IDHAYA COLLEGE FOR WOMEN
KUMBAKONAM-612 001

PG & RESEARCH
DEPARTMENT OF COMPUTER SCIENCE

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SUBJECT NAME: OPERATING SYSTEMS
SUBJECT CODE: 16SCCCS8

UNIT-V

FILE MANAGEMENT

The File Manager -Interacting with the File Manager -File Organization - Physical Storage Allocation -Access Methods-Levels in a File Management System - Access Control Verification Module

Operating Systems:

File Management

Files

- Data collections created by users
- The File System is one of the most important parts of the OS to a user
- Desirable properties of files:

Long-term existence

- files are stored on disk or other secondary storage and do not disappear when a user logs off

Sharable between processes

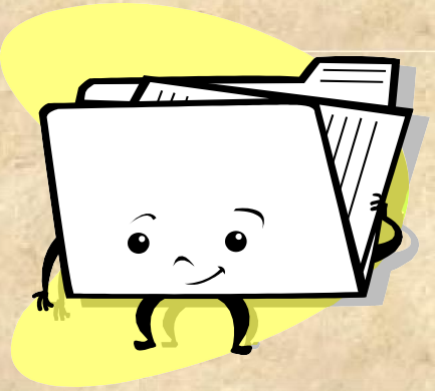
- files have names and can have associated access permissions that permit controlled sharing

Structure

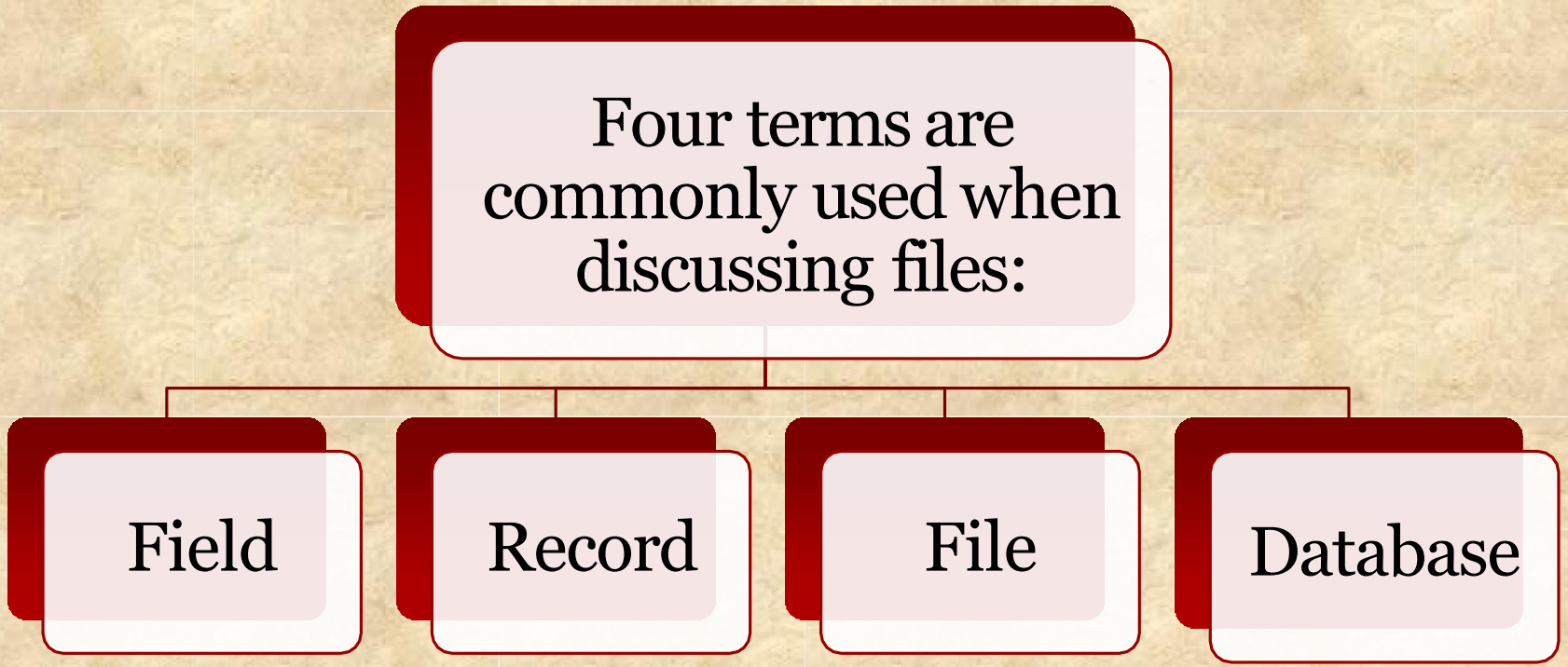
- files can be organized into hierarchical or more complex structure to reflect the relationships among files

