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Department (Communications Technical Engineering)
Class (First)
Subject (Computer) / Code (UOMU0000017)
Lecturer (Dr. Noor AbdAlKarem Mohammedali)
1st term – Lecture No. 3 & Lecture Name (Operating System)

3. Operating System and Graphical User Interface (GUI)

An Operating System (OS) is essential software that manages computer hardware and software resources, acting as an intermediary between users and the machine. It handles tasks such as file management, memory allocation, and process scheduling, providing a stable environment for applications to run efficiently. Various operating systems like Windows, macOS, Linux, and Unix cater to different user needs and system architectures, incorporating security features to protect data.

A Graphical User Interface (GUI) complements the OS by enabling intuitive interaction through visual elements such as icons, windows, and buttons, making technology more accessible to users without technical expertise. Together, operating systems and GUIs enhance usability, streamline computing tasks, and empower users to navigate and control their digital environments effectively.

3.1 Key responsibilities of an OS include:

1. Resource Management

Resource management is a fundamental function of an Operating System (OS) that ensures the efficient and fair allocation of the various hardware and software resources available in a computer system. This includes the management of the CPU, memory, storage devices, input/output devices, and network resources.

2. Task Scheduling

The OS employs various strategies to optimize resource utilization, such as process scheduling, which determines which processes should run at any given time, and memory management, which allocates and deallocates memory space for applications. Additionally, the OS ensures that multiple applications can run simultaneously without conflict, maintaining system stability and performance.

3. File Management

File management is a crucial aspect of an Operating System (OS) that involves the organization, storage, retrieval, and manipulation of data on storage devices. The OS provides a structured way to store files in a hierarchical format, typically using directories or folders, which allows users and applications to locate and manage their data easily.

4. Security

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Effective resource management also involves enforcing security and access controls to protect resources from unauthorized access or misuse. By balancing the demands of different applications and users, operating systems can maximize overall system performance, enhance user experience, and ensure that available resources are used efficiently and equitably. This capability is vital in environments ranging from personal computers to large-scale servers and cloud computing infrastructures.

3.2 Basics of Common Operating Systems

Operating Systems (OS) serve as the backbone of computer systems, managing both hardware and software resources to facilitate user interaction and application functionality. Understanding the basics of standard operating systems is essential for anyone navigating the digital landscape, whether for personal or professional use.

The most prevalent operating systems today include Windows, macOS, and Linux, each designed with unique features, interfaces, and purposes.

<u>Windows</u>

- Windows is one of the most widely used operating systems in personal and business environments worldwide. Developed by Microsoft, it is renowned for its user-friendly Graphical User Interface (GUI), which allows users to navigate their computers intuitively through visual elements like windows, icons, and menus. This accessibility has made it a staple in homes, schools, and workplaces.
- A significant advantage of Windows is its extensive software compatibility, supporting a vast ecosystem of applications ranging from productivity software like Microsoft Office to creative tools and games. This versatility caters to a diverse user base, whether casual users or business professionals, facilitating tasks such as word processing, data analysis, graphic design, and gaming. Additionally, Windows provides regular updates to enhance security, fix bugs, and introduce new features.

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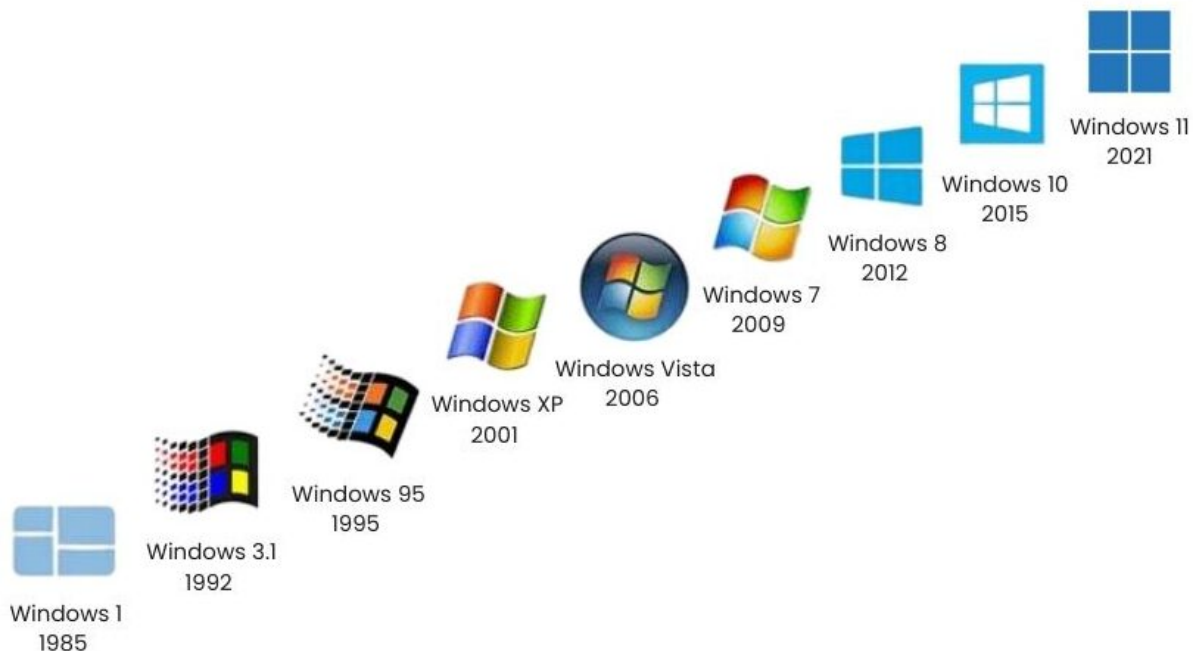
MacOS

