Lesson 1: Introduction to the Operating System

Lesson Objectives

In this lesson, you will learn about the importance of selecting a suitable operating system for your home or organization and about the wide variety of Windows 7 editions and installation options available. You will also learn how virtualization can allow an organization to upgrade to Windows 7 and still support legacy applications. By the completion of this lesson, you will be able to:

- Explain the difference between 32-bit and 64-bit operating systems.
- Describe the Windows 7 operating system editions, including features, availability and minimum requirements.
- □ Identify upgrade paths from various versions of Windows to Windows 7.
- □ Explain the function and characteristics of Windows Anytime Upgrade.
- Understand hardware and software compatibility issues and explain why upgraving to Windows 7 requires planning.
- □ Use the PC Upgrade Advisor.
- Use the Windows 7 Compatibility Center to check for software a
- Explain the difference between an in-place upgrade and a clean i
- Explain different types of installation strategies, including High Touch installation, High Touch with Standard Image, Lite Touch Installation and Zero Touch installation.
- Understand media-based and network-based insta
- Explain cloud-based software deployment
- Explain the purpose and advantages of virtualization.
- Explain the function and characteristics of Windows XP Mode.
- Explain the function and characteristics of MED-V.

A Matter of Perspective

Regardless of the number of hours you may have logged as a computer user, you should approach this course with the eyes of an emerging technology professional. At the most basic level, an IT professional is expected to know how to set up (configure), update and maintain computer systems.

The specific job setting in which you may find yourself will often determine the method and approach you use. For example, manually configuring and updating one or two systems in a residential office is an easy task. Configuring and updating over a thousand machines across an enterprise network is a different story, and requires automated or semiautomated techniques, many of which may need to be deployed from a remote location.

o adequately prepare for the Microsoft Technology Associate Windows Operating System Fundamentals exam (98-349), ou should:

Understand the essential tasks required to configure, update and maintain the Windows 7 operating system.

- Understand the different challenges inherent in small residential networks, small-to-medium sized business networks, and enterprise-level networks.
- Be aware of the wide variety of tools and techniques that allow administrators in various job settings to perform essential tasks efficiently.

re compatibility issues.

Introduction to the Operating System

Lesson

Exam Objectives

- 2.1 Identify Windows operating system editions
- 2.2 Identify upgrade paths
- 2.3 Understand installation types
- 2.4 Understand virtualized clients
- 3.5 Understand application virtualization



This course will present the essential tasks of operating system configuration and maintenance and provide hands-on experience in a localized setting. Enterprise-level and remote location deployments are beyond the scope of this course. However, you will also be introduced to various Web sites where you can find detailed information and explicit instructions on how to perform enterprise-level deployments.

Reviewing the Basics

In this course, you will learn to install, configure and manage the Windows 7 operating system. Before delving into operating system specifics, it is important to review a few preliminary concepts pertaining to the function and operation of computer systems.

You should already be familiar with these concepts. If you require further information, see "Computer Basics" on the microsite.

Hardware, Drivers, OS and Apps

Knowing where to locate information/instructions for performing specific tasks is one of the best tools an IT protessional can prosess

A computer is a system that consists of various hardware components, various device drivers, an operating system, and any installed application software. Each of these "pieces" must interact with the others to provide a system that is functional and productive.

Hardware will be discussed momentarily. An *operating system* is a software drogram that controls all hardware and application software on the computer. *Device drivers* are small programs that enable the operating systems to communicate with the installed devices. *Application software* is used to perform certain functions such as word processing or database functions. Applications, also called programs, are installed on a computer system and must interact with the operating system in order to function.

Hardware Essentials

Most modern computer systems are comprised of a system board and chip set, a central processing unit (CPU), one or more hard drives, an optical drive and system memory (RAM).

Central Processing Unit (CPU)

The CPU is a silicon chip that processes instructions, manipulates data and controls the interactions of other circuits and components within the computer. Often, the term processor is used to refer to the CPU. A processor includes one or more cores. The core processes instructions and data. A dual-core process has two cores; a quad-core processor has four cores. Multi-core processors are common today. All the cores in a multi-core processor are combined onto a single silicon chip.

Processor speed is measured in units called hertz (Hz). The hertz (Hz) is the unit of frequency or cycles per second and is usually represented with the prefixes shown in the following table.

Do not confuse multi-core processors with systems that contain multiple processors (CPUs). Commercial servers, and high-end workstations and PCs may contain more than one physical CPU.

Name	Abbreviation	Multiplies by	Equal to
Hertz	Hz		1 cycle per second
Kilohertz	KHz	One thousand	1,000 cycles per second
Megahertz	MHz	One million	1,000,000 cycles per second
Gigahertz	GHz	One billion	1,000,000,000 cycles per second
Terahertz	THz	One trillion	1,000,000,000,000 cycles per second

A computer with a processor speed (or clock rate) of 500 MHz is running at 500,000,000 cycles per second. A computer with a clock rate of 2.8 GHz is running at 2,800,000,000 cycles per second. CPUs need 1 to 4 cycles to execute each instruction in a program, depending on the complexity of that instruction. Therefore, the general rule of thumb is that computers with higher processor speeds will execute more instructions in the same time period than those with slower speeds. This is a very simplistic view of how computer processing power is measured – computer manufacturers and technology enthusiasts often have lively debates over the complex aspects of this topic, which is beyond the scope of this course.

Operating systems and applications require a minimum processor speed to run successfully.



32-bit and 64-bit Processors

The basic structural design of a processor is called its architecture. A chip's architecture determines how much memory it can address and control, thereby also determining its performance speed. Processor architecture has evolved over time, offering increasing power and speed with each newer iteration. In the 1980s, most desktop systems used 16-bit processors. (Some of the most common 16-bit processors were the Intel 8086 and 80286 chips.)

By the mid-80s and early 90s, however, the 32-bit processor was common. Because the instruction set for a 32-bit processor is based on an expansion of the original 8086 chip instruction set, the term *x86* is commonly used to refer to the 32-bit class of processors. The 32-bit processor can address up to 4 GB of system memory (although applications are generally limited to 3.0 or 3.5 GB with the rest reserved for use by the operating system), and has found its way into servers, desktop systems and laptops all over the world.

Today, 64-bit processors are widely available. The term *x64* is used to refer to the 64-bit class of processors. A 64-bit processor can theoretically support up to 256 TB of physical system memory. However, system boards limit the amount of physical memory that can be installed, and operating systems often impose limits on how much physical memory can be addressed.

Device drivers, operating systems and application software are whitten to conform to specific objects architectures — that is, they are designed to take advantage of the addressable memory made available.

System Memory

Memory, specifically system random access memory (RAM) is the main memory of a computer. It stores data and programs currently in use. RAM can store large amounts of information, but exists only when power to the computer is turned on. Once you power off the machine, you lose any information stored in RAM.

Physically, memory consists of chips mounted on small circuit boards that plug into memory banks on the system board. The more RAM a system contains, the faster its programs run. Considerable amounts of RAM are required for graphics, media playback and online gaming.

Having sufficient RAM in a system is essential for good performance. In many cases, sluggish performance is the result of too little RAM rather than inadequate processing power. Ope aling systems and applications require a minimum amount of RAM to run as designed. If your system has less than the recommended minimum requirement, the program may not run, or may perform poorly.

RAM capacity is typically measured in megabytes (MB) and gigabytes (GB). The following table lists standard capacity measurements:

Measurement	Abbreviation	Équal to (approximately)	About the same as
bit		A single binary digit	
byte		Eight bits	One character
kilobyte	КВ	1,024 bytes (a "thousand" bytes)	Half a typewritten page
megabyte	МВ	1,024 KB (a "million" bytes)	One 500-page novel
gigabyte	GB	1,024 MB (a "billion" bytes)	One thousand 500-page novels
terabyte	ТВ	1,024 GB (a "trillion" bytes)	One million 500-page novels

Hard Drives and Optical Drives

Hard drives and optical media provide permanent storage space (that is, storage that persists whether the computer is in or off). Most computers contain at least one hard drive (some contain more than one physical hard drive). An operating system is installed on (that is, written to) the hard drive. When planning to install an operating system, it is important to ensure that there is sufficient hard drive space.

Optical drives read data from Compact Disc (CD), Digital Video Disc (DVD) or Blue-Ray (BD) media. Unlike hard drives, these discs can be removed from the optical drive and stored elsewhere. As a result, they are often used as backup media where valuable data can be stored in a safe location in case of a disaster. Operating systems are generally installed from CD or DVD, although they can be installed from other media, as you will learn later in this lesson.

Storage capacity for hard drives is measured in MB, GB or TB. Storage capacity for optical media is generally measured in MB and GB.



