Windows® 7 Inside Out

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Chapter 2

Installing and Configuring Windows 7

Before You Start … Setting Up Windows 7
Upgrading from Another Windows 7 Edition
Installing and Updating Drivers
Activating and Validating Windows
Transferring Files and Settings from Another Computer
Tweaking and Tuning Your Windows Installation

Some Windows users never have to deal with the Windows setup program. If you buy a new computer with Windows 7 already installed and set up an effective backup routine, you might be able to use it forever without having to do anything more than minor maintenance or, in the worst case, a system recovery.

For upgraders, hobbyists, and inveterate tinkerers, however, the Windows 7 setup program is inescapable. Knowing the arcane secrets of upgrades, clean installations, and activation can spell the difference between a smooth-running system and a box of troubles. If you're upgrading from Windows Vista, many of the skills you've learned will transfer directly. If you're moving to Windows 7 from Windows XP, however, prepare to unlearn nearly everything you knew about setup. The image-based installation process in Windows 7 (fundamentally the same as its Windows Vista counterpart) is faster and much more reliable than its Windows XP equivalent, especially when it comes to upgrades.

In this chapter, we'll explain the subtleties and intricacies of the Windows setup program, explore the workings of the Windows Easy Transfer utility, and show you how to set up a computer with multiple versions of Windows.

What's in Your Edition?

All the tools and techniques we discuss in this chapter are available in all editions of Windows 7.

Before You Start…

Programs originally written for earlier versions of Windows (including Windows XP and Windows Vista) might not run properly under Windows 7. Likewise, some older hardware devices require drivers that have never been updated for use with Windows 7. The worst possible time to find out about either type of compatibility problem is right after you complete a fresh installation of Windows 7, when you try to use a favorite program or device.

To spare yourself unnecessary headaches, if the computer on which you plan to install Windows 7 is currently running Windows XP (with Service Pack 2 or later) or any edition of

Windows Vista that you are planning to upgrade, download and run the free Windows 7 Upgrade Advisor first. This tool, available from www.microsoft.com/windows/windows-7/upgrade-advisor.aspx, scans installed programs and devices and produces a report identifying any potential issues you're likely to confront as part of an upgrade.

The purpose of the Upgrade Advisor (which was available only in a pre-release version at the time we wrote this) is to identify hardware and software issues that might interfere with your ability to install Windows 7 or programs that might not run properly after the upgrade is complete. Figure 2-1 shows a typical Upgrade Advisor report. Scroll through the entire list to identify any urgent warnings or compatibility issues that require your immediate attention. If this tool identifies any potential problems with drivers or installed software, we recommend that you resolve those issues before continuing.

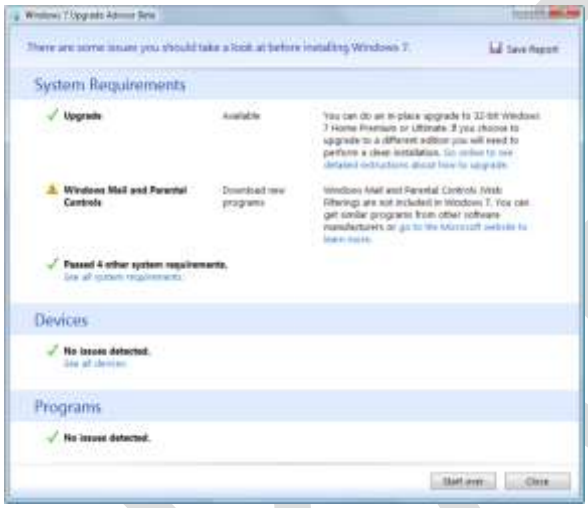

Figure 2-1 Read this upgrade report carefully before continuing with setup. In some cases, you might need to uninstall programs or find new drivers before going any further.

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Use dynamic updates

When you upgrade over an existing Windows version, the setup program offers to check for dynamic updates. If you have an active internet connection, be sure to take advantage of this option. Dynamic updates can include service packs, updated drivers for hardware detected on your system, and upgrade packs for programs you're currently running. Rolling these updates into Windows setup increases the likelihood that your installed applications and devices will work with Windows 7 and ensures that you don't have to install a slew of updates immediately after you run Windows 7 for the first time.

Know Your Hardware

Microsoft has published minimum hardware requirements for the retail editions of Windows 7 (Home Premium, Professional, and Ultimate). The specifics are listed in Table 2-1. Note that RAM and disk space requirements are slightly higher for 64-bit versions of Windows 7.

Table 2-1 Windows 7 Hardware Requirements

Component	Minimum System Requirement
Processor (CPU)	1-GHz or faster, 32-bit (x86) or 64-bit (x64) processor
Memory	1 GB RAM (32-bit) 2 GB RAM (64-bit)
Graphics processor	Support for DirectX 9 graphics with WDDM 1.1 driver
Hard disk	16 GB available disk space (32-bit) 20 GB available disk space (64-bit)

A DVD or other optical storage device is optional but useful for many tasks. For most everyday tasks you'll also need a mouse or other pointing device, a keyboard, audio playback capabilities, and internet access. In addition, certain Windows 7 features require additional hardware, such as a television tuner card (for viewing and recording television in Media Center).

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Find the hardware bottlenecks

Defining an acceptable level of performance is strictly a matter of personal preference. Some tasks, such as rendering 3D graphics or encoding video files, demand a lot from the CPU and the graphics processing unit and will benefit greatly from a more muscular processor and display adapter. For most everyday activities, including web browsing, sending and receiving e-mail, and creating standard business documents, the speed of the CPU is less critical. A fast hard disk with ample free space and at least 1 GB of memory should have no trouble keeping multiple applications running smoothly. If you use large, memory-intensive programs such as Adobe Photoshop, 2 GB of RAM should be considered a bare minimum.

Note

If you intend to install a 64-bit version of Windows 7, you'll need to confirm that digitally signed drivers are available for all devices you intend to install. This compatibility bar is far more stringent than with 32-bit versions, where you can choose to install drivers that have not been digitally signed by the Windows Hardware Quality Labs. In 64-bit versions of Windows 7, those drivers will not load.

Avoiding Software Compatibility Problems

When upgrading, be especially vigilant with utility software that works at the system level. If you use a system utility that was originally written for a previous Windows version, it's prudent to assume that it will require an upgrade to work properly with Windows 7. Most applications that are certified to be compatible with Windows Vista are also compatible

with Windows 7, but that is not universally true. For essential programs, it's important that you verify compatibility first.

Which classes of software are most likely to cause problems with an upgrade or a clean installation of Windows 7?

- Antivirus and antispyware software
- Software firewalls and other security programs
- CD- and DVD-burning programs
- Disk partitioning utilities and other low-level system maintenance programs

As a precaution when upgrading, you should consider disabling or uninstalling antivirus software and other system utilities that might interfere with setup. After setup is complete, reinstall or re-enable the programs and then test to ensure that they're working properly.

If the Upgrade Advisor identifies any programs as incompatible with Windows 7, we strongly recommend that you uninstall those programs before continuing with the upgrade.

Backing Up Data and Settings

If you're planning an upgrade, don't underestimate Murphy's Law. Use a reliable backup program or Windows Easy Transfer (described in "Transferring Files and Settings from Another Computer" on page 2xx) to make a safe copy of important data files before continuing with the upgrade.

If you own a software utility that can create an image copy of your existing system volume, this is an excellent strategy. Some hard disk upgrade packages sold at retail outlets include this sort of tool; Norton Ghost (www.symantec.com/norton/ghost) and Acronis True Image (www.acronis.com/) are highly regarded examples of third-party imaging tools. A disk image stored on an external hard disk is excellent protection against data disasters.

Setting Up Windows 7

As we mentioned briefly at the beginning of this chapter, the setup program in Windows 7 is based on the architecture introduced with Windows Vista and is unlike its Windows XP predecessor. The re-engineered process is specifically designed to go very quickly, with an absolute minimum of attention required from you. In this section, we'll explain the ins and outs of the most common scenarios you'll confront when installing or upgrading Windows 7 on a single PC. We assume that you have a bootable DVD containing a full copy of Windows 7, suitable for use in a clean installation or upgrade.

Note

Windows 7 is sold in a variety of packages, and not all are covered in the scenarios we discuss here. For a discussion of the different types of licenses and installation media available to you, see "Activating and Validating Windows 7" on page 2xx.

As part of the setup process, you need to make a series of relatively simple but important decisions:

- Which Windows 7 edition do you want to install? This will normally be the version you purchased; however, retail copies of the Windows 7 DVD contain program code for all three Windows editions available through the retail channel—Home Premium, Professional, and Ultimate—as well as the Home Basic and Starter editions, which are not intended for installation by end users. As we explain later in this section, you can install and run any of these editions for up to 30 days without entering a product key or activating your copy of Windows 7.
- Do you want to perform a clean installation or an upgrade? A clean installation starts from scratch; you need to reinstall your programs and re-create or transfer settings from another system. An upgrade retains installed programs and settings, at the risk of some compatibility issues.
- Do you need to adjust the layout of the system disk? The Windows 7 installation program includes disk management tools that you can use to create, delete, format, and extend (but not shrink) partitions on hard disks installed in your computer. Knowing how these tools work can save you a significant amount of time when setting up Windows.
- Do you want to install Windows 7 alongside another operating system? If you want to set up a dual-boot (or multiboot) system, you'll need to understand how different startup files work so that you can manage your startup options effectively. Understanding these details is especially important if you plan to use Windows 7 and Windows XP in a dual-boot configuration.

If the system on which you plan to install Windows 7 is already running Windows XP, Windows Vista, or Windows 7, you can start the setup program from within Windows. As an alternative, you can start the system from the installation media. Depending on which option you choose, you will notice some important differences.

If you run setup from within Windows:

- You can upgrade Windows Vista (SP1 or later).
- You can reinstall Windows 7. (You can also use this option to upgrade from one edition of Windows 7 to a more advanced edition; however, the Windows Anytime Upgrade option, described later in this chapter, is far preferable.)
- You cannot run the 64-bit setup program on a PC running a 32-bit version of Windows, or vice-versa.
- You can run the Windows 7 Upgrade Advisor from an option on the startup screen.
- You cannot upgrade Windows XP.
- You can install Windows 7 on the same volume as an existing Windows version. (You'll find step-by-step instructions in the following section.)

- You cannot make any changes to the layout of a disk; you must use existing partitions, and the setup program will not recognize or use unallocated space on an attached hard drive.

If you boot from the Windows 7 DVD:

- You cannot upgrade an existing Windows version. Your only option is a custom install.
- You can delete existing partitions, create new partitions, extend an existing disk partition to unallocated space, or designate a block of unallocated space as the setup location.
- You can install Windows 7 on the same volume as an existing Windows version.

Performing a Clean Installation

The simplest setup scenario of all is installing Windows 7 in a newly created partition on a system that does not currently have any version of Windows installed. This is the case if you start with a brand-new hard disk or if you wipe out a partition that contains an existing version of Windows). The safest way to embark on a clean installation is to boot from the Windows 7 DVD. Insert the Windows 7 DVD and restart your computer. Watch for a boot prompt; typically, you need to press a key to boot from the DVD. After the setup process begins, you can follow the instructions as outlined in this section.

