Chapter 1

Windows Client Installation

MICROSOFT EXAM OBJECTIVES COVERED IN THIS CHAPTER:

✓ **Install Windows Client**

- Select the appropriate Windows edition; prepare hardware for installation; perform a manual clean installation; plan and implement an upgrade from a previous version of Windows; customize a Windows client installation by using the Windows ADK; configure activation and troubleshoot activation issues.

✓ **Manage Windows updates**

- Check for updates, configure updates; validate and test updates; select the appropriate servicing channel; configure Windows update options; configure Windows delivery optimization; control updates by using group policy settings; configure updates using Windows Update for Business; troubleshoot updates.

This section of the book is for Exam MD-100, which is the first of two Windows Client exams (MD-100 and MD-101) for the Microsoft 365 Certified: Modern Desktop Administrator Associate. Let me be the first to welcome you to Windows Client and the beginning of a new journey. Both the MD-100 and the MD-101 have recently been updated to include Windows 11. So, these updates will be included in this book. This update consists mainly of adding Windows 11 and changing the name to reflect that addition. The name of the updated MD-100 is "Windows Client," and it covers both Windows 10 and 11. This book will feature both Windows 10 and Windows 11. There are a few differences between the two operating systems. Windows 11 is the next client operating system, and it's built on the same foundation as Windows 10.

But as with the start of any journey, we must take our first steps. The first step for this exam is to learn about the installation process. It is important that you understand the different versions of Windows clients and which one is right for you and your organization.

In this chapter, I will show you the many different features of Windows 10/11, and then I will describe each edition. I will then show you how to install Windows clients and also how to do an upgrade from a previous version.

Before you can perform an installation, you must first be sure your hardware meets the minimum requirements and is supported by the operating system. After we install the Windows client operating system, I will show you how to get updates.

Understanding the Basics

Microsoft Windows 11 is the latest version of Microsoft's client operating system software. Both Windows 11 and Windows 10 combine the best of Windows 7 and Windows 8, and they also make it much easier to work within the cloud.

Microsoft has released many different versions of the Windows 10 and Windows 11 operating systems. The following lists just a few of the most popular versions:

- Windows 10 Editions
  - Windows 10 Home
  - Windows 10 Pro
  - Windows 10 Pro for Workstation
  - Windows 10 Enterprise

  - Windows 10 Enterprise E3
  - Windows 10 Enterprise E5
  - Windows 10 Education
- Windows 11 Editions
  - Windows 11 Home
  - Windows 11 Pro
  - Windows 11 Pro for Workstation
  - Windows 11 Enterprise
  - Windows 11 Education
  - Windows 11 Pro Education
  - Windows 11 Mixed Reality

One major difference between Windows 10 and Windows 11 is basically the look. Windows 11 provides an interface with pastel colors and rounded corners for all windows. Another difference between the two is that the Start Menu has been moved to the center of the taskbar. But it can be moved back to the left side, as it was in Windows 10, if the user prefers. Other than the appearance, Windows 11 functions pretty much the same as Windows 10 with a few minor differences.

Microsoft also offers some of these operating systems as slimmed-down versions called "Windows 10 IoT Core." This version is one of the previously listed Windows 10 versions that doesn't require a monitor or system. For example, say you are building a toy robot and you want to load Windows 10 into your core computer. You can use the IoT (which stands for Internet of Things) versions to run the robot's functionality.

Windows 10 and 11 have been improved in many of the weak areas that plagued Windows 8. They have a much faster boot time and shutdown compared to Windows 8. They also bring back the previous Start button that we are all so familiar with from previous editions. In Windows 10 the Start button is on the left side of the taskbar and in Windows 11 it's in the center of the taskbar.

The Windows 10 and 11 operating system functions are also faster than their previous counterparts. The processes for opening, moving, extracting, compressing, and installing files and folders are more efficient than they were in previous versions of Microsoft's client operating systems.

Let's take a look at some of the features of each Windows 10 edition (this is just an overview of some of the benefits to using Windows 10). Table 1.1 and Table 1.2 show each edition and what some of the features are for those editions.

The information in Table 1.1 and Table 1.2 was taken directly from Microsoft's website and documentation.

TABLE 1.1 Windows 10 security and protection

Description	Home	Pro	Pro for Workstation	E3	E5
Integrity enforcement of operating system boot-up process	☐	☐	☐	☐	■
Integrity enforcement of sensitive operating system components	☐	☐	☐	☐	■
Advanced vulnerability and zero-day exploit mitigations	☐	☐	☐	☐	■
Reputation-based network protection for Microsoft Edge, Internet Explorer, and Chrome	☐	☐	☐	☐	■
Host-based firewall	☐	☐	☐	☐	■
Ransomware mitigations	☐	☐	☐	☐	■
Pre-execution emulation executables and scripts	☐	☐	☐	☐	■
Runtime behavior monitoring	☐	☐	☐	☐	■
In-memory anomaly and behavior monitoring	☐	☐	☐	☐	■
Machine learning and AI-based protection from viruses and malware threats	☐	☐	☐	☐	■
Cloud protection for fastest responses to new/unknown web-based threats	☐	☐	☐	☐	■
Protection from fileless-based attacks	☐	☐	☐	☐	■
Industry standards–based multifactor authentication	☐	☐	☐	☐	■
Support for biometrics (Facial and Fingerprints)	☐	☐	☐	☐	■
Support for Microsoft Authenticator	☐	☐	☐	☐	■
Support for Microsoft-compatible security devices	☐	☐	☐	☐	■
Automatic encryption on capable devices	☐	☐	☐	☐	■
Advanced encryption configuration options		☐	☐	☐	■
Removable storage protection		☐	☐	☐	■
Supports for Active Directory and Azure Active Directory		☐	☐	☐	■

Description	Home	Pro	Pro for Workstation	E3	E5
Hardware-based isolation for Microsoft Edge		☐	☐	☐	■
Application control powered by the Intelligent Security Graph		☐	☐	☐	■
Device Control (e.g., USB)		☐	☐	☐	■
Personal and business data separation		☐	☐	☐	■
Application access control		☐	☐	☐	■
Copy and paste protection		☐	☐	☐	■
Removable storage protection		☐	☐	☐	■
Integration with Microsoft Information Protection		☐	☐	☐	■
Network protection for web-based threats				☐	■
Enterprise management of hardware-based isolation for Microsoft Edge				☐	■
Hardware isolation of single sign-in tokens				☐	■
Direct Access & Always On VPN Device Tunnel				☐	■
Centralized configuration management, analytics, reporting, and security operations					■
Centralized management, analytics, reporting, and operations					■
Customizable network protection for web-based threats					■
Host intrusion prevention rules					■
Device-based conditional access					■
Tamper protection of operating system					■
Advanced monitoring, analytics, and reporting for attack surface					■
Advanced machine learning and AI-based protection for Apex-level viruses and malware threats					■

TABLE 1.1 Windows 10 security and protection *(Continued)*

Description	Home	Pro	Pro for Workstation	E3	E5
Advanced cloud protection that includes deep inspection and detonation					■
Emergency outbreak protection from the Intelligent Security Graph					■
ISO 27001 compliance					■
Geolocation and sovereignty of sample data					■
Sample data retention policy					■
Monitoring, analytics, and reporting for Next Generation Protection capabilities					■

TABLE 1.2 Windows 10 updates

Description	Home	Pro	Pro for Workstation	E3	E5
In-place upgrades	☐	☐	☐	☐	■
Express updates	☐	☐	☐	☐	■
Delivery optimization	☐	☐	☐	☐	■
Windows Analytics Upgrade Readiness		☐	☐	☐	■
Windows Analytics Update Compliance		☐	☐	☐	■
Windows Update for Business		☐	☐	☐	■
Windows Analytics Device Health				☐	■
30 months of support for September targeted releases				☐	■
Windows 10 LTSC Access				☐	■

Windows 10/11 Features

Now that you have seen which editions contain which features, let's take a look at some of the features in greater detail. This section describes only a few of these features, but all features will be explained throughout this book.

Cortana Integration Windows 10/11 comes with Cortana integration. Cortana is your very own personal assistant. You can type in or ask Cortana a question and Cortana will seek out the best possible answer based on your question.

Secure Boot Windows 10/11 provides the ability for securely booting the operating system. Secure Boot validates all drivers and operating system components before they are loaded against the signature database.

Virtual Smart Cards Windows 10/11 has started offering a new way to do two-factor authentication with virtual smart cards. Virtual smart cards help an IT department that doesn't want to invest in extra hardware and smart cards. Virtual smart cards use Trusted Platform Module (TPM) devices that allow for the same capabilities as physical smart cards with the physical hardware.

Miracast Windows 10/11 allows you to project your laptop or mobile device to a projector or television. Miracast allows you to connect to an external device through the use of your mobile wireless display (WiDi) adapter.

Hyper-V Windows 10/11 (except the Home version) come with Hyper-V built into the operating system. Hyper-V is Microsoft's version of a virtual server.

Enterprise Data Protection Windows 10/11 Enterprise Data Protection (EDP) helps protect corporate data in a world that is increasingly becoming a Bring Your Own Device (BYOD) environment. Since many organizations are allowing employees to connect their own devices to their network, the possibility of corporate data being compromised because of noncorporate programs running on these personnel devices is increasing. For example, many third-party apps may put corporate data at risk by accidently disclosing corporate information through the application.

Enterprise Data Protection helps protect information by separating corporate applications and corporate data from being disclosed by personal devices and personal applications.

Device Guard Because employees can use multiple types of Windows 10/11 devices (Surface Pros, Intel and ARM-based devices, and Windows 10/11 computer systems), Device Guard is a feature that helps guarantee that only trusted applications will run on any of these devices.

Device Guard uses both hardware and software security features to lock down a device so that it can run only trusted and approved applications. This also helps prevent hackers from running malicious software on these devices.

Microsoft Passport/Windows Hello Microsoft has introduced two security features for Windows 10/11 called Windows Hello and Microsoft Passport. Windows Hello is a biometrics system integrated into Windows 10/11 and is a piece of the user's authentication experience. Microsoft Passport allows users to use a two-factor authentication system that combines a PIN or biometrics with an encrypted key from a user's device to provide two-factor authentication.

Start Menu Windows 10 brought back the Start Menu that users are familiar with. The Start Menu combines the best of both Windows 7 and Windows 8. So, the Start Menu gives you a menu that we were familiar with in Windows 7 as well as the Live Tiles that users liked in Windows 8. However, in Windows 11 the Start Menu is now in the center of the taskbar.

Microsoft Edge and Internet Explorer 11 Windows 10 has introduced a new way to surf the Internet with Microsoft Edge. But Windows 10 also still comes with Internet Explorer 11 in the event that you need to run ActiveX controls or run backward-compatible web services or sites. However, Windows 11 only comes with Microsoft Edge.

Microsoft Edge allows users to start using many new Microsoft features, including Web Note (allows you to annotate, highlight, and call things out directly on web pages), Reading View (allows you to print and save as a PDF for easy reading), and Cortana (personal assistant).

Domain Join and Group Policy Depending on the version of Windows 10 or Windows 11 that you are using, administrators have the ability to join Windows 10/11 clients to either a corporate version of Active Directory or a cloud-based version of Azure Active Directory.

Microsoft Store for Business Microsoft Store has included many applications that allow users to get better functionality and productivity out of their Windows 10/11 devices. One advantage for corporations is that they can create their own applications and load them into the Microsoft Store for users to download (called *sideloading*).

Mobile Device Management Mobile Device Management (MDM) allows administrators to set up Windows 10/11 policies that can integrate many corporate scenarios, including the ability to control users' access to the Microsoft Store and the ability to use the corporate VPN. MDM also allows administrators to manage multiple users who have accounts set up on Microsoft Azure Active Directory (Azure AD). Windows 10/11 MDM support is based on the Open Mobile Alliance (OMA) Device Management (DM) protocol 1.2.1 specification.

Windows 10 vs. Windows 11

Here are the differences between Windows 10 and Windows 11.

The information in Table 1.3 was taken directly from Microsoft's website and documentation.

TABLE 1.3 Comparison between Windows 10 and Windows 11

Feature and description	Windows 10	Windows 11
Auto HDR – Produces a wider, more vivid range of colors for a truly captivating visual experience.		■
Chat from Microsoft Teams – Reach anyone however you prefer (call, chat, text, video) right from your taskbar.		■
Desktop Groups – Switch between desktops for greater organization of open windows.		■
DirectStorage – Get faster load times and more detailed game worlds.		■
Microsoft Store – Find the apps, movies, and shows you love faster and select from a wider variety of apps.	□	■
Microsoft Teams – Call, chat, and make plans come to life all in one app.	□	■
New Emojis – Express every statement you write with faces, people, and celebration emojis.		■
Photos app –The updated Photos app makes editing and viewing much easier.	□	■
Seamless Redocking – Continue right where you left off when you plug/unplug from your external monitor.		■
Snap Assist – Features Layouts and Groups; helps you arrange your open windows into perfect grids.	□	
Touchscreen – New gestures make navigating with touch much more intuitive.	□	■

TABLE 1.3 Comparison between Windows 10 and Windows 11 *(continued)*

Feature and description	Windows 10	Windows 11
Updates – Faster reduction in download size for updates in Windows 11.		■
Widgets – Photos. News. To-dos. Weather. Widgets help you find content that matters to you.		■
Windows on ARM – Devices with thin and light designs and amazing battery lift that run the apps you care about.	□	■

What Has Been Changed in Windows 11?

When you're upgrading to Windows 11 from Windows 10 or when installing an update to Windows 11, some features may be removed or deprecated. Here are what will change:

- **Cortana:** Will no longer be included in the first boot experience or pinned to the taskbar.
- **Desktop wallpaper:** Cannot be roamed to or from device when signed in with a Microsoft account.
- **Internet Explorer:** Microsoft Edge with IE mode replaces the Internet Explorer 11 desktop application in Windows 11.
- **Management capabilities:** Organizations that want to deliver customized Start and Taskbar experiences are limited:
  - Start supports the ability for organizations to override the Start layout, but does not support locking down the layout from user modification.
  - Taskbar pins and ordering can be controlled by organizations.
- **Math Input Panel:** Has been removed. Math Recognizer will install on demand and includes the math input control and recognizer. Math inking in apps like OneNote are not impacted by this change.
- **Multi-App Kiosk Mode:** Is not available. Windows 11 only supports the use of a single app in Kiosk Mode.
- **News & Interests:** Has evolved. New functionality has been added, which can be found by clicking the Widgets icon on the taskbar.
- **Quick Status:** From the Lock screen and associated settings have been removed.
- **S Mode:** Is only available now for Windows 11 Home edition.

- **Search Results from the Internet:** Windows 11 does not support disabling the return of Internet Search results via `Registry` Key. The related Group Policy setting is not impacted by this change.
- **Snipping Tool and Snip and Sketch:** Have been merged into a single experience, keeping the familiar Snipping Tool name.
- **Start:** Has changed in Windows 11; changes include the following key deprecations and removals:
  - Named groups and folders of apps are no longer supported and the layout is not currently resizable.
  - Pinned apps and sites will not migrate when upgrading from Windows 10.
  - Live Tiles are no longer available.
- **Tablet Mode:** Has been removed and new functionality and capability is now included for keyboard attach and detach postures.
- **Taskbar:** Changes include:
  - People is no longer present on the taskbar.
  - Some icons may no longer appear in the System Tray (systray) for upgraded devices, including previous customizations.
  - Alignment to the bottom of the screen is the only location allowed.
  - Apps can no longer customize areas of the taskbar.
- **Timeline:** Has been removed. Some similar functionality is available in Microsoft Edge.
- **Touch Keyboard:** Will no longer dock and undock keyboard layouts onscreen sizes 18 inches and larger.
- **Wallet:** Has been removed.
- **Windows Deployment Services:** Is being partially deprecated.
- **Windows Store for Business and Windows Store for Education:** No longer include the Private Store tab.

Windows 10 and 11 Architecture

Windows 10 and 11 have limited the number of files that load at system startup to help with the core performance of the operating system, thus allowing for better performance.

Microsoft offers both a 32-bit version and a 64-bit version of Windows 10. But Windows 11 uses a 64-bit architecture only. The terms *32-bit* and *64-bit* refer to the CPU, or processor. The number represents how the data is processed. It is processed either as 2^{32} or 2^{64}. The larger the number, the larger the amount of data that can be processed at any one time.

To get an idea of how 32-bit and 64-bit processors operate, think of a large highway with 32 lanes. Vehicles can travel on those 32 lanes only, so when traffic gets backed up,

the result is delays. Now think of how many more vehicles can travel on a 64-lane highway. The problem here is that a 32-lane highway can't handle the number of vehicles a 64-lane highway can. You need to have the infrastructure to allow for that volume of vehicles. The same is true for computers. Your computer has to be configured to allow you to run a 64-bit processor.

So, what does all of this mean to the common user or administrator? It's all about random access memory, or RAM. A 32-bit operating system can handle up to 4 GB of RAM, and a 64-bit processor can handle up to 16 exabytes (EB) of RAM. None of this is new. Although 64-bit processors are just starting to get accepted with Windows systems, other operating systems, such as Apple, have been using 64-bit processors for many years.

Computer processors are typically rated by speed. The speed of the processor, or central processing unit (CPU), is rated by the number of clock cycles that can be performed in 1 second. This measurement is typically expressed in gigahertz (GHz). One GHz is one billion cycles per second. Keep in mind that processor architecture must also be taken into account when considering processor speed. A processor with a more efficient pipeline will be faster than a processor with a less efficient pipeline at the same CPU speed.

Now that you have seen the new features of Windows 10 and 11, let's look at how to prepare the machine to install Windows.

Preparing to Install Windows

Installing Windows can be relatively simple because of the installation wizard. The installation wizard will walk you through the entire installation of the operating system.

The most difficult part of installing Windows is preparing and planning for the installation. One thing I often say to IT pros is, "An hour of planning will save you days of work." Planning a Windows rollout is one of the hardest and most important tasks that you will perform when installing Windows. Since Windows 11 is built on the same foundation as Windows 10, you can use the same deployment capabilities, scenarios, and tools. You can also use the same basic deployment strategies that are used for Windows 10. So, when I'm mentioning Windows 10 in this book, it implies the same for Windows 11.

There are many decisions that should be made before you install Windows. The first decision is which version of Windows you want to install. As mentioned previously, Microsoft has several different versions of the Windows operating system. This allows an administrator to custom-fit a user's hardware and job function to the appropriate version and edition of Windows. Many times, Microsoft releases multiple editions of the operating system contained within the same Windows media disk. You can choose to unlock the one you want based on the product key you have. Let's take a closer look at the different versions of Windows that are offered with both Windows 10 and Windows 11.

In this book, we will not talk much about Windows 10 Education or Windows 11 Education. Windows Education is the counterpart to Windows Enterprise, but it is a volume-licensed version of Windows that is specifically priced for educational institutions. Educational institutions receive the same Enterprise functionality, but they pay much less than a corporation.

Windows Home

Windows Home is the main operating system for home users. Windows Home offers many features, including these:

- Broad application and device compatibility with unlimited concurrent applications
- A safe, reliable, and supported operating system
- Microsoft Passport/Windows Hello
- HomeGroup, which allows a user to easily share media, documents, and printers across multiple PCs in homes or offices without the need of a domain
- Improved taskbar and jump lists (the Jump Lists feature in Windows 10 and 11 allows you to quickly access files that you have been working on)
- Live thumbnail previews and an enhanced visual experience
- Advanced networking support (ad hoc wireless networks and Internet connection sharing)
- View Available Networks (VAN) (Windows by default has the ability, when you use a wireless network adapter, to choose the wireless network that you want to connect to by using the wireless network adapter properties)
- Device encryption
- Easy networking and sharing across all your PCs and devices
- Windows Update
- Multitouch
- Improved handwriting recognition

Windows Pro

Windows Pro is designed for small-business owners. Microsoft designed Windows Pro for users to get more done and safeguard their data. Pro offers the following features:

- Broad application and device compatibility with unlimited concurrent applications
- A safe, reliable, and supported operating system
- Microsoft Passport/Windows Hello
- Domain Join, which enables simple and secure server networking

- Improved taskbar and jump lists
- Enterprise Mode Internet Explorer (EMIE)
- Advanced networking support (ad hoc wireless networks and Internet connection sharing)
- View Available Networks (VAN) (Windows by default has the ability, when you use a wireless network adapter, to choose the wireless network that you want to connect to by using the wireless network adapter properties)
- Mobility Center
- Action Center, which makes it easier to resolve many IT issues yourself
- Easy networking and sharing across all your PCs and devices
- Group Policy Management
- Windows Update and Windows Update for Business
- Multitouch
- Improved handwriting recognition
- Domain Join, which enables simple and secure server networking
- BitLocker, which protects data on removable devices
- Device encryption
- Encrypting File System, which protects data
- Client Hyper-V
- Location-Aware Printing, which helps find the right printer when moving between the office and home
- Start Menu that includes Live Tiles

Windows Enterprise

Windows Enterprise is the version designed for midsize and large organizations. This operating system has the most features and security options of all Windows 10 and 11 versions. Here are some of its features:

- Broad application and device compatibility with unlimited concurrent applications
- A safe, reliable, and supported operating system
- Microsoft Passport/Windows Hello
- Enterprise Mode Internet Explorer (EMIE) (not available in Windows 11)
- Group Policy Management
- Windows Update and Windows Update for Business
- Advanced networking support (ad hoc wireless networks and Internet connection sharing)

- View Available Networks (VAN) (Windows by default has the ability, when you use a wireless network adapter, to choose the wireless network that you want to connect to by using the wireless network adapter properties)
- Mobility Center
- Easy networking and sharing across all your PCs and devices
- Multitouch
- Start Menu that includes Live Tiles (not available in Windows 11)
- Improved handwriting recognition
- Domain Join, which enables simple and secure server networking
- Device encryption
- Encrypting File System, which protects data
- Location-Aware Printing, which helps find the right printer when you are moving between the office and home
- Client Hyper-V
- Credential Guard
- Device Guard
- BitLocker, which protects data on removable devices
- DirectAccess, which links users to corporate resources from the road without a virtual private network (VPN)
- BranchCache, which makes it faster to open files and web pages from a branch office
- AppLocker, which restricts unauthorized software and also enables greater security hardware requirements

Windows 10 Enterprise E3 and E5

Microsoft has released a new cloud-based way to deploy Windows 10 Enterprise with the introduction of Windows 10 Enterprise E3 and E5. Windows 10 Enterprise E3 and E5 are subscription-based versions of Windows 10 for organizations that like to work with Microsoft 365.

