

Operating Systems

What is OS?

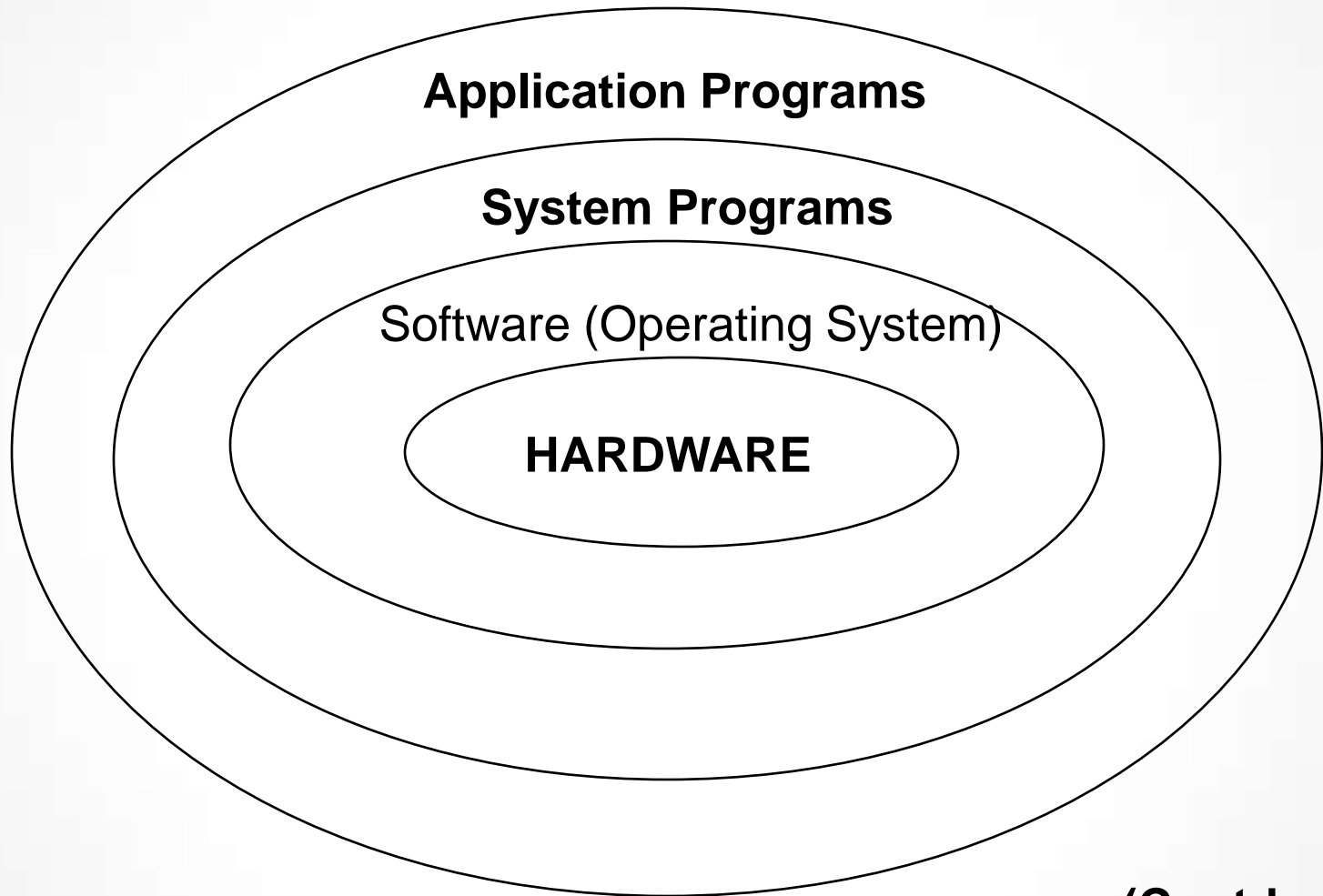
- Operating System is a software, which makes a computer to actually work.
- It is the software that enables all the programs we use.
- The OS organizes and controls the hardware.
- OS acts as an interface between the application programs and the machine hardware.
- Examples: Windows, Linux, Unix and Mac OS, etc.,

What OS does?

An operating system performs basic tasks such as,

- controlling and allocating memory,
- prioritizing system requests,
- controlling input and output devices,
- facilitating networking and
- managing file systems.

Structure of Operating System



(Contd...)

Structure of Operating System

(Contd...)

The structure of OS consists of 4 layers:

1. Hardware

Hardware consists of CPU, Main memory, I/O Devices, etc,

2. Software (Operating System)

Software includes process management routines, memory management routines, I/O control routines, file management routines.

