

CHAPTER
2

Installing and Maintaining Windows 10

**After completing
this chapter, you
will be able to:**

- Plan a Windows installation, install Windows 10, configure Windows settings after the installation, and troubleshoot a failed installation
- Install Windows 10 on a virtual machine
- Maintain Windows 10, including managing updates and keeping regular backups

Learning to support a new OS often starts with learning how to install it. In this chapter, you'll become familiar with the editions of Windows 10. Next, you'll learn how to install Windows 10 as an upgrade, clean install, and in a virtual machine using Client Hyper-V. You'll also learn what to do after an installation, how to update to the latest available Windows update, and how to troubleshoot an installation.

In the last part of the chapter, you learn how to maintain Windows 10, including managing updates and backing up data and system files.



Notes

Labs to accompany this chapter can be found in Appendix B at the end of this text.



Notes

The first part of this chapter is written to follow Chapter 8 in *A+ Guide to IT Technical Support*, ninth edition, or Chapter 2 in *A+ Guide to Software*, ninth edition. The last part of the chapter is written to follow Chapters 10, 13, 18, and 20 in *A+ Guide to IT Technical Support*, ninth edition, or Chapters 3, 6, 10, and 11 in *A+ Guide to Software*, ninth edition.



Notes

The instructions in this chapter assume that you are using a mouse and keyboard. If you're using a touch screen, simply tap instead of click; press and hold instead of right-click; double-tap instead of double-click; and swipe to scroll the screen to the right or left.

INSTALLING WINDOWS 10

Microsoft categorizes Windows installations according to the amount of manual configuration required:

- ▲ **High-touch.** Entirely manual, primarily intended for small organizations without a full-time IT staff.
- ▲ **Light-touch.** Some interaction at the beginning, with the rest of the installation completely automated.
- ▲ **Zero-touch.** Completely automated.

This chapter focuses on manual installations done by a technician working at the desktop, using media purchased through a retail outlet. This type of installation is called a high-touch with retail media installation. If you need to know about other types of installations, including creating and using a standard image, using a distribution share, and high-volume deployments of Windows 10, see the deployment guide by Microsoft at technet.microsoft.com/en-us/itpro/windows/deploy.



Notes The most recent major update to Windows 10 at the writing of this text is the Creators Update, initially released to the public in April 2017. The figures and steps in this text use Windows 10 Pro with the Creators Update and show screens available to an administrative user account. If you are using a different edition of Windows 10, your screens and steps might differ slightly from those presented here. If you're signed in as a standard user and you don't see the option to perform a task as directed, try signing in with an administrative account.

To find out which Windows 10 edition and version you are using, in the Settings app, open the **System** group and click **About**. In Figure 2-1, the About group shows Windows 10 Pro is installed. Version 1703 tells us the Creators Update is installed. The number 1703 is the year and month the version was created.

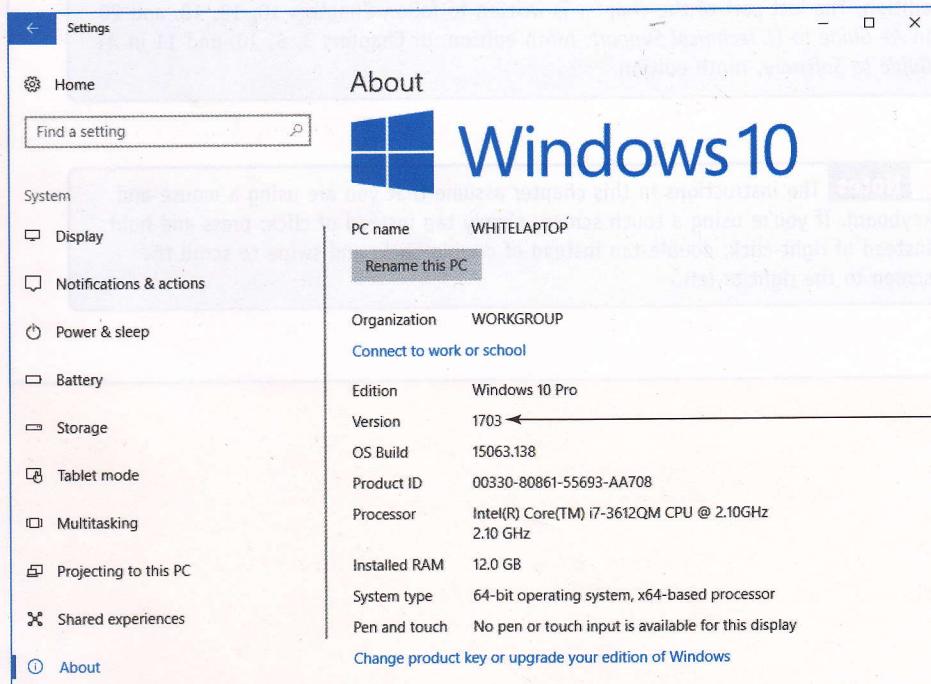


Figure 2-1 Windows 10 Pro system with Creators Update installed

HOW TO PLAN A WINDOWS 10 INSTALLATION

You'll need to make many decisions before installing Windows 10, and most of them apply to any Windows operating system. In this part of the chapter, you learn about your options when purchasing Windows and how to make sure your computer qualifies for the version and edition you've selected.

CHOOSE THE EDITION, LICENSE, AND VERSION OF WINDOWS

First you need to decide on a Windows edition and type of license, both of which will determine the price. You also need to decide between 32-bit and 64-bit architecture. Finally, if you are upgrading from Windows 8 or Windows 7 to Windows 10, you need to make sure you upgrade to the appropriate version of Windows 10 as shown in Table 2-1. To upgrade to Windows 10, you must be running the latest version of either Windows 8.1 or Windows 7 SP1. Note that you cannot upgrade Windows Vista to Windows 10.

Windows 8		Windows 7	
From	To	From	To
Windows 8.1	Windows 10 Home	Windows 7 Starter	
Windows 8.1 Pro	Windows 10 Pro	Windows 7 Home Basic	Windows 10 Home
Windows 8.1 Pro for Students		Windows 7 Home Premium	
Windows Phone 8.1	Windows 10 Mobile	Windows 7 Professional	
		Windows 7 Ultimate	Windows 10 Pro

Table 2-1 Windows 10 upgrade paths

Microsoft made an unprecedented offer of a free Windows 10 upgrade, as long as the upgrade was completed in 2016. Now that the deadline has passed, an upgrade license for Windows 10 or Windows 10 Pro costs the same as a license for a new installation.

VERIFY YOUR SYSTEM QUALIFIES FOR WINDOWS

Here are the minimum hardware requirements needed to install and run Windows 10:

- ▲ **Processor.** 1 GHz or faster processor or SoC
- ▲ **Memory.** 1 GB for 32-bit OS or 2 GB for 64-bit OS
- ▲ **Hard disk free space.** 16 GB for 32-bit OS or 20 GB for 64-bit OS
- ▲ **Video card or onboard graphics.** Must support DirectX 9 or later with WDDM 1.0 or higher driver

Notes An **SoC (System on a Chip)** is a fully contained microcomputer on a single complex circuit board. Most smart phones and tablets use SoC technology.

Microsoft does not provide a Windows 10 Upgrade Assistant as was available for Windows 8. Microsoft also retired the Windows Compatibility Center in Windows 10.

Instead, you now learn about any incompatible applications during the installation, when you are notified that such applications will be removed.



Notes When upgrading Windows Phone 8.1 to Windows 10 Mobile, start by downloading the Windows 10 Mobile Upgrade Advisor from the Microsoft store, which is available for free. Run the app to check whether your device can handle the new Windows Mobile OS.

CHOOSE IN-PLACE UPGRADE OR CLEAN INSTALL

If you are installing Windows on a new hard drive, you must perform a clean install, which, in the Windows setup program, is called a custom installation. If an OS is already installed on the hard drive, you have two choices:

- ▲ **Clean install.** A clean install overwrites the existing operating system and applications. The main advantage of a clean install is that problems with the old OS are not carried forward, giving it a clean new start. During the installation, you will have the option to format the hard drive, erasing everything on the drive. If you don't format the drive, the data will remain on the drive. The previous operating system settings and user profiles are collectively stored in the Windows.old folder, which is created by the setup program on the hard drive. After Windows is installed, you will need to install the applications. After you're sure the new installation is working as expected, you can delete the Windows.old folder to save space on the drive. Windows 10 automatically deletes most of the content of this folder 28 days after the installation.
- ▲ **In-place upgrade.** In an in-place upgrade, all user settings and preferences and installed applications that are compatible with Windows 10 carry forward into the new OS. You can perform an in-place upgrade from Windows 8/7 to Windows 10 if the current installation is healthy.

If your system is giving errors or is especially sluggish, it's probably best to perform a clean install. On the other hand, an in-place upgrade works well on a healthy system because it's faster—you don't need to reinstall applications, and data and user settings stay intact.

VERIFY YOU HAVE THE WINDOWS 10 PRODUCT KEY AND SETUP FILES

Typically, you'll purchase Windows 10 online, with the product key emailed to the Microsoft account used to make the purchase. If you purchased Windows 10 on flash drive or DVD, look for the product key printed on the cover of the Windows setup DVD, on a card inside the flash drive or DVD case, or affixed to the back of the Windows documentation booklet.

If you are reinstalling Windows on an existing system and you can't find the product key documentation, you can download and run freeware that will reveal the key. For example, try Magical Jelly Bean freeware at magicaljellybean.com/keyfinder.

However, keep in mind that the product key might not be required to reinstall Windows. After Windows 10 is activated the first time with a valid product key, Windows assigns a **digital license** to the machine and stores it along with information about the computer's physical hardware (called the **hardware signature**) on Microsoft activation servers. If Windows is installed later, it can retrieve this information from Microsoft servers rather than requesting that you reenter the product key.

In addition, for a laptop, all-in-one, or other brand-name computer, the computer manufacturer might have stored the Windows product key on motherboard firmware. When

reinstalling Windows, setup can retrieve this product key from firmware. Either way, the new Windows installation is assigned a digital license and you don't have to enter the product key during the installation.

Notes

To determine if Windows was activated using a product key or digital license, in the Settings app, click **Update & security**, and click **Activation** (see Figure 2-2).

2

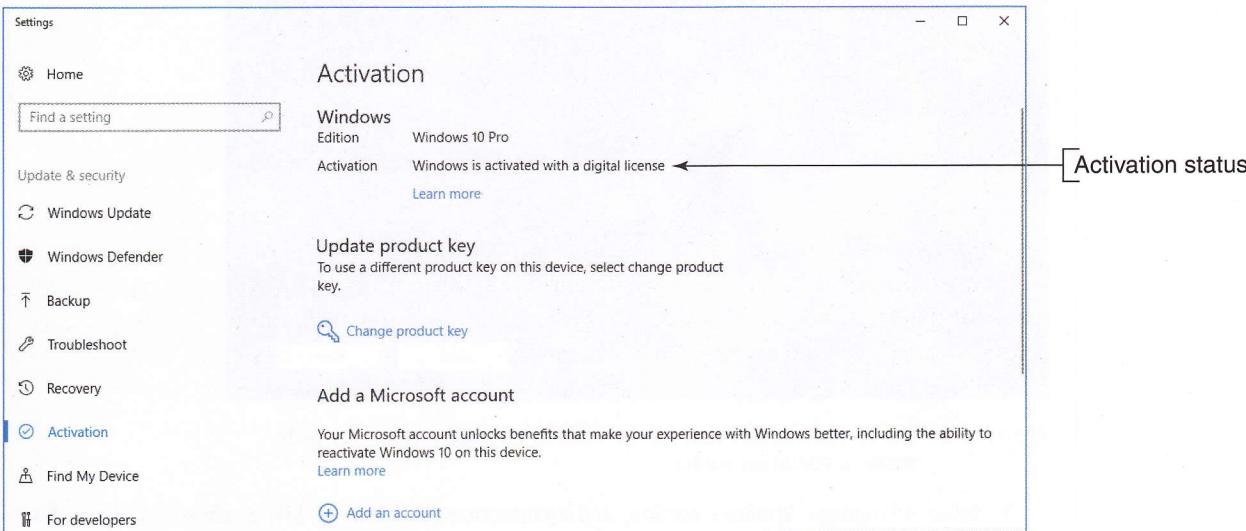


Figure 2-2 This installation of Windows has activated using a digital license stored on Microsoft activation servers

>> HANDS-ON PROJECT

PROJECT 2-1: Create an ISO File for Windows Setup

Use the Media Creation Tool to download Windows 10 setup. Save the setup files as an ISO file. Later in this chapter, you will use the ISO file to install Windows in a virtual machine.

APPLYING CONCEPTS

USE THE MEDIA CREATION TOOL TO CREATE A BOOTABLE WINDOWS SETUP DVD OR FLASH DRIVE

If you don't have the setup files handy, you can use the [Media Creation Tool](#) to create a bootable DVD or USB flash drive that contains Windows setup. To download the tool and setup files and create the media, follow these steps:

1. To create the installation media, you'll need a flash drive, DVD, or external drive with at least 4 GB of free space. Use a blank flash drive or DVD because any data on it will be lost. On a working computer, go to the website microsoft.com/en-us/software-download/windows10 and click **Download tool now**. Save the file and then run **MediaCreationTool.exe**.
2. Accept the license terms. On the next window as shown in Figure 2-3, select **Create installation media (USB flash drive, DVD, or ISO file)** for another PC and click **Next**.

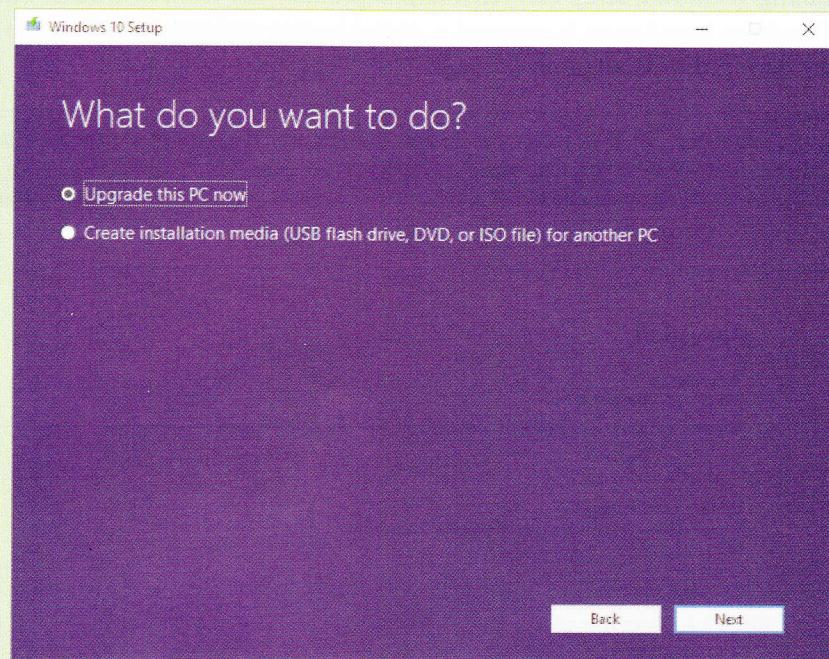


Figure 2-3 The Media Creation Tool can be used to upgrade a computer or to create installation media

3. Select a language, Windows edition, and architecture (64-bit or 32-bit) as shown in Figure 2-4. Alternatively, if you're creating installation media as a troubleshooting tool for the computer you're using, check **Use the recommended options for this PC**. Click **Next**. Select USB flash drive or ISO file to burn to a DVD later, and follow on-screen instructions. If you chose to save an ISO file, you will be given the opportunity to insert a DVD in the disk drive, right-click the ISO file, and click **Burn disc image**.

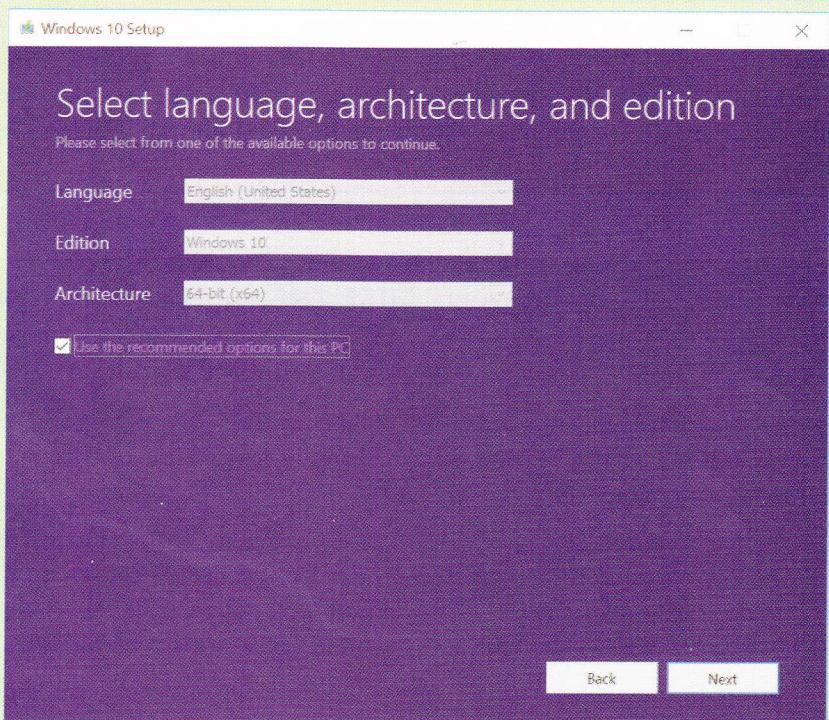


Figure 2-4 Installation media is bit specific: Choose 32-bit for a 32-bit computer and 64-bit for a 64-bit computer

Notes

An ISO file is an image of the contents of a DVD disc. You can mount an ISO file to a virtual DVD drive in a virtual machine and use it in the VM as you would a physical DVD installed in a physical computer. You'll learn how to do this later in the chapter.

Later in the chapter, you learn how to use the installation media to install Windows 10 on a computer. Recall that to boot from a flash drive or DVD, you might need to change the boot order in UEFI/BIOS.

FINAL CHECKLIST BEFORE BEGINNING THE INSTALLATION

Before you begin the installation, complete the final checklist shown in Table 2-2 to verify you are ready.

Question to Answer	Further Information
Does the computer meet the minimum or recommended hardware requirement?	CPU: RAM: Hard drive partition size: Free space on the partition:
Do you have in hand the Windows device drivers for your hardware devices and application setup files?	List hardware and software that need to be upgraded:
Do you have the product key available? (The product key might not be required if you are reinstalling Windows 10.)	Product key:
How will users be recognized on the network?	Homegroup password: Workgroup name: Domain name: Computer name: Network ID: Network password:
How will the computer be recognized on the network?	Static or dynamic IP addressing: IP address (for static addressing):
Will you do an upgrade or clean install?	Current operating system: Does the old OS qualify for an upgrade?
For a clean install, will you set up a multiboot?	List reason for a multiboot: Size of the second partition: Free space on the second partition:
Have you backed up important data on your hard drive?	Location of backup:

Table 2-2 Checklist before installing Windows 10

STEPS TO INSTALL WINDOWS 10

As you install and configure software, be sure to document your actions. This documentation will be helpful for future maintenance and troubleshooting. Let's begin with how to perform an in-place upgrade of Windows 10.

PERFORM A WINDOWS 10 IN-PLACE UPGRADE

The Windows 10 upgrade retail package comes with 32-bit and 64-bit options. The product key is found in a slip pocket inside the box or included in the emailed receipt. Here are the steps to perform an in-place upgrade from Windows 8.1 to Windows 10 when you're working with a Windows 10 Setup DVD, USB flash drive, or ISO file:

1. As with any upgrade installation, before you start the upgrade, do the following:
 - ▲ Scan the system for malware using an updated version of anti-malware software. When you're done, be sure to close the anti-malware application so it's not running in the background.
 - ▲ Uninstall any applications or device drivers you don't intend to use in the new installation.
 - ▲ Make sure your backups of important data are up to date and then close any backup software running in the background.
2. Insert the Windows 10 setup DVD or flash drive or make sure the setup ISO file is mounted. Open File Explorer and double-click the setup.exe program in the root of the device or in the ISO file. (For a DVD, the setup program might start automatically.) Respond to the UAC box. The setup program loads files, examines the system, and reports any problems it finds. If it finds the system meets minimum hardware requirements, setup asks permission to go online for updates (see Figure 2-5). Make your selection and click Next.

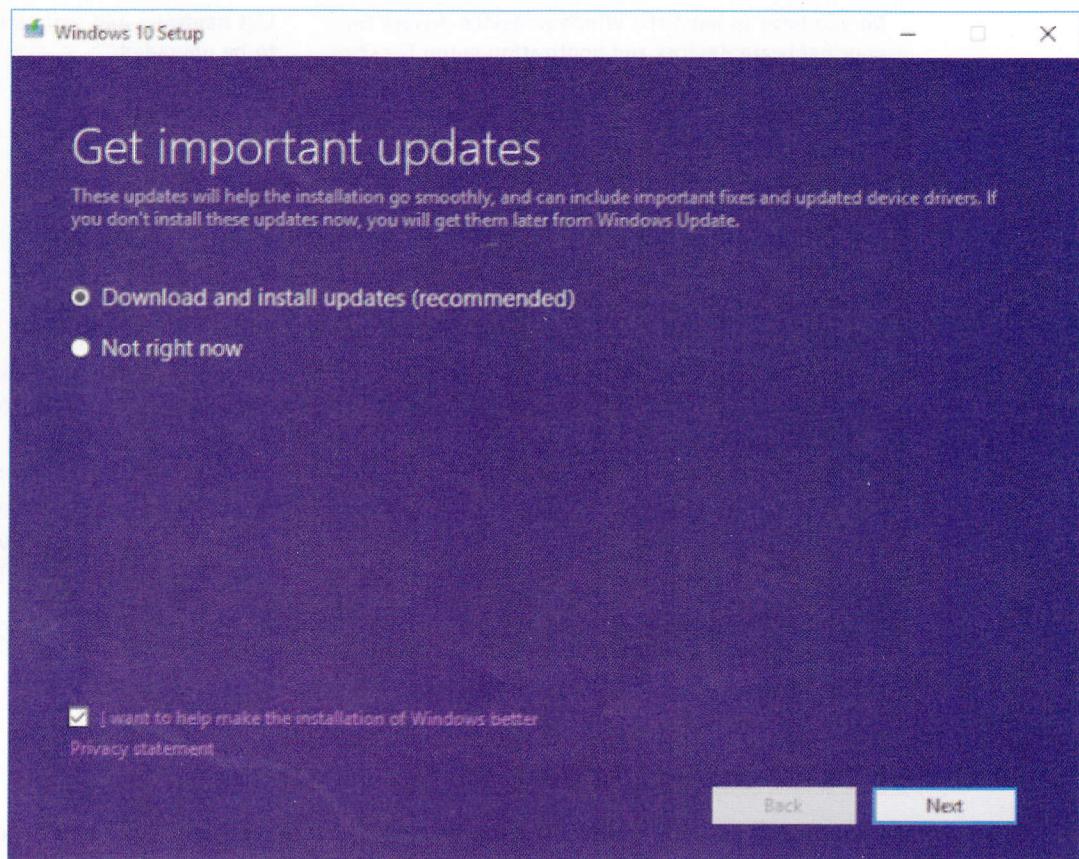


Figure 2-5 Decide how you will handle updates to the setup process

3. The next window requests the product key (see Figure 2-6). Enter the product key and Windows verifies the key is a valid key. If the computer is connected to the Internet, setup will automatically activate Windows during the installation. Click Next.