File Systems

- Provide a means to store data organized as files as well as a collection of functions that can be performed on files
- Maintain a set of attributes associated with the file
- Typical operations include:
  - Create
  - Delete
  - Open
  - Close
  - Read
  - Write



File Structure



Structure Terms

Field

- basic element of data
- contains a single value
- fixed or variable length

Database

- collection of related data
- relationships among elements of data are explicit
- designed for use by a number of different applications
- consists of one or more types of files

File

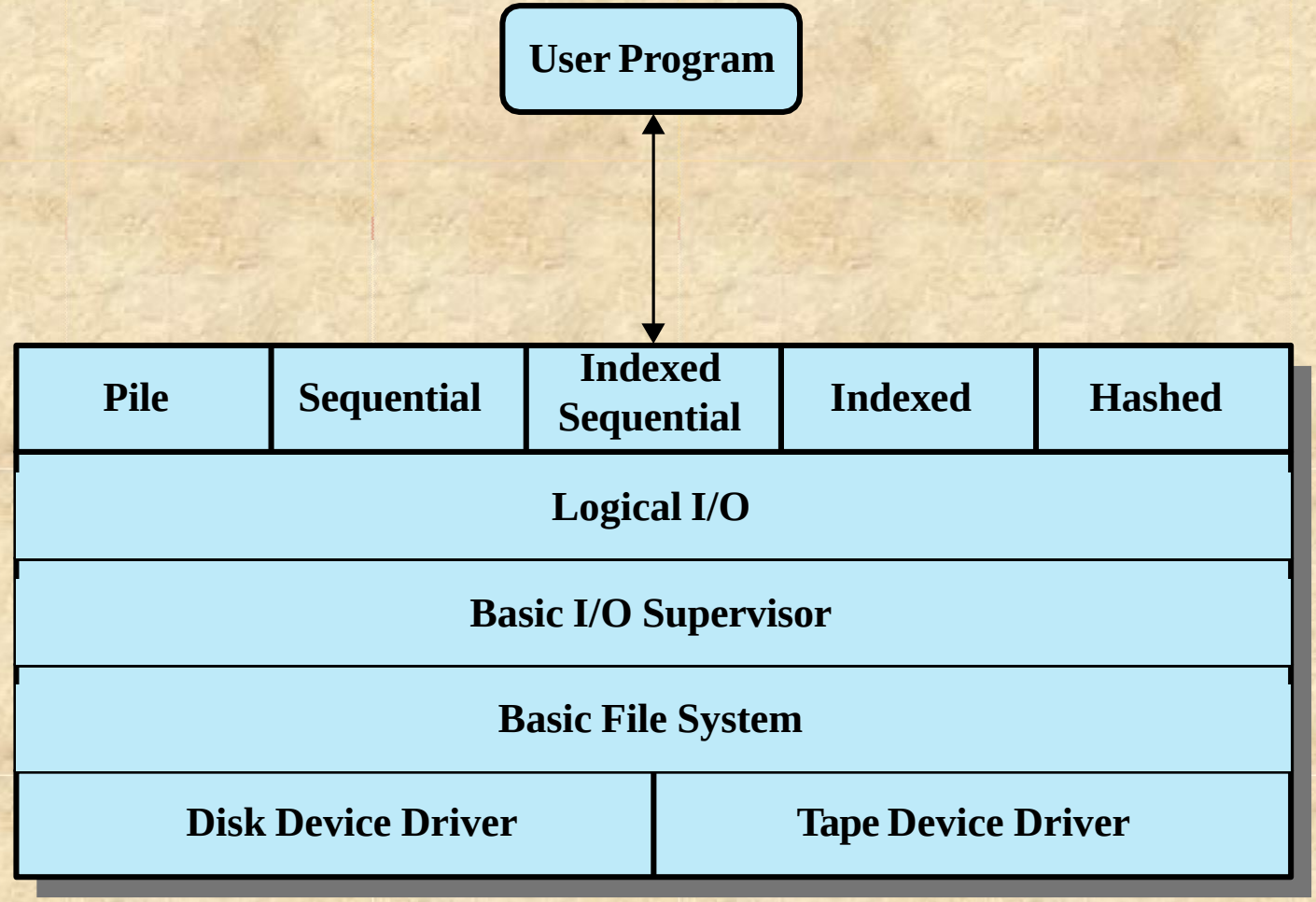
- collection of similar records
- treated as a single entity
- may be referenced by name
- access control restrictions usually apply at the file level

