



Overview

• File organisation and Access





#### **Files**

- Files are the central element to most applications
- The File System is one of the most important part of the OS to a user
- Desirable properties of files:
  - -Long-term existence
  - Sharable between processes
  - -Structure



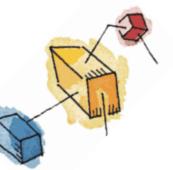


### **Typical Operations**

- File systems also provide functions which can be performed on files, typically:
  - -Create
  - -Delete
  - -Open
  - -Close
  - -Read
  - -Write







#### **Terms**

- Four terms are in common use when discussing files:
  - -Field
  - -Record
  - -File
  - -Database





#### Fields and Records

- Fields
  - -Basic element of data
  - -Contains a single value
  - -Characterized by its length and data type
- Records
  - -Collection of related fields
  - -Treated as a unit





#### File and Database

- File
  - -Have file names
  - -Is a collection of similar records
  - -Treated as a single entity
  - -May implement access control mechanisms

#### Database

- -Collection of related data
- -Relationships exist among elements
- -Consists of one or more files







## File Management Systems

- Provides services to users and applications in the use of files
  - -The way a user or application accesses files
- Programmer does not need to develop file management software





## Objectives for a File Management System

- -Meet the data management needs of the user
  - Ability to perform all operation on data
- -Guarantee that the data in the file are valid
- -Optimize performance
  - System point of view, overall throughput and from user point of view in term of response time
- -Provide I/O support for a variety of storage device type
- -Minimize lost or destroyed data
- -Provide a standardized set of I/O interface routines to user processes
- Provide I/O support for multiple users (if needed)



## Requirements for a general purpose system

- 1. Each user should be able to create, delete, read, write and modify files
- 2. Each user may have controlled access to other users' files
- 3. Each user may control what type of accesses are allowed to the users' files
- 4. Each user should be able to restructure the user's files in a form appropriate to the problem







- 5. Each user should be able to move data between files
- 6. Each user should be able to back up and recover the user's files in case of damage
- 7. Each user should be able to access the user's files by using symbolic names





## Typical software organization (File System Architecture)

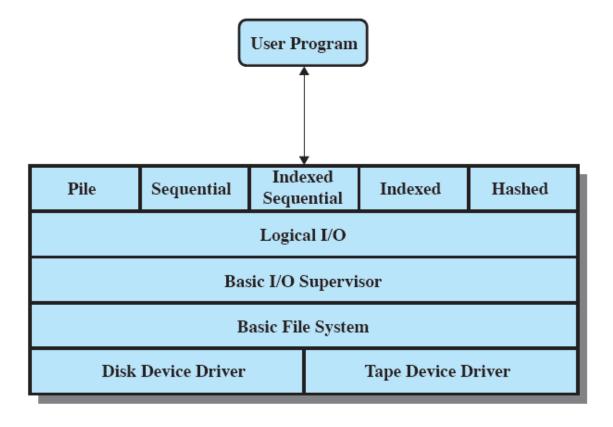
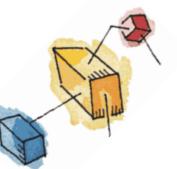




Figure 12.1 File System Software Architecture





#### **Device Drivers**

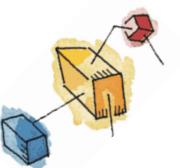
- It is at Lowest level
- It Communicates directly with peripheral devices, channels and their controllers..

Device driver considered to be part of operating system

• it is Responsible for starting I/O operations on a device







#### Basic File System

- Physical I/O
- Primary interface with the environment outside the computer system
- Deals with exchanging blocks of data
- Concerned with the placement of blocks
- Concerned with buffering blocks in main memory
- It does not understand the content of data or structure of file involved.



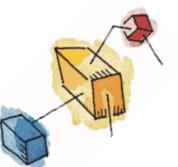


#### Basic I/O Supervisor

- Responsible for all file I/O initiation and termination.
- Control structures deal with
  - Device I/O,
  - Scheduling,
  - File status.
- Selects and schedules I/O operation with the device
- It is also concerned with scheduling disk and tape accesses to optimize performance.
- I/O buffer are assigned and secondary memory is allocated.





