# Comparison of Operating Systems: Windows, macOS, and Linux

## Windows

### Directory Structure

* Organizes files and folders in a hierarchical structure.
* A disk designator with a backslash, for example: C:\ or D:\.
* A single backslash is used for paths, e.g., \directory or \file.txt.

### Naming Conventions

* Not case-sensitive (File.txt is treated the same as file.txt).
* Cannot use characters like \ / : \* ? " < > |.
* Reserved names like CON, AUX, NUL are not allowed.

### File Systems

* Uses NTFS, FAT32, and exFAT.
* FAT is used in older systems and USB devices.

### Executable File Types

* .exe: Main executable file type.
* .bat: Batch script file, runs in Command Prompt (CMD).
* .msi: Microsoft Installer Package.
* .ps1: PowerShell script file.

### Script Execution

* CMD (Command Prompt): Older shell for .bat and .cmd files.
* PowerShell: Modern shell for .ps1 scripts; supports advanced scripting and automation.
* Windows Terminal: Unified shell for CMD, PowerShell, and WSL (Windows Subsystem for Linux).

## Linux

### Directory Structure

* Organizes files and folders in a hierarchical structure.
* Uses a single root directory /, from which all folders branch.
* Paths use forward slashes, for example: /home/user/file.txt.

### Naming Conventions

* Case-sensitive (File.txt and file.txt are different).
* Cannot use the forward slash / in file names.
* Filenames can contain most other characters, including spaces.

### File Systems

* Common file systems include ext4, ext3, ext2.
* Also supports FAT32 and exFAT for external drives.
* FAT is still used in removable media and embedded systems.

### Executable File Types

* No specific extension is required for executables.
* Common script types include .sh, .py, .bin, .run.
* Files must have executable permissions set (e.g., chmod +x).

### Script Execution

* Uses Terminal to run commands and scripts.
* Default shells include bash, zsh, or sh.
* Scripts are run using ./script.sh or by calling an interpreter (e.g., bash script.sh).

## macOS

### Directory Structure

* Organizes files in a hierarchical structure similar to Linux.
* Uses a single root directory /, branching into folders like /Applications, /Users, /System.
* Paths use forward slashes, for example: /Users/username/Documents.

### Naming Conventions

* Not case-sensitive by default, but can be configured to be case-sensitive.
* Cannot use the colon : in file names.
* Allows most characters and supports long file names.

### File Systems

* Uses APFS (Apple File System) by default.
* Also supports HFS+, FAT32, and exFAT for compatibility.
* FAT is often used for external drives and shared storage.

### Executable File Types

* Executables do not require specific extensions.
* Common script types include .command, .sh, .py.
* Files need executable permission set using chmod +x.

### Script Execution

* Uses the Terminal app to access the shell environment.
* Default shell is zsh (previously bash).
* Scripts are run using ./script.sh or with an interpreter like bash or python.