

# Operating System

An Operating System is a collection of programs that *control* the computer system.

The four main areas of Operating System or OS (oh-ess) control are:

## Hardware

The OS controls your computer and its attached peripheral hardware. For example, when you type on the keyboard, the OS senses it and instructs the computer to reset switches in memory and display your words on screen. When you select the print command, the OS instructs the printer to print.

## Programs

The OS controls the other programs you use. For example, when you start a program, the OS instructs the computer to find it on disk and copy its magnetic settings to the switches in memory. When you quit a program, the OS frees up the computer's memory to make room for new programs.

## Data

The OS controls your data. For example, when you want to save changed switch settings, the OS finds an available track and sector on your disk and instructs the disk read/write head to magnetize particles to match. When you want to retrieve saved data, the OS finds it on the disk and resets the switches in memory to match.

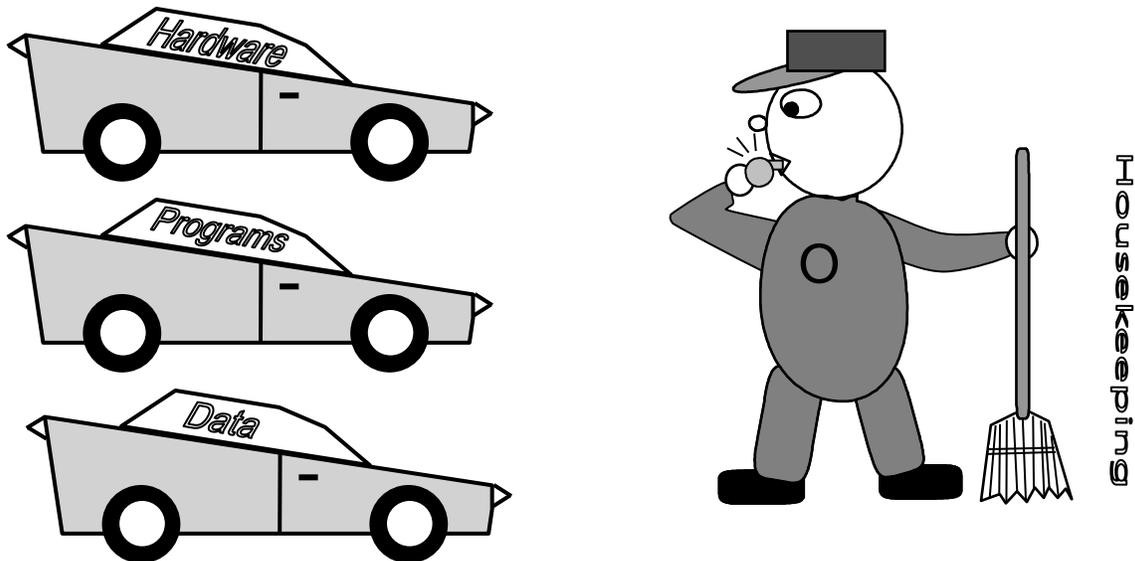
## Housekeeping

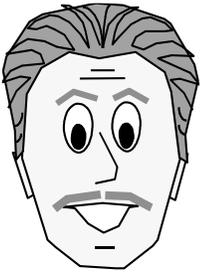
The OS helps you control the computer system environment with a variety of disk and file housekeeping tools such as format, copy, backup, erase, move, rename, or make a folder.



Imagine a policeman named OS (awss) controlling traffic. OS is the boss! In one hand he holds a whistle to control three vehicles named Hardware, Programs, and Data. In his other hand he holds a Housekeeping broom to sweep up the streets (the city budget is tight!).

## OS CONTROLS





*Since most users shy away from Operating Systems as being too hard or technical, your knowledge of this vital program type will set you apart, giving you the confidence to perform tasks that others fear or have no clue how to attempt. Following are some of the most common OS terms and concepts.*

## DOS / NOS

DOS (dawss) is an acronym for Disk Operating System.