When Microsoft released Windows 10 version 1703, it included a Windows 10 Enterprise E3 and E5 benefit for Microsoft customers with either Enterprise Agreements (EAs) or Microsoft Products & Services Agreements (MPSAs).

One of the advantages of using the subscription-based service for Windows 10 E3 and E5 is that the users can activate the Windows 10 subscription on up to five devices. Users can then download the corporate version of Windows 10 onto their work systems, personal systems, and other devices.

As you can see from Table 1.1 and Table 1.2, by purchasing the Windows 10 E3 and E5 subscriptions, you get many additional features, including enterprise-level security and

control. Some of the E3 and E5 components are available if you would like to purchase them separately.

Windows Client Requirements

Before you can install the operating system, you must make sure the machine's hardware can handle the operating system.

To install the Windows client successfully, your system must meet or exceed certain hardware requirements. Table 1.4 lists the minimum requirements for a Windows client–capable PC.

TABLE 1.4 Hardware requirements

Component	Windows 10 requirements	Windows 11 requirements
CPU (processor)	1 GHz or faster processor or system-on-a-chip (SoC)	1 GHz or faster with 2 or more cores on a compatible 64-bit processor or system-on-a-chip (SoC)
Memory (RAM)	1 GB for 32-bit or 2 GB for 64-bit	4 GB
Hard disk	32GB or larger hard disk	64 GB or larger storage device
Video adapter	DirectX 9 or later with WDDM 1.0 driver	DirectX 12 or later with WDDM 2.0 driver
Internet Connection	Internet connectivity is necessary to perform updates and to download and take advantage of some features.	For all Windows 11 editions, Internet access is required to perform updates and to download and take advantage of some features.

The hardware requirements listed in Table 1.4 are those specified at the time this book was written. Always check the Microsoft website for the most current information.

The Windows client–capable PC must meet or exceed the basic requirements to deliver the core functionality of the Windows operating system. These requirements are based on the assumption that you are installing only the operating system, without any premium functionality. For example, you may be able to get by with the minimum requirements if you are installing the operating system just to learn the basics of the software. Remember, the better the hardware, the better the performance.

Real World Scenario

Deciding on Minimum Hardware Requirements

The company you work for has decided that everyone will have their own laptop running Windows 10. You need to decide on the new computers' specifications for processor, memory, and disk space.

The first step is to determine which applications will be used. Typically, most users will work with an email program, a word processor, a spreadsheet, presentation software, and maybe a drawing or graphics program. Additionally, an antivirus application will probably be used. Under these demands, a 1 GHz Celeron processor and 1 GB of RAM will make for a very slow-running machine. So, for this usage, you can assume that the minimum baseline configuration would be higher than a 1 GHz processor with at least 2 GB of RAM.

Based on your choice of baseline configuration, you should then fit a test computer with the applications that will be used on it and test the configuration in a lab environment simulating normal use. This will give you an idea of whether the RAM and processor calculations you have made for your environment are going to provide a suitable response.

Today's disk drives have become capable of much larger capacity while dropping drastically in price. So, for disk space, the rule of thumb is to buy whatever is the current standard. At the time this book was written, 500 GB drives were commonplace, which is sufficient for most users. If users plan to store substantial graphics or video files, you may need to consider buying larger-than-standard drives.

Also consider what the business requirements will be over the next 12 to 18 months. If you will be implementing applications that are memory or processor intensive, you may want to spec out the computers with hardware sufficient to support upcoming needs to avoid costly upgrades in the near future.

The requirements for the graphics card depend on the resolution at which you want to run. The required amount of memory is as follows:

- 64 MB is required for a single monitor at a resolution of 1,310,720 pixels or less, which is equivalent to a 1280×1024 resolution.
- 128 MB is required for a single monitor at a resolution of 2,304,000 pixels or less, which is equivalent to a 1920×1200 resolution.
- 256 MB is required for a single monitor at a resolution larger than 2,304,000 pixels.

Measurement Used for Disk Space and Memory

Storage, such as hard disks and solid-state drives, are commonly rated by capacity. The following measurements are used for disk space and memory capacity:

- 1 MB (megabyte) = 1,024 KB (kilobytes)
- 1 GB (gigabyte) = 1,024 MB
- 1 TB (terabyte) = 1,024 GB
- 1 PB (petabyte) = 1,024 TB
- 1 EB (exabyte) = 1,024 PB

If you are not sure if your machine meets the minimum requirements, Microsoft includes some tools that can help you determine if a machine is Windows 10 or 11 compatible, which we will look at in the following sections.

BIOS Compatibility

Before you install Windows, you should verify that your computer has the most current BIOS. This is especially important if your current BIOS does not include support for Advanced Configuration and Power Interface (ACPI) functionality. ACPI functionality is required for Windows to function properly. Check the computer vendor's website for the latest BIOS version information.

Driver Requirements

To successfully install Windows 10 or 11, you must have the critical device drivers for your computer, such as the hard drive device driver. The Windows media comes with an extensive list of drivers. If your computer's device drivers are not on the Windows installation media, you should check the device manufacturer's website.

New Installation or Upgrade?

Once you've determined that your hardware meets the minimum requirements, you need to decide whether you want to do an upgrade or a clean installation. An upgrade allows you to retain your existing operating system's applications, settings, and files.

The bad news is that if you are moving from Windows Vista, Windows XP, or earlier versions of Windows to Windows 10 or 11, you must perform a clean installation. You can perform an upgrade to Windows 10 or 11 if the following conditions are true:

- You are running Windows 7 or Windows 8.
- You want to keep your existing applications and preferences.

- You want to preserve any local users and groups you've created.

You must perform a clean installation if any of the following conditions are true:

- There is no operating system currently installed.
- You have an operating system installed that does not support an in-place upgrade (such as DOS, Windows 9*x*, Windows NT, Windows Me, Windows 2000 Pro, Windows Vista, or Windows XP).
- You want to start from scratch, without keeping any existing preferences.
- You want to be able to dual-boot between Windows 10 or 11 and your previous operating system.

Table 1.5 shows each operating system that can be upgraded and the edition of Windows 10 to which it should be upgraded.

TABLE 1.5 Windows 7 and Windows 8 upgrade options

From current edition	Windows 10 edition
Windows 7 Starter	Windows 10 Home
Windows 7 Home Basic	Windows 10 Home
Windows 7 Home Premium	Windows 10 Home
Windows 7 Pro	Windows 10 Pro
Windows 7 Ultimate	Windows 10 Pro
Windows 7 Enterprise	Windows 10 Enterprise
Windows 8.1 Home	Windows 10 Home
Windows 8.1 Pro	Windows 10 Pro
Windows 8.1 Enterprise	Windows 10 Enterprise
Windows 8.1 Pro for Students	Windows 10 Pro

Upgrade Considerations

Almost all Windows 7 and Windows 8 applications should run with the Windows 10 operating system. However, possible exceptions to this statement include the following:

- Applications that use filesystem filters, such as antivirus software, may not be compatible.
- Custom power-management tools may not be supported.

Before upgrading to Windows 10 or 11, be sure to stop any antivirus scanners, network services, or other client software. These software packages may see the installation as a virus and cause issues.

Windows 7 and 8 cannot be upgraded to Windows 11. If you are looking to upgrade to Windows 11, then your device must be running Windows 10, version 2004 or later. At the time of this writing, Microsoft is offering free updates to Windows 11. They are currently available through Windows Update in Settings ➢ Update and Security.

If you are performing a clean installation to the same partition as an existing version of Windows, the contents of the existing Users (or Documents and Settings), Program Files, and Windows directories will be placed in a directory named Windows.old, and the old operating system will no longer be available.

Hardware Compatibility Issues

You need to ensure that you have the device drivers for the hardware for the version of Windows you are installing. If you have a video driver without a compatible driver, the upgrade will install the Standard VGA driver, which will display the video with an 800×600 resolution. Once you get the appropriate driver for your video, you can install it and adjust video properties accordingly.

Application Compatibility Issues

Not all applications that were written for earlier versions of Windows will work with Windows 10 or Windows 11. After the upgrade, if you have application problems, you can address the problems in any of the following ways:

- If the application is compatible with Windows 10 or 11, reinstall the application after the upgrade is complete.
- If the application uses dynamic-link libraries (DLLs) and there are migration DLLs for the application, apply the migration DLLs.
- Use the Microsoft Application Compatibility Toolkit (ACT) to determine the compatibility of your current applications with Windows. ACT will determine which applications are installed, identify any applications that may be affected by Windows updates, and identify any potential compatibility problems with User Account Control and Internet Explorer. Reports can be exported for detailed analysis.
- If applications were written for earlier versions of Windows but are incompatible with Windows 10, use the Windows 10 Program Compatibility Wizard. From the Control Panel, click the Programs icon, and then click the Run Programs From Previous Versions link to start the Program Compatibility Wizard. If the application is not compatible with Windows 10, upgrade your application to a Windows 10–compliant version.

An Upgrade Checklist for Upgrading from Windows 7 or Windows 8/8.1 to Windows 10

Once you have made the decision to upgrade, you should develop a plan of attack. The following upgrade checklist (valid for upgrading from Windows 7 or Windows 8/8.1) will help you plan and implement a successful upgrade strategy:

- Verify that your computer meets the minimum hardware requirements for Windows 10.
- Make sure you have the Windows 10 drivers for the hardware. You can verify this with the hardware manufacturer.
- To audit the current configuration and status of your computer, run the Get Windows 10 App tool from the Microsoft website, which also includes documentation on using the utility. It will generate a report of any known hardware or software compatibility issues based on your configuration. You should resolve any reported issues before you upgrade to Windows 10.
- Make sure your BIOS is current. Windows 10 requires that your computer has the most current BIOS. If it does not, it may not be able to use advanced power-management features or device-configuration features. In addition, your computer may cease to function during or after the upgrade. Use caution when performing BIOS updates because installing the incorrect BIOS can cause your computer to fail to boot.
- Take an inventory of your current configuration. This inventory should include documentation of your current network configuration, the applications that are installed, the hardware items and their configuration, the services that are running, and any profile and policy settings.
- Back up your data and configuration files. Before you make any major changes to your computer's configuration, you should back up your data and configuration files and then verify that you can successfully restore your backup. Chances are, if you have a valid backup, you won't have any problems. Likewise, if you don't have a valid backup, you will likely have problems.
- Delete any unnecessary files or applications, and clean up any program groups or program items you don't use. Theoretically, you want to delete all the junk on your computer before you upgrade. Think of this as the spring-cleaning step.
- Verify that there are no existing problems with your hard drive prior to the upgrade. Perform a disk scan, a current virus scan, and defragmentation. These too are spring-cleaning chores. This step just prepares your hard drive for the upgrade.
- Perform the upgrade. In this step, you upgrade from the Windows 7 or Windows 8/8.1 operating system to Windows 10.
- Verify your configuration. After Windows 10 has been installed, use the inventory to compare and test each element that was inventoried prior to the upgrade to verify that the upgrade was successful.

Handling an Upgrade Failure

Before you upgrade, you should have a contingency plan in place. Your plan should assume the worst-case scenario. For example, what happens if you upgrade and the computer doesn't work anymore? It is possible that, after checking your upgrade list and verifying that

everything should work, your attempt at the actual upgrade may not work. If this happens, you may want to return your computer to the original, working configuration.

Indeed, I have made these plans, created my backups (two, just in case), verified them, and then had a failed upgrade anyway—only to discover that I had no clue where to find the original operating system CD. A day later, with the missing CD located, I was able to get up and running again. My problem was an older BIOS, and the manufacturer of my computer did not have an updated BIOS. Thankfully, nowadays, it is also possible to download a Windows ISO image and create a bootable CD or USB device.

Disk Partitioning

Disk partitioning is the act of taking the physical hard drive and creating logical partitions. A logical drive is how space is allocated to the drive's primary and logical partitions. For example, if you have a 500 GB hard drive, you might partition it into three logical drives:

- C: drive, which might be 200 GB
- D: drive, which might be 150 GB
- E: drive, which might be 150 GB

The following items detail some of the major considerations for disk partitioning:

Partition Size One important consideration in your disk-partitioning scheme is determining the partition size. You need to consider the amount of space taken up by your operating system, the applications that will be installed, and the amount of stored data. It is also important to consider the amount of space required in the future.

For Windows 10, Microsoft recommends that if you are installing the 32-bit version you will need at least 16 GB, while the 64-bit version will require 20 GB of free space. However, if you are installing Windows 11, Microsoft recommends 64 GB of free space. This allows room for the operating system files and for future growth in terms of upgrades and installation files that are placed with the operating system files.

System and Boot Partitions When you install the Windows operating system, files will be stored in two locations: the system partition and the boot partition. The system partition and the boot partition can be the same partition.

The system partition contains the files needed to boot the operating system. The system partition contains the Master Boot Record (MBR) and boot sector of the active drive partition. It is often the first physical hard drive in the computer and normally contains the necessary files to boot the computer. The files stored on the system partition do not take any significant disk space. The active partition is the system partition that is used to start your computer. The C: drive is usually the active partition.

The boot partition contains the Windows operating system files. By default, the Windows operating system files are located in a folder named Windows.

Disk Partition Configuration Utilities If you are partitioning your disk prior to installation, you can use several utilities, such as the DiskPart utility or a third-party utility such as Partition Magic. You can also configure the disks during the installation of the Windows operating system.

You might want to create only the first partition where Windows will be installed. You can then use the Disk Management utility to create any other partitions you need. The Disk Management utility is covered in Chapter 5, "Configuring Security and Devices."

Language and Region Pack

In this chapter, we will briefly discuss the language and region settings. These will determine the language the computer will use. Windows supports many languages for the operating system interface and utilities. We will cover this in greater detail later in this book.

Regional settings are for configuring the format for items such as numbers, currencies, times, and dates. For example, English for the United States specifies a short date as mm/dd/yyyy (month/day/year), while English for South Africa specifies a short date as yyyy/mm/dd (year/month/day).

It is very important to only choose the locales that this machine will need to use. The reason for this is that your system will get updates for every locale you choose and set up.

Installing Windows 10

This section will discuss how to install Windows 10. The first step to installing Windows 10 is to know what type of media you need to install the Windows 10 operating system. Windows 10 gives you multiple ways to do an installation.

You can install Windows 10 either from the bootable DVD or through a network installation using files that have been copied to a network share point or USB device. You can also install Windows 10 by using a virtual hard drive (VHD). This option will be discussed in Chapter 2, "Configuring Users." You can also launch the `setup.exe` file from within the Windows 10 operating system to upgrade your operating system.

To start the installation, you simply restart your computer and connect to either a USB thumb drive or boot to the DVD. The installation process will begin automatically. You will walk through the steps of performing a clean installation of Windows 10 from the DVD in Exercise 1.1.

If you are installing Windows 10 from the network, you need a distribution server and a computer with a network connection. A distribution server is a server that has the Windows 10 distribution files copied to a shared folder. The following steps are used to install Windows 10 over the network:

1. Boot the target computer.
2. Attach to the distribution server and access the share that has the files copied to it.
3. Launch `setup.exe`.
4. Complete the Windows 10 installation using either the clean installation method or the upgrade method. These methods are discussed in detail in the following sections.

Performing a Clean Installation of Windows 10

On any installation of Windows 10, there are three stages.

Collecting Information During the collection phase, Windows 10 gathers the information necessary to complete the installation. This is where Windows 10 gathers your local time, location, keyboard, license agreement, installation type, and installation disk partition information.

Installing Windows This phase is where your Windows 10 files are copied to the hard disk and the installation is completed. This phase takes the longest because the files are installed.

Setting Up Windows In this phase, you set up a username, computer name, and password; enter the product key; configure the security settings; and review the date and time. Once this is finished, your installation will be complete.

As explained earlier, you can run the installation from the optical media, from a USB, or over a network. The only difference in the installation procedure is your starting point: from your optical drive or USB or a network share. The steps in Exercise 1.1 and Exercise 1.2 assume you are using the Windows 10 DVD to install Windows 10.

Setting Up Your Computer for Hands-On Exercises

Before beginning Exercise 1.1, verify that your computer meets the requirements for installing Windows 10, as listed earlier in Table 1.4. For Exercise 1.1, it is assumed you are not currently running a previous version of Windows that will be upgraded.

The exercises in this book are based on your computer being configured in a specific manner. Your computer should have at least a 50 GB hard drive (this exceeds the basic minimums) that is configured with the minimum space requirements and partitions.

When you boot to the Windows 10 installation media, the Setup program will automatically start the Windows 10 installation. In Exercise 1.1, you will perform a clean installation

of Windows 10. This exercise assumes that you have access to Windows 10 Enterprise; other editions may vary slightly. You can also download an evaluation version of Windows 10 from the Microsoft website.

Also, I may list steps that you may not see or I may not list steps that you see—this is because my version of Windows may be different. For example, the version of Windows 10 Enterprise I am installing, I am not required to enter a license number during installation. A normal version bought from a vendor may ask for the license during the actual installation.

I am loading Windows 10 Enterprise into a VMware Workstation virtual machine. Again, this may make your installation a little different than the steps listed in Exercise 1.1. Plus, depending on your version and license model, not all screens may appear.

EXERCISE 1.1

Performing a Clean Installation of Windows 10

1. Insert the Windows 10 DVD, USB thumb drive, or ISO image in the machine or virtual machine with no operating system and start the computer.
2. If you are directed to "Hit any key" to start the DVD, press Enter.
3. The first screen will ask you to enter your language, time and currency format, and keyboard or input method (see Figure 1.1). After filling in these fields, click Next.

FIGURE 1.1 Windows Setup screen

EXERCISE 1.1 *(continued)*

4. On the next screen, click the Install Now button (see Figure 1.2).

FIGURE 1.2 Windows install screen

5. Depending on your installation media, the next screen will ask you which version of Windows 10 you want to install. I am choosing Windows 10 Enterprise (see Figure 1.3).
6. A message appears to tell you that the setup is starting. The licensing screen will be first. Read the license agreement and then select the I Accept The License Terms check box. Click Next.
7. When asked which type of installation you want, click Custom (Advanced) as shown in Figure 1.4.