Operating System Essentials

An operating system stores files, enables you to use software programs and (in tandem with device drivers) coordinates the use of computer hardware, such as the keyboard, mouse and printer. It also controls the computer's interaction and communication with the user.

Modern operating systems provide a graphical user interface (GUI), which enables a user to use a pointing device to point to objects, select options and functions, execute commands and launch application programs. (You will explore the GUI in the next lesson.) Application vendors design their programs to work within the environment provided by the operating system.

APIs and Graphics Drivers

One of the ways in which application software interacts with Windows is through application programming interfaces, or APIs. An API is a complete set of all operating system functions that an application can use to perform tasks such as managing files and displaying information. The API also defines functions to support windows, icons, drop-down menus and other components of the GUI.

The graphics card in a computer system handles the graphics processing – it draws the screens and windows with which users interact. A graphics card is a circuit board that includes its own on-board memory, called graphics RAM or video RAM. Additionally, graphics cards support particular APIs and use specific device drivers.

Microsoft DirectX is a collection of APIs for handling multimedia tasks, especially game programming and video. Windows Display Driver Model (WDDM) is a device driver for graphics cards on systems running Windows Vista or higher.

Windows 7 requires a graphics card that supports DirectX 9, and uses a WDDM driver. As you will learn shortly, you can use the Windows 7 Upgrade Advisor to scan your system and determine if your video card is compatible. You can also use the Windows 7 Compatibility Center to find compatible hardware from various manufacturers.

User Accounts

A Windows user account is a collection of information that controls what files and folders a particular user can access, and what changes that user can make to the system. Several users can share one physical computer through distinct user accounts. Each account is accessed through a user name and (optional) password.

The Windows 7 operating system provides three types of user accounts. These are:

Standard A standard user account is sufficient for normal computing. A standard user can generally run application programs, print, and use the Internet. However, a standard user cannot install or uninstall software, or make changes that affect other user accounts on the system.

Administrator Administrator account is a user account that allows the user to make changes to the system that will affect other users. Administrators can change security settings, install and uninstall software and hardware, and access all files on the system. When Windows 7 is installed on a system, it automatically creates an administrator account to enable the installation and configuration of programs. The administrator account can then be used to create other user accounts.

Guest

A guest account is also automatically created when Windows 7 is first installed, but it is turned off by default. The guest account is provided for users who do not have a permanent account on the computer, but allows them to use the computer without providing access to the personal files of trandard or administrator accounts on the system. Guest accounts provide access to a printer or to the Internet, for example.

lients and Servers

majority of computer users log onto systems that are part of a network. A *network* is simply a group of two or more omputers connected in such a way that they can communicate, share resources and exchange data with one another.

The terms client and server become important when discussing networking. A *client* is a system that requests a service or information from another computer on the network. Any PC connected to a network is considered a client – it requests Internet access or print services from another computer on the network. Client systems run a client operating system, and are intended to be used directly by users. When a user is finished for the day, he or she is free to turn off the system without affecting anyone else. Windows XP, Vista and Windows 7 are all examples of client operating systems.



A *server* is a computer in the network that manages network resources and/or provides information and services to clients on the network. For example, servers are used to run security software that determine who can access the network, and run routing software that directs which programs and services a particular client system can use. Servers run a specialized server operating system, and are generally more powerful than client systems. For this reason, server operating systems support the use of multiple processors and some support server clustering (which is the process of combining the computing power of several servers in order to achieve super-computing speeds). Servers are expected to remain up and running at all times; in fact, server operating systems require that you enter a reason for powering the system off. Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 are examples of server operating systems.

Windows 7 and Windows Server 2008 R2 are client and server operating systems based on the same code. These two operating systems are used together in corporate networks.

Peer-to-peer Networks

Most home and small office networks consist entirely of client systems. These types of network are called peer-to-peer networks. A *peer-to-peer network* is one in which all the participating computers are more or less equal, and there is no central server or centralized management of network resources. Each computer connected to a peer-to-peer network is called a host, and hosts act as both clients and servers. When a host is sharing a resource (such as a file, a printer), it is acting as a server. When a host requests a service or information from another host, it is acting as a client. The following figure illustrates a peer-to-peer network:



Any computer on a peer-to-peer network can communicate with any other computer on the network. A Windows 7 HomeGroup (or in previous versions of the Windows operating system, a Microsoft Windows Workgroup) is an example of a peer-to-peer network.

Server-based Networks

In most business settings, networks are server-based. A server-based network is one in which one or more servers centrally manage the network and control access to its resources. Individual computers and networking devices on a server-based network are referred to as nodes. Nodes interact with one another through one or more servers to which they are all connected. A server-based network is shown in the following figure:



Domains, Workgroups and HomeGroups

Domains, workgroups and HomeGroups represent different methods for organizing and managing computers and other resources on a network.

Computers running Windows on a network must be part of either a workgroup or a domain. Computers running Windows on home networks can also be part of a HomeGroup, but that is not required.



Workgroups

A workgroup is a named group of computers on a peer-to-peer network. The default workgroup name in Windows 7 is: WORKGROUP. Additionally,

- All the computers in a workgroup are peers.
- Each computer in the workgroup has its own set of user accounts. In order to access a particular computer in the workgroup, you must have an account on that computer.
- All computers in the workgroup must be on the same local network.
- A workgroup is not protected by a password.

Theoretically, workgroups support up to 20 computers. However, in practical application, 10 systems is about that can be well-supported.

HomeGroups

Computers on a home network must belong to a workgroup, but they can also belong to a HomeGroup. Computers in a HomeGroup:

- Must explicitly join the HomeGroup by supplying the HomeGroup name and password.
- Can easily share pictures, music, video, documents and printers with other computers in the HomeGroup without requiring an account on each computer in the HomeGroup.

Home Groups are not supported in Windows Server 2008 R2.

You will learn more about HomeGroups later in the course.

Domains

Most corporate networks today are domain-based or directory-based networks. A domain is a logical collection of network resources. The domain is centrally managed by a server of

logical collection of network resources. The domain is centrally managed by a server designated as the domain controller. In a domain, there is one master list of users and there corresponding privileges. Domain services were first introduced in Windows NT networks.

Large-scale network management today is usually handled through directory-based networking or directory services. In a directory-based network, all network resources (servers, workstations, printers, users, files, etc.) are treated as objects. Network objects are stored in a hierarchical directory. This directory is copied to directory servers throughout the network.

In Windows networks, directory services are implemented through Active Directory. A (directory) server running Active Directory is called a domain controller.

Active Directory was first released with Windows 2000 server, and has been revised and improved through successive server operating systems. In Windows Server 2008 R2, the domain controller role was renamed Active Directory Domain Services.

The following are important points to remember about domains:

- One or more computers are servers. The servers manage and control the domain and all its resources.
- Domain users must specifically log on to the domain by supplying a user name and password.
- A domain user canlog on to a domain from any computer connected to the network, regardless of whether the user has a user account on that specific machine.
- The users in a domain can be on different local networks.
 - omains can support thousands of computers.

ensing and Activation

When you purchase operating system software, you are purchasing a license, or the right to use the software on a computer. Windows 7 can be purchased for use on one or more systems, depending on the terms of the license agreement.

Additionally, after you install Windows 7 you must activate the product before you can use it. Product activation is a license validation procedure that requires you to enter a valid product key. The Windows product key is typically located on an orange or yellow sticker on the back of a CD case or DVD case. The product key is a string of 25 characters, divided into groups of 5 characters each.



There are three basic types of licensing options for Windows 7:

Retail	You purchase the software from a retailer and bring it home in a box that includes a manual, holographic discs and a license. A retail product can be activated as many times as necessary as long as it is not installed on more computers than the license allows at the same time. The first activation can typically be performed online, while subsequent activations require that you use the telephone activation service, as you must confirm that you are not activating the product on a second PC without having removed it from the first one.
Original Equipment Manufacturer (OEM)	The software comes preinstalled on a new PC. OEM licenses are meant to be used only on the PC with which they were originally supplied, and can be activated only on that original PC
Volume Licensing	Available to organizations that require five or more licenses. One product key is used for all the installations and the software is usually supplied as a download or on Volume Licensing-branded discs. Activation for volume licenses can be performed through the use of either a Key Management Service (KMS) or a Multiple Activation Key (MAK). A KMS runs on a server (called the KMS host) in an organization's local network. Individual systems connect to the KMS host for activation instead of using Microsoft's hosted activation service. A MAK includes a predetermined number of allowed activations per the terms of the volume licensing agreement. Each time a system activates with Microsoft's hosted activation service, the number of remaining allowed activations is decremented.