Record

- collection of related fields that can be treated as a unit by some application program
- fixed or variable length

File Management System Objectives

- Meet the data management needs of the user
- Guarantee that the data in the file are valid
- Optimize performance
- Provide I/O support for a variety of storage device types
- Minimize the potential for lost or destroyed data
- Provide a standardized set of I/O interface routines to user processes
- Provide I/O support for multiple users in the case of multiple-user systems



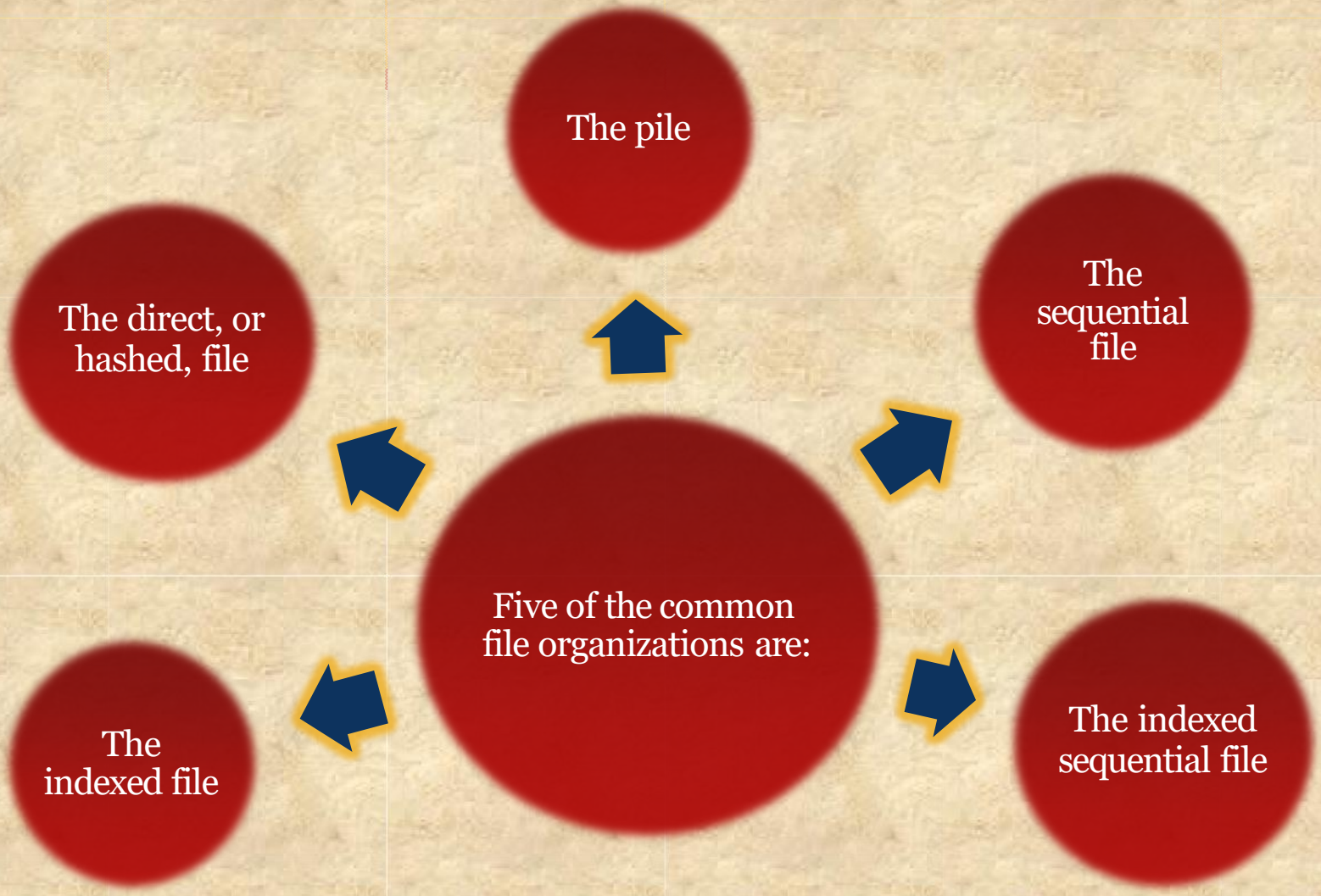
File System Software Architecture

File Organization and Access

- ***File organization*** is the logical structuring of the records as determined by the way in which they are accessed
- In choosing a file organization, several criteria are important:
  - short access time
  - ease of update
  - economy of storage
  - simple maintenance
  - reliability

- Priority of criteria depends on the application that will use the file

File Organization Types



The Pile

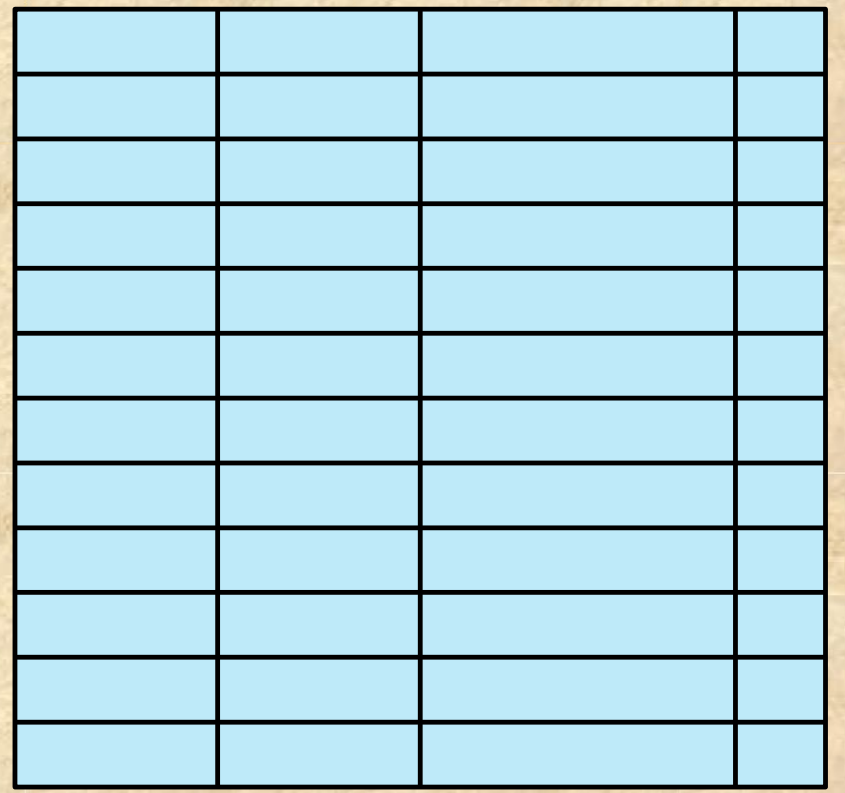
- Least complicated form of file organization
- Data are collected in the order they arrive
- Each record consists of one burst of data
- Purpose is simply to accumulate the mass of data and save it
- Record access is by exhaustive search

Variable-length records
Variable set of fields
Chronological order

(a) Pile File

The Sequential File

- Most common form of file structure
- A fixed format is used for records
- Key field uniquely identifies the record
- Typically used in batch applications
- Only organization that is easily stored on tape as well as disk