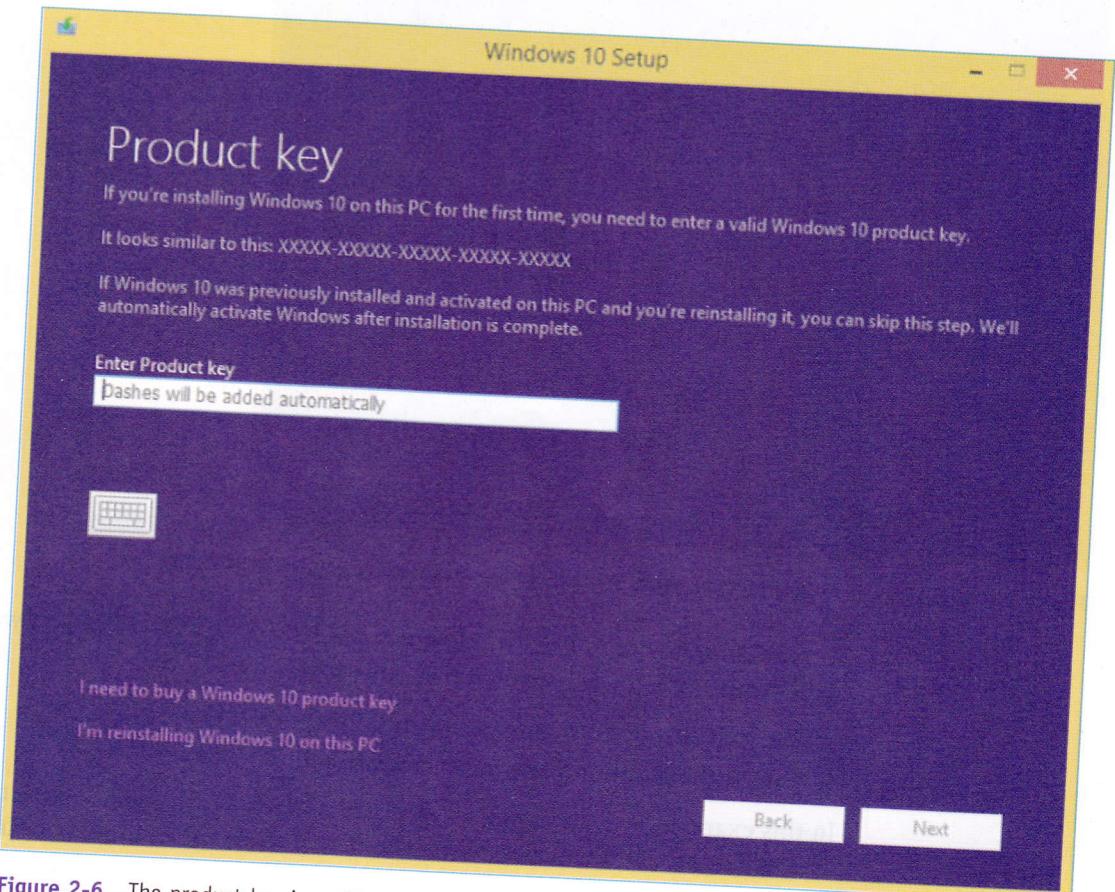


Figure 2-6 The product key is verified as a valid key during the setup process



Notes If you prefer to validate Windows 10 after installing, you can click **I'm reinstalling Windows 10 on this PC**, which allows you to proceed without a product key and install Windows 10 not yet activated.

4. The *License terms* window appears. Click **Accept**.
5. Wait for updates to download, and then, in the *Ready to install* window, verify **Keep personal files and apps** is selected. To specify what you want to retain from the previous installation, click **Change what to keep** (see Figure 2-7).

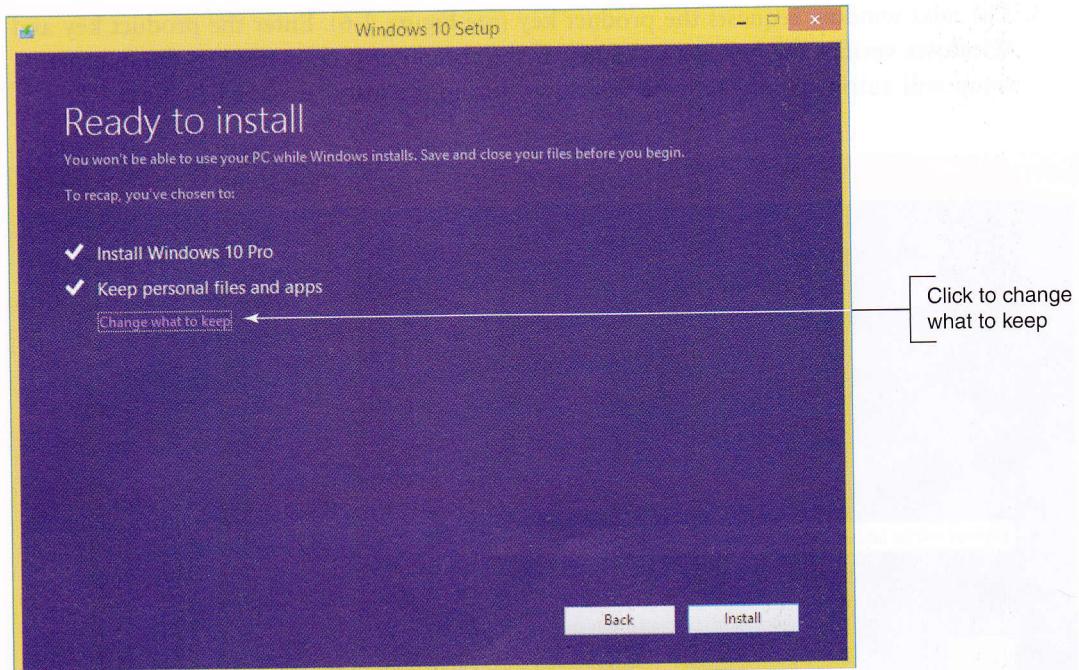


Figure 2-7 Windows is ready to install as an upgrade, but you can still change what to keep

6. In the *Choose what to keep* window (see Figure 2-8), decide what you want to do with Windows settings, personal files, and apps:

- ▲ The first two options perform upgrades to Windows 10.
- ▲ The Nothing option performs a clean install of Windows 10.

In this example, you are doing an in-place upgrade installation, so select **Keep personal files and apps**, and then click **Next**. The *Ready to install* window appears again.

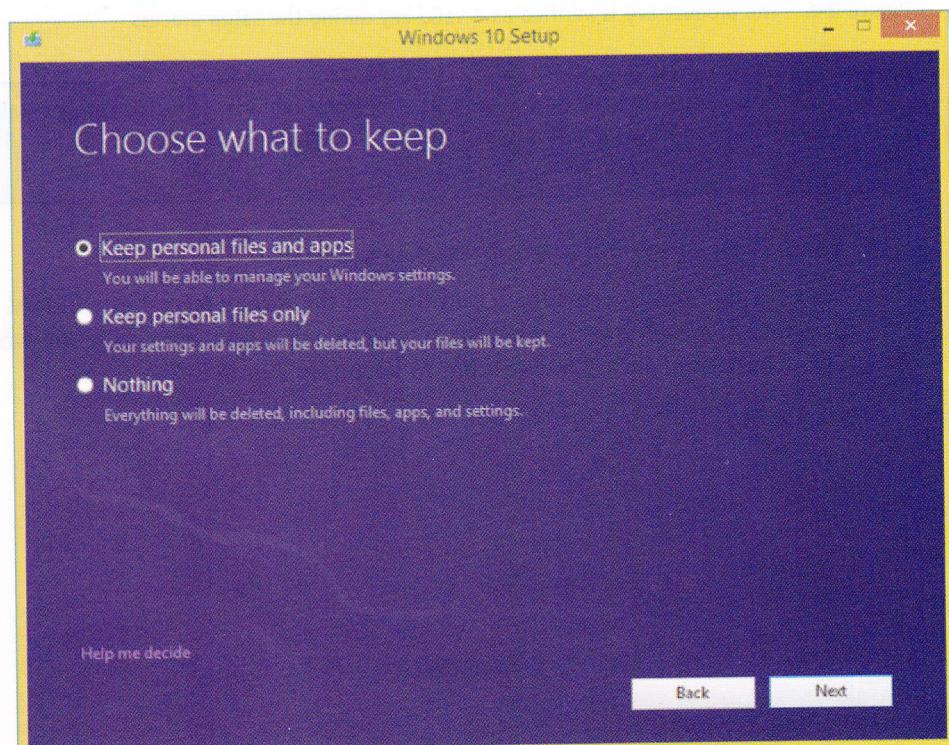


Figure 2-8 Decide what to keep of the old installation

7. On the *Ready to install* window, verify the choices listed and click **Install** to begin the installation.
8. During the installation, setup might restart the system several times. When the *Welcome to Windows 10!* screen appears showing your user name, click **Next**.
9. On the *Choose privacy settings for your device* screen (see Figure 2-9), select the privacy settings for location, speech recognition, diagnostics, tailored experiences with diagnostic data, and relevant ads, and then click **Accept**.

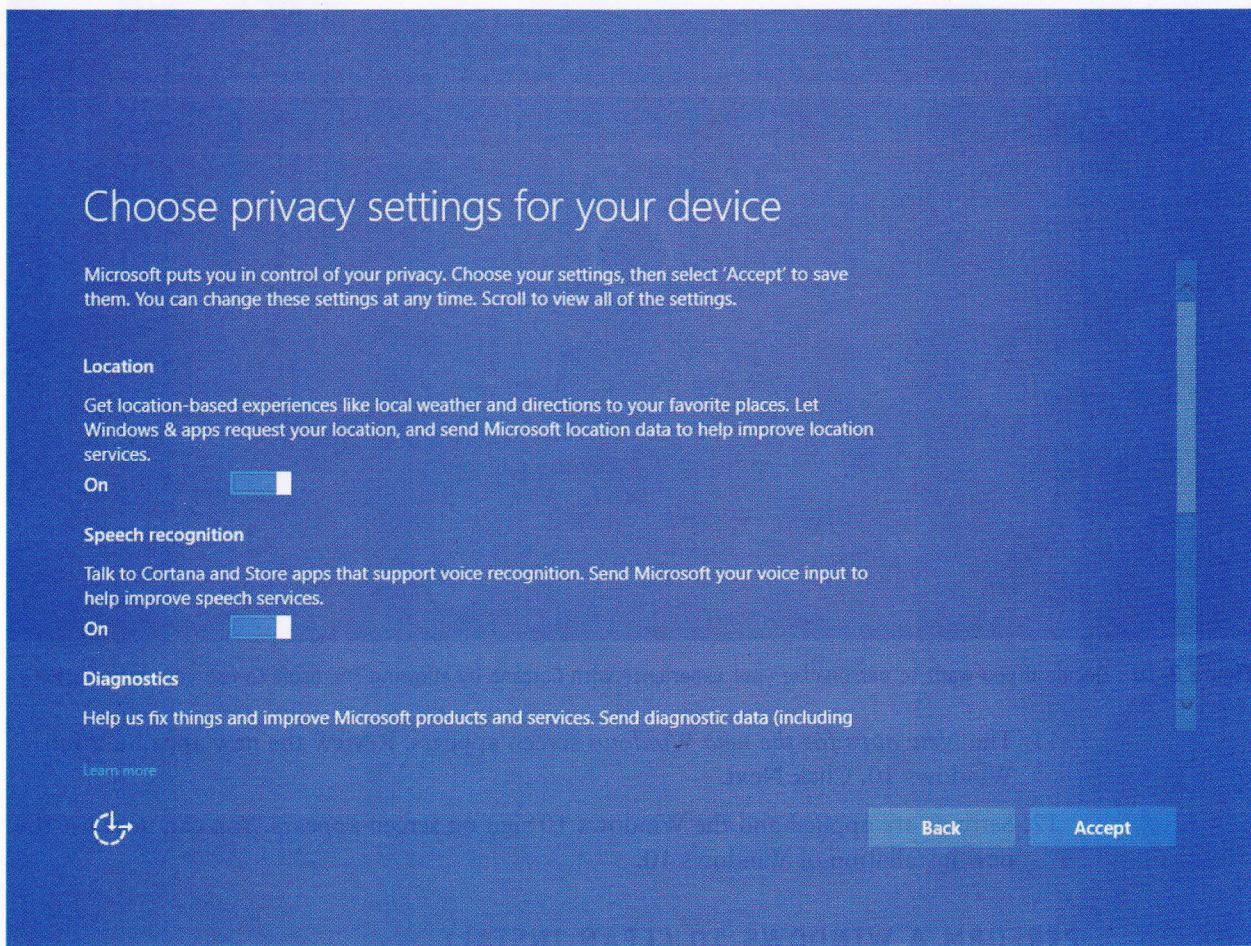


Figure 2-9 Choose privacy settings to decide how Microsoft will use your information

Notes You might need to scroll down to view all the privacy settings on this screen.

10. On the *Meet Cortana* screen, you can decide to give Microsoft permission to use your information to personalize your experience with Cortana (see Figure 2-10). To read more about the type of information Microsoft collects for Cortana, click **Learn more**. Click **Not now** or **Use Cortana** to move to the next screen.

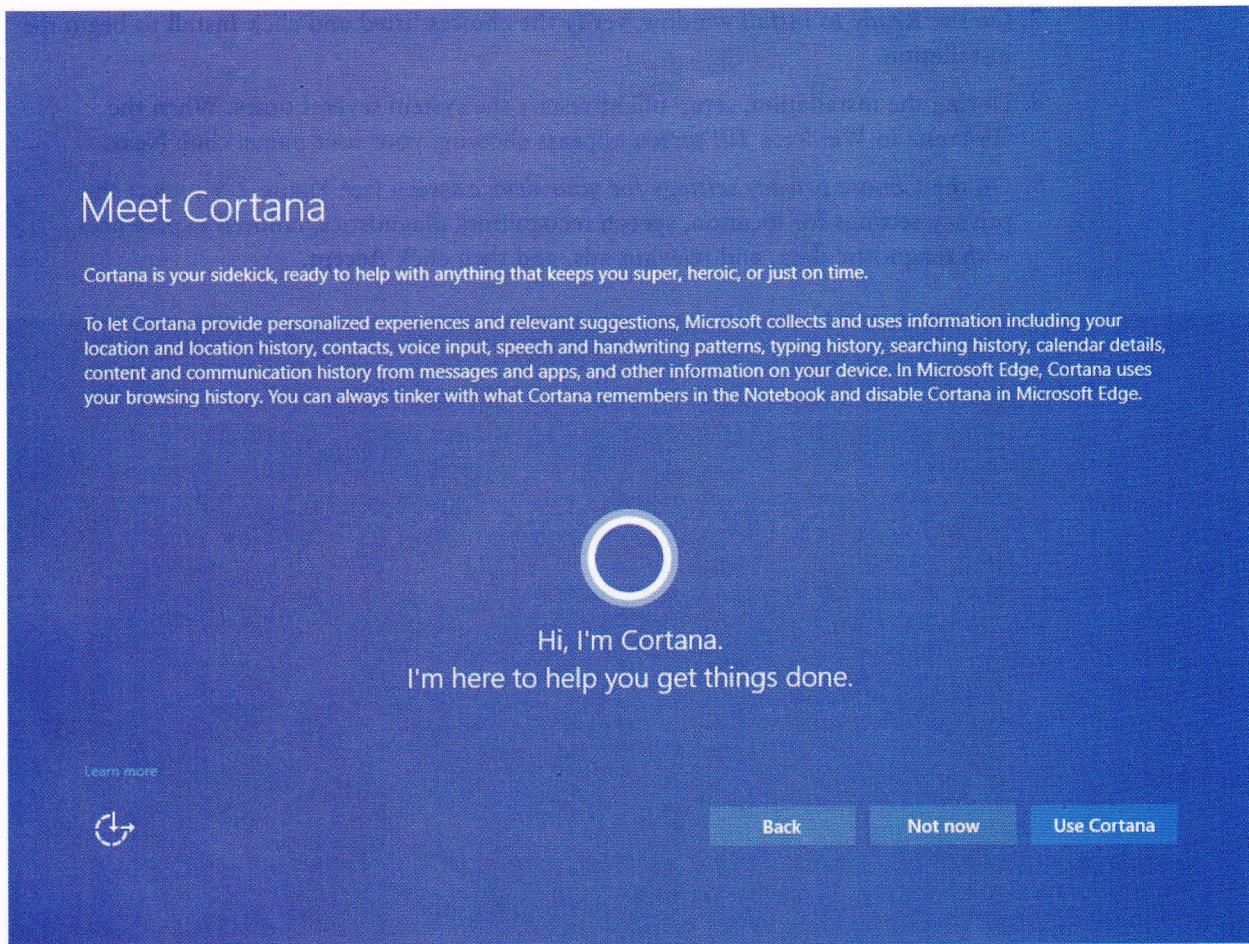


Figure 2-10 Decide if you want to personalize your experience with Cortana by allowing Microsoft to use your information

11. The *New apps for the new Windows* screen appears. Review the new apps built into Windows 10. Click **Next**.
12. Settings are applied and the Windows 10 sign on screen appears. You can now use the new installation of Windows 10.

PERFORM A WINDOWS 10 CLEAN INSTALL

Recall that a clean install is the best option to use if the current installation is sluggish or causing problems, the currently installed OS does not allow for an in-place upgrade, or you're installing Windows 10 on a new hard drive or new desktop computer you're building.

If you have a Windows 8/7 installation that qualifies for a Windows 10 upgrade and you need to do a clean install, follow these steps:

1. Begin by starting the installation from the Windows desktop as you would for an upgrade.
2. Follow the steps for an in-place upgrade to enter the product key, accept license terms, and download updates.
3. When you get to the *Ready to install* window (refer back to Figure 2-7), click **Change what to keep**.

4. On the *Choose what to keep* window (refer back to Figure 2-8), click **Nothing** and click **Next**. Then continue with the installation. The contents of the volume holding the previous version of Windows is deleted. If the hard drive has other volumes, these volumes are left unchanged.

Here are the steps to perform a clean install on a computer that has a corrupted Windows installation that refuses to start, on a newly installed hard drive, or on a new computer you're building:

1. Boot from the Windows setup DVD or USB flash drive. In the Windows Setup screen (see Figure 2-11), select the language and regional preferences and click **Next**. On the next screen, click **Install now**.

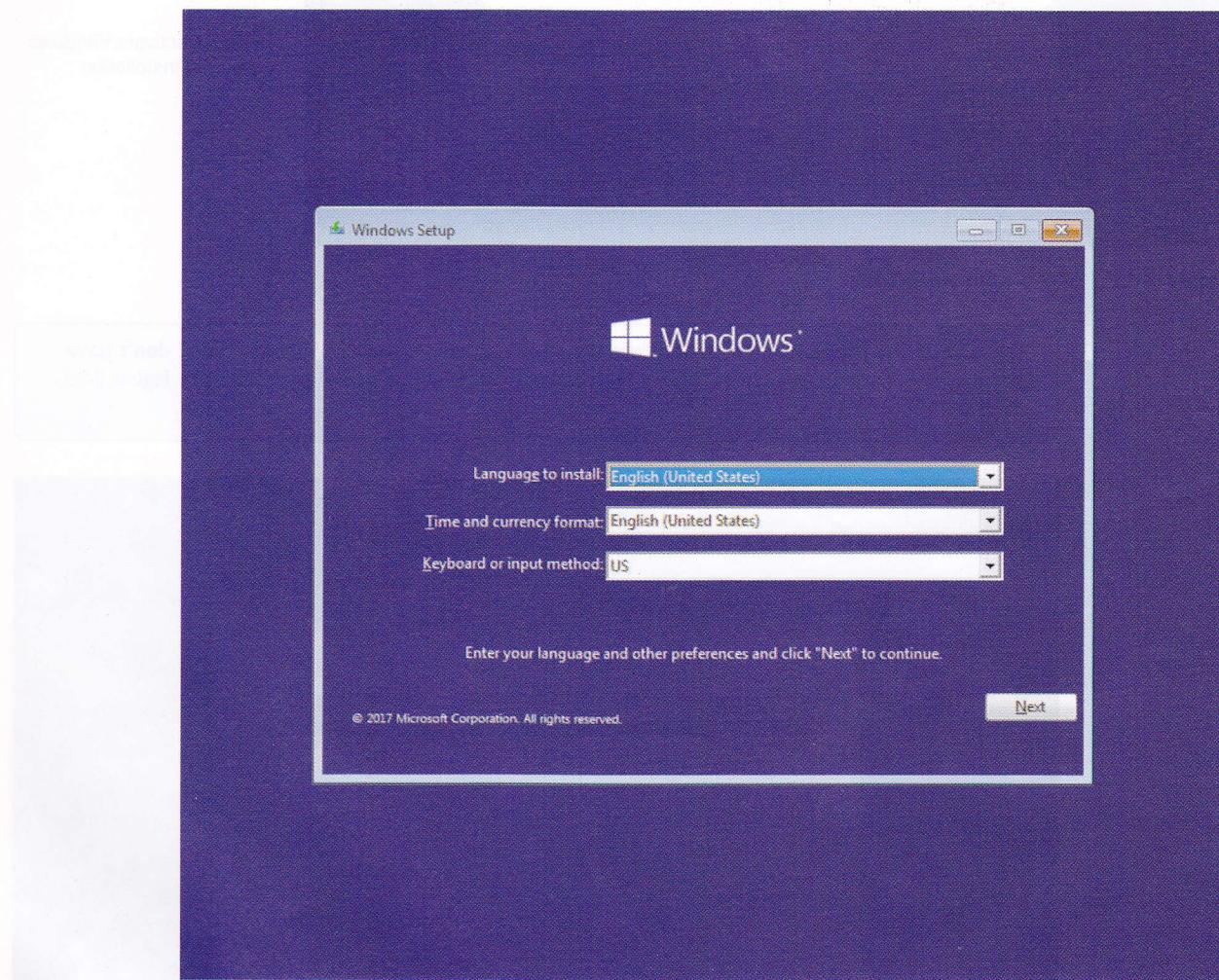


Figure 2-11 Decide on language and keyboard preferences

2. Enter your product key on the next screen (see Figure 2-12). Click **Next**. Setup verifies the key is a valid product key, which then determines the version of Windows to install.

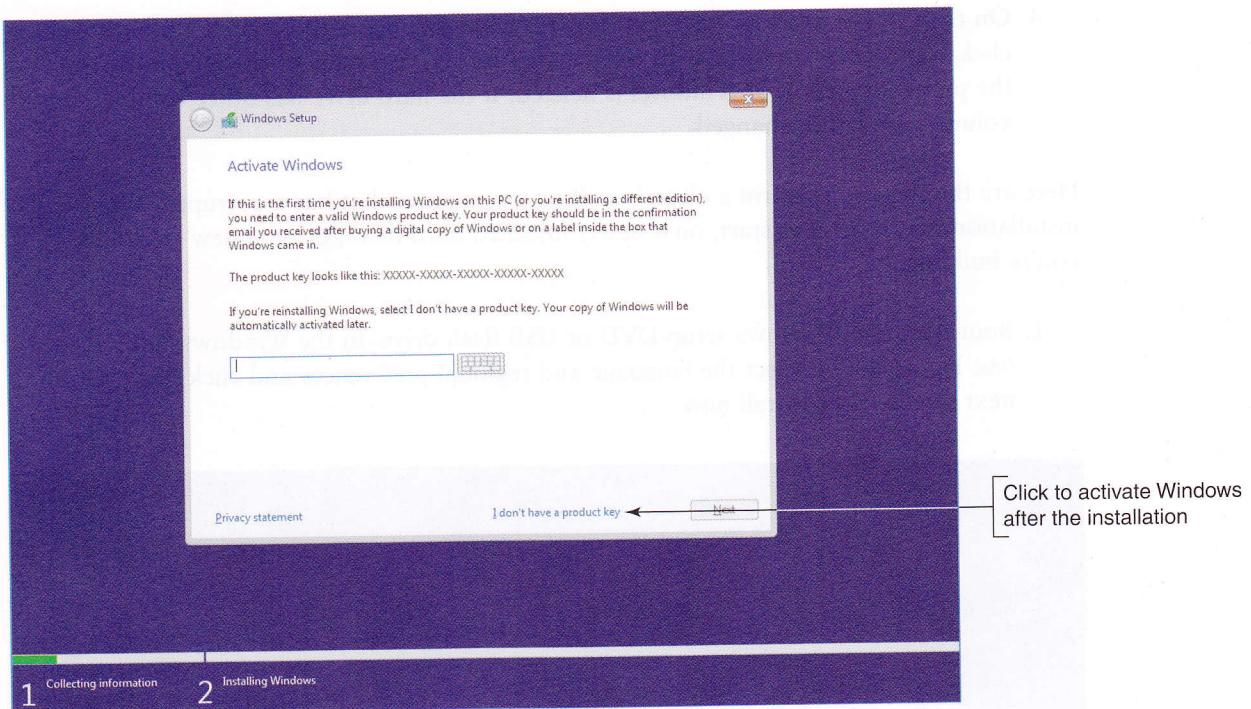


Figure 2-12 Enter a valid product key

Notes If you prefer to enter the product key after you have installed Windows, click **I don't have a product key**. On the next screen, select the version of Windows you want to install (see Figure 2-13). Click **Next**.