DOS rhymes with "boss" which is also an apt description for a master control program. DOS got its name because it was developed for *disk*-based computers. (Earlier computers used magnetic tape.) DOS OS's are primarily text-based (most modern OS's are graphics-based). Different versions of DOS exist for different types of computers.

NOS (nawss) is an acronym for Network Operating System.

A NOS controls two or more networked (connected) computers, allowing them to communicate with each other and share peripheral devices.

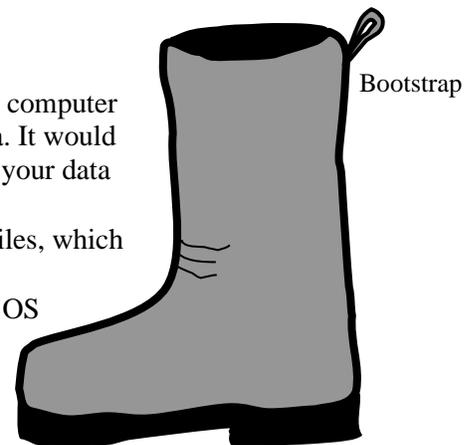
**Trap!** Don't call an *Operating* System an *Operation* System.

## BOOT

Boot is the process of loading the OS to memory.

When you turn on your computer, several things occur automatically:

- Startup instructions, permanently stored inside your computer, tell the computer to test itself. It's important to test everything before you enter any data. It would be a shame to start working and find that the computer couldn't retain your data because of defective circuitry.
- The startup instructions then tell your computer to search for the OS files, which are usually stored on a magnetic disk attached to the computer.
- Finally, the startup instructions tell your computer to copy or load the OS instructions by resetting switches inside the computer to match the instructions on the disk. Once the OS is loaded, it takes over and controls everything else.



In everyday usage, "to boot" is "to start" the computer. The term comes from the saying "Pull yourself up by your bootstraps," which means to be self-sufficient. The earliest OS's were *not* self-booting. A computer operator had to insert a magnetic tape or disk and type a command to get the OS to load into computer memory.



**Analogy:** In olden days, cars had to be hand-cranked to start them. So did the earliest OS's. Today's cars are self-starting, as are today's OS's. You merely turn on the ignition (switch) and the car (computer) starts automatically.

### Cold Boot

A cold boot occurs when the computer is off (cold) and you turn it on. A cold boot takes longer because the computer's circuits must be tested prior to loading the OS.

### Warm Boot

A warm boot occurs when the computer is already on (warm), and you restart it (by pushing your computer's [Reset] button or a special key combination). Since they were tested on the cold boot, the computer's circuits don't have to be retested, which saves time. Warm booting loads a fresh copy of the OS.

**Trap!** Rebooting erases any data in memory that wasn't saved to a disk.

**Tip:** Reboot only when needed; e.g., when the computer "locks up" and stops responding to your requests.

## CONFIGURE

Configure is the OS process that matches a computer to its work environment.

Configuration settings, which are merely lists of OS instructions stored in files, tell your computer to adjust itself to the hardware and software you are using. These settings can load device drivers that tell your computer how to operate attached devices; they can make sure you verify the current date and time on each startup; or they can load your favorite program for you.

Nowadays, most configuration settings are preprogrammed at the factory or by your computer vendor, and new settings are automatically created when you install new hardware and software. But if you're careful and know what you are doing, you can tailor these settings to fix problems or maximize computer performance.

## TASK

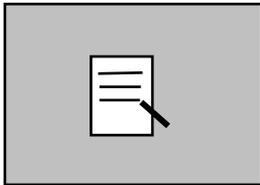
Task is the OS process that determines how many programs can run at the same time.

### Single Task

Single task OS's can run only one program at a time. This was a characteristic of older OS's, mostly due to memory limitations. When you finished a task, you had to quit the current program before starting another.

For example, you could start a word processing program to create a business letter. But if you needed to include a calculation in that letter, you'd have to quit the word processing program before you could start the calculating program. Once you had performed your calculations, you'd have to quit the calculating program before you could restart the word processing program and type in your calculations.