Troubleshooting

You can't boot from the Windows 7 DVD

For a bootable CD or DVD to work properly, you must set the boot order in the BIOS so that the drive appears ahead of the hard disk drive and any other bootable media; we recommend setting the DVD drive as the first boot device, followed by the hard disk, floppy disk (if present), and any other bootable devices, in whichever order you prefer. The boot options available for every computer are different, as is the technique for accessing the BIOS setup program. During boot, watch for a message that tells you which key to press for setup. If you're lucky, the BIOS setup program on your computer includes a Boot section where you can specify the order of boot devices; if this option isn't immediately apparent, look for a page or tab called Advanced CMOS Settings or something similar.

What if your computer lacks the capability to boot from a DVD drive? This problem is most likely to affect you if you're trying to install Windows 7 on a notebook computer that doesn't include an integrated DVD drive, or if the DVD drive in an existing system is damaged. Try one of these alternatives to work around the problem (you will need temporary access to a computer with a functioning DVD drive to complete any of these steps):

- Copy the DVD files to a folder on your hard disk, and run the setup program from that location.
- Copy the DVD files to a partition on an external hard disk, set that partition as active, and boot from the external drive. This option might require adjusting the order of boot devices in your system BIOS.

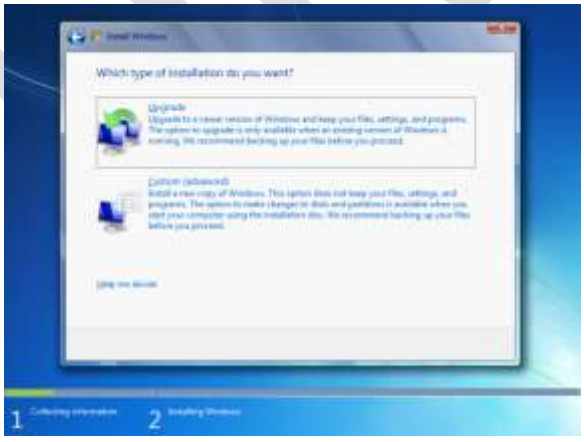
- Copy the DVD files to a USB flash drive and run setup from that location. The drive must have enough space to accommodate all installation files (2.5 GB for 32-bit, 3.2 GB for 64-bit). The procedure for preparing the flash drive to be a bootable device is cumbersome but straightforward. Step-by-step instructions are in this article at the Microsoft TechNet site: http://technet.microsoft.com/en-us/magazine/dd535816.aspx.

- Use a full-featured DVD-burning program such as Nero (nero.com) or Roxio Easy Media Creator (roxio.com) to copy the Windows 7 DVD to an ISO image file. Then install an ISO image-mounting program such as Virtual Clone Drive (www.slysoft.com/en/virtual-clonedrive.html) or Daemon Tools (daemon-tools.cc) and point it at the ISO file you created. The mounted image file appears as a DVD drive in the Computer window, and you can run the setup program from that virtual drive.

Any of the preceding options allow you to upgrade the current Windows installation or to install a clean copy on a separate volume or on the same volume, alongside the current copy of Windows. You must boot from a removable storage device (an external hard drive or USB flash drive) if you want to delete the current partition on which Windows is installed and install a clean copy in that location.

When you boot from the Windows 7 DVD, your first stop is the Install Windows screen, where you choose your language preferences. These should match the Windows version you purchased. Click Next, and then, on the following screen, click Install Now, which takes you to a page that spells out the license terms for the edition of Windows you're about to install.

After you accept the license agreement, you'll reach the screen shown here:



Because you booted from the DVD, the Upgrade option is not available (if you try to select it, you'll get an error message). Click the Custom (Advanced) option to continue with a clean installation. The Where Do You Want To Install Windows? screen, shown in Figure 2-2, lists all physical disks, partitions, and unallocated space.

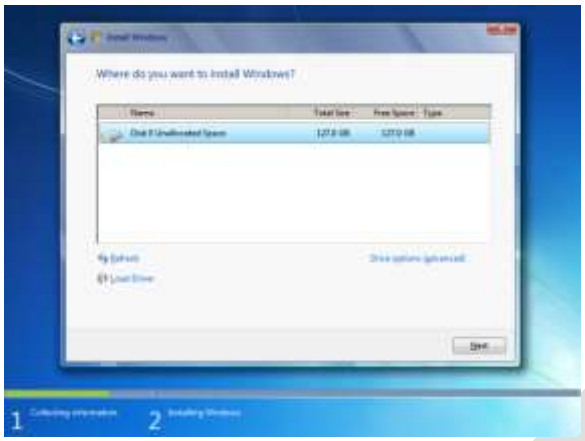


Figure 2-2 In this simple scenario, with a single physical disk that does not contain any partitions, you can click Next to create a partition and install Windows using the entire physical drive.

In this example, we assume that you're using a freshly formatted disk with no existing partitions, and that you want to use all unallocated space as your system drive. For alternative scenarios involving multiple partitions or changes to existing partitions, see the following section, "Setup and Your Hard Disk."

Troubleshooting

Setup doesn't detect your hard disk

The Windows 7 DVD includes drivers for most commonly used IDE and SATA disk controllers. If you have an older PC or an unusual disk configuration, the setup program might not recognize your disk controller. In that case, you'll be prompted to provide a driver when you reach the Where Do You Want To Install Windows? screen. For 32-bit (x86) versions of Windows 7, you should be able to supply a driver that is compatible with Windows Vista or Windows 7 on a USB flash drive, on a floppy disk, or on a CD or DVD. For the last option mentioned, remove the Windows 7 DVD and insert the disc containing the storage driver; after the driver loads successfully, remove the disc and reinsert the Windows 7 DVD.

Troubleshooting

During setup, some peripherals don't work properly

Check your system BIOS. An outdated BIOS can cause problems with disk partitioning, power management, peripheral configuration, and other crucial low-level functions. To find out whether an update is available, check with the manufacturer of your computer or its motherboard. For "white label" PCs, which are built by small system builders from standard parts, identifying the BIOS and tracking down the appropriate source for updates isn't always easy; you'll find detailed information at the indispensable (and thoroughly independent) Wim's BIOS (wimsbios.com).

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It's okay to share a partition

Thanks to the radically revised setup architecture introduced in Windows Vista and also used in Windows 7, you can safely discard one of the basic tenets that have governed installation decisions since the beginning of the Windows era. You want to point Windows 7 setup to a partition on which another version of Windows is already installed? As long as you have sufficient free disk space and you don't plan to use the copy of Windows on that volume any more, go right ahead. When you choose to do a clean installation in this nondestructive configuration, Windows 7 setup moves the old Windows, Program Files, and user profile folders (Documents and Settings for Windows XP, Users for Windows Vista or Windows 7) to a folder named Windows.old.

Why would you want to do this? Let's say you currently have a system that has a single disk with a single partition and plenty of free disk space. You want to start fresh with a clean installation, but you have lots of valuable data and you don't want to lose any of it. Performing a nondestructive clean installation gives you the fresh start you're looking for, with your data files safely ensconced in the Windows.old folder. You can no longer start up your old Windows installation, but you can copy any of the saved files from that folder to your new user profile whenever you're ready. (In addition, all the device drivers from your previous installation are available for your use; you'll find them in Windows.old\Windows\System32\DriverStore\FileRepository.)

Why is this option acceptable now? In Windows XP and earlier versions, the operation of the setup program invariably involved some commingling of files in the old and new Windows installations. Those unwanted system files and leftovers from previously installed programs defeated the purpose of doing a clean installation. But the image-based Windows setup used by Windows Vista and Windows 7 quarantines your old files and allows you to do a truly clean installation of your new operating system.

After you select the disk location where you want to install Windows 7, setup proceeds automatically, copying files and configuring hardware devices with no further input required from you. The Installing Windows screen provides a progress bar to indicate how close to completion you are. After the technical portion of a clean installation is complete, you need to fill in some basic information and set some essential systemwide options:

1. Choose a user name and a computer name. The user name you enter here becomes the first user account, which is a member of the Administrators group. Setup suggests a default computer name by removing any spaces and tacking the "-PC" suffix to the user name you entered above. You're free to replace the auto-generated name with a more descriptive name if you prefer.

2. Set a password for your user account. Although you're not required to assign a password to this account, we strongly recommend you do so.

Note

When you perform a clean installation of Windows 7, entering a password is optional. However, if you choose to enter a password, then you must enter something in the Type A Password Hint box. The password hint reduces the likelihood that you'll one day forget your password and be locked out of your own computer. This unfortunate situation is exacerbated because the Administrator account is disabled by default in Windows 7, so you can't use it as a back door into your computer. If you're confident about your ability to recall your password and you don't want to offer any clues to a would-be intruder, enter a nonsense word or phrase (or just a single punctuation mark) here. For more information, see "Setting a Logon Password" on page 16xx.

3. Enter your Windows product key. You can enter the product key included with your purchased copy, or you can bypass this screen and install Windows without entering a product key. (For more details on these options, see "Activating and Validating Windows 7".)

4. Select Automatic Update settings. For most people, the first option, Use Recommended Settings, is the correct one.

5. Review your time and date settings. A clean installation of Windows 7 from U.S. English media sets the time zone to Pacific (U.S. and Canada), with Daylight Saving Time enabled. Changing the time zone does not change the time displayed. After selecting your time zone, check the date and time carefully. Incorrect values in any of the settings on this page can cause complications later.

6. Set up your network. If you're installing Windows 7 on a notebook with a supported wireless adapter, you might be prompted to enter a security passphrase for your wireless access point before you reach the dialog box shown here. The network location setting determines basic network security, including firewall settings and sharing options. On most home or small business networks connected to the internet through a router, you can safely select the Home or Work option. Click Public Location if your computer is directly connected to a cable or DSL modem (that is, with no router or gateway appliance separating your computer from the modem) or if you connect to the internet by means of a dial-up modem. If you choose Home, the next dialog box allows you to you create or join a HomeGroup.

For more details about your network options, see Chapter 17, "Setting Up a Small Office or Home Network."

After completing the final step in this process, setup takes you to a logon screen.

Setup and Your Hard Disk

In the previous section, we described the steps for a clean installation on the simplest of all PC configurations: a single hard disk, containing a single partition to be used as the system drive. Out in the real world, especially among Windows enthusiasts, we know that disk configurations are often much more complex.

On most desktop PCs and on some notebooks, you can connect multiple physical disk drives. You can choose to install Windows 7 to a volume on any IDE or SATA drive (including eSATA drives, which attach to the system via an external cable but appear to Windows as an ordinary internal drive). You cannot, however, install Windows to an external drive connected via USB or IEEE1394 (FireWire)

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What's that mysterious 100MB partition?

If you install Windows 7 on a clean disk with no existing partitions, it creates a System Reserved partition of 100 MB at the beginning of the disk and uses the remainder of the unallocated space to create your system drive. That small partition isn't assigned a drive letter, so you won't even know it exists unless you look in the Disk Management console (as shown here) or use Diskpart or a similar low-level utility to inspect the disk structure.

This stub of a partition, new in Windows 7, serves two functions. First, it holds the Boot Manager code and the Boot Configration Database (which we explain in more detail in "Understanding the Windows 7 Startup Process," page 2xx). And second, it reserves space for the startup files required by the BitLocker Drive Encryption feature. If you ever decide to encrypt your system drive using BitLocker, you won't have to repartition your system drive (a genuinely tedious process) to make it possible.

