the Q drivers, your video options will be fewer than with Parallels Desktop. For example, Q offers fewer screen resolution settings and no full-screen mode.

Shutting down, starting up, pausing, suspending, and resuming

In Windows, as in Mac OS X, you should not turn off the computer without telling the operating system to shut down; doing so prevents Windows from properly closing files and performing certain cleanup tasks. However, in lieu of shutting down, you can choose to suspend Windows, saving its state (even if you quit Q) so that you can return to exactly where you were in your next session quickly—without waiting for Windows to boot.

Table 2 lists the procedures for controlling Windows in Q.

Table 2: Controlling Windows in Q	
To Do This…	**Follow These Steps…**
Shut down Windows	1. Choose Start > Turn Off Computer. 2. Click Turn Off, and wait until the screen says "It is now safe to turn off your computer." 3. Close the window. An alert appears saying the Guest PC is still running; click Don't Save PC. After shutting down, you can quit Q if you wish.
Start up Windows	Select the virtual machine in the Q Control list and click the triangular Start PC button on the toolbar.
Suspend Windows	1. Press Control-Option to release mouse control to Mac OS X. 2. Click the close button of the virtual machine's window. 3. Click Save PC.
Resume Windows after suspending it	Select the virtual machine in the Q Control list and click the triangular Start PC button on the toolbar, just as when starting up Windows normally.

Warning! *The current unstable build as of the time I wrote this (0.8.0d1105) was truly unstable when it came to restoring a suspended virtual machine: Windows crashed every time. This may have been fixed by the time you read this, but be sure to save any important work before suspending Windows when running Q.*

Share files between Windows XP and Mac OS X in Q

When you run Q, it creates a new folder on your Mac OS X Desktop called Q Shared Files. To access this folder from within Windows, simply double-click the Q HD shortcut icon on your Windows Desktop. (Feel free to move this icon to another location if you prefer.) You can read and write files in this folder exactly as if it were any other Windows folder. Alternatively, you can share files using Windows Sharing as you can in Parallels; see Use Windows Sharing.

Create a Slipstream Installer Disc

I had an old, unused retail copy of Windows XP in my closet, and figured I'd finally put it to use by installing it under Boot Camp. But when I looked at the CD, I saw that it was an early release of Windows XP from 2001—before SP2 and even before SP1. Boot Camp requires a Windows CD with SP2 already on it; you can't simply install an earlier version and then apply updates later. But I didn't want to repurchase something I already had.

By searching the Web, I found numerous instructions for creating what's called a *slipstream* installer—one in which the components of SP2 (or other updates) have been merged with the original installer in such a way that the result is indistinguishable from a direct-from-Microsoft Windows XP-plus-SP2 CD. Unfortunately, to create an SP2 slipstream installer, you have to be running Windows already, and I had no Windows machines at my disposal.

My solution was to install Parallels Desktop first, install Windows XP under Parallels, and then use that Windows installation to prepare the SP2 slipstream installer disc that I could later use with Boot Camp.

Note Some Windows licenses expressly disallow installation both as a primary OS and within a virtual machine on the same computer, counterintuitive as that may sound (since it's the same hardware and you can't use both installations at once). Be sure to verify that you're operating within the limits of your license. In addition, when you try to activate Windows on the second installation on a given machine with a given Product Key (whether within Microsoft's licensing terms or not), you may encounter an error message prompting you to call Microsoft for assistance.

Whether you find yourself in my situation or simply want to save yourself time later on, should you ever have to reinstall Windows (not a bad idea!), you can easily create a slipstream CD on any Windows computer with a CD/DVD burner, or on a Mac that's already running Windows (by way of Parallels Desktop or otherwise).

Before we get to the instructions, I should mention that you can find dozens of different methods on the Web for creating slipstream installers. This is just one of many, but I like it because it's easy, flexible, and fast, and it produced good results for me.

Prepare Your Computer

As always, you must assemble certain ingredients and configure your computer properly before getting down to business. Follow these steps:

1. Boot into Windows XP. This can be a copy running on a PC, via Boot Camp, or in a Parallels Desktop or Q virtual machine. The copy of Windows you use for creating a slipstream CD does not have to include Service Pack 2.

2. Obtain a copy of Service Pack 2. You can do this in either of two ways:

   a. Download it from http://www.microsoft.com/downloads/details.aspx?FamilyId=049C9DBE-3B8E-4F30-8245-9E368D3CDB5A&displaylang=en. However, note that this is a 266 MB download; if you don't have a very high-speed Internet connection, that will take a while.

   b. Alternatively, order it on CD from Microsoft, using this page: http://www.microsoft.com/windowsxp/downloads/updates/sp2/cdorder/en_us/default.mspx. The software itself is free but Microsoft charges you for shipping and handling: this CD will set you back a whopping $1.65 (plus tax!). Microsoft claims that your CD requires 4 to 6 weeks for shipping, but my copy arrived 4 days after I ordered it.

3. Copy the contents of your (older) Windows CD onto your hard disk. To do this:

   a. Insert the Windows CD into your optical drive. A window will probably appear automatically; close it.

   b. Right-click (or Control-click) on the Desktop, choose New > Folder, and enter a name for the folder (such as **`XP_Installation`**).

   c. Choose Start > My Computer. Right-click (or Control-click) the icon for the Windows CD and choose Explore.

d. Select all the files and folders on the CD and drag them into your **`XP_Installation`** folder.

e. Leave the Windows CD in your drive for now; the installer you run in the next step may need to copy some files from it.

4. If you haven't already done so (or aren't sure), install the Microsoft .NET framework. To do this:

   a. In Internet Explorer (or the browser of your choice), go to http://www.microsoft.com/downloads/details.aspx?FamilyID=0856eacb-4362-4b0d-8edd-aab15c5e04f5&DisplayLang=en and click the Download button.

   b. Click Save when asked what you want to do with the file and select your Desktop as the destination.

   c. When the download is complete, double-click the file **`dotnetfx.exe`** on your Desktop; if a Security Warning dialog box appears, click Run.

   d. Follow the prompts to install the .NET framework. When installation is done, click Finish.

Your computer is now ready for the slipstreaming process.

Run nLite

Although you can create a slipstream installer using nothing more than the Windows command prompt, a free helper application called nLite makes the process easier. Follow these steps:

1. Download and install nLite:

   a. Download nLite from http://www.nliteos.com/download.html.