- MacOS is the operating system developed by Apple specifically for its line of Macintosh computers. It is known for its aesthetic design and minimalist interface that emphasizes simplicity and visual appeal.
- macOS offers seamless integration with other Apple devices such as iPhones and iPads through features like Handoff, AirDrop, and Universal Clipboard, improving productivity and connectivity.
- It is built on a Unix-based foundation and includes strong security features such as built-in encryption, application sandboxing, and regular updates, making it a reliable and secure operating system.

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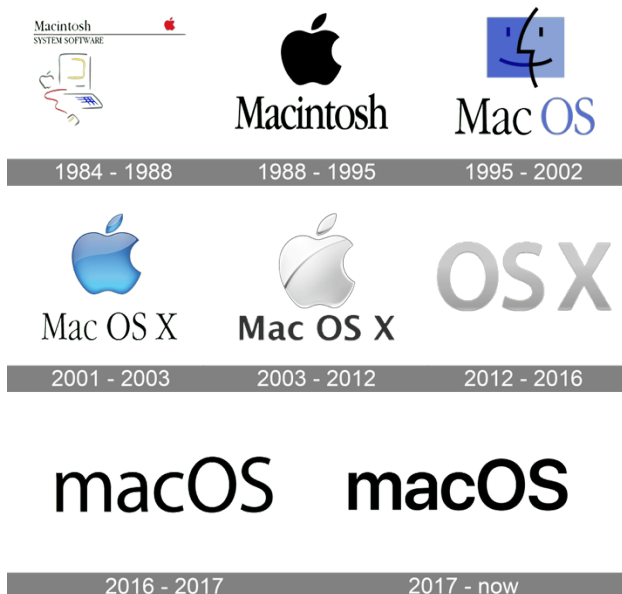
Linux

- Linux is an open-source operating system popular among developers, IT professionals, and enterprises. Its source code is freely available, allowing users to modify and customize the system.
- Linux is widely used in server environments due to its stability, efficiency, and security. It supports heavy workloads and is commonly used in cloud infrastructures.
- Popular Linux distributions include Ubuntu, Fedora, and CentOS.

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Android / iOS

- Android and iOS are mobile operating systems designed for touchscreen devices.
- Android, developed by Google, is open-source and supports a wide range of devices, making it the most widely used mobile OS.
- iOS, developed by Apple, is proprietary and known for its performance, security, and seamless ecosystem integration.
- Both platforms support app-based interactions through app stores (Google Play Store and Apple App Store).

3.3 The User Interface (UI)

The User Interface (UI) is a critical component of any operating system that determines how users interact with a computer or mobile device. It encompasses all the visual elements that allow users to navigate and utilize the system effectively, including icons, buttons, menus, and windows. A well-designed UI enhances the overall user experience by making interactions intuitive and efficient.

A. Using Mouse Techniques:

The mouse is a fundamental input device for interacting with Graphical User Interfaces (GUIs). Mastering basic mouse techniques enhances user efficiency and effectiveness when navigating through applications and menus. Here are some common mouse techniques:

1. Click: A single left-click is primarily used to select or open items, such as files, folders, or buttons within an application. It's the most basic form of interaction.
2. Double-Click: Quickly clicking the left mouse button twice allows users to open files or folders. This technique is often used in desktop environments to quickly access applications or files.

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3. Right-Click: Clicking the right mouse button opens context menus, offering additional options related to the selected item. For example, right-clicking a file may present options to rename, delete, or view properties.
4. Drag-and-Drop: This technique involves clicking on an item, holding the mouse button down, and dragging it to a new location before releasing the button. It's commonly used for moving files between folders or rearranging items on the desktop.
5. Scroll: Utilizing the scroll wheel (if present) allows users to navigate vertically through documents, web pages, or lists within windows without needing to use scroll bars. Scrolling can also involve clicking and dragging the scroll bar or using touchpad gestures on laptops.

By becoming familiar with these mouse techniques, users can navigate GUIs more efficiently, making their interactions with applications smoother and more intuitive. Each technique plays a vital role in enhancing user productivity and overall experience.
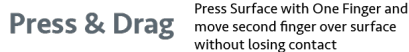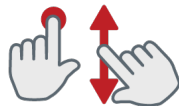

B. Using touchpad:

Using a laptop touchpad involves simple finger movements for navigation and gestures for functions like scrolling, zooming, and right-clicking, with single taps for selection, two-finger slides for scrolling/zooming (pinch/spread), and multi-finger taps or swipes for advanced tasks like switching apps or showing the desktop, all customizable in your laptop's settings
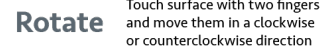
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Tap
Briefly touch surface
with fingertip

