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Lecture 10 – File Management

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Objectives

- In this class we will discuss:
  - File terminology
  - Characteristics of file systems
  - Device drivers

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File Management

- File management system is considered part of the operating system
- Input to applications is by means of a file
- Output is saved in a file for long-term storage

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Terms Used with Files

- **File**
  - **Collection of similar records**
  - **Treated as a single entity**
  - **Have unique file names**
  - **May restrict access**

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File Management System

- **The way a user of application may access files**
- **Programmer does not need to develop file management software**

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Objectives for a File Management System

- **Meet the data management needs and requirements 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**

Minimal Set of Requirements

- Each user should be able to create, delete, read, and change files
- Each user may have controlled access to other users' files
- Each user may control what type of accesses are allowed to their own files
- Each user should be able to restructure their own files in a form appropriate to the problem
  - I.e. minimum of "structure" on files imposed by the operating system

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Objectives for a File Management System

- **Minimize or eliminate the potential for lost or destroyed data**
- **Provide a standardized set of I/O interface routines**
- **Provide I/O support for multiple users**

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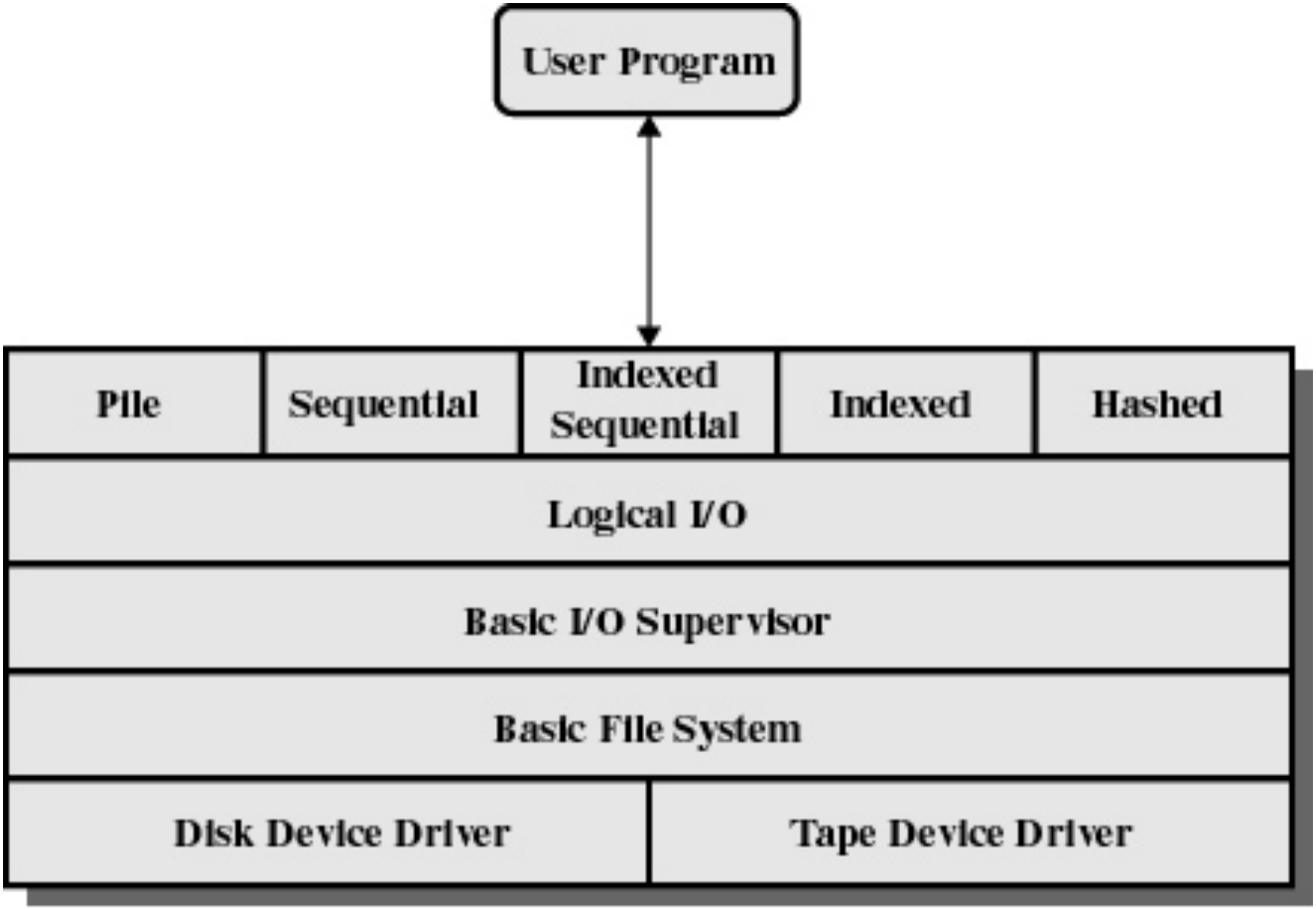
Minimal Set of Requirements

- **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**


User Program
File
Sequential
Indexed Sequential
Indexed
Hashed
Logical I/O
Basic I/O Supervisor
Basic File System
Disk Device Driver
Tape Device Driver

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Device Drivers

- Lowest level
- Communicates directly with peripheral devices
- Responsible for starting I/O operations on a device
- Processes the completion of an I/O request

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Basic File System

- **Physical I/O**
- **Deals with exchanging blocks of data**
- **Concerned with the placement of blocks**
- **Concerned with buffering blocks in main memory**

