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,