FIGURE 1.3 Windows Version screen

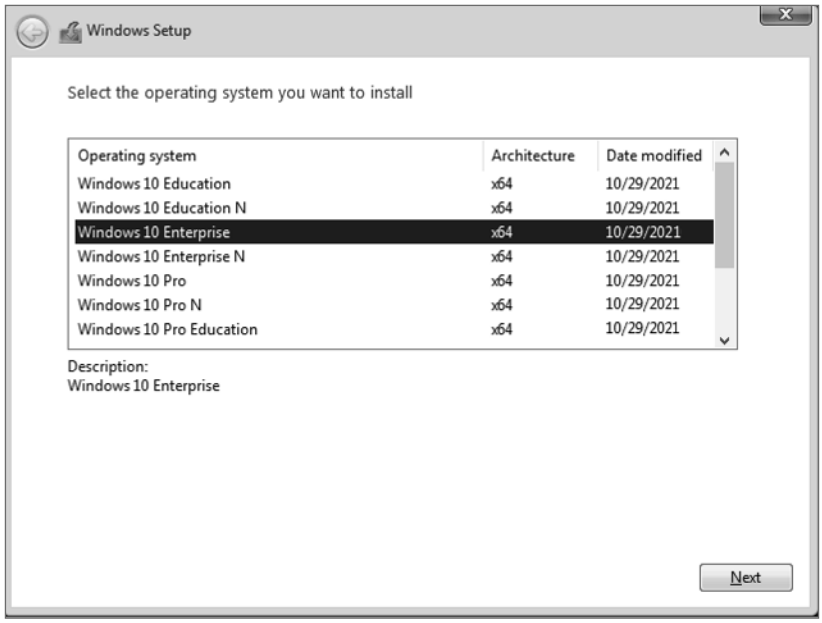
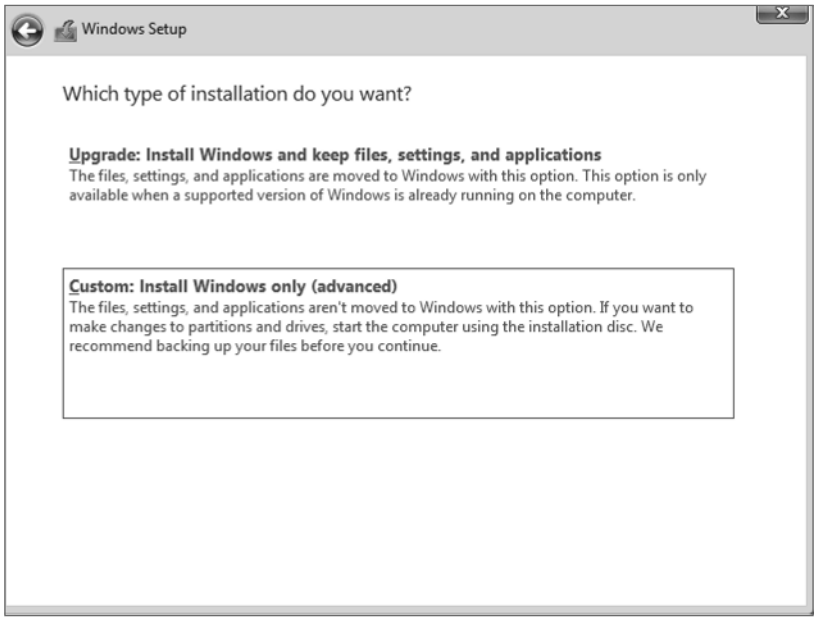


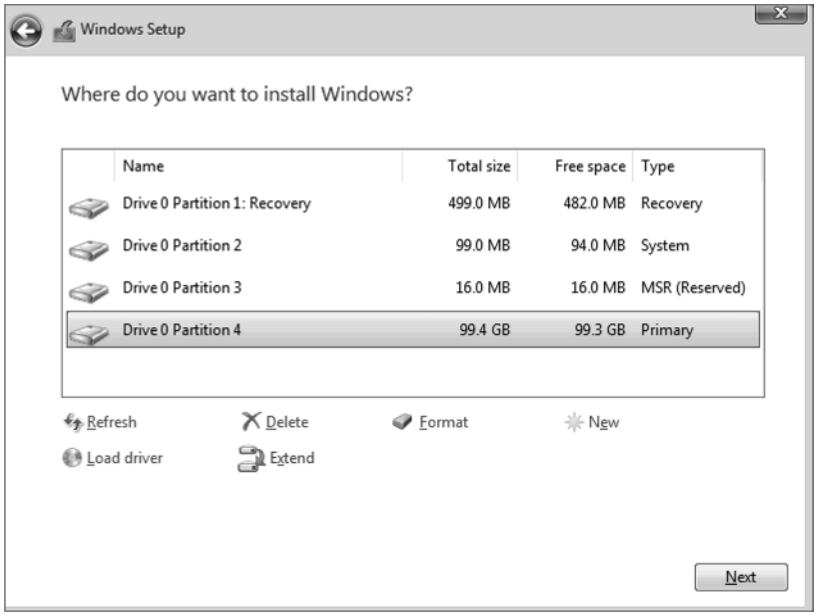
FIGURE 1.4 Type of installation screen



EXERCISE 1.1 *(continued)*

8. The next screen asks you to identify the disk to which you would like to install Windows 10. Choose an unformatted free space or a partition (partition will be erased) with at least 50 GB available. You can also click the Drive Options (Advanced) link to create and format your own partition, as shown in Figure 1.5. Click the New link and click Apply to create the new partition for Windows 10. A message will appear stating that Windows 10 will set some partitions for system files. Just click the OK button. After you choose your partition, click Next.

FIGURE 1.5 Windows disk setup screen



9. When your partition is set, the installation will start (as shown in Figure 1.6). You will see the progress of the installation during the entire process. When the installation is complete, the machine will reboot.
10. After the restart, a screen appears that asks you to choose your region. Select your region (see Figure 1.7), and then click the Yes button.

FIGURE 1.6 Windows installation status screen

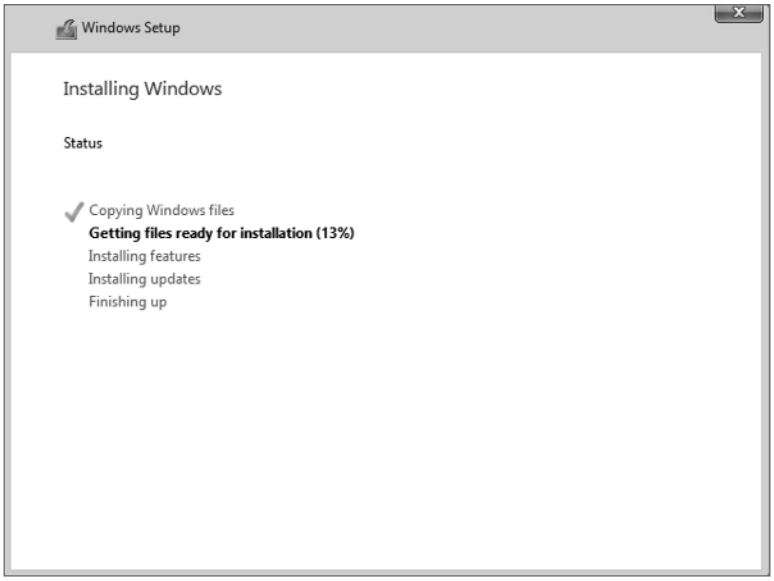
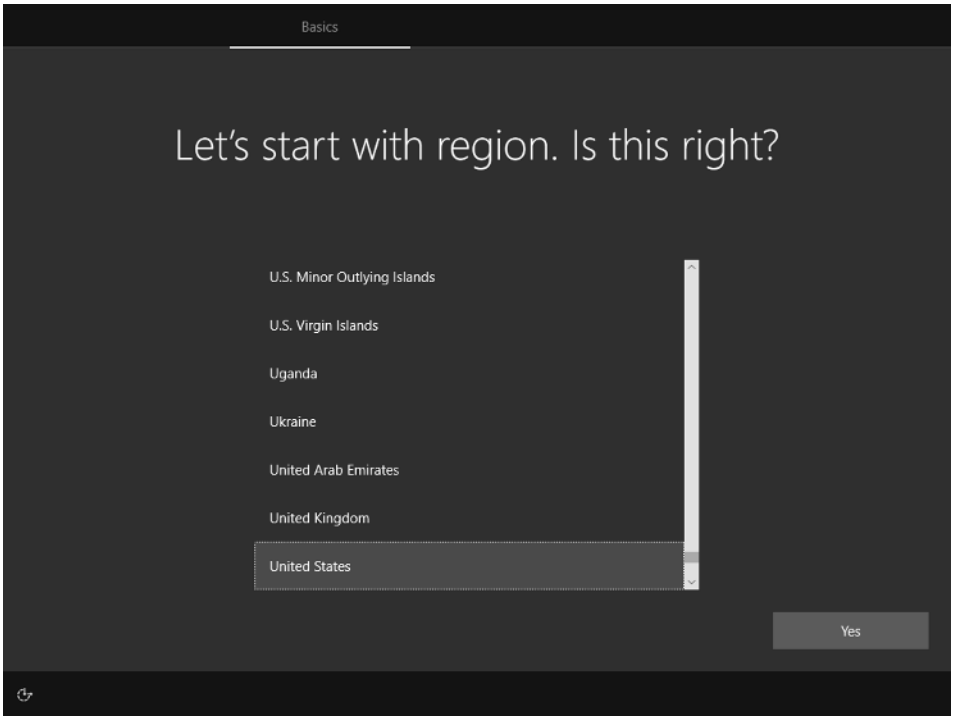


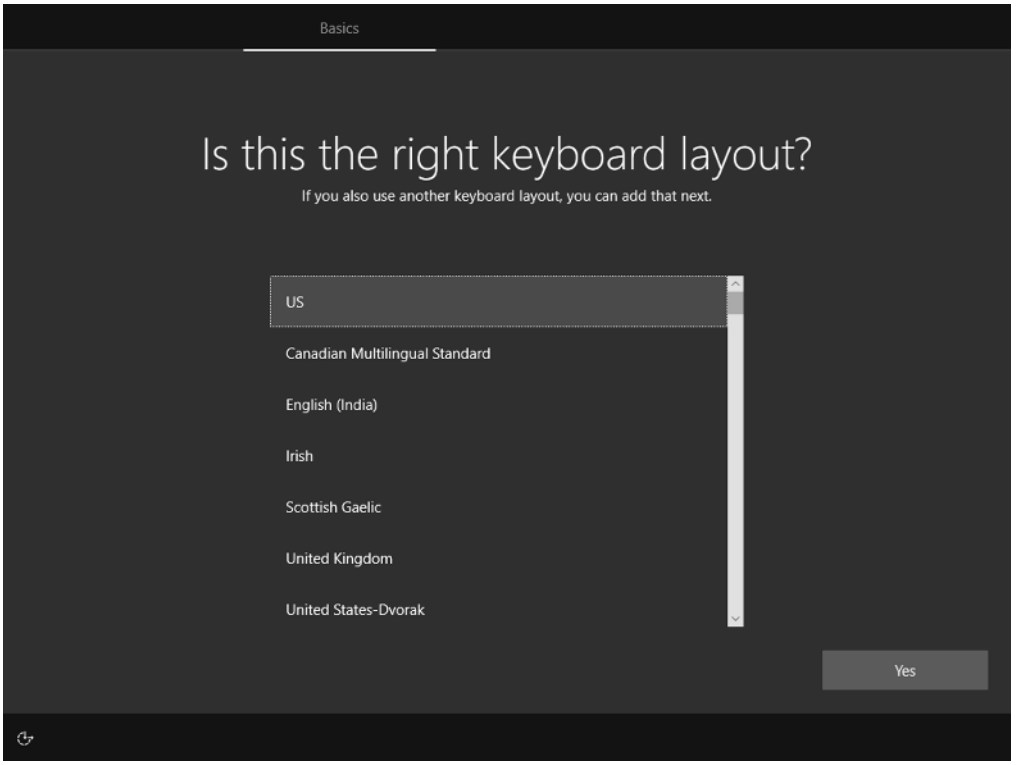
FIGURE 1.7 Choose your Region screen.



EXERCISE 1.1 *(continued)*

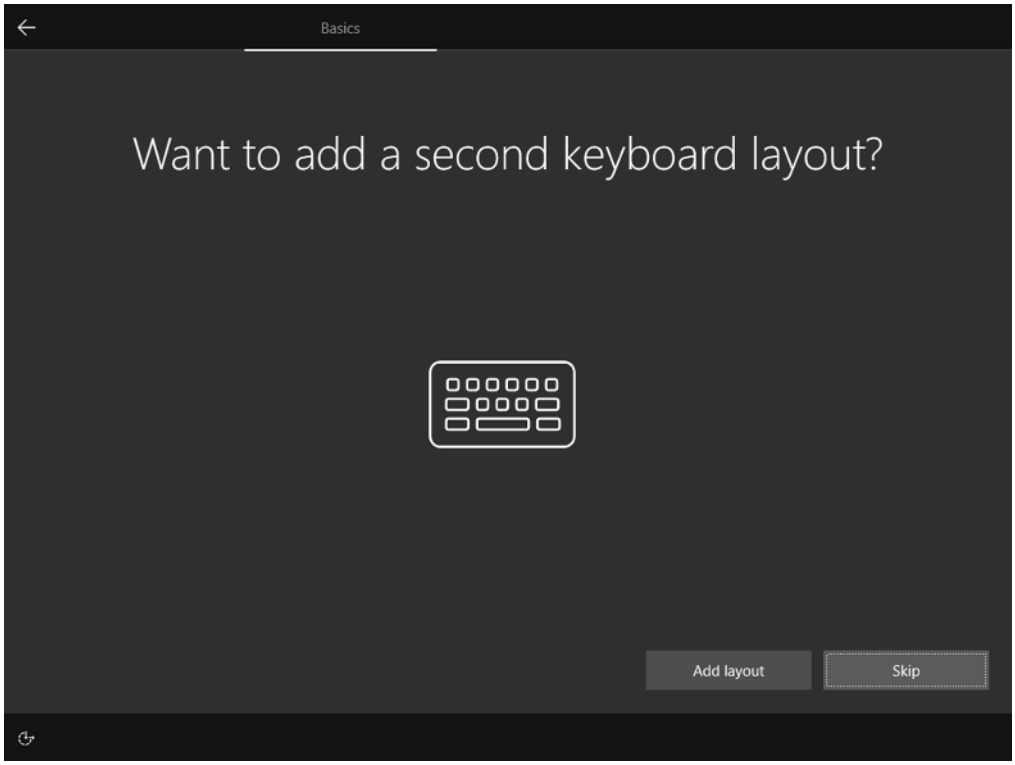
11. The next screen will ask you about your keyboard layout. Choose your keyboard layout (see Figure 1.8) and then click the Yes button.

FIGURE 1.8 Choosing your keyboard layout



12. The next screen will ask you if you have a second keyboard. If you do, click the Add Layout button. If not, click the Skip button (as seen in Figure 1.9).

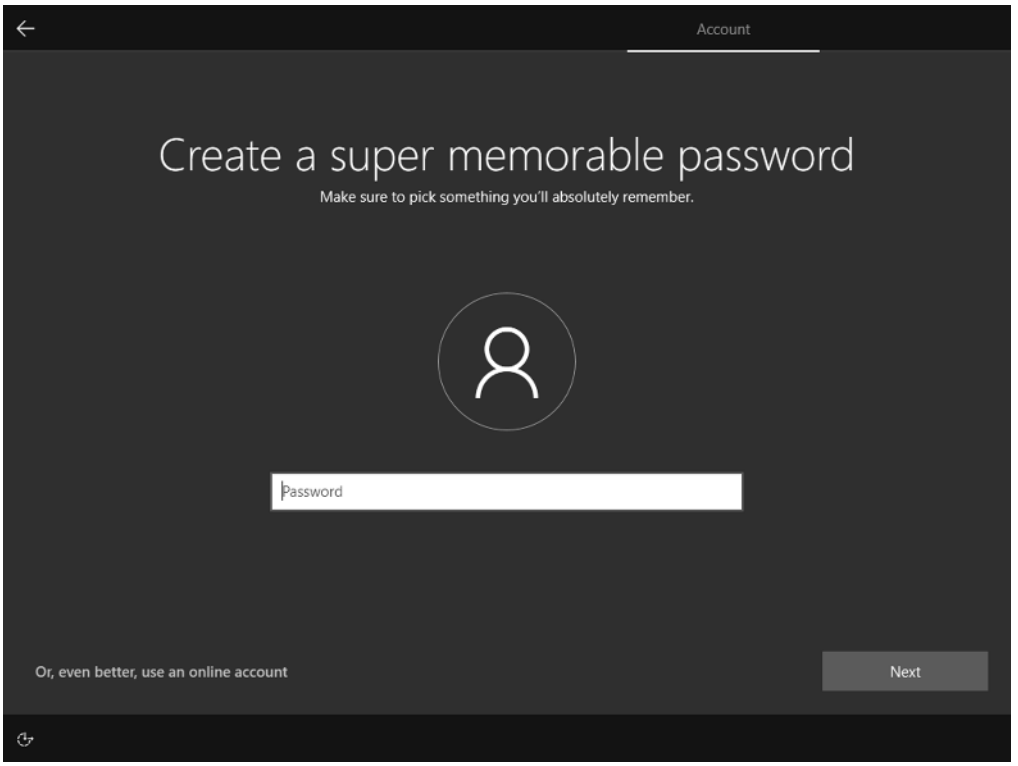
FIGURE 1.9 Adding a Second Keyboard



13. At the Sign In With Microsoft screen, choose the Domain Join Instead link. It will ask you who is going to use this PC. Enter your username and click the Next button.
14. Next it's going to ask you to enter a super memorable password (as shown in Figure 1.10). Type in your password and click the Next button.
15. You will be asked to reenter your password. Enter your password again and click the Next button.

EXERCISE 1.1 *(continued)*

FIGURE 1.10 Windows 10 screen



16. Depending on your version, you may be asked to create three security questions. If your edition asks this, put in your security questions and click the Next button for each security question. After the third question, click the Next button to move on.
17. The next screen will ask if you want to make Cortana your personal assistant. You can either accept or decline this. I am going to choose Decline.
18. The next screen will ask if you want Microsoft to save your activity history. If you accept this, you will send Microsoft information about all activities that you are doing. This allows you to continue to finish these activities from any other device. Since this is a corporate machine, I will choose not to send Microsoft my activity history by clicking the No button (see Figure 1.11).

FIGURE 1.11 Windows activity screen

19. The next screen will be the privacy settings screen. Disable any of the privacy settings that you want disabled (all will be enabled by default). Once you're finished, click the Accept button.
20. A different screen will appear letting you know that the system is being set up. This may take a few minutes. Be sure not to turn off the machine during this process. Once this is all completed, the system may ask you to log in. Put in your password and click the right arrow next to the password box. Your installation is now complete.

Before we talk about the Windows 10 upgrade procedure, I want to quickly explain something that you saw during the Windows 10 installation. In step 13, I had you choose Domain Join Instead rather than using a Microsoft password. We will explore both of the choices in greater detail, but I wanted to quickly explain why we chose one over the other.

Microsoft offers two main networks: workgroup-based or domain-based. *Workgroups* (also referred to as peer-to-peer networks) are when you just connect your computers

together directly to each other. A perfect example for most of us is what you do in your home network. Many home users connect their machines together without the use of a main server.

Corporations normally do things a bit differently than that. *Domains* are networks that are controlled by servers called *domain controllers*. Domain controllers are Windows servers that have a copy of a database called Active Directory (AD). Recently Microsoft took domain-based networks a step further by allowing companies to set up a cloud-based version of an Active Directory domain (Azure AD). This means that companies no longer need to maintain and manage their own domain controllers. Since most people don't have a cloud-based version of Azure AD, I had you choose the option Join A Domain so that we could finish the Windows 10 installation.

We will go over all of these options in greater detail throughout this book, but I wanted to introduce you to these two Windows 10 options.

Performing an Upgrade to Windows 10 from Windows 8.1

This section describes how to perform an upgrade to Windows 10 from Windows 8.1. Similar to a clean installation, you can run the process from the installation DVD, from a USB, or over a network. The only difference in the procedure is your starting point: from your optical or USB drive or from a network share. For the steps in the following sections, it is assumed that you are using the Windows 10 DVD to install the Windows 10 operating system.

Upgrading a Windows 7 or Windows 8/8.1 system to Windows 10 will save you a lot of time and trouble. Because we are upgrading the system, all of the user's data and applications will remain installed and most likely will still work the same way. Sometimes when we upgrade a system, we run into problems with applications. But many times that is caused by a driver or a needed software update that will most likely solve the issue.

The three main steps in the Windows 10 upgrade process are very similar to the ones for a clean installation. The three steps of upgrading to Windows 10 are as follows:

1. Collecting information
2. Installing Windows
3. Setting up Windows

In Exercise 1.2, you will go through the process of installing Windows 10 by upgrading Windows 8.1. I have a Windows 8.1 Enterprise system that I will update to Windows 10 Enterprise.

EXERCISE 1.2

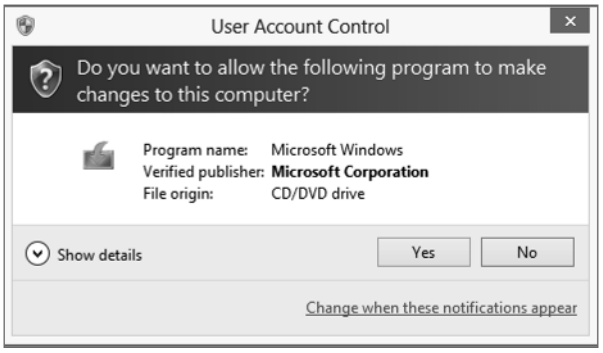
Upgrading Windows 8.1 to Windows 10

1. Insert the Windows 10 DVD. (We are upgrading Windows 8.1 Enterprise to Windows 10 Enterprise.)
2. If Autorun does not start, navigate to the DVD drive and click `setup.exe`. Once the setup starts (via either `setup.exe` or Autorun), click Run Setup.exe, as shown in Figure 1.12.