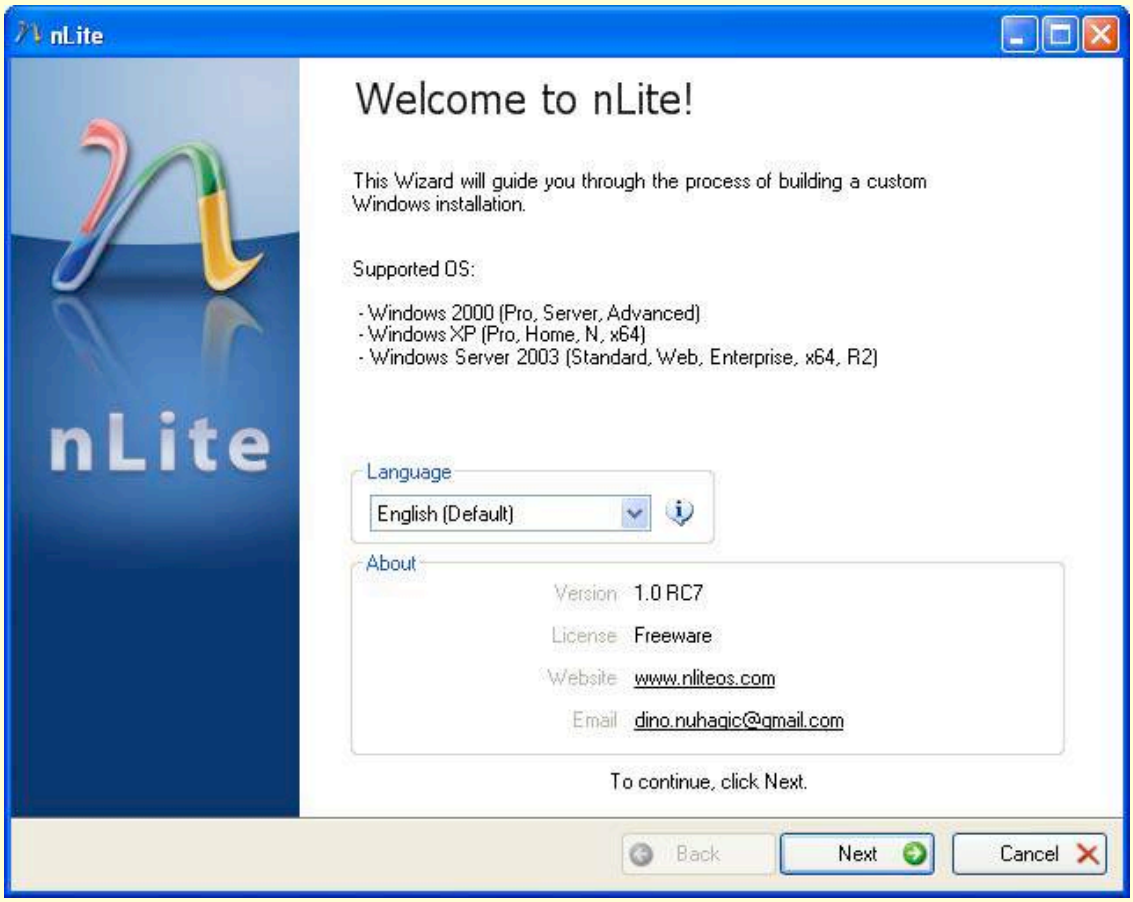
   b. Click Save when asked what you want to do with the file and select your Desktop as the destination.

   c. When the download is complete, double-click the nLite file on your Desktop (which may have a name like **`nlite1.0rc7i.exe`**); if a Security Warning dialog box appears, click Run.

d. Follow the prompts to install the nLite application. (You can accept all the default settings in the installer.) When installation is done, make sure the Launch nLite checkbox is selected and click Finish.

2. The nLite application opens (**Figure 31**). Click Next.

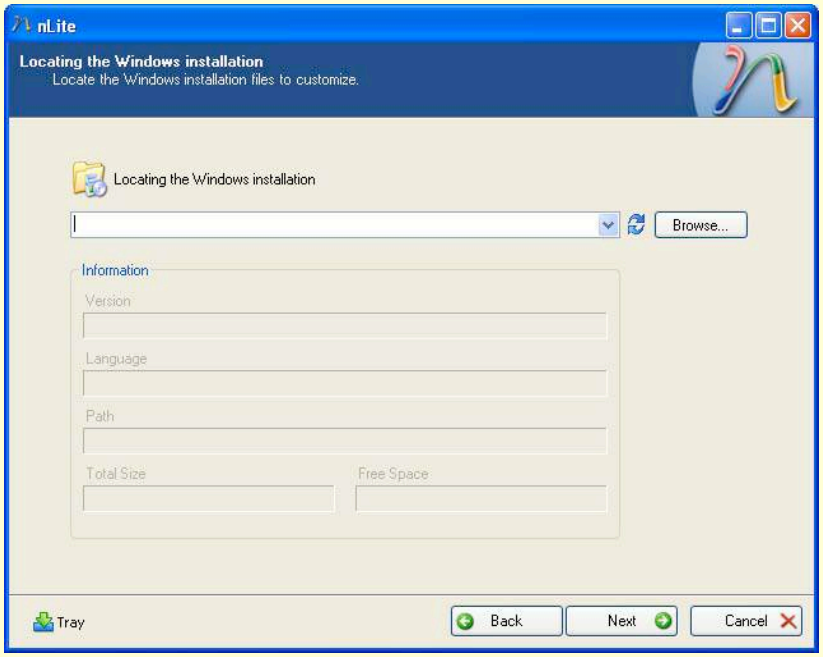
Figure 31



The opening window of nLite, a slipstream helper application.

3. In the next window (**Figure 32**), click Browse. Select the **`XP_Installation`** folder on your Desktop and click OK. Click Next.

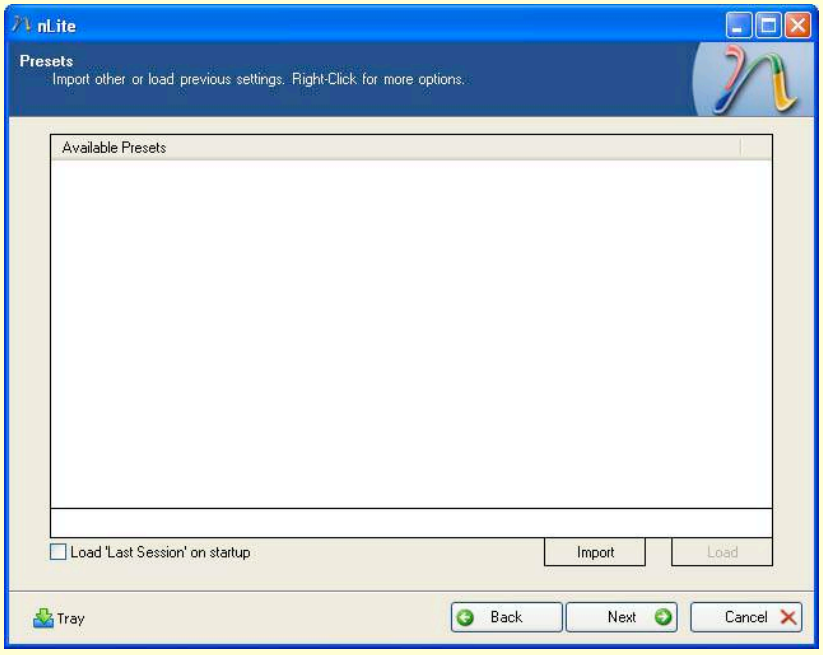
Figure 32



Click Browse and navigate to the folder into which you copied the contents of your Windows CD.