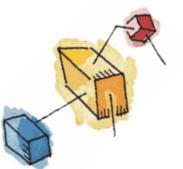


### Logical I/O

- It Enables users and applications to access records
- logical I/O module deals with file records
- Maintains basic data(metadata) about file.





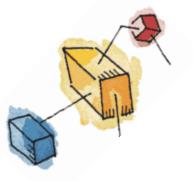


#### **Access Method**

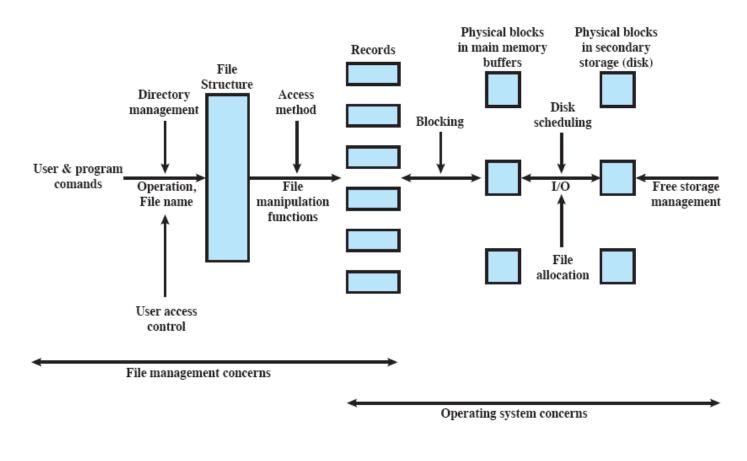
- Closest to the user
- Provide standard interface between application and the file system.
- Reflect different file structures
- Provides a standard interface between applications and the file systems
- Access method varies depending on the ways to access and process data for the device.

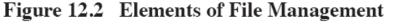




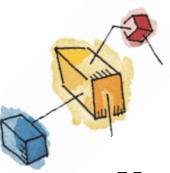


## Elements of File Management





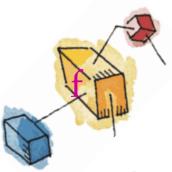




- -User creating and deleting files and performing operations on files.
- -Before performing operation the file system must identify and locate the selected file.
- -This requires the use of some sort of directory that serves to describe the location of all files and their attributes
- -Only authorized user are allowed to access particular files in particular ways.
- -Basic operation that user or application perform are performed on record level.

File having a structure that organize the records





- -For accessing file user commands is translated into file manipulation commands.
- -I/O operation done on block basis.
- -Secondary storage must be managed for free storage,
- -And what blocks are available for new files and growth in existing file.
- -Individual block i/o request must be scheduled.







Overview



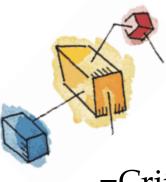




### File Organization

- **-"file organization"** refers to the logical structuring of the records as determined by the way in which they are accessed.
- -Physical organization of the file on secondary storage depends on the blocking strategy and the file allocation strategy
- Criteria for File Organization
  - -Short access time
  - -Ease of update
  - -Economy of storage
  - -Simple maintenance
  - -Reliability
  - -Criteria depends on the application that will use the file

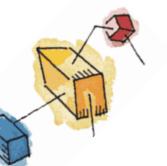




-Criteria may conflict, as for storage economy minimum redundancy of data while for speed of data







### File Organisation Types

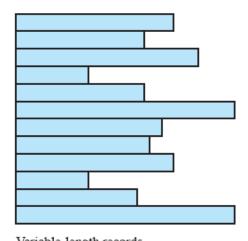
- Many exist, but usually variations of:
  - -Pile (just for reference)
  - -Sequential file
  - -Indexed sequential file
  - -Indexed file





## Pile [ just for reference purpose added

- Data are collected in the order they arrive
  No structure
- Purpose is to accumulate a mass of data and save it
- Records may have different fields
- Record access is by complete search
- Data is stored in chronological order