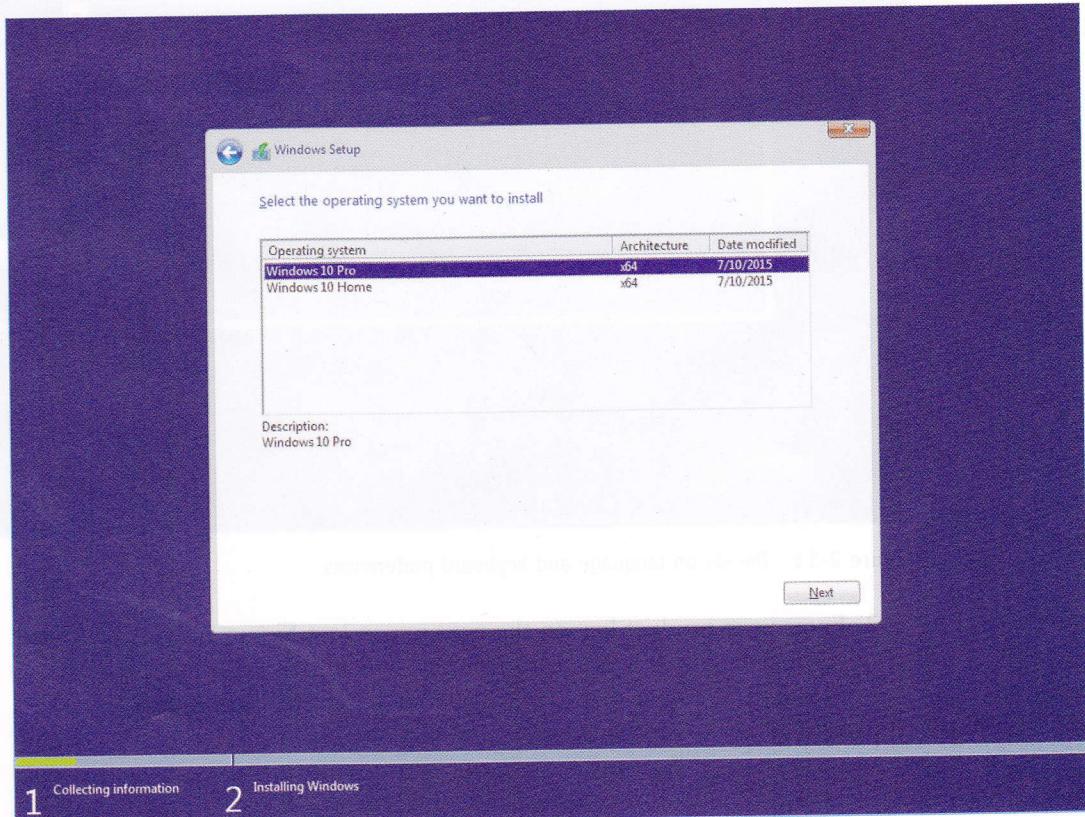


Figure 2-13 Decide which edition of Windows you want to install

3. Accept the license agreement on the next screen, and click Next. On the next screen (see Figure 2-14), click Custom: Install Windows only (advanced).

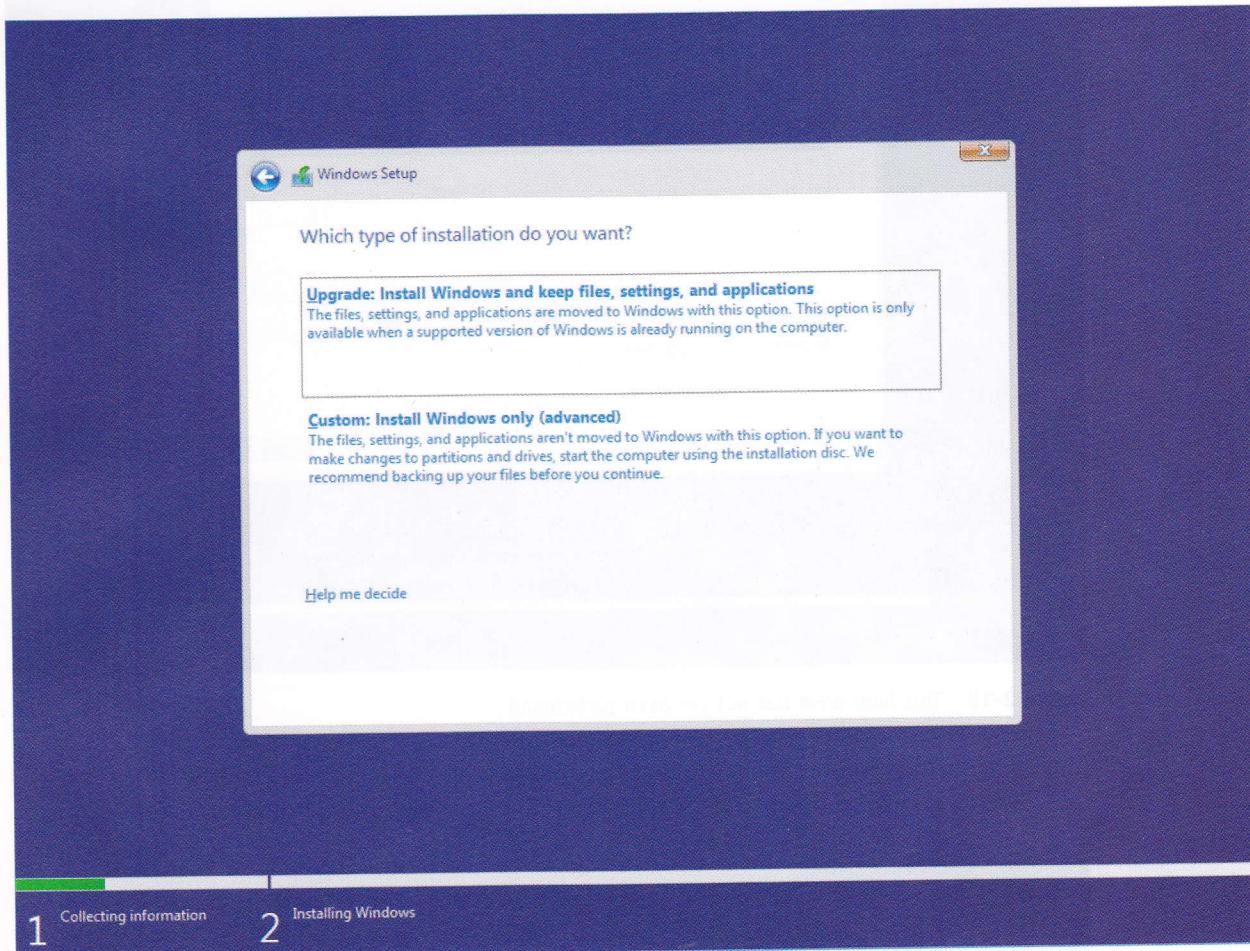


Figure 2-14 Decide between an upgrade and a clean install

4. The *Where do you want to install Windows?* screen appears. Select the drive and volume where you want to install Windows. Figure 2-15 shows the screen that appears for a new hard drive that has not been partitioned. By default, setup will use the entire unallocated space for the Windows volume. If you want to use only a portion of the space, click New and enter the size of the volume. (Setup will also create a small system partition that it later uses for system files and the startup process.) Click Next to continue.

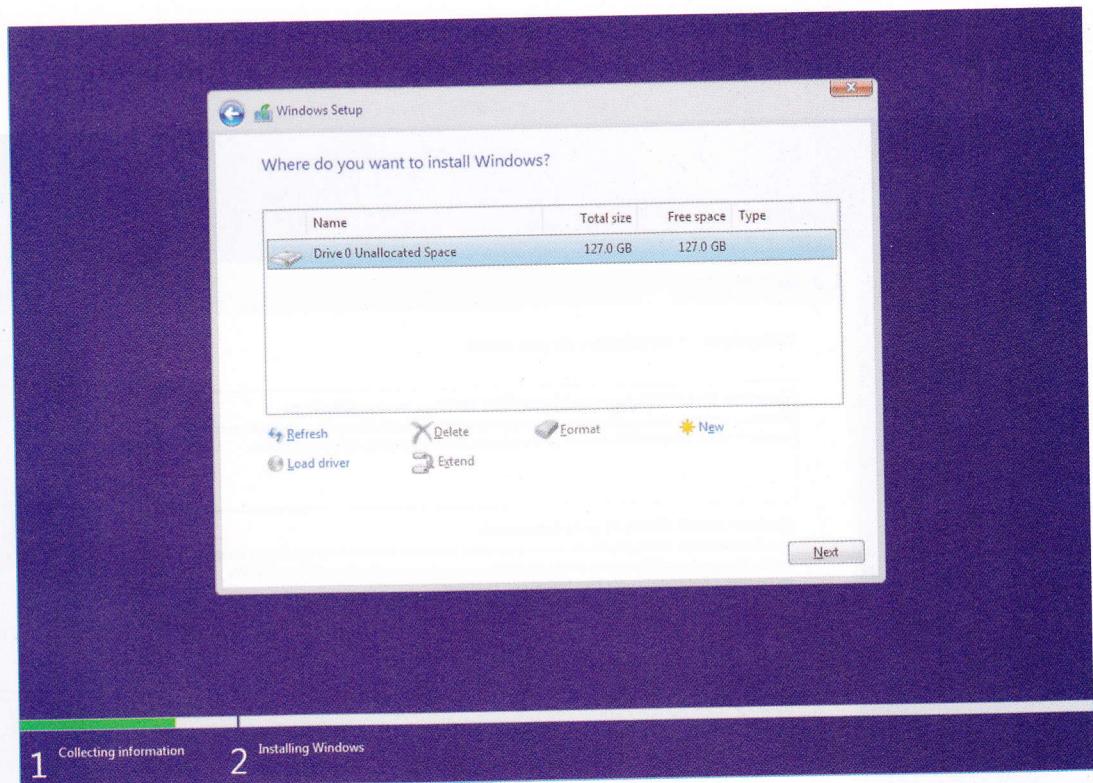


Figure 2-15 This hard drive has not yet been partitioned

5. The installation begins. Note that the system might restart several times. When the screen shown in Figure 2-16 appears, choose your region, and then click Yes.

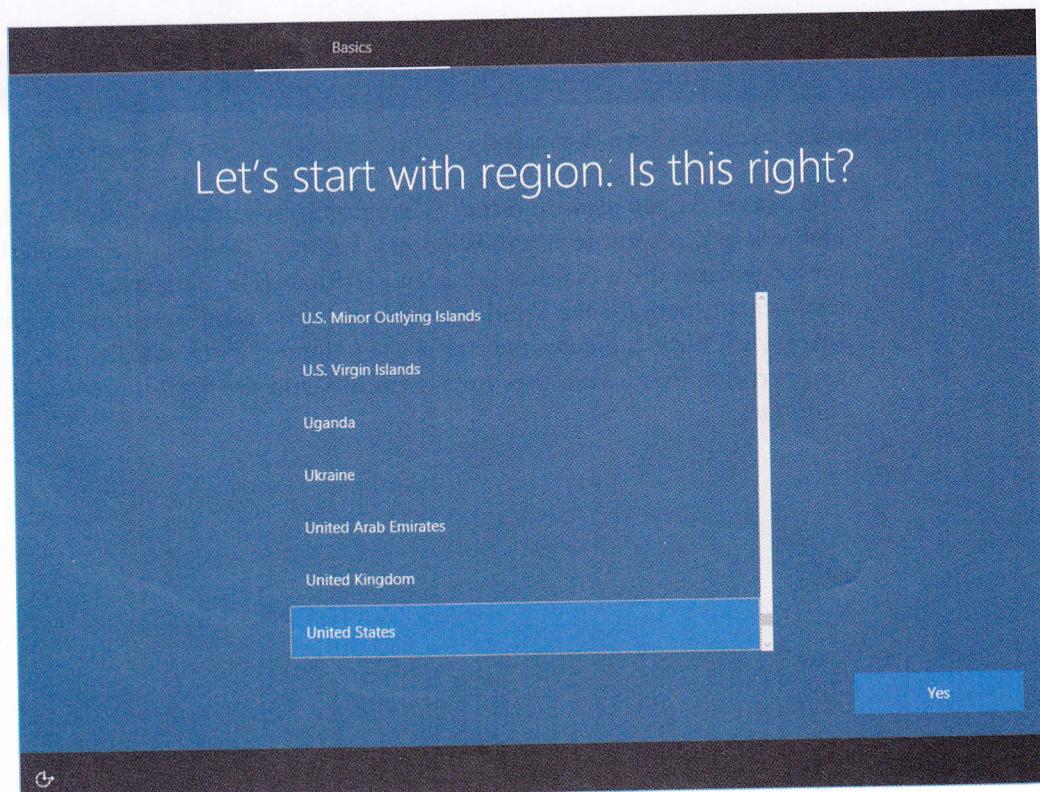


Figure 2-16 Choose your region on the first Basics screen

6. On the next screen, choose the right keyboard layout, and click Yes. On the next screen, which gives you the option of adding a second keyboard layout, click Skip.
7. If your computer is connected to the Internet, setup detects this, checks for updates and then moves on to the next screen. If your computer has no connection, the *Let's connect you to a network* screen appears. For example, Figure 2-17 shows the screen when a wired connection is possible. Click Ethernet to make the connection.

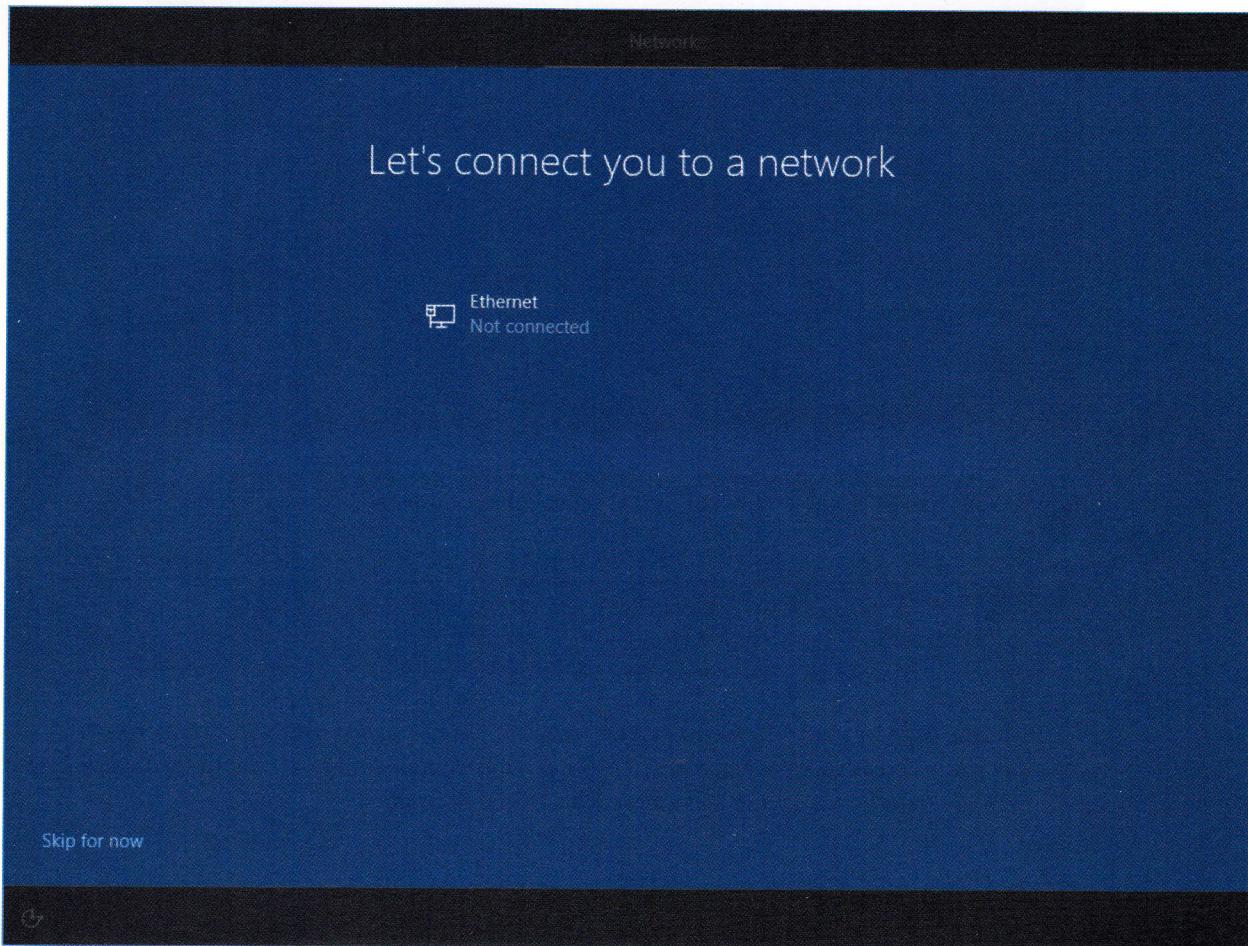


Figure 2-17 Use the *Let's connect you to a network* screen to connect to the Internet

8. On the *How would you like to set up?* screen (see Figure 2-18), you can choose to set up this computer on a school or business network and have limited control, or you can choose to set up this computer for personal use and have full control of the computer. Select **Set up for personal use**, and click **Next**.

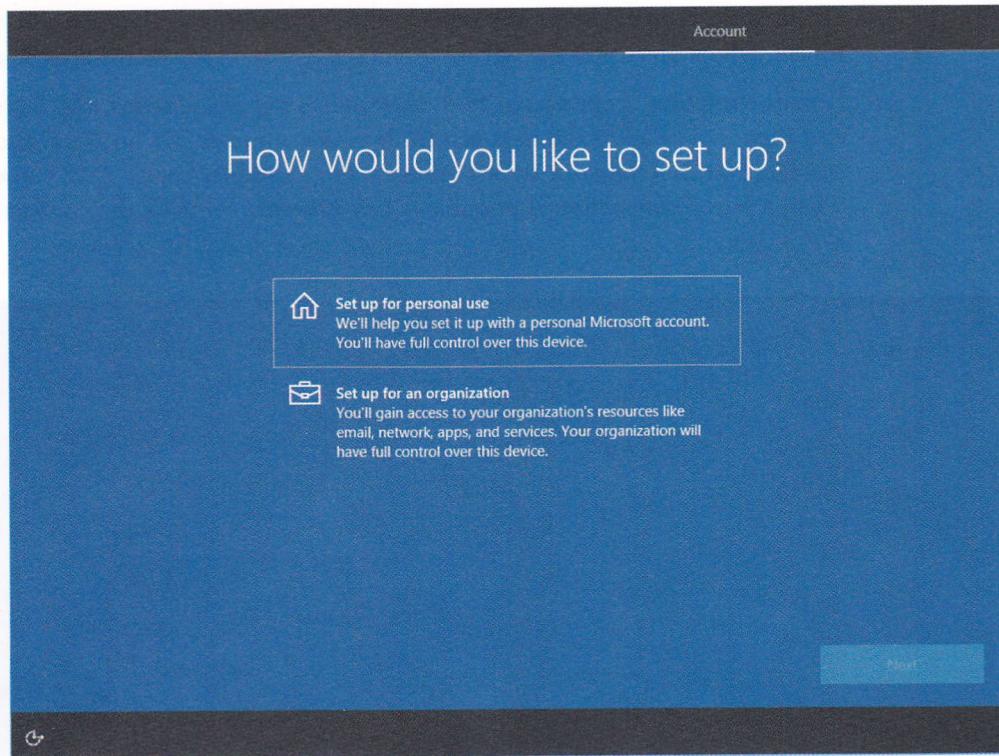


Figure 2-18 Decide if you want full or limited control of the computer



Notes If you do not have a network connection set up, Windows has you use an offline, local account by default.

9. In the *Sign in with Microsoft* screen, you can choose to use an existing Microsoft account, create a new Microsoft account, or create an offline account (see Figure 2-19). To create a local, offline account, click **Offline account**.

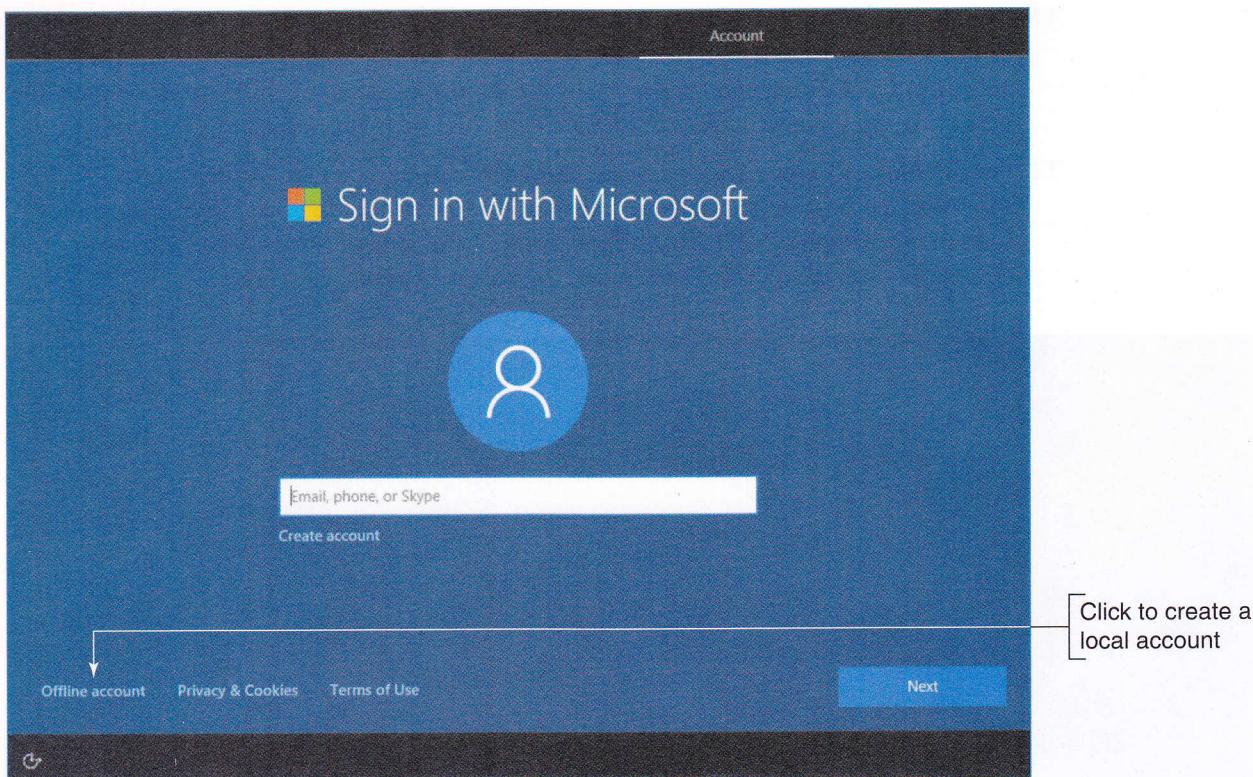


Figure 2-19 Choose the type of account to set up

10. On the *Sign in with Microsoft Instead?* screen, Microsoft again encourages you to use a Microsoft account instead of an offline account (see Figure 2-20). To continue with creating an offline account, click No.