Windows Operating System Versions and Editions



There are several versions and editions of the Windows operating system in current use around the world. As an IT professional, you should be aware of the versions and editions available and understand how to make a sound choice when selecting an operating system for your organization.

An operating system *version* refers to the specific code base that was used to develop the operating systems. Currently, the most common versions of Windows client operating systems running on systems around the world are: Windows XP, Windows Vista, and Windows 7.

Each version of Windows comes in different editions. The operating system *edition* determines which features are available. Generally, the lower the edition, the fewer the features. That is, a basic edition has fewer features than a premium edition or a professional edition.

Additionally, each version and edition of Windows (with the exception of Windows 7 Starter) comes in a 32-bit and a 64bit version.

The available Windows 7 editions are described in the following table. Of the six editions, only Home Premium, Professional and Unimate are widely available for retail purchase.



Windows 7 Home Basic

Starter only comes preinstalled on new systems with low-end processors – such as netbooks, which are designed primarily for accessing the Internet. Starter is not available for retail sale; that is, you cannot purchase a copy of Windows 7 Starter. The Windows Aero theme is not included, and the Desktop wallpaper and visual styles are not user-changeable. Starter supports a maximum of one physical CPU (although each CPU can have multiple cores), comes in a 32-bit version only, and can address up to 2 GB of RAM. Starter is designed to perform basic computing tasks, such as accessing the Internet, sending e-mail and creating documents. Most of the advanced Windows 7 features are not supported.

Basic The Home Basic edition is available in emerging markets (e.g., China or India) only, where it can be purchased preinstalled or through a retail supplier. Home Basic supports a maximum of one physical single or multi-core CPU. The 32-bit version can address up to 4 GB of RAM. The 64-bit version can address up to 8 GB of RAM. Home Basic includes only partial support for the Aero interface.

Introduct Operati Lesson 1	tion to the ng System
Windows 7 Home Premium	Home Premium is the lowest edition available for purchase in retail stores in existing markets. (It is also available as an OEM license.) Home Premium supports a maximum of one physical single or multi-core CPU. The 32-bit version can address up to 4 GB of RAM. The 64-bit version can address up to 16 GB of RAM. The full Aero interface is supported in Home Premium.
Windows 7 Professional	Professional includes all the features of Home Premium and is the lowest edition that provides the ability to join a domain and the ability to operate as a remote desktop server. It is also the lowest edition that supports two physical single or multi-core CPUs, supports backing up to a network location, and supports Windows XP mode. (You will learn about XP mode later in this lesson.) Professional can be purchased OEM, retail or with volume licensing. The 32-bit version can address up to 4 GB of RAM. The 64-bit version can address up to 192 GB of RAM.
Windows 7 Ultimate	Ultimate edition is available to anyone as an OEM or retail license. Ultimate includes all the features of Professional and adds enhanced features such as BitLocker and AppLocker (you will learn about these features later in the course) and support for Multilingual User Interface (MUI) packages, UNIX applications and booting from a virtual hard disk. Ultimate supports a maximum of two physical single or multi-core CPUs. The 32-bit version can address up to 4 GB of RAM. The 64-bit version can address up to 192 GB of RAM.
Windows 7 Enterprise	Enterprise edition is available only to volume licensing customers. It is essentially the same as Windows 7 Ultimate, except that it is not available as an DEM or retail license.

Sub-editions

Sub-editions are editions of the operating system designed for sale in specific markets. The release of sub-editions was a response to legal pressures in certain countries regarding user freedom of choice in selecting and installing media player, instant messaging and Internet browser software. There is no difference in cost between a "regular" edition and a sub-edition. For Windows 7, the following sub-editions are available:

- Windows 7 N (Starter, Home Premium, Professional, Ukimate and Enterprise) designed for the European market. This sub-edition includes the same functionality as Windows 7 but does not include Windows Media Player 12 and related programs, such as Windows Media Center or Windows DVD Maker. Users must install their own media player and software to manage and play CDs, DVDs and other digital media. If the user wishes to install Windows Media Player 12 and its related technologies, the software is available as a free download.
- Windows 7 E also designed for the European market, including the UK. This sub-edition includes the same functionality as Windows 7 but does not include Internet Explorer 8 (IE8).
- Windows 7 K designed for the Korean market. This sub-edition includes the same functionality as Windows 7 and includes links to a Media Player Center Web site and a Messenger Center Web site which allow users to download third party media players or instant messaging software.
- Windows 7 KN also designed for the Korean market. This sub-edition includes the same functionality as Windows 7 K but does not include Windows Media Player and its related technologies, does not include links to download Windows Live Messenger or links to any third party Media Player or Messenger Center Web sites.

Comparing Edition Features

While having a broad idea of what each edition offers is a good starting point, it is important for an IT professional to compare the features offered in each edition in order to make an informed recommendation/choice for selecting an operating system for the organization. The following table compares the editions based on several features employed in various sized businesses.



Feature	Home Premium	Professional	Ultimate/Enterprise
Join a HomeGroup	Yes	Yes	Yes
Join a Domain	No	Yes	Yes
Support for XP Mode	No	Yes	Yes
Remote Desktop server	No	Yes	Yes
Network Backup	No	Yes	Yes
Group Policy Controls	No	Yes	Yes
Encrypting File System	No	Yes	Yes
AppLocker	No	No	Yes
BitLocker	No	No	Yes
BranchCache	No	No	Yes
DirectAccess	No	No	Yes

The features listed in the table are briefly described below. You will learn about these features in more detail throughout the course.

XP Mode	Provides compatibility for older programs by running those applications in Windows XP through the use of virtualization software.		
Remote Desktop server	Allows other computers to connect to this computer using the Remote Desktop Connection feature.		
Network Backup	Allows you to backup files to a network upation		
Group Policy Controls	Allows network administrators to control users and computers within the network. For example, an administrator can define a user's work environment one time, and then group policy continually enforces those settings. Group policy applies to domain-based networks.		
Encrypting File System (EFS)	Allows you to store particular information on a hard disk (e.g., files or folders) in an encrypted format.		
AppLocker	Allows network administrators to control which applications users can run and helps control the u of unauthorized software on corporate systems.		
BitLocker	Enables automatic encryption of internal drives and removable media.		
BranchCache	Enables content from servers outside the local area network to be cached (that is, stored) on local computers (computers within the local area network) for fast access. BranchCache improves application response time and reduces the amount of traffic flowing into and out of the local network.		
DirectAccess	Allows remote users to securely access network resources without having to connect through a virtual private network (VPN). DirectAccess establishes a connection between a corporate network and a user's portable computer every time that computer accesses the Internet. This allows the user to seamlessly access the network, and allows network administrators to manage the remote		

nderstanding 32-bit and 64-bit Operating Systems

Each Windows 7 edition (with the exception of Starter) is available in a 32-bit version and a 64-bit version. There are advantages and disadvantages to each.

32-bit Operating System

The 32-bit version of Windows will run on a system with either a 32-bit processor or a 64-bit processor.

systems even when they are not connected to the VPN.

This version can run 32-bit applications and most 16-bit applications. While most modern software is designed to run on 64-bit machines, many companies have significant money invested in old applications, or custom-built applications that were created to run on older hardware.

A 32-bit operating system can address only up to 3.5 GB of RAM (or less), regardless of how much physical RAM is installed on the system.



64-bit Operating System

The 64-bit version of Windows will run on a system that has a 64-bit processor. It will not run on a system with a 32-bit processor.

This version can address up to 8 GB of RAM in the Home Premium version, and up to 192 GB of RAM in the Professional and Ultimate/Enterprise version.

This version can run 64-bit applications and most 32-bit applications. However, some 32-bit applications include 16-bit artifacts. Artifacts are old portions of code or sub-routines found within an application. If a 32-bit application includes 16-bit artifacts, the application will not run or will not perform well on a 64-bit operating system. (As you will learn shortly, Windows XP mode can provide a solution for running these older applications.)

If you elect to run a 64-bit version of Windows 7, you must be sure that you can obtain and install 64-bit device drivers for your devices (e.g., scanners and printers). The 64-bit version of the operating system is not compatible with 32-bit drivers.

To check whether a device includes 64-bit drivers you can check the product documentation visit the manufacturer Web site, or visit the Windows 7 Compatibility Web site at www.microsoft.com/windows/compatibility/windows-7.

Exercise 1-1: Determining Your Operating System Edition

In this exercise, you will determine which edition and bit-level of Windows 7 you are running

- 1. Click the **Start** button, then in the search box that displays at the bottom of the search menu,
 - type:winver.



art menu displays the winver program at the top of the list. Click **winver** to open an About Windows dialog otice that the information indicates the edition, but not the bit level.

Exercise



3. Click **OK** to close the About Windows dialog box, then click **Start**, right slick **Computer**, then click **Properties** to open the System page of the Control Panel. The edition and bit level are indicated on this screen.



