

UNIT-1

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Operating System

- It is a system program that manages the computer hardware.
- It provides a basis for application programs.
- It acts as an interface between computer user & hardware.
- It controls & co-ordinates the use of the hardware among the various application programs for the various users.
- Resources → CPU time, memory space, file-storage space, I/O devices & so-on.
The operating system manages these resources.
- Operating system is a control program.
A control program manages the execution of user program to prevent errors & improper use of the computer.
- It provides a platform on which other application programs are installed.

* Functions of an operating System

- ① Process Management → Creating, deleting, process synchronization, process communication, suspending & resuming & deadlock handling.
- ② Memory Management → Keeping track of which part is being used & by whom.
 - allocating & deallocating memory spaces.
 - deciding which process or data to move in or out.

⑥ Job management → A Job is a collection of one or more related programs & their data. OS prepares, schedules control & monitor jobs submitted for execution to ensure most efficient processing.

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③ File-Storage Management →

→ Creating & deleting files

→ Creating & deleting directories to organise files.

→ Manipulating files & directories.

→ Mapping files onto secondary storage.

→ Backing up files on a stable storage media.

④ Mass-Storage Management → Free-space Management
Storage allocation
Disk scheduling

⑤ Caching → Bringing the information from main memory to cache or CPU registers for execution purpose is called caching.

* Types of Operating Systems

1. Batch operating.

2. Multiprogramming

3. Time sharing / Multitasking

4. Multiprocessor → Consists of several processors that share a common physical memory.

→ enhanced performance

→ less cost than multiple single systems.

→ Increased throughput

→ Increased reliability

→ Speeding up the execution.

⑥ Distributed OS → Consists of several computers that are interconnected by communication networks.

Distributed Computing

Client-Server system.

Centralised

→ Server satisfies the request generated by Client system.

Peer-to-peer system

→ Collection of processors.
→ Do not share memory.
→ each processor has its own local memory.

Server System

→ Processors communicate through high speed buses, telephone lines.

Compute-server
(for computation)

file-server
(for file-handling) (Loosely Coupled System)

⑦ * Clustered System

- clustered comp share storage & are closely linked via LAN networking.
- composed of two or more individual coupled system.

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⑧ Desktop System → They are neither multiuser nor multitasking. The goals of these computers is to maximize user convenience & responsiveness.

Asymmetric Clustering

→ one host stand by server monitors the other active servers

Symmetric Clustering

→ two or more servers runs applications & monitors each other

Parallel Clustering

→ allows multiple hosts to access the same data

→ expands as Storage Area Network (SAN)

⑨ Real-Time Operating System

→ Known to give maximum time to critical operations like OS calls, interrupt handlings.

Hard Real Time OS

→ guarantees the maximum time for critical operations & complete them on time.

Soft Real Time OS

→ can only guarantee a maximum of the time. i.e. the critical task will get priority, but no assurance of completing it in a defined time.

Throughput → No. of process executed per unit time
Put)

1. Tightly Coupled Processing

Advantages.

- Increase Throughput
- Increase Reliability.
- Cost effective.
- Power Efficient

Disadvantages

- Large memory is Required
- Maximum Speed can't be achieved.

* Symmetric → There will be no monitor
all the systems work symmetrically

* Asymmetric → There is Master-slave
approach, one monitor is there
to monitor other processors.

2. Loosely - Coupled Processing →

(Distributed Computing).

→ Multiple computers are connected in
network.

Distributed Computing

- ↳ Client - Server System
- ↳ peer to peer System.

