

Technology in Action

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Eleventh Edition

Technology in Action

Chapter 4

System Software:

The Operating System, Utility Programs, and File Management

Chapter Topics

- Operating System Fundamentals
- What the Operating System Does
- The Boot Process: Starting Your Computer
- The Windows Interface
- Organizing Your Computer: File Management
- Utility Programs

Understanding System Software: Operating System Fundamentals

- Two basic types of software
 - Application software
 - System software

Understanding System Software: Operating System Fundamentals

- Categorized by device
 - Mainframes
 - Network computers
 - Personal computers
 - Mobile devices
 - Robots

Common Operating Systems		
OS NAME	DEVELOPED BY	AVAILABLE ON
Windows 8 	Microsoft	Laptops, tablets, desktops, all-in-ones, cell phones
OS X 10.9 (Mavericks) 	Apple	Laptops, desktops, all-in-ones
iOS 7 	Apple	Tablets, iPhones, iPod Touches
Android 4.4 	Google	Cell phones, tablets
Linux 	Open source	Laptops, desktops

Understanding System Software: Operating System Fundamentals

- Operating System Fundamentals
 - Multitasking
 - Networking capabilities
 - Categorized by type

Understanding System Software: Real-Time Operating Systems

- Used for machinery
- Minimal user interaction
 - Car engines
 - Medical devices
 - Common appliances
 - Robotic cameras



Understanding System Software: Operating Systems for Networks, Servers, and Mainframes

- Multiuser operating system
- Networks
- Manage user requests
- Examples
 - Windows Server
 - Linux
 - UNIX

Understanding System Software:

Operating Systems for Networks, Servers, and Mainframes

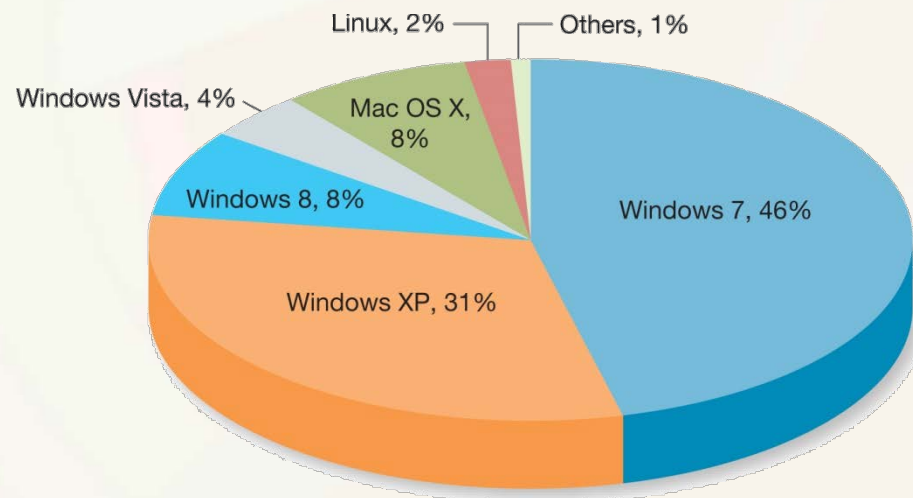
- UNIX
 - Multiuser, multitask operating system
 - Network operating system used primarily with mainframes
 - The Open Group

Understanding System Software: Operating Systems for Mobile Devices

- Smartphones
 - Multitasking capabilities
- Gaming systems and personal media players
 - Require system software developed for the device

Understanding System Software: Operating Systems for Personal Computers

- Top three operating systems
 - Windows
 - Mac OS X
 - Linux
- Windows 8 optimized for touch screen



Understanding System Software: Operating Systems for Personal Computers

- Mac OS
 - Mavericks
 - Mac OS X based on UNIX

Understanding System Software: Operating Systems for Personal Computers

- Linux
 - Open source OS
 - Personal computer and network OS
 - Stable OS
 - Quickly modified or updated
 - Download as distros

Understanding System Software: Operating Systems for Personal Computers

- Platform
- Windows and Linux can run on most hardware sold today
- Application software is OS-dependent

Understanding System Software: Operating Systems for Personal Computers

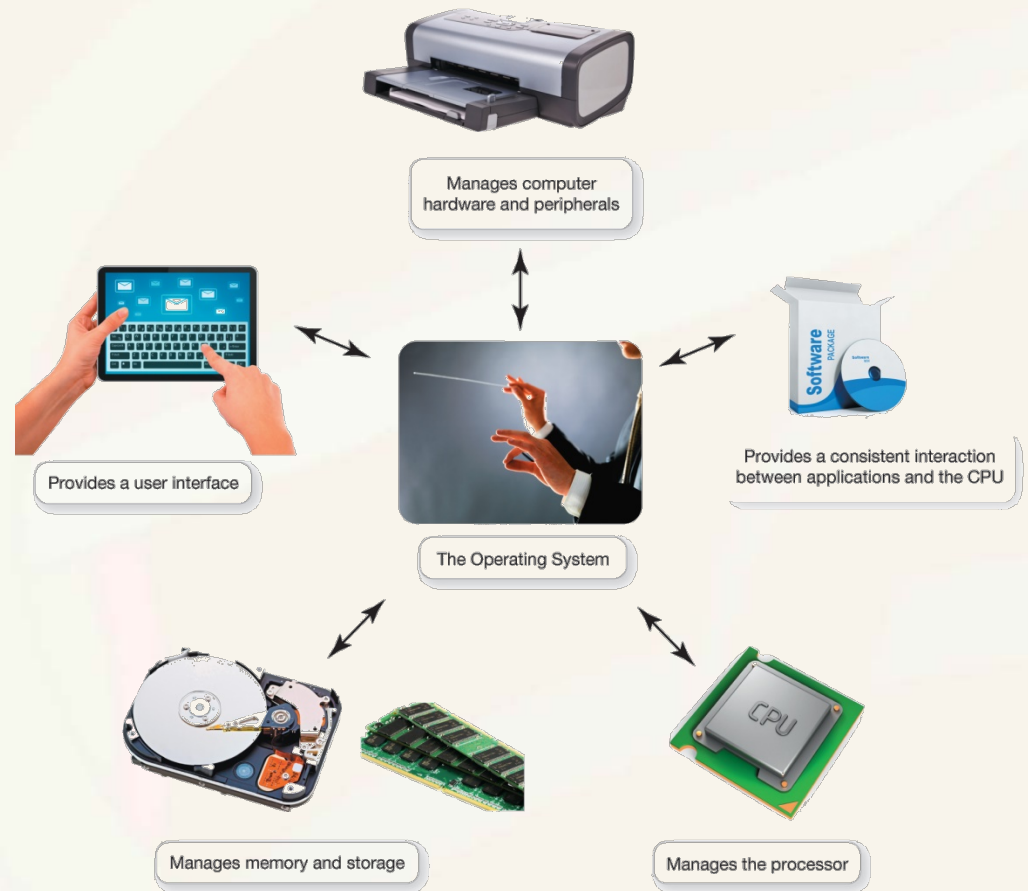
- More than one OS on one computer
 - Boot Camp utility in OS X
 - Parallels or VMware Fusion for Windows
 - Partition hard drive in Windows

