What is a File System?

A file system is the way a computer organizes and stores files on a storage device like a hard drive, pen drive, or memory card.

It helps the computer:

Know where files are located

Keep files organized in folders

Allow users to save, open, delete, or move files

Without a file system, the computer wouldn't understand how to read or write data properly.

Simple Example:

Imagine your storage (like a pen drive or hard disk) is a **library**:

- **Folders** = Bookshelves
- **Files** = Books
- **File system** = The **rules and labels** that tell you:
  - Where to put each book (file),
  - What the book is called (file name),
  - What shelf it belongs to (folder),
  - And how to find it again later.

Without a file system, everything would be just a big mess of bits!

Common File Systems:

File System	Used In	Notes
FAT32	USB drives, memory cards	Very compatible but limited file size (4GB max)
NTFS	Windows computers	Supports large files, permissions, etc.
ext4	Linux systems	Fast and reliable for Linux
APFS	macOS (Apple)	Modern file system for Macs

What it Does:

- Keeps track of **file names** and **locations**

- Manages **free space**
- Controls **permissions** (who can read/write)
- Handles **data storage** efficiently

Without a File System?

The computer wouldn't know: - Where one file ends and the next starts - What data belongs to which file - How to find your documents, photos, etc.

It would be like trying to find a book in a library with no shelves, labels, or index — total chaos!

How the File System Works — In Depth

This explains how your computer handles file operations step-by-step using the OS, File System, and Disk.

Goal:

To open, save, or manage a file (e.g., a document, image, or video) on your computer.

Step-by-Step Process

1. You (the User) Perform an Action

- You double-click a file to open it or save a new one.
- This action goes through an application like Word, Photoshop, or File Explorer.

  Example: You try to open `report.docx` on your desktop.

2. Operating System (OS) Takes Control

- The OS (Windows, Linux, etc.) receives your request.
- It **does not know** where the file is on the disk.
- So it asks the **File System** to find the file.

  "Hey File System, where is `report.docx`?"

3. File System Looks Up File Details

- The **File System** is like a librarian.
- It keeps an **index** of all files on the disk, including:
  - File size
  - File location (disk blocks)
  - Attributes (read-only, hidden)
  - Folder structure (hierarchy)

  - Full path (e.g., `C:\Users\John\Desktop\report.docx`)

4. File System Accesses the Disk

- Using the stored location, the File System tells the **Disk** to fetch the data.
- The Disk (HDD or SSD) reads the data:
  - HDD: from spinning platters
  - SSD: from flash memory

"Here is the file's raw data!"

5. Data is Sent Back to OS

- The Disk returns the file data to the OS.
- OS checks if the user has permission to access it.

6. OS Delivers It to the Application (or You)

- The file is now available in your app (Word, image viewer, etc.)
- You can now read, view, or edit the file.