Evolution of OS

1. Batch OS
2. Multiprogramming OS
3. Multitasking OS / Time Sharing
4. Multiplex OS
5. Multiprocessing OS
6. Distributed Computing
7. Cluster Computing (LAN)
 - parallel cluster
 - Cloud Computing → Cluster over WAN
8. Real time OS
9. Embedded OS

(System call)

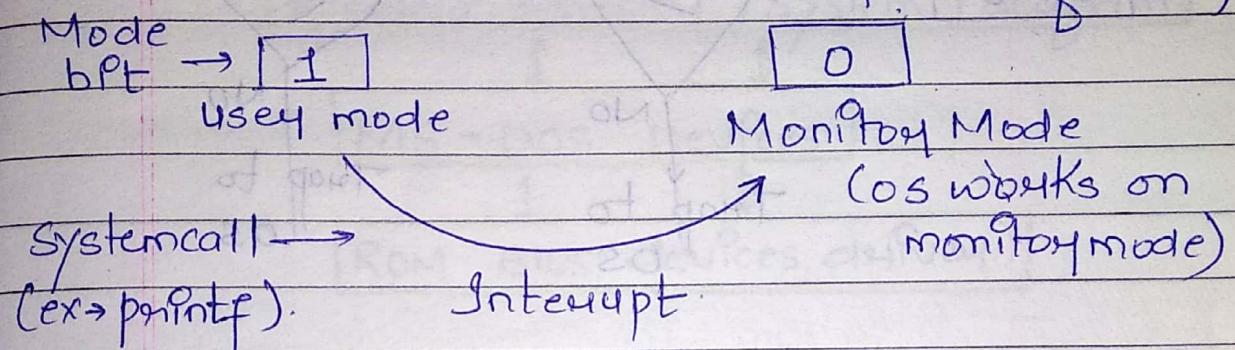
function → The functions defined in the OS.

* Hardware Protection

1. Dual Mode of Operation →

↳ User Mode

↳ Monitor Mode (Supervised, Privileged Mode)



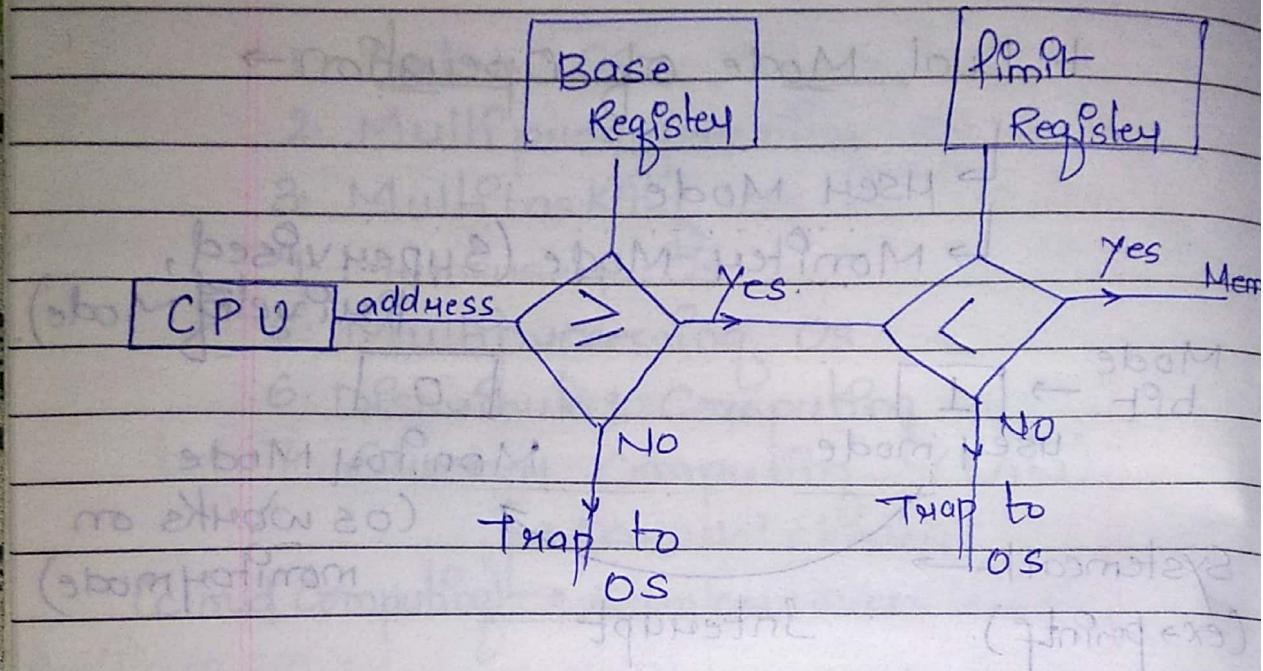
→ Interrupt Vector → It is a register that stores what next to be done.

