CH 1: Operating System Management

- Identify Operating Systems
- Windows Features and Tools
- Manage Files
- Manage Disks
- Manage

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Topic A: Identify Common Operating Systems

Operating system types

- Business, (NOS) Network Operating System, Home, Smartphone/Tablet
  - Windows 10 and Windows 11 versions and editions
  - Windows Server versions
  - Apple macOS:
  - Upgrades and compatibility

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What Is an Operating System?

The OS provides the interface between the hardware, application programs, and the user.

Enables hardware, software, and users to communicate.

Handles basic system functions:

- Hardware interfaces
- Input/output

Consists of core files (Kernel), device drivers, and programs.

Command-line interface or GUI (Shell).

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OS Types

Market Section	Description
Business client	OS designed to work as a client on business networks.
NOS	OS designed to run on servers on business networks.
Home client	OS designed to work on standalone or workgroup PCs in a home or small office environment.
Cell phone/Tablet	OS designed to work with a handheld portable device. For this section, the OSs must have a touch-operated interface.

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Compatibility Issues

- Running applications on different OS's (Platforms) is not always a compatible.
  - Developers create platform-specific versions of apps.
- OS updates are affected by compatibility issues.
  - New code in an OS might cause an app or device driver to stop working.
  - Extensive testing before adoption in some business environments.
- Web apps partially mitigate the OS update concerns.
- Different OSs might communicate over a network differently.
  - Common network protocols must be supported for global communication.

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Microsoft Windows

Microsoft Windows:

- A GUI-based OS for home and business users that has been developed into client and server versions.

Shell:

- It is the main layer between the OS and hardware for operating systems.

Kernel:

- It is the main layer between the OS and hardware

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Microsoft Windows Versions

- Windows 11
  - Windows 11 was officially released on 5 October 2021
  - The current version of 11at the time of writing version 21H2
  - New center-aligned taskbar, and other features.

Licensing and upgrade rights

- (OEM) Original equipment manufacturer - (valid for that device only)
- Retail license - (transferred between computers)

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Windows Editions

Editions for different markets:

- Windows 10 & 11 editions:
  - Home
  - Pro/ Pro Workstatin
  - Enterprise
  - Education

- Windows Mobile
  - Consistent user interface and code base for all devices.
  - Ships on Windows 10 Mobile smart- phones and Surface tablets.

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OS Lifecycles

End of life system: A system that is no longer supported by the developer or vendor.

- No more security updates.
  - Critical vulnerability for active systems.

- Windows support lifecycle policy:
  - 5 years mainstream support per version.
  - 5 years extended support per version.
  - Dependent on Service Pack applications.
  - For Windows 10 feature updates, 18 or 30 months depending on edition.

- Always verify hardware compatibility before installing or upgrading an OS.

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Windows Versions (No longer Tested)

- Windows 7
- Windows Vista
- Windows XP

Not Supported or (EOL)
End of life state!

- Windows 11
- Windows 10
- Windows 8

Extended support

More limited patch and support availability

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Work and Education Features

Other Windows editions are designed for use at work and in education.

- Pro, Enterprise, and Education editions
  - OEM, retail, and volume licensing'
- Domain access versus workgroup

Additional features

- Group Policy Editor (gpedit.msc)
  - Lock desktop
  - Styles/personalization
  - Apply uniform policies
- BitLocker
- Remote Desktop server

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32-Bit and 64-Bit Windows

- All versions and editions are available as 32-bit or 64-bit software.
- 64-bit Windows can run 32-bit apps.
- 32-bit Windows can't run 64-bit apps.
- 64-bit Windows requires 64-bit device drivers signed by Microsoft.
  - If no 64-bit driver is available, the hardware can't be used on a 64-bit Windows installation.

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Windows System Limits

Windows Home System Limitations:

- Windows Home does not support the use of multiple CPUs
- Windows Home does not support the use of Domain access, Bit Locker, ex..
- Multicore (up to 64 cores) and Hyper-Threading.
- The 64-bit edition is restricted to 128 GB RAM.

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Windows System Limits

Windows Pro /Pro Workstation /Enterprise /Education: 10 & 11

- Pro/Education support 2 CPU up to 128 cores, 2TB memory
- Pro Workstation- (High End), support 4 CPU ,6TB memory, ReFS
- Enterprise editions support 4 CPU and, 6TB memory, ReFS

UX control –User Experience Control, more granular customization, Kiosk

The **N** editions don't include Windows Media Player, Skype, or preinstalled media apps (Music, Video, Voice Recorder).

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Windows Upgrade Paths

- Feature updates vs quality updates
  - Feature updates are identified with a name and number.
  - Example: July 2016, Microsoft released Win 10 feature update called Windows 10 Anniversary Update.
  - This release was identified with the number 1607, which corresponds to the year (2016) and month (07/July) of release.