Understanding System Software: Operating Systems for Personal Computers

- Cloud-based OS
 - Prototypes being developed
 - Still need a computer, operating system, and web browser
 - Enables users to access applications and content via the web anywhere, on any machine, and at any time
 - Google is taking steps toward developing a complete web-based operating system

What the Operating System Does

OS: Coordinates and directs the flow of data and information through the computer system



What the Operating System Does: The User Interface

- Enables user to interact with the computer
- Types of interfaces
 - Command-driven interface
 - Menu-driven interface
 - Graphical user interface (GUI)



```
C:\>cd c:\wordproc\memos
C:\wordproc\memos>dir/w
Volume Serial Number is 216C-11F8
Directory of C:\wordproc\memos

[.]                [.]
    0 file(s)                0 bytes
    2 dir(s)                4,266.55 MB free

C:\wordproc\memos>_
C:\wordproc\memos>cd..
C:\wordproc>rd memos
C:\wordproc>dir/w
Volume Serial Number is 216C-11F8
Directory of C:\wordproc

[.]                [.]
    0 file(s)                0 bytes
    2 dir(s)                4,266.50 MB free

C:\wordproc>cd..
C:\>rd wordproc
C:\>
```

What the Operating System Does: The User Interface

- Graphical user interface (GUI)
 - Windows and Mac OS
 - Linux
 - GNOME
 - KDE

What the Operating System Does: Processor Management

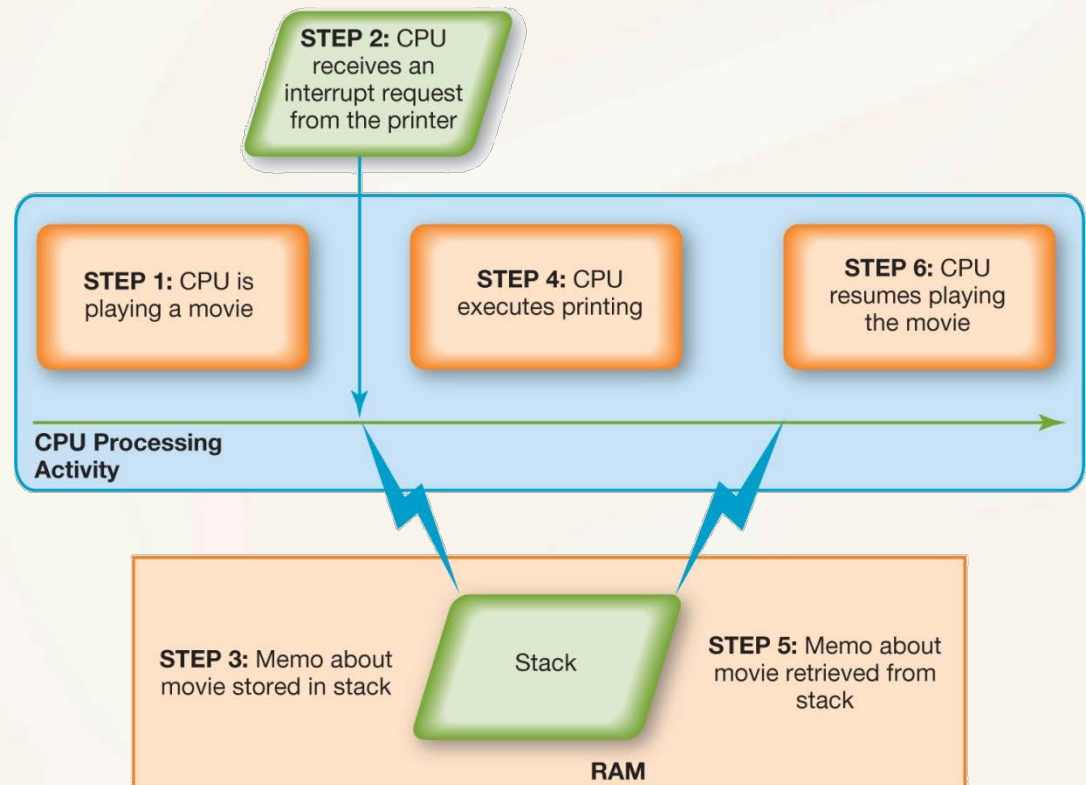
- CPU performs several tasks at once
- OS arranges for execution of activities
- Assigns time to each activity
- Switches among processes
- Appears everything happens seamlessly

What the Operating System Does: Processor Management

- Event
 - Sequentially or concurrently
 - OS switches back and forth

What the Operating System Does: Processor Management

- Interrupt
- Interrupt handler
- Preemptive multitasking



What the Operating System Does: Processor Management

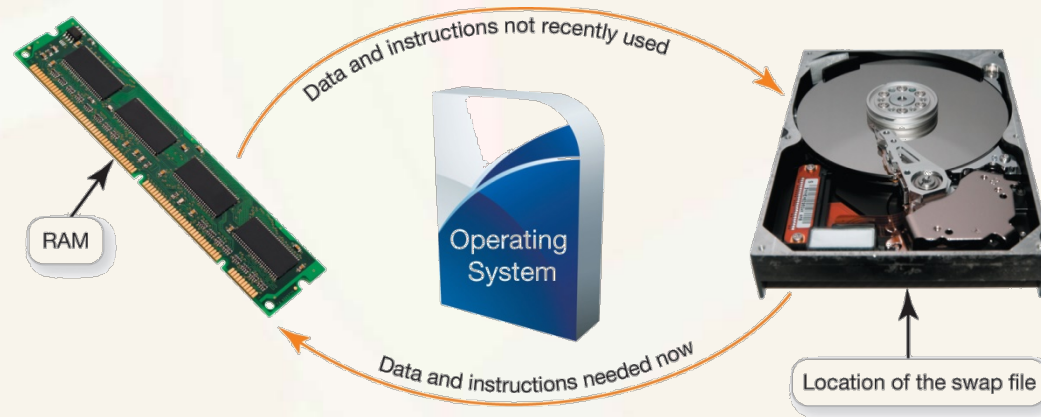
- When OS receives interrupt:
 - Suspends current activity
 - Creates memo in the stack
- OS coordinates activities for peripheral devices

What the Operating System Does: Memory and Storage Management

- OS uses RAM as a temporary storage
- Processor accesses these instructions and data from RAM
- OS is responsible for coordinating space allocation in RAM
- Clears item from RAM when processor no longer needs them