Double Tap
Rapidly touch surface
twice with fingertip

Drag
Move fingertip over
surface without
losing contact

Flick
Quickly Brush Surface
with fingertip

Pinch
Touch surface with
two fingers and bring
them closer together

Spread
Touch surface with
two fingers and
move them apart

Press
Touch surface for
extended period
of time

Press & Tap
Press surface with
one finger and briefly
touch surface with
second finger

Press & Drag
Press Surface with One Finger and
move second finger over surface
without losing contact

or

Rotate
Touch surface with two fingers
and move them in a clockwise
or counterclockwise direction

or

C. Use of Common Icons:

Icons play a vital role in user interfaces by providing small graphical representations of applications, files, commands, and system functions. They enhance navigation and usability by allowing users to quickly identify and access various features and resources. Here are some common icons and their uses:

1- Folder Icon: This icon represents a directory or a group of files, allowing users to organize and access related documents easily. Clicking on the folder icon typically opens the directory to reveal its contents.
2- Trash Bin/Recycle Bin Icon: This icon is used to delete or recover files. When a user drags a file to the trash bin, it is marked for deletion; users can also restore items from the bin if they change their minds.
3- File Icon: Each file type often has a distinct icon that represents it, such as a text document, image, or PDF. These icons help users quickly identify the type of document they are working with or looking for.
4- Shortcut Icon: A shortcut icon provides a link to quickly access a program, file, or folder without navigating to its original location. This is particularly useful for frequently used applications or documents, enabling users to save time and increase productivity.

Understanding and utilizing these common icons enhances user interaction with the operating system, making tasks more straightforward and more efficient. Their visual nature allows for instant recognition, improving overall usability and navigation within digital environments.

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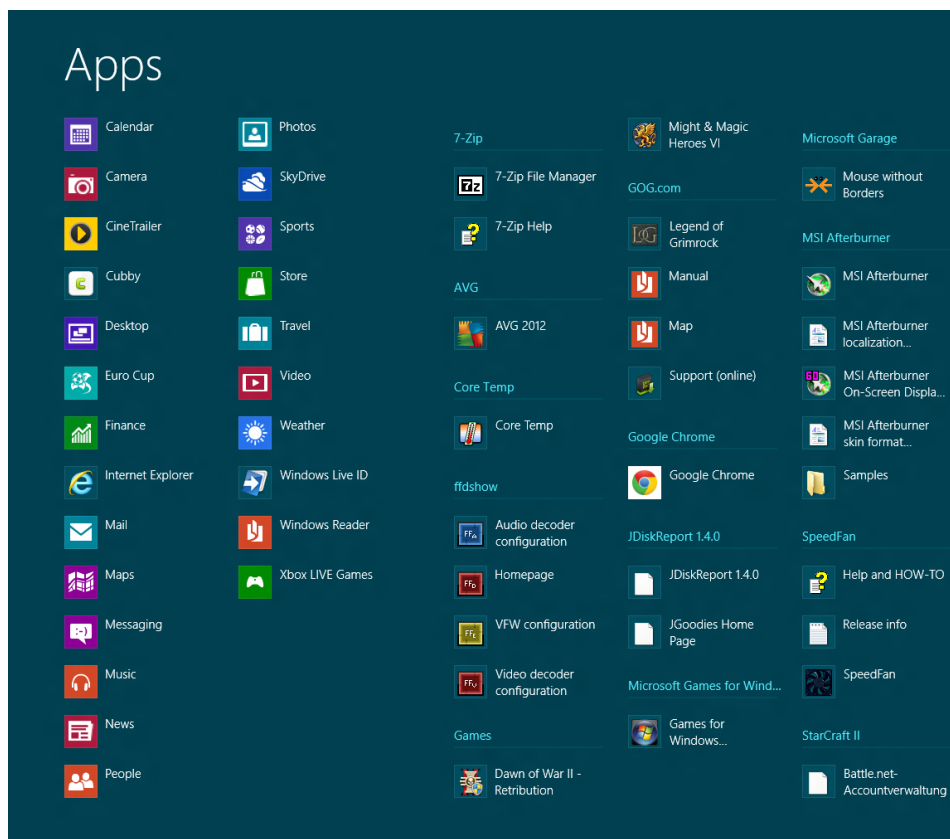
D. Status Bar:

The status bar is a crucial component of many applications, typically located at the bottom of a window. It provides users with contextual information and feedback related to the current state of the application or document. Here are some common uses of the status bar:

1. File Explorer Status Bar: In file management applications, the status bar often displays the number of items in a folder, the amount of free space on the disk, or other relevant statistics that help users manage their files effectively.