FIGURE 1.12 DVD setup screen

3. If a pop-up box appears for User Account Control, click the Yes button (see Figure 1.13).

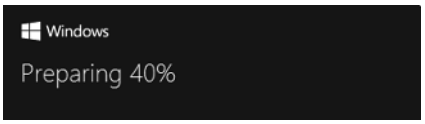
FIGURE 1.13 User Account Control screen



EXERCISE 1.2 *(continued)*

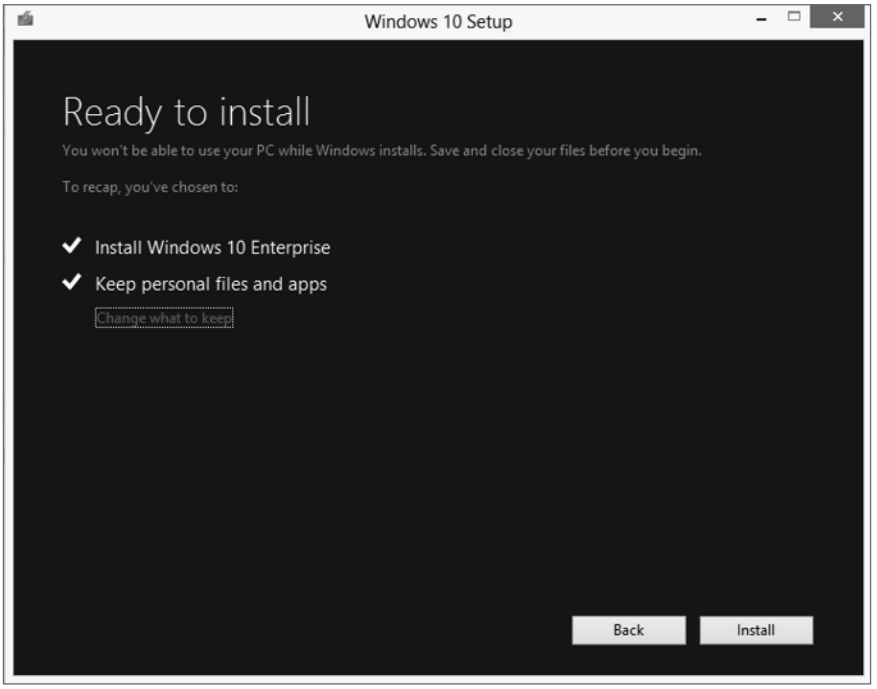
You should then see a message appear stating that Windows is preparing the system, as shown in Figure 1.14.

FIGURE 1.14 Preparing screen



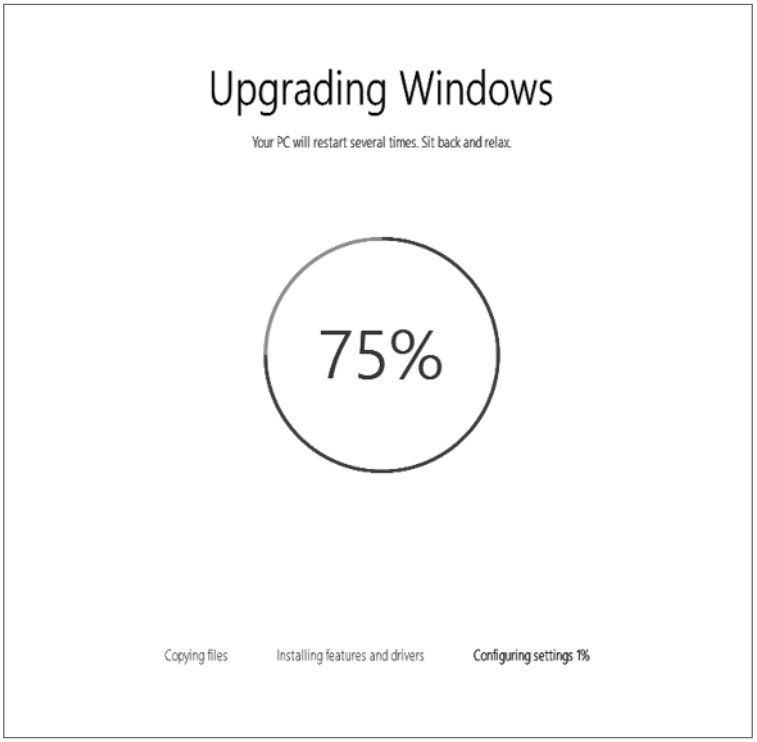
4. You may be prompted to Get Important Updates. You can choose to either download the updates or not do them at this time. Make a choice and click the Next button. (During my installation, I decided to download the updates.)
5. The Microsoft Windows 10 license terms appear. Read the terms and then click Accept. (The installation will not allow you to continue until you click Accept.)
6. At the Ready To Install screen (shown in Figure 1.15), you can change what files and/or apps you want to keep by clicking the Change What To Keep link. Once you're ready, click the Install button.

FIGURE 1.15 Ready To Install screen



7. Windows 10 will begin to install (as shown in Figure 1.16). Your computer may restart multiple times. This is normal. As the upgrade status screen states, "Sit back and relax."
8. After the upgrade has completed, a welcome screen will be displayed, similar to the one shown in Figure 1.17. Click Next.

FIGURE 1.16 Installing Status screen



9. At the Get Going Fast screen, click the Use Express Settings button.
10. At the New Apps screen, just click Next.

And that's it—Windows 10 is installed (see Figure 1.18). Congrats.

EXERCISE 1.2 *(continued)*

FIGURE 1.17 Welcome screen

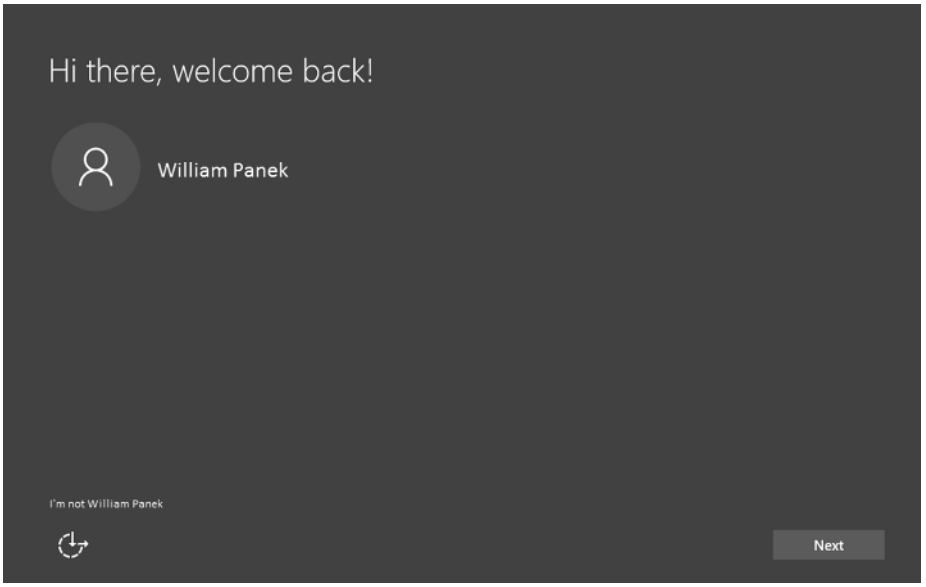
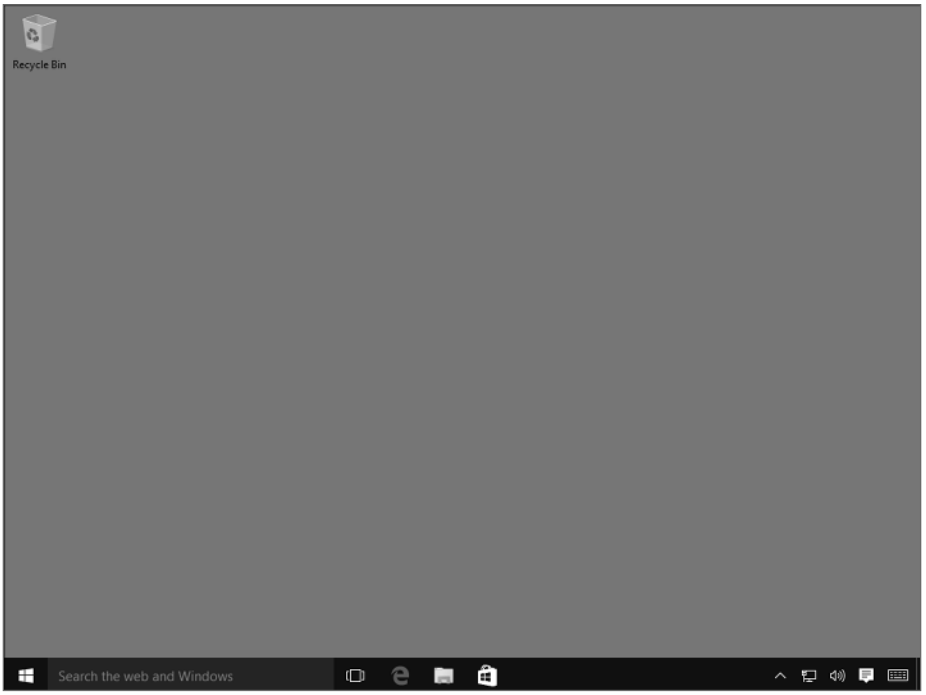


FIGURE 1.18 Windows 10 screen



Now that we have installed the Windows 10 operating system, let's take a look at how to change your system's locales. Earlier I explained that the locale settings help you with the system's language format, settings, and region-specific details.

In Exercise 1.3, I will show you how to change your current locale. This helps when you take your Windows 10 laptop, tablet, or phone to another part of the world.

EXERCISE 1.3

Configuring Locales

1. Click the Start button and choose Settings.
2. Once on the Settings screen, choose Time And Language.
3. This should place you on the Date & Time screen. Make sure your time zone is set correctly. If it's not, pull down the time zone options and choose your time zone.
4. Scroll down and make sure the date and time formats are set the way you want. If they are not, click the Change Date And Time Formats link. Change the formats to the way you want them set.
5. Click the Region And Language link on the left-hand side.
6. Make sure the country or region is set properly. If you want to add a second language to this Windows 10 system, click the Add A Language link. Choose the language you want.
7. Once completed, close the Settings screen.

Installing Windows 11

This section will discuss how to install Windows 11. The method of installing Windows 11 is the same as installing Windows 10. The first step to is to know what type of media you need to install the operating system. Windows 11 gives you multiple ways to perform an installation.

You can install Windows 11 either from the bootable DVD or through a network installation using files that have been copied to a network share point or USB device. You can also install Windows 11 by using a virtual hard drive (VHD). This option will be discussed in Chapter 2. You can also launch the `setup.exe` file from within the Windows 11 operating system to upgrade your operating system.

To start the installation, you simply restart your computer and boot to the DVD. The installation process will begin automatically.

If you are installing Windows 11 from the network, you need a distribution server and a computer with a network connection. A distribution server is a server that has the Windows

11 distribution files copied to a shared folder. Use the following steps to install Windows 11 over the network:

1. Boot the target computer.
2. Attach to the distribution server and access the share that has the files copied to it.
3. Launch `setup.exe`.
4. Complete the Windows 11 installation using either the clean installation method or the upgrade method. These methods are discussed in detail in the following sections.

Performing a Clean Installation of Windows 11

On any installation of Windows 11, you have the same three stages listed earlier in the section "Performing a Clean Installation of Windows 10." The stages include collecting information, installing Windows, and setting up Windows.

As explained earlier, you can run the installation from the optical media, from a USB, or over a network. The only difference in the installation procedure is your starting point: from your optical drive or USB or a network share.

I am going to discuss how to create a Windows 11 USB with the Media Creation Tool to install Windows 11. To create an installation media using this tool, connect a USB flash drive with at least 8 GB of space and perform the following:

1. Go to the Microsoft Windows 11 download page at `www.microsoft.com/en-gb/software-download/windows11`.
2. Under Create Windows 11 Installation Media, click the Download Now button to save the file on the device.
3. Double-click the `MediaCreationToolW11.exe` file to launch the tool.
4. Click the Accept button to agree to the terms.
5. Clear the Use The Recommended Options For This PC (Optional) option.
6. Select the correct language and edition of Windows 11.
7. Click Next.
8. Select the USB Flash Drive option.
9. Click Next.
10. Select the USB flash drive.
11. Click Next.
12. Click Finish.

After you finish these steps, the files will be downloaded and will create the installation media. You can then use this USB to boot the device and proceed with a fresh copy of Windows 11.

Performing an Upgrade to Windows 11 from Windows 10

This section describes how to perform an upgrade to Windows 11 from Windows 10. Remember, if you are looking to upgrade to Windows 11, then your device must be running Windows 10, version 2004 or later.

If your computer meets the minimum system requirements to run Windows 11, as shown in Table 1.4 earlier, and you are running Windows 10, version 2004 or later, then typically you should expect to receive an offer from Microsoft to upgrade to Windows 11. If you don't receive the offer to upgrade to Windows 11, then you can also go to Microsoft's website at `www.microsoft.com/en-us/windows/get-windows-11` for more information.

You can also check and see if the Windows 11 upgrade is ready for your machine by going to your Windows Update settings page. Click the Start button and type **Settings**, then press Enter to get to the Settings app. From there, select Update & Security and then Windows Update, then click the Check For Updates button.

If your upgrade is ready, the option to download and install should show up. You can download it and install it, then follow the onscreen prompts.

Troubleshooting Installation Problems

The Windows installation process is designed to be as simple as possible. The chances for installation errors are greatly minimized through the use of wizards and the step-by-step process. However, it is possible that errors will occur.

Identifying Common Installation Problems

As most of you are aware, errors sometimes do occur during installations. You might encounter some of the following installation errors:

Media Errors Media errors are caused by defective or damaged DVDs. To check the disc, put it into another computer and see if you can read it. Also check your disc for scratches or dirt—it may just need to be cleaned.

Insufficient Disk Space Both Windows 10 and 11 have minimum requirements needed for the amount of disk required. Please refer to Table 1.4 from earlier in this chapter or check out Microsoft's website for updated requirements. If the Setup program cannot verify that this space exists, the program will not let you continue.

Not Enough Memory Make sure your computer has the minimum amount of memory required. Having insufficient memory may cause the installation to fail or blue-screen errors to occur after installation.

Not Enough Processing Power Make sure your computer has the minimum processing power required. Having insufficient processing power may cause the installation to fail or blue-screen errors to occur after installation.

Hardware That Is Not on the HCL If your hardware is not listed on the hardware compatibility list (HCL), Windows may not recognize the hardware or the device may not work properly.

Hardware with No Driver Support Windows will not recognize hardware without driver support.

Hardware That Is Not Configured Properly If your hardware is Plug and Play (PnP) compatible, Windows should configure it automatically. If your hardware is not Plug and Play compatible, you will need to manually configure the hardware per the manufacturer's instructions.

Incorrect Product Key Without a valid product key, the installation will not go past the Product Key screen. Make sure you have not typed in an incorrect key (check your Windows installation folder or your computer case for this key).

Failure to Access TCP/IP Network Resources If you install Windows with typical settings, the computer is configured as a DHCP client. If there is no DHCP server to provide IP configuration information, the client will still generate an autoconfigured IP address but be unable to access network resources through TCP/IP if the other network clients are using DHCP addresses.

Installing Nonsupported Hard Drives If your computer is using a hard disk that does not have a driver included on the Windows media, you will receive an error message stating that the hard drive cannot be found. You should verify that the hard drive is properly connected and functional. You will need to obtain a disk driver for the version of Windows you are installing from the manufacturer and then specify the driver location by selecting the Load Driver option during partition selection.

Troubleshooting with Installation Log Files

When you install Windows 10 or 11, the Setup program creates several log files. You can view these logs to check for any problems during the installation process. Two log files are particularly useful for troubleshooting:

- The action log includes all the actions that were performed during the setup process and a description of each action. These actions are listed in chronological order. The action log is stored as `\Windows\setupact.log`.
- The error log includes any errors that occurred during the installation. For each error, there is a description and an indication of the severity of the error. This error log is stored as `\Windows\setuperr.log`.

In Exercise 1.4, you will view the Windows Setup logs to determine whether there were any problems with your Windows installation.

EXERCISE 1.4

Troubleshooting Failed Installations with Setup Logs

1. Select Start ➢ Computer.
2. Double-click Local Disk (C:).
3. Double-click Windows.
4. In the Windows folder, double-click the `Setupact.log` file to view your action log in Notepad. When you are finished viewing this file, close Notepad.
5. Double-click the `Setuperr.log` file to view your error file in Notepad. If no errors occurred during installation, this file will be empty. When you are finished viewing this file, close Notepad.
6. Close the directory window.

Supporting Multiple-Boot Options

You may want to install Windows 10 or 11 and still be able to run other operating systems. *Dual-booting* or multibooting allows your computer to boot multiple operating systems. Your computer will be automatically configured for dual-booting if there was a dual-boot–supported operating system on your computer prior to the Windows installation, you didn't upgrade from that operating system, and you installed Windows 10 or 11 into a different partition.

One reason for dual-booting is to test various systems. If you have a limited number of computers in your test lab and you want to be able to test multiple configurations, you should dual-boot. For example, you might configure one computer to dual-boot with Windows 7, Windows 8/8.1, and Windows 10.

Here are some keys to successful dual-boot configurations:

- Make sure you have plenty of disk space.
- Windows 10 or 11 must be installed on a separate partition in order to dual-boot with other operating systems.
- Install older operating systems before installing newer operating systems. If you want to support dual-booting with Windows 7 and Windows 10, Windows 7 must be installed first. If you install Windows 10 first, you cannot install Windows 7 without ruining your Windows 10 configuration; this applies to Windows 11 also.
- Do not install Windows 10 or 11 on a compressed volume unless the volume was compressed using NTFS compression.

Once you have installed each operating system, you can choose the operating system that you will boot to during the boot process. You will see a boot-selection screen that asks you to choose which operating system you want to boot.

The Boot Configuration Data (BCD) store contains boot information parameters that were previously found in `boot.ini` in older versions of Windows. To edit the boot options in the BCD store, use the `bcdedit` utility, which can be launched only from a command prompt. To open a command prompt window, you can do the following:

1. Launch `\Windows\system32\cmd.exe`.
2. Open the Run command by pressing the [Windows] key + R and then entering **`cmd`**.
3. Type **`cmd.exe`** in the Search Programs And Files box and press Enter.

Once the command-prompt window is open, type **`bcdedit`** to launch the `bcdedit` utility. You can also type **`bcdedit/?`** to see all the different `bcdedit` commands. A few `bcdedit` commands may be needed when dual-booting a machine. Table 1.6 shows some of the `bcdedit` commands that may be needed when dual-booting.

TABLE 1.6 `bcdedit` commands for dual-booting

Command	Explanation
`/createstore`	Creates a new empty Boot Configuration Data store
`/default`	Allows you to specify which operating system will start when the timeout expires
`/deletevalue`	Allows you to delete a specified element from a boot entry
`/displayorder`	Shows the display order that the boot manager uses when showing the display order to the user
`/export`	Allows you to export the contents of the system store into a file
`/import`	Restores the system store by using the data file previously generated by using the `/export` option
`/set`	Allows you to set an entry option value
`/store`	Specifies the store to be used
`/timeout`	Specifies the amount of time used before the system boots into the default operating system

Using Windows Activation

Windows Activation is Microsoft's way of reducing software piracy. Unless you have a corporate license for Windows 10 or Windows 11, then you will need to perform post-installation activation. This can be done online or through a telephone call. Windows will attempt automatic activation three days after you log onto it for the first time. There is a grace period when you will be able to use the operating system without activation. After the grace period expires, a permanent watermark is displayed. Until the activation key is entered, certain personalization settings are not configurable until Windows is activated. When the grace period runs out, the Windows Activation Wizard will automatically start; it will walk you through the activation process.

To access the Windows Activation screen, click the Start button and choose Settings (the spoke icon). Scroll down to Update And Security and click that link. On the left side, you will see a link for Activation. When you click Activation, you will see the Activation screen (shown in Figure 1.19). Scroll down to the Activate Windows Now section. You may need to click the Change Product Key button and put in the license number that came with your Windows 10 or 11 copy. Once Windows 10 is activated, it will show that you are activated.

FIGURE 1.19 The Windows Activation Wizard screen

Understanding Automated Deployment Options

If you need to install Windows 10 or 11 on multiple computers, you could manually install the operating system on each computer. However, automating the deployment process will make your job easier, more efficient, and more cost effective if you have a large number of client computers on which to install Windows.