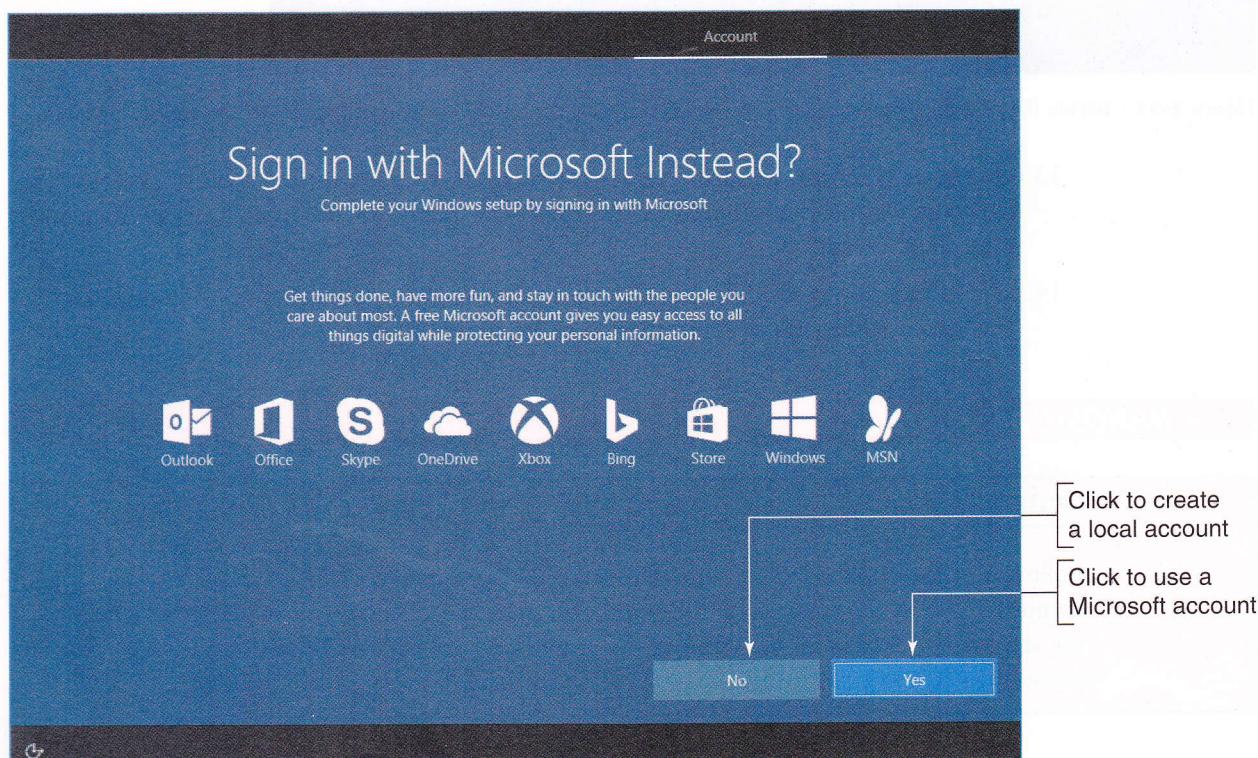


Figure 2-20 Microsoft strongly encourages the use of a Microsoft account and not a local account

11. On the next screen, enter the name for the user of the local account. (Again you see at the bottom of the screen that Microsoft is still encouraging you to use a Microsoft account.) Click **Next**, enter a password for the offline account, click **Next**, confirm the password, click **Next**, create a password hint, and then click **Next**.
12. On the *Make Cortana your personal assistant?* screen, you can decide to give Microsoft permission to use your information to personalize your experience with Cortana (see Figure 2-21). To read more about the type of information Microsoft collects for Cortana, click **Learn more**. To accept Cortana, click **Yes**.

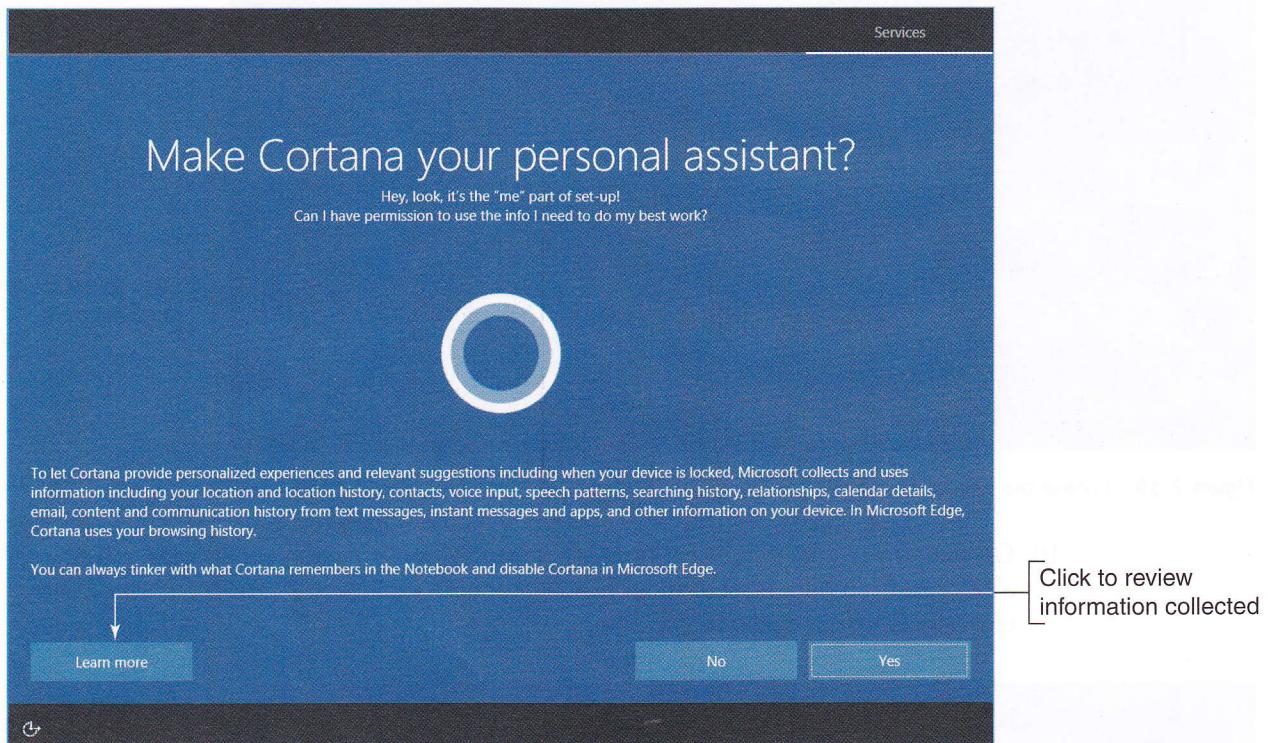


Figure 2-21 Decide if you want to personalize your experience with Cortana by allowing Microsoft to use your information

13. On the next screen, select the privacy settings for your device for location, speech recognition, diagnostics, tailored experiences with diagnostic data, and relevant ads, and then click **Accept**.
14. The installation continues, settings are applied, and the Windows desktop appears. You can now use the new installation of Windows 10.

>> HANDS-ON PROJECT

PROJECT 2-2: Install 64-bit Windows 10 Pro

Following the directions in the chapter, install 64-bit Windows 10 Pro on your lab computer. If you need help with the installation, see the directions in the chapter or follow the steps in the labs in Appendix B at the end of this text. Set up Windows to use a local account to sign in to Windows.

UPGRADE FROM WINDOWS 10 HOME TO WINDOWS 10 PRO

If you want to upgrade from Windows 10 Home to Windows 10 Pro, verify your computer is currently running an activated installation of Windows 10 Home. Then do the following:

1. Go to Windows Updates and apply any pending updates to Windows 10 Home.
2. If you don't yet have a product key for Windows 10 Pro, open the Windows Store, find the Windows 10 Pro upgrade, and purchase it.
3. Open the Settings app. On the Settings window, click **Change product key or upgrade your edition of Windows**.
4. In the Activation window, click **Change product key**, enter the new product key, and follow directions on screen to upgrade to Windows 10 Pro.

WHAT TO DO AFTER A WINDOWS 10 INSTALLATION

After you have installed Windows, you need to do the following:

- ▲ Verify you have network access.
- ▲ Activate Windows.
- ▲ Update Windows and verify automatic updates and Windows Defender Antivirus settings.
- ▲ Install hardware and applications, including anti-malware software.
- ▲ Set up user accounts and transfer or restore from backup user data and preferences to the new system.
- ▲ Turn Windows features on or off.



Caution

To protect your computer from malware, don't surf the web for drivers or applications until you have: (1) installed Windows updates; (2) verified Windows Defender is providing real-time protection; and (3), if you don't use Defender, configured other anti-malware software.

Now let's look at the details of the items in the preceding list.

VERIFY YOU HAVE NETWORK ACCESS

To make a wired connection to a network when using Windows, simply plug in the network cable and, for most situations, Windows does the rest. To create a wireless connection, do the following:

1. Click the network icon in the system tray. A list of available wireless networks appears (see Figure 2-22a). Click a network to select it, and then click Connect (see Figure 2-22b).
2. If the network is secured, enter the security key.

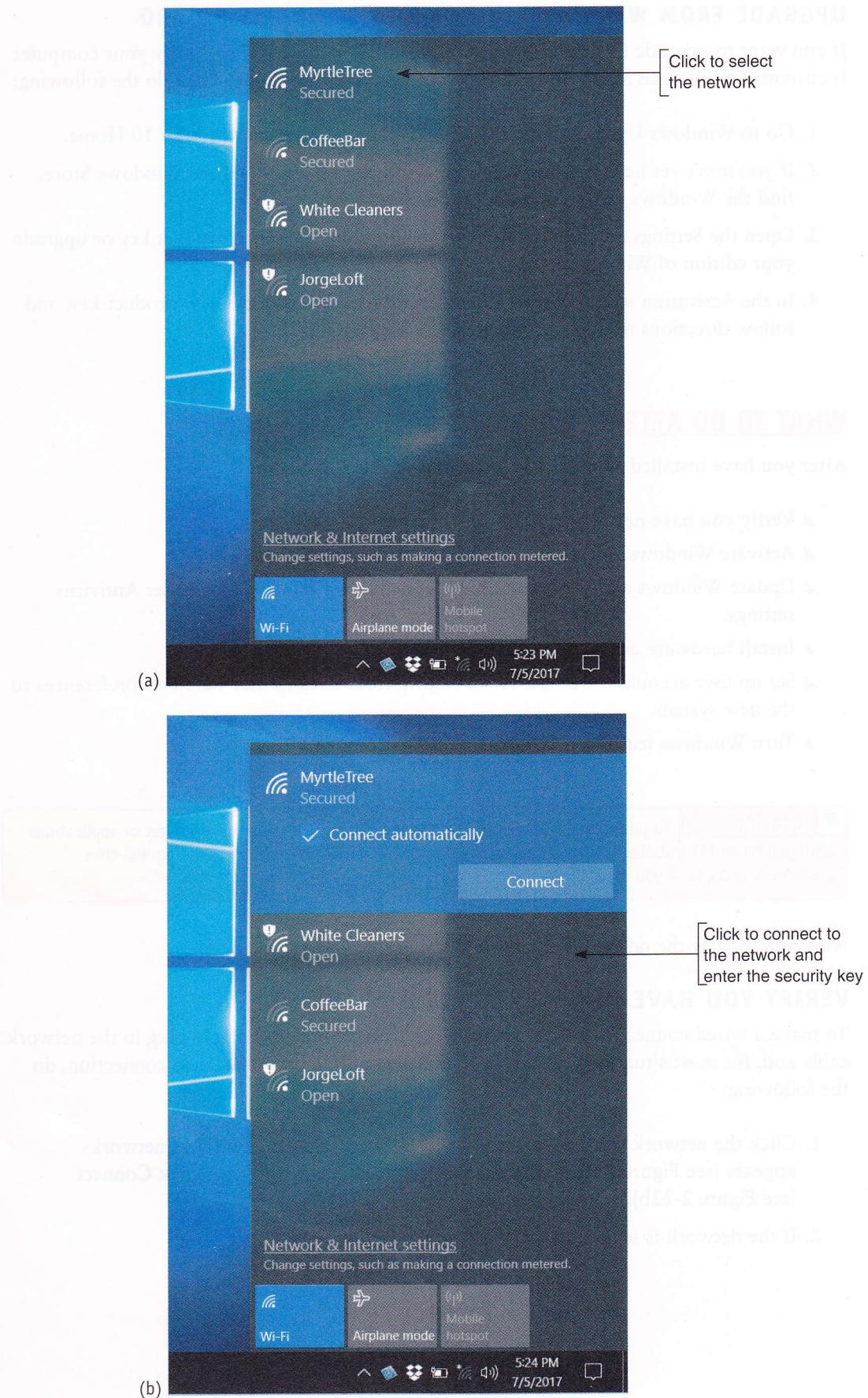


Figure 2-22 (a) View a list of available wireless networks, and (b) select a wireless network to connect

If you can't connect to the network, you might need to install drivers for the motherboard, including drivers for the onboard network port. Also, the IP address, wireless network or network security settings might be wrong.

ACTIVATE WINDOWS

To make sure a valid Windows license has been purchased for each installation of Windows, Microsoft requires product activation. Windows 10 setup sometimes does not require you to enter a product key during the installation. However, if you do enter the product key during installation and, if the computer is connected to the Internet, Windows will automatically activate on the next restart after the installation completes. As with Windows 7, you can activate Windows 10 any time within the 30-day grace period.

To view the activation status, open the Settings app, select the **Update & security** group, and then select **Activation**. Figure 2-23 shows the Activation window for a system that is not activated. To activate, you have a couple options. First, make sure you're connected to the Internet. If you need to purchase Windows 10, click **Go to Store**. If you already have a product key, click **Change product key**.

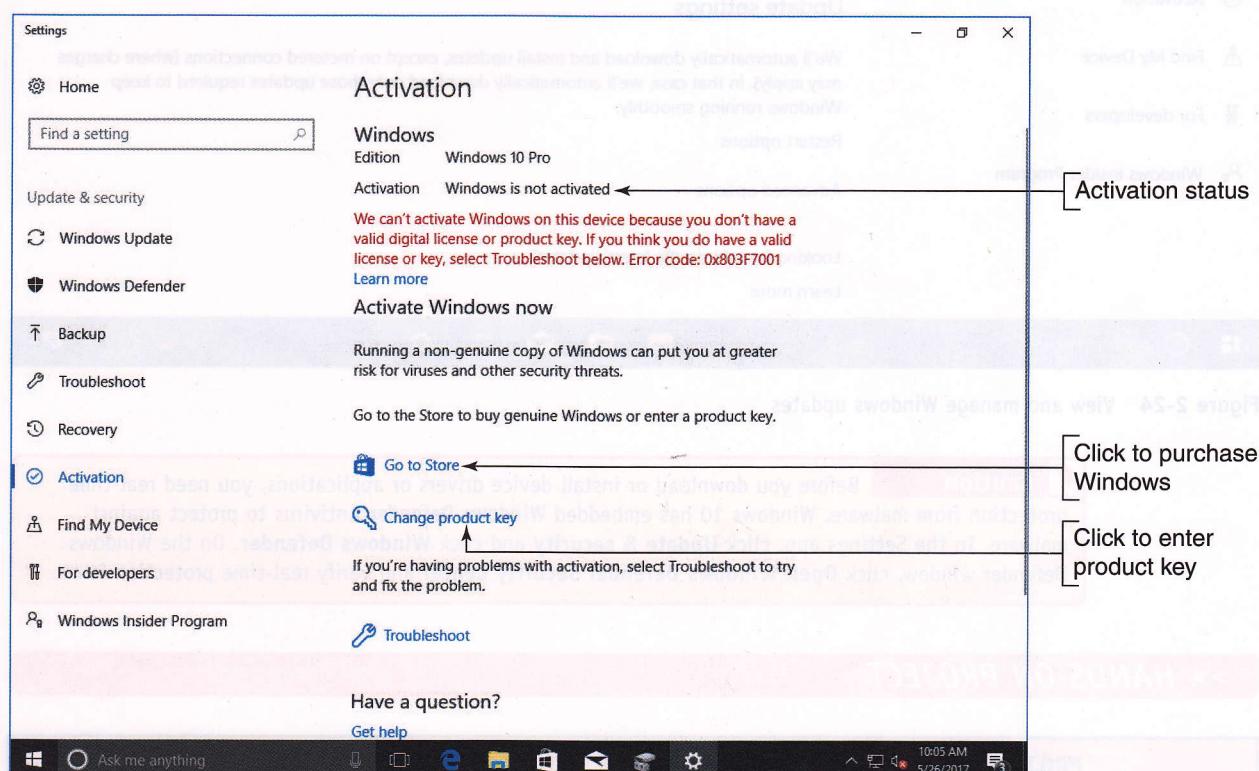


Figure 2-23 Activation status

UPDATE WINDOWS AND VERIFY REAL-TIME PROTECTION FROM MALWARE

To update Windows, open the Settings app and click **Update & security** group. In the Windows Update window (see Figure 2-24), you can view the update status and install any available updates. Before you move on, make sure all important updates are installed. If there are no updates already listed, you can check for new updates by clicking **Check for updates**. Keep installing important updates and checking for more updates until no more updates are available. You might need to restart the system after certain updates are installed. Later in the chapter, you learn how to manage update settings.

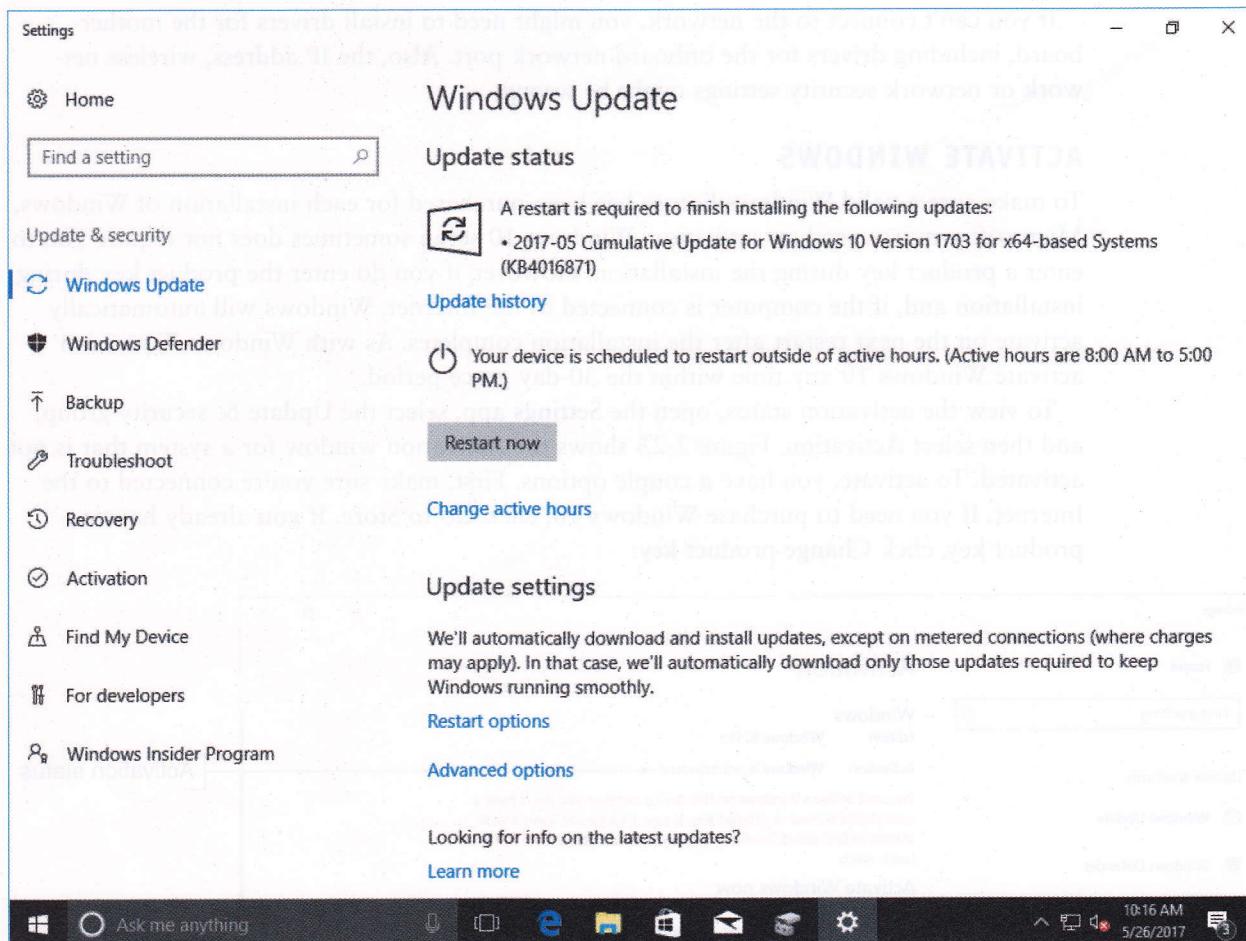


Figure 2-24 View and manage Windows updates

Caution Before you download or install device drivers or applications, you need real-time protection from malware. Windows 10 has embedded Windows Defender Antivirus to protect against malware. In the Settings app, click **Update & security** and click **Windows Defender**. On the Windows Defender window, click **Open Windows Defender Security Center** and verify real-time protection is on.

>> HANDS-ON PROJECT

PROJECT 2-3: Recommended Updates

On a Windows 10 system connected to the Internet, open the Settings app and click the **Update & security** group. Under *Looking for info on the latest updates?*, click **Learn more**. Windows Update opens the Microsoft website and recommends Windows updates. Print the webpage showing a list of recommended updates. For a lab computer, don't perform the updates unless you have your Instructor's permission.

INSTALL HARDWARE AND APPLICATIONS

In Windows 10, the process for installing hardware and desktop applications is the same as in Windows 8/7. To get to Device Manager to manage your device drivers and uninstall hardware, press **Win+X**, and click **Device Manager** in the Quick Launch menu.



Notes To install a second monitor, first connect the second monitor. Then right-click the desktop and select **Display settings**. Click **Detect**. Windows will detect the new monitor. You can then use this window to configure the dual-monitor system.

To install a USB printer, as with Windows 8/7, plug in the printer and let Windows do the rest. To install a network printer in Windows 10, you'll need the printer's IP address then complete the following steps:

1. Open the Settings app, select the Devices group, and then click Printers & scanners. A list of installed printers and scanners appears. Click Add a printer or scanner. Windows searches for available printers and scanners, but probably will not find the network printer.
2. Click **The printer that I want isn't listed**. In the Add Printer box (see Figure 2-25), select **Add a printer using a TCP/IP address or hostname** and click **Next**.