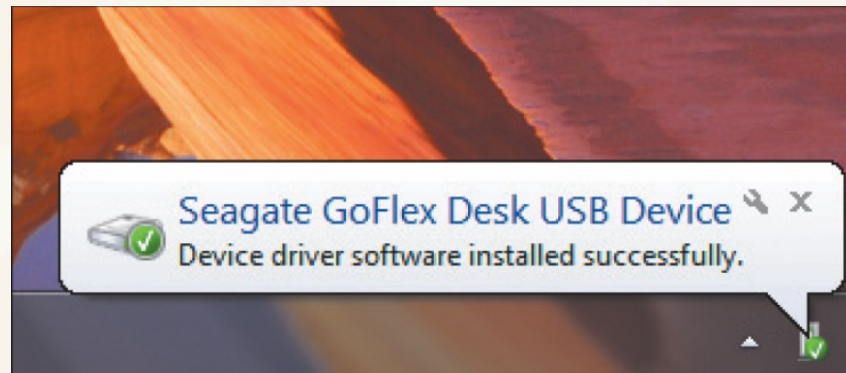
What the Operating System Does: Virtual Memory

- RAM
 - Limited capacity
- When RAM is full, instructions and data are stored on the hard drive
- Borrowing hard drive space is called virtual memory
- Increase RAM to avoid using virtual memory



What the Operating System Does: Hardware and Peripheral Device Management

- Device drivers
- Plug and Play (PnP)

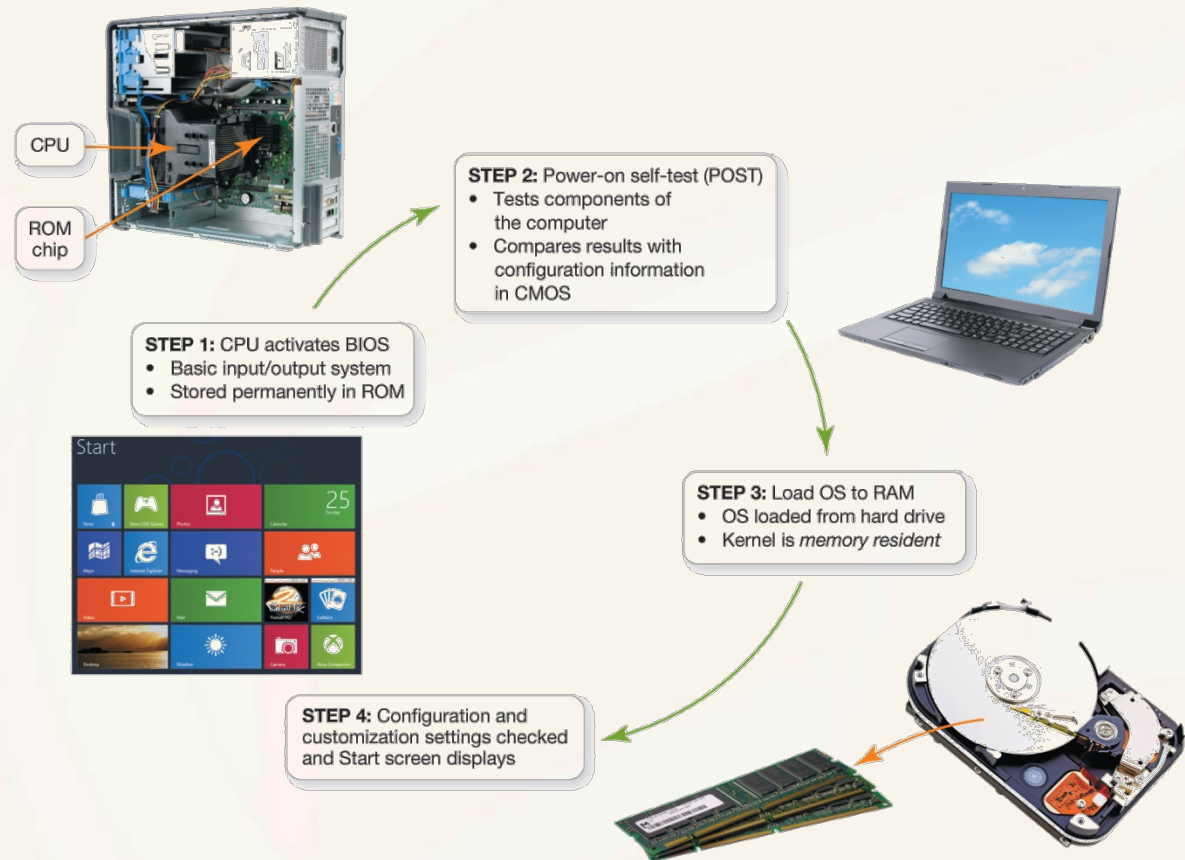


What the Operating System Does: Software Application Coordination

- For programs to work, they must contain code the CPU recognizes
- Application programming interface (API)

The Boot Process: Starting the Computer

- The boot process loads the operating system into RAM



The Boot Process: Starting the Computer:

Step 1: Activating BIOS

- CPU activates the basic input/output system (BIOS)
- BIOS
 - Loads OS into RAM
 - Stored on ROM

The Boot Process: Starting the Computer: Step 2: Performing the Power-On Self-Test

- Power-on self-test (POST)
 - CMOS—complementary metal-oxide semiconductor

The Boot Process: Starting the Computer:

Step 3: Loading the OS

- System files
- Loads OS into RAM
 - Kernel is loaded
 - Kernel: essential component of the OS
 - Responsible for managing the processor and all components

The Boot Process: Starting the Computer:

Step 4: Checking Further Configurations and Customizations

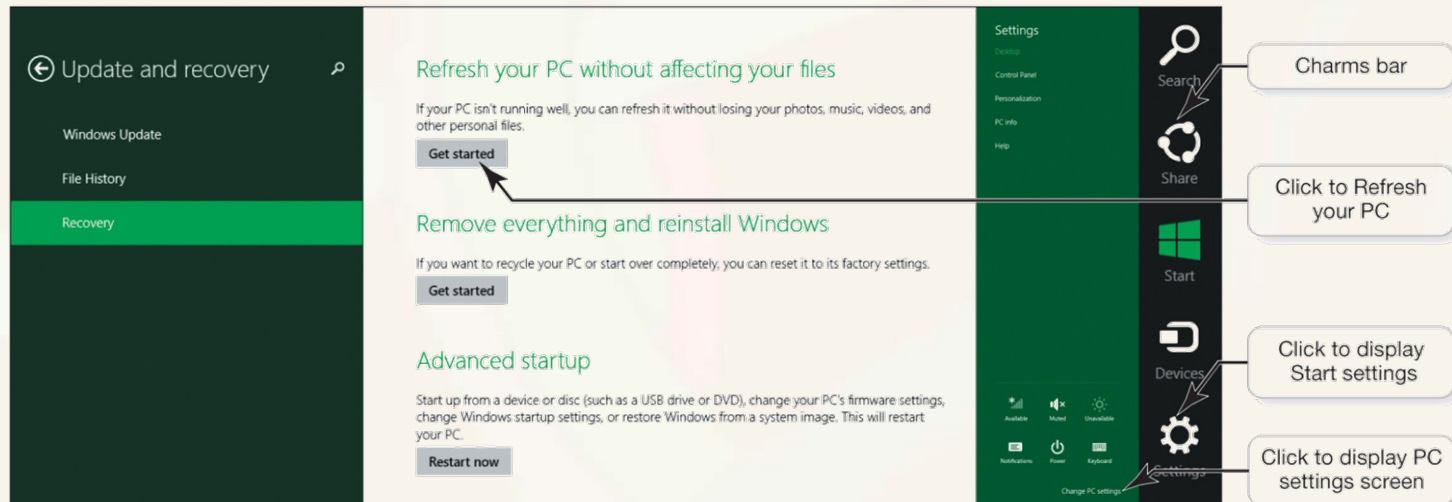
- Checks registry for configuration of other system components
- Authentication
- Windows 8
 - Default setting: Microsoft account

The Boot Process: Starting the Computer: Handling Errors in the Boot Process

- Uninstall recently installed software
 - Use uninstall program or Control Panel
- Last Known Good Configuration
- Try refreshing your computer
 - New in Windows 8

The Boot Process: Starting the Computer: Handling Errors in the Boot Process

- Refresh your PC:
 - New utility program in Windows 8
 - Attempts to diagnose and fix errors
 - Back up PC prior to refreshing



The Boot Process: Starting the Computer: Handling Errors in the Boot Process

- During the boot process, BIOS can skip a device or improperly identify it
- Device won't respond
 - Reboot
 - Check for patches
 - Technical assistance

Check Your Understanding

What software is included in system software?

- Operating system (OS)
 - Controls how your computer system functions
- Utility programs
 - Perform general housekeeping tasks for the computer, such as system maintenance and file compression

Check Your Understanding

What are the different kinds of operating systems?

- Real-time operating systems (RTOSs) - require no user intervention
- Multiuser operating system (network operating system) - provides access to a computer system by more than one user at a time
- Smartphones have their own specific operating systems, which allow the user to multitask
- Tablets use operating systems (such as iOS, Android, and Windows 8) that allow interaction with touchscreen interfaces
- Gaming consoles use operating systems developed specifically for those particular devices

Check Your Understanding

What are the most common operating systems?

- Microsoft Windows
 - Windows 8.1
- Mac OS
 - Mac OS X, is based on the UNIX OS
- Linux - an open source OS based on UNIX

Check Your Understanding

How does the operating system provide a means for users to interact with the computer?

- The OS provides a user interface that enables users to interact with the computer
- Graphical user interface (GUI) is most popular today
- GUIs display graphics and use the point-and-click technology of the mouse and cursor (or touch-sensitive screens)
- Common features of GUIs include windows, menus, and icons

Check Your Understanding

How does the operating system help manage resources such as the processor, memory, storage, hardware, and peripheral devices?

- When the OS allows you to perform more than one task at a time, it is multitasking
- The OS controls the timing of the events on which the processor works
- RAM is used as a temporary storage area for instructions and data the processor needs
- The OS manages storage by providing a file management system that keeps track of the names and locations of files and programs
- Programs called device drivers facilitate communication between devices attached to the computer and the OS
 - Device drivers translate the specialized commands of devices to commands that the OS can understand, and vice versa, enabling the OS to communicate with every device in the computer system

Check Your Understanding

How does the operating system interact with application software?

- For programs to work with the CPU, they must contain code that the CPU recognizes
- The OS includes the blocks of code to which software applications refer
 - These blocks of code are called application programming interfaces (APIs)

Check Your Understanding

How does the operating system help the computer start up?

- When you start your computer, it runs through a special process called the boot process. The boot process consists of four basic steps:
 - (1) The basic input/output system (BIOS) is activated when the user powers on the CPU
 - (2) In the POST check, the BIOS verifies that all attached devices are in place
 - (3) The OS is loaded into RAM
 - (4) Configuration and customization settings are checked

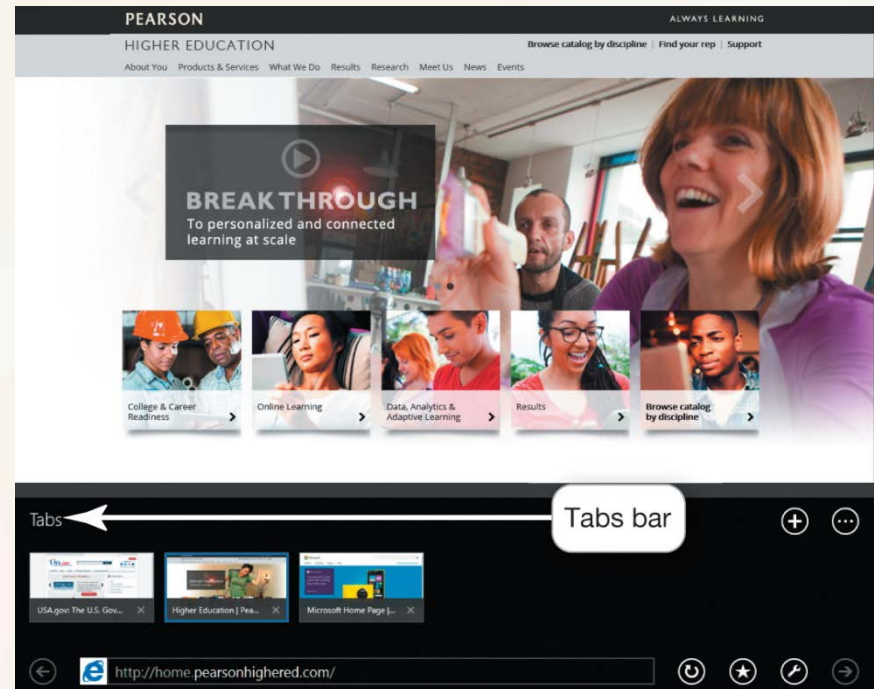
The Windows Interface

- Windows 8
 - Laptops, smartphones, and tablets
 - Three ways to accomplish tasks
 - Using a mouse
 - Touching the screen
 - Using keystrokes
 - Start screen