4. In the nLite Presets window (**Figure 33**), click Next.

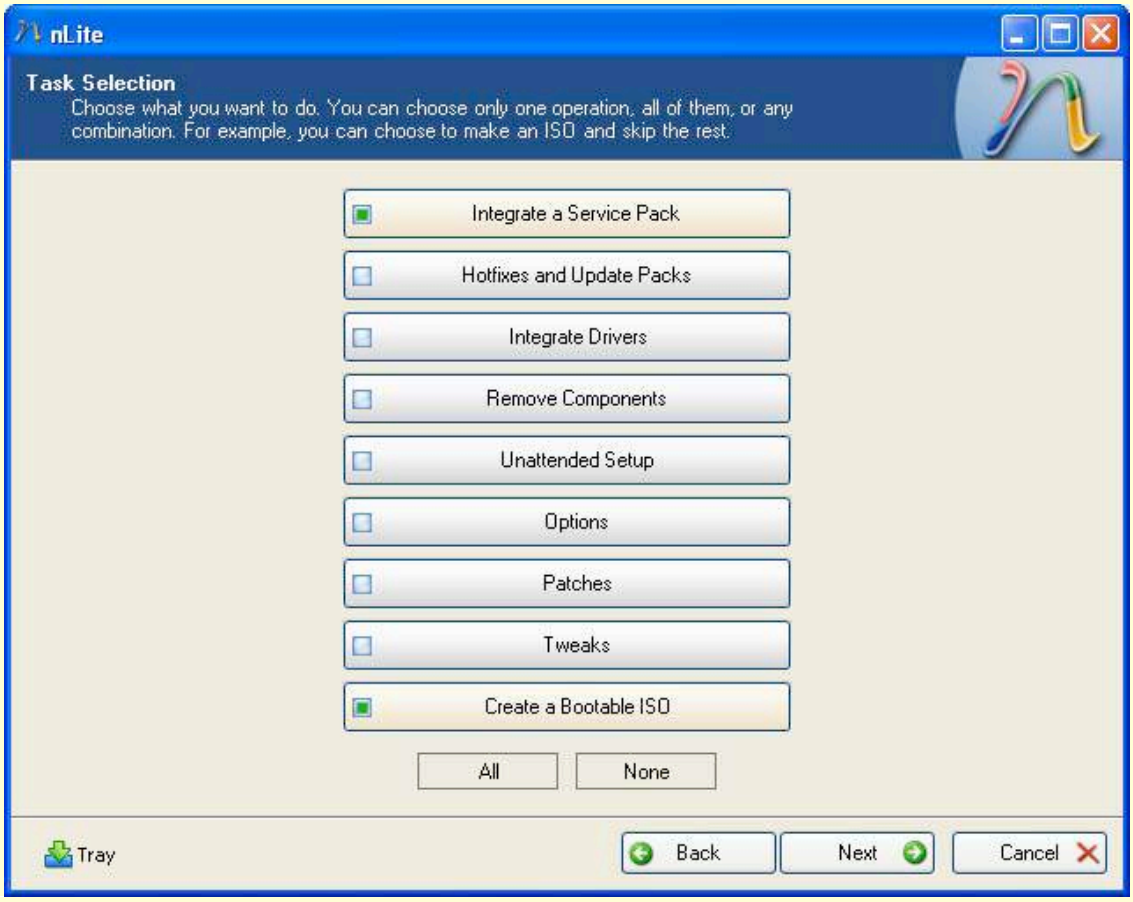
Figure 33



You can safely ignore this window.

5. In the Task Selection window (**Figure 34**), click Integrate a Service Pack and Create a Bootable ISO to select those two options. Then click Next.

Figure 34



For a basic slipstream installer, select just the top and bottom options here. The other options give you more control over your Windows installation and are more appropriate for advanced users.

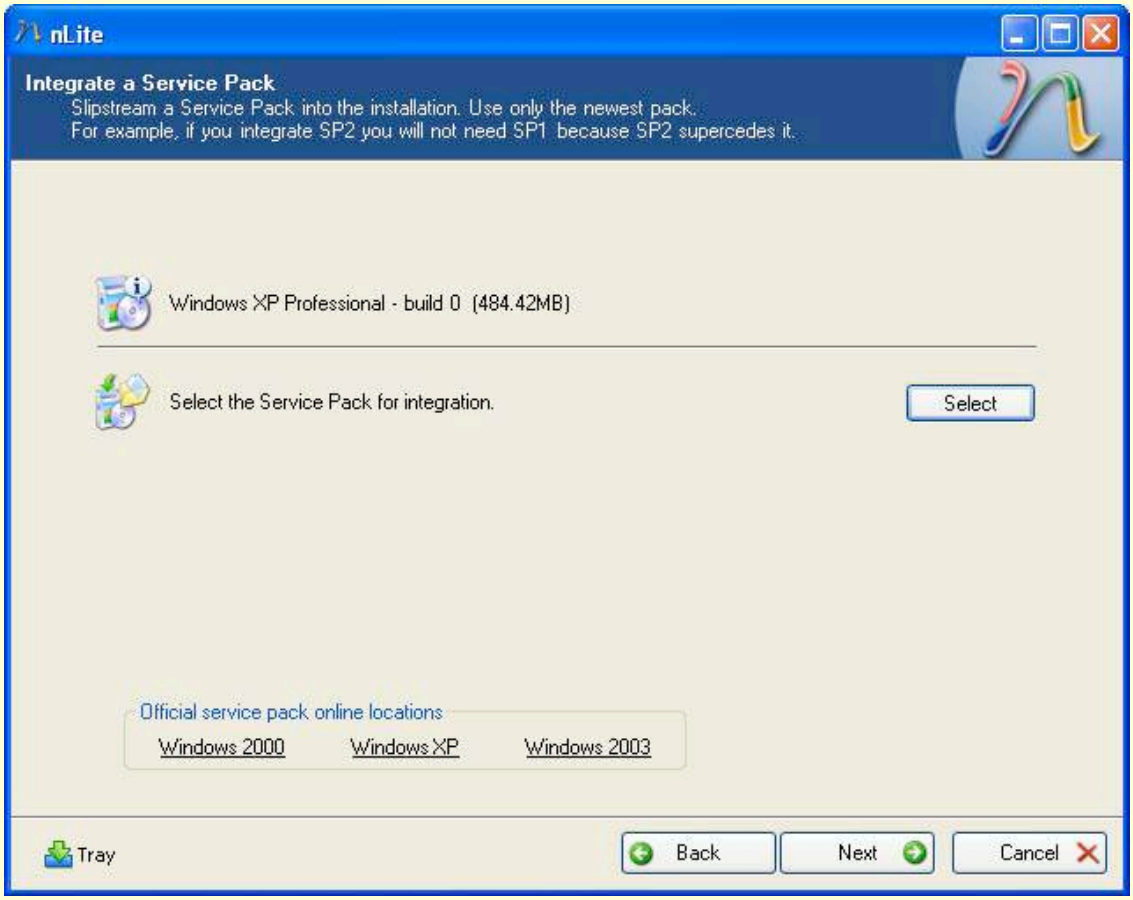
NOTE The nLite software offers a wide range of options I don't cover here. For example, it can integrate not only service packs but also other updates and patches. In addition, it can build into your installer settings such as your Product Key (to enable unattended installation) and can preconfigure a wide variety of Windows settings to save you time after the installation is finished. All these can greatly reduce the hassle of reinstalling Windows, should you ever need to do so. Consult the nLite documentation for details on these extra features.