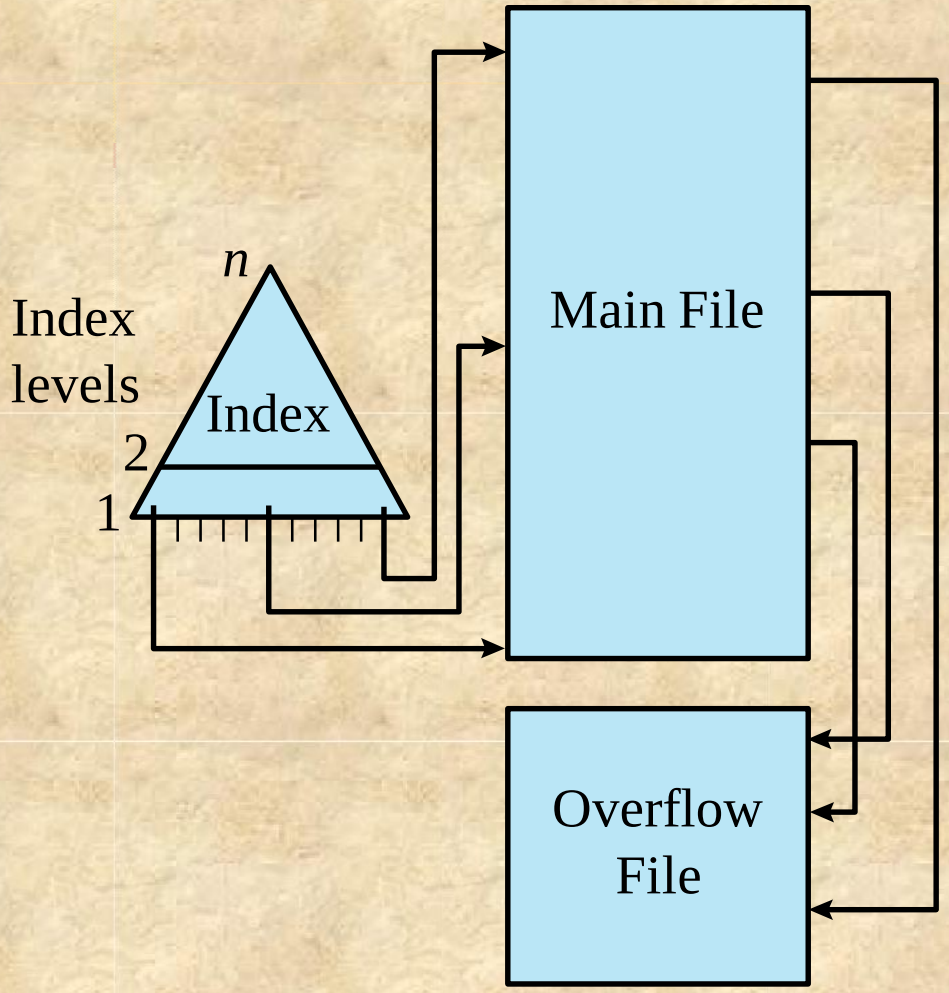


Fixed-length records
Fixed set of fields in fixed order
Sequential order based on key field