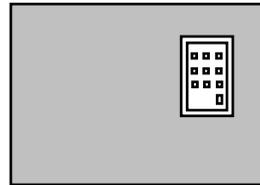
Single tasking keeps your desktop uncluttered, but it makes it difficult to work on more than one thing at a time. Imagine having to clear your real desk off every time you switched tasks.



1. Write a letter.



Clear off desktop.



2. Do some calculating.



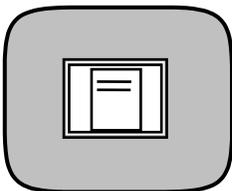
Clear off desktop.

### Multitask

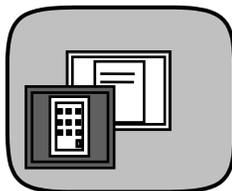
Multitask (MUL-tee-task) OS's can run many programs at a time. Thanks to today's cheap and abundant memory, you can run multiple programs on the same screen with each program in its own rectangular window.

For example, you can be typing a letter in a word processing program, then load a calculating program to work some figures, followed by a calendar program to check your appointments, followed by a client list program to look up an address, then add all this information to your letter.

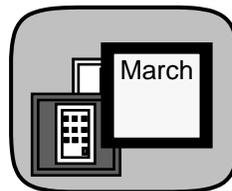
Multitasking is a more efficient way to work. Its downside is the confusion that can occur from having too many things going on at once and cluttering up your computer screen as tasks overlap.



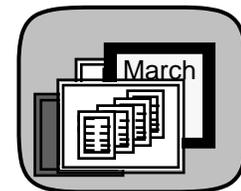
1. Write a letter.



2. Do some calculating.



3. Check your calendar.



4. Find an address.

### Background Tasks

Even in single task OS's, programs necessary for computer operation are running continuously behind the scenes. Most OS's also have the ability to run optional programs in the background, like a virus checker that continuously monitors for virus activity, or a calculator that pops up when you press a certain key combination. These types of programs are sometimes referred to as Terminate & Stay Resident or TSRs, because they can be terminated (stopped) yet remain resident in memory for the next use.

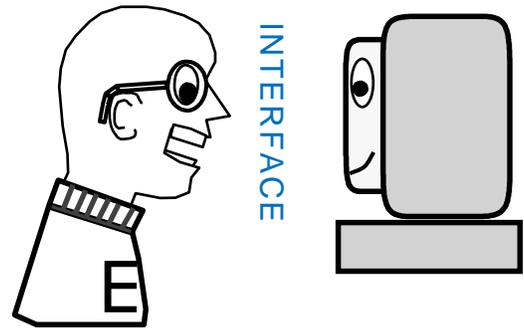
# INTERFACE

An interface is the interconnection between the user and the OS.

An interface (aka user interface) includes the equipment you use (e.g., keyboard, mouse, screen), the items you see onscreen (e.g., lists, boxes, buttons, aka "controls"), and the methods (e.g., keystrokes, mouseclicks) you use to manipulate and respond to these items.



Imagine that an *interface* is the physical space between the user's face and the computer's face.

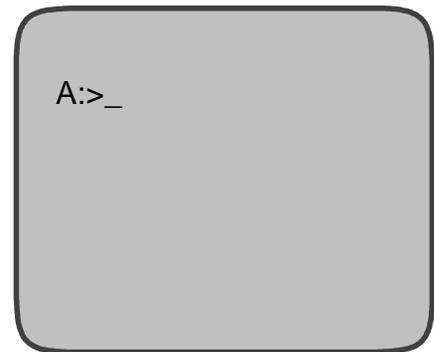


## Command Line Interface

A command line interface displays some type of "prompt" symbol that "urges" you to type a command on its line.

**Pro:** Quick access. You type in the desired command, tap the [Enter] key, and the command is instantly carried out. There is no need to wade through multiple menu levels to get to the option you want.

**Con:** Harder to use. You must remember the names of commands or refer to a user's manual or online help. You must type commands letter-by-letter following an exact syntax (punctuation).