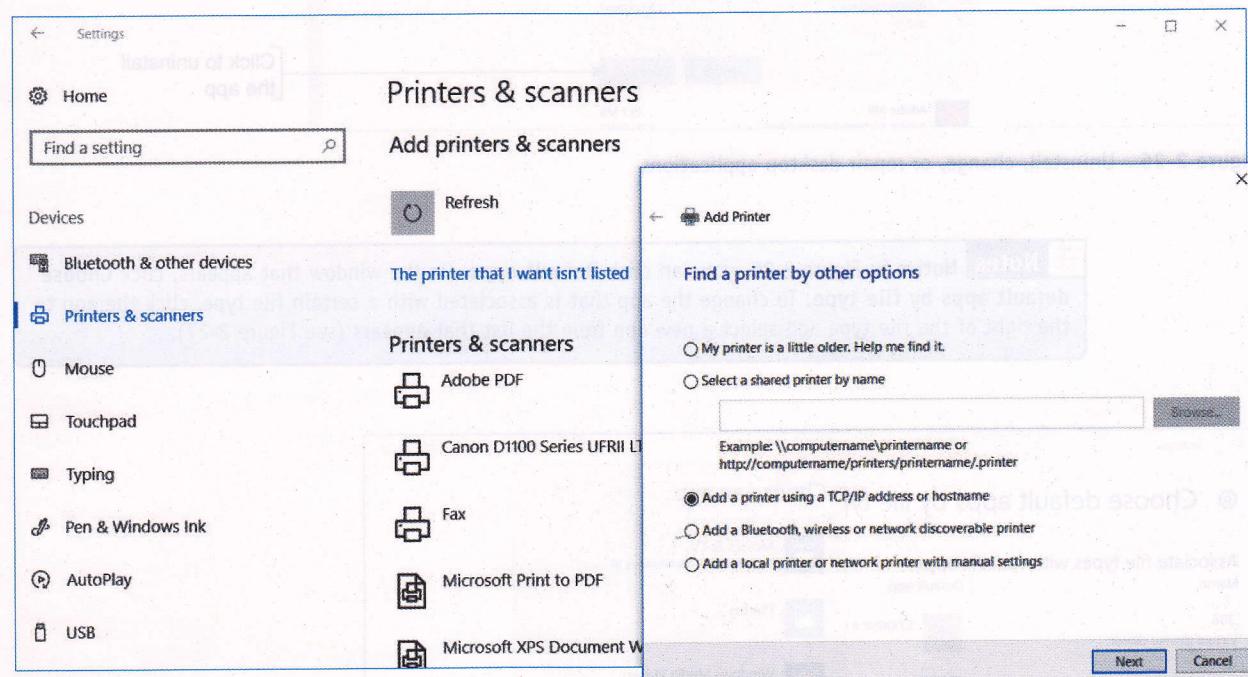


Figure 2-25 The IP address of a network printer is required to install it

3. Enter the printer's IP address and click **Next**. Windows searches the network for the printer. If it finds the printer, the installation proceeds as with Windows 8/7, where you next select the printer manufacturer and model. Alternately, you can provide the printer drivers that you can download to your computer. After the printer is installed, be sure to print a test page.

To install an application, double-click the setup program for the app in File Explorer. To install Windows apps, use the Store app on the Start menu. To uninstall applications, open the **Settings** app and select the **Apps** group. The Apps & features window appears. Select the app and click **Uninstall**. See Figure 2-26.

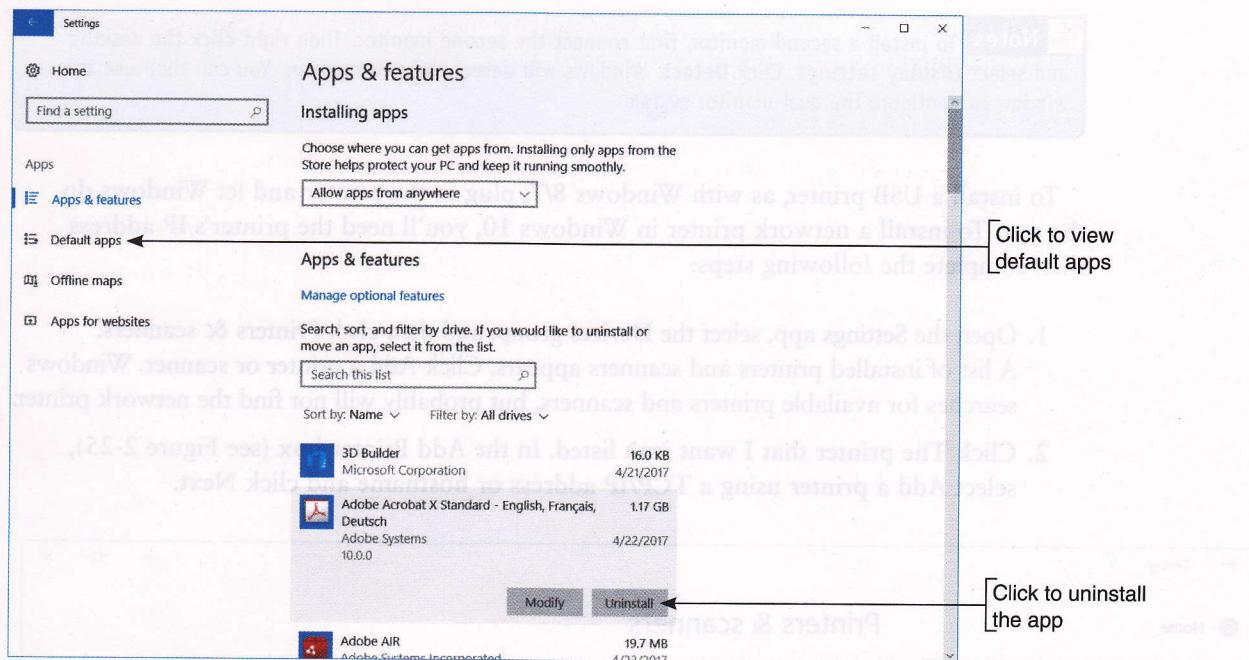


Figure 2-26 Uninstall, change, or repair desktop applications

Notes Notice in Figure 2-26, you can click **Default apps**. On the window that appears, click **Choose default apps by file type**. To change the app that is associated with a certain file type, click the app to the right of the file type and select a new app from the list that appears (see Figure 2-27).

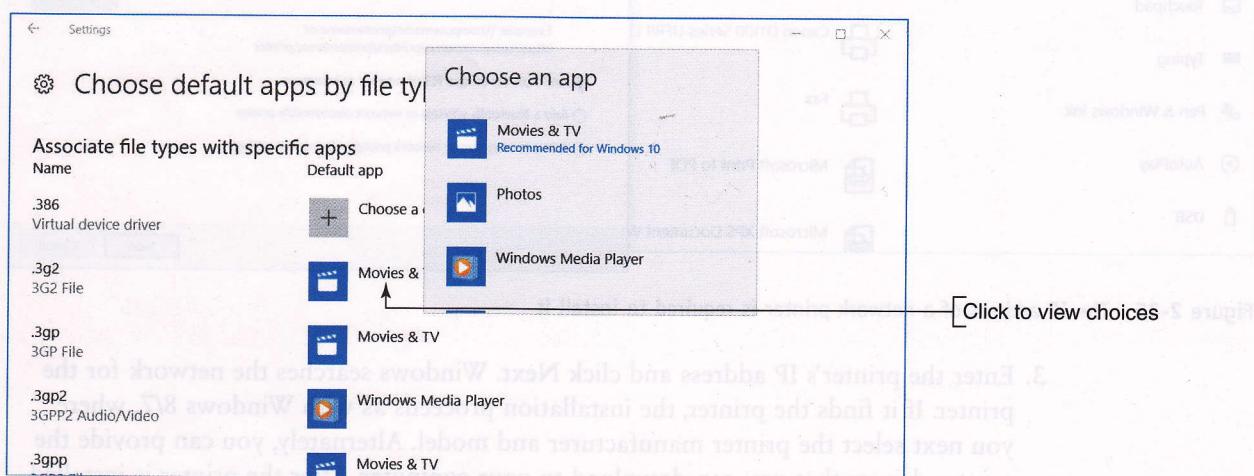


Figure 2-27 Change the app associated with a file type

SET UP USER ACCOUNTS AND RESTORE USER DATA AND PREFERENCES

In the chapter, “Survey of Windows Features and Support Tools,” of this text, you learned how to create user accounts. In Windows 8/7, you can use Windows Easy Transfer to copy user data and settings from one computer to another; however, this utility is not available in Windows 10. Microsoft suggests you use PCMover by Laplink at laplink.com/pcmover to move user data and settings and applications from one Windows installation to another. Note the software is not free. Alternately, you can manually copy data files from the user

profile folder on one computer to another and manually install applications or you can use other data migration software for these tasks.

TURN WINDOWS FEATURES ON OR OFF

To turn Windows features on or off, open the **Settings** app, select the **Apps** group, scroll down to the bottom of the Apps & features window and click **Programs and Features**. On the Programs and Features window, click **Turn Windows features on or off**. In the Windows Features window (see Figure 2-28), check or uncheck a feature, and click **OK**. Sometimes a restart is necessary for the changes to take effect.

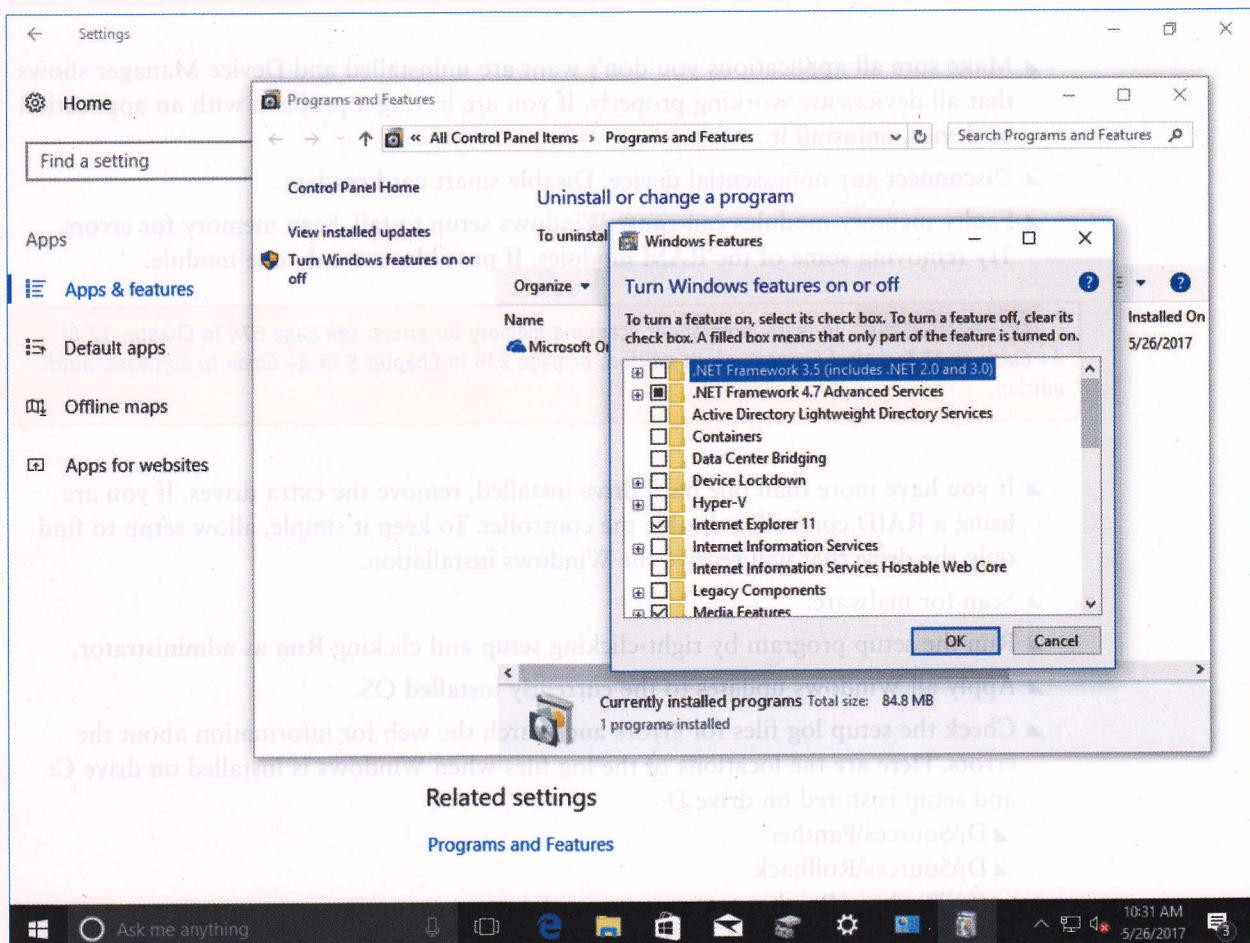


Figure 2-28 Turn on or off a Windows feature

TROUBLESHOOT WINDOWS 10 INSTALLATIONS

This section covers what to do if you have problems installing or activating Windows 10.

PROBLEMS WITH UPGRADES

If an upgrade installation fails, try the following:

- ▲ Reboot the machine and try again.
- ▲ Search the web for an error message or a description of the point where the installation fails. For example, search on “Windows setup locks on license screen.” The Microsoft websites are the best source of information.

- ▲ Verify there is enough free space on the hard drive to install Windows.
- ▲ Make sure you're selecting the correct partition during setup. Don't select the System Reserved partition.
- ▲ To give setup the best chance for success, perform a clean boot and then start the setup program.

**To Learn More**

To learn more about performing a clean boot, see page 508 in Chapter 11 of *A+ Guide to IT Technical Support*, ninth edition, or page 172 in Chapter 4 in *A+ Guide to Software*, ninth edition.

- ▲ Make sure all applications you don't want are uninstalled and Device Manager shows that all devices are working properly. If you are having a problem with an application or device, uninstall it.
- ▲ Disconnect any nonessential device. Disable smart card readers.
- ▲ Faulty memory modules can cause Windows setup to fail. Scan memory for errors. Try removing some of the RAM modules. If possible, use only one module.

**To Learn More**

To learn more about scanning memory for errors, see page 574 in Chapter 12 of *A+ Guide to IT Technical Support*, ninth edition, or page 238 in Chapter 5 in *A+ Guide to Software*, ninth edition.

- ▲ If you have more than one hard drive installed, remove the extra drives. If you are using a RAID controller, disable the controller. To keep it simple, allow setup to find only the drive that will receive the Windows installation.
- ▲ Scan for malware.
- ▲ Run the setup program by right-clicking setup and clicking Run as administrator.
- ▲ Apply all Windows updates to the currently installed OS.
- ▲ Check the setup log files for errors and search the web for information about the errors. Here are the locations of the log files when Windows is installed on drive C: and setup is stored on drive D:
 - ▲ D:\Sources\Panther
 - ▲ D:\Sources\Rollback
 - ▲ C:\Windows\Panther
 - ▲ C:\Windows\Inf\setupapi.*.log
 - ▲ C:\Windows\Memory.dmp
 - ▲ C:\Windows\Minidump.dmp
 - ▲ C:\Windows\System32\Sysprep\Panther

In all these locations, look for files with date modified as the current day. You can view .log files in Notepad. For example, Figure 2-29 shows a log file documenting a problem with an application that might not be compatible with Windows 10.

```

setupapi.app.log - Notepad
File Edit Format View Help
>>> [SetupVerifyInfFile - C:\$WINDOWS.-BT\Drivers\DU\8e972750-a206-42db-9a5d-dc7084731b8c\fgd1h64.inf]
>>> Section start 2017/04/20 17:08:26.056
| cmd: "C:\$WINDOWS.-BT\Sources\SetupHost.exe" /Install /Media /InstallFile "D:\Sources\Install.esd" /MediaPath "D:"
| sig: Verifying file against specific (valid) catalog failed! (0xe0000244)
| sig: Error 0xe0000244: The software was tested for compliance with windows Logo requirements on a different version of Windows, and may not be valid
| sig: Verifying file against specific (valid) catalog failed! (0xe0000244)
| sig: Error 0xe0000244: The software was tested for compliance with windows Logo requirements on a different version of Windows, and may not be valid
<<< Section end 2017/04/20 17:08:26.071
<<< [Exit status: FAILURE(0xe0000244)]
```



```

>>> [SetupVerifyInfFile - C:\$WINDOWS.-BT\Drivers\DU\9ad1b87d-44c7-44dc-8e38-fda8f03cbcf7\VX2453_Series.inf]
>>> Section start 2017/04/20 17:08:26.149
| cmd: "C:\$WINDOWS.-BT\Sources\SetupHost.exe" /Install /Media /InstallFile "D:\Sources\Install.esd" /MediaPath "D:"
| sig: Verifying file against specific (valid) catalog failed! (0xe0000244)
| sig: Error 0xe0000244: The software was tested for compliance with windows Logo requirements on a different version of Windows, and may not be valid
| sig: Verifying file against specific (valid) catalog failed! (0xe0000244)
| sig: Error 0xe0000244: The software was tested for compliance with windows Logo requirements on a different version of Windows, and may not be valid
<<< Section end 2017/04/20 17:08:26.165
<<< [Exit status: SUCCESS]
```



```

>>> [SetupVerifyInfFile - C:\$WINDOWS.-BT\Drivers\DU\a2f3adeb-5144-484b-9b12-fb80a9268d3d\Netwew00.INF]
>>> Section start 2017/04/20 17:08:26.461
| cmd: "C:\$WINDOWS.-BT\Sources\SetupHost.exe" /Install /Media /InstallFile "D:\Sources\Install.esd" /MediaPath "D:"
| sig: Verifying file against specific (valid) catalog failed! (0xe0000244)
| sig: Error 0xe0000244: The software was tested for compliance with windows Logo requirements on a different version of Windows, and may not be valid
| sig: Verifying file against specific (valid) catalog failed! (0xe0000244)
| sig: Error 0xe0000244: The software was tested for compliance with windows Logo requirements on a different version of Windows, and may not be valid
<<< Section end 2017/04/20 17:08:26.493
<<< [Exit status: FAILURE(0xe0000244)]
```



```

>>> [SetupVerifyInfFile - C:\$WINDOWS.-BT\Drivers\DU\b40738a3-d02c-4d57-a327-2da4dbb0f428\HECI.inf]
>>> Section start 2017/04/20 17:08:26.555
| cmd: "C:\$WINDOWS.-BT\Sources\SetupHost.exe" /Install /Media /InstallFile "D:\Sources\Install.esd" /MediaPath "D:"
```

Figure 2-29 Windows 10 setup reports a problem with an application

Some of the other log files are event logs that you can view with Event Viewer. To see these files, open Event Viewer. In the Actions pane on the right, click Open Saved Log and navigate to the folder where you found log files.

After you have unsuccessfully attempted an upgrade several times and researched any problems, it's a good idea to make sure you have complete backups of all data on the drive and move on to a clean install of Windows 10.

PROBLEMS WITH CLEAN INSTALLS

If a clean install fails, try the following:

- ▲ As with upgrades, reboot and try again, search the web for error messages or descriptions of the problem, and check error logs for helpful information about the problem. Disconnect or disable all nonessential devices. Boot from the setup media and use it to test memory and check the hard drive for errors.
- ▲ Consider the possibility that the setup media is corrupted. Go to the Microsoft website, download the Media Creation Tool and use it to build fresh Windows setup files on a bootable DVD or USB flash drive. Boot from the media and try the clean install again.

PROBLEMS WITH ACTIVATION

As explained earlier in this chapter, if the system already has a digital license or the product key is stored on the motherboard firmware, an upgrade or clean install will activate itself; you don't need to enter a product key. Here are some situations that might cause trouble when activating Windows:

- ▲ **Replacing a failed hard drive.** If you replace a failed hard drive with a new drive, you should still be able to perform a clean install of Windows 10 on the new hard drive and rely on the digital license, with no need to enter the product key. During setup, don't enter a product key. After Windows is installed, open the Settings app, select the Activation group, and verify Windows is activated. If it is not, click Troubleshoot in the Activation window. Windows troubleshoots the problem and offers solutions. For example, in Figure 2-30, when you click I changed hardware on this device recently, the troubleshooter gives you opportunity to communicate with Microsoft to verify the computer has a license to use Windows.

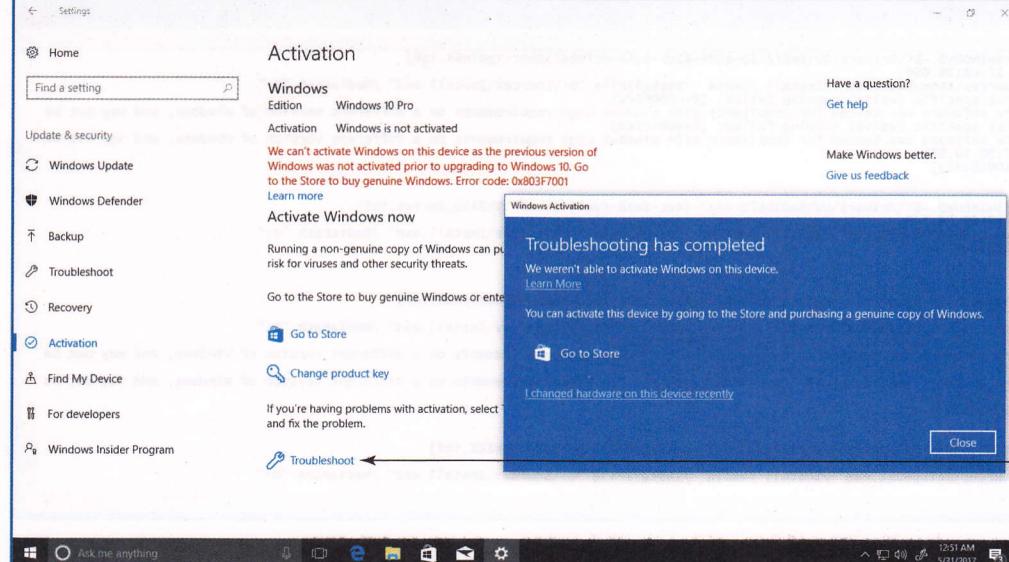


Figure 2-30 Activation troubleshooter tool resolves activation problems and might lead you to a chat window with Microsoft support

▲ **Upgrading the motherboard.** If the system is working, before you upgrade the motherboard, be sure to associate your Microsoft account with the Windows installation. To do so, add the MS account and sign in to Windows using that account. This will associate the digital license and hardware signature stored on Microsoft activation servers with your Microsoft account.

Later, after you upgrade the motherboard, start Windows, sign in using your Microsoft account, and the system should be activated when Microsoft servers recognize your Microsoft account and the machine. If the installation is not activated, open the **Settings** app, select the **Activation** group, and then click **Troubleshoot**.

▲ **Replacing a failed motherboard.** Suppose the motherboard fails and you replace it, but you have never signed in to Windows using the Microsoft account that purchased the product key. In that case, Windows might not activate automatically and the Activation troubleshooter might not be able to resolve the problem. In this situation, you most likely will need to talk with Microsoft support staff and explain the situation.

▲ **Upgrading from Windows 8 Home to Windows 10 Pro.** When upgrading from Windows 8 Home to Windows 10 Pro, the installation may automatically upgrade to Windows 10 Home without giving you the option to choose Pro. If this happens, after installation is complete, go to the Activation screen and enter your new product key for Windows 10 Pro. The system should reactivate with Windows 10 Pro.

▲ **Reinstalling Windows 10 Pro.** Suppose Windows 10 Pro is activated on a system and then gets corrupted. You perform a clean install to fix the problem, but setup automatically installs and activates Windows 10 Home without asking for a product key. You can fix the problem by going to the Activation window and changing the product key to the **default product key** for Pro: VK7JG-NPHTM-C97JM-9MPGT-3V66T. The system should reactivate with Windows 10 Pro.