6. In the next window (**Figure 35**), click Select. Locate your Windows XP Service Pack 2 file, in either of these ways:

   - If you downloaded SP2, navigate to the file named **`XPSP2.exe`** and select it.
   - Or, if you have SP2 on a CD, click My Computer. Right-click (or Control-click) the CD-ROM icon and choose Eject to eject your Windows CD. Insert the SP2 CD. When it appears in the window, double-click it and select the XPSP2 icon.

   Then click Open.

Figure 35



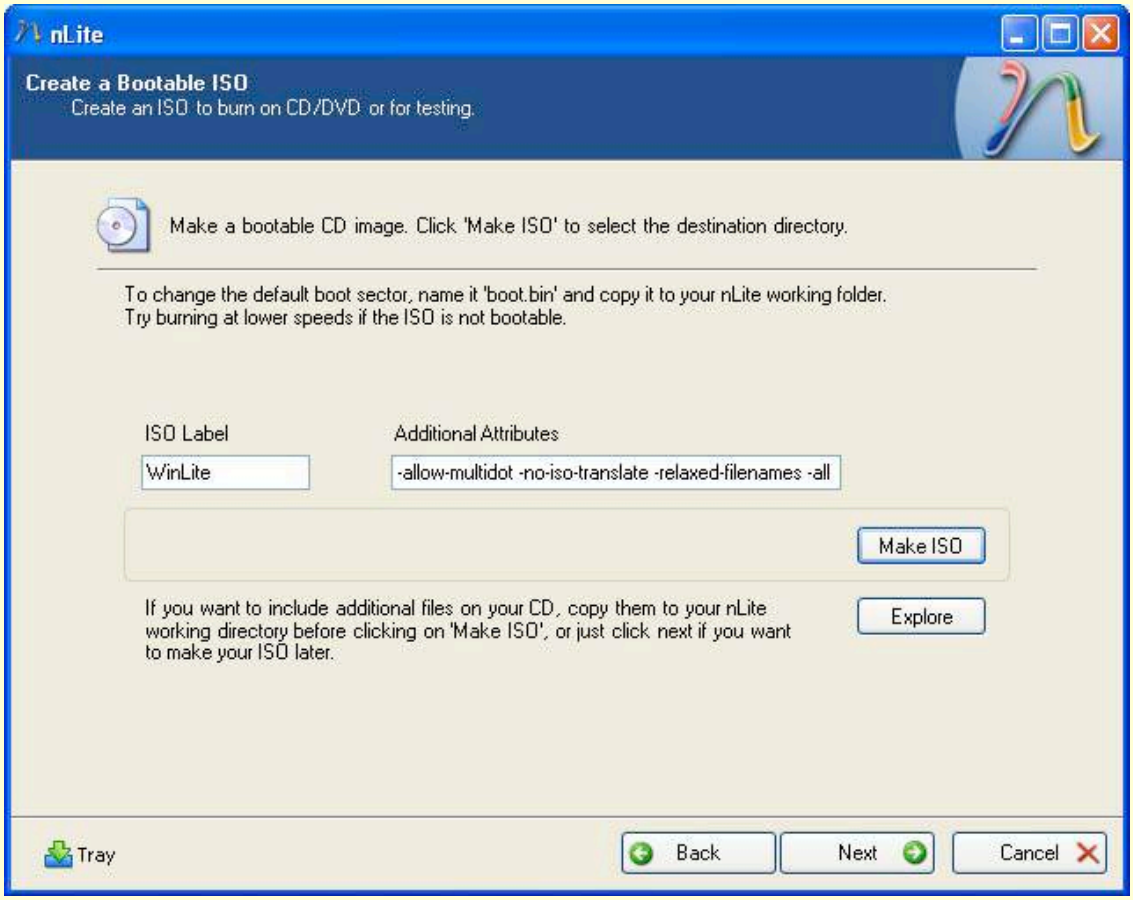
Click Select to locate the CD or downloaded file containing Service Pack 2.

7. nLite immediately begins creating the slipstream installer. When the process is finished, click OK. Then click Next.

8. Your final task in nLite is to create a disk image for the installer, from which you can later burn a CD. To do this, fill in a name for the CD (such as **`WinXP-SP2`**—or stick with the default, WinLite)

and click Make ISO (see **Figure 36**). Select a destination (your Desktop is a good idea) and click Save. When the image is complete, click Next and then Finish.

Figure 36



Enter a name for your slipstream disc image and click Make ISO.

Burn a Windows XP+SP2 CD

Last but not least, burn a CD from the disk image you created in the previous section. You can go about this in any of several ways.

If you created the image using Parallels Desktop or Q:

1. Copy or move the file into your shared folder, so that you can access it from Mac OS X. (Both Parallels Desktop and Q place a shortcut to your shared folder on the Desktop, assuming you've configured them correctly; see Share Files between Windows XP and Mac OS X or Share Files between Windows XP and Mac OS X in Q.)

2. In Mac OS X, open Disk Utility (in **`/Applications/Utilities`**).

3. Choose Images > Burn.
4. Navigate to the disk image file, select it, and click Burn.
5. Insert a blank recordable CD into your optical drive and click Burn.

Disk Utility automatically ejects the disc when it's ready; you can then quit Disk Utility.

If you created the image on a PC or using Boot Camp:

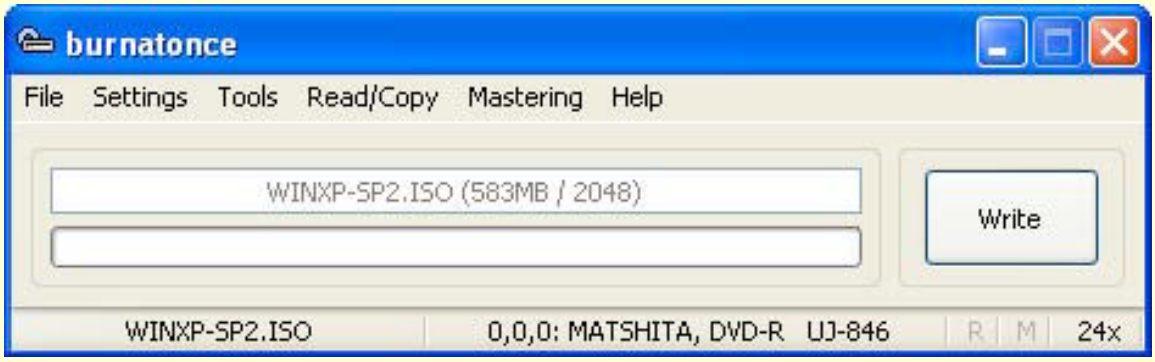
Windows includes built-in CD-burning capabilities, but unfortunately, this does not include *bootable* CDs. Therefore, you'll have to use third-party software. If you have a commercial tool such as Roxio's Easy Media Creator (http://www.roxio.com/en/products/emc/family.jhtml; editions ranging from $50 to $100) or Nero (http://ww2.nero.com/nero7/enu/Products.html; $80), you can certainly use that. However, you can also achieve acceptable results using a small program called burnatonce that's free for noncommercial use.