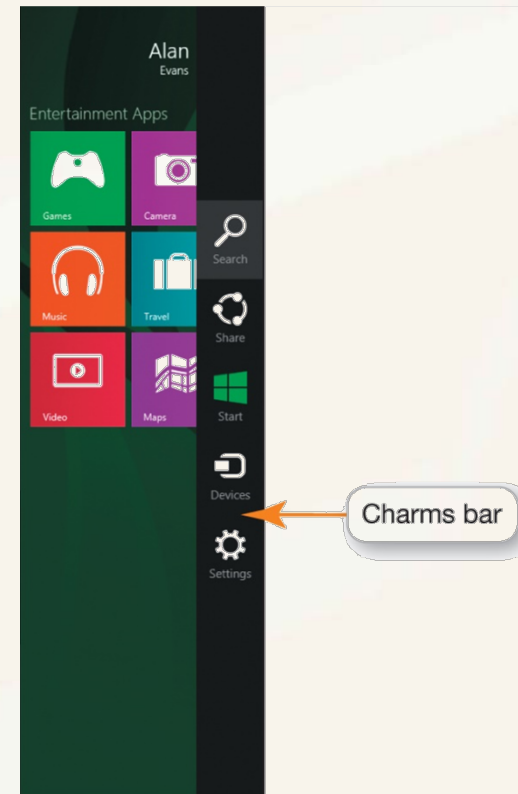
The Windows Interface

- Windows 8 apps
 - Preinstalled
 - Download from Windows Store
 - Displayed full-screen
 - Controls and settings are contained in app bars



The Windows Interface

- Start screen based on Windows smartphones
- Charms
- Pinning

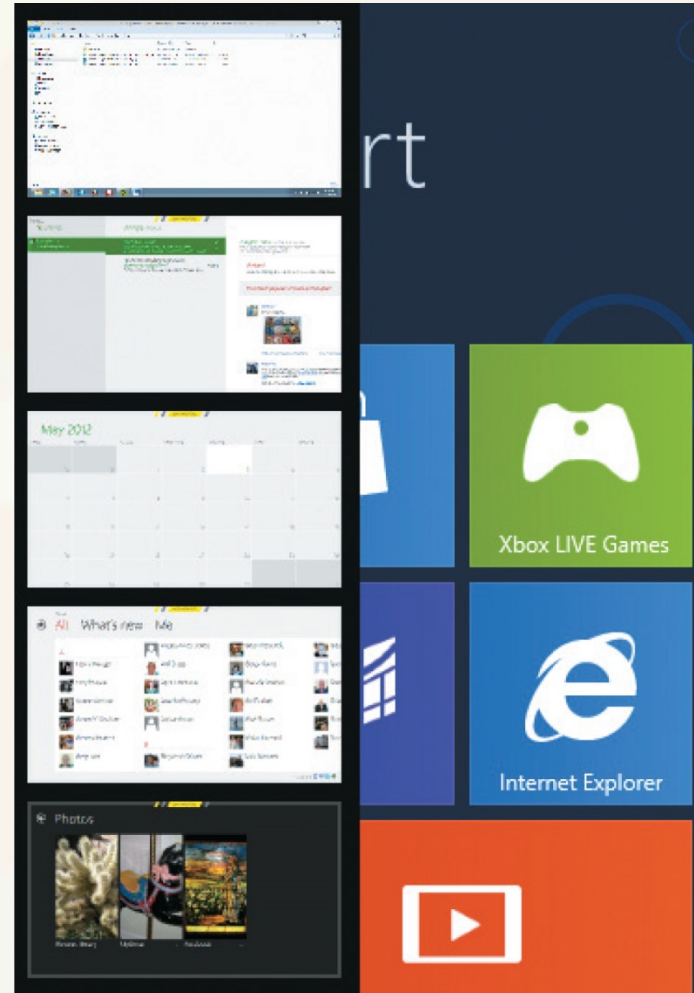


The Windows Interface

- Start button in Windows 8.1
 - Located on desktop taskbar
 - Does not have functionality of old Windows 7 Start button
 - Returns to the Start screen
 - Right-clicking lower left corner of screen
 - Jump List

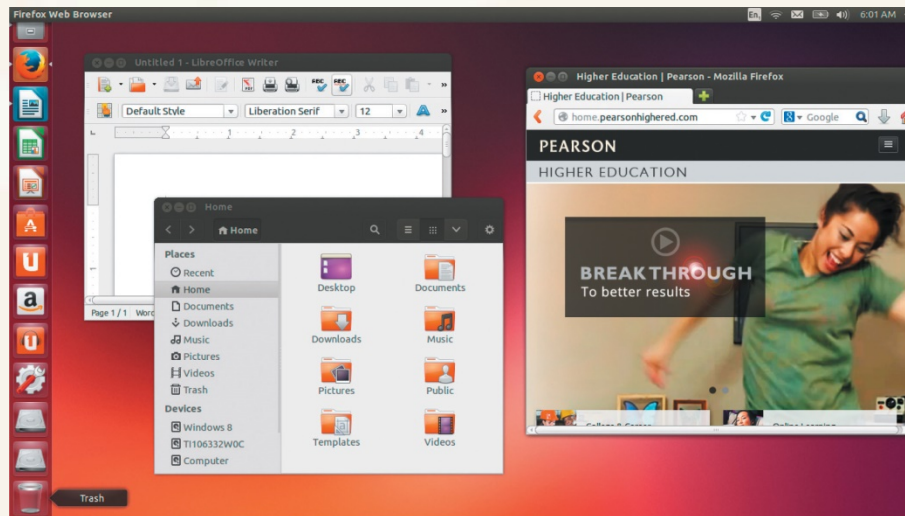
The Windows Interface

- Switching between programs
- Display a list of open programs



The Windows Interface

- Mac OS X and Windows
 - Not compatible
 - Similar in functionality
- Linux
 - Most interfaces are based on familiar Windows and OS X paradigms



Organizing Your Computer: File Management

- Additional function of the operating system
- Organizational structure
- Hierarchical directory structure
 - Folders
 - Libraries
 - Drives
- Root directory