The current version of Windows 10 at the time of writing is 21H2

The current version of Windows 11 at the time of writing is 22H2

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Windows Edition changes

- Edition changes

Existing fundamentals
Existing differentiated management and security features

Features	Home	Pro	Enterprise	Education
Device Encryption[6]	✓	✓	✓	✓
Domain Join		✓	✓	✓
Group Policy Management		✓	✓	✓
BitLocker[2]		✓	✓	✓
Enterprise Mode Internet Explorer (EMIE)		✓	✓	✓
Assigned Access 8.1		✓	✓	✓
Remote Desktop		✓	✓	✓
Direct Access			✓	✓
Windows To Go Creator			✓	✓
AppLocker			✓	✓
BranchCache			✓	✓
Start Screen Control with Group Policy			✓	✓

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Windows Upgrade Paths

- Windows 7 to Windows 10

Windows 10 Free Upgrade Plan and Matrix

Windows version and edition	Windows 10 edition
Windows 7 Starter	Home
Windows 7 Home Basic	
Windows 7 Home Premium	
Windows 7 Professional	Pro
Windows 7 Ultimate	
Windows 8.1 with Bing	Home
Windows 8.1	
Windows 8.1 Pro	Pro
Windows Phone 8.1	Mobile

Windows version	Windows edition	Upgrade target				
		Windows 10 Home	Windows 10 Pro	Windows 10 Pro Education	Windows 10 Enterprise	Windows 10 Education
Windows 7	Starter	Yes	Yes	Yes	No	Yes
	Home Basic	Yes	Yes	Yes	No	Yes
	Home Premium	Yes	Yes	Yes	No	Yes
	Professional	Downgrade	Yes	Yes	Yes	Yes
	Ultimate	Downgrade	Yes	Yes	Yes	Yes
	Enterprise	No	No	No	Yes	Yes
Windows 8.x	(Core)	Yes	Yes	Yes	No	Yes
	Professional	Downgrade	Yes	Yes	Yes	Yes
	Enterprise	No	No	No	Yes	Yes
Windows 8.x Embedded	Industry	No	No	No	Yes	No
Windows 10	Home	N/A	Yes	Yes	No	Yes
	Pro	Downgrade	N/A	Yes	Yes	Yes
	Enterprise	No	No	No	N/A	Yes
	Education	No	No	No	Downgrade	N/A

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Windows Upgrade Paths

- Windows 10 to Windows 11

Upgrade from	Upgrade to
Windows 10/11 Pro	Windows 10/11 Education Windows 10/11 Enterprise Windows 10/11 Pro Education
Windows 10/11 Pro N edition	Windows 10/11 Education N edition Windows 10/11 Enterprise N edition Windows 10/11 Pro Education N edition
Windows 10/11 Pro Education	Windows 10/11 Education
Windows 10/11 Pro Education N edition	Windows 10/11 Education N edition
Windows 10/11 Enterprise	Windows 10/11 Education
Windows 10/11 Enterprise N edition	Windows 10/11 Education N edition

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Windows File System Types

- New Technology File System (NTFS)
  - Reliability (journaling and snapshots) and security (permissions and encryption) features
  - Required file system for Windows boot volume
- File Allocation Table 32 (FAT32)
  - Legacy file system
  - Used for compatibility with other operating systems and devices (removable disks, memory cards, ...)
- Extensible File Allocation Table (exFAT)
  - Updated version of FAT32 with support for larger drives & file size. (over 4GB)

(NTFS) Key Features

- New Technology File System (NTFS) Key Features
  - Journaling—When data is written to an NTFS volume, it is re-read, verified, and logged.
  - Dynamic Disks—This disk management feature allows space on multiple physical disks to be combined into volumes.
  - Snapshots—This allows the Volume Shadow Copy Service to make read-only copies of files at given points in time even if the file is locked by another process.
  - Security—Features such as file permissions and ownership, file access audit trails, quota management, and encrypting file system (EFS)
  - POSIX Compliance—To support UNIX/Linux compatibility

(ReFS) Key Features

Resilient File System (ReFS) Is being developed as a replacement for NTFS

- ReFS is only available for Pro for Workstations and Enterprise editions

- ReFS cannot currently be used for the boot volume

The key design advantages:

- ReFS include automatic integrity checking and data scrubbing, no need running chkdsk,
- Protection against data degradation
- Built-in handling of hard disk drive failure and redundancy
- Integration of RAID functionality
- Larger Drives- NTFS provides a maximum capacity of 16 exabytes, while ReFS has 262,144 exabytes.

Apple Operating Systems

- Apple Mac OS, OS X, and macOS.
  - Available only on Apple-built machines.
  - You put a macOS on an ordinary PC
  - Only 17.04% of the market!
  - Less extra hardware available.
  - Kernel is based on UNIX.
  - Updates to Mac owners at no cost.
  - At the time of writing, supported versions are:

10.15 (Catalina), 11 (Big Sur), and 12 (Monterey).