To burn a CD with burnatonce, follow these steps:

1. Download burnatonce from http://www.afterdawn.com/software/cdr_software/cdr_applications/burnatonce.cfm.
2. Click Save when asked what you want to do with the file, and select your Desktop as the destination.
3. When the download is complete, double-click the burnatonce file on your Desktop (which may have a name like **`bao0995.exe`**); if a Security Warning dialog box appears, click Run.
4. Follow the prompts to install the burnatonce application. (You can choose all the default settings in the installer.) When installation is done, make sure the Launch burnatonce checkbox is selected and click Finish.

5. In the burnatonce window (**Figure 37**), choose File > Load New Image. Navigate to the disk image file, select it, and click Open.

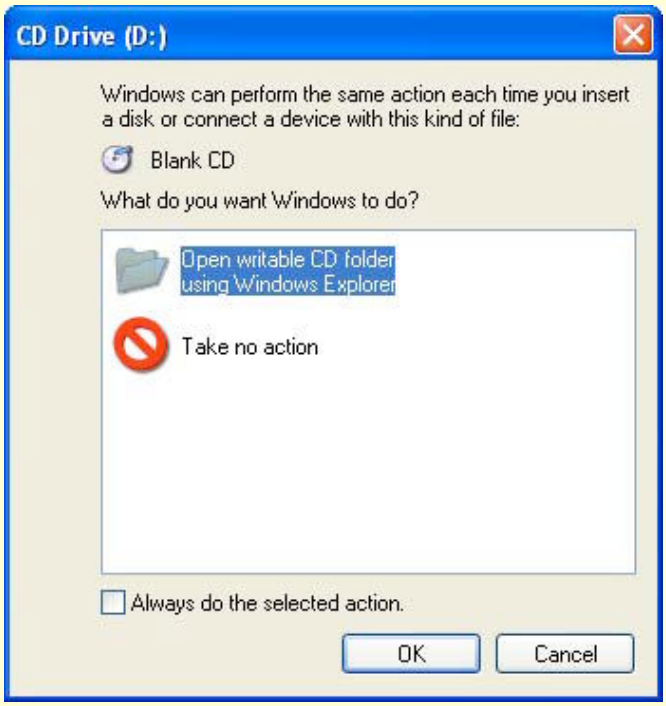
Figure 37



This simple utility enables you to burn a .iso disk image as a bootable CD.

6. Insert a blank recordable CD into your optical drive. When the window shown in **Figure 38** appears, select Take No Action and click OK.

Figure 38



If this alert appears, select Take No Action, click OK, and keep going.

7. Back in the burnatonce window, click Write. Click OK to confirm that you want to burn the CD.

When burnatonce finishes burning the CD, it ejects the disc automatically.

Protect Your Windows Setup from Malware

As a Mac user, you've probably never lost any sleep over viruses, Trojan horses, worms, spyware, adware, and all the other nasty stuff known collectively as *malware* (that is, malicious software). Such programs are few and far between on Mac OS X, but they're a gigantic problem on Windows. Now that you're running Windows on your Mac, you have to worry about malware too, especially since a program could conceivably cause damage not only to your Windows partition (or virtual disk) but also to your Mac files. You can learn more about malware in the Wikipedia: http://en.wikipedia.org/wiki/Malware.

Note Much of this section was inspired by Kevin van Haren's article "Windows Tips and Tricks for Mac Users" in TidBITS: http://db.tidbits.com/getbits.acgi?tbart=08502. The full article contains numerous other suggestions, including a list of utility software you may find handy for duplicating certain features built into Mac OS X.

Preventing attacks by malware (and repairing the damage they've caused) is a large and complex subject that could easily fill several large books. In this section, I want to outline just the basics, acquainting you with some of the most important steps you should take to protect your computer and a few good tools to help you.

Tip If you already have malware on your computer and you can't figure out how to remove it, one easy step to try is using Microsoft's Malicious Software Removal Tool, available free from http://go.microsoft.com/fwlink/?LinkId=40587. This program, which is updated monthly, does not *prevent* malware from being installed on your computer, but it can undo many types of damage.

Apply Windows Updates

Beyond Service Pack 2 are numerous smaller updates from Microsoft that fix bugs, plug security holes, and make your computer more resistant to malware. You should install these as soon as possible after installing Windows (and configure Windows to download and install new updates automatically as they appear).

Previously, the recommended way to install updates was to visit Microsoft's Windows Update site (http://update.microsoft.com/). You can still do that, but Microsoft now offers an easier way to keep your system current: Automatic Updates. To sweeten the deal even further, another new service, called Microsoft Update, extends the process to cover Microsoft software other than Windows.

Automatic Updates

During installation of Windows XP (or of Service Pack 2, if you installed it separately), you may have seen a screen like the one shown in **Figure 39**. If you selected Help Protect My PC by Turning on Automatic Updates Now, the Automatic Updates feature is already active. This means your computer connects to the Windows Update site in the background, downloads and installs any new updates as they appear, by default once a day at 3:00 A.M.