→ System call → Software Interrupt

→ I/O devices or Memory → hardware allocation. Interrupt.

2. I/O Protection → Same as dual mode

3. Memory Protection → Required in multiprogramming, multitasking & multiuser OSs.



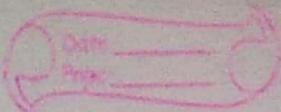
4. CPU Protection (Timey is arranged to process different tasks).

→ We will set a timer for each program to execute.

Times having → Divide time for each task equally for execution of tasks.

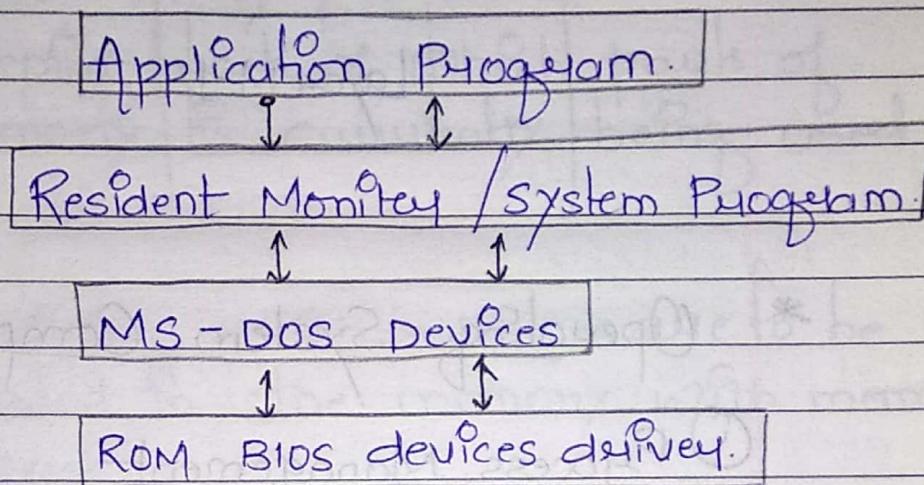
Real time → It has time constraint for completion of tasks. It has less functionality & used where special task with high speed is to be completed.

4/11/2020



* Operating System Structure

① Simple Structure (MS-DOS structure)



→ Monolithic program (single program)
(No modularity) (No abstraction).

→ Unix → Complex

→ MS-DOS → Simple.

(UNIX Structure)

Uses

Shells & Commands.

// System call Interface to Kernel

file mgmt CPU scheduling

device mgmt Page Replacement
Downward paging.

Kernel Interface to hardware.