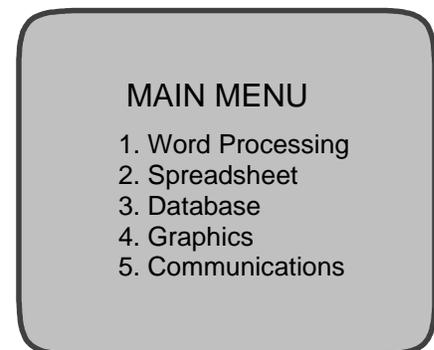
Command Line

## Menu Interface

A menu interface lists commands/options for you to select.

**Pro:** Easier to use. You do not need to remember a command, you can just travel through the menus until you find it. You choose options by pressing a key or clicking with a mouse—you do not have to type in a command or be concerned with syntax errors.

**Con:** Slower access. You may have to navigate through many submenus to get to a command. You may know of a command but not know where to find it on the menus.



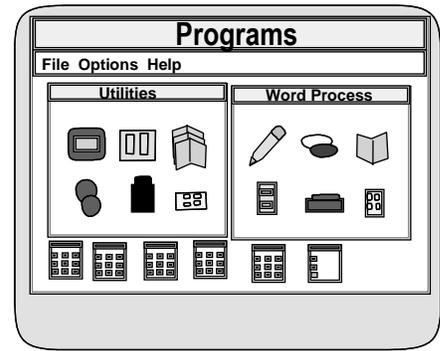
Menu

## GUI Interface

A Graphical User Interface (GUI) displays icons (small symbolic pictures) representing programs, data, or devices, that you click on with a mouse.

**Pro:** Pictures are more intuitive than words, (but to avoid ambiguity, icons are usually labeled as well). GUIs can display text/graphics on screen exactly as it will be printed, reducing the need for trial and error printouts. GUIs require programs to perform common tasks (open, save, exit, etc.) the same way, greatly reducing the time it takes to learn new programs. GUIs give you several options for performing a task (keys, mouse, menu, toolbar, etc.) to best match your operating preferences. GUIs allow several program or data files to be onscreen simultaneously.

**Con:** GUI programs are generally large and graphic intensive, hence they require more powerful—and more expensive—computers to run them. Unlabeled icons can be ambiguous. GUIs can be visually overwhelming as multiple windows and icons overlap. Having too many options for performing the same task can be confusing.



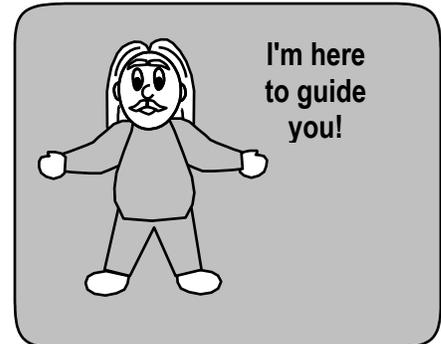
GUI

## Social Interface

A social interface displays an agent that helps you accomplish tasks, just as a real person might. Agents (aka Assistants, Butlers, Coaches, Daemons, Experts, Genies, Guides, and Wizards), can be text-only dialog boxes or human/animal graphics that offer step-by-step guidance through a procedure. Whereas standard help screens merely list the steps you must take, agent screens prompt you for input at each step, resulting in a finished product at the end. Some agents can also be "trained" to gather data or perform other functions unassisted, like retrieving electronic mail or searching for desired articles in an electronic newspaper.

**Pro:** You get a task done quickly without having to learn too much.

**Con:** You have to do the task the way the agent says to, with less room for customization. The agent may not offer to do what you need and it may not be easy to manually change what's been done for you automatically.



Social

## Browser Interface

A browser interface displays links (aka hyperlinks) to local or remote computers, programs, and data. Mouseclicking on a hyperlink, which is typically a colored word or graphic on your screen, automatically connects you to a computer that contains the information or items you seek—whether it's your own computer or a computer located halfway around the world connected to the Internet.

**Pro:** Links make nonlinear navigation easy. A single mouseclick activates links (many people struggle with the doubleclicks required in a GUI).