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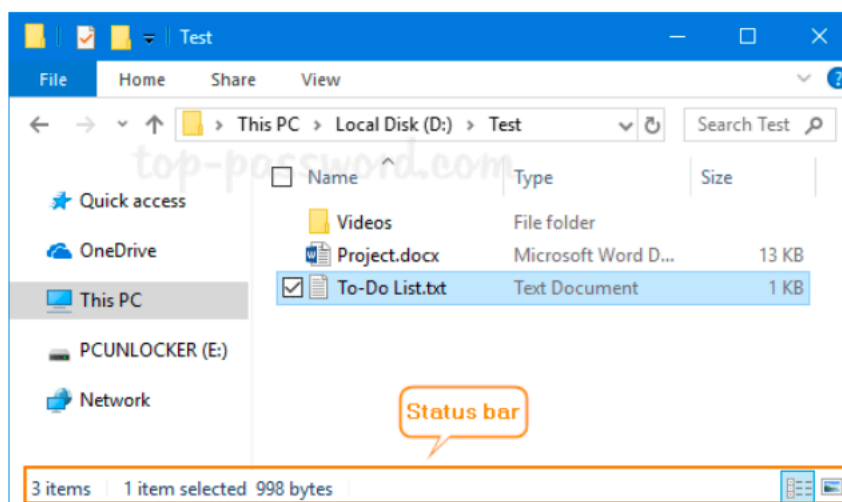
2. Web Browser Status Bar: In web browsers, the status bar may show the URL of a link when users hover over it, providing important information about where the link will direct them. It can also display loading progress or security information about the current site
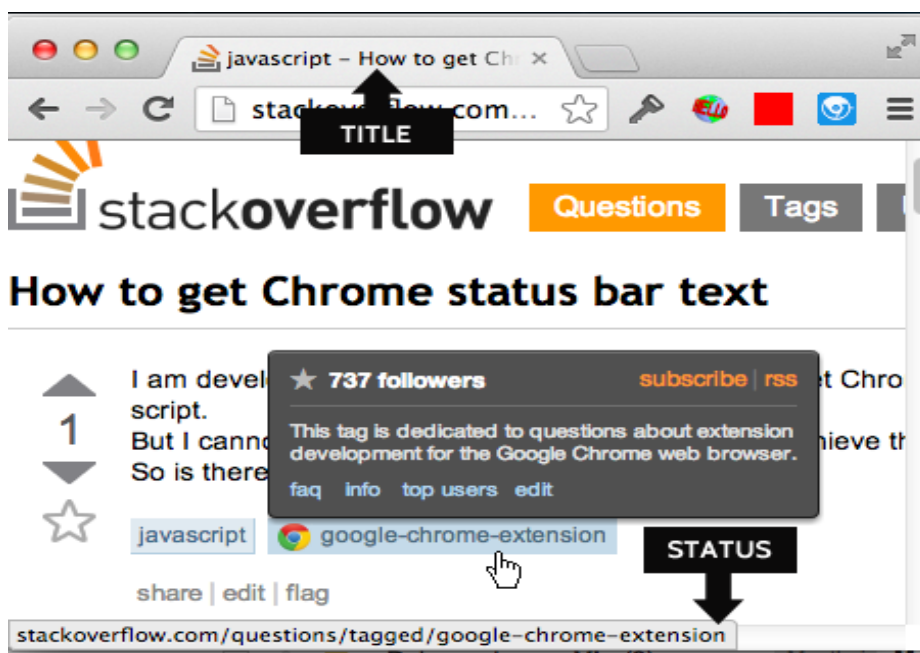
3. Application-Specific Information: Many applications utilize the status bar to convey specific information relevant to their functions. For example, in word processors, the status bar might display the current zoom level, the state of the caps lock key, or the word count of the document

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being edited. The status bar serves as a helpful tool for users, offering quick access to important information without cluttering the main interface. By keeping users informed about the application's state and relevant details, the status bar enhances the overall user experience and facilitates more efficient task completion.

E. Using Menu and Menu-Selection:

Menus are fundamental components of graphical user interfaces (GUIs) that provide users with a structured way to access commands and features within an application. They help organize options logically, making it easier for users to find and execute tasks.

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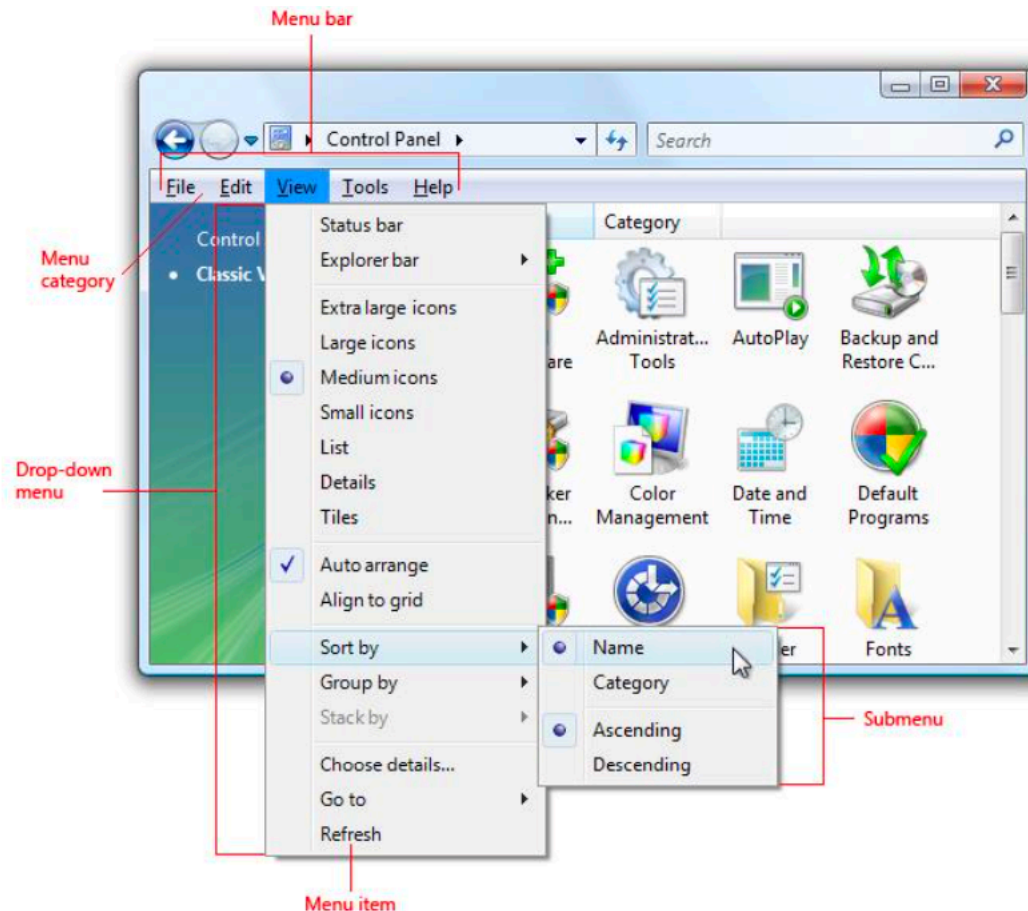
Here are some common menu types and examples:

1. **File Menu:** This menu typically includes essential options for managing documents and files. Common entries might include:

- New: Create a new document or file.
- Open: Access an existing file.
- Save: Save the current document or file.
- Print: Send the document to a printer.

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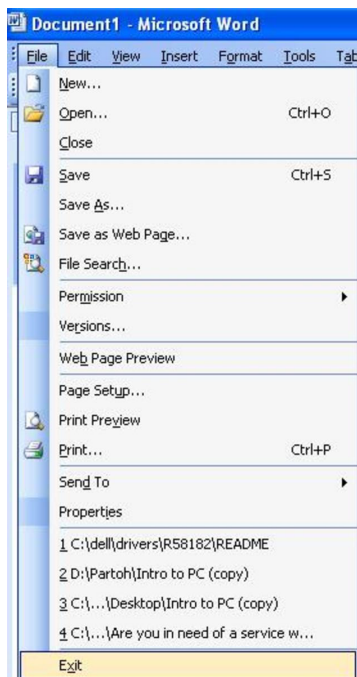
2. **Edit Menu:** This menu contains commands that allow users to manipulate content within the application. Standard options often found here include:

- Cut: Remove the selected content and copy it to the clipboard.
- Copy: Copy the selected content to the clipboard without removing it.
- Paste: Insert the content from the clipboard into the current location.
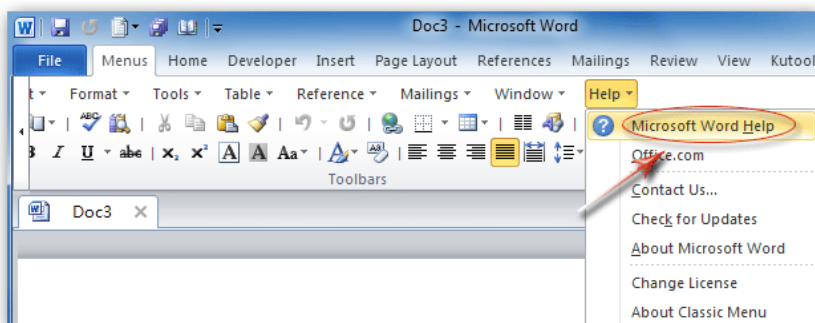- Undo: Reverse the last action taken by the user.

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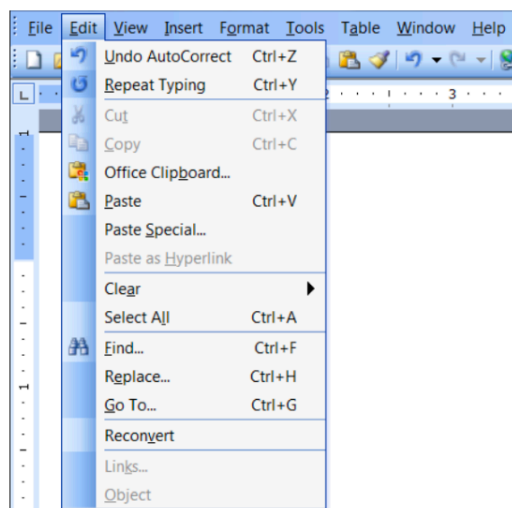
3. **Help Menu:** This menu provides access to support and documentation resources. Users can typically find:

- User Manual: A guide to using the application.
- FAQs: Answers to frequently asked questions.
- Troubleshooting: Common solutions for issues users may encounter.

F. Keyboard Navigation

Menus can often be navigated using keyboard shortcuts, which offer an efficient way to access commands without using the mouse. Examples of common shortcuts include:

- Ctrl + N: New document.
- Ctrl + O: Open a file.