Windows 10 and 11 come with several utilities that can be used for deploying and automating the Windows installation. With access to multiple utilities with different functionality, administrators have increased flexibility in determining how to best deploy Windows within a large corporate environment.

The following sections contain overviews of the automated deployment options, which will help you choose which solution is best for your requirements and environment. Each utility will then be covered in more detail throughout this chapter. The options for automated deployment of Windows 10 or 11 are as follows:

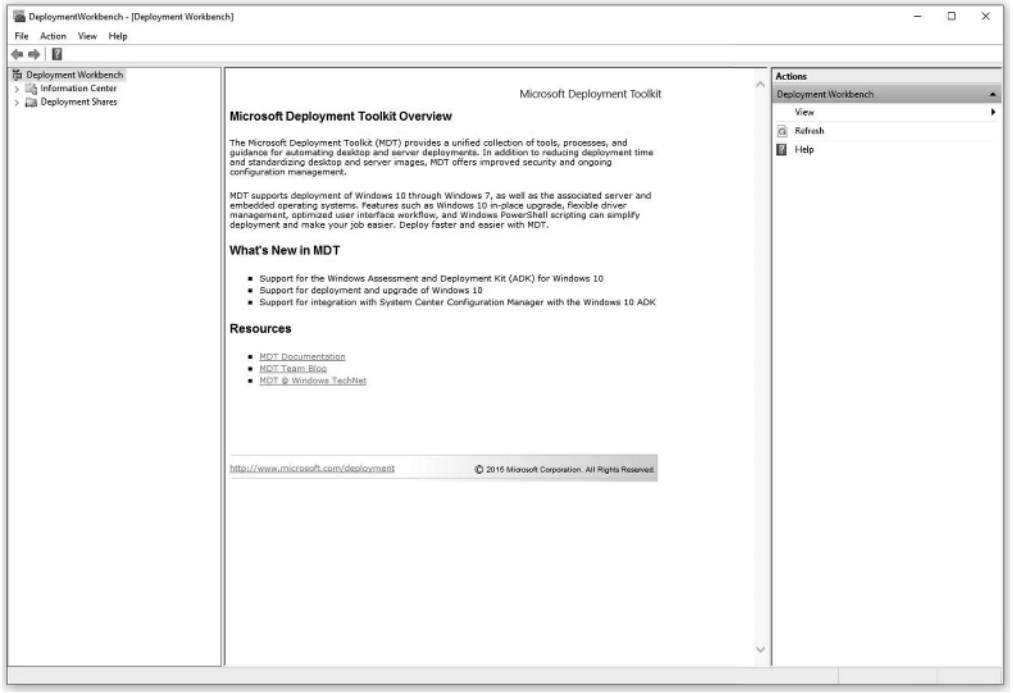
- Microsoft Deployment Toolkit (MDT)
- Unattended installation, or unattended setup, which uses `Setup.exe`
- Windows Automated Installation Kit (Windows AIK)
- Windows Deployment Services (WDS) server, which requires Windows Server for deployment
- System Preparation Tool (`Sysprep.exe`), which is used to create images or clones
- Windows Assessment and Deployment Kit (ADK)

An Overview of the Microsoft Deployment Toolkit

Microsoft includes a deployment assistance toolset called the *Microsoft Deployment Toolkit (MDT)*. It is used to automate desktop and server deployment. The MDT provides an administrator with the following benefits:

- Administrative tools that allow for the deployment of desktops and servers through the use of a common console (see Figure 1.20)
- Quicker deployments and the capabilities of having standardized desktop and server images and security
- Zero-touch deployments of Windows 11, Windows 10, Windows Server, and Windows 7 / 8 / 8.1

FIGURE 1.20 Microsoft Deployment Toolkit console



To install the MDT package onto your computer (regardless of the operating system being deployed), you must first meet the minimum requirements of MDT. These components need to be installed only on the computer where MDT is being installed:

- Windows 11, Windows 10, Windows 7, Windows 8, Windows 8.1, or Windows Server.
- The Windows Assessment and Deployment Kit (ADK) for Windows 10 or 11 is required for all deployment scenarios.
- System Center 2012 R2 Configuration Manager Service Pack 1 with the Windows ADK for Windows 10 or 11 is required for zero-touch installation (ZTI) and user-driven installation (UDI) scenarios.
- If you are using ZTI and/or UDI, you are allowed to add the MDT SQL database to any version of System Center Configuration Manager with SQL Technology; if you are using LTI, you must use a separately licensed SQL Server product to host your MDT SQL database.

You can install MDT without installing Windows (ADK) first, but you will not be able to use the package fully until Windows (ADK) is installed.

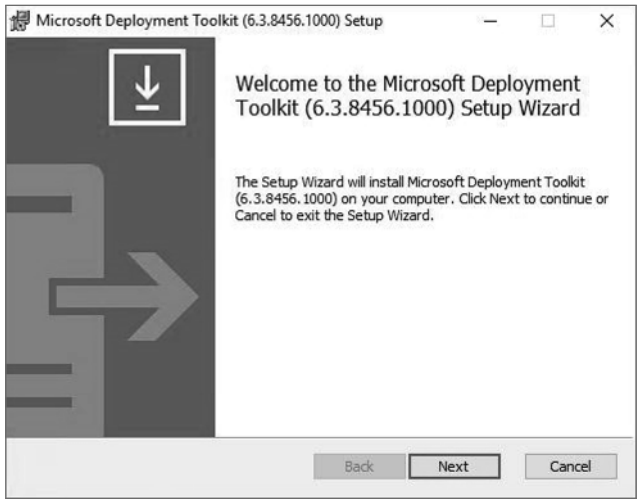
In Exercise 1.5, you will download and install MDT. You can install MDT on the Windows operating system machine. If you decide to install the MDT onto a server or production machine, I recommend that you perform a full backup before completing Exercise 1.5. Installing MDT will replace any previous version of MDT that the machine may currently be using.

EXERCISE 1.5

Downloading and Installing MDT

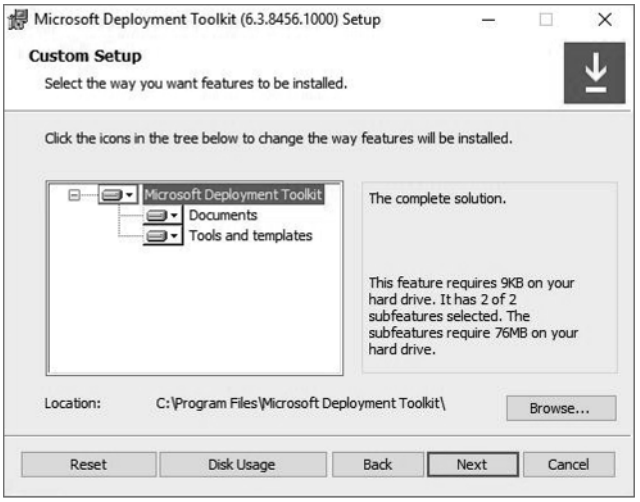
1. Download the MDT Update 1 utility from Microsoft's website (`www.microsoft.com/en-us/download/details.aspx?id=54259`).
2. Click the Download button.
3. You get a screen asking you to "Choose the download you want." Select the x64 or x86 version. Click Next.
4. A message box may appear asking if you want to run or save the MDT. I clicked the down arrow next to Save and saved the files to the Downloads directory.
5. Double-click `MicrosoftDeploymentToolkit_xxx.exe`, which you choose to start the installation.
6. At the Welcome screen, click Next, as shown in Figure 1.21.

FIGURE 1.21 Microsoft Deployment Toolkit setup screen



7. At the License screen, click the I Accept The Terms In The License Agreement radio button and click Next.
8. At the Custom Setup screen, click the down arrow next to Microsoft Deployment Toolkit and choose Entire Feature Will Be Installed On Local Hard Drive. Click Next, as shown on Figure 1.22.

FIGURE 1.22 Microsoft Deployment Toolkit Custom Setup screen



9. At the Customer Experience Improvement Program screen, choose if you want to participate or not and click Next.
10. At the Ready To Install screen, click the Install button.
11. If a User Account Control dialog box appears, click Yes.
12. When the installation completes, click Finish.

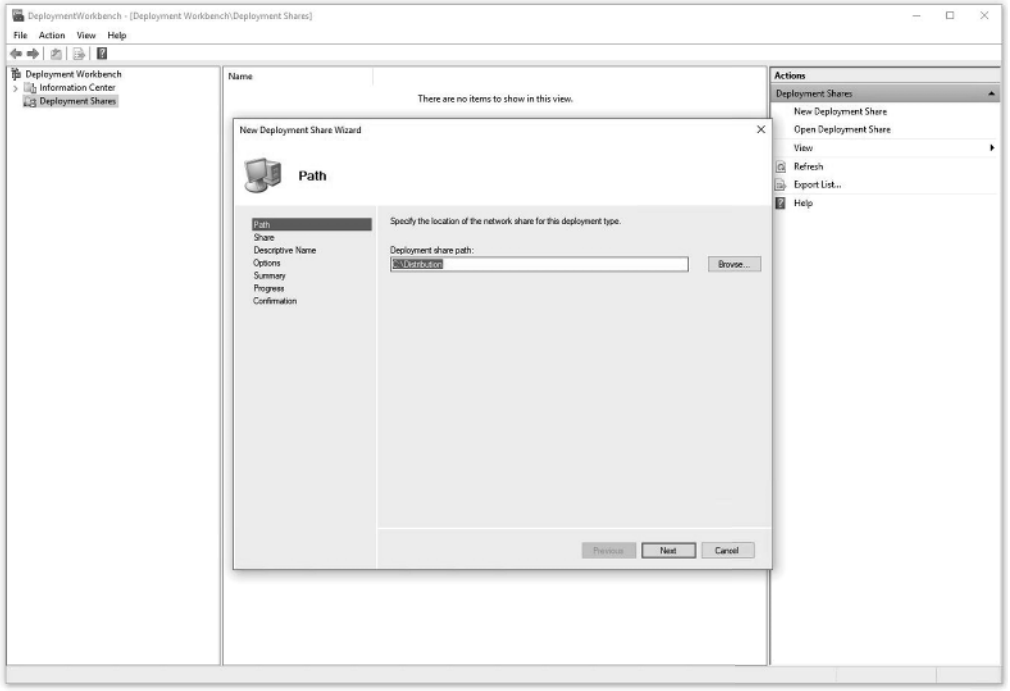
Now that you have installed MDT, you are going to configure the package. In Exercise 1.6, you will configure MDT and set up a distribution share and database. I am creating the MDT on a Windows Server machine so that we can distribute Windows 10. Make sure the Windows Assessment and Deployment Kit (ADK) for Windows 10 is installed because it is required for this deployment scenario. If installing Windows 11 you will want to be sure to install the ADK for Windows 11. The steps will be the same.

EXERCISE 1.6

Configuring MDT

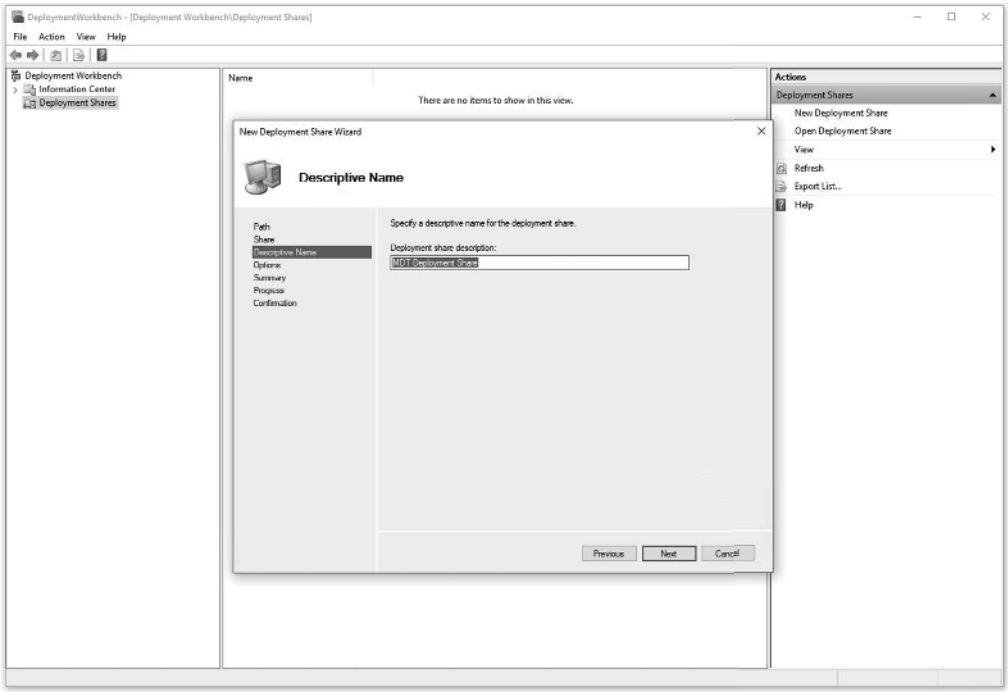
1. Create a shared folder on your network called `Distribution`, and give the Everyone group Full Control to the folder for this exercise.
2. Open the MDT workbench by choosing Start ➢ Microsoft Development Toolkit ➢ Deployment Workbench.
3. If the User Account Control box appears, click Yes.
4. In the left-hand pane, click Deployment Shares, and then right-click the deployment shares and choose New Deployment Share.
5. The New Deployment Share Wizard begins (as shown in Figure 1.23). At the first screen, you will choose the directory where the deployments will be stored. Click the Browse button and choose the Distribution share that you created in step 1. Then click Next.

FIGURE 1.23 New Deployment Share Wizard Path screen



6. At the Share Name screen, accept the default, Distribution. Click Next.
7. At the Deployment Share Description screen, accept the default description name (as shown in Figure 1.24) and click Next.

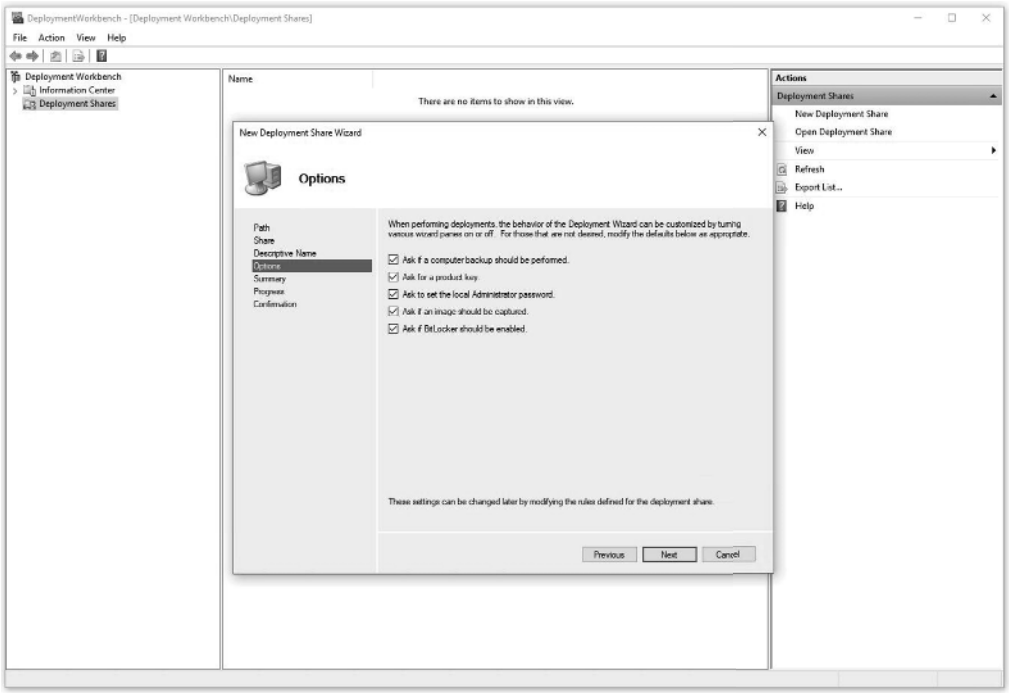
FIGURE 1.24 New Deployment Share Wizard Deployment Share Description screen



8. At the Options screen, make sure all check boxes are selected, as shown in Figure 1.25.
9. At the Summary screen, look over the options and click Next.
10. The Installation Will Progress screen will show you how the installation is performing. Once it's finished, click Finish.

EXERCISE 1.6 *(continued)*

FIGURE 1.25 New Deployment Share Wizard Options screen



11. The new Deployment share is set up and ready to start deploying. Now an operating system needs to be set up in the MDT for deployment.
12. Close the MDT workbench.

Now that you have seen how to install the MDT utility, let's take a look at some other ways to automatically install Windows 10 or 11.

An Overview of Unattended Installation

Unattended installation is a practical method of automating deployments when you have a large number of clients to install and the computers require different hardware and software configurations. Unattended installations allow you to create customized installations that are

specific to your environment. Custom installations can support custom hardware and software installations.

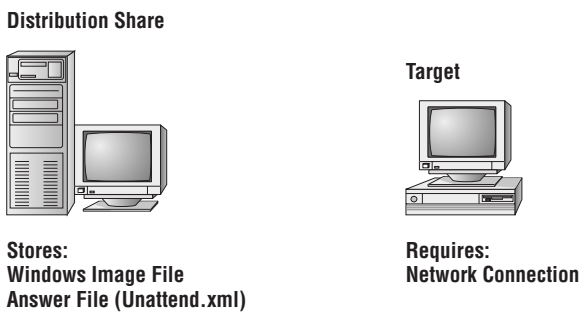
Unattended installations utilize an answer file called `Autounattend.xml` to provide configuration information during the installation process. Think about the Windows installation from earlier in this chapter. You are asked for your locale, type of installation, and so on. The answer file allows these questions to be answered without user interaction. In addition to providing standard Windows configuration information, the answer file can provide installation instructions for applications, additional language support, service packs, and device drivers.

With an unattended installation, you can use a distribution share to install Windows 10/11 on the target computers. You can also use a Windows DVD with an answer file located on the root of the DVD, or on a universal flash device (UFD), such as an external USB flash drive.

Unattended installations allow you to create customized installations that are specific to your environment. Custom installations can support custom hardware and software installations. Since the answer file for Windows 10/11 is in XML format, all custom configuration information can be contained within the `Autounattend.xml` file. This is different from past versions of Windows, where creating automated installation routines for custom installations required multiple files to be used.

If you use a distribution share, it should contain the Windows operating system image and the answer file to respond to installation configuration queries. The target computer must be able to connect to the distribution share over the network. After the distribution share and target computers are connected, you can initiate the installation process. Figure 1.26 illustrates the unattended installation process.

FIGURE 1.26 Unattended installation with distribution share and a target computer



Advantages of Unattended Installation

In a midsize or large organization, it just makes sense to use automated setups. As stated earlier, it is nearly impossible to install Windows 10/11 one at a time on hundreds of machines.

But there are many advantages to using unattended installations as a method for automating Windows:

- Unattended installation saves time and money because users do not have to interactively respond to each installation query.
- It can be configured to provide automated query responses while still selectively allowing users to provide specified input during installations.
- It can be used to install clean copies of Windows 10/11 or upgrade an existing operating system (providing it is on the list of permitted operating systems) to Windows.
- It can be expanded to include installation instructions for applications, additional language support, service packs, and device drivers.
- The physical media for Windows 10/11 does not need to be distributed to all computers on which it will be installed.

Disadvantages of Unattended Installation

As stated earlier, a manual installation is not practical for mass installations. But one of the biggest disadvantages to performing an unattended installation is that an administrator does not physically walk through the installation. A client operating system is one of the most important items that you will install onto a machine. As an IT manager and consultant, I have always felt better physically installing a client operating system. This way, if there are any glitches, I can see and deal with them immediately. If something happens during an unattended installation, you may never know it, but the end user may experience small issues throughout the lifetime of the machine.

Two other disadvantages of using unattended installations as a method for automating Windows 10/11 installations are listed here:

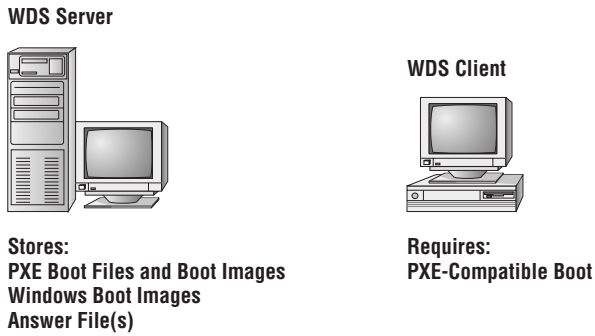
- They require more initial setup than a standard installation of Windows 10/11.
- Someone must have access to each client computer and must initiate the unattended installation process on the client side.