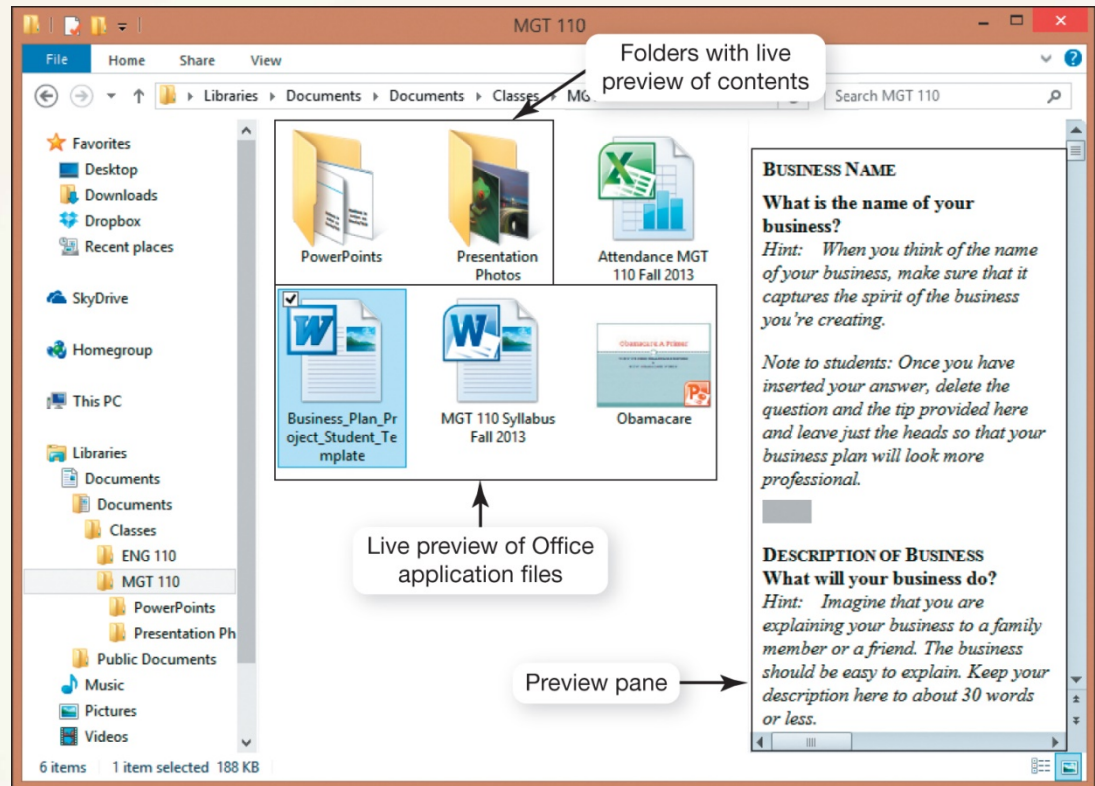
Organizing Your Computer: File Management:

Organizing Your Files

- File Explorer
- Creating folders
 - Key to organizing files

Organizing Your Computer: File Management: Viewing and Sorting Files and Folders

- View tab
 - Details view
 - Large Icons view
 - Search app



Organizing Your Computer: File Management: Naming Files

- File name
- Extension, or file type

Common File Name Extensions

EXTENSION	TYPE OF DOCUMENT	APPLICATION
.docx	Word processing document	Microsoft Word 2007 and later
.xlsx	Workbook	Microsoft Excel 2007 and later
.accdb	Database	Microsoft Access 2007 and later
.pptx	Presentation	Microsoft PowerPoint 2007 and later
.pdf	Portable Document Format	Adobe Acrobat or Adobe Reader
.rtf	Text (Rich Text Format)	Any program that can read text documents
.txt	Text	Any program that can read text documents
.htm or .html	HyperText Markup Language (HTML) for a web page	Any program that can read HTML
.jpg	Joint Photographic Experts Group (JPEG) image	Most programs capable of displaying images
.zip	Compressed file	Various file compression programs

Organizing Your Computer: File Management: Naming Files

- Naming conventions
- Up to 255 characters
- All files must be uniquely identified

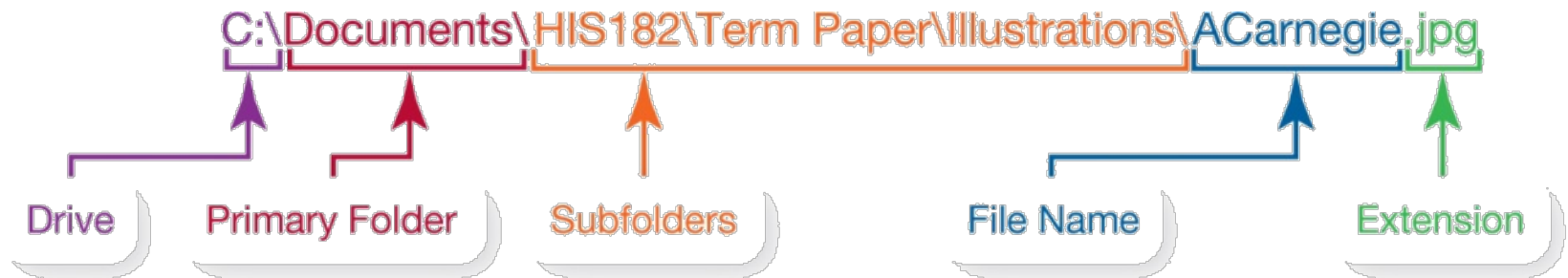
File-Naming Conventions

	OS X	WINDOWS
File and folder name length	As many as 255 characters*	As many as 255 characters
Case sensitive?	Yes	No
Forbidden characters	Colon (:)	" / \ * ? < > :
File extensions needed?	No	Yes

**Note: Although OS X supports file names with as many as 255 characters, many applications running on OS X still support only file names with a maximum of 31 characters.*

Organizing Your Computer: File Management: Naming Files

- File Save Location
 - Determine location of a file by its file path
 - File path



Organizing Your Computer: File Management: Working with Files

- File-management actions
 - Open
 - Copy
 - Move
 - Rename
 - Delete

Organizing Your Computer: File Management: Working with Files

- Recovering deleted files
 - File History utility
 - File retrieval programs
 - FarStone's RestoreIT
 - Norton Ghost

Utility Programs

- Incorporated into operating system
 - Firewall and file-compression utilities
- Standalone utility programs
 - Antivirus and security programs
 - Freeware

Utility Programs: Display Utilities

- Personalization
 - Background
 - Screen savers
 - Window colors
- Downloadable options

