



مرکز آموزش نیرا سیستم

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Filesystem

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Introduction

- A file system is a method and data structure that an operating system uses to manage files on a disk or partition.
- It organizes data into files and directories, providing a way to store, retrieve, and manage files.
- File systems play a critical role in managing how data is stored, accessed, and secured on storage devices like hard drives, SSDs, and removable media.



Applications

- **Operating Systems**
 - Managing system files, user files, and application data.
- **Database Management Systems**
 - Storing and organizing large volumes of data efficiently.
- **Embedded Systems**
 - Handling data storage for firmware and application code.
- **Enterprise Storage Solutions**
 - Managing large-scale data storage for businesses, including network-attached storage (NAS) and storage area networks (SAN).
- **Consumer Electronics**
 - Managing data on devices like digital cameras, smartphones, and gaming consoles.



Properties

- **Data Integrity**
 - Ensures data is not corrupted and remains consistent over time.
- **Access Control**
 - Manages permissions and access rights to files and directories.
- **Scalability**
 - Ability to handle large volumes of data and a large number of files.
- **Performance**
 - Efficiently manages read/write operations to optimize speed and resource usage.
- **Reliability**
 - Minimizes data loss and maintains accessibility even in case of hardware failures.



Categories

- **Disk-Based File Systems**
 - Used for managing files on disk storage (e.g., NTFS, FAT32, ext4).
- **Network File Systems**
 - Designed for accessing files over a network (e.g., NFS, SMB/CIFS).
- **Flash File Systems**
 - Optimized for flash memory storage devices (e.g., F2FS, JFFS2).
- **Distributed File Systems**
 - Spread data across multiple nodes for redundancy and performance (e.g., HDFS, GlusterFS).
- **Special-Purpose File Systems**
 - Tailored for specific applications or devices (e.g., ISO 9660 for optical discs, UDF for DVDs).



Features

- **File Naming and Path**
 - Supports hierarchical file organization and unique file naming conventions.
- **Metadata Management**
 - Maintains information about files, such as size, creation date, and modification date.
- **Journaling**
 - Keeps a log of changes to prevent data corruption and ensure recovery after crashes (e.g., ext3, NTFS).
- **Encryption**
 - Provides file-level or disk-level encryption to secure data.
- **Compression**
 - Reduces file size to save storage space (e.g., NTFS compression).
- **Snapshots**
 - Captures the state of the file system at a specific point in time for backup and recovery purposes.
- **Quota Management**
 - Limits the amount of disk space and number of files a user or application can use.
- **Access Control Lists (ACLs)**
 - Provides detailed permission settings beyond basic read, write, and execute permissions.