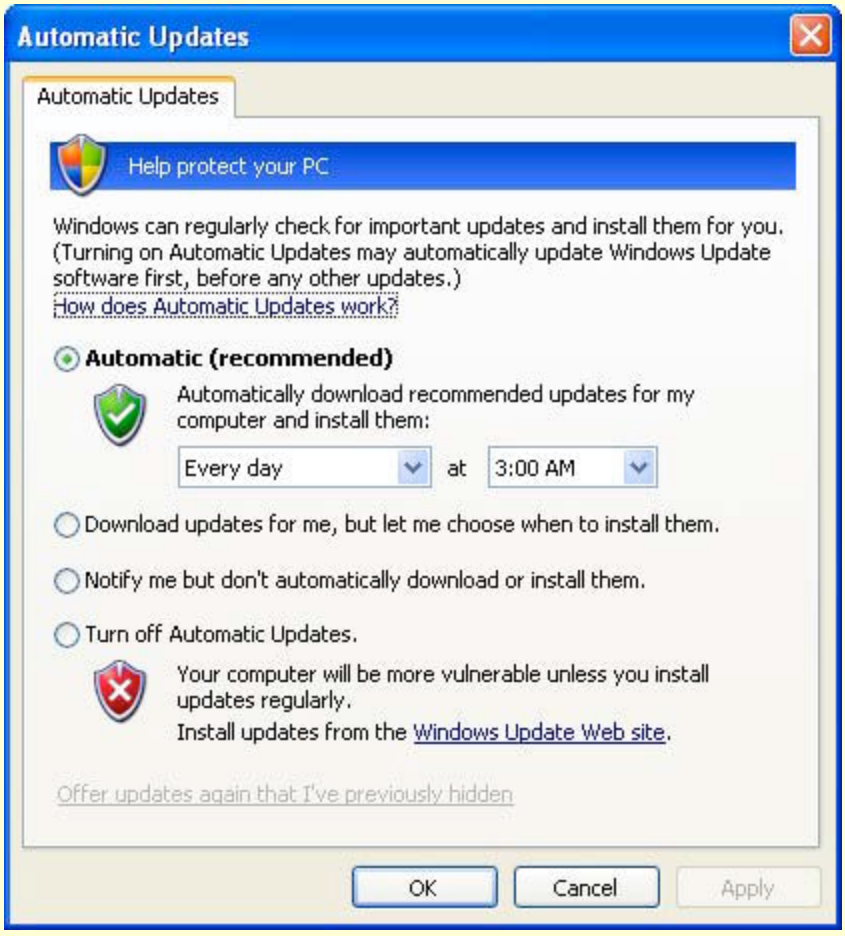
Figure 39

If you turned on Automatic Updates during the Windows (or SP2) installation, give yourself a pat on the back.

If you did not turn on Automatic Updates during installation, or if you want to change its settings (such as how often or at what time it connects), choose Start > Control Panel. If the window says "Pick a

category," click the Switch to Classic View link. Then double-click the Automatic Updates icon. In the control panel that appears (**Figure 40**), make any desired settings and click OK.

Figure 40



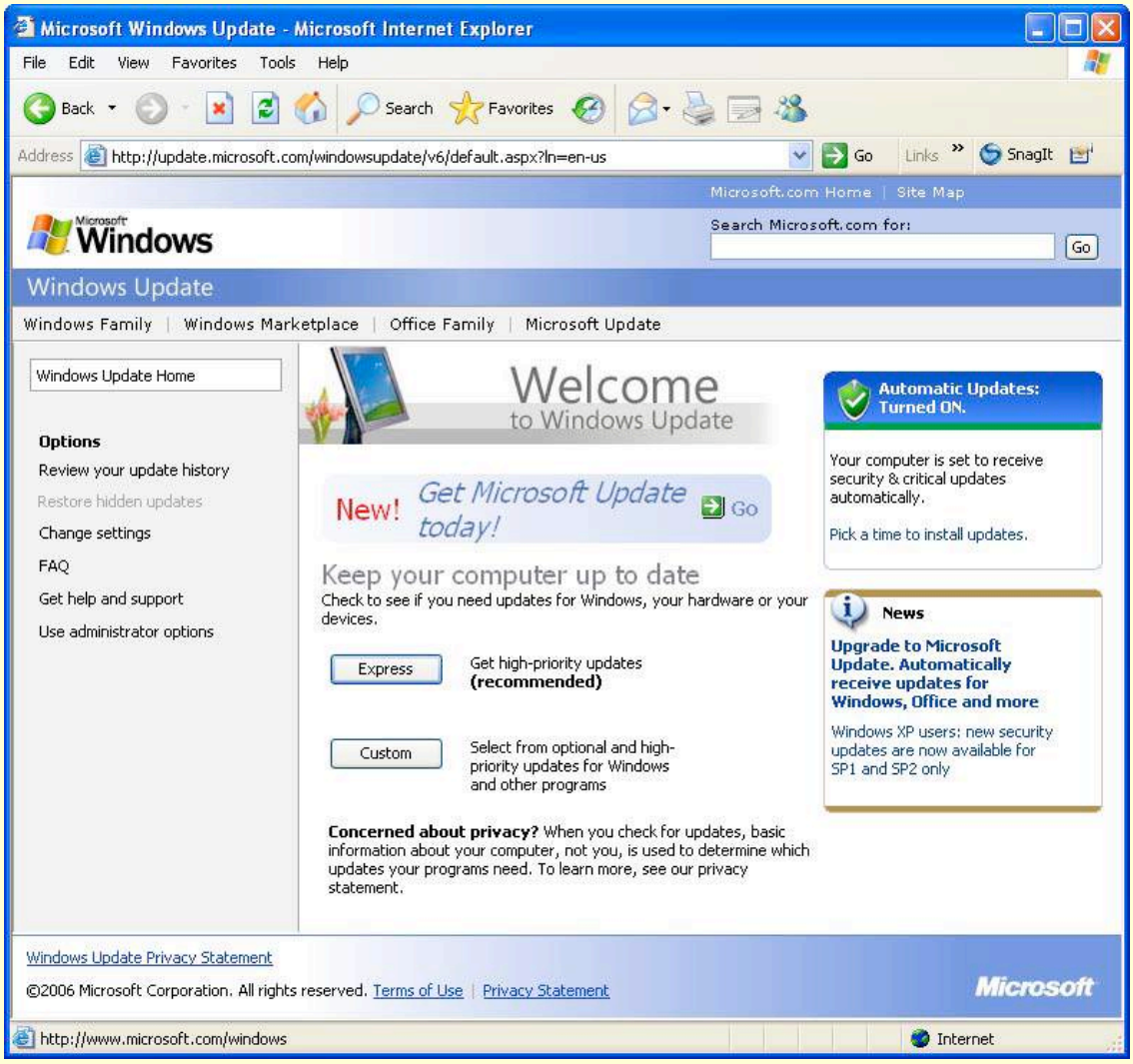
The Automatic Updates control panel lets you change the frequency and time of checking for new Windows updates.

Microsoft Update

Windows Update (along with Automatic Updates) applies only to Windows itself and the software included with it. To extend the same system so that it provides updates for other Microsoft software (notably Microsoft Office), turn on Microsoft Update. Follow these steps:

1. In Internet Explorer (*not* a third-party browser, such as Firefox), visit http://update.microsoft.com/.
2. Next to the large message "New! Get Microsoft Update today!" is a Start Now button (see **Figure 41**). Click it.

Figure 41



To turn on Microsoft Update, click Start Now—and be prepared to click it again on the next page!