In this exercise, you determined which edition of Windows 7 you are running.



Understanding Windows Anytime Upgrade

Instead of creating separate installation code for the different editions of Windows 7, Microsoft includes all the features of all editions in every installation pack. When a user purchases a Windows Anytime Upgrade, he or she is purchasing an upgrade key (a new software license) which activates the appropriate enhanced features. Upgrade keys can be purchased from retailers, or online from Microsoft.

Windows Anytime Upgrade is a feature built directly into the operating system. You can use Anytime Upgrade to upgrade from one edition of Windows to another within the following limitations:

- You can upgrade to a higher-level edition, but you cannot downgrade. For example, you can
 Professional to Ultimate, but you can't go from Professional to Home Premium.
- You can upgrade only within the same bit level. That is, you cannot upgrade from Home Premium 32 bit Professional 64-bit.
- You cannot use Windows Anytime Upgrade to upgrade from a previous version of Windows. That is, you cannot use Anytime Upgrade to upgrade from Windows Vista to Windows 7.

To use Windows Anytime Upgrade, you must be running an activated copy of Windows. Because the purchase of an upgrade key simply makes the enhanced features available, you can upgrade your current edition of Windows 7 without having to perform an installation. This allows you to keep your programs, files and settings intact, and is the easiest way to upgrade to a new (same bit-level) edition.

You can launch Windows Anytime Upgrade from the Start menu. Click the **Start button**, click **All Programs**, then click **Windows Anytime Upgrade** to open the Windows Anytime Upgrade dialog box. You can enter an upgrade key or go online to select the edition of Windows 7 you want to purchase.



If you elect to go online, you are presented with the available upgrades.





When you click the **Buy** button, you are prompted to enter your purchase information and will be provided with an upgrade key.

Planning for Windows 7 Installation



Any installation of Windows 7 should begin with proper planning. When you have identified the edition of Windows you think you want to use, you must ensure that your computer system(s) meet (or preferably, exceed) the minimum system requirements. You should also be sure to identify any compatibility issues and their solutions before installing.

System Requirements

You must ensure that a system meets the minimum requirements before installing any application or operating system. The minimum requirements are determined by the software vendor.

The minimum system requirements to run Windows 7 Starter and Home Basic are:

- 1 GHz or faster x86 or x64 processor
- 512 MB RA

GB hard disk space (Starter); 20 GB hard disk space (Home Basic) plus 15 GB free space

DirectX 9 graphics card with WDDM 1.0 and at least 32 MB video RAM

he minimum system requirements to run Windows 7 Home Premium, Professional, Ultimate and Enterprise are:

- 1 GHz or faster x86 or x64 processor
- 1 GB RAM (32-bit); 2 GB RAM (64-bit)
- 40 GB hard disk space plus 15 GB free space
- DirectX 9 graphics card with WDDM 1.0 or higher and at least 128 MB video RAM

Keep in mind that minimum system requirements are the bare minimum required for the software to run. It is strongly recommended that a system exceed the minimum requirements to ensure that the software performs well. Most organizations establish a standard baseline for their systems to ensure uniform performance across the enterprise.



A common baseline for Windows 7 is:

- 2 GHz total processing power (includes multiple cores and/or multiple processors)
- 2 GB RAM
- DirectX 9 graphics card with WDDM 1.0 or higher with at least 512 MB video RAM
- 80 GB hard drive

Using the PC Upgrade Advisor

You can use the PC Upgrade Advisor (also called the Windows 7 Upgrade Advisor) to determine if a particular system capable of running Windows 7 and to generate a report of any potential compatibility issues with installed programs an connected devices. It is supported on Windows 7, Windows Vista, and Windows XP Service Pack 2.



Upgrade Advisor can be used on a system running a previous version of Windows to determine whether the system will readily support Windows 7, or it can be used on a system currently running an edition of Windows 7 to determine if Anytime Upgrade can be used to upgrade to a higher edition. Upgrade Advisor checks the system and any connected devices (such as printers, cameras, scanners, etc.) and reports on system readiness to run Windows 7 and lists any potential compatibility issues with devices, device drivers and installed applications.

The results screen indicates which editions you can use and tells if your system meets the minimum hardware requirements. For example, the results screen in the following figure indicates that the system will support Windows 7 Home Premium or Ultimate. It also indicates that certain Windows Vista features, such as Windows Mail and Parental Controls, are not supported in Windows 7.





Upgrade Advisor will also list any device drivers or application programs that may have compatibility issues with Windows 7. Where possible, Upgrade Advisor provides links for finding compatible program versions, compatible hardware drivers, etc.

Devices	Status	Datails	
✓ ITECIR Infrared Receiver (EC) ⅢE Tech.Inc.	Check Windows Update	Oreck Windows Update after installing Windows 7 to make sure you have the latest driver for this device, otherwise it may not work.	
Lexmark Z2400 Series Lexmark Inkjet Drivers	Check Windows Update	Check Windows Update after installing Windows 7 to make sure you have the latest driver for this device, otherwise it may not work.	
V 13 devices listed as compatible See all devices	Status	Details	
Acrobat com version 1.1.377 Adob. Systems Incorporated	Update available	We don't have compatibility information about this version of the program. Get an update to a compatible version	
Adobe AIR version 1.0.4990 Adobe Systems Inc.	Free update available	We don't have compatibility information about this version of the program.	
Cisco Connect version 1.1 Cisco Consumer Products LLC	Update available	We don't have compatibility information about this version of the program. Get an update to a compatible version	
Cisco PEAP Module version 1.0.13 Cisco Systems, Inc.	Update available	We don't have compatibility information about this version of the program. Get an update to a compatible version	
Dell Wireless WLAN Card Utility version 4.170.77.7	Update available	We don't have compatibility information about this version of the program.	



You need to download and install PC Upgrade Advisor from the Microsoft Web site. Once installed, it can be launched from the Windows Start menu. Note that you must be logged on with an Administrator account, or provide an administrator user name and password in order to run Upgrade Advisor.

Exercise 1-2: Using PC Upgrade Advisor

In this exercise, you will download, install and run the PC Upgrade Advisor.

- Open a Web browser and go to <u>http://windows.microsoft.com/upgradeadvisor</u> to view the Windows 7 Upgrade Advisor page.
- Scroll to the bottom of the page and click the Download the Windows 7 Upgrade Advisor button to go to t Download Center page.
- 3. In the Quick details section, click the **Download** button. If you are presented with additional downloads, do not select any, then click the **Next** button.
- 4. When prompted to Run, Save or Cancel the download, click **Run** to begin the download and installation.
- 5. When the User Account Control agent appears, click **Yes** to allow the program to make changes to the computer and launch the setup wizard.

Note: Throughout this lesson and all subsequent lessons, when the User Account Control agent appears, click Yes unless directed otherwise.

6. Select I accept the license terms, then click the Install button to begin the installation. When the installation is complete, click the Close button.





the Web browser. You can now run the upgrade advisor from the Start menu.

art, click All Programs, then click Windows 7 Upgrade Advisor to start the program.

As advised in the first screen, be sure to connect and turn on all devices so that the upgrade advisor can check them, then click the **Start check** button to proceed. It may take several minutes for the upgrade advisor to run. At completion, a results screen similar to the one shown below will display.

Exercise



		Strencport int
System		Details
🗸 Anytime Upgrade av	vailable	You can upgrade to 64-bit Windows 7 Ultimate N with Windows Anytime Upgrade. Go online to learn how to get started with Windows Anytime Upgrade
More info from Hev Packard	wlett-	Hewlett-Packard has a website that might give you more information about getting Windows 7 running on your PC. Visit the Hewlett-Packard website
✓ 4 system requireme See all system require	ents passed ements	
Devices		
8 devices listed as conserved and the second sec	ompatible	
See all devices		

- 11. Scroll through the results. Are all your devices compatible? Are all your programs compatible?
- 12. When you are finished reviewing your results, click the **Close** button.

In this exercise, you used the PC Upgrade Advisor.