If you're confident you'll never use BitLocker and prefer to do without the additional complexity of this partition, your best bet is to make sure it's never created. If you're starting from a clean hard drive, don't point Windows setup to the unallocated space. Instead, use Windows 7's disk-management tools to create a single primary partition using all unallocated space, and then point the installer to the newly created partition as the setup location.

With a new hard disk or an existing one, you might have any of several good reasons to tinker with disk partitions. You might prefer to segregate your operating system files from your data files by placing them on separate volumes, for example, or you might be

planning to set up a dual- or multi-boot system. In any event, it's always easier to make partitioning decisions before setup than it is to resize and rearrange volumes after they're in use.

For a full inventory of all disk-management tools and techniques available in Windows 7, *see Chapter 26, "Managing Disks and Drives."*

To make adjustments to existing disk partitions, boot from the Windows 7 DVD (or a bootable hard drive or USB flash drive) and run through Windows setup until you reach the Where Do You Want To Install Windows? screen, shown earlier in Figure 2-2. Click Drive Options (Advanced) to expand the collection of tools below the list of disks and partitions, as shown in Figure 2-3.

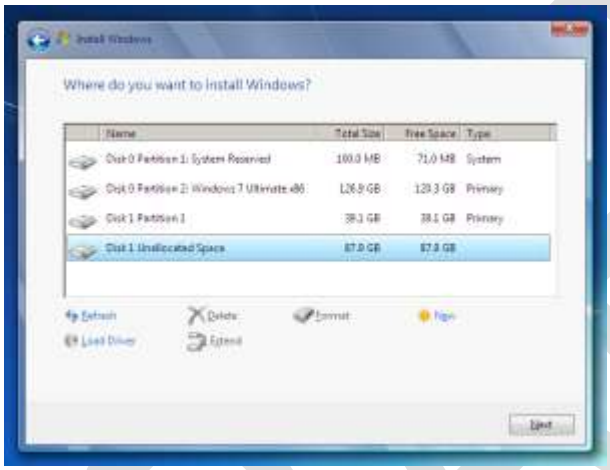

Figure 2-3 Use the disk management tools in this phase of the Windows Vista setup process to manage disk partitions for more efficient data storage and multi-boot configurations.

You can accomplish any of the following tasks here:

- Select an existing partition or unallocated space on which to install Windows 7. Setup is simple if you already created and formatted an empty partition in preparation for setting up Windows, or if you plan to install Windows 7 on an existing partition that currently contains data or programs but no operating system, or if you want to use unallocated space on an existing disk without disturbing the existing partition scheme. Select the partition or unallocated space, and click Next.

- Delete an existing partition. Select a partition and then click Delete. This option is useful if you want to perform a clean installation on a drive that currently contains an earlier version of Windows. Because this operation deletes data irretrievably, you must respond to at least two "Are you sure?" confirmation requests. After deleting the partition, you can select the unallocated space as the destination for your Windows 7 installation or create a new partition. Be sure to back up any data files before choosing this option.

- Create a new partition from unallocated space. Select a block of unallocated space on a new drive or on an existing drive after deleting partitions and click New to set up a partition in that space.

By default, the setup program offers to use all unallocated space on the current disk. You can specify a smaller partition size if you want to subdivide the disk into multiple drives. If you have a 1500-GB drive, for example, you might choose to create a small partition on which to install Windows and use the remaining space to create a second volume with its own drive letter on which to store data files such as music, pictures, documents, and recorded TV.

- Extend an existing partition using unallocated space. If you want to upgrade an existing copy of Windows and you're not happy with your existing partition scheme, you can use the Extend option to add unallocated space to any partition. If you originally set up a 60-GB notebook hard drive with a 10-GB partition for Windows XP and set aside the remaining 50 GB for data files, you might be unable to upgrade to Windows 7 because your system drive doesn't meet the requirement of at least 15 GB of free space. The solution? First, back up your data files to an external drive. Then delete the data partition, select the partition you want to make larger, and click Extend. Choose the total size of the extended partition in the Size box (the default is to use all available unallocated space), and click Apply. You can now restore your backed-up data files and continue with Windows setup.

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Use labels to tell volumes apart

In both the Disk Management console and the disk-management tools available via Windows setup, it can be confusing to tell which partition is which. Confusion, in this case, can have drastic consequences if you inadvertently wipe out a drive full of data instead of writing over an unwanted installation of Windows. One good way to reduce the risk of this sort of accident is to label drives well. In Figure 2-3, for instance, you can see at a glance that the second partition on Disk 0 contains a current installation of Windows 7 Ultimate x86 and that the smaller partition on Disk 1 is empty.

Alert observers will no doubt notice that one option is missing from that list. Unfortunately, the setup program does not allow you to shrink an existing disk partition to create unallocated space on which to install a fresh copy of Windows 7. The option to shrink a volume is available from the Disk Management console after Windows 7 is installed, but if you want to accomplish this task before or during setup, you'll need to use third-party disk-management tools.

Upgrading a Previous Windows Version

To perform an in-place upgrade of your existing copy of Windows, you must be running either Windows Vista with Service Pack 1 or later installed or Windows 7. The installed edition (32-bit or 64-bit) must match the upgrade edition; you can't install 32-bit Windows 7 over a 64-bit Windows installation or vice versa. Finally, you must have enough free disk space to accommodate the new installation of Windows 7—typically, 15 to 20 GB. The exact upgrade paths available are listed in Table 2-2.

Table 2-2 Supported Paths for In-Place Upgrades from Windows Vista

If Your Current Operating System Is...	You Can Upgrade To...
Windows Vista Home Basic	Windows 7 Home Basic, Home Premium, Professional, Ultimate
Windows Vista Home Premium	Windows 7 Home Premium, Professional, Ultimate
Windows Vista Business	Windows 7 Professional, Ultimate
Windows Vista Ultimate	Windows 7 Ultimate

If you want to upgrade your existing copy of Windows XP to Windows 7, you'll need to jump through a few hoops. Direct upgrades from Windows XP are not possible, so you'll have to perform a clean installation. You can use the Windows Easy Transfer utility to migrate your files and settings from the old computer to the new one, and then you'll need to reinstall applications that are compatible with Windows 7.

To begin an in-place upgrade, start your existing copy of Windows and run the Windows 7 setup program. If you're using the Windows 7 DVD, you can kick off setup from the AutoPlay dialog box, or open the contents of the DVD in Windows Explorer and double-click Setup, or enter d:\setup.exe (substituting the letter of your DVD drive for d) at any command prompt, including the Run dialog box. In the Install Windows dialog box, click Install Now to begin.

The upgrade process involves significantly fewer steps than a clean installation. After accepting the license agreement, you see the dialog box shown in Figure 2-4. If you have a working internet connection, we strongly recommend that you accept the default option to download the latest updates for installation.

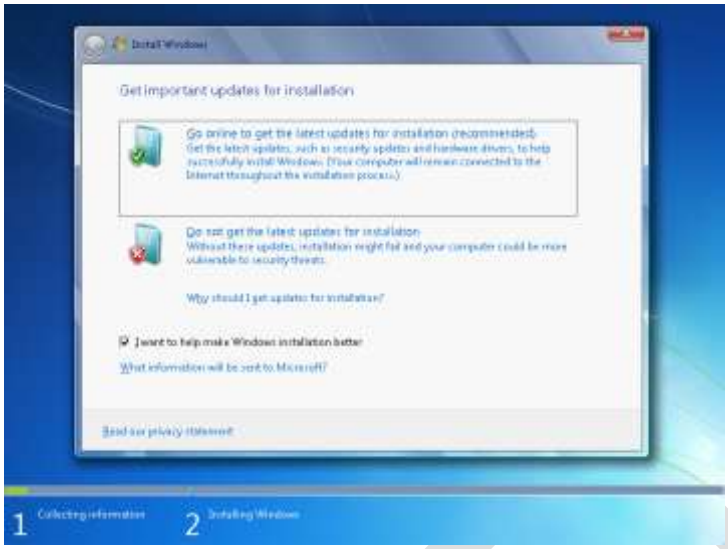

Figure 2-4 For an upgrade installation, you'll avoid headaches if you take advantage of the option to download security updates and new drivers as part of setup.

Next, you're prompted to choose the type of installation you want. Click Upgrade to begin setup.

Before beginning the actual upgrade, the setup program runs a brief compatibility test analogous to the Windows 7 Upgrade Advisor. If this test detects any potential software or hardware compatibility issues, you will see a Compatibility Report dialog box listing the issues and recommending steps to resolve them. You can (and should) interrupt setup at this point to uninstall a program or driver if setup recommends that you do so; or, if you're satisfied that the issue won't affect your upgrade, click Next to continue.

An upgrade from Windows 7 takes significantly more time than a clean installation. In fact, the upgrade actually gathers settings and drivers from your existing installation; moves your existing Windows, Program Files, and Users folders to a new folder; performs a clean installation of Windows 7 using a prebuilt image file; migrates the settings and drivers it gathered in the first step to the new copy of Windows 7; moves user data to the correct locations in the newly created user profiles; and finally restarts Windows 7. All of this happens without requiring any intervention on your part. During the upgrade, the setup program creates the following temporary hidden folders in the root of your system drive:

- $WINDOWS.~BT This folder contains the minimal copy of Windows 7 that manages the actual work of setting up the new operating system and migrating files and settings.

- $UPGRADE.~OS The setup program gathers settings for the operating system and stores them in this temporary folder to be applied to Windows 7 after installation is complete.
- $WINDOWS.~LS This folder contains the large image file (in Windows Image format) and temporary files used during the upgrade.
- $INPLACE.~TR User-specific and machine-specific settings are temporarily stored here after being gathered during the first stage of the upgrade.
- $WINDOWS.~Q This folder contains the original Windows installation.

If setup fails for any reason, it automatically rolls back the installation, removing the newly installed image and restoring the original Windows installation from its saved location. After a successful upgrade, most of these temporary folders are deleted. The $INPLACE.~TR and $WINDOWS.~Q folders are preserved, to allow you to recover files and settings that were not properly migrated.

INSIDE OUT

Clean up after an upgrade

After you complete the upgrade and are satisfied that all your data files are intact and all settings were properly migrated, you can clean up the bits and pieces the upgrade process leaves behind. The quickest and safest way to accomplish this goal is to use the Disk Cleanup utility. Select the Files Discarded By Windows Upgrade option and click OK. If you've installed Windows 7 on the same partition as an existing copy of Windows, use the Previous Installation(s) Of Windows option, which removes the Windows.old folder and its contents. For more details on how to use this option, see "Cleaning Up with Disk Cleanup" on page 21xx.

Creating and Configuring a Multi-Boot System

If your computer already has any version of Windows installed and you have a second disk partition available (or enough unallocated space to create a second partition), you can install a clean copy of Windows 7 without disturbing your existing Windows installation. At boot time, you choose your Windows version from a startup menu. Although this is typically called a dual-boot system, it's more accurate to call it a multiboot configuration, because you can install multiple copies of Windows or other PC-compatible operating systems.

Having the capability to choose your operating system at startup is handy if you have a program or device that simply won't work under Windows 7. When you need to use the legacy program or device, you can boot into your other Windows version without too much fuss. This capability is also useful for software developers and IT professionals, who need to be able to test how programs work under different operating systems.