(Contd...)

Structure of Operating System (Contd...)

3. System programs

This layer consists of compilers, Assemblers, linker etc.

4. Application programs

This is dependent on users need. Ex. Railway reservation system, Bank database management etc.,

Evolution of OS

- The evolution of operating systems went through seven *major phases*.
- Six of them significantly changed the ways in which users accessed computers through the open shop, batch processing, multiprogramming, timesharing, personal computing, and distributed systems.
- In the seventh phase the foundations of concurrent programming were developed and demonstrated in model operating systems.

(Contd...)

Evolution of OS (contd..)

Major Phases	Technical Innovations	Operating Systems
Open Shop	The idea of OS	IBM 701 open shop (1954)
Batch Processing	Tape batching, First-in, first-out scheduling.	BKS system (1961)
Multi-programming	Processor multiplexing, Indivisible operations, Demand paging, Input/output spooling, Priority scheduling, Remote job entry	Atlas supervisor (1961), Exec II system (1966) (Contd...)

Evolution of OS (contd..)

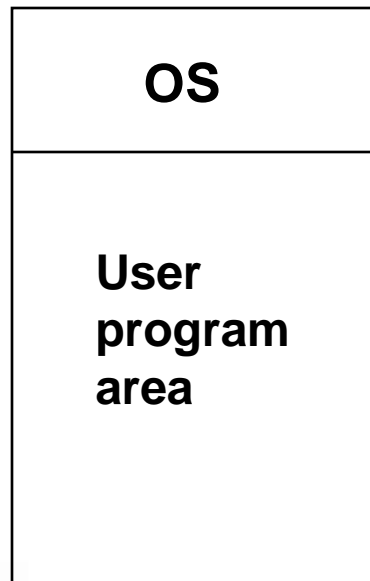
Timesharing	Simultaneous user interaction, On-line file systems	Multics file system (1965), Unix (1974)
Concurrent Programming	Hierarchical systems, Extensible kernels, Parallel programming concepts, Secure parallel languages	RC 4000 system (1969), 13 Venus system (1972), 14 Boss 2 system (1975).
Personal Computing	Graphic user interfaces	OS 6 (1972) Pilot system (1980)
Distributed Systems	Remote servers	WFS file server (1979) Unix United RPC (1982) 24 Amoeba system (1990)

Batch Processing

- In Batch processing same type of jobs batch (*BATCH- a set of jobs with similar needs*) together and execute at a time.
- The OS was simple, its major task was to transfer control from one job to the next.
- The job was submitted to the computer operator in form of punch cards. At some later time the output appeared.
- The OS was always resident in memory. (Ref. Fig. next slide)
- Common Input devices were card readers and tape drives.

Batch Processing (Contd...)

- Common output devices were line printers, tape drives, and card punches.
- Users did not interact directly with the computer systems, but he prepared a job (comprising of the program, the data, & some control information).



Multiprogramming

- Multiprogramming is a technique to execute number of programs simultaneously by a single processor.
- In Multiprogramming, number of processes reside in main memory at a time.
- The OS picks and begins to executes one of the jobs in the main memory.
- If any I/O wait happened in a process, then CPU switches from that job to another job.
- Hence CPU in not idle at any time.

Multiprogramming (Contd...)

OS
Job 1
Job 2
Job 3
Job 4
Job 5

- Figure depicts the layout of multiprogramming system.
- The main memory consists of 5 jobs at a time, the CPU executes one by one.

Advantages:

- Efficient memory utilization
- Throughput increases
- CPU is never idle, so performance increases.

Time Sharing Systems

- Time sharing, or multitasking, is a logical extension of multiprogramming.
- Multiple jobs are executed by switching the CPU between them.
- In this, the CPU time is shared by different processes, so it is called as “Time sharing Systems”.
- Time slice is defined by the OS, for sharing CPU time between processes.
- Examples: Multics, Unix, etc.,

Operating Systems functions

The main functions of operating systems are:

1. Program creation
2. Program execution
3. Input/Output operations
4. Error detection
5. Resource allocation
6. Accounting
7. protection

Types of OS

Operating System can also be classified as,-

- **Single User Systems**
- **Multi User Systems**

Single User Systems

- Provides a platform for only one user at a time.
- They are popularly associated with Desk Top operating system which run on standalone systems where no user accounts are required.
- Example: DOS

Multi-User Systems

- Provides regulated access for a number of users by maintaining a database of known users.
- Refers to computer systems that support two or more simultaneous users.
- Another term for *multi-user* is *time sharing*.
- Ex: All mainframes and are multi-user systems.
- Example: Unix