Dock-Taskbar

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Apple Operating Systems

Spotlight

- Find files, apps, images, etc.
- Like Windows search

Finder

- The central OS file manager
- Like Windows Explorer

Remote Disk

- Optical drive from another computer
- Designed for copying files
- Will not work with audio CDs or video DV

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Apple Operating Systems

Mission Control and Spaces

- Quickly view everything that's running
- Spread out the desktop into a viewable area
- Spaces
- Multiple desktops
- Add Spaces inside of Mission Control

Keychain

- Password management
- Passwords, notes, certificates, etc.
- Integrated into the OS - Keychain Access
- Passwords and Secure Notes are encrypted
- Login password is the key

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Apple Operating Systems

System Preferences

- Like Control Panel!
- It allows users to modify various system settings,

System Preferences

- Displays
- - Networks
- - Printers
- - Scanners
- - Privacy- makes available to others across the internet or on a network
- - Accessibility
- - Time Machine

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Apple Operating Systems

Terminal

- Command line access to the operating system

Image recovery

- Build a disk image in Disk Utility
- Creates an Apple Disk Image (.dmg) file

Force Quit

- Stop an application from executing
- Some applications are badly written

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Apple Operating Systems

Boot Camp

- Dual-boot into Windows on Mac hardware
- Not virtualization
- Builds a Boot Camp partition
- Installs Windows OS and drivers

Time Machine backups

- Automatic and easy to use
- Mac OS takes snapshots if the Time Machine storage isn't available
- You can restore from the snapshot

Disk Utility

- Manage disks and images
- Similar Disk Management

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Apple Operating Systems

- Apple iOS.
  - iPhone and iPad.
  - Closed source OS based on UNIX.
  - Touch interface.
  - Gestures.
  - Update limitations for new versions (support.apple.com)

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Chrome OS

Overview

- Chrome OS is a proprietary Linux-based OS.
- Made by Google.
- OS is designed to perform all your tasks via the internet and store it in the cloud.
- Software, is installed thru Google's web apps, on your desktop
- Works on laptops designed specifically for this system: Chromebooks.

Linux Disk and File Management

Linux File Systems

- ext file systems
  - ext3
  - ext4
- VFAT
  - FAT/FAT32
- NFS

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Linux and macOS Filesystem Types

- Fourth extended filesystem (ext4)
  - Popular choice for Linux storage
  - Support for journaling and 48-bit addressing
  - Third extended filesystem (ext3) limited to 32-bit addressing
- Apple File System (APFS)
  - Support for 64-bit addressing, journaling, and encryption

Mount point: A partition or volume mapped to a folder in another file system rather than allocated a drive letter.

UNIX-Based Operating Systems

UNIX: Family of OSs typically running mission critical applications and infrastructure.

UNIX is portable to different hardware platforms.

- Interchangeable shells run on the kernel to provide the user interface
- Several versions/flavors of UNIX.
  - Often not compatible.
  - Not always open source.

Distos:

- Solaris – macOS – Darwin - IBM AIX - HP-UX

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UNIX /Linux

System updates

- • Command line tools
- • apt-get, yum
- • Graphical update managers

Driver/firmware updates

- • Many drivers are in the kernel
- • Updated when the kernel updates

• Commands are similar in both Linux and Mac OS

Vendor Life Cycle Limitations

Hardware compatibility and update limitations

- Support for peripheral devices

Network compatibility

- Devices running different operating systems cannot “talk” to one another directly.
- The operating systems must support Common network protocols(Tcp/IP) that allow data to be exchanged.

User training and support

- Different desktop styles by a new OS version or changing from one OS to another:
- Users struggle to navigate the new desktop and file system.

Screenshot courtesy of Microsoft

BETA Life Cycle

A public BETA phase might be used to gather user feedback.

• While the product is being actively marketed, the vendor releases regular patches to fix critical issues and feature

• During the extended support phase, the product is no longer commercially available.

• An end of life (EOL) system is one that is no longer supported by its developer or vendor. (security updates)

Linux-Based Operating Systems

Linux OS: is a fully open-source OS kernel, derived from UNIX.

- Linux OS.
  - Linux was designed to be open source.
  - Many distributions/distros of Linux.
  - Linux distributions (distros),

- Android.
  - Derived from Linux.
  - Open source.
    - Developed by mobile device manufacturers for smart phones and tablets.

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Distributions

Distributions (**distros**): A complete Linux implementation, including kernel, shell, applications, and utilities, that is packaged, distributed, and supported by a software vendor.

Red Hat/CentOS

SUSE

Debian/Ubuntu

Knoppix

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Linux User Accounts

root user: A user who has access rights to all files and resources on the system and is the default administrative account on a Linux system.

superuser: Another term for the root user.

primary group: In Linux, users can be members of one primary group and multiple supplemental groups.

effective group ID: In Linux, the group ID used by the kernel in determining the group permissions a process has when accessing files and shared resources.