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- Ctrl + S: Save changes.
- Ctrl + C: Copy selected content.
- Ctrl + V: Paste content.
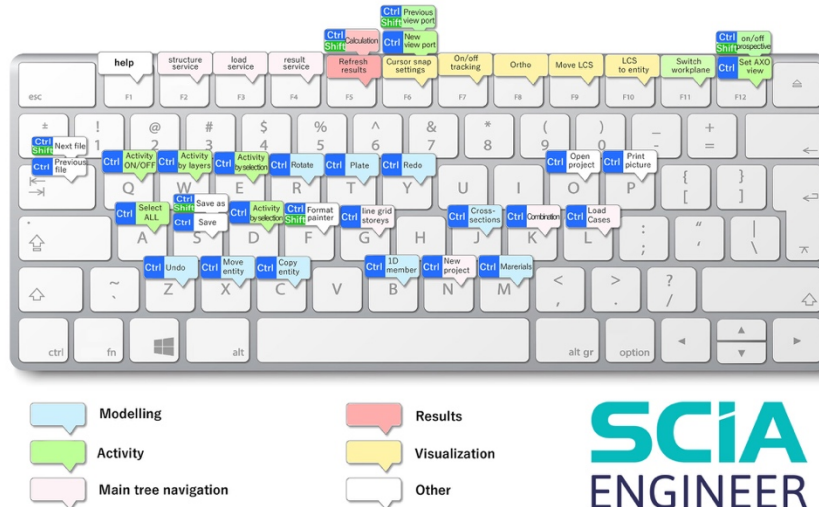
Using these keyboard shortcuts can significantly enhance productivity, especially for power users who want to minimize mouse use and speed up their workflow.

G. Concept of Folders and Directories

Folders, also known as directories, are essential components of file systems that help organize and categorize files, making it easier for users to store, retrieve, and manage data.

Here are some key aspects of folders and directories:

1. **Directory Tree:** This refers to the hierarchical organization of folders and files within a file system. Each folder can contain subfolders and files, creating a structure that resembles an upside-down tree. This hierarchy allows users to group related items together, facilitating efficient navigation and organization. For example:

   - Root Folder: At the top of the tree is the root folder (or root directory), which houses all other folders and files.
   - Subfolders: Folders can also contain multiple levels of subfolders, further categorizing content.

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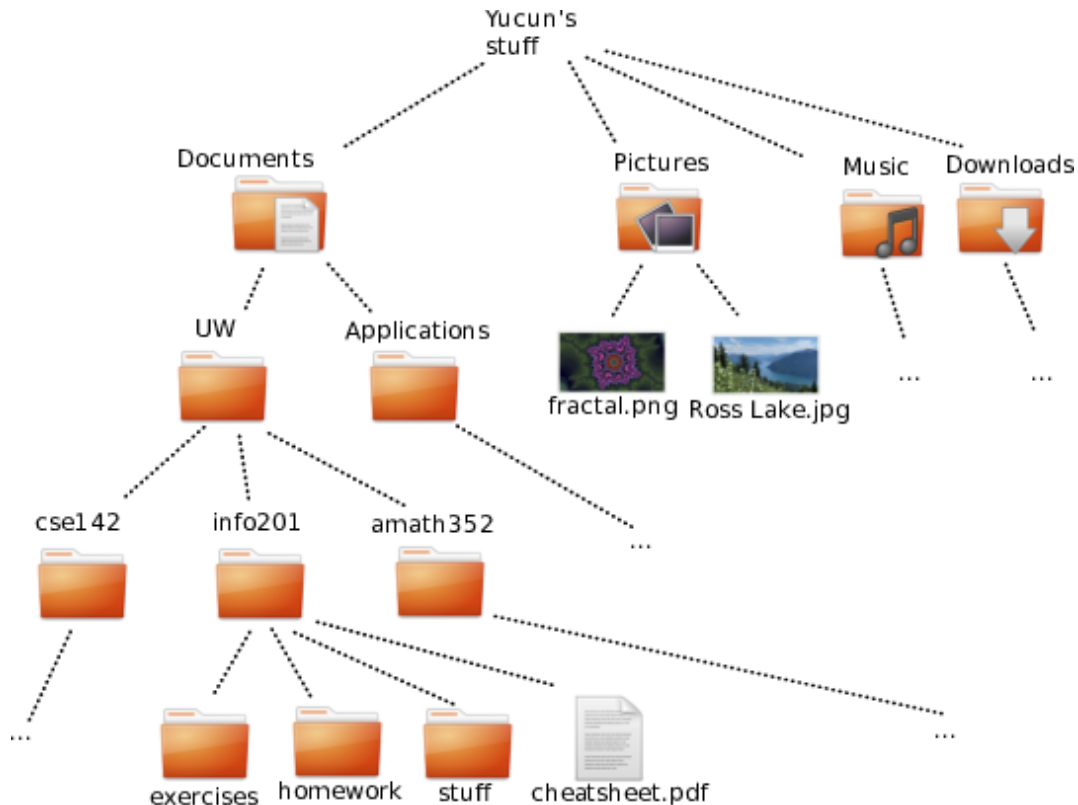
2. **Root Directory:** The root directory is the highest level in the directory structure. It serves as the starting point for all file paths. For example, in Windows, the root directory might be represented **as C:\,** while in Unix-based systems, it is typically represented as **/.** From the root directory, users can navigate deeper into the hierarchy to find specific files or folders.