An Overview of Windows Deployment Services

Windows Deployment Services (WDS) is an updated version of Remote Installation Services (RIS). WDS is a suite of components that allows you to remotely install Windows on client computers.

A WDS server installs Windows 10 on the client computers, as illustrated in Figure 1.27. The WDS server must be configured with the Preboot Execution Environment (PXE) boot files, the images to be deployed to the client computers, and the answer file. WDS client computers must be PXE-capable. PXE is a technology that is used to boot to the network when no operating system or network configuration has been installed and configured on a client computer.

FIGURE 1.27 Windows Deployment Services (WDS) uses a WDS server and WDS clients.



The WDS clients access the network with the help of a Dynamic Host Configuration Protocol (DHCP) server. This allows the WDS client to remotely install the operating system from the WDS server. The network environment must be configured with a DHCP server, a Domain Name System (DNS) server, NTFS volumes, and Active Directory to connect to the WDS server. No other client software is required to connect to the WDS server. Remote installation is a good choice for automatic deployment when you need to deploy to large numbers of computers and the client computers are PXE-compliant.

Starting with Windows 11, the operating system deployment functionality of WDS is being partially deprecated. Workflows that rely on `boot.wim` from installation media or on running Windows Setup in WDS mode will no longer be supported and will be blocked. When you PXE-boot from a WDS server that uses the `boot.wim` file from installation media as its boot image, Windows Setup will automatically launch in WDS mode. According to Microsoft, alternatives to WDS, such as Microsoft Endpoint Configuration Manager and Microsoft Deployment Toolkit (MDT), provide a better, more flexible experience for deploying Windows images. WDS PXE boot is not affected by this change, and you can still use WDS to PXE-boot devices with custom boot images, but you cannot use `boot.wim` as the boot image and run Windows Setup in WDS mode.

Advantages of WDS

The advantages of using WDS as a method for automating Windows 10/11 installations are as follows:

- Allows an IT department to remotely install Windows operating systems through the network. This advantage helps reduce the difficulty and IT labor cost compared to a manual installation.
- Allows an IT department to deploy multiple images for mixed environments, including Windows 7, Windows 8/8.1, Windows 10, Windows 11, and Windows Server.
- For Windows 10, allows IT departments to use Windows setups, including Windows Preinstallation Environment (Windows PE), WIM files, and image-based setups.

- WDS uses multicasting to allow the transmitting and image data to communicate with each other.
- An IT department can create reference images using the Image Capture Wizard, which is an alternative to the ImageX tool.
- Allows an IT administrator to install a driver package to the server and configure the drivers to be deployed to client computers at the same time the image is installed.
- Allows IT departments to standardize Windows 10/11 installations throughout a group or organization.
- The physical media does not need to be distributed to all computers that will be installed.
- End-user installation deployment can be controlled through the Group Policy utility. For example, you can configure what choices a user can access or that are automatically specified through the end-user Setup Wizard.

Disadvantages of WDS

The disadvantages of using WDS as a method for automating Windows 10/11 installations include the following:

- WDS can be used only if your network is running Windows Server 2008 and above with Active Directory installed.
- The clients that use WDS must be PXE-capable.

You can configure WDS on a Windows Server computer by using the Windows Deployment Services Configuration Wizard or by using the WDSUTIL command-line utility. Table 1.7 describes the WDSUTIL command-line options.

TABLE 1.7 WDSUTIL command-line options

WDSUTIL option	Description
`/initialize-server`	Initializes the configuration of the WDS server
`/uninitialized-server`	Undoes any changes made during the initialization of the WDS server
`/add`	Adds images and devices to the WDS server
`/convert-ripimage`	Converts Remote Installation Preparation (RIPrep) images to WIM images
`/remove`	Removes images from the server
`/set`	Sets information in images, image groups, WDS servers, and WDS devices

WDSUTIL option	Description
`/get`	Gets information from images, image groups, WDS servers, and WDS devices
`/new`	Creates new capture images or discover images
`/copy-image`	Copies images from the image store
`/export-image`	Exports to WIM files images contained within the image store
`/start`	Starts WDS services
`/stop`	Stops WDS services
`/disable`	Disables WDS services
`/enable`	Enables WDS services
`/approve-autoadddevices`	Approves Auto-Add devices
`/reject-autoadddevices`	Rejects Auto-Add devices
`/delete-autoadddevices`	Deletes records from the Auto-Add database
`/update`	Uses a known-good resource to update a server resource

An Overview of the System Preparation Tool and Disk Imaging

The *System Preparation Tool,* or *Sysprep* (`Sysprep.exe`), is used to prepare a computer for disk imaging, and the disk image can then be captured using Image Capture Wizard (an imaging-management tool included with Windows 10/11) or third-party imaging software. Sysprep is a free utility that comes on all Windows operating systems. By default, the Sysprep utility can be found on Windows Server and Windows operating systems in the `\Windows\system32\sysprep` directory.

Disk imaging is the process of taking a checkpoint of a computer and then using that checkpoint to create new computers, thus allowing for automated deployments. The reference, or source, computer has Windows 10/11 installed and is configured with the settings and applications that should be installed on the target computers. The image (checkpoints) is then created and can be transferred to other computers, thus installing the operating system, settings, and applications that were defined on the reference computer.

Using Imaging Software

Using the System Preparation Tool and disk imaging is a good choice (and the one most commonly used in the real world) for automatic deployment when you have a large number of computers with similar configuration requirements or machines that need to be rebuilt frequently.

For example, StormWind Studios, an online computer education company, reinstalls the same software every few weeks for new classes. Imaging is a fast and easy way to simplify the deployment process.

Most organizations use images to create new machines quickly and easily, but they also use them to reimage end users' machines that crash.

In most companies, end users will have space on a server (home folders) to allow them to store data. We give our end users space on the server because this way we need to back up only the servers at night and not the end users' machines. If your end users place all of their important documents on the server, that information gets backed up.

Now, if we are also using images in our company and an end user's machine crashes, we just reload the image and they are backed up and running in minutes. Since their documents are being saved on the server, they do not lose any of their information.

Many organizations use third-party imaging software (such as Ghost) instead of using `Sysprep.exe` and the Image Capture Wizard. This is another good way of imaging your Windows machines. Just make sure your third-party software supports the Windows 10/11 operating system.

To perform an unattended installation, the System Preparation Tool prepares the reference computer by stripping away any computer-specific data, such as the Security Identifier (SID), which is used to uniquely identify each computer on the network; any event logs; and any other unique system information. The System Preparation Tool also detects any Plug and Play devices that are installed and can adjust dynamically for any computers that have different hardware installed.

When the client computer starts an installation using a disk image, you can customize what is displayed on the Windows Welcome screen and the options that are displayed through the setup process. You can also fully automate when and how the Windows Welcome screen is displayed during the installation process by using the `/oobe` option with the System Preparation Tool and an answer file named `Oobe.xml`.

Sysprep is a utility that is good only for setting up a new machine. You do not use Sysprep to image a computer for upgrading a current machine. There are a few switches that

you can use in conjunction with Sysprep to configure the Sysprep utility for your specific needs. Table 1.8 shows you the important Sysprep switches and what they will do for you when used.

TABLE 1.8 Sysprep switches

Switch	Explanation
/pnp	Forces a mini-setup wizard to start at reboot so that all Plug and Play devices can be recognized.
/generalize	This allows Sysprep to remove all system-specific data from the Sysprep image. If you're running the GUI version of Sysprep, this is a check box option.
/oobe	Initiates the Windows Welcome screen at the next reboot.
/audit	Initiates Sysprep in audit mode.
/nosidgen	Sysprep does not generate a new SID on the computer restart. It forces a mini-setup on restart.
/reboot	Stops and restarts the computer system.
/quiet	Runs without any confirmation dialog box messages being displayed.
/mini	Tells Sysprep to run the mini-setup on the next reboot.

Real World Scenario

The SID Problem with Deployment Software

For many years, when you had to create a number of machines that each had a Microsoft operating system on it, you would have to use files to help deploy the multiple systems.

Then, multiple third-party companies came out with software that allowed you to take a picture of the Microsoft operating system, and you could deploy that picture to other machines. One advantage was that all the software that was installed on the system could also be part of that picture. This was a great way to copy all the software on a machine over to another machine.

There was one major problem for years—*Security Identifier (SID)* numbers. All computers get assigned a unique SID that represents them on a domain network. The problem for a long time was that when you copied a machine to another machine, the SID number was also copied.

Microsoft released Sysprep many years ago, and that helped solve this problem. Sysprep would allow you to remove the SID number so that a third-party software package could image it to another machine. Many third-party image software products now also remove the SID numbers, but Sysprep was one of the first utilities to help solve this problem.

When you decide to use Sysprep to set up your images, there are a few rules that you must follow for Sysprep to work properly:

- You can use images to restart the Windows activation clock. The Windows activation clock starts to decrease as soon as Windows starts for the first time. You can restart the Windows activation clock only three times using Sysprep.
- The computer on which you're running Sysprep has to be a member of a workgroup. The machine can't be part of a domain. If the computer is a member of the domain, when you run Sysprep, the computer will automatically be removed from the domain.
- When installing the image, the system will prompt you for a product key. During the installation, you can use an answer file, which in turn will have all the information needed for the installation, and you will not be prompted for any information.
- A third-party utility or the Image Capture Wizard is required to deploy the image that is created from Sysprep.
- If you are using Sysprep to capture an NTFS partition, any files or folders that are encrypted will become corrupt and unreadable.

One advantage to Sysprep and Windows 10/11 is that you can use Sysprep to prepare a new machine for duplication. You can use Sysprep to image a Windows machine. The following steps are necessary to image a new machine:

1. Install the Windows 10/11 operating system.
2. Install all components on the OS.
3. Run `Sysprep /generalize` to create the image.

When you image a computer using the Windows Sysprep utility, a Windows image (WIM) file is created. Most third-party imaging software products can work with the Windows image file.

Advantages of the System Preparation Tool

The following are advantages of using the System Preparation Tool as a method for automating Windows 10/11 installations:

- For large numbers of computers with similar hardware, it greatly reduces deployment time by copying the operating system, applications, and desktop settings from a reference computer to an image, which can then be deployed to multiple computers.
- Using disk imaging facilitates the standardization of desktops, administrative policies, and restrictions throughout an organization.
- Reference images can be copied across a network connection or through DVDs that are physically distributed to client computers.

Disadvantages of the System Preparation Tool

There are some disadvantages of using the System Preparation Tool as a method for automating Windows 10/11 installations:

- The Image Capture Wizard, third-party imaging software, or hardware disk-duplication devices must be used for an image-based setup.
- The version of the System Preparation Tool that shipped with Windows must be used. An older version of Sysprep cannot be used on a Windows 10/11 image.
- The System Preparation Tool will not detect any hardware that is not Plug and Play compliant.

Overview of the Windows Assessment and Deployment Kit

Another way to install Windows 10/11 is to use the *Windows Assessment and Deployment Kit (ADK)*. The Windows ADK is a set of utilities and documentation that allows an administrator to configure and deploy Windows operating systems. An administrator can use the Windows ADK to do the following:

- Windows Configuration Designer
- Windows Assessment Toolkit
- Windows Performance Toolkit

The Windows ADK can be installed and configured on the following operating systems:

- Windows 11
- Windows 10
- Windows 7 with SP1
- Windows 8 / 8.1
- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2012
- Windows Server 2008
- Windows Server 2008 R2

The Windows ADK is a good solution for organizations that need to customize the Windows deployment environments. The Windows ADK allows an administrator to have the flexibility needed for mass deployments of Windows operating systems. Since every organization's needs are different, the Windows ADK allows you to use all or just some of the deployment tools available.

You want to choose the right ADK to meet your needs. If possible, use the ADK version that matches the Windows version that you are working with. If your environment uses a

mix of Windows versions, then use the ADK version that matches the latest operating system in your environment.

ADK allows you to manage deployments by using some additional tools:

Windows Configuration Designer The tools included with this part of the Windows ADK will allow an administrator to easily deploy and configure Windows operating systems and images.

Windows Assessment Toolkit When new Windows operating systems are installed, applications that ran on the previous version of Windows may not work properly. The Windows Assessment Toolkit allows an administrator to help solve these issues before they occur.

Windows Performance Toolkit The Windows Performance Toolkit is a utility that will locate computers on a network and then perform a thorough inventory of them. This inventory can then be used to determine which machines can have Windows 10/11 installed.

Windows Configuration Designer

The Windows Configuration Designer allows an administrator to work with images. The Windows Configuration Designer allows an IT department to do the following;

- View and configure all of the settings and policies for a Windows 10/11 image or provisioning package.
- Create Windows provisioning answer files.
- Allow an answer file to add third-party drivers, apps, or other assets.
- Create variants and specify the settings that apply to each variant.
- Build and flash a Windows image.
- Build a provisioning package.

The Windows Configuration Designer gives an IT department many options for deploying and setting up Windows 10/11 clients. The following are some of the tools included with the Windows Configuration Designer:

- Configure and edit images by using the Deployment Image Servicing and Management (DISM) utility.
- Create Windows Preinstallation Environment (Windows PE) images.
- Migrate user data and profiles using the User State Migration Tool (USMT).
- Windows Configuration Designer (Windows Configuration Designer).

Summary of Windows Client Deployment Options

Table 1.9 summarizes the installation tools and files that are used with unattended, automated installations of Windows 10/11, the associated installation method, and a description of each tool.

TABLE 1.9 Summary of Windows 10/11 unattended deployment utilities

Tool or file	Automated installation option	Description
`Setup.exe`	Unattended installation	Program used to initiate the installation process
`Autounattend.xml`	Unattended installation	Answer file used to customize installation queries
Windows System Image Manager	Unattended installation	Program used to create answer files to be used for unattended installations
`DISM.exe`	DISM	Command-line utility that works in conjunction with Sysprep to create and manage Windows image files for deployment
`Sysprep.exe`	Sysprep	System Preparation Tool, which prepares a source reference computer that will be used in conjunction with a distribution share or with disk duplication through the Image Capture Wizard, third-party software, or hardware disk-duplication devices

The Windows 10/11 installation utilities and resources relating to automated deployment are found in a variety of locations. Table 1.10 provides a quick reference for each utility or resource and its location.

TABLE 1.10 Location of Windows 10/11 deployment utilities and resources

Utility	Location
`DISM.exe`	Included with Windows 10/11; installed to `%WINDIR%\system32\DISM`
`Sysprep.exe`	Included with Windows 10/11; installed to `%WINDIR%\system32\sysprep`
`Image Capture Wizard.exe`	Installed with the WAIK; installed to `C:\Program Files\Windows AIK\Tools\x86\Image Capture Wizard.exe`
Windows System Image Manager	Installed with WAIK; installed to `C:\Program Files\Windows AIK\Tools\Image Manager\ImgMgr.exe`

Deploying Unattended Installations

You can deploy Windows 10/11 installations or upgrades through a Windows distribution DVD or through a distribution server that contains Windows 10/11 images and associated files, such as `Autounattend.xml` for unattended installations. Using a DVD can be advantageous if the computer on which you want to install Windows is not connected to the network or is connected via a low-bandwidth network. It is also typically faster to install a Windows 10/11 image from DVD than to use a network connection.

Unattended installations rely on options configured in an answer file that is deployed with the Windows image. Answer files are XML files that contain the settings that are typically supplied by the installer during attended installations of Windows 10/11. Answer files can also contain instructions for how programs and applications should be run.

The Windows Setup program is run to install or upgrade to Windows from computers that are running compatible versions of Windows. In fact, Windows Setup is the basis for the other types of installation procedures, including unattended installations, WDS, and image-based installations.

The Windows Setup program (`Setup.exe`) replaces `Winnt32.exe` and `Winnt.exe`, which are the setup programs used in versions of Windows prior to Windows 7. Although it's a graphical tool, Windows Setup can be run from the command line. For example, you can use the following command to initiate an unattended installation of Windows 10/11:

```
setup.exe /unattend:answerfile
```

The Windows Setup program has several command-line options that can be applied. Table 1.11 describes the `Setup.exe` command-line options.

TABLE 1.11 `Setup.exe` command-line options and descriptions

`Setup.exe` **Option**	**Description**
`/1394debug:` *channel* `[baudrate:`*baudrate*`]`	Enables kernel debugging over a FireWire (IEEE 1394) port for troubleshooting purposes. The `[baudrate]` optional parameter specifies the baud rate for data transfer during the debugging process.
`/debug:`*port*`[`*baudrate*`:`*baudrate*`]`	Enables kernel debugging over the specified port for troubleshooting purposes. The `[baudrate]` optional parameter specifies the baud rate for data transfer during the debugging process.
`/DynamicUpdate {enable | disable}`	Used to prevent a dynamic update from running during the installation process.
`/emsport:{com1|com2|usebiossettings |off}[/emsbaudrate:`*baudrate*`]`	Configures EMS to be enabled or disabled. The `[baudrate]` optional parameter specifies the baud rate for data transfer during the debugging process.

`Setup.exe` **Option**	**Description**
`/m:`*`folder_name`*	Used with Setup to specify that replacement files should be copied from the specified location. If the files are not present, Setup will use the default location.
`/noreboot`	Normally, when the down-level phase of `Setup.exe` is complete, the computer restarts. This option specifies that the computer should not restart so that you can execute another command prior to the restart.
`/tempdrive:`*`drive letter`*	Specifies the location that will be used to store the temporary files for Windows 10/11 and the installation partition.
`/unattend:[`*`answerfile`*`]`	Specifies that you will be using an unattended installation for Windows 10/11. The *`answerfile`* variable points to the custom answer file you will use for installation.

Next, we'll look at the System Preparation Tool (Sysprep); using it is one of many ways to install Windows 10/11 automatically.

Using the System Preparation Tool to Prepare an Installation for Imaging

You can use disk images to install Windows 10 or Windows 11 on computers that have similar hardware configurations. Also, if a computer is having technical difficulties, you can use a disk image to quickly restore it to a baseline configuration.

To create a disk image, you install Windows 10/11 on the source computer with the configuration that you want to copy and use the System Preparation Tool to prepare the installation for imaging. The source computer's configuration should also include any applications that should be installed on target computers.

Once you have prepared the installation for imaging, you can use imaging software such as the Image Capture Wizard to create an image of the installation.

The System Preparation Tool (`Sysprep.exe`) is included with Windows 10/11, in the `%WINDIR%\system32\sysprep` directory. When you run this utility on the source computer, it strips out information that is unique for each computer, such as the SID. Table 1.12 defines the command options that you can use to customize the `Sysprep.exe` operation.

TABLE 1.12 System Preparation Tool command-line options

Switch	Description
`/audit`	Configures the computer to restart into audit mode, which allows you to add drivers and applications to Windows or test the installation prior to deployment
`/generalize`	Removes any unique system information from the image, including the SID and log information
`/oobe`	Specifies that the Windows Welcome screen should be displayed when the computer reboots
`/quiet`	Runs the installation with no user interaction
`/quit`	Specifies that the System Preparation Tool should quit after the specified operations have been completed
`/reboot`	Restarts the target computer after the System Preparation Tool completes
`/shutdown`	Specifies that the computer should shut down after the specified operations have been completed
`/unattend`	Indicates the name and location of the answer file to use

In the following sections, you will learn how to create a disk image and how to copy and install from it.

Preparing a Windows 10/11 Installation

To run the System Preparation Tool and prepare an installation for imaging, take the following steps:

1. Install Windows 10 or Windows 11 on a source computer. The computer's hardware configuration should be similar to that of the destination computer(s). The source computer should not be a member of a domain.
2. Log onto the source computer as Administrator and, if desired, install and configure any applications, files (such as newer versions of Plug and Play drivers), or custom settings (for example, a custom desktop) that will be applied to the target computer(s).
3. Verify that your image meets the specified configuration criteria and that all applications are properly installed and working.
4. Select Start ➢ Computer, and navigate to `C:\%WINDIR%\System32\sysprep`. Double-click the Sysprep application icon.

5. The Windows System Preparation Tool dialog box appears. Select the appropriate options for your configuration.
6. If configured to do so, Windows 10/11 will be rebooted into setup mode, and you will be prompted to enter the appropriate setup information.
7. You will now be able to use imaging software to create an image of the computer to deploy to other computers.

In Exercise 1.7, you will use the System Preparation Tool to prepare the computer for disk imaging. The Sysprep utility must be run on a machine with a clean version of Windows 10/11. If you upgraded a Windows 7/8/8.1 machine to Windows 10, you will not be able to run the Sysprep utility.