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Linux Commands

1. **Wildcards:** A special character that is used to substitute characters in a string.
2. **Options (switches):** The modifiers used with Linux commands to make a command more versatile.
3. **Arguments:** Values supplied to the command for it to operate on, supplied in the correct order required by the command syntax.
4. **Pipe:** A vertical bar typed between commands to pipe or redirect the results or output of one command as the input to another command.
5. **Tab completion:** A feature in Linux that facilitates auto completion of commands and file names by pressing the Tab key.

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Distributions

Shells:

Bash	Bourne (sh)
C Shell (csh)	Korn (ksh)

CLI: Text interface where commands are entered to the OS.

Shell: An OS component that interacts directly with users and functions as the command interpreter for operating systems.

Terminal window: A computer interface for text entry and display, where information is displayed.

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Linux User Accounts

- Common user account commands:
  - **Su**: Become super user
  - **Sudo**: Execute a command as the super user
  - **Passwd**: Change a user account password

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Linux System Commands

Linux processes: An instance of a running program that performs a data processing task.
Process ID: The number assigned to a Linux process.

- **Ps**: View the current processes
- **Kill** : Stop the CMD
- **Ifconfig** : View or configure a network interface.
- **Iwconfig** : View or change wireless network configuration
- **Shutdown** –h - r

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Navigation in the Linux Directory Structure

Command	Used To
ls	List files.
pwd	Print working directory.
cd	Change directory.
cp	Copy files.
mv	Move files.
rm	Remove files.
grep	Filter files.

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UNIX /Linux-Based OS

Common CMD'S

man: help

Grep: Find text in a file

Chmod: Change mode r=read, w=write, x=execute

Chown: To change owner, user and/or group ownership of File to a new Owner.

- pwd
- mv
- cp
-rm
-ls
- df
- grep
-ps
- yum

- ip
- df
- grep
- ps
- top
- find
- dig
- cat
- nano

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Chrome Operating Systems

Chrome OS: Proprietary OS developed by Google.

Android: Open-source OS used on smart phones and tablets.

- Chrome OS.
  - Derived from Linux and Chromium.
  - Proprietary. Developed by Google for Chromebook and Chromebox.
  - Focus is on web apps.

- Android.
  - Derived from Linux.
  - Open source.
    - Developed by mobile device manufacturers for smart phones and tablets.

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Discussing OS Types

- **Apart from Windows and macOS, what operating system options are there for client PCs?**

- **ANSWER:**
  - The other main choice is one of the distributions of Linux.
  - Chrome OS is installed on Chromebox PCs.

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Discussing OS Types

- **In terms of system hardware, what is the main advantage of a 64-bit version of Windows?**

- **ANSWER:**
  - Support for more than 4 GB RAM.

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Discussing OS Types

- **A customer asks whether an iOS app will also work on her Apple macOS computer. What issue does this raise and what answer might you give?**

- **ANSWER:**
  - The issue here is compatibility between different operating systems.
  - Even though both are produced by Apple
  - iOS and macOS use different environments so the iOS app cannot be installed directly.

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Discussing OS Types

- **What feature of modern file systems assists recovery after power outages or OS crash events?**

- **ANSWER:**
  - Journaling - file system keeps a log of updates that it can use to recover damaged data.

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Topic B: Use Windows Features and Tools

Windows Tools:

- Folder in the Windows 11 Control Panel.
- Administrative Tools is in Windows 10 Control Panel.
- These folders contain tools for system administrators and advanced user

Windows Features:

- Windowed Apps. ...
- Cortana. ... (phasing out)
- Hello. ...
- Edge. ...
- Action Center. ...
- Virtual Desktops. ...
- Xbox Streaming.

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Windows Settings and Control Panel

The Windows Settings app and Control Panel are the two main interfaces for administering Windows.

All Windows configuration data is ultimately held in a database called the Registry….

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Windows Settings and Control Panel

- Windows Settings:
  - Touchscreen enabled
  - Most (but not all) configuration settings are here

  - Windows 10 feature update tends to move configuration options from Control Panel
  - to Windows 10 & 11 Settings.

Different: Windows 11, the Settings app has no “home” page. Use the Menu icon to navigate

User Accounts

User account: A logon ID used to access a Windows computer.

Protection through authentication.

Profile contains settings and default document folders.

Administrator and standard user accounts.

Local and Microsoft accounts.

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Accounts Settings

- Accounts settings app
  - Local versus Microsoft account
  - Administrator versus standard user
  - Sign-in options
  - Add other users plus family settings

- User Accounts control panel applet
  - Manage other accounts and change account type
  - Change User Access Control (UAC) settings

Accounts Settings

- UAC
  - User Account Control
  - Administrator versus standard user
  - Sign-in options
  - Add other users plus family settings

- User Accounts control panel
  - Manage accounts and change account type
  - Security Shield icon: Confirmation of admin rights usage.