For experienced Windows users, installing a second copy of Windows 7 in its own partition can also be helpful as a way to experiment with a potentially problematic program or device driver without compromising a working system. After you finish setting up the

second, clean version of Windows 7, you'll see an additional entry on the startup menu that corresponds to your new installation. (The newly installed version is the default menu choice; it runs automatically if 30 seconds pass and you don't make a choice.) Experiment with the program or driver and see how well it works. If, after testing thoroughly, you're satisfied that the program is safe to use, you can add it to the Windows 7 installation you use every day.

INSIDE OUT

The ins and outs of system drive letters

Which drive letter will your clean installation of Windows 7 use? As with previous versions of Windows, the assigned drive letter varies depending on how you start setup. If you currently have a working copy of any Windows version on drive C and you install a clean copy of Windows 7 on a different partition, drive letters are assigned using the following logic:

- If you begin the installation process by booting from the Windows 7 media and choose a partition other than the one containing your current copy of Windows, the new installation uses the drive letter C when you start up. The volume that contains the other Windows installation uses the next available drive letter when you start your new installation of Windows. When you choose the previous Windows installation from the startup menu, it uses the drive letter C, and your new Windows 7 installation is assigned the next available drive letter. In this configuration, you can be certain that your current operating system is always on the C drive, but drive letters assigned to volumes you use for data might shift in unexpected ways.
- If you begin the installation process by running the setup program from within your current version of Windows and use the Custom (Advanced) option to perform a clean installation on a partition that does not have a drive letter assigned to it, each installation will use the drive letter C as well, with the drive letter for other partitions shifting accordingly depending on which choice you made from the Windows boot menu.
- If you begin the installation process by running the setup program from within your current version of Windows and use the Custom (Advanced) option to perform a clean installation on a partition that currently has a drive letter assigned to it, the new installation uses that drive letter. Other volumes maintain their original drive letters when you start your newly installed copy of Windows 7. Thus, if you run setup from within Windows and choose to install a clean copy of Windows on drive E:, the system drive for the new installation will be E; as well.

There's no inherent reason to prefer one of these options over the other. If you find comfort in the consistency of knowing that system files and program files are always on the C drive, you'll probably want to choose the first or second option. If you

would rather use drive letters to keep track of which Windows version is running at any given time, you'll prefer the third option. But any of these configurations should work reliably with any combination of software, hardware, and settings.

Understanding and Managing the Windows 7 Startup Process

Windows 7, Windows Vista, and Windows Server 2008 share a common startup process. If you've learned the ins and outs of a multiboot system with Windows Vista or Windows Server 2008, your accumulated knowledge will serve you well with Windows 7. However, if your only experience with multiboot systems involves Windows XP, Windows Server 2003, and Windows 2000, you'll need to read this section carefully.

Fundamental changes in the boot loader change the way you manage multiple operating system installations that include Windows 7 or Windows Vista. The Ntldr and Boot.ini files from an installation of Windows XP, Windows 2000, or Windows Server 2003 are used only in a secondary role in a multiboot configuration with Windows 7, Windows Vista, or Windows Server 2008.

The startup process in Windows 7 begins when your computer performs its power-on self test (POST), which is followed by the POST for each adapter card that has a BIOS, such as advanced storage adapters and video cards. The system BIOS then reads the master boot record (MBR)—the first physical sector on the hard disk defined as the boot device—and transfers control to the code in the MBR, which is created during setup of Windows 7 or Windows Vista. This is where Windows takes over the startup process. Here's what happens next:

1. The MBR reads the boot sector—the first sector of the active partition—which contains code that starts the Windows Boot Manager program, Bootmgr.exe.
2. The Windows Boot Manager reads the contents of the Boot Configuration Data store, which contains configuration information about all operating systems installed on the computer. It uses this data to build and display the boot menu.
3. When you make a selection from the boot menu, you trigger one of the following actions:
    - If you select an instance of Windows 7 or Windows Vista, the Windows Boot Manager starts the OS loader, Winload.exe, from the %SystemRoot%\System32 folder for that installation.
    - If you choose the option to resume Windows 7 or Windows Vista from hibernation, the Boot Manager loads Winresume.exe and restores your previous environment.
    - If you choose the Earlier Version Of Windows option from the boot menu, the Boot Manager

locates the volume containing that installation, loads its Windows NT–style Legacy OS loader (Ntldr.exe), and if necessary, displays a new startup menu drawn from the Boot.ini file on that volume.

When you select an installation of Windows 7 from the boot menu, Windows starts by loading its core files, Ntoskrnl.exe and Hal.dll, reading settings from the registry, and loading drivers. That's followed by the Windows Session Manager (Smss.exe), which starts the Windows Start-Up Application (Wininit.exe), which in turn starts the Local Security Authority (Lsass.exe) and Services (Services.exe) processes, after which you're ready to log on.

Understanding the boot process can help you to pinpoint problems that occur during startup. For more information, see "Using Advanced Boot Options" on page 23xx.

INSIDE OUT

Use virtual machines instead of hassling with multiboot menus

You can create truly elaborate multiboot configurations using more than a decade's worth of Windows versions. But unless you're running a hardware testing lab, there's no good reason to do that. The much simpler, smoother alternative is to use virtualization software to run multiple versions of Windows on virtual hardware that faithfully re-creates the operating environment. During the course of researching and writing this book, we installed Windows 7 in virtual machines to capture details of several crucial tasks and processes that can't easily be documented on physical hardware, and we saved many hours compared to how long those tasks would have taken had we set up and restored physical hardware. Microsoft's Windows Virtual PC (www.microsoft.com/windows/virtual-pc/) runs on Windows 7 Professional and Ultimate editions that also support hardware virtualization. The Hyper-V virtualization software, which runs on Windows Server 2008 , can be used over a local area network by clients running Windows 7. (For more information about Hyper-V, visit www.microsoft.com/windowsserver2008/en/us/hyperv-overview.aspx. VMware (vmware.com) offers excellent virtualization software for use on desktop Windows machines and servers. The free VirtualBox package from Sun Microsystems (virtualbox.org) is compatible with all Windows 7 editions and can host an extensive selection of guest operating systems. Using any of these solutions, you can install even the most ancient Windows version. Backing up a machine's configuration and restoring it is as simple as copying a file. Legally, you'll need a license for every operating system you install in a virtual machine. If you have a license to use Windows for evaluation purposes, this option is a lifesaver.

To add Windows 7 to a system on which an existing version of Windows is already installed, first make sure that you have an available partition (or unformatted disk space) separate from the partition that contains the system files for your current Windows version.

The target partition can be a separate partition on the same physical disk, or it can be on a different hard disk. If your system contains a single disk with a single partition used as drive C, you cannot create a multiboot system unless you add a new disk or use software tools to shrink the existing partition and create a new partition from the free space. (The Windows 7 Disk Management console, Diskmgmt.msc, includes this capability; to shrink partitions on a system running an older Windows version, you'll need third-party software. For details, see "Shrinking a Volume" on page 26xx.) The new partition does not need to be empty; however, it should not contain system files for another Windows installation. Run the setup program, choose the Custom (Advanced) option, and select the disk and partition you want to use for the new installation.

The setup program automatically handles details of adding the newly installed operating system to the Boot Configuration Data (BCD) store.

And how do you edit and configure the Boot Configuration Data store? Surprisingly, the only official tool is a command-line utility called Bcdedit. Bcdedit isn't an interactive program; instead, you perform tasks by appending switches and parameters to the Bcdedit command line. To display the complete syntax for this tool, open an elevated Command Prompt window (using the Run As Administrator option) and enter the command `bcdedit /?`.

For everyday use, most Bcdedit options are esoteric and unnecessary. In fact, the only option that we remember using more than once in the past four years is the command to change the text for each entry in the boot menu. By default, the setup program adds the generic entry "Windows 7" for each installation. If you set up a dual-boot system using two copies of Windows 7 (one for everyday use, one for testing), you'll be unable to tell which is which, because the menu text will be the same for each. To make the menu more informative, follow these steps:

1. Start your computer, and choose either entry from the boot menu. After startup completes, make a note of which installation is running.
2. Click Start, type `cmd` in the Search box, and press Ctrl+Shift+Enter. Click Continue in the User Account Control box to open an elevated Command Prompt window.
3. Type the following command: `bcdedit /set description "Menu description goes here"` (substitute your own description for the placeholder text, and be sure to include the quotation marks). Press Enter.
4. Restart your computer, and note that the menu description you just entered now appears on the menu. Select the other menu option.
5. Repeat steps 2 and 3, again adding a menu description to replace the generic text and distinguish this installation from the other one.

A few startup options are still available from the Startup And Recovery dialog box (open the System option in Control Panel, click the Advanced System Settings link in the Tasks pane, and click the Settings button under the Startup And Recovery heading). As shown below, you can choose which installation is the default operating system (this is where descriptive menu choices come in handy) and how long you want to display the list of operating systems. The default is 30 seconds; we typically set this value to no more than

10 seconds (you can choose any number from 1 through 999). To set the boot menu so that the default operating system starts automatically, clear the check box at the left or enter 0 (zero). These options write data directly to the Boot Configuration Data store.

The syntax of the Bcdedit command is daunting, to say the least. It's also something you're unlikely to use often enough to memorize. Those facts are enough to strongly recommend using a graphical editor for the BCD store instead. VistaBootPRO (vistabootpro.org) has been in our toolkit for years. It includes the capability to repair the Windows 7\Windows Vista boot loader or uninstall it and return to booting from the Legacy OS Boot Loader (Ntldr.exe). VistaBootPRO also works in Windows XP, so you can boot to either operating system and then adjust boot settings. It costs $10 for a single-user license. A free alternative, equally powerful if slightly more difficult to use, is EasyBCD, from NeoSmart Technologies (neosmart.net). Both utilities offer the ability to customize multiboot installations and to repair a damaged boot loader or switch on the fly to the old-style Windows XP boot loader.

How do you remove Windows 7 (or Windows Vista) from a dual-boot installation and restore the Windows XP boot loader? Insert the Windows 7 DVD and enter the following command at a command prompt, substituting the letter of your DVD drive for <d:>:

```
<d:>\boot\bootsect.exe /nt52 all
```

You can now delete all system files from the volume containing the Windows 7 installation you no longer plan to use. For even more effective removal, use the Disk Management console in Windows XP to reformat the drive and start fresh.

Troubleshooting

You installed Windows XP, and Windows 7 is no longer on the boot menu

Each time you install a version of Windows, it rewrites the MBR to call its own boot loader. If you install Windows 7 (or Windows Vista) as a second operating system on a PC where Windows XP is already installed, the Windows boot menu incorporates the options from the older boot menu. But if you install a fresh copy of Windows XP (or Windows Server 2003) on a system that is already running Windows 7, you'll overwrite the MBR with one that doesn't recognize the Windows 7 Boot Loader. To repair the damage, open a Command Prompt window in the older operating system

and run the following command from the Windows 7 DVD, substituting the letter of your DVD drive for d here:

```
d:\boot\ bootsect.exe /nt60 all
```

When you restart, you should see the Windows 7 menu. To restore the menu entry for your earlier version of Windows, open an elevated Command Prompt window and enter this command:

```
bcdedit /create {ntldr} –d "Menu description goes here"
```

Substitute your own description for the placeholder text, being sure to include the quotation marks. The next time you start your computer, the menus should appear as you intended

An even easier solution is to use one of the boot-editing utilities we highlight in this section. Both VistaBootPro and EasyBCD run on Windows XP, Windows Vista, Windows 7, and Windows Server 2003 or 2008 and can be used to switch quickly from an XP-style boot loader to its Windows 7 counterpart and back again.