EXERCISE 1.7

Prepare a System for Imaging by Using the System Preparation Tool

1. Log onto the source computer as Administrator, and if desired, install and configure any applications that should also be installed on the target computer.
2. Select Start ➢ Computer, and navigate to `C:\%WINDIR%\System32\sysprep`. Double-click the Sysprep application icon.
3. In the System Preparation Tool dialog box, select Enter System Out-Of-Box Experience (OOBE) in the System Cleanup Action.
4. Under the shutdown options, depending on the options selected, the System Preparation Tool will quit, the computer will shut down, or the computer will be rebooted into setup mode, where you will need to configure the setup options. Choose the Reboot option. Click OK.
5. Configure the Sysprep utility and name the image **`image.wim`**.

After creating the Sysprep image, you need to use some type of third-party software to capture it. Windows includes a utility called Image Capture Wizard for just that purpose.

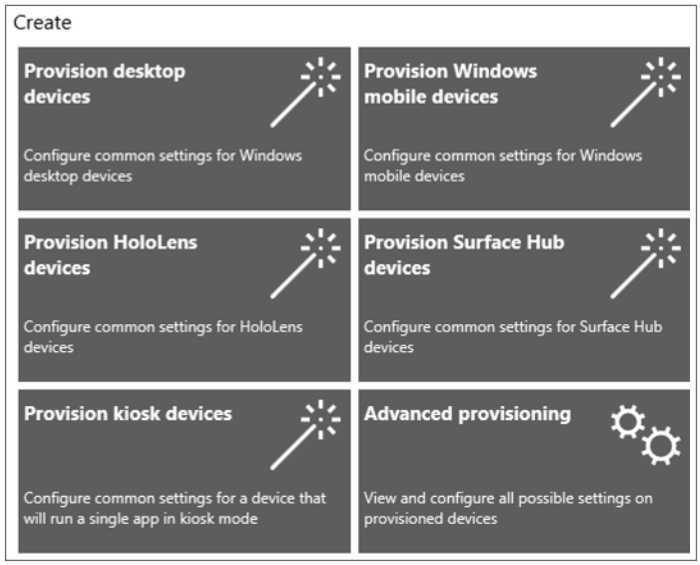
Using Windows Configuration Designer to Create a Disk Image

After you've run the System Preparation Tool on the source computer, you can create an image from the installation, and you can then install the image on target computers. To create an image, you can use the Image Capture Wizard, which is a utility that can be used to create and manage Windows image (WIM) files.

To run the Image Capture Wizard utility to create a disk image of a Windows 10/11 installation, follow these steps:

1. Open Windows Configuration Designer.
2. Select your desired option on the Start page (see Figure 1.28).

FIGURE 1.28 Windows Configuration Designer Start page



3. Name your project and click Finish. The pages for desktop provisioning will walk you through the following steps:
    1. Set up device (this includes device name and Product Key number).
    2. Set up network settings.
    3. Set up Account Management (this includes adding the machine to a domain or Azure domain and inputting the username and password).
    4. Add applications.
    5. Add any needed certificates.
    6. Finish the configuration.

There is also a command-line version of the Windows Configuration Designer tool that you can use called the Windows Configuration Designer command-line interface (CLI). The Microsoft exams have started using a lot of command-line utilities on their tests. So let's take a look at the Windows Configuration Designer CLI.

Table 1.13 shows you the Windows Configuration Designer CLI switches that you can use to configure the images.

TABLE 1.13 Windows Configuration Designer command-line interface (CLI) switches

Switch	Description
`/CustomizationXML`	This command identifies the location of the Windows provisioning XML file. This file holds the information for customization assets and settings.
`/PackagePath`	Identifies the location and the built provisioning package name where the package will be saved.
`/StoreFile`	This command allows IT administrators to use their own settings store instead of the default store used by Windows Configuration Designer. If an IT administrator does not determine their own store, then a default store that's common to all Windows editions will be loaded by Windows Configuration Designer.
`/Variables`	Identifies a macro pair that is separated by semicolon `<name>` and `<value>`. The format for the argument must be <name>=<value>.
`Encrypted`	Indicates whether or not the provisioning package should be created with encryption. Windows Configuration Designer will then automatically generate a decryption password that is included with the output.
`Overwrite`	Indicates whether or not to overwrite the existing provisioning package.
`/?`	This command is used to access the Windows Configuration Designer help. The help lists the switches and their descriptions for the Windows Configuration Designer command-line tool.

Using the Deployment Image Servicing and Management Tool

Deployment Image Servicing and Management (`DISM.exe`) is a command-line utility that allows you to manipulate a Windows image. DISM also allows you to prepare a Windows PE image. DISM replaces multiple programs that were included with Windows 7/8/8.1. These programs include Package Manager (`Pkgmgr.exe`), PEimg, and Intlcfg. These tools have been consolidated into one tool (`DISM.exe`), and new functionality has been added to improve the experience for offline servicing.

When DISM was first released, it was primarily used for servicing and managing Windows images. But now DISM has become even more powerful, including capturing images and deploying images.

DISM provides additional functionality when used with Windows 10/11 and Windows Server. You can use DISM to do the following:

- Capture Windows images.
- Copy and move Windows images.
- Install Windows images.
- Add, remove, and enumerate packages.
- Add, remove, and enumerate drivers.
- Enable or disable Windows features.
- Apply changes to an `Unattend.xml` answer file.
- Configure international settings.
- Upgrade a Windows image to a different edition.
- Prepare a Windows PE 3.0 image.
- Work with all platforms (32-bit, 64-bit, and Itanium).
- Use Package Manager scripts.

Table 1.14 shows the different commands that can be used with `DISM.exe`.

TABLE 1.14 `DISM.exe` command-line commands

Command	Description
`/Add-Driver`	Adds third-party driver packages to an offline Windows image.
`/Get-CurrentEdition`	Displays the edition of the specified image.
`/Get-Drivers`	Displays basic information about driver packages in the online or offline image. By default, only third-party drivers will be listed.
`/Get-DriverInfo`	Displays detailed information about a specific driver package.
`/Get-Help /?`	Displays information about the option and the arguments.
`/Get-TargetEditions`	Displays a list of Windows editions that an image can be changed to.
`/Remove-Driver`	Removes third-party drivers from an offline image.

Command	Description
`/Set-ProductKey:<productKey>`	Can only be used to enter the product key for the current edition in an offline Windows image.
`/Online /Enable-Feature /All /FeatureName:Microsoft-Hyper-V`	This command allows you to install Hyper-V into a Windows image while it's an actual image.

Using Windows System Image Manager to Create Answer Files

Answer files are automated installation scripts used to answer the questions that appear during a normal Windows 10/11 installation. You can use answer files with Windows 10/11 unattended installations, disk image installations, or WDS installations. Setting up answer files allows you to easily deploy Windows 10 or Windows 11 to computers that may not be configured in the same manner, with little or no user intervention. Because answer files are associated with image files, you can validate the settings within an answer file against the image file.

You can create answer files by using the Windows System Image Manager (Windows SIM) utility. There are several advantages to using Windows SIM to create answer files:

- You can easily create and edit answer files through a graphical interface, which reduces syntax errors.
- It simplifies the addition of user-specific or computer-specific configuration information.
- You can validate existing answer files against newly created images.
- You can include additional application and device drivers in the answer file.

In the following sections, you will learn about options that can be configured through Windows SIM, how to create answer files with Windows SIM, how to format an answer file, and how to manually edit answer files.

Configuring Components through Windows System Image Manager

You can use Windows SIM to configure a wide variety of installation options. The following list defines which components can be configured through Windows SIM and gives a short description of each component:

auditSystem Adds additional device drivers, specifies firewall settings, and applies a name to the system when the image is booted into audit mode. Audit mode is initiated by using the `sysprep/audit` command.

auditUser Executes `RunSynchronous` or `RunAsynchronous` commands when the image is booted into audit mode. Audit mode is initiated by using the `sysprep/audit` command.

generalize Removes system-specific information from an image so that the image can be used as a reference image. The settings specified in the generalize component will be applied only if the `sysprep/generalize` command is used.

offlineServicing Specifies the language packs and packages to apply to an image prior to the image being extracted to the hard disk.

oobeSystem Specifies the settings to apply to the computer the first time the computer is booted into the Windows Welcome screen, which is also known as the Out-Of-Box Experience (OOBE). To boot to the Welcome screen, the `sysprep/oobe` command should be used.

specialize Configures the specific settings for the target computer, such as network settings and domain information. This configuration pass is used in conjunction with the generalize configuration pass.

Windows PE Sets the Windows PE specific configuration settings as well as several Windows Setup settings, such as partitioning and formatting the hard disk, selecting an image, and applying a product key.

Windows Update

Windows Update is a utility that connects to the Microsoft website or to a local update server called a Windows Server Update Services (WSUS) server to ensure that the Windows 10/11 operating system (along with other Microsoft products) has the most up-to-date versions of Microsoft operating system files or software.

Some of the common update categories associated with Windows Update are as follows:

- Security updates
- Critical updates
- Service packs
- Drivers
- Product/software updates
- Windows Store

So, let's begin by looking at how Windows 10/11 updates get created by Microsoft.

The Update Process

To truly understand updates, you need to understand how the update process works with Microsoft. Microsoft normally releases updates to their products on Tuesdays (this is why we use the term *Patch Tuesdays*). But before that update gets released to the public, it has already been tested at Microsoft.

It all starts with the Windows engineering team adding new features and functionality to Windows using product cycles. These product cycles consist of three phases; development, testing, and release.

After the new Windows 10/11 features or functionality are developed, Microsoft employees test these updates out themselves on their own Windows machines. This is referred to as "self-host testing."

After the updates get tested at Microsoft, they then get released to the public. With Windows 10, Microsoft has introduced new ways to service updates. Microsoft's new servicing options are referred to as Semi-Annual Channel, Long-Term Servicing Branch (LTSB), and Windows Insider. Table 1.15 (taken directly from Microsoft's website) shows the different servicing options and the benefits of those options.

TABLE 1.15 Servicing options

From this channel	To this channel	You need to
Windows Insider Program	Semi-Annual Channel (Targeted)	Wait for the final Semi-Annual Channel release.
	Semi-Annual Channel	Not directly possible, because Windows Insider Program devices are automatically upgraded to the Semi-Annual Channel (Targeted) release at the end of the development cycle.
	Long-Term Servicing Channel	Not directly possible (requires wipe-and-load).
Semi-Annual Channel (Targeted)	Insider	Use the Settings app to enroll the device in the Windows Insider Program.
	Semi-Annual Channel	Select the Defer Upgrade setting, or move the PC to a target group or flight that will not receive the next upgrade until it is business ready. Note that this change will not have any immediate impact; it only prevents the installation of the next Semi-Annual Channel release.
	Long-Term Servicing Channel	Not directly possible (requires wipe-and-load).

TABLE 1.15 Servicing options *(Continued)*

From this channel	To this channel	You need to
Semi-Annual Channel	Insider	Use the Settings app to enroll the device in the Windows Insider Program.
	Semi-Annual Channel (Targeted)	Disable the Defer Upgrade setting, or move the device to a target group or flight that will receive the latest Current Semi-Annual Channel release.
	Long-Term Servicing Channel	Not directly possible (requires wipe-and-load).
Long-Term Servicing Channel	Insider	Use media to upgrade to the latest Windows Insider Program build.
	Semi-Annual Channel (Targeted)	Use media to upgrade. Note that the Semi-Annual Channel build must be a later build.
	Semi-Annual Channel	Use media to upgrade. Note that the Semi-Annual Channel build must be a later build.

Using Windows Update

There are multiple ways a user can receive updates: directly from Microsoft or by using Microsoft Windows Server Update Services (WSUS). WSUS runs on a Windows server, and that server goes out to the Microsoft website and downloads the updates for your Windows clients. This allows client machines to receive their updates from a local server.

When it comes to company-based updates, there are better options. Administrators can set up either Group Policy Objects (GPOs) or Azure MDM solutions (such as Microsoft Intune) to configure the Windows Update for Business settings that control how and when Windows 10 devices are updated and which updates get accepted by the IT department. Windows Update for Business updates are updates that you receive from your Microsoft cloud-based services (MDM and Intune).

One advantage to using WSUS is that administrators can approve the updates before they get deployed to the client machines. Another advantage is that your clients only need to download updates locally, without using your Internet bandwidth.

WSUS is discussed in detail in *MCSA Windows Server 2016 Complete Study Guide: Exam 70-740, Exam 70-741, Exam 70-742, and Exam 70-743, 2nd Edition,* by William Panek (Wiley, 2018).

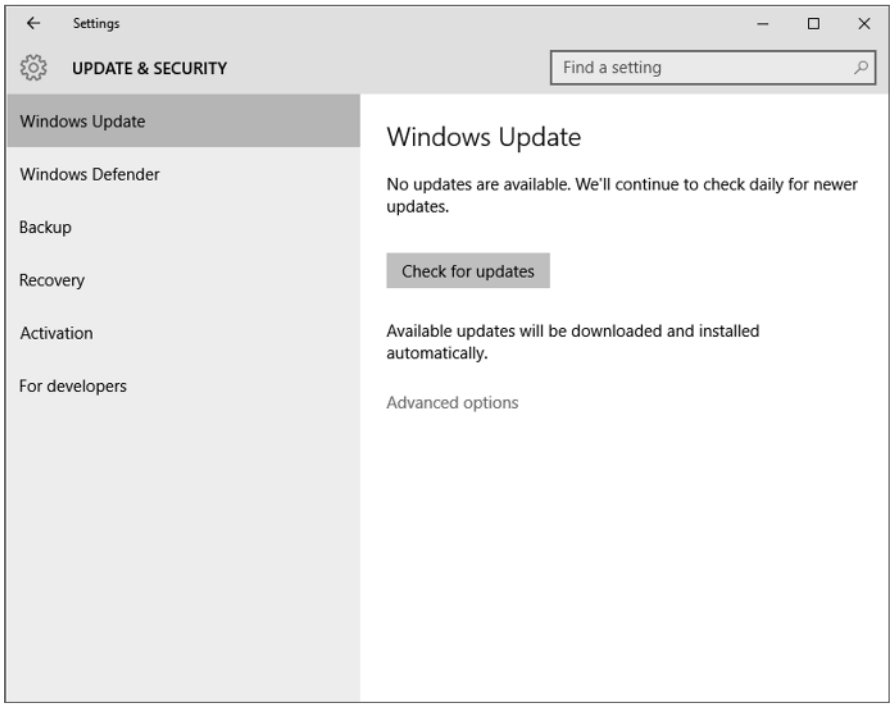
If you want the Windows 10/11 clients to access and get their own updates follow these steps to configure Windows Update:

1. Select Start ➢ Settings.
   - From Settings, select Update And Security.
2. Configure the options you want to use for Windows Update by clicking the Advanced Options link. You can access the following options from Windows Update:
   - Give Me Updates For Other Microsoft Products.
     - This setting allows you to get updates for other Microsoft products like Microsoft Office.
   - Choose When Updates Are Installed.
   - Pause Updates.
   - Delivery Optimization.
     - Windows Update Delivery Optimization provides you with Windows and Store app updates and other Microsoft products quickly and reliably.
     - Allow updates from other PCs.
   - Privacy Settings.
     - This option allows you to set all of your system's privacy settings.

Check For Updates

When you click Check For Updates, Windows Update will retrieve a list of available updates from the Internet. You can then click View Available Updates to see what updates are available. Updates are marked as Important, Recommended, or Optional. Figure 1.29 shows the Check For Updates button.

FIGURE 1.29 Check For Updates button



Using Windows Update for Business

Windows Update for Business allows an IT administrator to keep their organization's Windows 10/11 devices up-to-date with the latest Microsoft security defenses and Windows features by using Microsoft Azure. Windows Update for Business allows your Windows systems to connect to Microsoft's Windows Update service.

Administrators have the ability to configure Windows Update for Business by using Group Policies or MDM solutions to configure the Windows Update for Business settings. These settings will control how and when Windows devices are updated.

So, what does this mean for your organization? Administrators have total control over how updates are delivered and which updates will be delivered. Administrators can do this best by doing reliability and performance testing on a small group of systems (including just a single system for testing) before allowing updates to roll out to all of the computers in their organization. By testing updates, administrators can determine which updates will work best for their company.

Windows Update for Business Update Types

Windows Update for Business allows an organization to choose which updates an organization wants delivered to their Windows 10/11 systems. Administrators can do this by setting up management policies to help choose which updates they want delivered to their users. The following are different types of updates that administrators can deploy to their Windows devices:

Feature Updates These updates were previously referred to as upgrades. Feature Updates not only contain security updates and revisions, but also include major feature additions and changes. Feature Updates are released semi-annually in the spring and in the fall.

Quality Updates Quality Updates are normally operating system updates that are usually released the second Tuesday of each month. Sometimes these updates, depending on their importance, can be released at any time. Quality Updates include security updates, critical updates, and driver updates.

Windows Update for Business also deploys non-Windows operating system updates (for example, Visual Studio) as part of the Quality Updates deployment.

Driver Updates Driver Updates are updates for third-party devices that apply to your Windows 10/11 systems. For example, you may be using a printer that Microsoft Windows 10 has a driver for; these drivers get updated as part of the Driver Updates process. Administrators have the ability to enable or disable Driver Updates by using Windows Update for Business policies.

Microsoft Product Updates Microsoft Product Updates are updates for Microsoft application or software products like Office. Administrators have the ability to enable or disable Microsoft Product Updates by using Windows Update for Business policies.

Deferring Updates

Windows Update for Business allows administrators to defer updates from being installed for a specific period of time. Administrators can defer the installation of both Feature Updates and Quality Updates for a specific period of time, but that specific period of time starts as soon as those updates are first made available through the Windows Update service.

Administrators can use this time to test and validate the updates before they are pushed to all of your Windows client devices. The way deferrals work is by allowing administrators to specify the amount of time after an update is released before it is offered to your Windows 10 devices.

For example, if an administrator decides to defer Feature Updates for 365 days, the Windows devices will not install any Feature Update before the 365 days expire. Administrators can defer Feature Updates by using the Select When Preview Builds And Feature Updates Are Received policy.

Table 1.16 shows the different updates that can be deferred and the maximum time that they can be deferred for.

TABLE 1.16 Maximum update deferral

Update	Maximum deferral
Feature Updates	365 days
Quality Updates	30 days
Nondeferrable	None

Pausing an Update

Administrators also have the ability to pause an update if they discover an issue while they are deploying Feature Updates or Quality Updates. Administrators can choose to pause the update for up to 35 days. This helps prevent other Windows devices from experiencing the same issues.

If the administrator pauses the installation of a Feature Update, then Quality Updates are still deployed, and vice versa. When an administrator sets a pause time period for an update, the pause time is calculated from the start date that the administrator sets.

To pause a Feature Update, the administrator uses the Select When Preview Builds And Feature Updates Are Received policy. To pause a Quality Update, the administrator uses the Select When Quality Updates Are Received policy.

Selecting Branch Readiness Level for Feature Updates

Windows Update for Business allows administrators to choose which channel of Feature Updates they want to receive. Currently Microsoft offers branch readiness level options to organizations for prerelease and released updates. The following options are included:

- Windows Insider Program for Business prerelease updates. These updates include Windows Insider Fast, Windows Insider Slow, and Windows Insider Release Preview.
- Semi-Annual Channel for released updates.

Prior to version 1903 of Windows 10, there were only two channels for released updates: Semi-Annual Channel and Semi-Annual Channel (Targeted). Versions of Windows 10 released after version 1903 get a single release channel: Semi-Annual Channel.

Administrators have the ability to configure the branch readiness level by configuring the Select When Preview Builds And Feature Updates Are Received policy. But if an administrator wants to manage prerelease builds, they need to enable preview builds by configuring the Manage Preview Builds policy.

Monitoring Windows Updates

Administrators have the ability to monitor which Windows computers are receiving their updates by using the Update Compliance utility. The Update Compliance utility lets administrators see a complete view of Windows 10/11 operating system updates. Administrators can view which operating systems are meeting compliance, how the update deployments are progressing, and any errors that may have occurred on the Windows devices.

The Update Compliance utility uses multiple factors to show you a complete view of the update process. These factors include diagnostic data from the installation progress, Windows Update configuration settings, and additional data (for example, Windows Defender Antivirus diagnostic data). This service is included free with your Azure subscription, and there is no need to set up any additional infrastructure requirements.

Update Compliance Prerequisites

To use the Update Compliance utility, your organization must meet some prerequisites:

- Only Windows 10/11 Professional, Education, and Enterprise editions can be used with the Update Compliance utility. Update Compliance only gathers data for the standard desktop Windows version. The Update Compliance utility is not currently compatible with other operating systems like Windows Server, Surface Hub, or IoT.
- Windows 10/11 devices must be on the Semi-Annual Channel and the Long-Term Servicing Channel. The Update Compliance utility will show you Windows Insider Preview devices. But currently Windows Insider Preview devices will not have any detailed deployment information.
- The Update Compliance utility requires at the minimum the Basic level of diagnostic data and a Commercial ID to be enabled on the Windows device.
- You must opt in to the Windows Analytics to see device names for versions of Windows 10 version 1803 or higher.
- If you want to use the Windows Defender Status, Windows devices must be E3 licensed and have Cloud Protection enabled. E5-licensed devices should use Windows Defender ATP instead.
- You must add the Update Compliance utility to your Azure subscription. To do this, you must log in to the Azure portal and select + Create A Resource. At the Search For window, type **Update Compliance**. At the bottom of the screen, click the Create button to add the Update Compliance utility to your Azure subscription.