**Con:** Most browser "pages" have no fixed length and require frequent scrolling.



Browser

## Mixed Interface

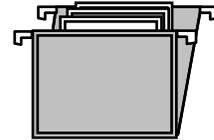
Most modern interfaces mix elements of GUI, social, and browser interfaces.

# DIRECTORY (FOLDER)

A directory is an electronic storage compartment for subdirectories and files. A subdirectory is a directory that exists inside or under another directory (sub = under as in *submarine = underwater*.) A subdirectory can in turn hold more subdirectories and files.



Drawer



Subdivider



Folder

These are the office equivalents of computer directories.

## Root

The root is the top or main directory. Technically, it's the only true directory since all other directories are beneath it (hence, they're *subdirectories*). But in everyday conversation, subdirectories are also called directories. In addition to holding subdirectories, the root generally contains OS startup files.

## FILE

A file is an electronic storage unit for programs or data.



Sheet

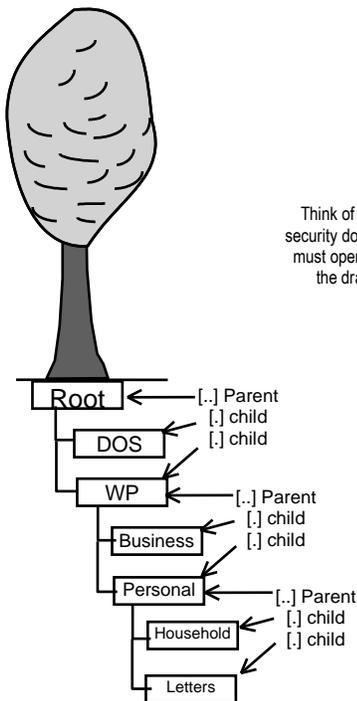
This is the office equivalent of a computer file.

# HIERARCHY

A hierarchy (HII-ur-ar-kee) is a top-to-bottom arrangement of directories. Just as you wouldn't haphazardly dump thousands of paper files into one large drawer in a filing cabinet (because it would be nearly impossible to find a particular file again), you wouldn't dump thousands of computer files into one large directory on a disk. Instead you'd create a hierarchy of directories to categorize your files. Below are a few metaphors:

## Tree-Root

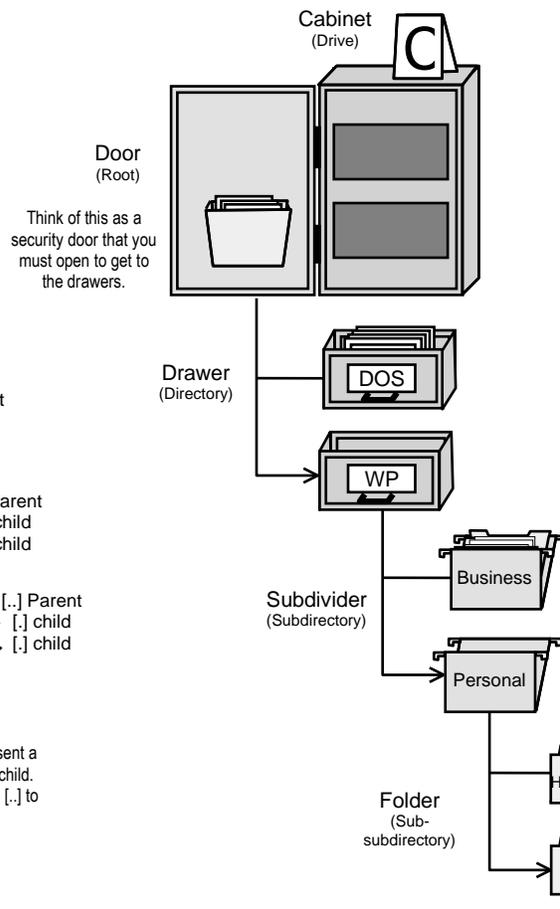
Parent-Child



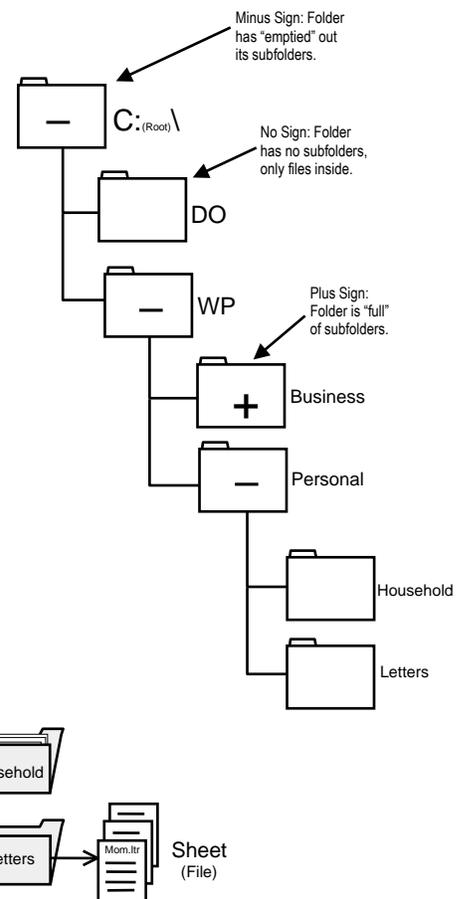
In some OS's, two dots represent a parent; one dot represents a child. BrainAid: It takes two parents [...] to have one child [...].

## Cabinet

Door-Drawer-Subdivider-Folder



## Nested Folders



# FILESPEC

A filespec (aka file specification) gives the exact location and name of a file. In a typical OS, a filespec contains the following four items:



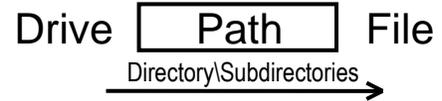
**Acronym:** D:\P\F.E (DIP-fee)  
Drive:\Path\Filename.Extension

## Drive

The drive is a motorized device that spins the disk the file resides on. In some OS's, drives are lettered alphabetically A: to Z: (a colon after the drive letter designates it as a drive and not just a capital letter) or given names such as MyDrive.

## Path

The path consists of the directories between a drive and a file. Backslashes are used (like commas) to separate directories. All paths begin with the root directory. Think of the root (which doesn't appear by name) as hiding between the drive colon and the first backslash (C:\<sub>root</sub>\). In a GUI, the root is typically represented by a drive icon or folder.



Observe that the Path is everything *between* the Drive and the File, so it does NOT include the Drive or the File.

## Filename

The filename is a file's first name. It identifies the file within its file type, just as people's first names identify them within their families (e.g., brothers John vs. Tom Smith). Some OS's restrict the length of a filename to 8 characters. Others allow filenames up to 256 characters.

## Extension

The extension is a file's last name. It indicates the file's type or family (e.g., .txt files contain text; .com files contain commands). Typically, extensions can be up to 3 characters long and are separated from the filename by a period (aka dot), (e.g., myfile.txt). Note: In some OS's, the term *extension* (aka TSR) refers to a small program that loads in the background and provides "extended" capabilities to the computer.



**Analogy:** If I asked you to get a paper file from my office, you would need to know these things:

- Cabinet: Which cabinet to look in.
- Path: The drawer, subdivider, folder to open.
- Sheet: The name of the file I wanted.

Cabinet Path Sheet

Drawer, Subdivider, Folder



Imagine walking a path



\* Following the path (arrows provided) on the Cabinet hierarchy illustration on the previous page, fill in the filespec to the sheet called Mom.ltr. Think of the door [root] on the cabinet as a security door which you must open in order to get to the drawers, subdividers, folders, and sheets.

Drive \_\_\_\_ Path \_\_\_\_\_ Filename \_\_\_\_\_ Ext \_\_\_\_\_

\* Fill in the blanks for this filespec: A:\School\Computer\Tasks\Notes.txt

Drive \_\_\_\_ Path \_\_\_\_\_ Filename \_\_\_\_\_ Ext \_\_\_\_\_

Answers

C:	[root]\WP\Personal\Letters\	Mom	ltr
A:	[root]\School\Computer\Tasks\	Notes	txt

## Filespec Tips

- When you save a file to disk, be sure to specify exactly where (drive and path) you want it to be stored.
- Be sure to use the correct extension type or the file may not list when you try to open it again.
- If you "lose" a file, try using the OS's Search or Find command to find it.