Installing Windows 7 and Linux in a Multiboot Configuration

It's possible to install Windows 7 and Linux in a multiboot configuration that works much like the Windows multiboot setup described on the preceding pages. You can set it up to use the Windows 7 boot menu, or you can use a Linux boot loader (most commonly, GRUB) if you prefer. The procedure is a bit more complex than the procedure for installing another version of Windows, and it varies somewhat depending on which Linux distribution you use and which Linux tools (such as partition editors, boot loaders, and the like) you prefer. It's generally easier to set up such a system if the Windows partition is set up first, but it can be done either way: Windows and then Linux, or Linux and then Windows.

An internet search for "dual boot linux windows 7" turns up plenty of detailed instructions, and if you add the name of your Linux distribution to the search input you're likely to find the specific steps needed to make it work with Windows 7. As an example, check out the fully illustrated and meticulously detailed steps prepared by APC magazine (apcmag.com/the_definitive_dualbooting_guide_linux_vista_and_xp_stepbystep.htm) that covers most combinations of Windows and Linux..

Upgrading from Another Windows 7 Edition

The basic procedure for upgrading from one edition of Windows 7 to another is unlike anything Microsoft has ever created before. The Anytime Upgrade feature was first introduced in Windows Vista, but the name is about all that the two features have in common.

So what's changed? If you purchase a new PC with Windows 7 Starter, Home Basic, Home Premium, or Professional installed, you'll find an unpretentious link beneath the name of

your edition on the System Properties page: Get more features with a new edition of Windows 7.

Click that link, and it opens the Windows Anytime Upgrade dialog box, shown in Figure 2-5.

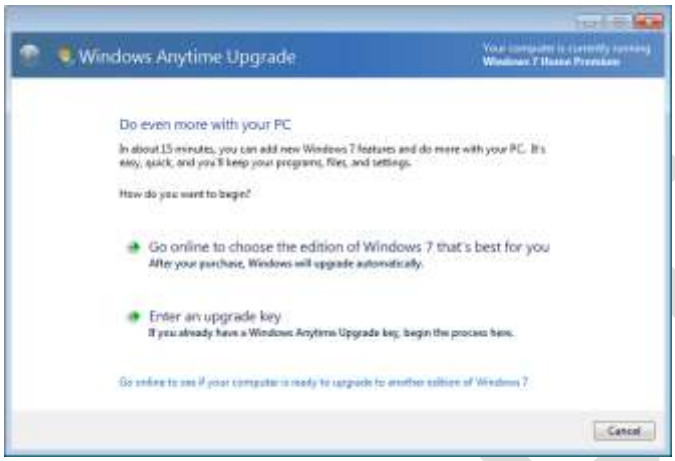

Figure 2-5 Upgrading from one edition of Windows 7 to another takes less than 10 minutes. You can buy an upgrade key online or from a local retailer.

If you're ready to upgrade, choose the top option to buy the upgrade online from Microsoft or from a partner, such as an online software vendor or the company that manufactured your PC. After selecting the edition you want to upgrade to, you'll be taken straight to a dialog box that allows you to initiate the upgrade process. You'll also receive a product key in the same format as the Windows product key that comes with a new retail version of Windows 7. (This upgrade key is for your use in the event that you need to reinstall Windows later.)

If you purchase an Anytime Upgrade package from a brick-and-mortar retailer, the upgrade key will be included with the package and you can click the bottom option to continue. After you enter the Anytime Upgrade product key, the remainder of the process is automatic.

What's most startling about the Anytime Upgrade process in Windows 7 is how quick and unobtrusive it is. The upgrade typically takes 10 minutes or less, in sharp contrast to the identically named feature in Windows Vista, which required a complete reinstallation of Windows and several hours.

It doesn't require you to insert the original installation media or download any code. It simply unlocks the features in the upgraded edition. The upgrade process restarts the computer on its own, once. You don't need to restart the computer at the end of the upgrade.

Installing and Updating Drivers

The Windows 7 installation disk includes signed hardware drivers that support an enormous number of devices. Thousands of additional drivers are available from Windows

Update, with hundreds of new devices added every month. (To give an idea of the scale of the ongoing driver development effort, consider that Microsoft added roughly 1600 new drivers per month in the first year after Windows Vista was released, and that pace has not slowed down.) Assuming that you're working with a relatively modern PC with no esoteric parts, the chances are good that virtually all of your hardware will work immediately after you finish Windows setup. (That's certain to be true if you purchase a new PC with Windows 7 already installed; in that case, the manufacturer is required to install drivers for all devices included with the system.)

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Pay special attention to these drivers

Which hardware drivers should you care most about? The most important is the chipset driver, which helps Windows identify capabilities of integrated devices on the motherboard, such as USB and disk controllers. We also recommend that you ensure you have the best driver available for your display adapter, network adapter, sound adapter, storage controller, and any specialized input devices such as a wireless keyboard, trackpad, touch screen, or webcam,. In some cases, this might mean replacing a generic driver supplied by Windows 7 with one designed especially for your hardware, even if the OEM driver is older than the Windows 7 alternative. In most cases, the best place to look for alternative drivers is on the support website for the manufacturer of your PC or the peripheral you're trying to use.

To verify that every installed device is working as it should, open Device Manager. (Begin typing device manager in the Search box on the Start menu or in Control Panel, and click Device Manager in the results list.) Look in the list of installed devices for any warning icons that indicate a device was detected but no driver was installed. Figure 2-6, for example, shows a Multimedia Audio Controller (in this case, a sound card) for which Windows 7 was not able to find a compatible driver.

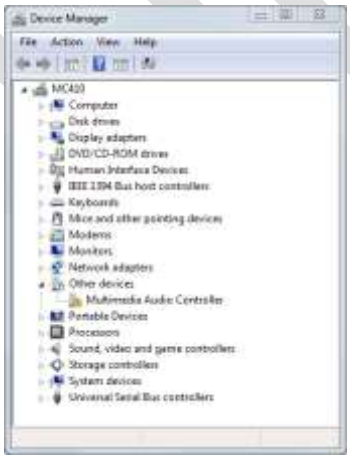


Figure 2-6 The yellow exclamation point alongside the item under the Other Devices category indicates that it is missing a compatible device driver.

If you have any USB or IEEE 1394 (FireWire) devices, such as printers, external hard drives, cameras, or scanners, connect them now and confirm that they work correctly. If you downloaded any updated drivers before setting up Windows 7, this is the time to install them. In many cases, a visit to Windows Update will locate the correct driver for a device.

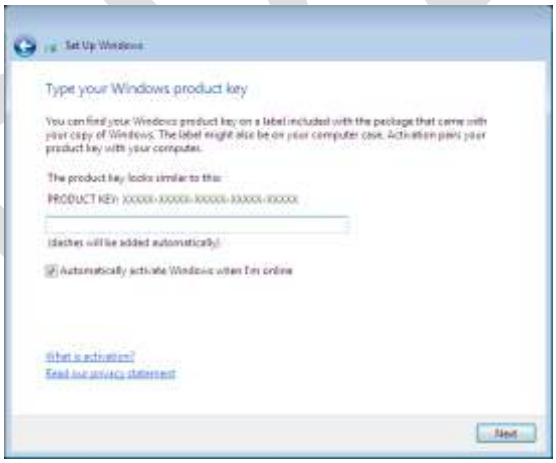
For a complete discussion of Device Manager and drivers, see Chapter 7, "Setting Up and Troubleshooting Hardware."

Activating and Validating Windows 7

Windows 7 includes a set of antipiracy and antitampering features that Microsoft refers to collectively as Windows Activation Technologies (in previous Windows versions, these were included under the Windows Genuine Advantage branding). The various checks and challenges in Windows 7 are, in essence, enforcement mechanisms for the Windows 7 license agreement, which is displayed during the process of installing the operating system (you must provide your consent to complete setup). We're not lawyers, so we won't presume to interpret this license agreement. We do recommend that you read the license agreement, which is fairly straightforward and is written clearly enough that even a non-lawyer can understand it. In this section, we explain how the activation and validation mechanisms in Windows 7 affect your use of the operating system.

Entering a Product Key

When you perform a clean installation or upgrade an existing Windows installation using a retail copy of Windows 7, you might be prompted to enter a 25-character alphanumeric product key that uniquely identifies your licensed copy of Windows.



Here are some key facts you should know about this procedure:

- The product key is entered automatically on any copy of Windows that is preinstalled on a new PC by a large computer maker. If you use the original installation media to reinstall this copy of Windows, you won't be required to enter a product key.

- Your product key identifies your edition of Windows. If you purchase a full or upgrade version of Windows 7 from a retail outlet, the installation media (typically a DVD) contains all editions of Windows 7: Starter, Home Basic, Home Premium, Professional, and Ultimate. The product key unlocks the edition you purchased. When you enter a valid product key in this box and click Next, the setup program installs the edition that matches that key.
- You are not required to enter a product key when installing Windows 7. If you leave the Product Key box blank and click Next, the setup program continues. You will be prompted to enter a valid product key later, when you activate Windows.

If you choose to install Windows 7 without entering a product key, you might be asked to select the edition you want to install (a file named Ei.cfg, in the Sources folder on the installation disk, can restrict these options to a specific edition; if that file exists, you will not see this list of options). You can then use the installed copy of Windows 7 without restriction for 30 days. Before the end of that 30-day grace period, you must enter a valid product key and activate your copy, as described in the next section. If you fail to complete these steps, Windows displays notifications at startup that urge you to activate your installation; additional notifications warning you appear on the desktop and in the notification area. To make the notifications more visible, Windows replaces your personalized desktop background with a stark black background

INSIDE OUT

Extend your activation grace period by 30 days

The 30-day period before activation is required is called the "grace period." If, at the end of that 30 days, you are not ready to activate, you can extend the grace period by an additional 30 days. Open a Command Prompt window using the Run As Administrator option and type the following command: `slmgr -rearm`. When the command completes, restart your computer. You can run this command a total of three times, giving you up to 120 days of use before activation is required.

Activating a Retail Copy of Windows

Just as with Windows XP and Windows Vista, you must activate your installation of a retail copy of Windows 7 within 30 days, either by connecting to a Microsoft activation server over the internet or by making a toll-free call to an interactive telephone activation system.

The activation mechanism is designed to enforce license restrictions by preventing the most common form of software piracy: casual copying. Typically, a Windows 7 license entitles you to install the operating system software on a single computer. If you use the same product key to install Windows 7 on a second (or third or fourth) system, you might be unable to activate the software automatically.

On the setup screen where you enter your product key, the Automatically Activate Windows When I'm Online check box is selected by default. If you leave this option

selected, Windows will contact the activation servers three days after installation and complete the activation process for you. At any time, you can confirm your system's activation status by looking at the Windows Activation section at the bottom of the System dialog box. (Click Start, right-click Computer, and click Properties.) This dialog box displays the number of days left in the grace period and includes links where you can manually activate or change your product key.