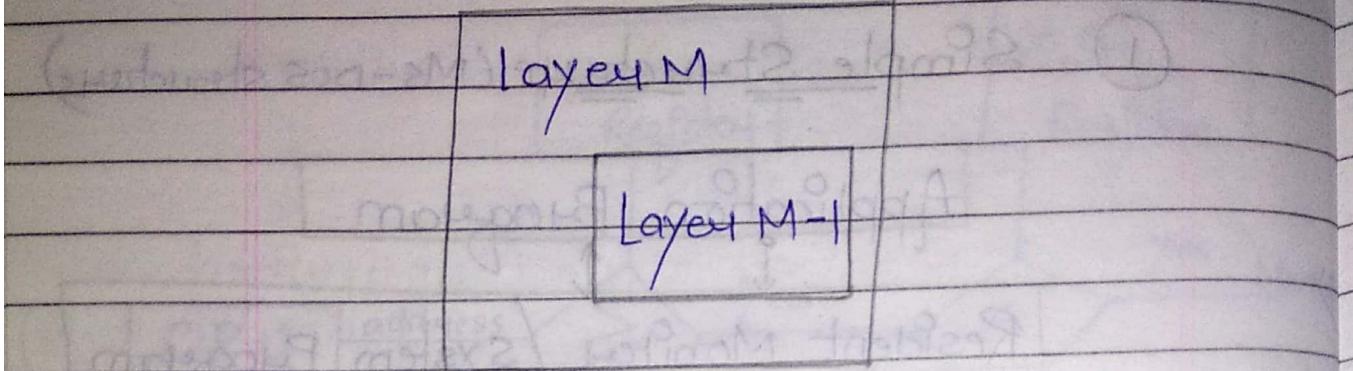
Terminal Controller

Disc Controller Point Controller

Terminal.

Disc & Tapes printer.

② Layered structure



* Operating System Components

① Process Management

→ Program ^{to} execution is process.

Creation → Creating & deleting both system & user processes.

Operating system → System processes.

Suspending / Resuming processes →

Providing mechanism for process synchronisation, process comm. & Deadlock handling.

② Main Memory Management →

- Allocation & deallocation of memory as needed by processes.
- Keeping track of which parts of memory is currently being used & by whom.
- Deciding which processes are to be loaded in the memory with memory space.

15/01/2020

③ File Management →

- Creating & deleting files.
- Reading & Writing files/directories.
- Supporting primitives for manipulation of files & directories.
- Mapping files on to secondary storage.
- Backing up files on stable storage media.

④ I/O System Management →

- A general device driver interface.
- Drivers for specific hardware device.

⑤ Secondary Storage Management →

- Disk scheduling is a part of Secondary storage.
- Free space Management
- Storage Allocation.

⑥ Networking

(distributed computing)

(uses high speed bus) / (Network)

- Communication (either by Shared Memory or message Passing).

⑦ Protection & Security →

(external attack.)

- Protection → protection from external threat attacks.

- Security → from unauthorised access of other users.

⑧ Command Interpreter →

- To interpret the command coming from user end.
(I/O device drivers)

* Operating System Services

(1.) Services for User / Programs →

① Program Execution →

→ program must be loaded into main memory to run it.

② User Interface →

→ for loading the program.

③ I/O execution → I/O device Ps to be given to the user by OS & then take it when execution is done.

④ File Manipulation →

→ reading & writing, creat & delete files. (manipulation).

⑤ Error Handling →

→ while executing program → errors must be pointed / shown to the user & program can be executed normally.

⑥ Communication →

→ Comm betw two process.

(Shared Memory / Message Passing).

(2.) Services for System

① Resource Allocation →

- Keeping track of what resources are allocated to the users.
- (accounts / user statistics).

② Accounting →

- user statistics

③ Security / Protection →

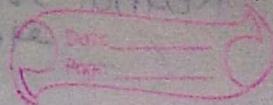
- Protection from external attack.
- Security from unauthorised access of other programs & users.

* System Calls

It is an interface b/w user & processes & operating system.

- System calls are used to change the mode from user mode to monitor mode.

~~allow & signal~~ → parent & child signals.



1. Process Control →
 - ↳ Create & end the process.
 - ↳ fork() → a process can create its sub processes.
 - ↳ load & execute the program.
 - ↳ end & abort the program.
 - ↳ get process attributes, set process attributes.
 - ↳ wait system call, signal.