# HOUSEKEEPING COMMANDS

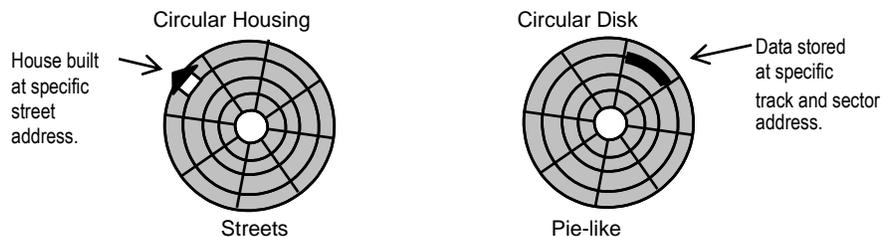
## Format (Initialize) Command

Format is a command that realigns a disk's magnetic particles to prepare it to receive files. In most computer systems, programs and data are stored on magnetic disks. Disks are made of plastic or metal covered with tiny magnetic particles aligned South or North to represent Off or On switch settings.

Before storing programs or data on a disk, it must be formatted or initialized so its magnetic particles are aligned and organized into addressable sections. When you save data to a formatted disk, the OS stores it on a concentric track of particles within a pie-like sector. You don't have to worry about where it's stored, the OS remembers for you. When you want to use your data again, the OS knows where to find it.



**Analogy:** Before houses can be built in a new housing tract, the land must be leveled and subdivided into addressable units. Similarly, before data can be stored on a new disk, the disk surface must be formatted and subdivided into addressable units. Exception: Unlike a house, which is built in a single location, data may be spread across multiple tracks and sectors.



## Disk Contents Commands

These commands let you list disk directories and files.

Besides a filename and extension, most file listings include the number of bytes (characters) stored in each file, and the date and time the file was last saved.

Office equivalent: A table of contents listing the files stored in each drawer, subdivider, and folder.

**Trap!** Make sure your computer's internal clock/calendar has the correct date and time *before* you save a file as this date and time will be "stamped" on the file. If the date or time are incorrect, and you have multiple copies of the file in different locations, you'll have trouble determining which is the newest version and may end up deleting it

## Directory Maintenance Commands

These commands let you create and maintain a directory hierarchy. You can make, change, move, rename, and remove directories as desired.

## File Maintenance Commands

These commands let you maintain your files. You can copy, move, rename, or delete files as desired.

## **Find Commands**

These commands let you search your directories for a file. Typically, you can search by filename, by extension type, by date, or by text contained in the file.

## **Backup Commands**

These commands let you make backup copies of your disks. If your originals get damaged, stolen, or lost, you'll still have copies so you can continue with your work.

**Tip:** Back up your disks after *every* work session—it can save your business or career! And store your backup disks offsite, so if natural disaster or theft occurs, you won't lose them along with the original disks.

## **Defragment (Optimize) Commands**

These commands let you reorganize your disk files to minimize saving and retrieval time.

As your disk fills up, the OS saves new files to gaps left between previously saved files. Over time, files become fragmented (broken up into several pieces electronically "chained" together) which slows down file saving and retrieval. Defragmenting rewrites all files into contiguous (joined together) segments, eliminating gaps between the files.

## **Scan & Repair Commands**

These commands let you scan a disk's surface to check for physical flaws, marking damaged areas as unusable so the OS won't try to save data to them. Some scan commands can also find and rejoin files whose "chains" have been broken and are no longer accessible through the programs that created them.

## OS SUMMARY



Write a definition for each listed term and memorize it.

Operating System—

Boot—

Configure—

Task—

Interface—

Directory—

File—

Hierarchy—

Filespec—

Path—

Format—