Windows Compatibility Center

You can also use the Microsoft Windows 7 Compatibility Center Web site to check the compatibility of hardware and software. It is useful if you are not able to use the PC Upgrade Advisor; e.g. you are currently using a different computer than the one that will be upgraded. The Compatibility Center lists thousands of popular devices and applications (for both 32-bit and 64-bit systems).

e Edit View Favorites Tools Help		
Mindows		
NULL CONS		
Home Explore Windows	Products Shop Downloads Help & How-to	
Httindayu 7 Carenatik	silit: Contor	
Windows X Compatib	United States - English *	
Home About Feedback FA	AQ Partners	
Hardware Enter product name	Search Advanced search	
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Hardware Enter product name Home > Hardware > Graphics Card	Advanced search	
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Home > Hardware > Graphics Card	Advanced search ds & Components: Sound Cards Sort: Relevant	ce Show: 10 Results per page
Home > Hardware > Graphics Card Home > Hardware > Graphics Card Select a system type	Advanced search ds & Components: Sound Cards Sort: Relevant Results 1 - 10 of 11	ce Show: 10 Results per page a
Home > Hardware > Graphics Card Home > Hardware > Graphics Card Select a system type 64-bit Windows 7 32-bit Windows 7	Advanced search ds & Components: Sound Cards Sort: Relevant Results 1 - 10 of 11	ce Show: 10 Results per page S Page 1 of 2 Go to page: 60
Home > Hardware > Graphics Card Home > Hardware > Graphics Card Select a system type 64-bit Windows 7 32-bit Windows 7 Select a results filter	Advanced search Search Advanced search Sort: Relevant Results 1 - 10 of 11 Are you looking for laptop or desktop drivers?	ce Show: 10 Results per page Page 1 of 2 Go to page: 60
Home > Hardware > Graphics Card Home > Hardware > Graphics Card Select a system type 64-bit Windows 7 32-bit Windows 7 Select a results filter Graphics Cards & Components	Search Advanced search Sort: Relevant Results 1 - 10 of 11 Are you looking for laptop or desktop drivers? If you're looking for laptop or desktop drivers? If you're looking for a 90 bardware driver such as video or networking	ce Show: 10 Results per page Page 1 of 2 Go to page: 60
Hanto de Contraction de la con	Search Advanced search ds & Components: Sound Cards Sort: Relevant Results 1 - 10 of 11 Are you looking for laptop or desktop drivers? If you're looking for a PC hardware driver, such as video or networkir manufacturer support sites. If you're looking for a PC hardware driver, such as video or networkir manufacturer support sites.	ce Show: 10 Results per page Page 1 of 2 Go to page: 60 ng, see the FAQ for a list of popular PC
Enter product name Home > Hardware > Graphics Card Select a system type 64-bit Windows 7 32-bit Windows 7 Select a results filter Graphics Cards & Components Biometrics Biometrics Biometrics	Search Advanced search ds & Components: Sound Cards Sort: Relevant Results 1 - 10 of 11 Are you looking for laptop or desktop drivers? If you're looking for laptop or desktop drivers? If you're looking for a PC hardware driver, such as video or networking manufacturer support sites. Sort: Results a video or networking for laptop or desktop drivers?	ce Show: 10 Results per page Page 1 of 2 Go to page: 60 ng, see the FAQ for a list of popular PC
	Search Advanced search ds & Components: Sound Cards Sort: Results 1 - 10 of 11 Results 1 - 10 of 11 Are you looking for laptop or desktop drivers? If you're looking for a PC hardware driver, such as video or networking manufacturer support sites. Effective Sound Blaster 16 PCI Sound Card	ce Show: 10 Results per page a Page 1 of 2 Go to page: 60 ng, see the FAQ for a list of popular PC



By searching for a particular product, you can easily determine whether it will work with Windows 7, if an upgrade might be required, or if there is no compatible version available.



You can use the site to download device drivers and software updates. The site also provides links to manufacture web sites.

Exercise 1-3: Using the Compatibility Center

In this exercise, you will explore various features of the Windows 7 Compatibility Center Web-

- 1. Open a Web browser and visit www.microsoft.com/windows/compatibility/windows
- 2. Click in the Enter product name text box, type: Office 2000 then click the Search button. Notice that you must pay for an upgrade to find a version that will work on a 64-bit operating system.
- 3. In the navigation bar near the top of the window, click the **Home** link to return to the Compatibility Center home page.
- 4. Hover the mouse pointer over the **Security** icon, then click **Anti-spyware** in the shortcut menu to view a list of anti-spyware applications.
- 5. In the navigation pane at the left side of the page, scroll down to the **Compatibility** section, then under Compatibility, click **Not compatible** to view only anti-spyware applications that are not compatible with Windows 7.
- 6. Return to the Compatibility Center home page, then click the Hardware tab.
- 7. Click in the Enter product name text box, type: HP scanjet then click the Search button. Are all the HP scanners compatible?
- 8. For any product on the page, click the Learn More link. What type of information is available?
- 9. How easy or difficult do you think it would be to find out if a product you own is compatible with Windows 7?
- 10. If you were planning to upgrade an organization's computers, how would you use the Compatibility Center?

In this exercise, you explored the Windows 7 Compatibility Center Web site.

Windows 7 Upgrade Versus Clean Install

Windows Easy Transfer is supported in Windows XP, Windows Vista and Windows 7.

Objective 2.2 When you have decided which edition of Windows 7 to install, the next step is determining whether to perform an upgrade or a clean install.

Upgrade

you perform an *upgrade*, existing user settings, files and installed applications are retained and you do not need to all them. When you boot from the Windows 7 installation DVD, the default option is to perform an upgrade.

Atrue in-place upgrade to Windows 7 is supported only from Windows Vista Service Pack 1, and this upgrade must maintain the same bit level. To upgrade from a version of Windows prior to Windows Vista Service Pack 1, you would first have to upgrade to Vista SP1 and then upgrade from there to Windows 7.

Even when moving from Windows Vista SP1 to Windows 7, you have the option of performing a clean install instead of an upgrade.



Clean Install

When you perform a *clean install*, you should re-format the hard drive before installing Windows 7. Thus, the operating system files are installed fresh, user settings must be configured anew, user files and any programs that were installed on the system prior to the clean install must be reinstalled and reconfigured. Any user documents that need to be retained must be copied to back up media before the clean install, and then copied back onto the system after the new operating system installation is complete.

You must perform a clean install if you want to change the bit-level of the operating system or if you want to move from a version of Windows prior to Windows Vista SP1 to Windows 7.

Because all existing settings, files and applications are destroyed when you perform a clean install, you must take steps to migrate your files, folders and settings (if you want to retain them) to the new installation. This process involves copying the data you want to retain to backup media and then transferring it to Windows 7 after the clean install has been performed.

Windows Easy Transfer is a tool designed to facilitate the transfer of data and settings from one operating system to another, and will work for transferring data between operating systems on the same computer or on different computers. You can use Windows Easy Transfer to migrate settings, user accounts files, music, pictures, e-mail, videos, and Internet favorites.

Additionally, you must ensure that you have access to the installation discs for any applications you want to reinstall on the new Windows 7 system. Windows Easy Transfer cannot migrate applications. You should also have access to any required device drivers if they are not available through Windows.

Of course, you can also perform a clean install and elect to discardeall previous settings and files.

Identifying Upgrade Paths

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As an IT professional, you should understand the available paths for upgrading from various operating systems to Windows 7.

From Windows XP

To upgrade from Windows XP you can:

- Upgrade first to Windows Vista SP1, then upgrade to Windows 7,
- Perform a clean install directly to Windows 7 and migrate all existing application program settings using Windows Easy Transfer, or
- Perform a clean install directly to Windows 7 and discard the old settings.

From Windows Vista

To upgrade from Windows Vista you can:

- Apply Service Pack 1 and then upgrade to Windows 7,
- Perform a clean install of Windows 7 and migrate the existing application program settings using Windows Easy Transfer, or
- Perform a clean install of Windows 7 and discard the old settings.

m Earlier Versions of Windows

o upgrade from earlier versions of Windows such as Windows 95/98/ME or 2000 you can:

- Upgrade through multiple Windows versions up through Windows Vista SP1, then upgrade to Windows 7, or
- Perform a clean install directly to Windows 7 and discard the old settings.

From Non-Microsoft Operating Systems

To upgrade from a non-Microsoft operating system, you must:

• Perform a clean install.

If you want to retain your old data files, you can copy them to backup media and copy them back after Windows 7 has been installed. To open these old data files, however, you must find and install application software that is both compatible with Windows 7 and compatible with your old files.



Application Compatibility

There are various reasons that applications stop functioning or perform erratically after an operating system upgrade. These reasons can include:

- Applications may include artifacts which use a bit level that is no longer supported.
- Applications may rely on features that were supported in previous versions of Windows but are no longer supported.
- Applications may be incompatible with new features in the upgraded operating system. For example, the User Account Control feature is designed to allow users to perform their work tasks while logged d as standard users. In previous versions of Windows, many users logged on as Administrators. Older app expect the user to have administrative rights on the system and certain application functions may user does not have sufficient rights or privileges.

Identifying Issues

As you have seen, using the Upgrade Advisor and the Compatibility Center can ale m administrator to ie sv potential application compatibility issues. These tools are well suited for a small computing nvironment. However, identifying potential issues across an enterprise can be a different story.

