UNIVERSITI TENAGA NASIONAL

CHAPTER 11 FILE MANAGEMENT

CGMB143 COMPUTER SYSTEM

Files and File systems

- File system provides the resource abstractions typically associated with secondary storage.
- It permit user to create data collections, called files with the following properties:
  - Long-term existence
    - Files are stored on disk/other secondary storage do not disappear when a user logs off.
  - Sharable between processes
    - Files have names and can have associated access permissions that permit controlled sharing

Files and File systems

- Structure
  - file can have internal structure that convenient for a particular applications. It can be organized in hierararchical structure.

- A collection of functions that can be performed on files:
  - Create
    - New file is define and positioned within the structure of files
  - Delete
    - A file is removed from the file structure and destroyed

Files and File systems

- Open
  - An existing file is declared to be “opened” by a process, allowing the process to perform function on the file.
- Close
  - The file is closed with to respect to a process, process no longer may perform functions on file.
- Read
  - a process reads all /portion of data in a file
- Write
  - Process updates a file , add new data /changing values.

File structure

- Terms are commonly used when discussing about files:
  - Field
    - Basic element of data
    - An individual field contains single value, e.g. employee‘s name.
    - It’s characterized by its length and data type
    - Can be fixed or variable length depending on file design
    - Can contains subfields

File structure

- Record
  - Collection of related fields
  - Can be treated as a unit by some application program.
  - Exp: employee record have fields such as name, social sec number, date hired etc…
  - Can be fixed/variable length
- File
  - A collection of similar records
  - Treated as s single entity by users and applications and may be referenced by name
  - May be created and deleted
  - Applying access control

File structure

- Database
  - Collection of related data.
  - Essential aspects of database are that the relationships that exist among elements of data are explicit and the database is designed for use by number of different applications.
  - May contain all of the info related to an organization.
  - Consists one/more types of files

File structure

- Operations that must be supported when to use files:
  - Retrieve_All
    - Retrieve all the record of a file.
    - Required for an application that must process all of the info in the file at one time.
  - E.g.: application that produces a summary of the info in the file
  - This operation is often equated with the term *sequential processing*
    - – since all records are access in sequence.

File structure

- Retrieve_One:
  - Just retrieve one record
  - E.g.: interactive transaction-oriented applications need this operation.
- Retrieve_Next
  - Retrieve the record that is “next” in some logical sequence to the most recently retrieved record.
  - E.g.: interactive application like filling in forms, performing a search operation.

File structure

- Retrieve_Previous
  - Record that is “previous” to the currently accessed record is retrieved.
- Insert_One
  - Insert new record into the file.
- Delete_One
  - Delete an existing record.
- Update_one
  - Retrieve a record, update one/more of its field and rewrite the updated record back into the file.

File Structure

- Retrieve_Few
  - Retrieve a number of records.

- The nature of the operations that are most commonly performed on a file will influence the way the file is organized.

File Management Systems (FMS)

File Management Systems (FMS)

- → set of system software that provides services to users an applications in the use of files.
- Users/application may access files through the FMS.
- Objectives:
  - To meet the data mgmt needs and requirements of the user, which include storage of data and the ability to perform the operation required.
  - To guarantee, to the extend possible, that the data in the file are valid.

File Management Systems (FMS)

- To optimize performance, both from the system point of view in terms of overall throughput and from user's point of view in term of response time.
- To provide I/O support for a variety of storage device types.
- To minimize/eliminate the potential for lost /destroyed data
- To provide a standardize set of I/O interface routines to use processes
- To provide I/O support for multiple users.

File Management Systems (FMS)

For objective 1: meeting user requirement

- Requirements depends on the variety of applications and the environment in which the computer system will be used.
- For an interactive general-purpose system, the following constitute a minimal set of requirements:
  - each user should be able to create, delete, read,write,modify files.
  - Each user may have controlled access to other users's files

File Management Systems (FMS)

- Each user may control what types of accesses are allowed to the user's files
- Each user should be able to restructure the user's files in a form appropriate to the problem.
- Each user should be able to move data between files
- Each user should be able to back up and recover the user's files in case of damage
- Each user should be able to access the user's files by using symbolic names

File System Architecture

- Need to look at software organization in order to understand file mgmt.
- Figure 12.1 show the File system software architecture.
- Lowest level:
  - device drivers communicate directly with peripheral devices
  - Device driver responsible for starting I/O operations on a device and processing the completion of an I/O request.
  - Exp: disk and tape.
  - Part of OS.

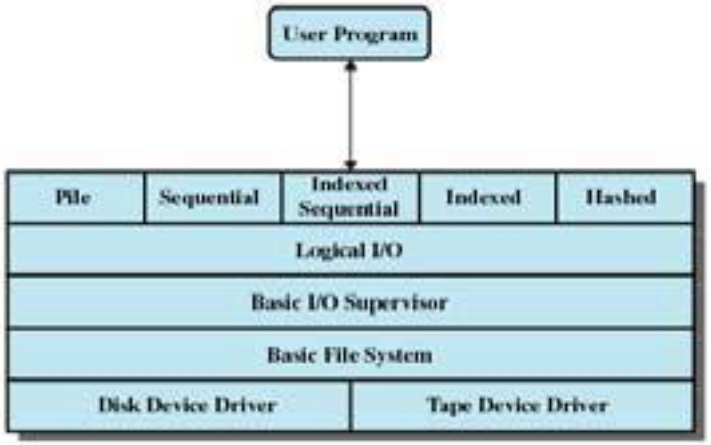


Figure 12.1 File System Software Architecture

File System Architecture

- Basic file system/physical I/O:
  - Primary interface with the environment outside of the computer system.
  - It deals with blocks of data that are exchanged with disk/tape
  - Concerns with the placement of those blocks on the 2nd storage
  - And on the buffering in main memory
  - Part of OS

File System Architecture

- Basic I/O supervisor
  - Responsible for all file I/O initiation and termination
  - Control structures are maintained that deals with device I/O, scheduling and file status
  - Part of OS

File System Architecture

- Logical I/O
  - Enables users and applications to access records
  - Deals with file records.
  - Provides a general-purpose record I/O capability and maintained basic data about files.

Access method

- Level that closest to the user
- Provide standard interface between application and the file system and devices that hold the data
- Different access methods reflect different file structures and way of accessing and processing the data

File Organization and access

- File organization refer to the logical structuring of the records as determined by the way in which they are accessed.
- Criteria need to look when choosing a file organization:
  - Short access time
  - Ease of update
  - Economy of storage
  - Simple maintenance
  - Reliability

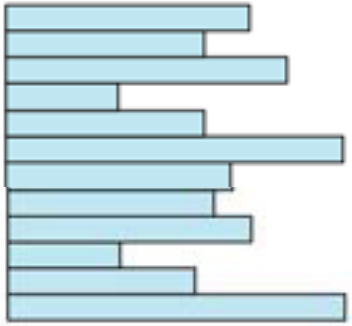
Continue..

- Focus on 5 organizations :
  - The pile
  - The sequential file
  - The indexed sequential file
  - The indexed file
  - The direct/hashed file

The pile

- Least complicated
- Data are collected in the order in which they arrive
- Purpose: simply to accumulate the mass of data and save it.
- Records may have different fields/similar fields in different order
- Each field should be self-describing, filed name as well as value
- No structure to the pile record, record access is by exhaustive search.
  - i.e: need to find record that contains a particular field with a particular value, necessary to examine each record in the pile until found/not found.

The Pile



Variable-length records
Variable set of fields
Chronological order

(a) Pile File