Delivery Optimization

Delivery Optimization is a cloud-managed solution that allows users to download packages from alternate sources. Delivery Optimization works by allowing you to obtain Windows updates and Microsoft Store apps from other sources such as other computers on the local network or computers on the Internet.

You can use Delivery Optimization with:

- Windows Update
- Windows Server Update Services (WSUS)
- Windows Update for Business
- Microsoft Endpoint Manager (when Express Updates is enabled)

Both access to the Internet and the Delivery Optimization cloud services are required in order to utilize Deliver Optimization. Depending on your settings, when Windows downloads an update or app using Delivery Optimization, it looks for other computers on your local network or on the Internet that have already downloaded that update or app. Delivery Optimization creates a local cache and then stores the downloaded files into that cache for a short period of time.

In Windows client Enterprise, Professional, and Education editions, Delivery Optimization is enabled by default for peer-to-peer sharing on the local network.

You can use Group Policy or an MDM solution such as Intune to configure Delivery Optimization.

You will find the Delivery Optimization settings in Group Policy under `Computer Configuration\Administrative Templates\Windows Components\Delivery Optimization`.

Controlling Windows Update Delivery Optimization in Windows 10

To stop downloading updates and apps from or sending updates and apps to other Windows 10 devices on the Internet, follow these steps:

1. Select Start, then select Settings ➢ Update & Security ➢ Windows Update ➢ Advanced Options.
2. Select Delivery Optimization (or choose how updates are delivered in earlier versions of Windows 10).
3. Select PCs On My Local Network.

To stop downloading from or uploading to other computers on the local network:

1. Select Start, then select Settings ➢ Update & Security ➢ Windows Update ➢ Advanced Options.
2. Select Delivery Optimization.
3. Make sure that the Allow Downloads From Other PCs option is turned Off. You will now only obtain updates and apps directly from Windows Update and from Microsoft Store.

Controlling Windows Update Delivery Optimization in Windows 11

To stop downloading updates and apps from or sending updates and apps to other Windows 11 devices on the Internet, follow these steps:

1. Select Start, then select Settings ➢ Windows Update ➢ Advanced Options.
2. Select Delivery Optimization. Under Allow Downloads From Other PCs, select Devices On My Local Network.

To stop downloading from or uploading to other computers on the local network:

1. Select Start, then select Settings ➢ Windows Update ➢ Advanced Options.
2. Select Delivery Optimization.
3. Make sure Allow Downloads From Other PCs is turned Off. You will now only obtain updates and apps directly from Windows Update and from Microsoft Store.

Using Command-Line Options

Command-line options are becoming more and more popular among administrators and users. Windows Update has a few command-line options that can be used to help configure and maintain it. First, to start Windows Update from a command prompt, you can type **`wuapp.exe`**. Another command-line option that works with Windows Update is called Windows Update Automatic Update Client (`wuauclt.exe`), which offers the following options:

`detectnow` When working with WSUS, waiting for detection to start can become very time-consuming. So, Microsoft has added an option to allow you to initiate the process of detecting available updates right away. To run the `detectnow` option, type the following command at the command prompt: **`wuauclt.exe /detectnow`**.

`reportnow` This command allows you to send all queued reporting events to the server asynchronously. To execute this command, type **`wuauclt.exe /reportnow`** at the command prompt.

`resetauthorization` WSUS uses a cookie on Windows 10/11 client computers to store different types of information. By default, an hour after the cookie is created, it expires. If you need the cookie to expire now, you can use the `resetauthorization` option along with the `detectnow` option. Using these options will expire the cookie, initiate detection, and have WSUS update computer group membership. To execute this command, type **`wuauclt.exe /resetauthorization /detectnow`** at the command prompt.

Installing Microsoft Store Updates

Besides getting updates for the Windows 10/11 operating system and the different Microsoft products, you may also need to get updates for any of the applications, games, music, videos, and software that you downloaded from the Microsoft Store. To receive Microsoft Store updates, you need to go to the Microsoft Store (see Figure 1.30). To get updates, perform the following steps:

1. Select Start ➢ Microsoft Store.
2. After you've opened the Microsoft Store app, select Library ➢ Get Updates (as shown in Figure 1.31).
3. If there are updates, select Update All or choose which apps you want to update. This will allow you to download and install any Microsoft Store updates.

FIGURE 1.30 Microsoft Store

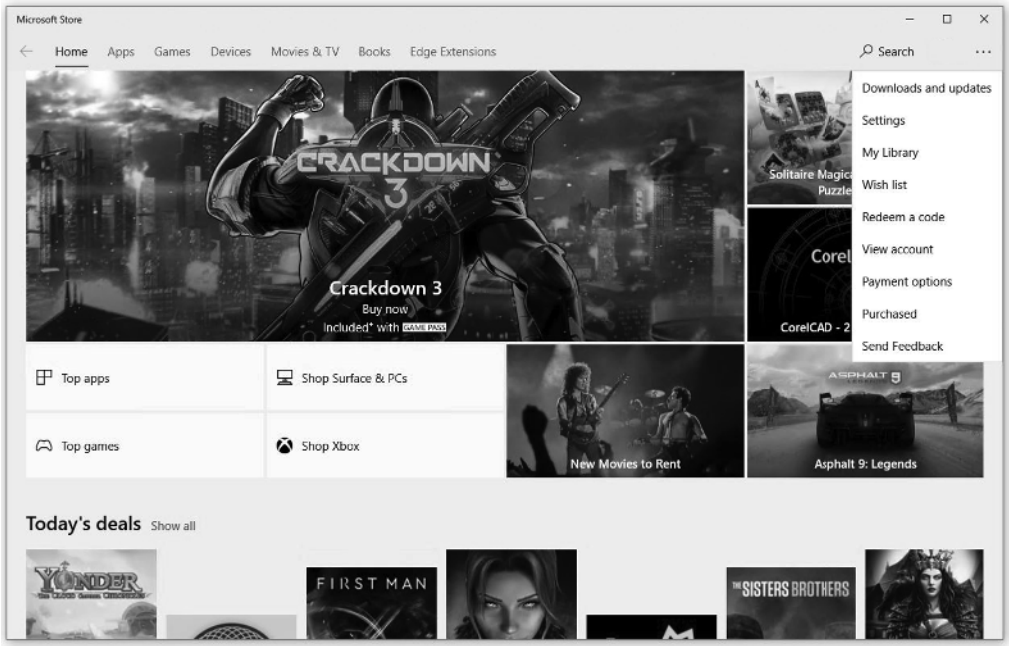
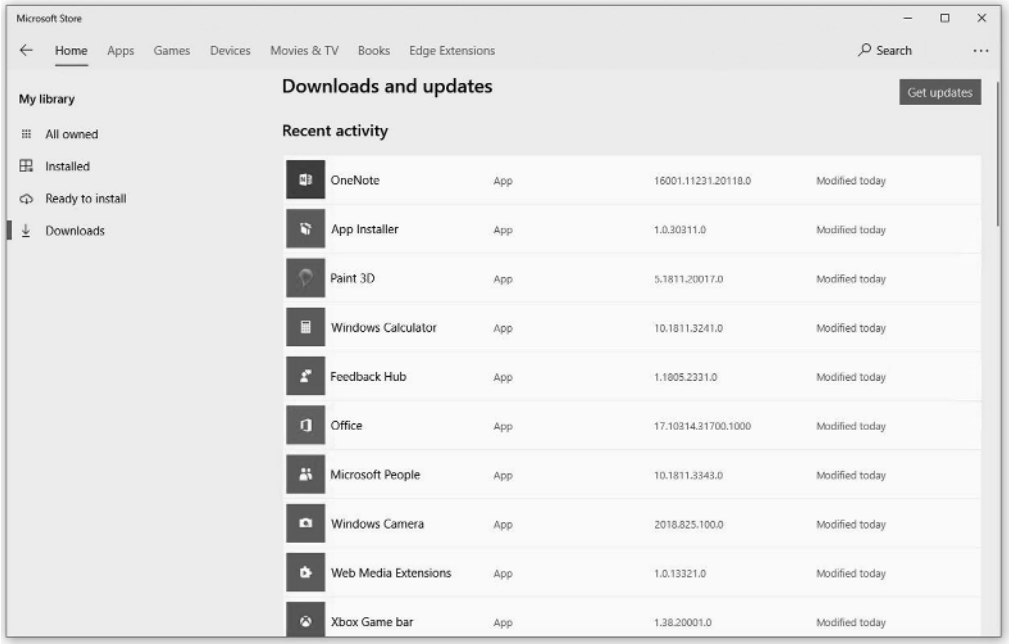


FIGURE 1.31 Get Updates button



Summary

This chapter started with a discussion of the features included with Windows 10/11. We also took a look at the difference between 64-bit and 32-bit operating systems and explored some of the advantages that 64-bit entails, such as greater RAM and processor speed.

Then you learned about installing Windows 10 and Windows 11. Installation is an easy process, but you must first make sure the machine is compatible with the Windows operating system.

There are two main ways to install Windows 10/11. You can either upgrade or perform a clean installation. You can upgrade a Windows 7 or Windows 8/8.1 machine to Windows 10. You can't upgrade Windows XP to Windows 10.

We discussed automated installation of Windows 10/11. Installing Windows 10/11 through an automated process is an effective way to install the Windows operating system on multiple computers.

There are several methods for automated installation: unattended installations, Windows Deployment Services (WDS), Windows Assessment and Deployment Kit (ADK), third-party applications, unattended installations, and using the System Preparation Tool along with the Image Capture Wizard.

Windows Deployment Services (WDS) is a suite of components that allows you to remotely install Windows 10/11 on client computers.

The Windows ADK is a set of utilities and documentation that allows you to configure and deploy Windows operating systems.

You can use unattended answer files to automatically respond to the queries that are generated during the normal installation process.

You can also prepare an installation for imaging by using the System Preparation Tool (`Sysprep.exe`) and creating a disk image by using the Image Capture Wizard utility or a third-party utility.

Microsoft Deployment Toolkit (MDT) is a way of automating desktop and server deployment. With the MDT, you can deploy desktops and servers through the use of a common console, which allows for quicker deployments; having standardized desktop and server images and security; and zero-touch deployments of Windows 11, Windows 10, Windows 8, Windows 7, and Windows Server.

After the Windows 10/11 installation is complete, you'll want to make sure all updates and service packs are installed. You can use Windows Update to complete that task. Finally, I explained how to set up and configure cloud-based updates by using Windows Update for Business. I talked about how you can use the Update Compliance utility to get reporting data on how updates are being delivered to your Windows 10/11 devices.

Exam Essentials

Understand the Windows 10 and Windows 11 hardware requirements. The minimum hardware requirements to run Windows 10 properly are a 1 GHz or faster processor or SoC, 1 GB of RAM for 32-bit or 2 GB for 64-bit of RAM, 32 GB or larger hard drive space, DirectX 9 or later with a WDDM 1.0 video driver, and an Internet connection in order to perform updates and to download and take advantage of some features. The minimum hardware requirements to run Windows 11 properly are 1 GHz or faster with two or more cores on a compatible 64-bit processor or SoC, 4 GB of RAM, 64 GB or larger storage device, DirectX 12 or later with a WDDM 2.0 driver, and for all Windows 11 editions, Internet access is required to perform updates and to download and take advantage of some features.

Understand how to complete a clean installation. If your machine meets the minimum hardware requirements, you can install Windows 10/11. There are a few different ways to install Windows clients onto a computer. You can use the installation disk or USB, install it over a network, or install it from an image.

Understand how to complete an upgrade. You can't upgrade a Windows Vista machine to Windows 10. To complete an upgrade on a Windows 7 or Windows 8/8.1 machine, insert the Windows 10 DVD into the Windows machine or connect to the Windows 10 files over the network and complete an upgrade on the computer.

You can't upgrade a Windows XP machine directly to Windows 10. If the machine is running Windows XP, you have to use a migration tool to migrate all the user data from Windows XP to a Windows 10 machine.

If you are looking to upgrade to Windows 11, then your device must be running Windows 10, version 2004 or later.

Know the difference between the various unattended installation methods. Understand the various options available for unattended installations of Windows 10/11 and when it is appropriate to use each installation method.

Understand the features and uses of WDS. Know when it is appropriate to use WDS to manage unattended installations. Be able to list the requirements for setting up WDS servers and WDS clients. Be able to complete an unattended installation using WDS.

Be able to use disk images for unattended installations. Know how to perform unattended installations of Windows 10/11 using the System Preparation Tool and disk images.

Understand the Microsoft Deployment Toolkit (MDT). Know that the MDT is a way of automating desktop and server deployment. Understand that the MDT allows an administrator to deploy desktops and servers through the use of a common console.

Understand how to receive updates. You need to understand how to set up and receive Microsoft updates for Windows 10/11, Microsoft products, and the Microsoft Store. Make sure you know the different settings for configuring update advanced options.

Understand Windows Update for Business. You need to understand how to set up and receive Microsoft updates for Windows 10/11 using Windows Update for Business in Azure. Make sure you know the different settings for configuring Windows Update for Business options.

Video Resources

There are videos available for the following exercises:

1.1

1.2

1.7

You can access the videos at `www.wiley.com/go/sybextestprep`.

Review Questions

1. You are the administrator in charge of a computer that runs both Windows 7 and Windows 10. Windows 10 is installed on a different partition from Windows 7. You have to make sure that the computer always starts Windows 7 by default. What action should you perform?
   - **A.** Run `Bcdedit.exe` and the `/default` parameter.
   - **B.** Run `Bcdedit.exe` and the `/bootcd` parameter.
   - **C.** Create a `Boot.ini` file in the root of the Windows 10 partition.
   - **D.** Create a `Boot.ini` file in the root of the Windows 7 partition.

2. You are the administrator for a Windows 10 computer. You have decided to use Windows Update, but you want to be able to change the settings manually. What should you do?
   - **A.** Log onto Windows 10 as a member of the Administrators group.
   - **B.** From the local Group Policy, modify the Windows Update settings.
   - **C.** Right-click Windows Update and select Run As Administrator.
   - **D.** Right-click the command prompt, select Run As Administrator, and then run `Wuapp.exe`.

3. You want to initiate a new installation of Windows 10 from the command line. You plan to accomplish this by using the `Setup.exe` command-line setup utility. You want to use an answer file with this command. Which command-line option should you use?
   - **A.** `/unattend`
   - **B.** `/apply`
   - **C.** `/noreboot`
   - **D.** `/generalize`

4. You are the network administrator for your organization. You have a reference computer that runs Windows 10. You need to create and deploy an image of the Windows 10 computer. You create an answer file named `answer.xml`. You have to make sure that the installation applies the answer file after you deploy the image. Which command should you run before you capture the image?
   - **A.** `DISM.exe /append answer.xml /check`
   - **B.** `DISM.exe /mount answer.xml /verify`
   - **C.** `Sysprep.exe /reboot /audit /unattend:answer.xml`
   - **D.** `Sysprep.exe /generalize /oobe /unattend:answer.xml`

5. You have a Windows 10 Windows Image (WIM) that is mounted. You need to view the list of third-party drivers installed on the WIM. What should you do?
   - **A.** Run DISM and specify the `/get-drivers` parameter.
   - **B.** Run `Driverquery.exe` and use the `/si` parameter.
   - **C.** From Device Manager, view all hidden drivers.
   - **D.** From Windows Explorer, open the `mount` folder.

6. You are planning on deploying 1,000 new Windows 10 computers throughout your company. Each new computer has the same configuration. You want to create a reference image that will then be applied to the remaining images. Which of the following utilities should you use?
   A. WDSUTIL
   B. `Setup.exe`
   C. Windows SIM
   D. `DISM.exe`

7. You are the network administrator for a large organization. You are in charge of developing a plan to install 200 Windows 10 computers in your company's data center. You decide to use WDS. You are using a Windows Server 2012 R2 domain and have verified that your network meets the requirements for using WDS. What command-line utility should you use to configure the WDS server?
   A. DISM
   B. WDSUTIL
   C. `Setup.exe`
   D. The WDS icon in Control Panel

8. Will is the network manager for a large company. He has been tasked with creating a deployment plan to automate installations for 100 computers that need to have Windows 10 installed. Will wants to use WDS for the installations. To fully automate the installations, he needs to create an answer file. Will does not want to create the answer files with a text editor. What other program can he use to create unattended answer files via a GUI interface?
   A. DISM
   B. Answer Manager
   C. Windows System Image Manager
   D. System Preparation Tool

9. You are using WDS to install 20 Windows 10 computers. When the clients attempt to use WDS, they are not able to complete the unattended installation. You suspect that the WDS server has not been configured to respond to client requests. Which one of the following utilities would you use to configure the WDS server to respond to client requests?
   A. Active Directory Users and Computers
   B. Active Directory Users and Groups
   C. WDS MMC Snap-in
   D. WDSMAN

10. You want to install a group of 25 computers using disk images created in conjunction with the System Preparation Tool. Your plan is to create an image from a reference computer and then copy the image to all the machines. You do not want to create an SID on the destination computer when you use the image. Which `Sysprep.exe` command-line option should you use to set this up?

A. `/specialize`

B. `/generalize`

C. `/oobe`

D. `/quiet`

11. You are the network administrator for a large communications company. You have 25 computers that currently run Windows 7. These computers have the following configurations:

- A single MBR disk
- A disabled TPM chip
- Disabled hardware virtualization
- UEFI firmware running in BIOS mode
- Enabled Data Execution Prevention (DEP)

You plan to upgrade the computers to Windows 10. You need to ensure that the computers can use Secure Boot. Which two actions should you perform? (Choose two.)

A. Convert the MBR disk to a GPT disk.

B. Enable the TPM chip.

C. Disable DEP.

D. Enable hardware virtualization.

E. Convert the firmware from BIOS to UEFI.

12. You are the administrator for your company network. You have a large number of computers running Windows 10 in a workgroup. These computers have low-bandwidth metered Internet connections. What should you configure if you need to reduce the amount of Internet bandwidth that is being consumed when updates are being downloaded?

A. Use Background Intelligent Transfer Service (BITS).

B. Use Delivery Optimization.

C. Use distributed cache mode in BranchCache.

D. Use hosted mode in BranchCache.

13. You are the network administrator for a large company. You have two computers that run Windows 7. Computer 1 has a 32-bit CPU that runs Windows 7 Enterprise. Computer 2 has a 64-bit CPU that runs Windows 7 Enterprise. You plan to perform an in-place upgrade to the 64-bit version of Windows 10. Which computers can you upgrade to the 64-bit version of Windows 10?

A. Computer 1 only

B. Computer 2 only

C. Computer 1 and Computer 2

D. Neither

14. You have recently just installed Windows client on a user's device and you want to review the action log that was generated during the installation process. What is the name of this log file, and where is it stored?
    A. `C:\Windows\setupact.log`
    B. `C:\Windows\setuperr.log`
    C. `C:\Windows\error.log`
    D. `C:\Windows\setuperror.log`

15. You and a colleague are discussing Windows Update and where you would need to go to configure it. To configure Windows Updates where should you go?
    A. Personalization
    B. Restore Hidden Updates
    C. Settings
    D. View Update History

16. You are the administrator for your company network. You have a Windows 10 computer with a microphone attached. You want a hands-free way to ask your system a question. You want to use Microsoft's digital assistant. What is the name of this application?
    A. Alexa
    B. Cortana
    C. Google Assistant
    D. Siri

17. You have two computers on your Windows domain named Computer1 and Computer2. You are currently sitting at Computer1, and you want to see what devices and drivers are installed. What should you run?
    A. `Driverquery.exe`
    B. `Get-OdbcDriver`
    C. `Get-PnpDevice`
    D. `Get-WindowsDriver`

18. If you decide to perform a clean installation of Windows client to the same partition as an existing Windows installation, the contents of the original Windows directory will be placed in which directory?
    A. `C:\Windows`
    B. `C:\Windows.old`
    C. `C:\Windows\old`
    D. `C:\WindowsOS`

19. You and a colleague are discussing Microsoft updates and how/when they become available to the public. Updates are usually released on a particular day of the week. What is the nickname of this day called?

A. Maintenance Mondays

B. Patch Tuesdays

C. Update Wednesdays

D. Fixed Fridays

20. You have a Windows client computer that you use to test new Windows features. You want this computer to receive preview builds as soon as they become available. What should you configure in the Settings ➢ Update & Security section to set this up?

A. Delivery Optimization

B. For Developers

C. Windows Insider Program

D. Windows Update