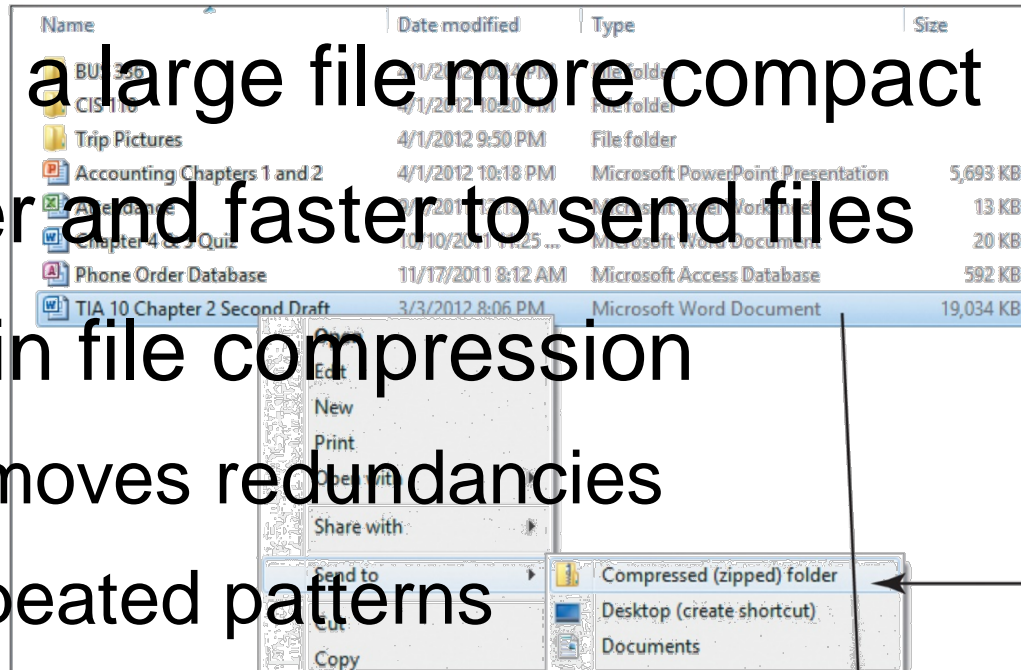
Utility Programs:

The Programs and Features Utility

- Installing a new program
 - Installation wizard

Utility Programs: File Compression Utilities

- Make a large file more compact
- Easier and faster to send files
- Built-in file compression
 - Removes redundancies
 - Repeated patterns

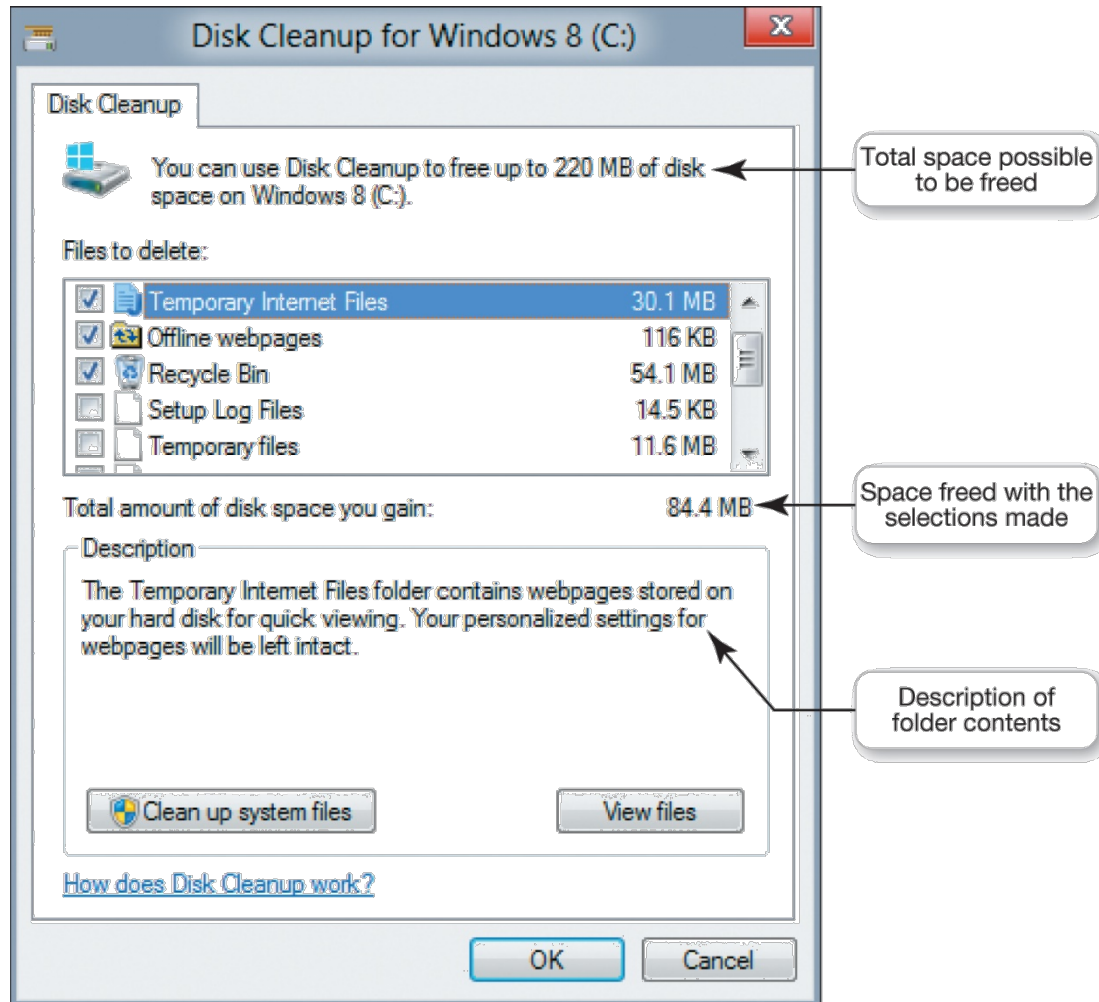


Compressed (zipped) folder

Phone Order Database	11/17/2011 8:12 AM	Microsoft Access Database	592 KB
TIA 10 Chapter 2 Second Draft	3/3/2012 8:06 PM	Microsoft Word Document	19,034 KB
TIA 10 Chapter 2 Second Draft	4/2/2012 12:44 AM	Compressed (zipped) Folder	18,457 KB