Ease of Access Settings

- Setting up assistive technologies for those who need them.
  - Configure input and output settings that are appropriate to user needs
  - Add other users plus family settings
- User Accounts control panel
  - Interaction configures options for keyboard and mouse usability. The user can
  - also enable speech- and eye-controlled input methods..

Privacy Settings

- Data collection
  - Ad and services personalization
  - Speech recognition and typing personalization
  - Diagnostics
  - Activity history
  - App permissions

Administrative Tools

- Component Services
- Computer Management
- Data Sources
- Event Viewer
- Local Security Policy
- Print Management
- Reliability and Performance Monitoring
- Services

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Access Options for System Tools

- My Computer or This PC
- WinX/Power Users menu

- Instant Search box and Run command

Management consoles:

- devmgmt.msc –Device Manager
- diskmgmt.msc – Disk Management
- compmgmt.msc – Computer Management

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Command Line Tools

Command Prompt

```
Microsoft Windows [Version 10.0.17134.285]
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C:\Users\James>netstat -abo
The requested operation requires elevation.

C:\Users\James>
```

- Some commands require elevated privileges.

Administrator: Command Prompt

```
Microsoft Windows [Version 10.0.17134.285]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>
```

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Windows Shutdown Options

- Shut down
- Standby/Sleep
- Hibernate
- Log off
- Switch user
- Lock
- Restart

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The Windows Registry

- The Registry
  - Stores configuration information for hardware, OS, and apps.
  - Structure:
    - Root keys
    - Subkeys
    - Values
    - Hives

- Registry Editor (regedit)
  - Impot /export: C:windows / sys32 /Config/ regback

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The Windows Registry

- HKEY_LOCAL_MACHINE (HKLM) is the most important key and contains hardware, software, and security data.
- HKEY_CURRENT_CONFIG (HKCC) contains information that identifies each hardware device installed on the computer.
- HKEY_CLASSES_ROOT (HKCR) stores information that determines which application to open when the user double-clicks a file. This file association relies on the file's extension. Data for this key is gathered from the HKLM key and the HKCU key.
- HKEY_USERS (HKU) contains data about all users and is taken from the DEFAULT hive.
- HKEY_CURRENT_USER (HKCU) contains data about the current user. The key is built when a user signs in using data kept in the HKEY_USERS key and in the Ntuser.dat file of the current user.

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Topic C: Manage Files in Windows

File Explorer enables you:

- open, copy, move, rename, view, and delete files and folders.
- Windows 11 is getting Tab's!

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File Explorer Objectives

- System objects
  - In Windows, access to data files is typically mediated by system objects.
  - Objectives - in the left-hand navigation pane in File Explorer. Some of the main system
  - Objects are: User account, OneDrive account, This PC, Network, Recycle Bin, …
- Home Folder / Profile
  - Roaming Profile
  - Users each user has a folder named after their user account.
  - This subfolder contains NTUSER.DAT (registry data)

System Hierarchies

Root directory C: Top of the file directory structure on a drive.
File extension: Characters at the end of a file name; used by an OS to identify the application that is associated with a file.

- Local drives.
- Folder creation rules:
  - Unique names within a folder.
  - No \ / : * ? < > |
  - Full path: no more than 260 characters.

- File creation.
  - Text or binary data.
  - File name extensions.

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System Files

System files: The files necessary for the operating system to function properly.

- System files and folders in a typical Windows installation:
  - Windows
  - Program Files/Program Files (x86)
  - Users
  - Bootmgr = first sector to help boot Windows
  - pagefile.sys = virtual Disk
  - hiberfil.sys = hibernate mode

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File Attributes

Attribute: A characteristic that can be associated with a file or folder that provides the operating system with important information about the file or folder and how it is intended to be used by system users.

Attribute	Usage
Read-only (R)	Prevents changes being saved back to the file. The user will be prompted to create another file containing the modified data.
Hidden (H)	Specifies whether the file is visible in the default view (it is possible to adjust Windows to display hidden files and folders, though).
System (S)	Specifies that the file should not be accessible to ordinary users.
Archive (A)	Shows whether a file has changed since the last backup.

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Permissions

- Needed to view, create, modify, and delete files or folders.
  - Full control
  - Modify
  - Read/list/execute
  - Write

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Folder Indexing

- Windows 10 **View** tab controls how files and folders are shown.
  - Hide extensions for known file types.
  - Hidden files and folders.
  - Hide protected operating system files.

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Directory Navigation at the Command Prompt

- Command prompt shows your location in the directory structure.
  - If you are at C:\, the command prompt is C: \ >
- Default drives:
  - Standard user: C: \ %HomePath%
  - Administrator: C: \ Windows \ System32

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Directory Navigation at the Command Prompt

Wildcard: A special character that is used to substitute characters in a string.