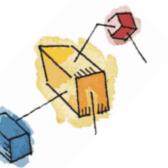


Variable-length records Variable set of fields Chronological order

(a) Pile File

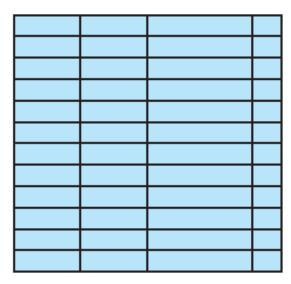






#### The Sequential File

- -Most common file structure
- -Fixed format used for records
- -Records are the same length
- -All fields of same order and length
- -Field names and lengths are attributes of the file
- -First field of each record is key field.
- -Key field
  - Uniquely identifies the record
  - Records are stored in key sequence



Fixed-length records
Fixed set of fields in fixed order
Sequential order based on key field

(b) Sequential File



#### Sequential File

- -It is easy
- -Access, require the sequential search of the file for a key match.
- -Physical organization of file on disk directly matches the logical organization of the file.
- -Records are stored in block.
- -Alternative organization is to organize file as linked list.
- -One or more record are stored in each physical block.
- -Each block contains a pointer to next block



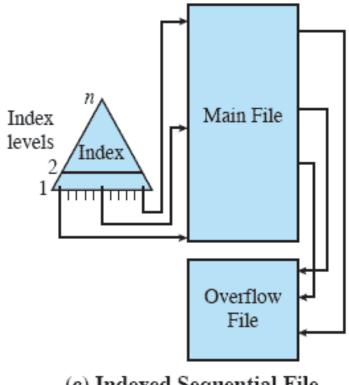


#### Indexed Sequential File

- -It is file organization which can use for overcome disadvantages
- -Of sequential organization
- It Maintains the key characteristic of the sequential file:
  - records are organized in sequence based on a key field.

#### Two features are added:

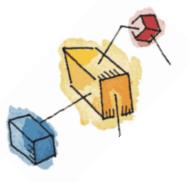
- an index to the file to support random access,
- and an overflow file.

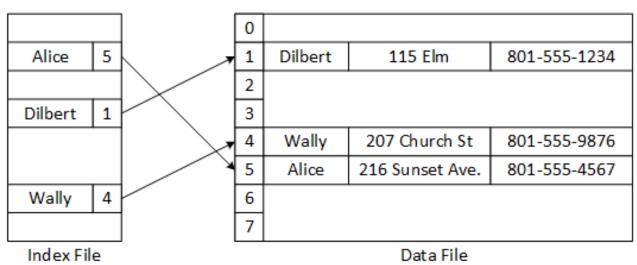












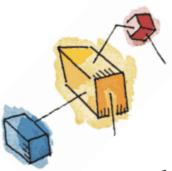






- -Index provides a search facility to reach at desired record randomly and quickly.
- -Record in overflow file is located by follwoing a pointer from its predecessor record.
- -In simple index sequential structure a single level of indexing is used.
- -Each record in index file consist of two field: key field and pointer to a main file
- -Each record in main file contains one more field. Which is pointer to a overflow file.
- -New record is inserted into overflow file.
- -The record in main file which is immediately precede the new record is update the pointer filed.





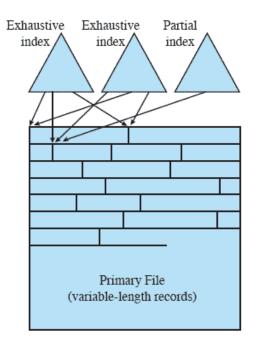
- -Index sequential file reduce the time required to access a single record.
- -For greater performance multilevel indexing can be used.
- -Indexed sequential file have limitation, it is indexed to single field of the file.
- -When record needs to be search from other attribute of the key filed then it required to be search whole file sequential.





#### Indexed File

- -To overcome of limitation of index sequential file, for searching record based on non key field attribute.
- Uses multiple indexes for different key fields
  - -May contain an complete index that contains one entry for every record in the main file
  - -May contain a partial index
- When a new record is added to the main file, all of the index files must be updated.
- Exclusive index contain one entry for each record .
- Partial index contains entry for record where field is available.
  - -Variable length record, may all fields are not available in all the records



(d) Indexed File



# Tradexed File example