INSTALLING AND USING VIRTUAL MACHINES WITH CLIENT HYPER-V

Client Hyper-V is the virtual machine (VM) manager that is part of 64-bit Windows 10 Pro. If your processor and motherboard support hardware-assisted virtualization (HAV), you can use Client Hyper-V to install and manage virtual machines on the desktop. Generation 1 VMs allow either a 32-bit or 64-bit installation of an OS in a VM. Generation 2 VMs require a 64-bit guest operating system. Hyper-V can connect a VM to the local network. Client Hyper-V supports dynamically expanding virtual hard drives and dynamically allocated memory. When using dynamically expanding virtual hard drives, the VM ties up only the portion of the host's hard drive that the VM's hard drive is actually using. When using dynamic memory, the VM ties up only the portion of allocated memory that it is actually using.



Notes Generation 2 VMs in Client Hyper-V became available with Windows 8.1.

2

APPLYING CONCEPTS SETTING UP A VM

Here are the steps to set up a VM using Windows 10 Pro:

1. Go into UEFI/BIOS setup on your computer, and make sure virtualization is enabled.
2. Hyper-V is disabled in Windows 10 Pro by default. To turn it on, open the **Settings** app, select the **Apps** group, select **Apps and features**, and click **Programs and Features**. In the Programs and Features window, click **Turn Windows features on or off** (refer back to Figure 2-28). Place a checkmark by **Hyper-V**, and click **OK**. You'll need to restart the system for the change to take effect.
3. To launch the Hyper-V Manager, go to the Cortana search box and type **Hyper-V**, and then click **Hyper-V Manager**. The Hyper-V Manager window appears on the desktop. In the Hyper-V Manager pane on the left, select the host computer (see Figure 2-31).

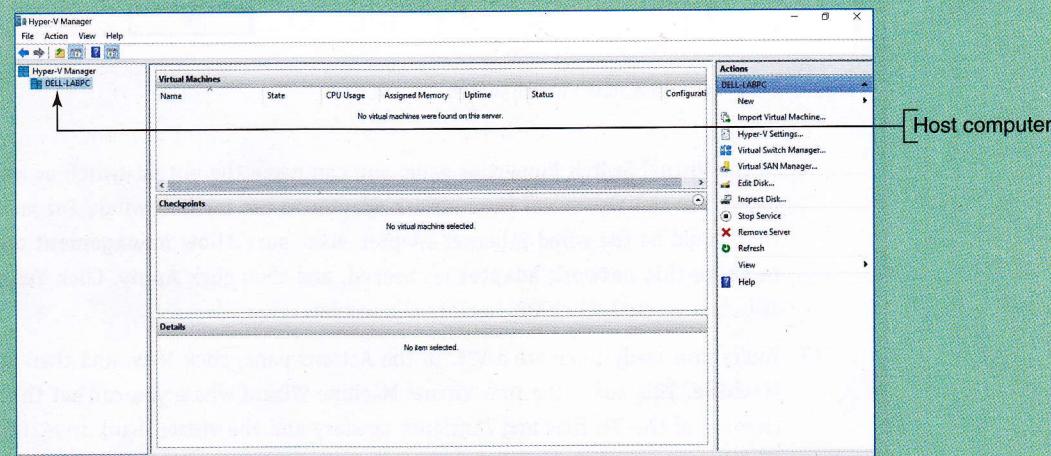


Figure 2-31 The host computer is selected for managing Hyper-V virtual machines

4. If you want your VMs to have access to the network or the Internet, you first need to install a virtual switch. To create a virtual switch, click **Virtual Switch Manager** in the Actions pane, on the right side of the Hyper-V Manager window.

5. The Virtual Switch Manager window appears (see Figure 2-32). In the left pane, make sure **New virtual network switch** is selected. To bind the virtual switch to the physical network adapter so the VMs can access the physical network, click **External** in the right pane. Click **Create Virtual Switch**.

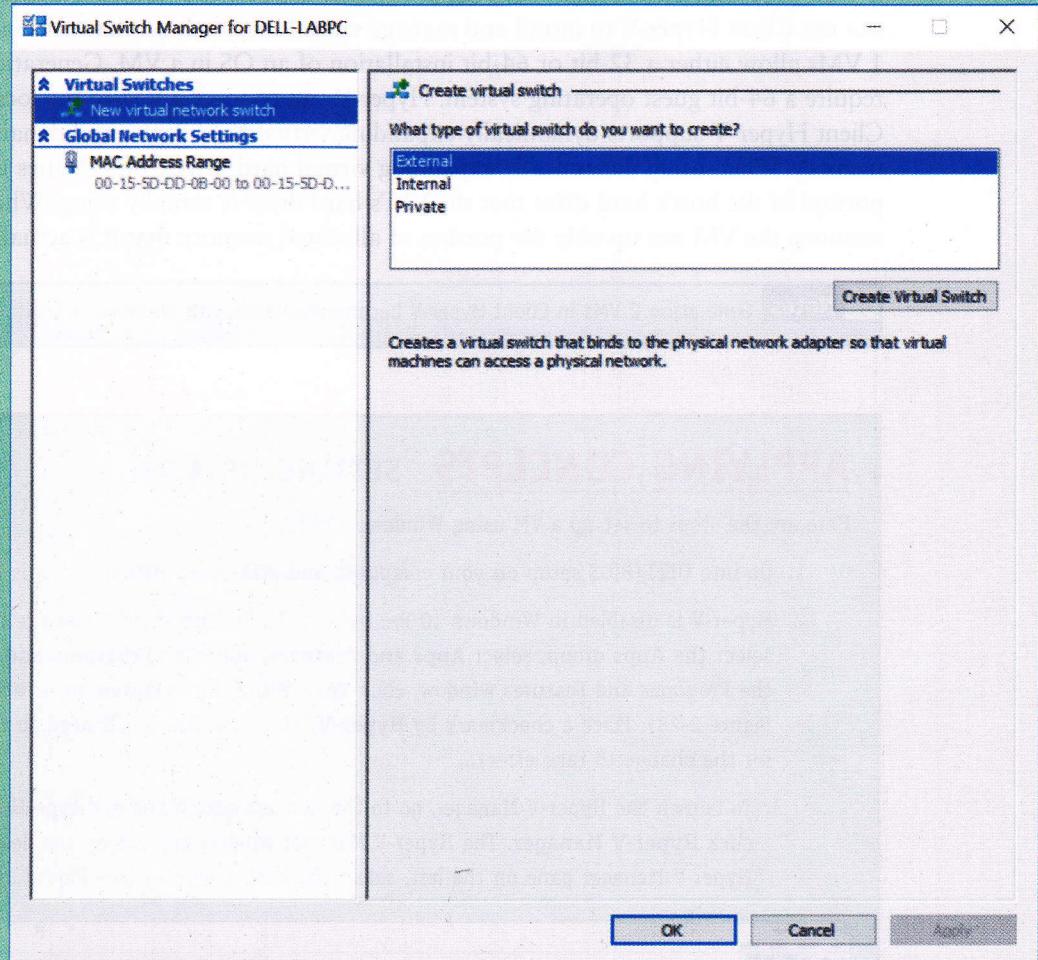


Figure 2-32 Create a new virtual switch

6. In the Virtual Switch Properties pane, you can name the virtual switch or leave the default name. You can also select the network adapter to use for the switch. For most situations, that would be the wired Ethernet adapter. Make sure **Allow management operating system to share this network adapter** is checked, and then click **Apply**. Click **Yes** and the virtual switch is created. Click **OK** to close the window.
7. You're now ready to create a VM. In the Actions pane, click **New**, and then click **Virtual Machine**. This opens the New Virtual Machine Wizard where you can set the name and location of the VM files and configure memory and the virtual hard drive. Click **Next**. (Notice you can click **Finish** to accept default settings for the VM.)
8. Assign a name to the VM. If you want the VM files stored in a different location than the default, check **Store the virtual machine in a different location**, and browse to that location (see Figure 2-33). After you've selected the location, click **Next**.

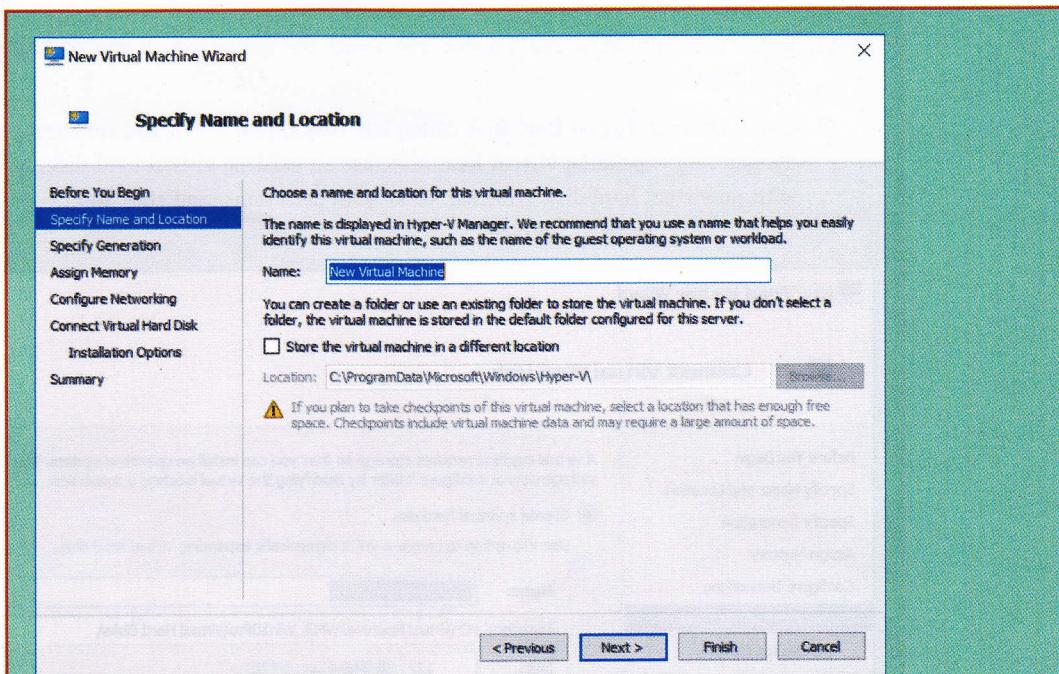


Figure 2-33 Name the VM and decide where the VM files will be stored

9. Now you need to choose between two generations for the VM. Generation 1 uses IDE for boot devices, and supports 32-bit or 64-bit guest operating systems. Generation 2 uses SCSI for boot devices, includes the ability to boot the VM from over the network, and requires 64-bit guest operating systems. If you're not sure which to use, select **Generation 1**. Click **Next** to continue.
10. Set the desired amount of RAM for the VM. Be sure to allow for at least the minimum requirement of RAM needed to install the OS. If you want Hyper-V to dynamically allocate RAM, check **Use Dynamic Memory for this virtual machine** (see Figure 2-34). Click **Next** to continue.

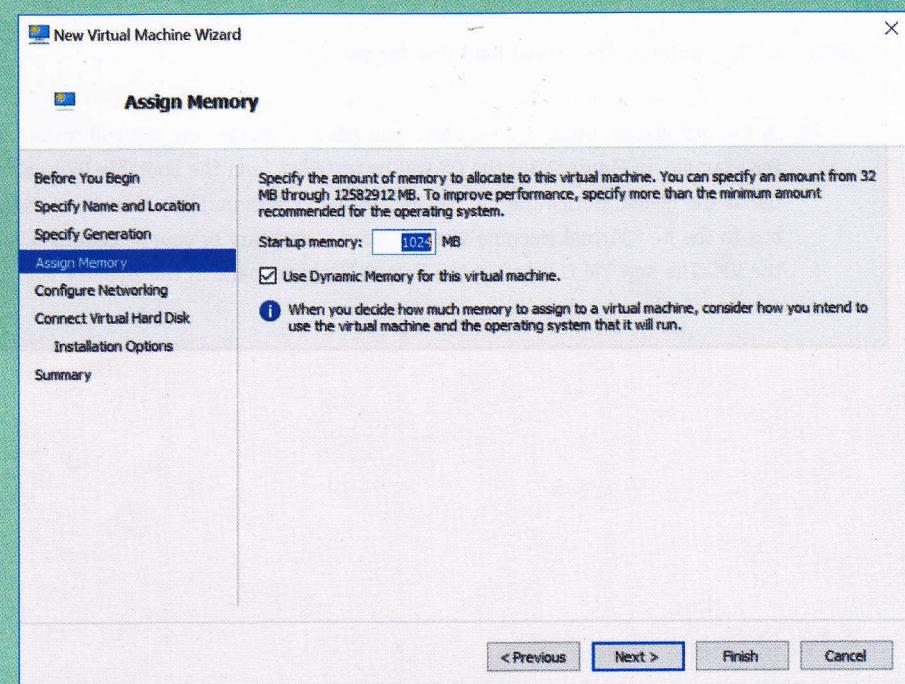


Figure 2-34 Use dynamic memory to conserve memory on the host computer

11. In the Configure Networking dialog box, select the virtual switch you created earlier, and click **Next**.
12. In the Connect Virtual Hard Disk dialog box (see Figure 2-35), you can create a new dynamically expanding virtual hard disk, use an existing virtual hard disk, or create the VM with no virtual hard disk attached. Make your selections, and click **Next**.

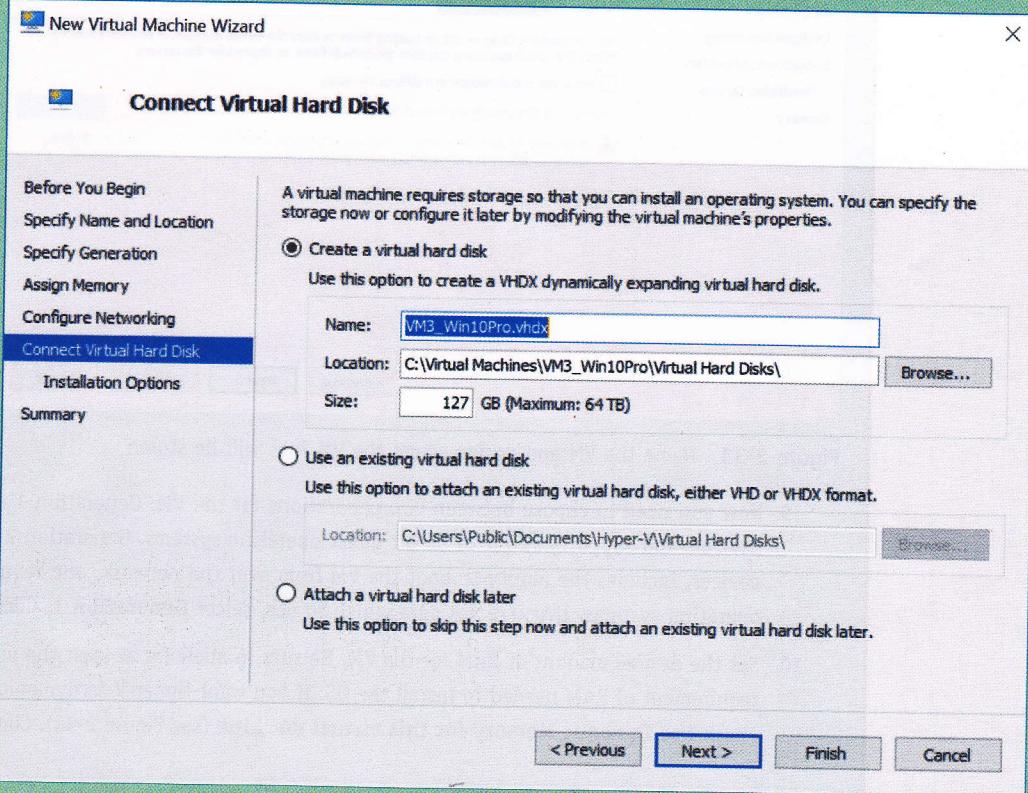


Figure 2-35 Configure the virtual hard disk for the VM

13. In the Installation Options dialog box, you need to decide how you will install an OS in the VM. For example, in Figure 2-36, the OS will be installed from the bootable DVD using an ISO image file as the media. Notice the file has an .iso file extension. Click **Next** to continue. The last dialog box in the New Virtual Machine Wizard shows a summary of your selections. Click **Finish** to create the VM. The new VM is listed in the Virtual Machines pane in the Hyper-V Manager window.

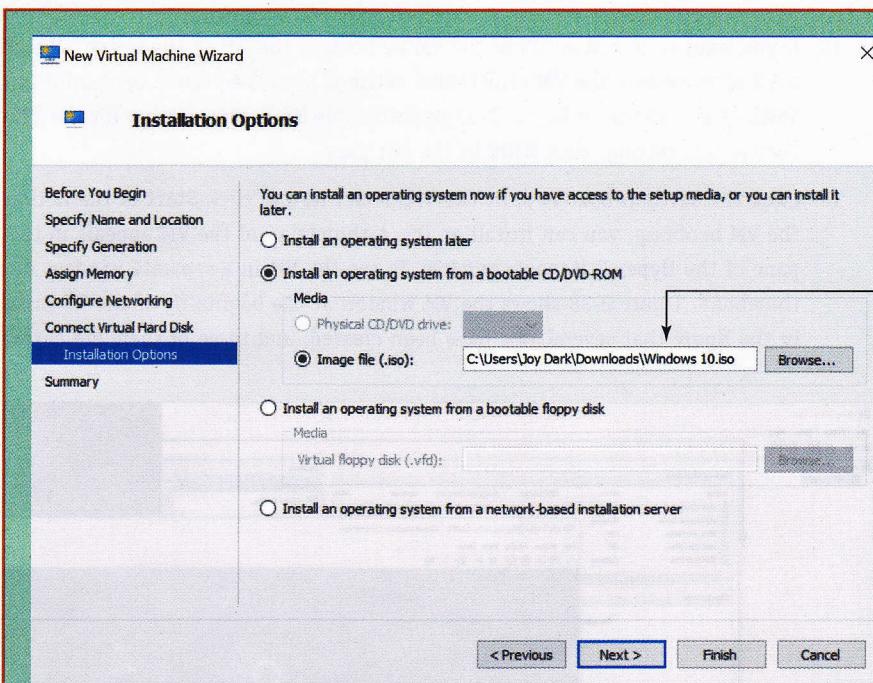


Figure 2-36 Decide how an OS will be installed in the VM

14. To manage the VM's virtual hardware, select the VM in Hyper-V Manager, and click **Settings** near the bottom of the Actions pane. The Settings dialog box for the VM appears. Select the hardware in the left pane, and apply your settings in the right pane. For example, in Figure 2-37, the DVD Drive is selected. Using the right pane you can mount a physical CD or DVD to the drive or you can mount an ISO file as shown in the figure.

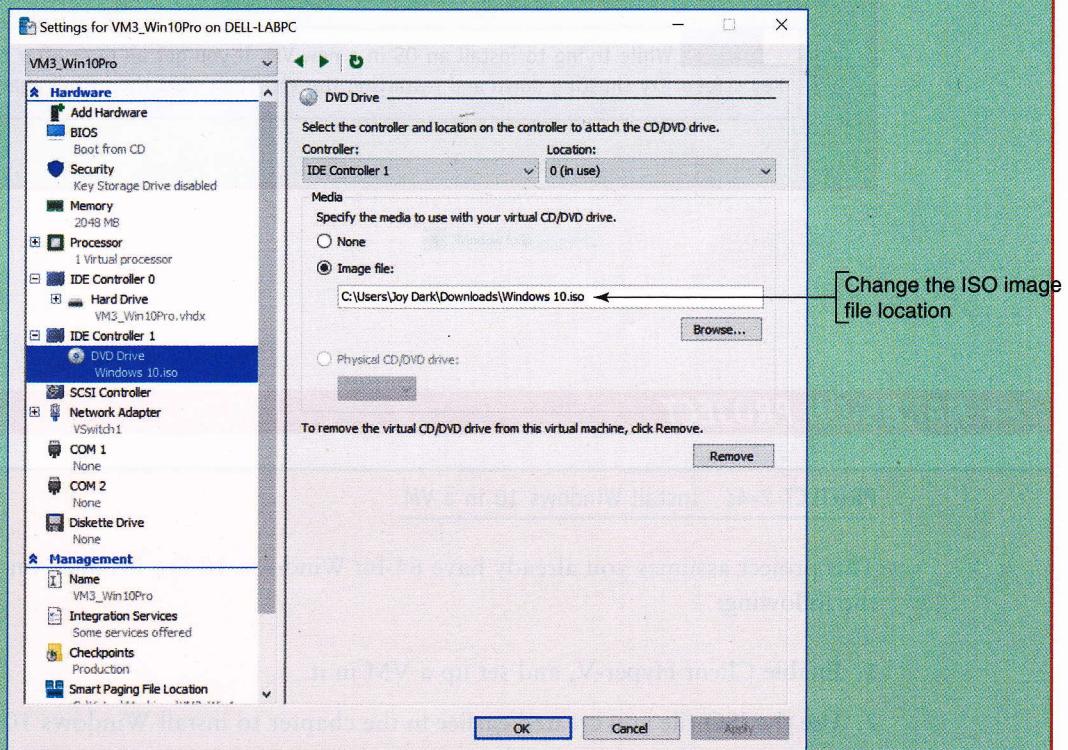


Figure 2-37 Mount an ISO file to the virtual DVD drive

15. If you want to install an OS in the VM by booting the VM to the virtual DVD drive, you need to make sure the VM's UEFI/BIOS settings have the correct boot priority order. Use the Settings box shown in Figure 2-37 to verify this UEFI/BIOS setting for the VM. To view and change this setting, click **BIOS** in the left pane.
16. Close the Settings box. To start the VM, select it, and click **Start** in the Actions pane. After the VM boots up, you can install an OS. A thumbnail of the VM appears in the bottom-middle pane of the Hyper-V Manager window. To see the VM in a separate window, double-click the thumbnail. Figure 2-38 shows the VM window at the beginning of the OS installation. Notice in the figure that several VMs have been created, and three of them are currently running.

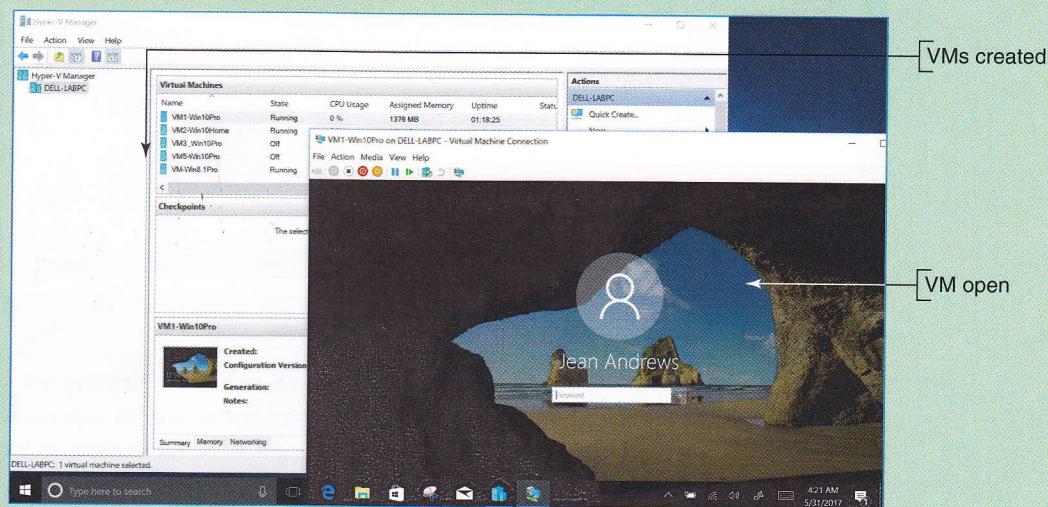


Figure 2-38 Windows 10 is running in the VM

Notes While trying to install an OS in a new VM, if you get an error after the Product Key screen, try shutting down and restarting the VM. Then start the install again.