- Listing files and directories with the dir command.
  - Switches
- Wildcards:
  - Question mark
  - Asterisk

Examples of wildcard characters

Character	Description
*	Matches any number of characters. You can use the asterisk (*) anywhere in a character string.
?	Matches a single alphabet in a specific position.
[ ]	Matches characters within the brackets.
!	Excludes characters inside the brackets.

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Discussing Windows Features and Tools

- **A user asks you how they can change Ease of Access settings. In which management interface(s) are these settings located in the different versions of Windows?**

- **ANSWER:**
  - User-level features like this are configured via the Control Panel in Windows 7.
  - In Windows 10 and Windows 11, there are Ease of Access settings in both the Control Panel and in the PC Settings/Windows Settings app but don't worry if you just answered "Settings app."
  - It is also worth remembering that you can use Instant Search to return a list of user configuration options quickly.

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Discussing Windows Features and Tools

- **You receive a call from a Windows 10 user who wants to "speed his computer up." After questioning him, you find that he is getting frustrated at having to click through UAC authorizations. He asks how to turn them off. Explain how this is done. Should you offer any other advice?**

- **ANSWER:**
  - There are several ways to disable User Account Control (UAC) but the simplest is via the User Accounts applet in Control Panel.
  - You can also just search for "UAC" to open the dialog box.

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Discussing Windows Features and Tools

- **True or false? Each version of Windows has an Administrative Tools shortcut folder in Control Panel.**

- **ANSWER:**
  - True—the contents do vary from version to version though.

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Discussing Windows Features and Tools

- **When would you use the mmc command?**

- **ANSWER:**
  - A Microsoft Management Console (MMC) is used for Windows administration. Running mmc opens an empty console.

  - You would do this to create a custom toolkit of the snap-ins used to configure advanced features of Windows. You can save the custom console for future use.

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Discussing Windows Features and Tools

- **You need to assist a user in changing the extension of a file. Assuming default Explorer view settings, How do you do it?**

- **ANSWER:**
  - Open a new command prompt window with sufficient privileges. You can right-click the Command Prompt icon and select Run as administrator or press Ctrl+Shift+Enter with the icon selected.

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Discussing Windows Features and Tools

- **Why might you run the shutdown command with the /t switch?**

- **ANSWER:**
  - To specify a delay between running the command and shutdown starting. You might do this to give users a chance to save work or to ensure that a computer is restarted overnight.

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Discussing Windows Features and Tools

- **What tasks would you perform using the regedit tool?**

- **ANSWER:**
  - This tool allows you to make manual changes to the Window Registry database. You can also use it to export and back up portions of the registry. You might also import registry files to apply a suggested fix.

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Topic D: Manage Disks in Windows

The Windows Disk Management Console

- Partition splits physical disk

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Disk Partitions

- **Partitioning:** The act of dividing a physical disk into logically separate storage areas, often referred to as drives.

MBR or GPT contains partition information.

Basic or dynamic.

MBR-style partitioning:

- Up to 4 primary partitions; 1 partition can be active or bootable.
- Boot sectors.
- System partition and boot partition.

GPT-style partitioning:

- Required for 64-bit Windows on UEFI firmware.
- Supports up to 128 primary partitions.
- Larger partitions and backups, plus a protective MBR for backward compatibility.

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File Systems

Sector: A uniformly sized subdivision of a drive track.

Cluster: A group of sectors.

- High-level formatting prepares the partition for the OS.
- Sectors and clusters:
  - Sectors were traditionally 512 bytes.
  - Clusters are groups of 2, 4, or 8 sectors.
  - Some sectors now 4096K.

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Discussing File Management In Windows

- **Which are the main location(s) for system files in Windows?**

- **ANSWER:**
  - The Windows folder (or system root) contains the files used to run Windows itself.
  - Program Files contains the executable and settings files installed by desktop applications.
  - You might also mention that the Users folder contains user settings files, user-specific application data, and user-generated data files.
  - There are also some additional hidden folders (notably ProgramData) but do not worry if you have not included these.

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Discussing File Management In Windows

- **You receive a call from a user trying to save a file and receiving an "Access Denied" error. Assuming a normal configuration with no underlying file corruption, encryption, or malware issue, what is the cause and what do you suggest?**

- **ANSWER:**
  - The user does not have "Write" or "Modify" permission to that folder. If there is no configuration issue, you should advise the user about the storage locations permitted for user-generated files. If there were a configuration issue, you would investigate why the user had not been granted the correct permissions for the target folder.

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Discussing File Management In Windows

- **You need to assist a user in changing the extension of a file. Assuming default Explorer view settings, what steps must the user take?**

- **ANSWER:**
  - The user must first show file extensions, using the View tab in the Folder Options applet. In Windows 8/10, extensions can be shown through a check box on the View menu ribbon. The user can then right-click the file and select Rename or press F2 and overtype the extension part.