Compression reduces file size from 19,034 KB to 18,457 KB

Utility Programs: System Maintenance Utilities

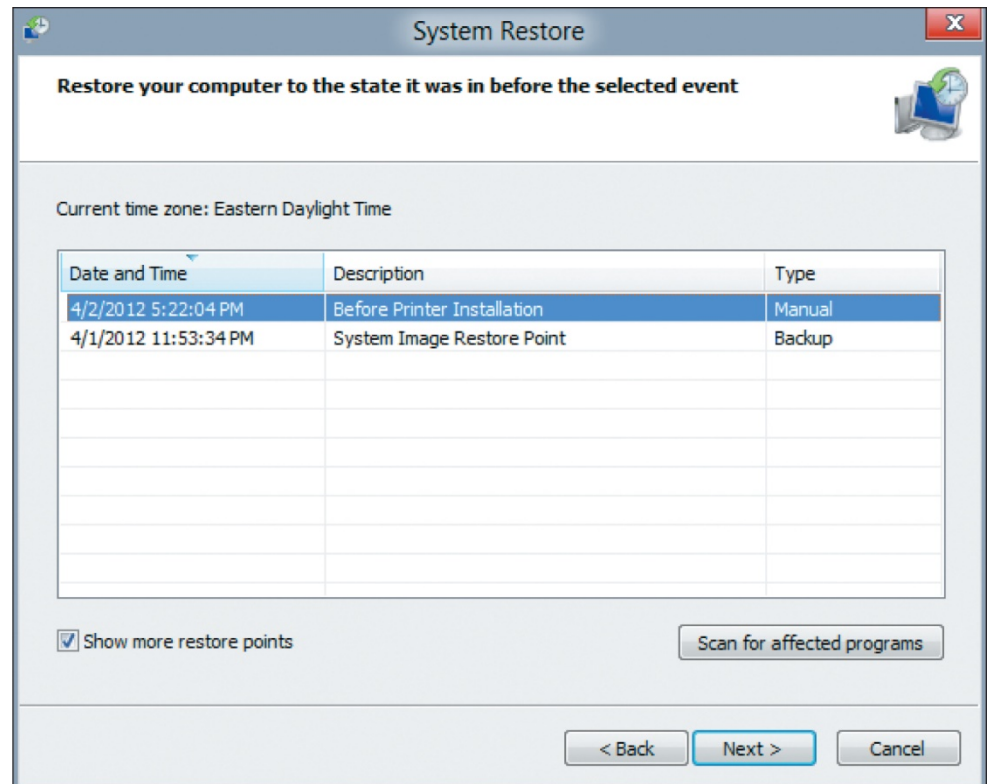


Utility Programs: System Maintenance Utilities

- Disk Defragmenter
- Error-checking
 - File allocation table (FAT)
- Task Manager

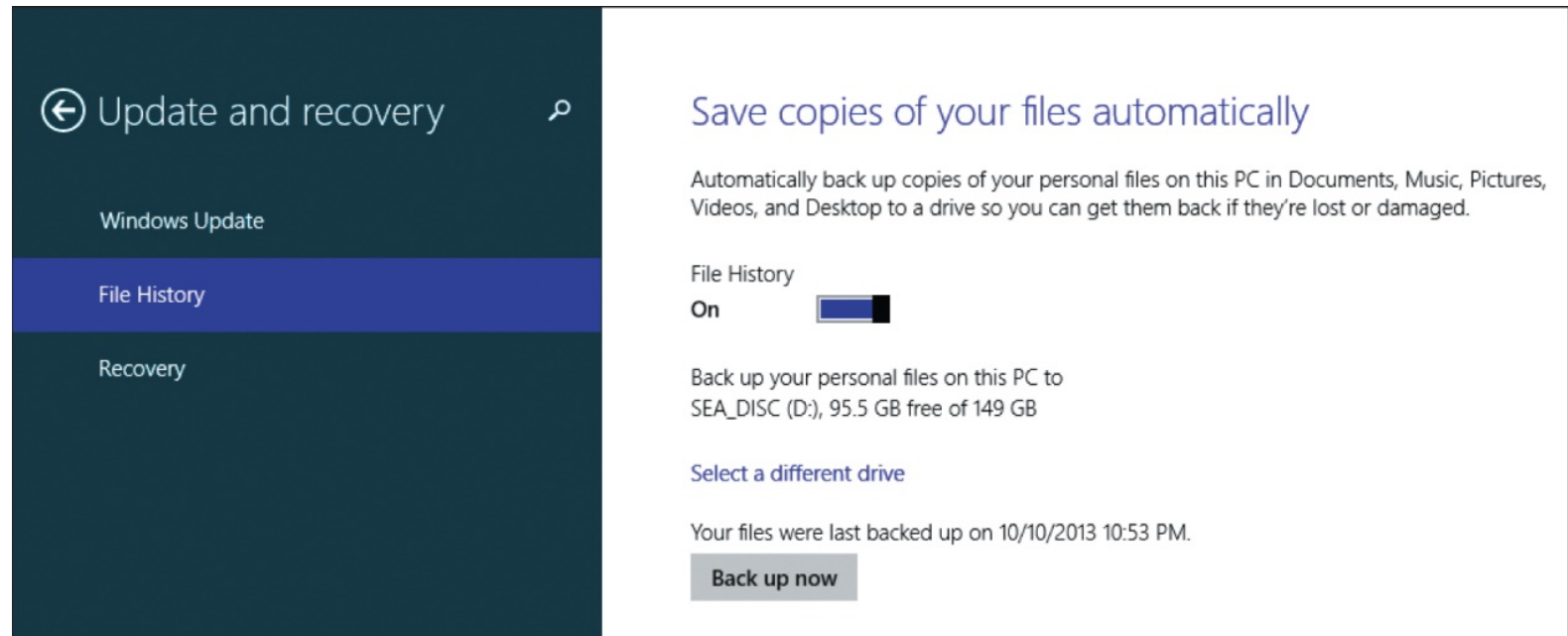
Utility Programs: System Restore and Backup Utilities

- System restore point
 - Made every week
 - Before installing software
 - Custom restore point





Utility Programs: System Restore and Backup Utilities

- File History utility in Windows 8.1
- Backup



Utility Programs: Accessibility Utilities

- Ease of Access Center

MAGNIFIER	NARRATOR
<ul style="list-style-type: none">• Creates a separate window that displays a magnified portion of the screen 	<ul style="list-style-type: none">• Reads what is on screen• Can read the contents of a window, menu options, or text you have typed 

SPEECH RECOGNITION	ON-SCREEN KEYBOARD	HIGH CONTRAST
<ul style="list-style-type: none">• Allows you to dictate text and control your computer by voice 	<ul style="list-style-type: none">• Allows you to type with a pointing device 	<ul style="list-style-type: none">• Color schemes invert screen colors for vision-impaired individuals 

Check Your Understanding

What are the main features of the Windows interface?

- The Start screen provides your first interaction with the OS
- Start screen provides you with access to your computer's apps, tools, and commonly used programs
- Windows 8 interface is designed for touchscreen devices
- Windows 8 apps run full-screen and feature commands hidden in app bars
- Non-Windows 8 programs run on the desktop

Check Your Understanding


How does the operating system help you keep your computer organized?

- The OS allows you to organize the contents of your computer in a hierarchical structure of directories that includes files, folders, libraries, and drives
- File Explorer helps you manage your files and folders by showing the location and contents of every drive, folder, and file on your computer
- Creating folders is the key to organizing files because folders keep related documents together
- Following naming conventions and using proper file extensions are also important aspects of file management

Check Your Understanding

What utility programs are included in system software and what do they do?

- Common Windows utilities include those that:
 - Enable you to adjust your display
 - Allow you to add or remove programs
 - Compress files
 - Clean unnecessary files off your system
 - Check for lost files and errors
 - Restore your system to an earlier setting
 - Back up your files
 - Check on programs that have stopped running.



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