(b) Sequential File

Indexed Sequential File

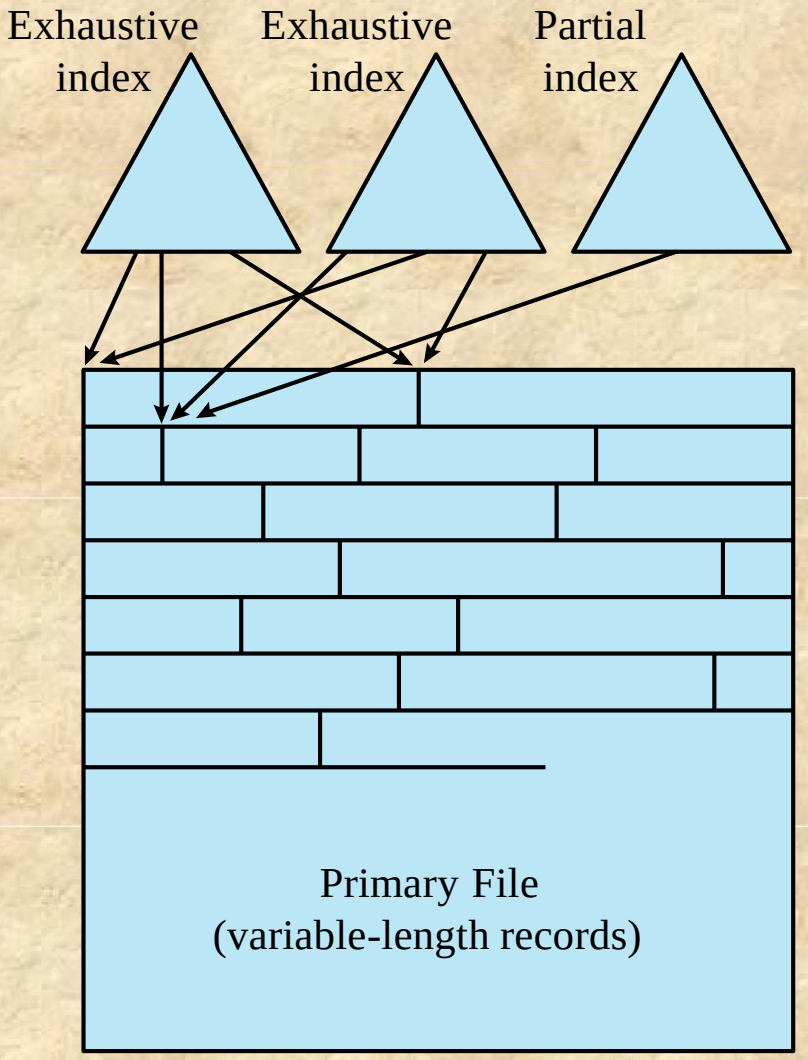
- Adds an index to the file to support random access
- Adds an overflow file
- Greatly reduces the time required to access a single record
- Multiple levels of indexing can be used to provide greater efficiency in access



(c) Indexed Sequential File

Indexed File

- Records are accessed only through their indexes
- Variable-length records can be employed
- Exhaustive index contains one entry for every record in the main file
- Partial index contains entries to records where the field of interest exists
- Used mostly in applications where timeliness of information is critical
- Examples would be airline reservation systems and inventory control systems



(d) Indexed File

Direct or Hashed File

- Access directly any block of a known address
- Makes use of hashing on the key value
- Often used where:
  - very rapid access is required
  - fixed-length records are used
  - records are always accessed one at a time

Examples are:

- directories
- pricing tables
- schedules
- name lists

User Access Rights

Owner

- usually the initial creator of the file
- has full rights
- may grant rights to others

Specific Users

- individual users who are designated by user ID

User Groups

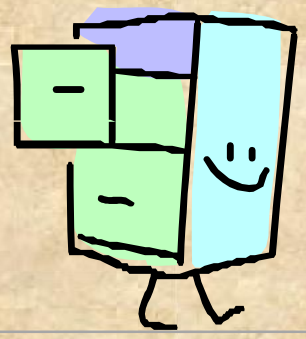
- a set of users who are not individually defined

All

- all users who have access to this system
- these are public files

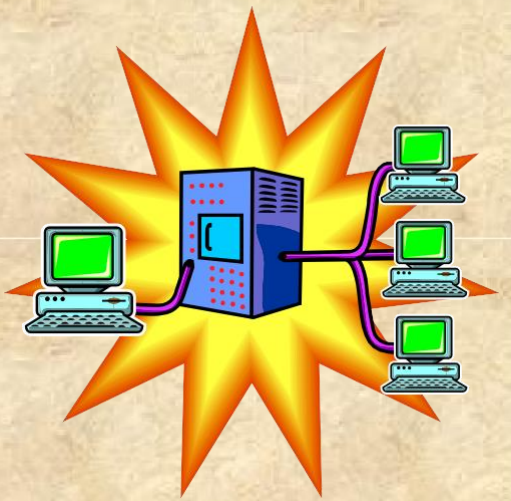
File Allocation

- File allocation is done on a block basis
- Allocation is dynamic, as needed, rather than using preallocation
- An indexed method is used to keep track of each file, with part of the index stored in the inode for the file
- In all UNIX implementations the inode includes a number of direct pointers and three indirect pointers (single, double, triple)



Windows File System

- The developers of Windows NT designed a new file system, the New Technology File System (NTFS) which is intended to meet high-end requirements for workstations and servers
- Key features of NTFS:
  - recoverability
  - security
  - large disks and large files
  - multiple data streams
  - journaling
  - compression and encryption
  - hard and symbolic links