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Discussing File Management In Windows

- **What is the effect of running the cd.. command?**

- **ANSWER:**
  - Change the directory focus to the parent directory (equivalent of Up One Folder).

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Discussing File Management In Windows

- **Which Windows command is probably best suited for scripting file backup operations?**

- **ANSWER:**
  - The robocopy command offers more options than xcopy so will usually be the better choice. The copy command is quite basic and probably not suitable.

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The Windows Disk Management Console

- Disk Management console.
  - Drives in the top pane.
  - Disks in the bottom pane.

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The Windows Disk Management Console

- Disk initialization

Drive addition and drive letter assignment

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The Windows Disk Management Console

- Drive letter and mount point assignment.

Drive formatting

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Disk Arrays

Array: (RAID) A set of vendor-independent specifications for fault-tolerant configurations on multiple-disk systems.

- Fixed disks are required.
- Dynamic volume types:
  - Simple
  - Spanned
  - Striped
  - Mirrored
  - RAID 5

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Storage Spaces

- Windows 8/10 feature for configuring disk arrays.

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Storage Spaces

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Mount Points and Disk Images

Mount point: A partition or volume mapped to a folder in another file system rather than allocated a drive letter.

- Mount points provide access to other file systems.
- Disk images provide access to virtual machines.

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Disk and Volume Management at the Command Prompt

- The diskpart command
- Basic process:
  - Run diskpart
  - Enter select disk 0
  - Enter detail disk
  - Enter select partition (volume) 0
  - Enter detail partition (volume)
  - Enter exit

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Disk and Volume Management at the Command Prompt

- The format command:
  - Formats a drive and removes all existing data.
  - Syntax: format *volume* switches

Switch	Use
/fs:	Specify the file system (NTFS, FAT, or FAT32).
/v:	Enter a label for the volume.
/q	Perform a quick format (does not scan for bad sectors).
/a:	Specify the size of allocation units (512, 1024, 2048, 4096, 8192, 16K, 32K, 64K).
/x	Force the volume to dismount. This will cause file errors for users with files open on the volume.
/c	Enable file compression if using NTFS. Avoid enabling compression on the drive root, especially if the drive contains system files.

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Discussing Windows Disk Management

- **If a single physical disk is divided into three partitions, how many different file systems can be supported?**

- **ANSWER:**
  - Three—each partition can use a different file system.

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Discussing Windows Disk Management

- **What is the difference between the boot partition and the system partition?**

- **ANSWER:**
  - The system partition contains the boot files; the boot partition contains the system root (OS files).

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Discussing Windows Disk Management

- **What type of partitioning scheme must a disk use if Windows is installed to a 64-bit UEFI-based computer?**

- **ANSWER:**
  - GPT-style partitioning.

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Discussing Windows Disk Management

- **True or false? A volume or partition MUST be assigned a drive letter to access it via Explorer.**

- **ANSWER:**
  - False—assigning a drive letter is common practice, but a partition can be mounted to any point in the file system.

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Discussing Windows Disk Management

- **You are troubleshooting a problem and find a disk marked as "foreign" listed under Drive Management. What does this mean?**

- **ANSWER:**
  - The disk was configured as dynamic under a different computer then installed in this one. You need to import the disk to make it usable.

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Discussing Windows Disk Management

- **A customer with a Windows 10 Home computer contacts you. She stores family photos on the computer's hard disk, but says she has read about disk failure and worries that they might be at risk. Is she right to be concerned and what solutions can you suggest?**

- **ANSWER:**
  - The customer is right to consider the risk and take steps to mitigate it. One option is to make a backup of the files so that they are always stored on at least two devices. You could also suggest configuring the RAID-like functionality available with the Storage Spaces feature of Windows 10. Note that you cannot recommend Dynamic Disks as that is not available with the Home edition. Using both Storage Spaces and an offsite backup method, such as copying to a cloud drive, will give the best protection.

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Discussing Windows Disk Management

- **Is the command format d: /fs:exfat /q valid? If so, what is its effect, and what precaution might you need to take before running it?**

- **ANSWER:**
  - Yes, it is valid. It formats drive D with the exFAT file system by using a quick format (does not scan for bad sectors). This will delete the file table on the drive so existing data files can be overwritten—the formatted drive will appear to be empty in Explorer. If there are existing files that need to be preserved, they should be backed up before running the format command.

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Discussing Windows Disk Management

- **Diagnose the configuration and error status shown in this exhibit. Examine the screenshot. Can you explain the current configuration, the status of the configuration, and next steps to remedy the error?**
  (Screenshot used with permission from Microsoft.)

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Discussing Windows Disk Management

- **ANSWER:**
  - You should be able to identify that a mirrored volume has been configured using the Dynamic Disks feature. One of the disks is missing—you cannot tell why from the screenshot, but it could have been physically removed or is damaged. You might also be able to identify from the Failed redundancy message that the volume has been reactivated, so data files are still accessible. The volume is at risk though, as failure of the remaining disk would result in complete data loss. You need to back up files on the volume as a matter of urgency. You should then either repair the mirror with the old drive or a new drive. If it is not possible to repair the mirror, you should recreate it with a new disk and restore files from backup.

