GALGOTIAS UNIVERSITY

School of Computing Science and Engineering

Program: MCA

Course Code: MCAS-2120

Course Name: OPERATING SYSTEM

Course Outcomes :

CO NUMBER	TITLE
CO1	Understand functions and services of Operating system and identify the use of system calls.(Remembering)
CO2	Apply various process scheduling algorithms for any given problem by understanding the concepts of process.(Comprehension)
CO3	Compare different memory mgmt schemes & page replacement algorithms.(Analysis)
CO4	Apply different disk scheduling algorithms with the help of understanding file system organization.(Analysis)
CO5	Analysis of Operating system in dynamic environment.(Evaluation)
CO6	Understand about the research and indexed publications. (Understanding)

Syllabus

- Unit I: Introduction

Introduction – Types of Operating Systems – I/O structure – Dual–mode operation – Hardware protection – General system architecture.

- UNIT II: **Process Management**

Process Management: Process concept – Concurrent process scheduling concepts – CPU scheduling – Scheduling algorithms, Multiple processors Scheduling – Critical section – Synchronization hardware – Semaphores, classical problem of synchronization, Interprocesscommunication. Deadlocks: Characterization, Prevention, Avoidance and Detection

- **UNIT III: Memory Management**

Storage management – Swapping, single and multiple partition allocation – paging – segmentation – page segmentation, virtual memory – demand paging – page replacement and algorithms, thrashing. Secondary storage management – disk structure – free space management – allocation methods – disk scheduling – performance and reliability improvements – storage hierarchy

- **UNIT IV: Control and Information Management**

Files and protection – file system organisation – file operations – access methods – consistency semantics – directory structure organisation – file protection – implementation issues – security encryption.

- **UNIT V: Case Study**

UNIX , Linux and Windows XP operating systems

- **Unit VI: Applications**

Advances and the latest trends in Operating System, latest applications, latest research conducted in the areas, Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums.

- **Text Book (s)**
- Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
- D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition
- **Reference Book (s)**
- Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education
- Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
- D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition
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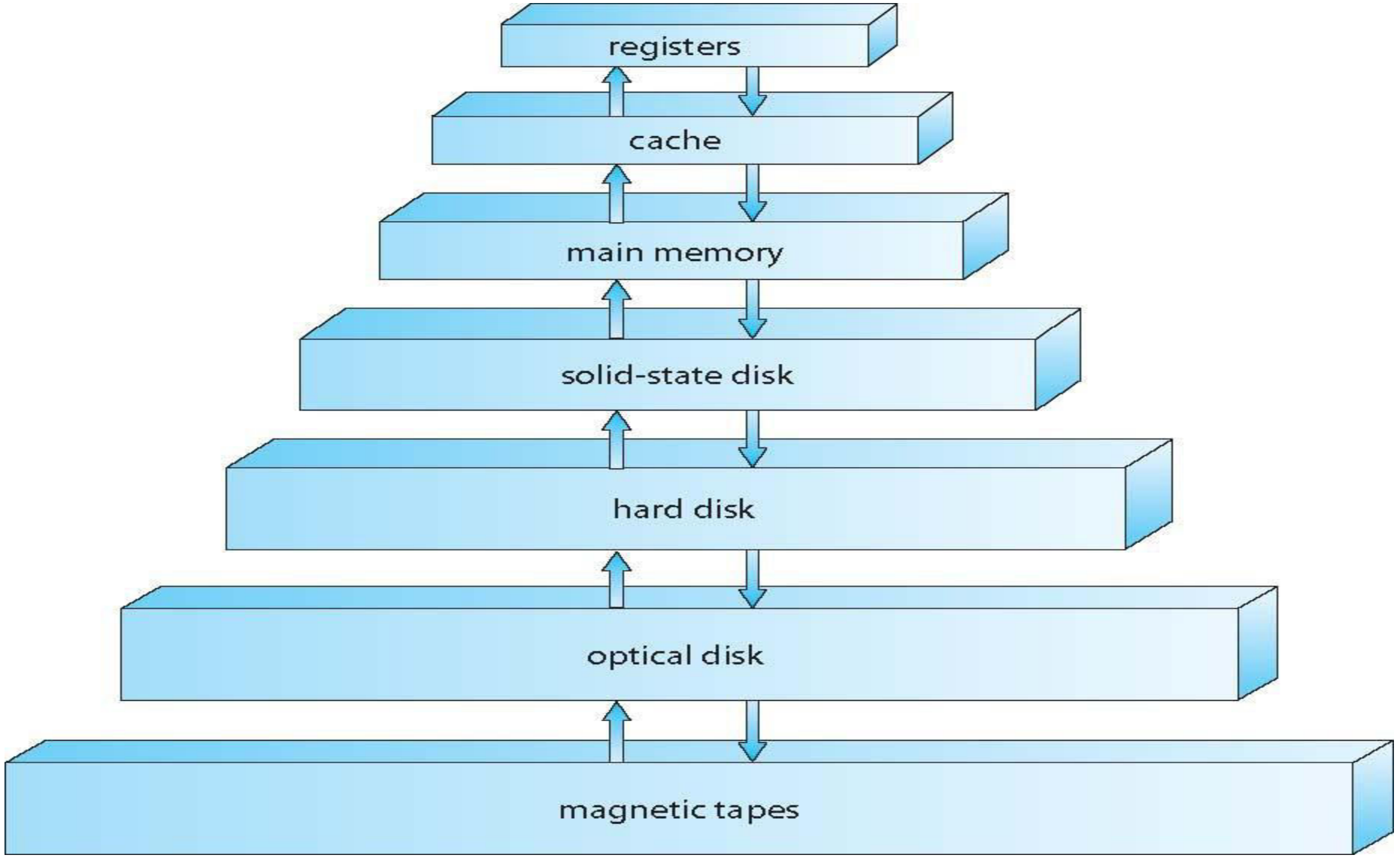
Storage Hierarchy