>> HANDS-ON PROJECT

PROJECT 2-4: Install Windows 10 in a VM

This project assumes you already have 64-bit Windows 10 Pro installed on a computer. Do the following:

1. Enable Client Hyper-V, and set up a VM in it.
2. Use the ISO file you created earlier in the chapter to install Windows 10 in the VM.
3. Verify you can use Microsoft Edge in the VM to surf the web.

When learning to maintain a new OS, you can build on your knowledge and experience gained from supporting previous OSs. Windows 10 has an architecture similar to those of Windows 8/7, and the folder structures are also the same. The most important folders in Windows 10 are identical to the most important folders in Windows 8/7. The following list explains where to find these folders, assuming Windows is installed on drive C:

- ▲ User profiles are kept in the C:\Users folder.
- ▲ For a 32-bit Windows installation, program files for applications are stored in the C:\Program Files folder.
- ▲ For a 64-bit Windows installation, program files for applications are stored here:
 - ▲ Program files for 64-bit applications are stored in the C:\Program Files folder.
 - ▲ Program files for 32-bit applications are stored in the C:\Program Files (x86) folder.
- ▲ Windows is stored in C:\Windows, and the folder structure within this folder is the same as in Windows 8/7.



Notes This portion of the chapter is written to follow Chapter 10 in *A+ Guide to IT Technical Support*, ninth edition, or Chapter 3 in *A+ Guide to Software*, ninth edition.

Let's begin this section by looking at changes to how Windows manages updates. After that, you'll learn about Windows backup methods.

MANAGE UPDATES TO WINDOWS, APPLICATIONS, AND DRIVERS

Earlier in the chapter, you learned how to use the Settings app to update Windows. In addition to Windows updates, updates are sometimes available for applications and device drivers. You may want to delay or defer automatic updates so as not to interfere with user activity, to conserve data usage on a metered connection (where data plans are limited), to prevent updates corrupting Windows or installed apps and drivers, and, in a corporate or educational environment, to maintain more control over the software that the IT department manages and supports. However, you don't want to prevent Windows from receiving security updates because not having the latest updates is the primary reason malware is able to attack a system.

Windows 10 updates automatically by default. Tools you can use to manage updates include the Settings app, Group Policy, and the registry editor.

USE THE SETTINGS APP

Here's a brief list of your options available for managing updates from the Settings app:

- ▲ **View or uninstall an update.** In the Settings app, click **Update & security** and then click **Windows Update** in the left pane. Click **Update history** to review recent updates and to uninstall updates that are available for uninstallation (see Figure 2-39).

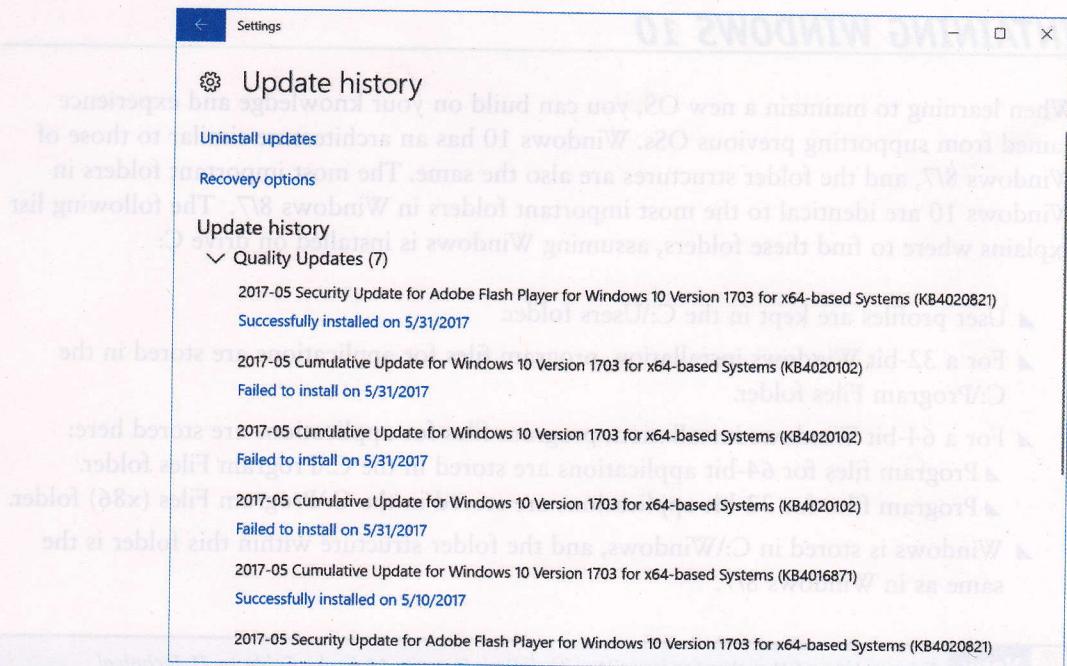


Figure 2-39 Use the Settings app to manage Windows 10 updates

- ▲ **Schedule restarts and active hours.** In the Windows Update window, use the Update settings section to schedule a pending restart or to set **active hours**, during which time the computer will avoid automatic restarts. Note that if a scheduled restart occurs outside of active hours, but when the computer is in use, you will have an opportunity to delay the restart.
- ▲ **Other Microsoft products and Windows features.** In the Windows Update window, click **Advanced options**. On the Advanced options window (see Figure 2-40), for all editions of Windows 10, you can choose to receive updates to other Microsoft products along with Windows updates. You can also allow Windows to automatically sign you in and finish installing updates after a Windows restart.

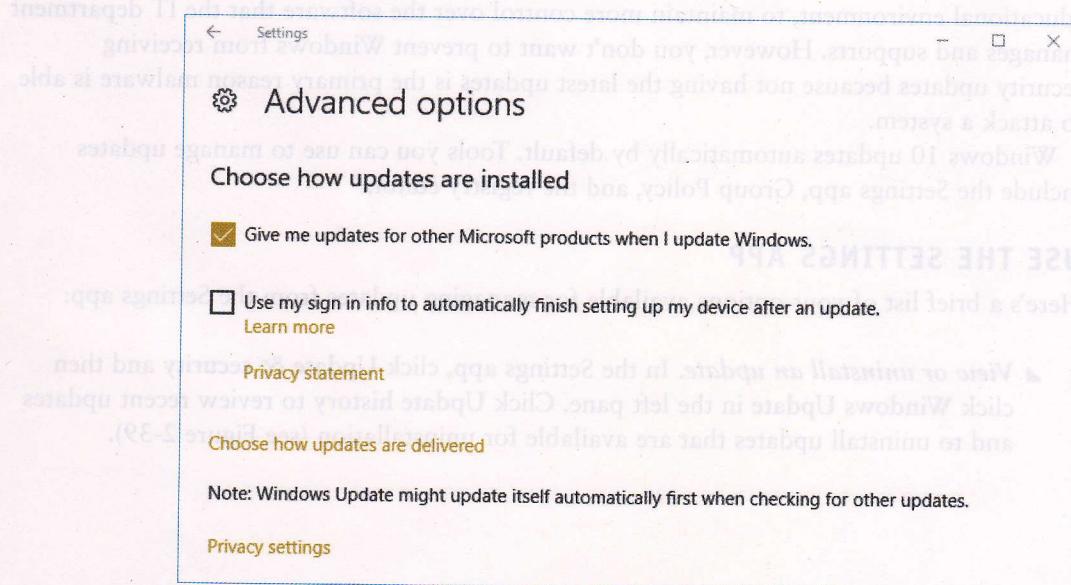


Figure 2-40 Control how updates to Windows and Microsoft apps are installed

- ▲ **Delivery Optimization.** Click Choose how updates are delivered to decide whether to receive Windows updates from other computers. This option speeds update downloading by sharing some of the update files between computers instead of downloading all of the files directly from Microsoft's servers. You can limit this sharing feature to computers on your local network, allow sharing with computers on the Internet, or turn this feature off.
- ▲ **Defer or pause updates.** For Windows 10 Pro, Windows 10 Enterprise, and Windows 10 Education, on the Advanced options window (see Figure 2-41), you can choose when updates are installed and also pause updates. Notice that updates to new features for Windows can be deferred for up to 365 days and quality updates (improvements to Windows) can be deferred for up to 30 days. You can pause updates for 35 days. You cannot defer or pause security updates in this window.

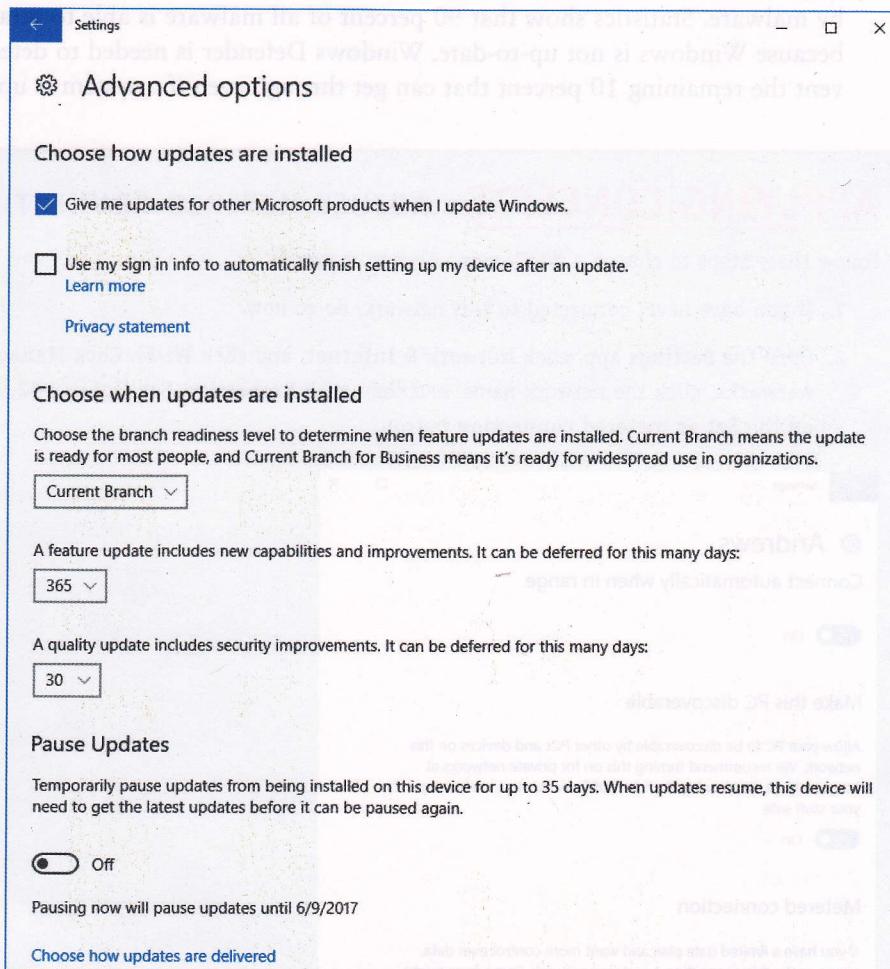


Figure 2-41 For Windows 10 Pro, Windows 10 Enterprise, or Windows 10 Education, use the Advanced options window to defer and pause features and quality updates



Notes On the Advanced options window, the two sections, *Choose when updates are installed* and *Pause Updates*, are visible only in Windows 10 Pro, Windows 10 Enterprise, and Windows 10 Education. Home editions are missing these two sections.

USE METERED CONNECTIONS

Setting your network connection to “metered” will prevent your computer from downloading updates, as Windows assumes you’re being charged for data and will wait until you’re on an unmetered connection. You can change Wi-Fi connections to be metered in the Settings app. For Ethernet connections, you’ll need to edit the registry. If you do decide to use metered connections, keep these important points in mind:

- Windows will still download and install short downloads of security updates. It will not download all important Windows updates that have been known to protect a system against malware. This means that stopping Windows updates using metered connections can put your computer at risk.
- You must manually download and install Windows updates. Do this at least weekly.
- Regularly maintain backups of data and system files in case your system gets attacked by malware. Statistics show that 90 percent of all malware is able to attack a system because Windows is not up-to-date. Windows Defender is needed to detect and prevent the remaining 10 percent that can get through even if a system is up-to-date.

APPLYING CONCEPTS ADJUST METERED CONNECTIONS

Follow these steps to change a Wi-Fi connection to metered:

1. If you have never connected to this network, do so now.
2. Open the **Settings** app, click **Network & Internet**, and click **Wi-Fi**. Click **Manage known networks**, click the network name, and then click **Properties**. See Figure 2-42. Click to turn on the **Set as metered connection** button.

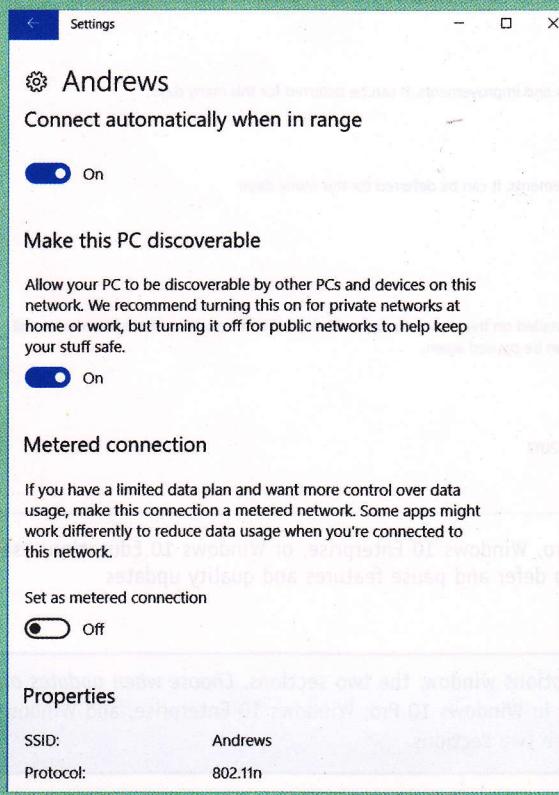


Figure 2-42 Set a Wi-Fi network to a metered connection

To edit the registry to change both Wi-Fi and Ethernet connections to metered connections, do the following:

1. Sign in to Windows using an administrator account.
2. In the Cortana search box, enter **regedit.exe** and press **Enter**. Respond to the UAC box. The registry editor opens.
3. Navigate to the key **HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\NetworkList\DefaultMediaCost**. See Figure 2-43.

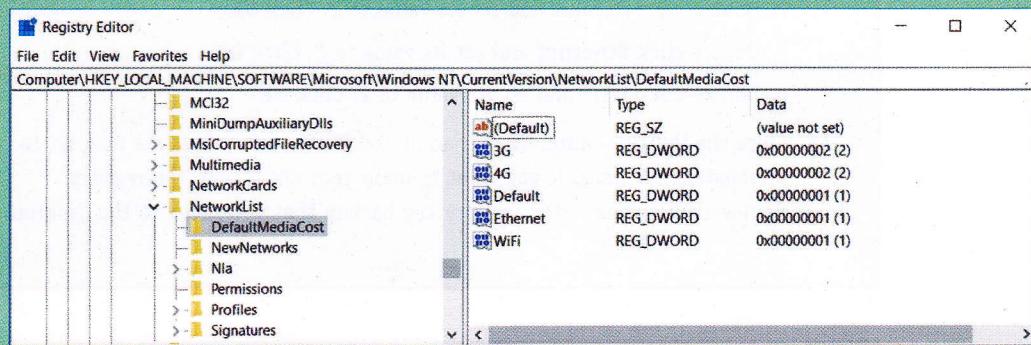


Figure 2-43 Three values of the DefaultMediaCost key must be changed

4. To back up the key, right-click the **DefaultMediaCost** key and export it to your desktop. Verify the backup file is stored on the desktop.
5. Right-click the **DefaultMediaCost** key, click **Permissions**, and click **Advanced**. In the Advanced Security Settings dialog box, note that the owner of the key is TrustedInstaller.
6. Click **Change**. The Select User or Group dialog box appears. In the text box, type **Administrators**. Click **Check Names**. Click **OK**.
7. Check **Replace owner on subcontainers and objects**. See Figure 2-44.

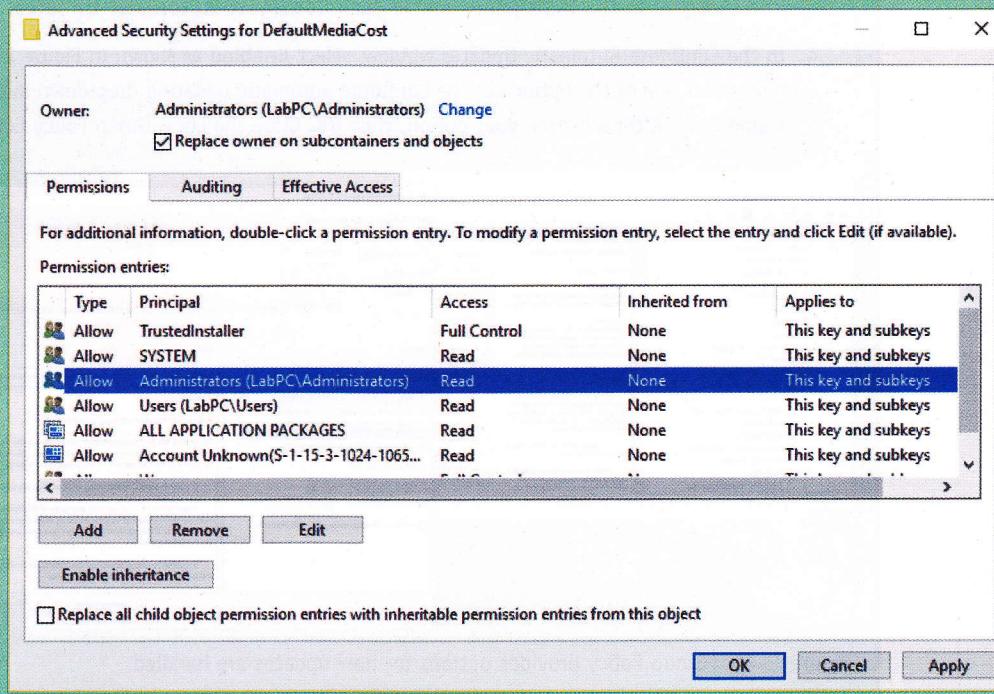


Figure 2-44 Set ownership properties for the registry key

8. In the Principal column, select **Administrators**. As shown in Figure 2-44, notice access to the key is now set to Read. Click **Edit**.
9. In the Permission Entry dialog box, check **Full Control** and click **OK**.
10. Click **OK** to close the Advanced Security Settings dialog box. Click **OK** to close the Permissions for DefaultMediaCost dialog box. You return to the main window of the registry editor.
11. In the right pane, notice that the Data values for Default, Ethernet, and WiFi Values are all set to 1. Do the following to change all three values to 2:
 - a. Double-click **Default** and set its value to 2. Click **OK**.
 - b. Double-click **Ethernet** and set its value to 2. Click **OK**.
 - c. Double-click **WiFi** and set its value to 2. Click **OK**.
12. Close the registry editor. The Ethernet and Wi-Fi connections are now set to metered connections. If you want to undo your changes to the registry, double-click the exported registry key backup that you saved to the desktop.

APPLYING CONCEPTS ADJUST GROUP POLICY

You can use Group Policy for Professional, Enterprise, and Education editions to manage how updates are downloaded and installed. Among other things, you can schedule when updates are installed, delay automatic restarts, configure active hours, and control restart notifications. Here's how:

1. Open the Local Group Policy Editor (gpedit.msc).
2. In the left pane, under *Computer Configuration*, double-click **Administrative Templates**, **Windows Components**, and then click **Windows Update**.
3. Notice that under Windows Update, you can configure how updates are managed. Let's look at one example. In the right pane, double-click **Configure Automatic Updates**.
4. In the Configure Automatic Updates window, select **Enabled** as shown in Figure 2-45. In the Options box, select one of the options in the Configure automatic updating drop-down menu, also shown in Figure 2-45. After selecting your option, click **OK**. Close the Local Group Policy Editor window.

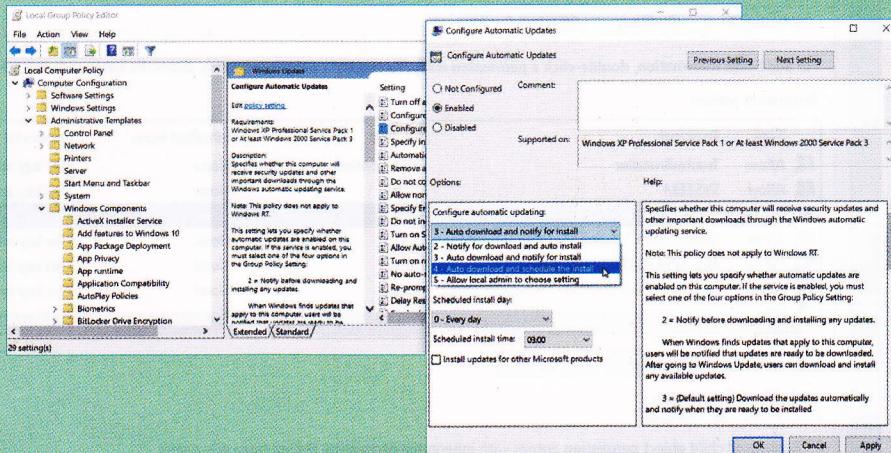


Figure 2-45 Group Policy provides options for how updates are handled

CONTROL DEVICE DRIVER UPDATES

When updating the OS, Windows 10 also downloads and installs updates to drivers for devices installed on the computer. You can use the System Properties dialog box to change this setting:

1. Open Control Panel and then open the System window. Click Advanced system settings.
2. The System Properties dialog box opens. Select the Hardware tab and then click Device Installation Settings (see Figure 2-46). To reject future updates to device drivers, select No (your device might not work as expected) and click Save Changes.

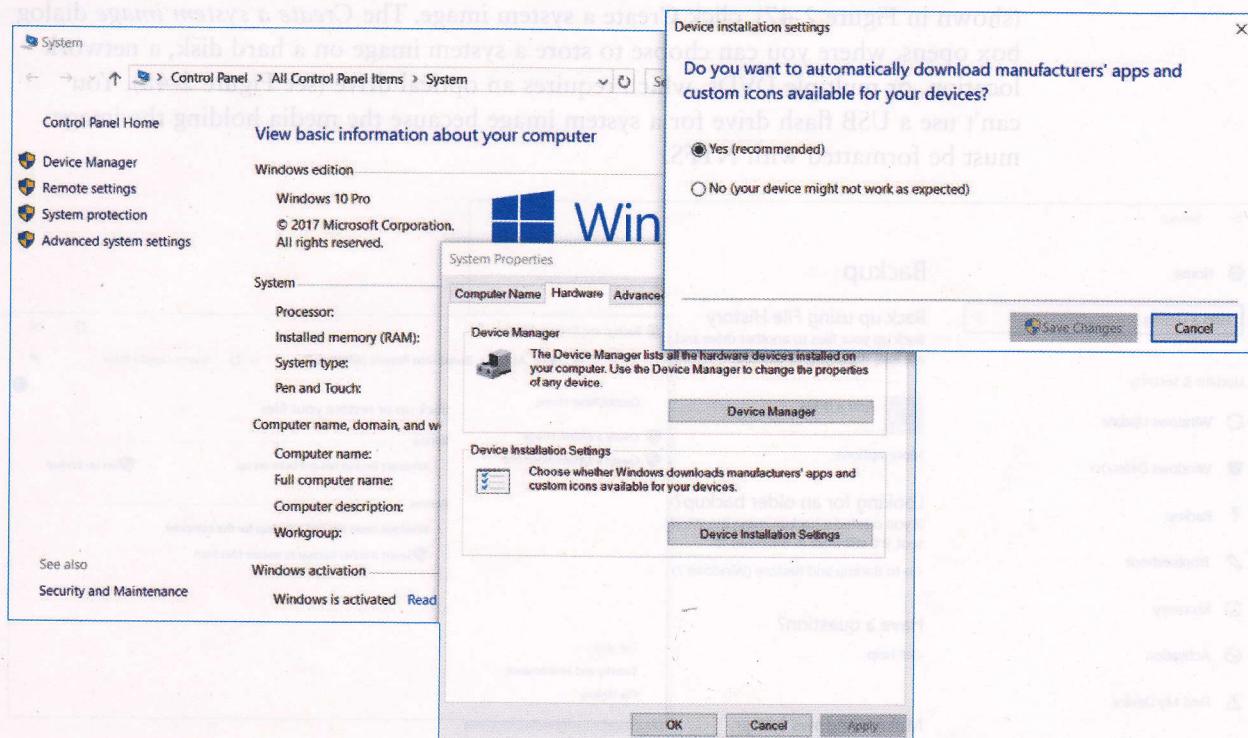


Figure 2-46 Decide how to handle automatic driver downloads

BACK UP DATA FILES AND SYSTEM FILES

Windows 10 improves on several familiar tools for backing up user data and system files. However, there are a few significant changes from Windows 8 that make these tools even more effective and helpful. Let's see what's new for Windows 10:

- **System image.** Recall that a **system image** is a bit-by-bit backup of the entire volume where Windows is installed; it can also include additional volumes. When you restore a hard drive using the system image, everything on the volume is removed and replaced with the system image. A system image was the only way to back up the entire Windows 7 volume, and was one option for backing up the Windows 8 volume.