Access Method

- Level of the file system closest to the user
- Provides a standard interface between applications and the file systems and devices that hold the data
- Different access methods reflect different file structures and different ways of accessing and processing the data

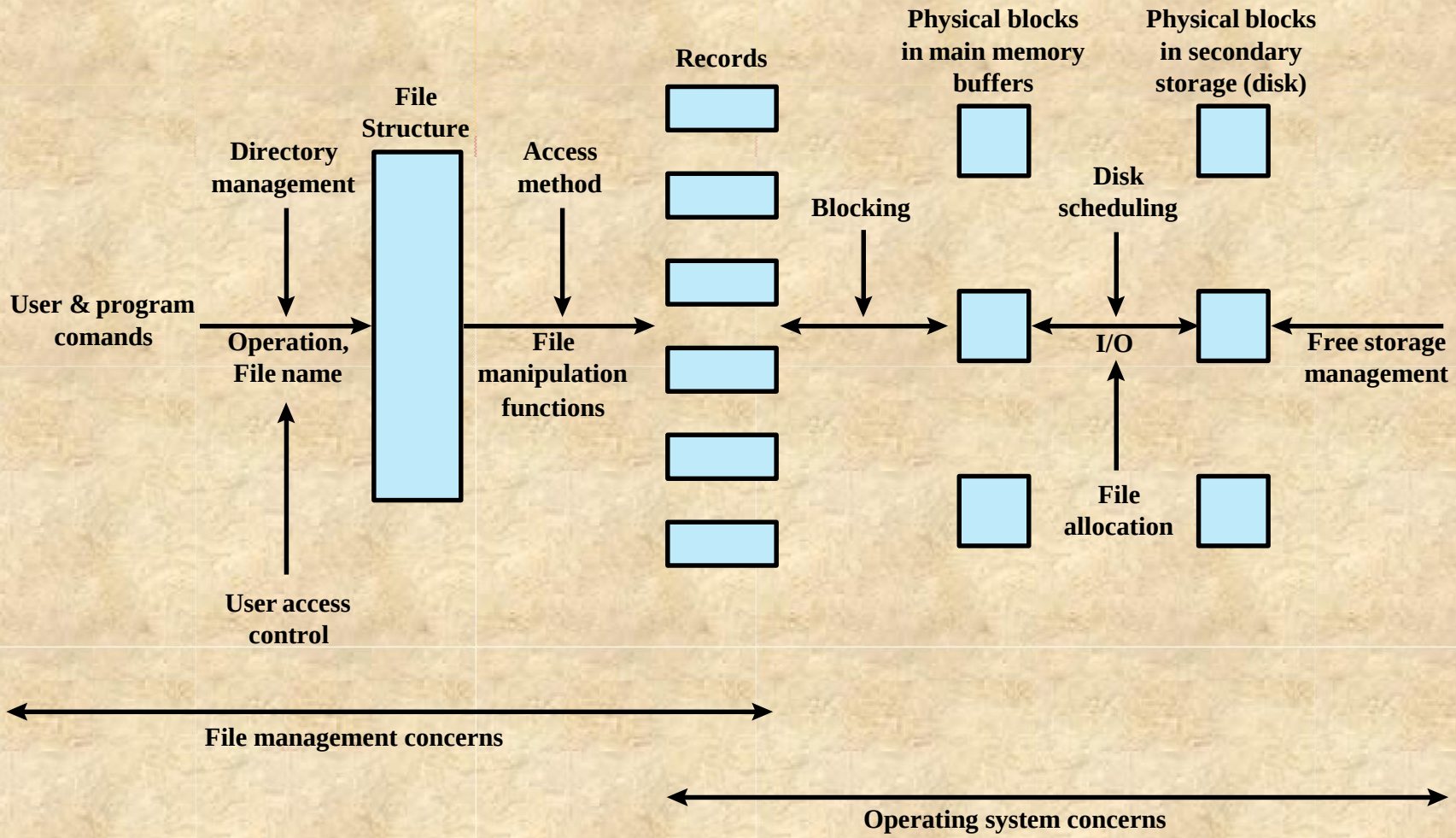


Figure 12.2 Elements of File Management