

Operating Systems

(Storage Management: file concepts, directory structures, file system in Linux)

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File-system Interface

For most users, the file system is the most visible aspect of an operating system. It provides the mechanism for on-line storage of and access to both data and programs

- ▶ **File Concept.** Computers can store information on various storage media, such as magnetic disks, magnetic tapes, and optical disks.
- ▶ A file is a named collection of related information that is recorded on secondary storage.
- ▶ The information in a file is defined by its creator. Many different types of information may be stored

File Attributes

- ▶ A file is named, for the convenience of its human users, and is referred to by its name.
 - Name
 - Identifier
 - Type
 - Location
 - Size
 - Protection
 - Time, date, and user identification
- ▶ Some newer file systems also support extended file attributes, including character encoding of the file and security features such as a file checksum.
- ▶ The information about all files is kept in the directory structure, which also resides on secondary storage.

File Operations

A file is an abstract data type. To define a file properly, we need to consider the operations that can be performed on files. The operating system can provide system calls to create, write, read, reposition, delete, and truncate files.

- ▶ Creating a file.
- ▶ Writing a file.
- ▶ Reading a file.
- ▶ Repositioning within a file (file seek).
- ▶ Deleting a file.
- ▶ Truncating a file (vs. delete).

File Operations...

- ▶ These six basic operations comprise the minimal set of required file operations. These primitive operations can then be combined to perform other file operations.
- ▶ Most of the file operations mentioned involve searching the directory. The operating system keeps a table, called the open-file table, containing information about all open files.
- ▶ Some systems implicitly open a file when the first reference and automatically closed when the job terminates.
- ▶ The implementation of the `open()` and `close()` operations is more complicated.

File operations, file types

- ▶ several pieces of information are associated with an open file:
 - File pointer.
 - File-open count.
 - Disk location of the file.
 - Access rights.
- ▶ A common technique for implementing file types is to include the type as part of the file name: .cpp, .c, .exe, .bat, .java, .asm, .perl, .xml, .doc, .docx, .gif, .pdf, .jpg, .rar, .zip, .tar, .mpeg, .mp3, .mp4

File structure

- ▶ **File Structure:** File types also can be used to indicate the internal structure of a file, e.g., the OS requires that an executable file have a specific structure so that it can determine where to load the file and at what the location the first instruction is.
- ▶ This brings the disadvantages of having the OS multiple file structures: the resulting size of the operating system is cumbersome.
- ▶ For example, assume that a system supports two types of files: text files (composed of ASCII characters) and executable binary files
- ▶ Some operating systems impose (and support) a minimal number of file structures. This approach has been adopted in UNIX, Windows,