In large enterprises, thousands of machines may be running various versions of application software on hardware platforms of varying power. Microsoft provides the Application Compatibility Todkit (APT) for inventorying applications and identifying and possibly creating fixes for potential compatibility issues. The it includes:

Application Compatibility Manager (ACM)	Creates modules that can be distributed to client computers to inventory hardware and software and analyzes the collected information.
Standard User Analyzer (SUA)	This tool is used to locate specific items in the application that cause a failure so that these items can be corrected. The fixes that are discovered with this tool are collected into a shim. A shim is a collection of fixes that are intended to make an application work on Windows 7. Shims are spored in shim databases.
Compatibility Administrator	This tool is used to view and manage shim databases.

Remediating Issues

Some applications that won't work in Windows 7 can be made to work through the use of application shims. Other applications may need to be upgrade ersion that is compatible with Windows 7.

It may seem an obvious solution Papplication won't function in Windows 7, it should be updated to a newer compatible version or replaced h another software package that can perform the same tasks. In many cases, this can be the appropriate so

However, consider t hé c of upgrading thousands of copies of a software package. Consider also that some applications are custom-built zation and that upgrades or replacements may not be available. For these situations, best solution. (You will learn about virtualization shortly.) virtualization may offer

Deployment Options

ne or two PCs in a home or very small business make take an hour or two. However, as you increase the systems to be upgraded, the time required to sit at each one and perform a manual installation adds up cickly. In large enterprises, the number of systems that require updating may be truly staggering, which makes it highly impractical for even a large IT staff to perform all the installations "live and in-person."

or this reason, various tools and methods are available for installing Windows 7. Some are suited for home users and small businesses, while others are geared for large enterprises which support a substantial infrastructure. These installation methods and deployment strategies are discussed in the following sections.



Preliminary Concepts

Before examining installation methods, you should understand the following concepts about how computers locate and load operating system software.

Boot disk	A removable medium from which a computer can load and run an operating system or utility program. The process of loading such a program is called "booting." Boot disks are used for several purposes, including data recovery, hardware and software troubleshooting, and operating system installation. A boot disk must be created in a specific manner so that it is bootable – that is, you cannot simply copy operating system files to a DVD or flash drive and use it to boot a system. You must take specific steps to make the media bootable.
Boot sequence	Most computers boot (load the operating system) from the hard drive. However, a computer can also load an operating system from a CD-ROM, DVD, or flash drive. The boot sequence determines the order in which each drive is accessed when the system is looking for the operating system files. Most systems check the hard drive (usually drive C) first, then they may search optical drives or USB devices. If a system checks the hard drive before any other drive, and a valid operating system is installed on the hard drive, then the system will boot from the hard drive begardless of whether bootable media exists in an optical drive or USB port. If you want to force a system to boot from a drive other than the hard drive, you can change the boot sequence by adjusting the system BIOS.
Basic Input Output System (BIOS)	BIOS software is built into a computer and is the first code run by a PC when it is powered on. When the computer starts, it performs the power-on self-test (ROST), which initializes the system and identifies system devices such as the CPU, RAM, video card, keyboard, mouse, hard drive, optical drive, etc. The next job of the BIOS is to locate boot loader software which loads the operating system (boots the computer).
BIOS setup utility	Any user can access the BIOS setup utility at startup in order to change the boot sequence, thereby instructing the computer to search the optical drive first, for example. Because the BIOS is built-in, it is accessible before the operating system is loaded. Power the system on, then watch for an "entering setup" message during the first dew seconds of startup. The message indicates the key(s) you need to press in order to enter the BIOS setup utility.
ISO image	A single file that is an "image" of an entire CD, DVD or Blue ray disc. Because an ISO is a complete image, you can download an ISO file from the Internet, or access it on a network, and then burn the image to an optical medium. If the ISO is an image of an installation program, such as for Windows 7, you can burn the image to optical media and then use the media as a boot disc.

Removable Media Installation

Most home and small organization installations are performed from removable media, such as a CD, DVD and most recently, a flash drive. The media must be bootable for the installation to proceed, and the computer must be configured with a boot sequence that will check the removable media drive for operating system files.

DVD

For an enduser, installing Windows 7 is a matter of inserting the installation DVD and answering the questions presented during the interactive installation setup procedure. Because the program requires the user to answer questions as the operating system is being installed, this type of installation is referred to as a "high-touch" installation (HTI).

Installing from a DVD can take several minutes to over an hour, depending on the speed of your machine. The computer will reboot automatically when the installation process completes. The following steps describe how to perform a clean installation of Windows 7 from the installation DVD. (If you prefer to perform an upgrade, select *Upgrade* in step 6):

- 1. Insert the Windows 7 disc into the DVD drive and power on the machine.
- 2. Select the option to boot from the DVD.
- 3. Specify your regional settings and click Next.
- 4. Click Install Now to start the installation.
- 5. Read and accept the license agreement, then click Next.
- 6. Select Custom to perform a clean install.



- 7. Click **Next** to allow the installation engine to prepare (format and partition) the hard disk and begin the process of extracting and copying the installation files.
- 8. After the system reboots, you will be prompted to enter a user name and a computer name. The user account created is automatically an Administrator account. The computer name should be unique on the network. Enter the user name and computer name, then click **Next**.
- 9. Enter and confirm a password for the user account. You can optionally specify a password hint. (Note that although a password is not required, it is strongly recommended that you add a password to each user account on the machine.)
- Specify whether you want to configure the system to receive automatic updates from Windows Update. Yo
 can postpone the decision by selecting Ask Me Later. (You will learn more about Windows Update in a late
 lesson.)
- 11. Specify the appropriate data and time zone settings, then click Next.
- 12. If the system is connected to a network, you will be asked to specify the network type (Home, Work or Public). When the installation is complete, the Windows 7 Desktop appears.

USB

Installing Windows 7 from a flash drive is faster than installing from DVD, and provides a method for installing to a Netbook computer (which usually doesn't include an optical drive). To perform a USB based installation, you must create a bootable flash drive and then copy the installation files from the original installation DVD onto the flash drive.

The process requires a USB flash drive with at least 4 GB of space. Note that the procedure will completely erase all data on the flash drive.

To make a flash drive bootable, you must open a command promot window as an administrator and launch the Diskpart utility, which allows you to create and view disk partitions. A command prompt window is a text-based interface you use to interact with the operating system. That is, you enter and execute commands in a non-graphical environment.

To open a command prompt window as an administrator, click Start, then type: cmd in the Search bar. When the command prompt shortcut appears in the Start menty, right click it and then select **Run as administrator**.

Enter the following commands by typing the command name and pressing ENTER. These steps will launch the Diskpart utility to make the flash drive bootable:

- 1. Diskpart (launches the utility
- 2. List Disk (the output from this command will show the number assigned to the USB drive on the system)
- 3. Select Disk x (replace x with the number assigned to the USB drive. This command selects the USB drive.)
- 4. Clean (removes all information from the USB drive)
- 5. Create Particion Primary (creates a primary partition on the flash drive)
- 6. Active (marks the primary partition as active)
- 7. Format fs=FAT32 quick (formats the flash drive)
- 8. An Ign (prepares the USB drive so that it can be assigned a drive letter when you connect it to a system)
- Exit (exits the Diskpart utility)

r you have exited the Diskpart utility, click the close button at the upper-right corner of the command prompt dow to close it.

se Windows Explorer to drag and drop all the files on the Windows 7 installation CD onto the flash drive. The flash drive on now be used as installation media.



Exercise 1-4: Bootable Flash Drive Demonstration

In this instructor-led exercise, the class will watch a video that demonstrates the steps for creating a Windows 7 installation flash drive.

1. Instructor: access and play the video listed below. Note that although the video is 8 minutes long, the pertinent information ends at the 6-minute mark.

http://www.techrepublic.com/blog/itdojo/video-install-windows-7-from-a-usb-flash-drive/1276

- 2. How easy (or difficult) was the procedure for creating a Windows 7 installation flash drive?
- 3. Do you think USB installation media would be beneficial in a corporate environment? Why or why
- 4. If you create a Windows 7 installation flash drive, on how many systems can you install the softw

In this exercise, you watched a demonstration of how to create a Windows 7 installation flash

Automated Installations

Because the interactive installation process is time-consuming and would be impractical for deploying Windows on a large number of systems, Microsoft provides tools and methods for automating the installation process. Automated installation strategies use an answer file, which is an Extensible Markup Language (XML) file that provides answers to the questions asked during installation. The Microsoft Automated Installation KK (AK) provides tools for creating answer files.