3. Another page appears, with another Start Now button. Click that too.

4. Read the "Review the License Agreement" page and click Continue.

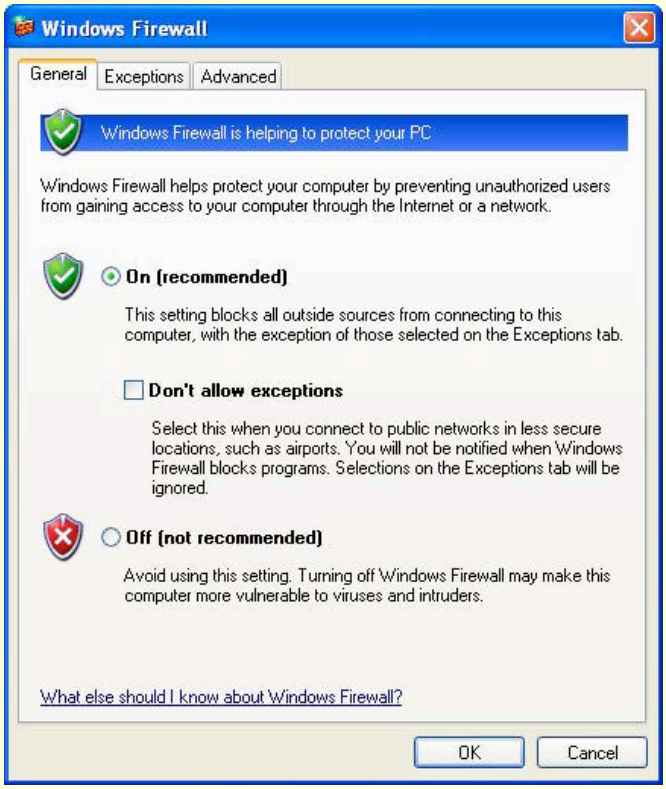
Microsoft Update is now active. Assuming you also activated Automatic Updates, you need do nothing else; the updates will be downloaded according to the schedule you set in the Automatic Updates control panel. To check for updates immediately, click the Check for Updates button on the confirmation Web page. Or, to check for updates manually at any time, choose Start > All Programs > Microsoft Update.

Use a Firewall

In computing terms, a firewall is a program that monitors all the network traffic to and from your computer and filters or blocks communication based on a set of rules. For example, a firewall may allow you to view Web pages and send email but prevent other computers from accessing your files, installing new software, or hijacking your computer to act as a spam-sending robot. Because a great deal of malware gets onto Windows computers because some potentially harmful avenue of network access was left open, a firewall is an important first line of defense.

Windows XP includes its own firewall, which is activated by default in Service Pack 2. This basic firewall should be adequate for most home users—and it provides much better protection than nothing. To confirm that your Windows Firewall is on, choose Start > Control Panel. Make sure you're in Classic view (if not, click the Switch to Classic View link), and then double-click the Windows Firewall icon. Make sure On is selected (**Figure 42**).

Figure 42



"On" is the only right setting for the built-in Windows Firewall, unless you've purchased a more advanced firewall utility as a replacement.

Third-party firewalls offer a number of additional features, so if your networking needs are more advanced, try one of these firewalls:

- Zone Alarm or Zone Alarm Pro
  http://www.zonelabs.com/ (Zone Alarm, free; Pro version, $50)
- Kerio Personal Firewall
  http://www.sunbelt-software.com/Kerio.cfm ($20)
- Lavasoft Personal Firewall
  http://www.lavasoft.de/ ($30)

TIP One particularly useful feature of Zone Alarm Pro is that it protects you against software that surreptitiously watches and records your keystrokes (to learn your passwords or bank account numbers, for example).

Install Anti-Virus Software

Every Windows computer—and that includes your Mac, now that it's running Windows—needs anti-virus software. No exceptions; no ifs, ands, or buts. Windows viruses are so numerous, virulent, and nasty that you'd be foolish not to avoid them if humanly possible. In fact, if you're running Windows XP with SP2, you'll see frequent reminders pop up on your screen if you haven't yet installed anti-virus software. Microsoft (rightly) wants you to take this matter seriously.

Numerous anti-virus programs are available, including:

- The best known, Symantec's Norton AntiVirus and McAfee's VirusScan. I've used both of these products, and although they are effective, they're also frequently intrusive and can in some cases significantly reduce your computer's performance.
  http://www.symantecstore.com/dr/sat1/ec_dynamic.main?sp=23&pn=3&sid=49997 ($40)
  http://us.mcafee.com/root/package.asp?pkgid=100&cid=16269 ($40 for a one-year subscription)
- AVG from Grisoft
  http://free.grisoft.com/doc/1 (free for home use, otherwise $39 for a two-year subscription)

- avast! antivirus
  http://www.avast.com/ (free for home use, otherwise $40 for a one-year subscription)
- Clam AntiVirus
  http://www.clamav.net/ (open-source, free, and also available for Mac OS X)

Of these, I'd personally lean toward AVG, but regardless of which package you choose, download and install some sort of anti-virus software *right now*.

Remove and Block Spyware and Adware

Technically a different category of software than viruses (and their cousins, Trojan horses and worms), spyware (or adware) runs in the background and monitors what you do, including which Web sites you visit. Usually this is for the purpose of displaying targeted ads (even when you don't have a Web browser open), though more devious and malign uses are also possible—such as stealing your passwords and other sensitive data.

The two most popular anti-spyware/adware applications at the moment are these:

- Ad-Aware SE
  http://www.lavasoft.de/ (Personal version, free; Plus version, $27; Pro version, $40)
- Spybot Search & Destroy
  http://www.safer-networking.org/ (free)

Microsoft is also getting into the act. Their new Windows Defender application, currently in beta testing, looks promising. http://www.microsoft.com/downloads/details.aspx?FamilyID=435bfce7-da2b-4a6a-afa4-f7f14e605a0d&DisplayLang=en (free)

Get a Better Browser

Microsoft Internet Explorer is notoriously susceptible to malware. Of the many alternative browsers, Firefox has the best reputation for robustness and resistance to everything from viruses to pop-up windows. You can download it from http://www.mozilla.com/firefox/. Other good options include Opera (http://www.opera.com/) and Mozilla (http://www.mozilla.org/download.html).

Learn More

For more information about running Windows (on a Mac or otherwise), consult these resources.

Ebooks:

Boot Camp Public Beta First Look by Ben Long
(Peachpit; 54 pages; $7)
http://www.peachpit.com/title/0321473779
This ebook includes some information on Windows configuration and usage that goes beyond what I describe here, but it provides only a cursory overview of Parallels.

Running Boot Camp by Chuck Toporek
(O'Reilly; 32 pages; $8)
http://www.oreilly.com/catalog/bootcamp/
This ebook focuses solely on Boot Camp, with the bulk of it covering the details of applying firmware updates and running the installer.

Printed books:

Windows XP Home Edition: The Missing Manual by David Pogue (O'Reilly)
http://www.amazon.com/gp/product/0596002602/

Windows XP Pro: The Missing Manual by David Pogue, Craig Zacker, and L.J. Zacker (O'Reilly)
http://www.amazon.com/gp/product/0596008988/

Windows XP for Starters: The Missing Manual by David Pogue (O'Reilly)
http://www.amazon.com/gp/product/0596101554/

Windows XP for Dummies, 2nd Edition by Andy Rathbone (For Dummies)
http://www.amazon.com/gp/product/0764573268/

Appendix A: Windows on a PowerPC Mac

Even if you have an older Mac with a PowerPC processor, you can still run Windows, albeit slowly. I'm aware of three software packages that support running Windows XP as a virtual machine under Mac OS X 10.4 on a PowerPC Mac. The problem is that the software still has to translate instructions so that they can be understood by a different processor, and all that translation takes time. Even with a top-of-the-line PowerPC Mac and the most highly optimized virtualization software, the performance of Windows will be less than stellar. If you happen to have a slower Mac and a less capable software package, performance can be downright abysmal.

That said, if you need to use Windows only occasionally, and if you don't plan to run processor-intensive tasks (such as games and video editing software), you may find one of these solutions perfectly acceptable.