If the 30-day grace period expires and you have not successfully activated your installation, you'll see the dialog box shown in Figure 2-7. Click Activate Windows Online Now to begin the internet activation process. If you left the Product Key box blank when installing Windows 7, you'll be prompted to enter a valid product key before you can complete activation.

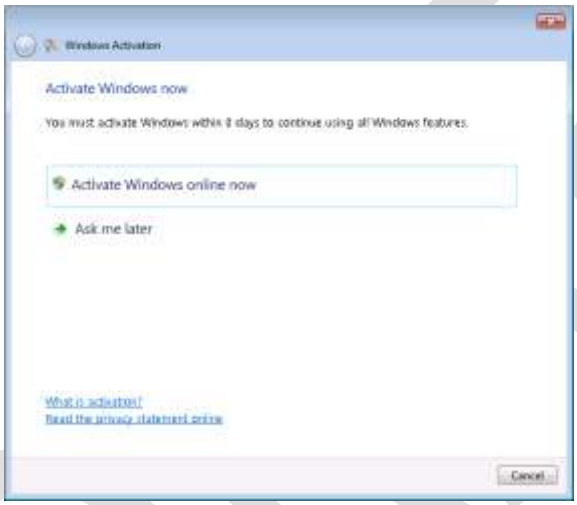


Figure 2-7 If you fail to activate Windows 7 within 30 days after installation, you're greeted with this dialog box when you log on.

Under most circumstances, activation over the internet takes no more than a few seconds. If you need to use the telephone, the process takes longer, because you have to enter a 50-digit identification key (either by using the phone's dial pad or by speaking to a customer service representative) and then input the 42-digit confirmation ID supplied in response.

INSIDE OUT

Don't rush to activate your installation

When you install a retail copy of Windows 7, the default settings delay automatic activation for three days. We recommend that you clear the Automatically Activate Windows When I'm Online check box when entering your product key. This option gives you a full 30 days to verify that Windows 7 works properly on your hardware and that you won't be required to replace any hardware or the entire computer.

After you're confident that Windows 7 is completely compatible with your hardware, you can open the System dialog box and choose the manual activation option.

What if you skip past this setting during Setup and forget to change it? Disabling automatic activation requires a Registry edit. (As always, the standard disclaimers apply: Don't try this unless you understand the consequences, including the risk that editing the Registry incorrectly can damage your system configuration.) Open Registry Editor and select the key HKLM\Software\Microsoft\Windows NT\CurrentVersion\SoftwareProtectionPlatform\Activation. In the right-hand pane, double-click the Manual value and change it from 0 to 1.

The activation process is completely anonymous and does not require that you divulge any personal information. If you choose to register your copy of Windows 7, this is a completely separate (and optional) task.

You're allowed to reinstall Windows 7 an unlimited number of times on the same hardware. During the activation process, Windows Vista transmits a hashed file that serves as a "fingerprint" of key components in your system. When you attempt to activate Windows using the same product key you used previously, the activation server calculates a new fingerprint and compares the value against the one stored in its database. If you're reinstalling Windows 7 on the original hardware, the fingerprints will match and activation will be automatic.

Just as with earlier Windows versions, the activation process is designed to prevent attempts to tamper with the activation components or to "clone" an activated copy of Windows and install it on another computer. What happens if you upgrade the hardware in your computer? When you activate your copy of Windows 7, a copy of the hardware fingerprint is stored on your hard disk and checked each time you start your computer. If you make substantial changes to your system hardware, you might be required to reactivate your copy of Windows. Because the activation mechanism assumes (mistakenly) that you've tried to install your copy of Windows on a second computer, internet activation will not work. In this case, you'll be required to speak to a support representative and manually enter a new activation code. For Windows XP, Microsoft published a detailed description of the algorithm it used to determine whether hardware changes were significant enough to require reactivation. For Windows Vista and Windows 7, Microsoft has chosen not to publish those details but has stated that if you replace a defective motherboard, you'll be required to reactivate your copy of Windows. (If you upgrade your PC with a new motherboard, that is considered a new PC and requires a new license.)

INSIDE OUT

Recover your product key

When you install a retail copy of Windows, the product key gets filed away, usually never to be seen again. But you might need to retrieve the product key at some point. If you have Windows 7 installed on multiple computers in your home or office, for example, you might lose track of which product key goes with which computer, resulting in confusion and hassle if you need to reinstall Windows, or if

you retire a computer and want to transfer its copy of Windows to a new computer. To find out which product key is in use on a given computer, we recommend a wonderful freeware utility called Keyfinder (magicaljellybean.com/keyfinder/). This application displays the product keys that were used to install any version of Windows or Microsoft Office on a computer.

Activation Requirements for OEM Installations

If you purchase a new computer with Windows 7 already installed on it, the licensing procedures are different, as are the rules for activation. In the arcane parlance of Windows, system makers are known as original equipment manufacturers, or OEMs. To make matters more confusing, not all OEMs are created equal; instead, they're divided into two classes:

- Large system builders (Microsoft refers to these firms as "named" or "multi-national" OEMs or, informally, as "royalty OEMs") are allowed to install and preactivate Windows using a technology called System Locked Preinstallation (SLP). The preinstalled copy of Windows (including the recovery CD) contains configuration files that look for specific information in the system BIOS. As long as the BIOS matches, no activation is required. When you purchase a new computer from one of these large companies, a sticker containing a unique product key is affixed to the PC's case, but that key isn't used to activate Windows initially. Instead, the OEM uses a single master key to activate large numbers of computers. If you need to reinstall Windows, you can use the recovery disk provided by the manufacturer and you won't be asked for a product key at all, nor is activation required—as long as you start your computer using the SLP CD on the same computer (or one with the same motherboard/BIOS combination).
- Smaller firms that build PCs can also preinstall Windows. These OEM copies are called System Builder copies, and they do require activation. The rules of the System Builder program require that the PC manufacturer preinstall Windows using specific tools so that you accept a license agreement and activate the software when you first turn on the PC. In addition, they are required to supply the purchaser with the Windows 7 media (typically a DVD) and affix a product key sticker to the PC's case. If you need to reinstall Windows on this computer, you must enter the product key and go through activation again.

The license agreement for a retail copy of Windows 7 allows you to transfer it to another computer, provided that you completely remove it from the computer on which it was previously installed. An OEM copy, by contrast, is tied to the computer on which it was originally installed. You can reinstall an OEM copy of Windows an unlimited number of times on the same computer. However, you are prohibited by the license agreement from transferring that copy of Windows to another computer.

Product Activation and Corporate Licensing

Businesses that purchase licenses in bulk through a Microsoft Volume Licensing (VL) program receive VL media and product keys that require activation under a different set

of rules than those that apply to retail or OEM copies. Under the terms of a volume license agreement, each computer with a copy of Windows Vista must have a valid license and must be activated. Under new activation procedures that apply to Windows 7 and Windows Vista, businesses can purchase product keys that allow multiple activations, or they can use Key Management servers to activate computers within their organization.

For more details on Volume Licensing programs for Windows and other Microsoft software, check the Microsoft Volume Licensing home page at microsoft.com/licensing.

Dealing with Product Validation

After you successfully activate your copy of Windows 7, you're still subject to periodic antipiracy checks from Microsoft. This process, called validation, verifies that your copy of Windows has not been tampered with to bypass activation. It also allows Microsoft to undo the activation process for a computer when it determines after the fact that the product key was stolen or used in violation of a volume licensing agreement.

Validation takes two forms: an internal tool that regularly checks licensing and activation files to determine that they haven't been tampered with; and an online tool that restricts access to some downloads and updates.

If your system fails validation, your computer continues to work. However, you will see some differences: the desktop background changes to black (and if you change it to something else, Windows changes it back to black after one hour), an "activate now" reminder appears on the desktop, and an Activate Now dialog box appears periodically. In addition, your access to Windows Update is somewhat restricted; you won't be able to download optional updates, new drivers, or certain other programs from the Microsoft Download Center until your system passes the validation check.

Note

An unactivated copy of Windows (or one that has failed validation) can still be used. All Windows functions work normally, all your data files are accessible, and all your programs work as expected. The nagging reminders are intended to strongly encourage you to resolve the underlying issue. Some forms of malware can result in damage to system files that has the same effect as tampering with activation components. Another common cause of activation problems is a lazy or dishonest repair technician who installs a stolen or "cracked" copy of Windows 7 instead of using your original licensed copy. Links in the Windows Activation messages lead to online support tools, where you might be able to identify and repair the issue that's affecting your system. Microsoft offers free support for activation issues via online forums as well, with separate forums for enterprise customers (social.technet.microsoft.com/Forums/en-US/itprovistaactivation/) and individuals (social.microsoft.com/Forums/en-US/category/genuine/). Telephone support is also available at no charge.

Transferring Files and Settings from Another Computer

If you upgrade your computer from Windows Vista to Windows 7, all of your data and most of your programs should survive the journey intact. But what do you do with your data and settings if you purchase a new computer, or if you decide to do a clean installation on your existing system, or if your old computer was running Windows XP and can't be directly upgraded? With Windows 7, you can use a utility called Windows Easy Transfer to handle much of the grunt work.

This utility is a significant upgrade to the version that appeared in Windows Vista (which in turn was a greatly improved replacement for Windows XP's Files And Settings Transfer wizard). With its help, you can migrate settings and files from your old Windows installation (Windows XP, Windows Vista, or Windows 7) to the new one.

Use Windows Easy Transfer with a single PC

When you use Windows Easy Transfer, the "old PC" and "new PC" don't have to be different physical machines. This utility will get the job done if you want to completely replace your existing Windows installation with a clean install of Windows 7. Use Windows Easy Transfer to save settings and files from your current Windows installation (your "old PC") to an external hard disk or network location. After you complete the clean install of Windows 7 on the same hardware, restore the saved files and settings to your "new PC."

Although the utility has its limitations, it's highly flexible and offers an impressive number of customization options. New in Windows 7 is a post-migration report, which shows you which files and settings were transferred and then lists all programs that the utility was able to detect on the old installation; you can use this report as a checklist to reinstall programs on the new computer.

Note

You can transfer files and settings from a 32-bit version of Windows to a 64-bit version, but the transfer won't work in reverse. You can't use this utility to copy files or settings from a 64-bit Windows version to a 32-bit version.

Windows Easy Transfer is simple and straightforward in operation, but describing it is another story. It would take a whiteboard the size of a Jumbotron scoreboard to map out all the possible paths you can follow when using this utility. So rather than describe every step, we'll list the broad outlines and count on you to find your way through the maze.

Note

Windows Easy Transfer works with files and settings, but it does not transfer the programs themselves. If you want to transfer programs as well as files from your old PC to a new one, you'll need to use third-party software, such as LapLink's PCMover (laplink.com/pcmover/).

Making a Connection

To accomplish the transfer, you need to establish a data connection between the old and new computers. When you run the Easy Transfer utility and click past the introductory screen, you're greeted with the list of options shown in Figure 2-8:

Figure 2-8 The first two Easy Transfer options require a physical connection between two PCs. The third option is intended for upgraders.