Notes Windows 8 provides the option of creating a custom refresh image that contains a backup of the Windows volume. However, Windows 10 does not support a custom refresh image. In Windows 10, the Refresh function and the `recimg` command have been deprecated, which means they are no longer available.

In the chapter, "Troubleshooting and Securing Windows 10 and Using Command Lines," you'll learn how to create a recovery drive in Windows 10 that can be used to reinstall Windows from system files stored on the drive.

To create a system image in Windows 10, open the **Settings** app, click **Update & security**, and then click **Backup**. In the Backup window, click **Go to Backup and Restore (Windows 7)**. (You can also access Backup and Restore from the Windows 10 Control Panel.) In the left pane of the Backup and Restore (Windows 7) window (shown in Figure 2-47), click **Create a system image**. The *Create a system image* dialog box opens, where you can choose to store a system image on a hard disk, a network location, or multiple DVDs, which requires an optical drive (see Figure 2-48). You can't use a USB flash drive for a system image because the media holding the image must be formatted with NTFS.

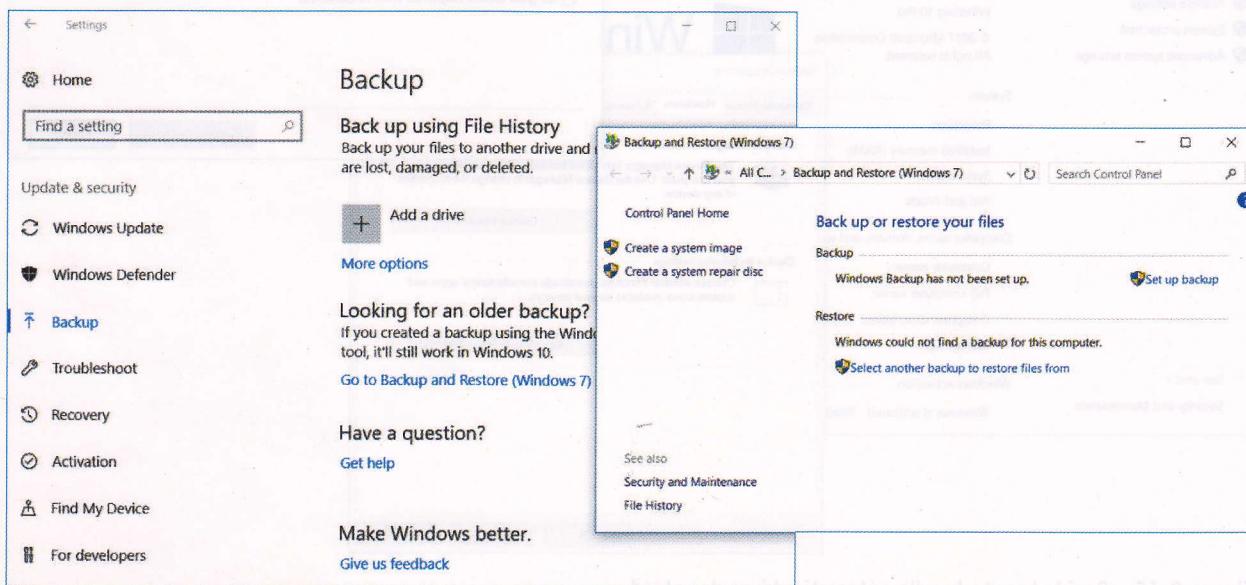


Figure 2-47 The familiar Windows 7 tool, *Create a system image*, is available in Windows 10

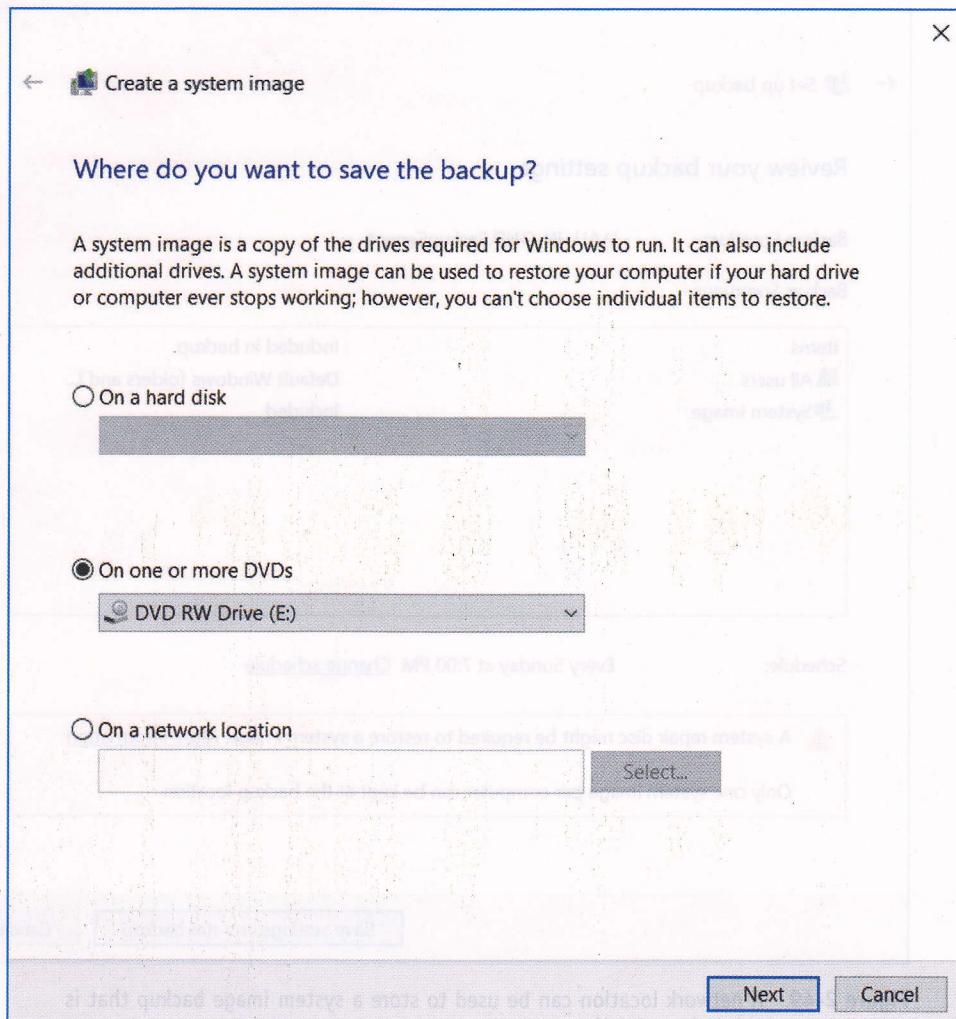


Figure 2-48 A system image is a copy of everything stored on the Windows volume and can include additional volumes

To Learn More To learn more about creating and using system images, see page 464 in Chapter 10 and page 621 in Chapter 13 of *A+ Guide to IT Technical Support*, ninth edition, or page 128 in Chapter 3 and page 285 in Chapter 6 of *A+ Guide to Software*, ninth edition.

▲ **Windows Backup.** This feature was called Backup and Restore in Windows 7. It wasn't available in Windows 8, but has returned for Windows 10 and works as it did before. Use this tool to back up personal data and choose whether to include the system image in the backup. To save a backup and set up an ongoing backup schedule, use the **Backup** window in the **Settings** app, or open **Control Panel** and click **Backup and Restore (Windows 7)**. In the **Backup and Restore (Windows 7)** window, click **Set up backup**. You can choose to store your backup on DVDs, an extra hard drive, or a network location. (For Windows 10 Home, you can save the image to a network location; this option was not available in Windows 7 Home.) If you choose to back up to a removable device, you cannot include the system image in the backup. Next, select the libraries and folders to include in the backup and whether to include a system image. Click **Change schedule** to set a backup schedule, and then save settings and run the backup as shown in Figure 2-49.

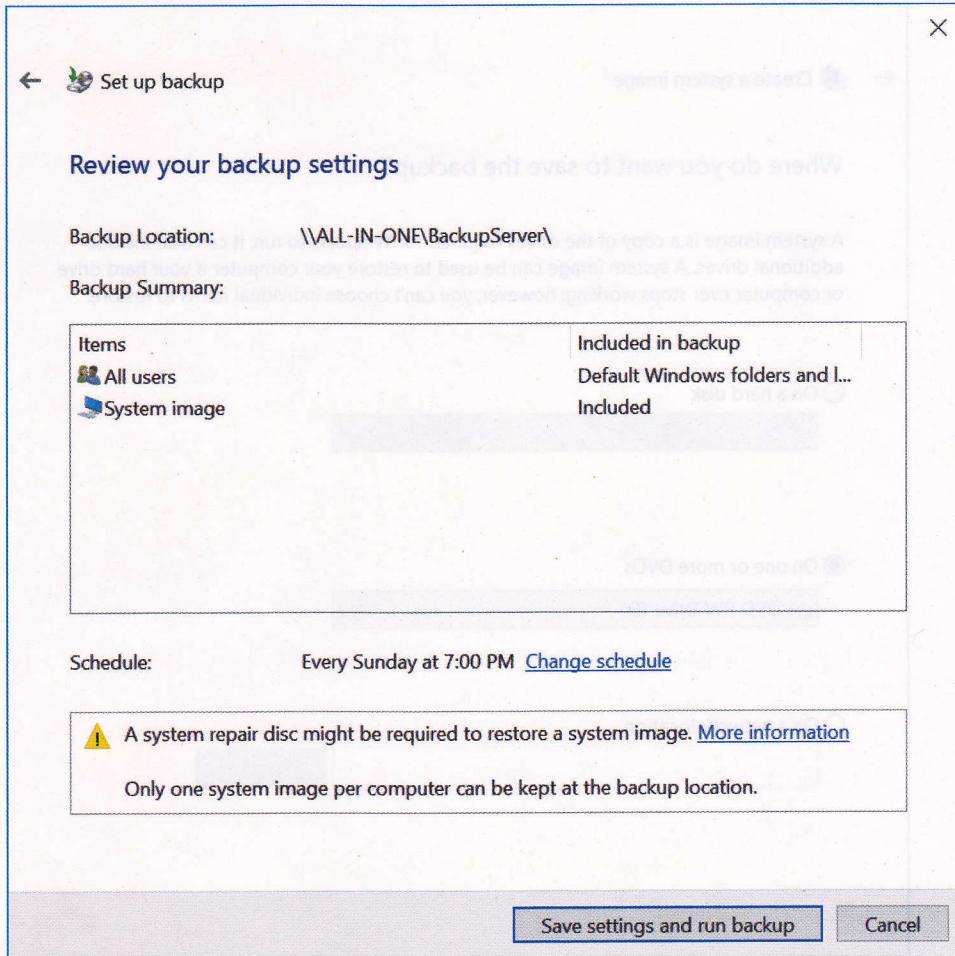


Figure 2-49 A network location can be used to store a system image backup that is regularly updated

? To Learn More To learn more about backing up personal data folders and files with Windows Backup, see pages 456–459 in Chapter 10 of *A+ Guide to IT Technical Support*, ninth edition, or pages 120–123 in Chapter 3 of *A+ Guide to Software*, ninth edition.

File History. File History works the same in Windows 10 as it did in Windows 8. File History can store backups on a flash drive and, by default, updates changes to backed-up files every hour. Use the Settings app for basic File History features and use the Control Panel for full access to all File History features. To find File History, open the Settings app, click **Update & Security**, and then click **Backup** in the left pane. On the left side of Figure 2-50, the Backup options window shows options available in File History in the Settings app. The Advanced Settings window on the right side of the figure shows additional options for File History available from Control Panel.

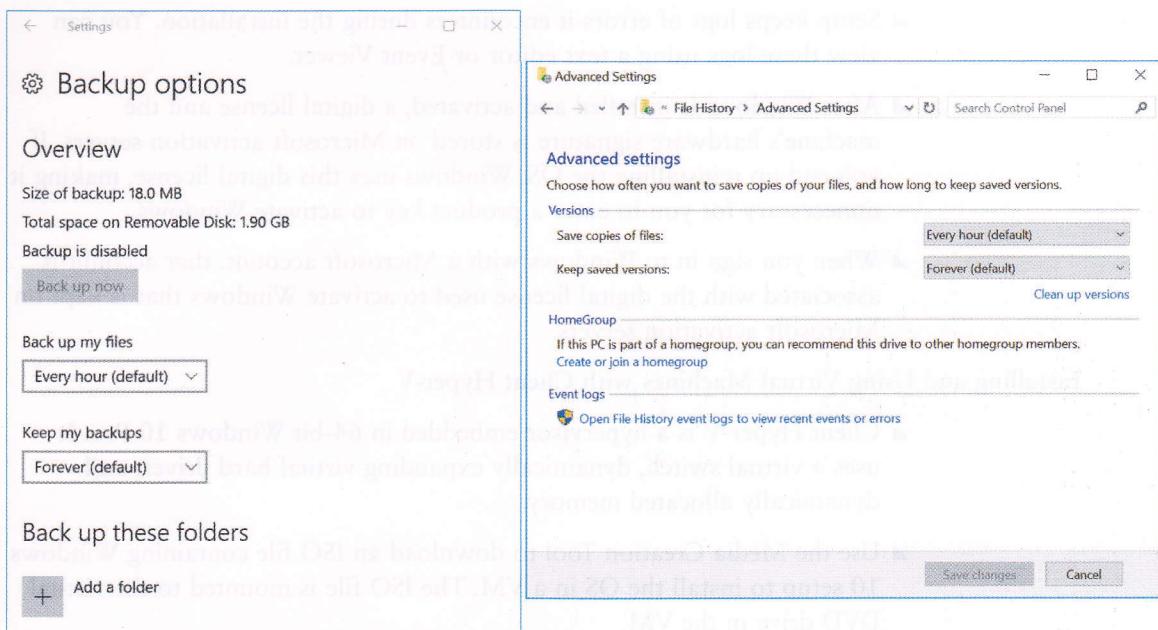


Figure 2-50 Settings app on the left shows backup options available, and File History on the right gives access to HomeGroup settings and File History event logs

To Learn More To learn more about backing up personal data folders and files with File History, see pages 455–456 in Chapter 10 of *A+ Guide to IT Technical Support*, ninth edition, or pages 119–120 in Chapter 3 of *A+ Guide to Software*, ninth edition.

>> HANDS-ON PROJECT

PROJECT 2-5: Back Up and Restore Files Using File History

Create a few data files in your Documents folder for your user account. Use File History to set up a backup of this folder to a network location or another device other than the hard drive that contains Windows. Delete one of the files. Use File History to recover the deleted files.

When instructing users how to maintain backups of their data files, which folders would you suggest they back up? Where would you suggest the backups be stored? Discuss these questions with others in your class.

>> CHAPTER SUMMARY

Installing Windows 10

- ▲ Use a clean install of Windows 10 on a new hard drive or when a sluggish or corrupted OS needs a fresh, new start. You can upgrade Windows 8/7 to Windows 10. Before you perform an upgrade, make sure all data in the system is backed up. During the upgrade, the old installation of Windows is stored in the Windows.old folder.
- ▲ After the installation, verify you have network access and Windows is activated. Install Windows updates, verify update settings, install hardware and applications, set up user accounts, restore user data and preferences, and turn Windows features on or off.

- ▲ Setup keeps logs of errors it encounters during the installation. You can view these logs using a text editor or Event Viewer.
- ▲ After Windows is installed and activated, a digital license and the machine's hardware signature is stored on Microsoft activation servers. If you end up reinstalling the OS, Windows uses this digital license, making it unnecessary for you to enter a product key to activate Windows.
- ▲ When you sign in to Windows with a Microsoft account, that account is associated with the digital license used to activate Windows that is kept on Microsoft activation servers.

Installing and Using Virtual Machines with Client Hyper-V

- ▲ Client Hyper-V is a hypervisor embedded in 64-bit Windows 10 Pro. It uses a virtual switch, dynamically expanding virtual hard drives, and dynamically allocated memory.
- ▲ Use the Media Creation Tool to download an ISO file containing Windows 10 setup to install the OS in a VM. The ISO file is mounted to the virtual DVD drive in the VM.

Maintaining Windows 10

- ▲ Windows 10 installs updates to the operating system automatically by default. The Pro, Education, and Enterprise editions allow features and quality updates (but not security updates) to be deferred for up to several months.
- ▲ Updates for the OS, applications, and drivers can be managed using the Settings app, metered connections, Group Policy, registry edits, or the System Properties dialog box.
- ▲ Windows 10 retains many of the familiar tools for making backups of user data and Windows system files. Use a Windows 7 system image to back up the entire Windows volume. Use Backup and Restore to back up data and maintain a system image. File History is a convenient way for users to maintain data backups.

>> KEY TERMS

active hours – The time of day the computer will avoid to perform an automatic restart when installing an update.

default product key – A Windows product key that can be used to fix a problem when you attempt to reinstall Windows 10 Pro, but Windows 10 Home installs instead.

digital license – A value stored on Microsoft activation servers along with a machine's hardware signature that verifies the machine has a valid license to use Windows.

hardware signature – Information about a computer's hardware stored on Microsoft activation servers that is used to verify the computer has a license to use Windows.

Media Creation Tool – Software available for free on the Microsoft website that is used to create bootable media for Windows setup. You can use the tool to create an ISO image of a DVD, bootable DVD, or USB flash drive. Creating the bootable setup media is free; however, you still need a product key or digital license to activate Windows 10.

SoC (System on a Chip) – A fully contained microcomputer on a single complex circuit board. Most smart phones and tablets use SoC technology.

system image – A backup of the entire volume where Windows is installed; can also include additional volumes.

>> REVIEWING THE BASICS

1. Which three Windows 10 editions allow you to restrict updates to only security updates?
2. Which method of backing up system files was available in Windows 7 and is now available again in Windows 10?
3. Following a failed attempt to upgrade Windows 8 to Windows 10, which two folders on drive D: might contain log files to help you troubleshoot the problem when Windows setup files are stored on drive D:?
4. Under what circumstances might the product key for Windows be stored on firmware on the motherboard?
5. Windows 10 has become corrupted and you decide to reinstall the OS. Will the setup process request a product key during the install? Why or why not?
6. What does the 4-digit version number for the installed edition of Windows 10 tell you about the version of Windows 10 installed?
7. Which version of Windows 10 was released in April, 2017?
8. How much free space on the Windows volume is required to install a 64-bit installation of Windows 10?
9. How long will the Windows.old folder be available on the Windows volume following a Windows 10 upgrade?
10. What information about a network printer do you need to know for Windows to find the printer on the network before installing it?
11. Suppose you suspect your Windows setup DVD is damaged. What tool available on the Microsoft web site can you use to create a new setup DVD?
12. Why would you want to set up a VM that uses dynamically allocated memory?
13. According to statistics, what one thing can you do to prevent 90 percent of malware from attacking a system?
14. Describe the purpose of a virtual switch when used by VMs on a host machine.
15. What two tools in Windows 10 Pro can be used to manage metered connections?
16. Which dialog box can be used to reject automatic future updates to device drivers?
17. What is the name of the Windows 10 bit-by-bit backup of the Windows volume?
18. Which Windows 10 backup tool is easy to use and the recommended tool for users to back up their personal data?
19. Does Windows 10 allow you to recreate a custom refresh image as did Windows 8?
20. When does Microsoft link a Microsoft account to a Windows digital license stored on its activation servers?

>> THINKING CRITICALLY

1. Which backup tool and media should you use to keep an up-to-date copy of the entire Windows volume?
 - a. System image on multiple DVDs
 - b. Windows Backup on a flash drive
 - c. File History on a flash drive
 - d. System image on a network location
2. Which installation of Windows 10 requests you enter a product key during the install process?
 - a. When you are replacing a failed hard drive and the failed drive already had Windows 10 installed.
 - b. When you are replacing a failed motherboard on a system with Windows 10 installed and a Microsoft account was not used to sign in to Windows.
 - c. When you are replacing a failed motherboard on a system with Windows 10 installed and a Microsoft account had been used to sign in to Windows.
 - d. When Windows 10 becomes corrupted and you decide to perform a clean install to recover the OS.
3. Which Windows 10 backup method is ideal for users to back up their personal data?
 - a. Create a system image
 - b. Backup and Restore with updates to the system image
 - c. Backup and Restore
 - d. File History
4. Which of the following is not a possible way to install Windows 10 in a VM?
 - a. Clean install from an ISO image
 - b. Clean install from a USB flash drive
 - c. Upgrade from Windows 8 using an ISO image
 - d. Upgrade from Windows Vista using an ISO image
 - e. All of the above
5. Suppose you want to boot a VM from its virtual DVD drive, but it boots to the VMs hard drive. Which of the following could be the source of this problem? Select all that apply.
 - a. There is no DVD or ISO file mounted to the virtual DVD drive
 - b. The virtual DVD drive is not enabled
 - c. The boot sequence is not correct in the VM's UEFI/BIOS settings
 - d. The hard drive does not have an OS installed

>> REAL PROBLEMS, REAL SOLUTIONS**REAL PROBLEM 2-1: Using Sysprep for an Out-of-Box Experience**

Suppose you have reinstalled Windows on an old computer and plan to give the computer to a friend. Windows 10 offers the Sysprep tool that you can use to give your friend a genuine Out-of-Box Experience (OOBE) the first time she turns on her computer.



Notes This Real Problem works great in a VM.

2

To see how this works, do the following:

1. Sign in to Windows as an administrator and open a Command Prompt window.
2. Navigate to the C:\Windows\System32\Sysprep folder and execute the sysprep command. Under System Cleanup Action, make sure Enter System Out-of-Box Experience (OOBE) is selected. Under Shutdown Option, select Shutdown. Click OK. The computer shuts down.
3. Boot up the computer to see how the OOBE works.

REAL PROBLEM 2-2: Practicing Backup and Restore Skills

An IT support technician is often called on to help users with corrupted data files. The best help you can give is to teach users how to create and maintain good backups and restore corrupted or lost files from backup. To prepare you to teach users these skills, do the following:

1. Create a standard user account named USER12. Put some files in the USER12 Documents folder. Use File History to back up USER12's libraries to a USB flash drive.
2. Delete the files you stored in the USER12 Documents folder.
3. Use File History to restore the deleted files.
4. When working on a lab computer, delete the USER12 account along with all its data.