Basic I/O Supervisor

- Responsible for file I/O initiation and termination
- Control structures are maintained
- Concerned with scheduling access to optimize performance
- Part of the operating system

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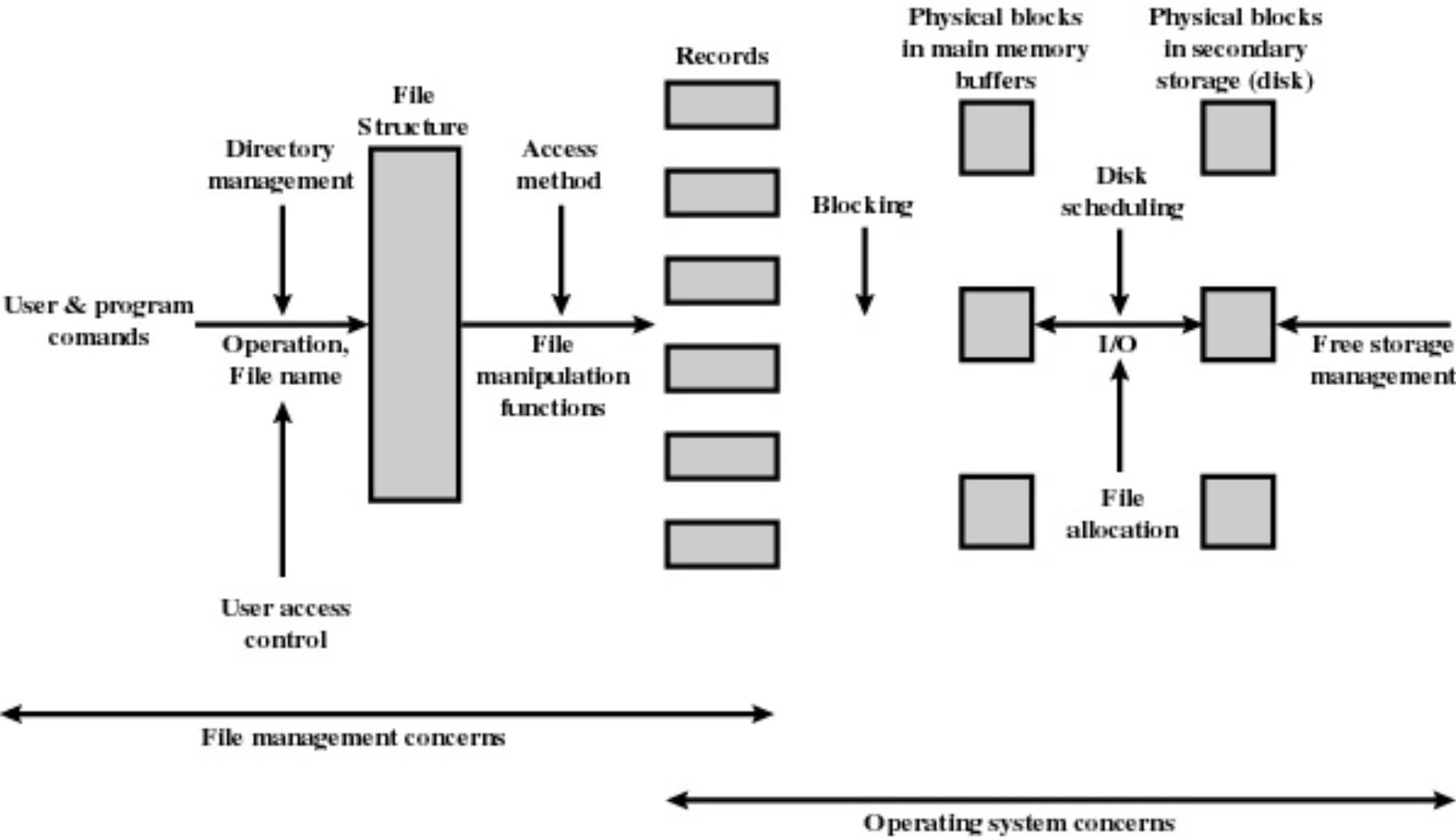
Logical I/O

- Enables users and applications to access records
- Provides general-purpose record I/O capability
- Maintains basic data about file

Access Method

- **Reflect different file structures**
- **Different ways to store and process data**


Physical blocks in main memory buffers
Physical blocks in secondary storage (disk)
Records
File Structure
Directory management
Access method
Blocking
Disk scheduling
User & program comands
Operation, File name
File manipulation functions
I/O
Free storage management
File allocation
User access control
File management concerns
Operating system concerns

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File Management Functions

- Identify and locate a selected file
- Use a directory to describe the location of all files plus their attributes
- On a shared system describe user access control
- Blocking for access to files
- Allocate files to free blocks
- Manage free storage for available blocks

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Criteria for File Organization

- **Rapid access**
  - **Needed when accessing a single record**
  - **Not needed for batch mode**
- **Ease of update**
  - **File on CD-ROM will not be updated, so this is not a concern**

Criteria for File Organization

- **Economy of storage**
  - **Should be minimum redundancy in the data**
  - **Redundancy can be used to speed access such as an index**
- **Simple maintenance**
- **Reliability**

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Summary

- **We have covered**
  - **What a file is**
  - **What is expected of a file system**
  - **The role of the operating system in file management**

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Next Lecture

- **We will begin discussing directories and access management**
- **Lecture Notes: http://www.cs.rhul.ac.uk/~karl**