Your three transfer options are as follows:

- Easy Transfer cable This custom cable, available for purchase from many vendors (just search the web for "Easy transfer cable"), allows high-speed transfers over a direct connection between USB 2.0 ports on both computers. You cannot use a standard USB cable for this task. If you connect the cable before running Windows Easy Transfer, the program assumes you plan to use it as the transfer mechanism and skips the other options.
- Network You can connect two computers over a local area network and transfer settings directly from the old computer to the new one. A Fast Ethernet or Gigabit Ethernet connection is by far your best choice, especially if you want to transfer a large number of data files.
- Removable media, including USB flash drives and external hard disks If a direct connection isn't practical or possible (if you're planning to wipe out an existing partition so that you can do a clean installation on the same computer, for example), you can save the Windows Easy Transfer output to a file and then restore it after you finish setup. You must have enough free space on the external storage device to accommodate all files to be transferred. The Windows Easy Transfer utility calculates the amount of data it expects to transfer and warns you if the destination you select has insufficient space.

INSIDE OUT

Use a shared network location for Easy Transfer storage

Although you wouldn't know it from the Windows Easy Transfer interface, you can store files and settings from one computer on a shared network folder and retrieve them later. The trick? Don't choose the Network option, which works in real time with two physical PCs. Instead, choose the third option, "An external hard disk or USB flash drive." After specifying that this is your old computer, go through the process of calculating which files will be transferred and click the Save button. In the Save Your Easy Transfer File dialog box, select a shared network folder and enter a file name. When you're ready to restore the files and settings, connect to the same location over the network and begin the transfer.

If you're replacing your old computer with a new one running Windows 7, your best bet is to connect the two computers over a local area network (or using an Easy Transfer cable) and then run Windows Easy Transfer. This technique is not only the fastest way to get your new computer up and running, it's also the best way to avoid losing data. Because your existing data files remain intact on the old computer, you can recover easily if the process inadvertently leaves behind a crucial data file. If neither of these options is available, you can use an external hard drive to physically store the data and settings to be transferred.

If you have any other programs running, stop them now; then start the Windows Easy Transfer utility on both computers.

- On the old computer, you can use the Windows 7 DVD (browse to the \support\migwiz folder on the DVD and double-click Migsetup.exe). If the installation disc isn't available or you want to make sure you have the most recent version of the utility, run Windows Easy Transfer on the new computer first and follow the prompts to copy the program files to an external hard disk, a USB flash drive, or a shared network folder; then connect your old PC to the device or network location and run the Windows Easy Transfer shortcut there. If the old computer is running Windows 7, this step isn't necessary; you can run Windows Easy Transfer from the Start menu.
- On the new computer, click the Start button and then choose All Programs, Accessories, System Tools, Windows Easy Transfer. (You can also type Windows Easy Transfer in the Search box on the Start menu or type migwiz at any command prompt, including the Run dialog box.) Click Next on the opening page.

If you're using an Easy Transfer cable, start by plugging the cable into the old PC, which will need to install a driver for the device. When the driver is successfully installed, follow the prompts to begin the transfer. After you specify that this is the old PC, you'll be prompted to plug in the cable on your new PC, where Windows Easy Transfer should make the connection automatically and begin cataloging files and settings that need to be transferred.

If you're transferring over a network, start with the old PC, then run Windows Easy Transfer on the new PC. The connection should be made automatically. You'll need to

enter a numeric key on the new PC (automatically generated on the old PC) to initiate the connection.

Choosing What to Transfer

When you reach the Choose What To Transfer stage, Windows Easy Transfer automatically catalogs all files and settings that are available for transfer, calculates their size, and displays the results in a dialog box like the one shown here:

Each user account on the old PC gets its own top-level entry in this list, followed by a Shared Items entry that grabs files from the Public folder hierarchy and settings for programs that are installed for all users.

The default settings for individual user profiles migrate files from your user profile, including documents, music, pictures, and videos, as well as per-user program settings and Windows settings like your desktop background and screen saver. The utility also migrates Internet Explorer Favorites and preferences; folder and taskbar options; and account settings, messages, and address books from supported e-mail programs., Windows Mail, and Microsoft Outlook, among other programs.

If you want to replicate the setup of your old PC on your new one, click Next and then find something else to do while the transfer takes place (transferring 100+ GB of data over a network can take hours). If you simply want to transfer your personal files and settings to the new PC, clear the check boxes next to the Shared Items entry and any other accounts; then click Next.

For more granular control over exactly what gets transferred, click the Customize link beneath your user account entry or the Shared Items entry. That displays a list of folders and program settings like the one shown in Figure 2-9.

Figure 2-9 Clear any check box to skip the selected item type. Click Advanced to specify individual folders and drives that you want to include or exclude.

If you have an enormous collection of music and videos, you might prefer to copy those files to an external hard disk and import them later. In that case, clear the checkmark next to Music or Videos for your user profile (Public Music and Public Videos in the Shared Items category).

Allow the mouse pointer to hover over the blue Information icon to see a list of which programs will have their settings migrated.

Windows Easy Transfer does not migrate program files; instead, it copies the settings and preference files to the correct location on the new computer and uses those preferences when you install the program on the new computer. Registry settings and preference files for a long list of programs are copied automatically. (Click Customize and allow the mouse pointer to hover over the blue Information icon to see a list of which programs will have their settings migrated for the selected account.) Naturally, this list is heavy on Microsoft programs, but it also includes a lengthy list of third-party products. Here's the complete list of programs covered as of the initial release of Windows 7:

- Ad-aware 6 Professional
- Adobe Creative Suite 2
- Adobe Photoshop CS
- Adobe Photoshop CS 4
- Adobe Reader 9.0
- AOL Instant Messenger 5 and 6
- Corel Paintshop Pro 9
- Google Chrome
- Google Picasa 3
- Google Talk 1

- iTunes 6, 7, and 8
- Lotus Notes 6, 7 and 8
- Lotus SmartSuite
- Microsoft Office 2003 and 2007
- Microsoft Works 9.0
- Mozilla Firefox 3
- Opera 9
- Peachtree 2009
- Quicken Deluxe 2009
- QuickTime Player 5, 6 and 7
- RealPlayer Basic 11
- Safari 4
- Skype 3
- Windows Live Mail
- Windows Live Messenger
- Windows Live Photo Gallery
- Windows Live Writer
- WinZip (8, 9, or 10)
- WordPerfect Office X3
- Yahoo! Messenger
- Zune Software 3

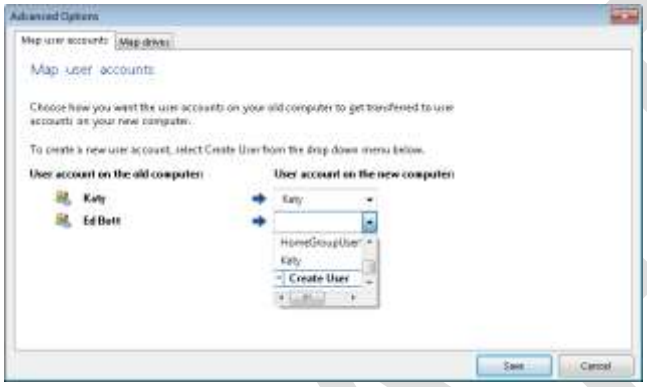
Restoring Files and Settings on Your New Computer

If you use a network or cable connection to transfer files between two computers with Windows Easy Transfer, you control both ends of the process. After you enter the correct security keys on each end, establish a connection, and specify which files and settings you want to copy to your new PC, click Transfer. When the operation is complete, you'll see a detailed status report on the new computer indicating which files and settings were transferred.

If you've saved the files and settings to a USB flash drive, an external hard disk, or a shared network drive, run Windows Easy Transfer on the new computer, specify that you're using

an external hard disk or USB flash drive, and click This Is My New Computer. Choose the location, enter a password (if you set one when saving the data), and click Next.

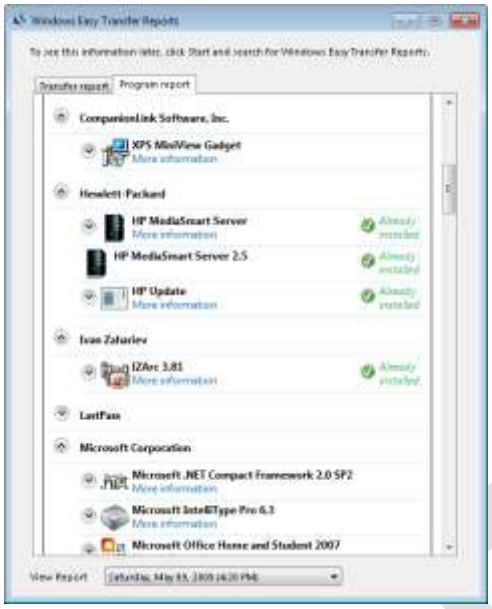
If the user names on the old and new computers are different, you have a choice to make. If you simply click Transfer, Windows will create a new account for each account that you saved that doesn't have a match on the new computer. If you want the settings from the old computer to go to a specific account on the new computer, click Advanced Options (at the bottom of the Choose What To Transfer To This Computer dialog box). That opens a dialog box like the one shown below. You can choose to match existing accounts or click Create User and type in a new name to create an account on the fly.



If you copied files from a secondary drive on the old computer and want those files to go on a drive with a different letter on the new PC, click the Map Drives tab and match the old and new drive letters. After completing both match-ups, click Next, and then click Transfer to complete the operation.

After the Windows Easy Transfer utility completes its restoration, it automatically displays a report of what it did. (You can call up this report later by clicking the Windows Easy Transfer Reports shortcut, which is also in All Programs, Accessories, System Tools.) Check for any errors, and correct them, if necessary.

Unfortunately, as we noted earlier, Windows Easy Transfer doesn't migrate installed programs. Instead, when the process completes, the Easy Transfer Report displays a list of programs that were installed on your old computer that you might need to reinstall on the new one.



If you chose to install some programs before running this step, you'll notice that some programs on the list are marked with a green check mark as Already Installed. The links under each entry in the list take you to the program developer's website, which typically includes the download link. You can leave this report window open, and it will update each entry in the list automatically as you complete it.

Tweaking and Tuning Your Windows Installation

Technically, Windows 7 setup is complete when you reach the desktop and log on for the first time. In the real world, there's still a short checklist of system settings you'll want (or need) to go through soon. Most of the items on the following list are one-time tasks that you'll set and forget. The list doesn't include performance tweaks or maintenance tasks that you perform occasionally, nor does it include personalization settings you might want to change over time. What all of these settings have in common is that they are per-machine settings, not per-user settings.

To learn how to adjust personal settings for your user account, *see Chapter 4, "Personalizing Windows Vista."*

Adjust Basic Display Settings

Your screen resolution determines how many pixels are available for Windows to use when displaying on-screen objects. Objects on the screen appear larger at lower resolutions and smaller when you switch to a higher resolution. If setup correctly detected the capabilities of your monitor and display adapter, your display should be set to the monitor's native resolution. To adjust resolution, right-click any empty space on the desktop and click Screen Resolution on the shortcut menu (or open Control Panel and click Adjust Screen Resolution, under Appearance And Personalization). The Display Settings dialog box that opens shows the full range of supported resolutions for your video adapter and display (as determined by Plug and Play). In Figure 2-10, for example,

you can move the Resolution slider to any of eight settings, ranging from 800 by 600 at the Low end of the scale to 1680 by 1050 at the High end.