2. File Management →
 - Create, open, close, delete.
 - open, close
 - Read, Write, Reposition.
 - Get & set the file attributes.
 - Modify, rename, print, copy

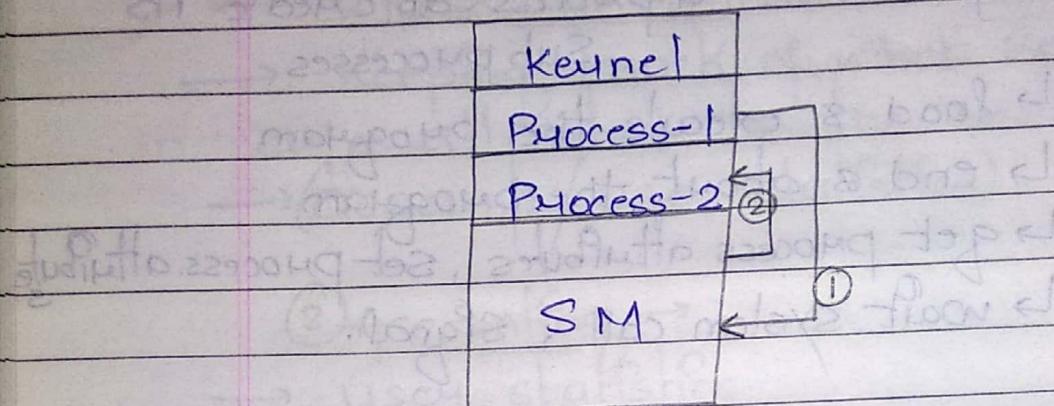
3. Device Management →
 - Request & Release
 - Read, Write, Reposition.
 - Get device attributes & set device attributes.

4. Information Maintenance →
 - Get time, Set time.
 - Get date, Set date.
 - Get system data (No. of process, System processes)
 - Get / set process, file, device attributes.

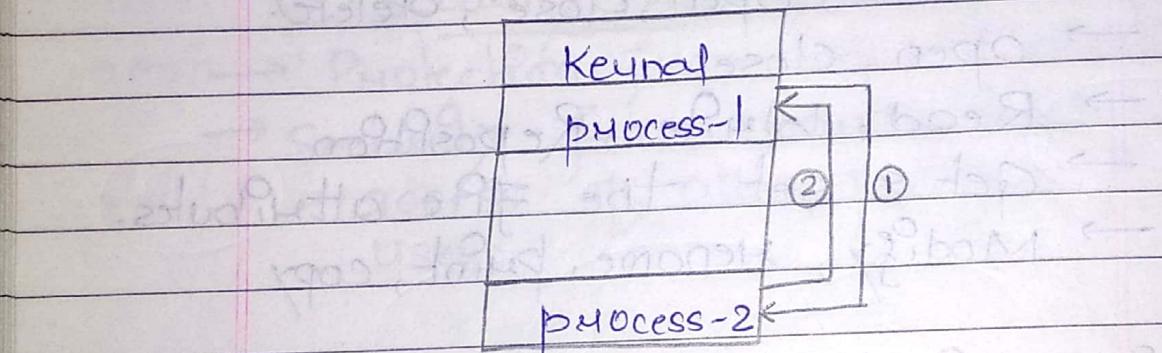
Kernel → Where all the system calls reside. In an operating system.

5. Communication

→ Shared Memory.



→ Message Passing.



→ Open & Close Connection

→ Create & delete

→ Send or receive.

→ Transfer Status Information.

Q - What could be the sequence of system calls if the content of a file is to be copied from that file to another file.

Ans → Source → copy → Destination

- Acquire Input file name.
- Write prompt to screen.
- Accept Input
- Acquire O/P file name.
- Write prompt to screen
- Open the I/P file.
- If file doesn't exist, about call.
- Create O/P file
- If file already exist, about call.
- Read from I/P file.
- Write to O/P file.
- Close files
- Write completion message to screen
- Terminate the process normally.

* System Programs →

- ① File modification / manipulation.
- ② Status Information
- ③ Programming language Supports (C, C++, Java, Python)
- ④ Program (Loading / Execution)
- ⑤ Communication.