3. **File Paths:** A file path is the specific location of a file or folder within the directory tree. It indicates how to navigate to that file or folder starting from the root directory. File paths can be either absolute or relative:

   - Absolute Path: This provides the full pathway to a file from the root directory (e.g.,**C:\Users\Username\Documents\File.txt).**

   - Relative Path: This indicates a location relative to the current directory (e.g., **Documents\File.txt if the current directory is C:\Users\Username**).

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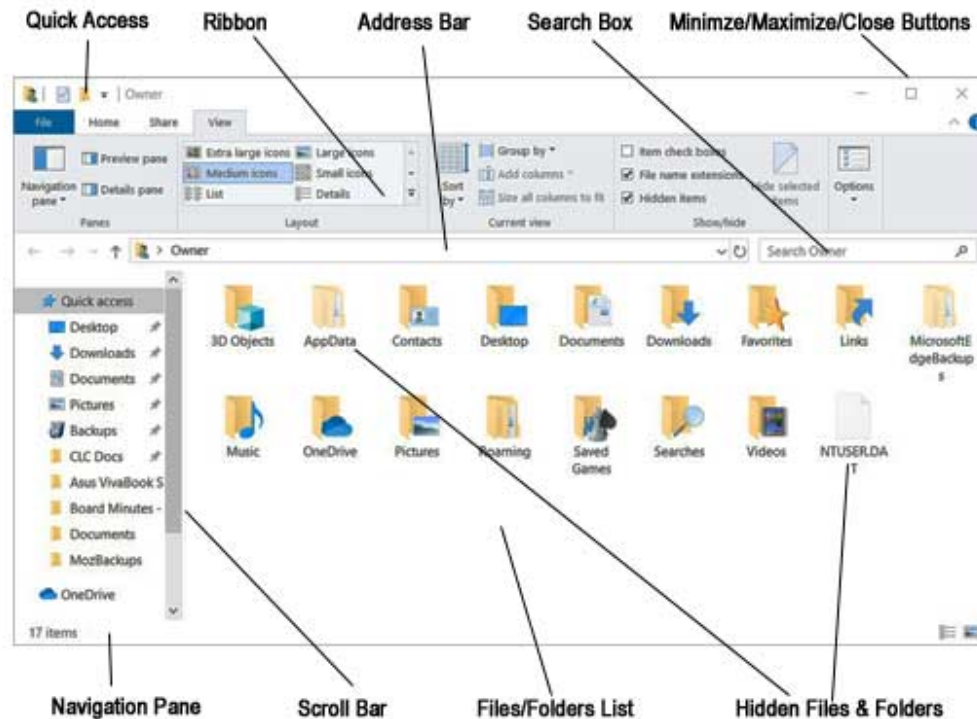
K. Opening and Closing Different Windows

Operating systems that support a graphical user interface (GUI) allow users to manage multiple tasks and applications simultaneously through the use of Windows.

Here are the key actions related to opening, closing, and switching between windows:

1. Open a Window: To open a new window, users can double-click on the icon of a file, folder, or application. This action launches the item in a new window, allowing users to interact with it. For applications, a single click followed by an "Open" command can also achieve this.

2. Close a Window: To close an open window, users can click the "X" button , which is typically located in the upper-right corner of the window (or upper-left corner on macOS). This action terminates the window and any associated tasks.

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Alternatively, users can press Alt + F4 (Windows) to close the currently active window. This shortcut is a quick way to exit applications.
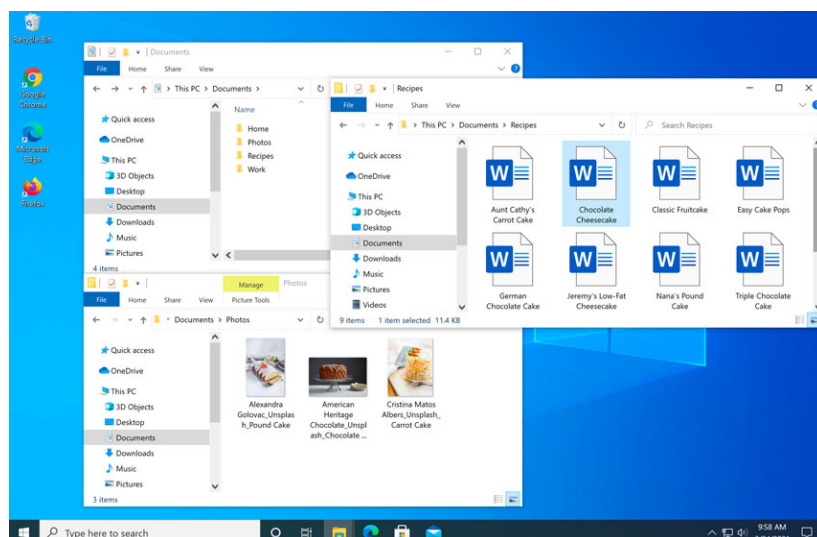
3. Switch Between Windows:

- To quickly navigate between open windows, users can use theAlt + Tab keyboard shortcut in Windows. Holding down the Alt key while tapping Tab allows users to cycle through open windows and select the one they wish to focus on.
- For macOS users, the equivalent shortcut is Command + Tab. This shortcut performs similar functionality by displaying icons of all open applications and allowing users to switch between them by continuing to hold Command and tapping Tab.