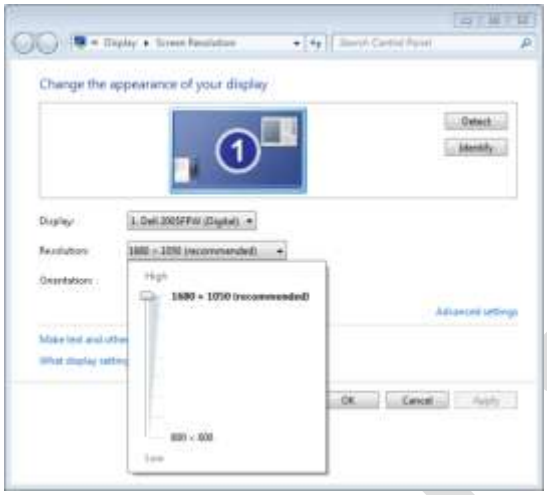


Figure 2-10 The (recommended) label appears alongside the setting for the native resolution of the current display.

On analog monitors, you can adjust the display to any resolution and get acceptable results. On flat-panel LCD displays, you'll get best results by setting this value to match the display's native resolution, which corresponds to the number of pixels on the display. If your video memory is extremely limited, you might need to choose a lower color depth to enable higher resolutions.

If you've connected multiple monitors, you can adjust display settings independently for each one. Click a monitor icon to select settings for that display

For instructions on how to adjust other display-related settings, including the DPI Scaling option that improves readability at high *resolutions, see "Making Text Easier to Read" on* page 4xx.

Update the Windows Experience Index

The Windows Experience Index (WEI) measures the performance of key subsystems of your PC, including the display adapter, memory, CPU, and hard disk. In Windows Vista, the individual benchmark tests that make up the WEI ran automatically at the end of setup, adding several minutes to the total installation time; in Windows 7, setup defers this task until you choose to run it manually. To fill in these scores and determine whether exch subsystem is performing as expected, open System Properties. In the place where the rating would normally appear, you should see a link reading "System rating is not available." Click that link to kick off the Windows System Assessment program and fill in the missing scores.

For a more detailed discussion of what the Windows Experience Index measures and how to interpret its findings, see "Using the Windows Experience Index".

Check Your System's Security

A default installation of Windows 7 includes basic security safeguards that protect your PC from a variety of threats—with one important exception. Windows 7 does not include antivirus software. If you've purchased a new PC with Windows 7 already installed, the PC maker might have included a full or trial version of a third-party antivirus program. You can use this software, or replace it with a package you prefer. To confirm whether you have antivirus software, open Action Center (it's at the top of the System and Security category in Control Panel) and look under the Security heading. The warning message shown in Figure 2-11 indicates that your system requires additional software for full protection.

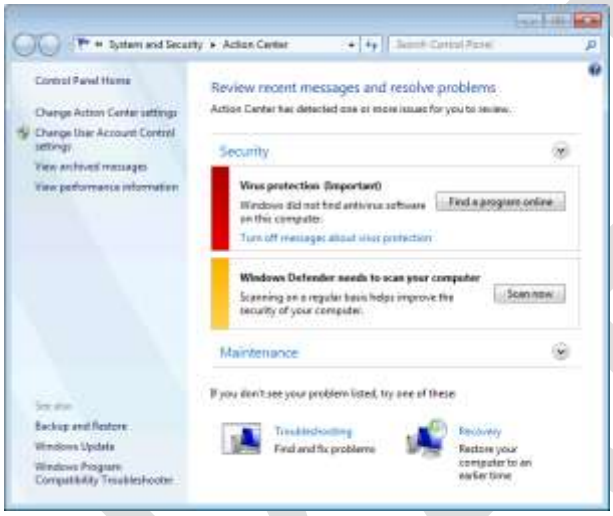


Figure 2-11 If you've chosen to use a third-party security program, make sure it reports its status accurately to Security Center.

If you've chosen to use a different program in place of any of the Windows default security features, you should check here after installing the other program to ensure that it's correctly reporting its coverage to Windows.

For details about how to view and adjust security settings, see *"Monitoring Security in* Windows 7."

Test Network and Internet Connections

Network And Sharing Center, available under the Network and Internet category in Control Panel, provides one-stop access to all networking settings. With most hardware, Windows 7 doesn't require any special setup to enable access to the Internet and to other computers on your network. To verify that your network is functioning properly, check the graphical display at the top of Network and Sharing Center. It should resemble the one shown here. If you see a red X between your Network icon and the Internet, click it to start the Network Troubleshooter.

This is also a good time to perform some functional tests. Can you access favorite web pages in your preferred browser? Can you open, save, and change files in shared network folders? The options elsewhere in Network and Sharing Center allow you to create, join, or leave a Homegroup, tweak adapter settings, fine-tune advanced file sharing, and perform other advanced tasks that might be appropriate for your network configuration.

For details about making network connections and working in Network And Sharing Center, *see Chapter 17, "Setting Up a Small Office or Home Network." For information about sharing files across your network, see Chapter 18, "Working with Network Resources."*

Adjust Windows Features

The basic feature set of Windows 7 is determined by the edition you install, and a standard installation makes all the features in your edition available without asking you (or allowing you, for that matter) to pick and choose. In addition to these core features, a small set of advanced and specialized features is available as well. To review the full list and enable or disable any of the features on it, open Programs in Control Panel and click Turn Windows Features On Or Off (under Programs And Features).

What happened to Windows Mail?

Unlike its predecessors, Windows 7 includes no default e-mail program, no instant-messaging program, no movie-editing software, and only rudimentary DVD-writing and photo-viewing applications. If you upgrade from a previous edition, your settings for Windows Mail, Windows Photo Gallery, and other programs that have been left out of Windows 7 will be preserved, but the programs themselves will be missing. You'll need to download and install the most recent versions of those programs separately from Windows Live (live.com). For details of what is included in the Windows Live family, see Chapter 7, "Adding Windows Live Programs and Services."

The Windows Features dialog box, shown in Figure 2-12, indicates which features are available for your edition. A check mark means the feature is currently enabled, and a blank box means the feature is disabled. If you see a filled box, the feature is partially enabled; click the plus sign to the left of the entry to see more details about it.

Figure 2-12 Some of the features in this list are familiar, but most involve esoteric networking options. Click any item in the list to see descriptive help text for that option.

You might be surprised to see that Windows 7 offers the ability to remove some features that were untouchable in previous edition: Internet Explorer 8, for example, along with Windows Media Center and Windows Media Player. Removing one or more of those options (as well as the default selection of games) might be appropriate on a PC intended for use in a business environment where you want to lock down access to potential distractions.

The Windows Features list might change over time as you add Windows components to your system. For example, if you install Windows Virtual PC, it is added to the list, allowing you to subsequently disable that feature if desired.

Choose Default Programs

One of the great strengths of the Windows platform is the staggering number of programs from which you can choose. Many of those options are designed to handle the same functions as programs included with Windows 7. For example, you might prefer Mozilla Firefox to Internet Explorer for daily web browsing, and fanatic iPod or iPhone owners will almost certainly prefer iTunes to Windows Media Player. If you prefer a third-party program (including programs in the Windows Live family) to one of those included by default with Windows 7, use the Default Programs dialog box to make your preference official.

To open Default Programs, click its link on the Start menu. As Figure 2-13 shows, you can adjust settings for each program that appears in this dialog box, setting the program to use all available defaults or adjusting them individually.

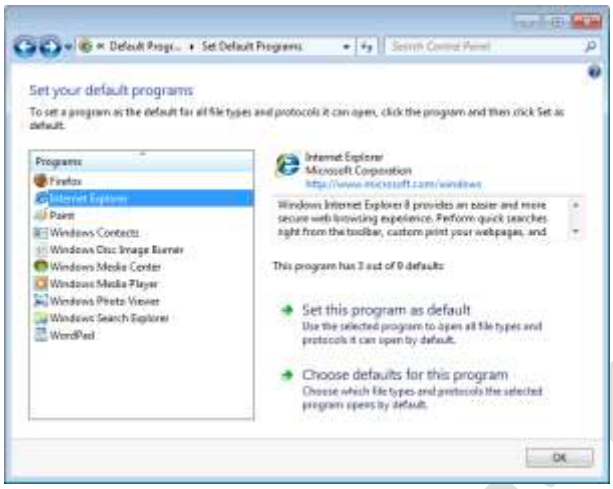


Figure 2-13 Use the top option to make this program the default for all file types it can handle; the bottom option allows you to adjust defaults individually.

Even if you've already used a function within your preferred program to set it as the default, it's worth a visit to this dialog box to see if another program has managed to hang on to the right to open one or more file types by default.

For a more detailed discussion of how programs and file types work together, see "Setting Default Programs, File Type Associations, and AutoPlay Options."

Personalize Power and Sleep Settings

If you install a retail version of Windows 7, the operating system sets default power-saving and sleep options based on the type of hardware you're using. On a PC that you purchase with Windows 7 already installed, the PC maker might set its own power and sleep defaults. In either case, you should check the current settings to ensure that they match your personal preferences. If necessary, you can adjust individual power settings or create a new power scheme. You'll find Power Options in Control Panel, under the Hardware and Sound category.

For more details about the ins and outs of power management, see "Setting Power and Sleep Options," page 4xx. For more on how to configure all system options that are specific to portable PCs, see Chapter 27, *"Using Windows 7 on a Notebook PC."*

Fine-tune System Protection Options

The System Protection feature is one that you probably won't appreciate until you have to use it, at which point you'll be very, very grateful to the anonymous programmer who dreamed it up. System Protection takes periodic snapshots of system files and configuration details, allowing you to run the System Restore utility to undo changes and roll back a system configuration to a time when it was known to work correctly. In Windows 7, those volume snapshots also include real-time backups of individual data files, allowing you to recover from unwanted edits or unexpected deletions by restoring a previous version of a deleted or changed file.

Those backed-up files and settings come at a cost in disk space, however. On a system where available storage is in short supply, you might want to reduce the amount of disk space set aside for System Protection. Figure 2-14 shows the settings dialog for a system volume approximately 140 GB in size. You can move the Max Usage slider to adjust disk space usage or use the options at the top to disable all or part of the System Protection feature on this drive.

Figure 2-14 Use these settings to restrict the amount of space that Windows 7 uses for System Restore snapshots and previous versions of files.

For *more details on how to choose the right settings for System Protection, see "Configuring* System Recovery Options."

Create Additional User Accounts

If you anticipate that your computer will be used by more than one person, set up an account for each additional user now. Creating standard accounts for users ensures that they won't be able to install malware or incapatible software and will be unable to install unsigned device drivers that can cause system instability. They'll also be blocked from deleting essential system files.

For details on how to create and manage user accounts in Windows Vista, see "Working with User Accounts.".

Set Up a Regular Backup Schedule

When you've finished with setup and tweaked basic system settings to match your preferences, it's a perfect time to set up a regular backup schedule. The first step, of course, should be to back up your newly installed and properly tweaked and tuned system by creating a system image. This option is available as part of the built-in Complete PC Backup feature in all retail editions of Windows 7. (If you prefer, you can choose from a multitude of third-party products that offer similar backup features.) After the image is complete, be sure to create a system repair disk so that you can restore the backed-up image easily in the event of a disk failure or other problem.

For a full discussion of the many backup options available in Windows 7, *see "*Using the Windows Backup Program.".