High Touch with Standard Image

This strategy involves creating a customized installation image for the new systems. Typically, this customized image includes settings, device drivers, installed applications, etc. Using a customized image for clean installs allows the IT staff to deploy systems more quickly. This strategy is recommended for companies with an IT person on staff and an unmanaged network of between 100 to 200 computers.

Lite Touch Installation (LTI)

Lite touch installation requires that the technician manually boot the system and begin the installation. The answer file provides the answers to the questions and the installation proceeds unattended. This deployment strategy is recommended for organizations with a dedicated IT staff and a managed network with between 200 and 500 client computers.

Zero Touch Installation (ZTI)

Zero touch installation does not require any physical interaction from the technician. The entire process can be started from a network server. This deployment strategy is recommended for organizations with managed networks of 500 or more computers, and an IT staff with advanced network management, configuration and deployment skills.

ZTI requires substantial infrastructure – Active Directory Domain Services (AD DS), Microsoft System Center Configuration Manager (SCCIV), and the Microsoft Deployment Toolkit (MDT).

Network-based Installations

Network-based installations are performed from network shares or special installation servers running Windows Deployment Services (WDS).

To **be** form an installation from a network share, you must install the Microsoft Deployment Toolkit (MDT) which includes tools for creating the shares, creating answer files and importing and customizing installation images. The MDT creates a custom Windows Preinstallation Environment (PE) boot disc that can be used to boot a computer and install the operating system from the network.

The Windows PE is a minimal operating system with limited services that is used to prepare a computer for Windows installation, to copy disk images from a network server, and to initiate Windows Setup.



When WDS is used for network-based installation, a custom image of the operating system is created and imported into the WDS server. Client systems are booted and then the custom image is installed. Client systems can be booted manually using a boot disc, or they can be connected to the network via specialized Preboot Execution Environment (PXE) –compliant adapters. A PXE-compliant network adapter allows a client system to boot from a server on the network.

Network versus Cloud-based Deployment

Cloud-based computing is computing that uses the Internet to provide its network infrastructure. That is, applications, storage space, and computer management consoles can be housed on Internet servers instead of being housed on an organization's privately-owned equipment.

Cloud-based services are leased monthly through a subscription service with a cloud provider. Microsoft's cloud solution is called Windows Intune, which allows you to centrally manage and secure all your PCs through a Web-based console.

Cloud-based management services allow the IT manager to monitor, update, and manage PCs without the requirement of building and maintaining a server-based network infrastructure. All that is required is an internet connection, installation of the Intune client software on each PC that is to be managed, and a subscription to the service.

IT managers can deploy software installations, patches, and upgrades to managed PCs using the cloud-based service. Client systems need only be connected to the Internet; users do not even have to be logged on to the machines. Cloudbased deployment supports users scattered around the planet.

Introducing Virtualization

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In the context of computing, the word *virtual* refers to the way a particular component or environment appears to a user. For example, a *virtual machine (VM)* is a software implementation of a computing environment that executes programs like a physical machine. That is, a VM is a simulated collection of computer hardware that exists and behaves like a real (physical) computer. You create a VM using virtualization software.

The machine that runs the virtualization software is the host Each VM running on the host can run its own guest operating system and application software. The guest operating system and application software will function exactly as if they were installed on a physical computer system.

The host machine stores and provide resources to VIVIS which run on it. Therefore, each VM will have a CPU and RAM to perform computations, a keyboard and mouse connection, a display driver for the monitor, and a network interface card (NIC) to connect to the network. You can also specify the size of a (virtual) hard drive, and decide to connect an optical drive, and USB ports.

Hypervisor

The software that runs the virtual machines is called a *hypervisor*. There are two types of hypervisors:



bare metal (Type
hosted (Type 2)

A hosted hypervisor is like any other application software that runs on top of an operating system. Examples of hosted hypervisors are Microsoft Virtual PC, Microsoft Server, Oracle VirtulBox, and VMware Server. A bare metal hypervisor is designed to run exactly as the name implies: directly on top of the computer hardware without an operating system in between. Examples are: Microsoft Hyper-V Server, VMware ESX, and Citrix XenServer.





Each hypervisor is able to run one or more guest operating systems (e.g., UNIX, Linux, Mac OS X). The only limitation imposed on the operating system is that it must be compatible with the virtual hardware created by the hypervisor. The maximum number and type of guest operating systems that can be supported is only limited by the amount of RAM and the number of CPU cores on the host machine.

The following screenshot shows a hypervisor software called VirtualBox running on top of Windows 7. The VirtualBox is running four guest operating systems at the same time: two different Windows XP machines, one Windows Server 2003 machine, and one Ubuntu (Linux) machine.





Microsoft offers two virtualization products with Windows Server 2008 and Windows 7:

Hyper-V	Runs on Windows Server 2008 and Windows Server 2008 R2 and runs VMs for an enterprise. Hyper-V does not run on Windows 7, but can run Windows 7 as a guest operating system within a VM.	
Windows Virtual PC	Runs VMs on all editions of Windows 7 and is an optional component that can be freely downloaded and installed. Windows Virtual PC can be used to run properly-licensed versions of Windows Vista, Windows 7 or Windows XP in a virtual environment. Windows Virtual PC is required to run Windows XP Mode (which you will read about in the next section.)	

XP Mode

New in Windows 7 is a feature called *XP Mode*, which enables you to create and run a Windows XP virtual machine on your Windows 7 Desktop. Any application software installed inside a VM functions as though it is installed on a physical machine, but interacts only with the virtual environment. By installing legacy applications in the Windows XP virtual machine, you are able to run application software that runs correctly in Windows XP, but is unable to runn Windows 7.

In other words, Windows XP Mode is used to allow applications that will not run on Windows 7 narvely to run in a VM on your Windows 7 computer. When an application runs in Windows XP Mode, you see the application windows on your local Windows 7 Desktop as if it were running locally, but it is actually running in a background Windows XP VM.



The following screenshot shows the Windows XP Mode running on the Windows 7 Desktop:

Once running in XP Mode, your application software will have access to all peripherals on the computer. For example, when you install your software in XP Mode, you can insert the installation DVD in your real computer's DVD drive, and the Virtual PC software will be able to connect to it. Similarly, you can access USB ports and send output to printers that are actually connected to the underlying physical computer. The Virtual PC performs all of the work of creating and maintaining these connections between XP Mode and the physical computer.



Keep in mind that you will most likely need a separate software license for any application you install in XP Mode. From a licensing point of view, a VM is a computer separate from (even though (it is running on) your physical computer. For example, you will need two licenses of MS Word if it is already installed in Windows 7, and you want another copy in XP Mode.

Software applications installed in XP Mode will appear under the Windows XP Mode Applications folder in the Start, All Programs menu. This arrangement makes it easier for users to see what applications are available on both their physical Windows 7 system and their Windows XP Mode virtual machine.



Installation and Requirements

Windows XP Mode is a special version of the Windows XP Professional (SP3) operating system designed specifically to run on Windows 7 as a guest operating system. Windows Virtual PC must be installed on the Windows 7 system in order for Windows XP Mode to run.

Note that while Windows Virtual PC will run on all editions of Windows 7, XP Mode is supported only in the Professional, Ultimate and Enterprise editions. (You can, however, install Windows Virtual PC on a lower edition of Windows 7 and then install a purchased, licensed copy of Windows XP or any other operating system and run it as a guest operating system in a VM.)

Windows XP Mode is an optional component of Windows 7 and is available for download free of charge at <u>http://www.microsoft.com/windows/virtual-pc/default.aspx</u>. No license is required to run Windows XP Mode.

It is possible run Windows XP Mode on a computer with as little as 1 GB of RAM. However, for optimal performance the system should have at least a 4 core CPU, 4 GB RAM, and a 7200 rpm hard drive or SSD. Using an under-powered system as the host can cause application software to perform slowly or inconsistently because of the extra processing power required to run the VM itself.



Exercise 1-5: Installing Windows Virtual PC and XP Mode

In this exercise, you will download and install Windows Virtual PC and XP Mode.

First, you will check to see if Windows Virtual PC and XP Mode came pre-installed on your system.

- 1. If necessary, power on your system and log on using an Administrator account. Click the **Start** button, click **All Programs**, then scroll the list to see if Windows Virtual PC is listed. If not, then you will need to install it.
- Click in an open space on the Desktop to close the Start menu, then open a Web browser and navigate to http://www.microsoft.com/windows/virtual-pc/default.aspx.
- 3. On the Windows Virtual PC Web page, click the Get Windows XP Mode and Windows Virtual PC now bu
- 4. On the Web page, use the drop-down lists to specify your edition of Windows 7 and the desired language for the installation.
- 5. Scroll down until you see Step 2 Windows XP Mode, then click the blue **Download** button below Windows XP Mode to begin downloading the application. It is a large file, and may take several minutes.
- 6. You may be prompted to validate your version of Windows. If you are, click the **Continue** button, wait for the Windows validation was successful message, then click the **Continue** button once more.