L. Creating Shortcuts

Shortcuts are convenient links that provide quick access to files, folders, or applications. They help users streamline their workflow and efficiently access frequently used items without navigating through the file system.

1. Right-click on the File/Folder: Locate the file, folder, or application for which you want to create a shortcut. Right-click on it to open the context menu.
2. Select the Shortcut Option:

- Windows: Choose "Create Shortcut" from the context menu. This action will generate a shortcut in the same directory as the original item.

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- macOS: Select "Make Alias." This will create an alias (Mac's term for shortcuts) of the selected item.

3. Drag the Shortcut: Once the shortcut or alias is created, you can drag it to the desktop or another preferred location for easy access. This allows you to place the shortcut in a convenient spot for frequent use.

Use of the Shortcut:

Double-Click the Shortcut: To access the target item directly, double-click the shortcut. This action opens the original file, folder, or application, allowing you to bypass any other navigation steps.

Benefits: Creating shortcuts enhances productivity by enabling quick access to essential files and applications. They reduce the time spent searching through directories and make it easier to manage frequently used resources, improving overall efficiency in the workspace.
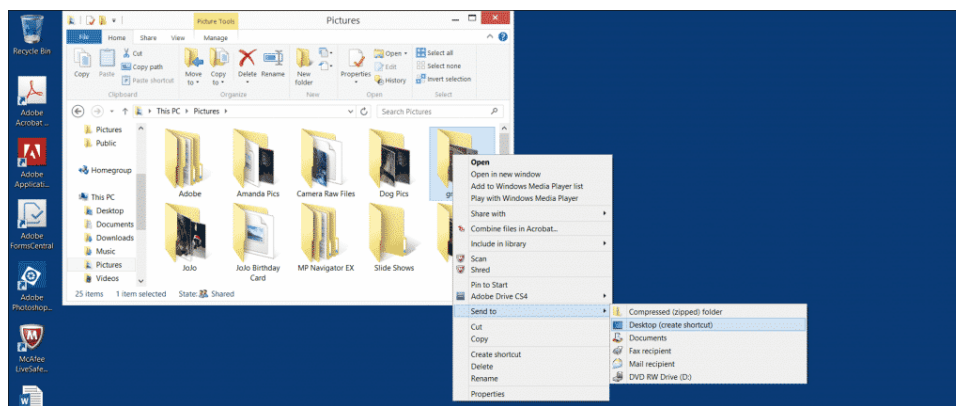

M. Shutting down your computer

When you're done using your computer, it's important to **shut it down properly**. The procedure will vary slightly depending on which version of Windows you're using.
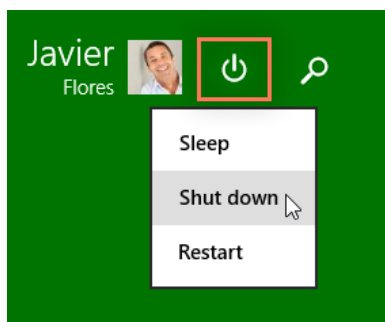
To shut down your computer:

- If you're using **Windows 10**, click the **Start** button, then the **Power** icon, then click **Shut down**.

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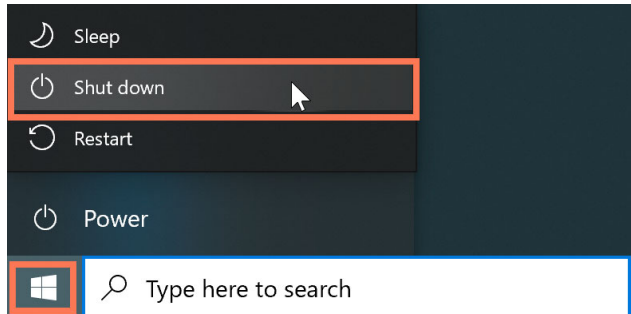
- If you're using Windows 8, click the **Start** button to access the **Start screen**, click the **Power** icon near the upper-right corner, and select **Shut down**.

- If you're using Windows 7 or earlier, Click the **Start** button, then select **Shut down**.

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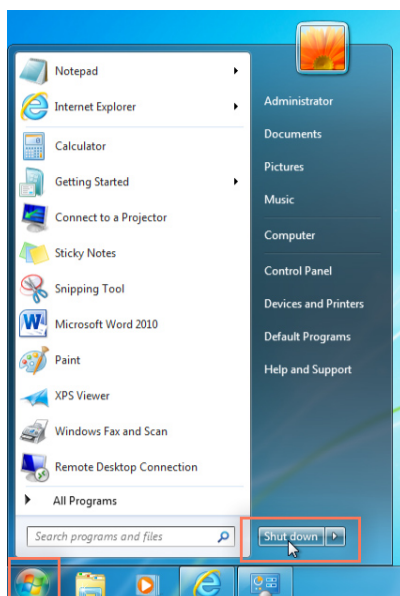
Restarting and Sleep mode

You can also click the **power button** for more options. For example, if your computer has become unresponsive, you can choose **Restart** to quickly turn it off and on again.

You can also choose to put your computer into **Sleep mode**. This turns off most of your computer's processes, but it remembers which applications and files are open. It allows the computer to **start up more quickly** because you won't have to wait for the operating system and applications to load. Note that your computer may go into Sleep mode **automatically** if you haven't used it for more than a few minutes.