

OS is the software connecting hardware & user application
 Windows - developed by Microsoft
 Mac OS - Apple
 Linux - open source. eg (Ubuntu, Fedora, CentOS)
 Unix - is the foundation of Linux & Mac OS - it is multi-user.
 Android - by Google.
 iOS - Apple.
 Realtime OS - in (SOT).

<u>Multiprogramming</u>	<u>Multithreading</u>	<u>Multiprocessing</u>
multiple process. each process has its own memory and resource work load is distributed	executing multiple threads within single process. it share same memory performed by dividing task into small unit	purpose to maximize CPU utilization by quick switching the program separate memory
<u>Multitasking</u> - parallel execution of task or set of task.	<u>Program</u> - set of instruction	<u>Process</u> - when program loaded into memory and executed it becomes process

Thread - single unit of execution within process.

Process State - (Non-preemptive - continue execute until it is completed)

- ① FCFS - ② SJF. ③ Round Robin is Preemptive
- ④ Priority scheduling ⑤ Multilevel Queue

Process Synchronization - as traffic signal co-ordinate the execution of processes or thread

Key requirement of synchronization

1- Mutual Exclusion (1 process at 1 time)

2- Progress

3- Bounded waiting

Process synchronization mechanism

OS-2

Locks / mutexes - mutual exclusion

Semaphore -

read write lock.

deadlock - when two processes wait for same resources at a time

conditions

mutual exclusion
Hold & Wait
no preemption
Circular Wait

deadlock handling

Prevention -

Avoidance - resource allocation algorithms

Detection - Banker's algorithm

Recovery -

Memory management -

fixed partitioning & dynamic partitioning are two approaches used in memory management

dynamic - first fit, best fit, worst fit
first availability, small available, large availability

Paging - mechanism used to retrieve process from

secondary storage into main memory in form of page.

is used to divide each process into form of pages

main memory in form of frame

when required pages are brought to main memory
otherwise not

OS-3

Virtual memory - Concept that computer uses more memory than it actually has & it creates imaginary memory space by combining RAM + Hard Disk (Secondary). By this degree of multi programming is increase & CPU utilization is also increases.

Page Replacement Algo

FIFO 1 2 3 4 1 2 5 1 2 3 4 5

Frame-3

1	2	3	4	1	2	5	1	2	3	4	5
1	1	1	4	4	4	5	5	5	5	5	5
2	2	2	1	1	1	1	1	1	3	3	3
3	3	3	2	2	2	2	2	2	2	4	4
P	F	F	F	F	F	F	H	H	H	H	H

pault = 9
hit = 3

- ③ optimal page replacement
- ④ LRU

Thrashing

Situation in Computer system is busy in moving page in & out of memory rather than executing important task.

Segmentation - divide the process into smaller subparts.

Disk management -

Seek time - time taken in locating the disk arm to specified track where read/write request will be satisfied

- ① ~~SC~~ FCFS -
- ② SSTF (shortest seek time first) -
Select request which have sort seek time
It may lead to starvation
- ③ SCAN - head in one direction
- ④ C-scan circular scan
- Look - goes as far as last request once there
no request in that direction it reverse
direction It reduces unnecessary traversal
improve response time
- ⑤ C-Look扫描 disk throughout

Starvation - when low priority process unable to execute because of high priority