- **Virtual PC for Mac:** This is the best-known and most reliable emulation software for running Windows on a PowerPC Mac. http://www.microsoft.com/mac/products/virtualpc/virtualpc.aspx ($249)
- **GuestPC:** Regarded by some as superior to Virtual PC and by others as unusably slow, GuestPC has fewer features, but also less overhead—not to mention a lower price. Unlike Virtual PC, you can't get it bundled with Windows, though; you must buy Windows separately. http://www.lismoresystems.com/en/ ($70)
- **Q:** In the Intel version of Q, Windows runs slowly; in the PowerPC version, it walks. Well, saunters. http://www.kberg.ch/q/ (free)

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In contrast to traditional print books, Take Control ebooks offer clickable links, full-text searching, and free minor updates. We hope you find them both useful and enjoyable to read.

About the Author

Joe Kissell is Senior Editor of TidBITS and the author of numerous print and electronic books about Macintosh software, including *Take Control of Upgrading to Tiger, Take Control o Mac OS X Backups,* and *Take Control of Maintaining Your Mac*. He's also a frequent contributor to *Macworld* magazine. Joe has worked in the Mac software industry for over 10 years, including positions managing software development for Nisus Software and Kensington Technology Group.

Joe holds the honorary title "Curator of Interesting Things" at alt concepts, an Internet publishing and consulting company. He invites you to read his popular Interesting Thing of the Day column at http://itotd.com/.

When not writing computer books or articles about interesting things, Joe likes to travel, cook, practice t'ai chi, and imitate the "ba-deep" sounds his TiVo makes. He lives in San Francisco with his wife, Morgen Jahnke. To contact Joe about this ebook, send him email at jwk@mac.com and be sure to include the words **`Take Control of Running Windows on a Mac`** in the subject of your message. But *please* don't ask him to make sense of Windows!

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Thanks to Adam and Tonya Engst for recommending (and facilitating) this project under an unusually rapid schedule, to Caroline for her usual excellent and speedy editing, to Glenn Fleishman for expert technical advice, and to Kevin van Haren for helpful information in *TidBITS*.

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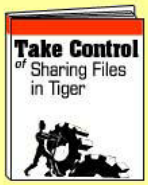

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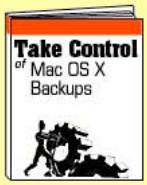

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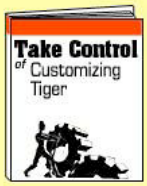

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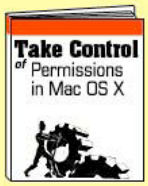

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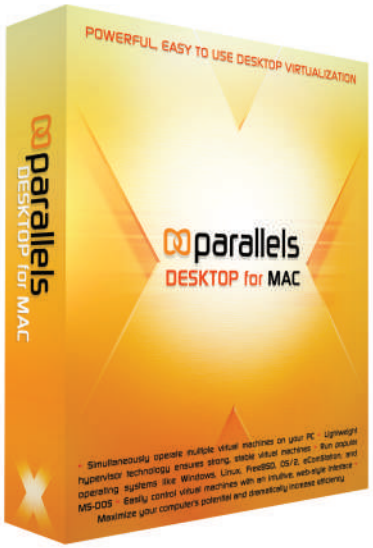

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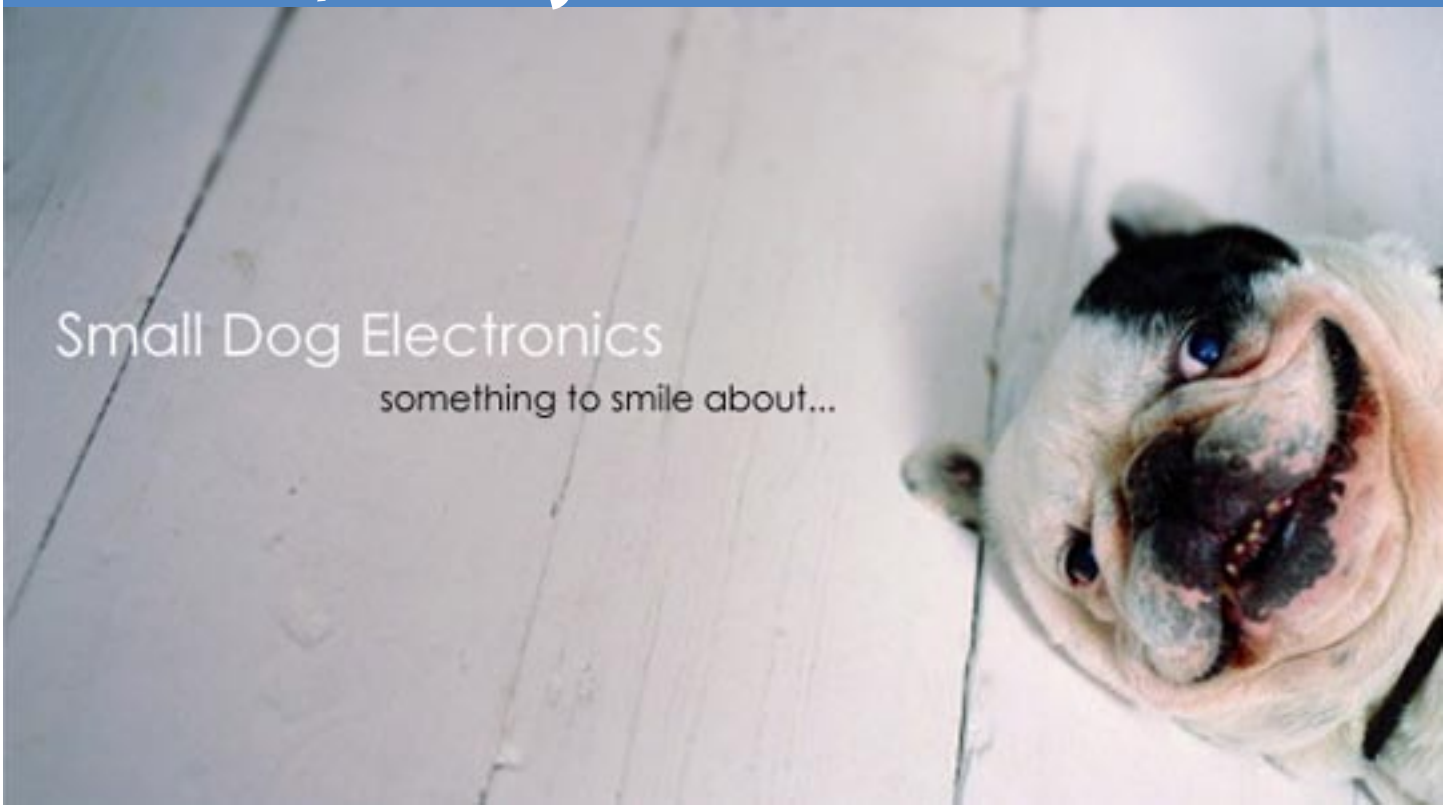

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