- Storage systems organized in hierarchy
- Speed
  Cost
- Volatility
- **Caching – copying information into faster storage system;**
- main memory can be viewed as a cache for secondary Storage
- **Device Driver for each device controller to manage I/O**
- Provides uniform interface between controller and kernel


registers
cache
main memory
solid-state disk
hard disk
optical disk
magnetic tapes

Functions of Operating System

- **Process Management**
- A process is a program in execution. It is a unit of work within the
- system. Program is a ***passive entity, process is an active entity.***
- Process needs resources to accomplish its task
- CPU, memory, I/O, files Initialization data
- Process termination requires reclaim of any reusable resources
- Single-threaded process has one **program counter specifying**
- location of next instruction to execute Process executes instructions sequentially, one at a time,
- until completion

- **Memory Management**
- To execute a program all (or part) of the instructions must be in memory
- All (or part) of the data that is needed by the program must be in memory.
- Memory management determines what is in memory and when Optimizing CPU utilization and computer response to users Memory management activities
- Keeping track of which parts of memory are currently being used and by whom
- Deciding which processes (or parts thereof) and data to move into and out of memory
- Allocating and deallocating memory space as needed

- **Storage Management**
- OS provides uniform, logical view of information storage
- Abstracts physical properties to logical storage unit - **file**
- Each medium is controlled by device (i.e., disk drive, tape drive)
- Varying properties include access speed, capacity, datatransfer rate, access method (sequential or random)
- File-System management
- Files usually organized into directories Access control on most systems to determine who can access what
- OS activities include
- Creating and deleting files and directories
- Primitives to manipulate files and directories
- Mapping files onto secondary storage
- Backup files onto stable (non-volatile) storage media

- **Mass-Storage Management**
- Usually disks used to store data that does not fit in main memory or
- data that must be kept for a “long” period of time
- Proper management is of central importance

  Entire speed of computer operation hinges on disk subsystem and its algorithms
- OS activities
- Free-space management

  Storage allocation
- Disk scheduling
- Some storage need not be fast
- Tertiary storage includes optical storage, magnetic tape
- Still must be managed – by OS or applications
- Varies between WORM (write-once, read-many-times)

- **Protection and Security**
- **Protection – any mechanism for controlling access of processes or**
- users to resources defined by the OS **Security – defense of the system against internal and external** attacks
- Huge range, including denial-of-service, worms, viruses, identity theft, theft of service
- Systems generally first distinguish among users, to determine who can do what
- User identities (**user IDs, security IDs) include name and**
- associated number, one per user

  User ID then associated with all files, processes of that user to determine access control
- Group identifier (**group ID) allows set of users to be defined and**
- controls managed, then also associated with each process, file
- **Privilege escalation allows user to change to effective ID with**