7. When prompted to run, save or cancel the executable file of the whole start the Windows XP Mode setup wizard.



Click Next twice, then click Finish.

On the Windows Virtual PC Web page, locate Step 3 Windows Virtual PC, then click the blue **Download** button below Windows Virtual PC and click **Open** to begin downloading and installing the application.

Exercise

on.





- 10. When prompted to install the software update, click Yes.
- 11. Click **I Accept** to accept the license agreement and install the update.
- 12. When the installation is complete, click **Restart Now** to restart the computer.
- 13. Log back onto the system using an Administrator account.
- 14. Click **Start**, click **All Programs**, then click **Windows Virtual PC** to make sure that Windows XP Mode displays in the Start menu.
- 15. In the open Start menu, click **Windows XP Mode** to begin configuring XP Mode. You will need to configure XP Mode to ensure it functions properly.
- 16. Accept the license terms and click **Next** to view the Installation folder and credentials screen. By default, the user name is set to XPMUser.

3	Windows XP Mode Setup					
	Installation folder and	credentials				
	Installation folder					
	C:\Users\Instructor\AppData\Local\Microsoft\Windows Viewet 20,011 Browse					
	Create credentials					
	User name:	XPMUser				
	Password:					
	Confirm password:					
	Remember credential	Recommended)				
	More about the desitial of	Vindows XP Mode				
		Next Cancel				

17. Specify and confirm a password. If you leave the Remember credentials (Recommended) option selected, you will not need to enter the password when you use XP Mode. Click **Next**.



- 18. Select **Help protect my computer by turning on Automatic Updates now. (recommended)**. Windows XP Mode relies on the Windows Update service to obtain updates for Windows XP with SP3. To ensure that Windows XP with SP3 receives updates, both the host computer and the virtual machine must be connected to the Internet—and the Windows Update service must be configured in the virtual machine that runs Windows XP Mode. Click **Next**.
- 19. Next you must share the drives on the physical computer with Windows XP Mode.



Click **Start Setup**, then wait while Windows sets up XP Mode on your system. This process can take several minutes. When setup is complete, Windows XP Mode will appear as a window on your Windows 7 Desktop.





21. Click the close button in the upper-right corner of the Windows XP Wode window to put XP Mode into hibernation. In this exercise, you installed and set up Windows XP Mode.

MED-V

Objective

Microsoft Enterprise Desktop Virtualization (MED-V) is essentially an enterprise-wide version of the XP Mode in Windows 7. It is packaged together with other products as part of the Microsoft Desktop Optimization Pack (MDOP).

Like Windows XP Mode, MED-V allows enterprise users to continue using applications that were designed to run in (32-bit) Windows XP, but are incompatible with Windows 7 to some degree or another. MED-V eliminates conflicts and allows older applications to run well on Windows 7.

MED-V is designed for enterprises; it allows you to use a centralized system management tool to create, configure, and deploy virtual Windows machines (called *workspaces*) to end user computers. This is a tremendous advantage over using XP Mode, as it would be very time-consuming to manually install and configure XP Mode on every user's computer.

A typical large enterprise may include thousands of users. To help organize and manage all those users, it makes sense to define groups of users who have common needs and use a common group of applications. For example, all users in the Accounts Payable department likely need access to several treasury and payment applications, and it therefore makes sense to create an Accounts Payable users group.

In MED-V, you create an *image* of a virtual machine (VM) and upload it using the Microsoft Enterprise Desktop Virtualization (MED-V) Management Console. You can think of an image as a template or a master copy; when a user is set up to use MED-V, the central server will create a new workspace by copying the image down to the user's local computer. All Accounts Payable users would then have an A/P workspace on their computer – that is, a copy of the A/P MED-V image. Sales users, on the other hand, would have their own Sales workspace.



Each image is further configured to identify which users are permitted to access this image. This setting is known as a *usage policy*, and is stored in Active Directory. This will ensure that the Sales users cannot download the A/P image onto their computers, for example.

🖄 nyc-dc1 - MED-V Manageme	ent (Policy Version - 34) *	
<u>File Policy V</u> iew <u>T</u> ools	<u>H</u> elp	
Policy Images	Reports	Enterprise Desktop Virtualization
Workspaces	Conversal Margan Manharin, Deployment Ubers / Goups: Page Confine Olyacon	Applications Web VM Setup Network Performance General C Enable Workspace for 'CONTOSO\aaron' Workspace expires on this date Offline work is restricted to Workspace deletion options Data Transfer Support file transfer between host and Workspace. Support file transfer between the host and Workspace. Support file transfer between the host and Workspace. Device Control Enable printing to printers connected to the host. Enable access to CD / DVD.
Add Remove	Add Remove	



The MED-V image is then configured to run selected applications, as shown in the following screen capture.



When a user is set up to access his or her MED-W workspace, the image is downloaded to his or her local machine as shown in the following screen captures.



installed, MED-V applications will simply appear in the **Start-All Programs** list, under the **MED-V Applications**. These applications can also be configured as individual shortcuts appearing at the top of the **All Programs** list.



When the MED-V administered software starts up, a border will appear around the application window to indicate that it is running under MED-V. Other than that indicator, a user cannot easily detect that the software is running in a virtual machine.

Microsoft has pursued seamless integration in other ways to make MDD-V easy to use. For example, printers will appear in the application as if they were installed on the local machine. Similarly, the local *My Document* folders and USB drives will also appear when users open and save data files. To access or save data files located in other locations such as on networked drives, the user must use the File Transfer tool to prove files to and from the virtual PC workspace.





Specific URLs (e.g., *finance.companyname.com*) can also be reserved to automatically run under MED-V instead of the default web browser installed on the user's computer. This capability is very useful because many software vendors offer a web front-end for their applications. Like WinXP applications, these web pages may be incompatible with the newer version of Internet Explorer.

For example, suppose you open the current version of Internet Explorer in your Windows 7 machine and enter the address of the website for your corporate finance system. MED-V can be configured to intercept this address, start up an older version of Internet Explorer and load the finance system for you in a separate window. Again, this searchess integration relieves you from having to remember which websites must run on older web browsers.

One of the Microsoft websites offers a hands-on demonstration (called virtual labs) of setting up, man MED-V. Go to <u>http://technet.microsoft.com/en-us/virtuallabs/</u> and click the Windows 7 link.

Lesson Summary

In this lesson, you learned how to plan for an operating system upgrade, about the various Windows 7 editions and installation options and about how virtualization can support legacy applications in Windows 7. You are now able to:

- ☑ Explain the difference between 32-bit and a 64-bit operating systems.
- Describe the Windows 7 operating system editions, including features, availability and minimum requirements.
- Identify upgrade paths from various versions of Windows to Windows 7.
- Explain the function and characteristics of Windows Anytime Upgrad
- Understand hardware and software compatibility issues and explain why upgrading to Windows 7 requires planning.
- ☑ Use the PC Upgrade Advisor.
- Use the Windows 7 Compatibility Center to check for software and hardware compatibility issues.
- Explain the difference between an in-place upgrade and a clean install.
- Explain different types of installation strategies, including High Touch installation, High Touch with Standard Image, Lite Touch installation and Zero Touch installation.
- ☑ Understand media-based and network-based installations.
- Explain cloud-based software deployment
- ☑ Explain the purpose and advantages of virtualization.
- ☑ Explain the function and characteristics of Windows XP Mode.
- ☑ Explain the function and characteristics of MED-V.

MMM Go online for Additional Review and Case Scenarios



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Review Questions

standard user account

- 1. In order to make changes to a system that will affect other users, you must be logged on with a(n):
 - a. power account

b.

b.

b.

5.

- administrator account c. d. guest account
- Windows XP mode is supported in which Windows 7 edition(s)? 2.
 - Starter, Home Premium and Enterprise a.
 - c. Professional, Ultimate and Enterprise d.
- Enterprise only Professional only
- 3. What is the amount of RAM required to run Windows 7 Home Premium 64-bit?
 - a. 1.0 GB c. 3.5 GB
 - b. 2.0 GB 4.0 GB d.
- The software that runs the virtual machines on a server is called: 4.
 - a. hypervisor software
- ISO software c.
- Remote Desktop software d. cloud deployment software
- Which of the following Windows 7 installation strategies requires substantial wor infrastructure, Active Directory
- Domain Services, and Microsoft System Center Configuration Manager (SCCM)? **High Touch Installation** a.
 - Lite Touch Installation c. d.
- b. High Touch with Standard Image
- Zero Touch Installati

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