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Topic E: Manage Devices in Windows

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Power Options

- Power management depends on hardware, firmware, and OS.
- ACPI power levels:
  - Standby/Suspend to RAM.
  - Hibernate/Suspend to Disk.
- Windows sleep and hybrid modes.
- Power Options applet.

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Display and Sound Devices

- Personalization settings in Control Panel or Windows Settings.
  - Display resolution.
  - Color depth and refresh rate.

- Sound applet for sound settings.

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Hardware Device Configuration and Management

Plug and Play: Universal Plug-and-Play (UPnP) is a protocol devices to autoconfigure services, such as allowing request for appropriate settings from a firewall.

- Windows automatically detects new or changed hardware, finds drivers, and installs and configures the device.
- Minimal user input includes installing vendor's driver.

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Hardware Device Configuration and Management

- Add Hardware Wizard

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Hardware Device Configuration and Management

- Devices and Printers:
  - Windows 7 and 8

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Hardware Device Configuration and Management

- Devices page in Windows Settings:
  - Windows 10

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Device Manager

- Device Manager:

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Device Manager

- A device driver is a small piece of software that tells the operating system and other software how to communicate with a piece of hardware.

- **Device**

- **Driver**

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Device Manager

- Device Manager:
  - Troubleshooting
  - Updates
  - Device properties
  - Verification of installation
  - Uninstall a device.

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Hardware Diagnostics

- Troubleshooting app

Located -Control Panel

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Hardware Diagnostics

- System Information
- Located -Control Panel –Admin tools

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Hardware Diagnostics

- DirectX Diagnostic Tool
- Type Dxdiag.exe

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Discussing Windows Device Management

- **You are supporting a user with a Windows 10 Home PC. The user has installed a computer game, but the game will not run. The computer is fitted with a dedicated graphics adapter. You determine that the adapter driver should be updated, but there is no newer driver available via Windows Update. How should you proceed?**

- **ANSWER:**
  - Browse the graphics adapter vendor's website and use the card's model number in the driver search tool to look for the latest version. Compare the version information for the driver on the website to the installed version (use Device Manager to check the installed version number). If the website driver is newer, download and run the setup file to install and configure it. You should ensure that the setup file is digitally signed by the vendor. If the driver is only provided as a compressed archive, extract the driver files then use the Update Driver button in Device Manager to select it for use with the adapter.

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Discussing Windows Device Management

- **You are supporting a user who has installed a vendor keyboard driver. The keyboard no longer functions correctly. Under Windows 10, what are the steps to revert to the previous driver?**

- **ANSWER:**
  - Open Device Manager from the WinX menu, Instant Search, or the Computer Management console. Expand Keyboards then right-click the device and select Properties. On the Driver tab, select Rollback Driver.

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Discussing Windows Device Management

- **A Windows 7 Professional user is trying to join a video conference and cannot hear any sound from her headset or the computer's built-in speakers. Which tool can you suggest using to try to remedy the fault?**

- **ANSWER:**
  - There is an automated Windows Troubleshooting tool for diagnosing and correcting problems with audio playback. You should advise the customer to open the Troubleshooting applet in Control Panel and select the troubleshooter for audio playback.

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Discussing Windows Device Management

- **You are troubleshooting an issue with a wireless adapter. When you open Device Manager, you find the device's icon is shown with a down arrow superimposed. What does this mean and why might this configuration have been imposed?**

- **ANSWER:**
  - The icon indicates that the device has been disabled. It could be that there was a fault or there may be a network configuration or security reason for disabling the adapter. In this sort of situation, use incident logs and device documentation to establish the reason behind the configuration change.

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Discussing Windows Device Management

- **Identify how to open the tool shown in this exhibit. (Screenshot used with permission from Microsoft.) What single word command can you use to open the tool shown in the exhibit? For what sort of troubleshooting task might you need to use the information shown?**

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Discussing Windows Device Management

- **ANSWER:**
  - Run the System Information tool using the msinfo32 command. Each hardware device uses hardware resources such as an Interrupt Request (IRQ) line to communicate with the processor. You might need to investigate these if using devices that are not Plug-and-Play compatible.

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Discussing Windows Device Management

- **You are assisting a laptop user. While she was away from her desk, the laptop has powered off. The user was in the middle of working on a file and had forgotten to save changes. Can you reassure her and advise on the best course of action?**

- **ANSWER:**
  - When a computer goes into a power saving mode, it will either maintain a small amount of power to the memory modules or write the contents of memory to a hibernation file on disk. Consequently, the user should be able to start the laptop again and the desktop will resume with the open file still there. You should advise the customer to save changes to files regularly however.

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