OPERATING SYSTEM

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TYPES OF OS

- BATCH PROCESSING OS
- MULTIPROGRAMMING OS
- TIMESHARING OS
- REAL-TIME OS

BATCH PROCESSING OS

- A batch is a sequence of user jobs.
- Batch processing is a technique in which an Operating System collects the programs and data together in a batch before processing starts.
- A computer operator forms a batch by arranging jobs in a sequence & inserting JCL(job ctrl language) commands to automate various activities of the OS.

JCL COMMANDS

- It includes (1)commands for marking of job beginning and end,
- (2)commands for loading and execution of pgm and
- (3) commands to announce resource needs.

Batch processing os.....

- After forming a batch, the operator submits it to the os for processing.
- <u>Main function</u>: to implement the processing of a batch of jobs without requiring any intervention of the operator.
- The OS keeps a number a jobs in memory and executes them without any manual information.
- Jobs are processed in the order of submission, i.e., first come first served fashion.

Batch monitor

- A m/y resident portion of the batch os called Batch monitor.(reads, nterprets & executes the JCL commands.)
- It accepts a cmd from the s/m operator for initiating the processing of a batch of the first job of the batch.
- At the end of the job, performs job termination process initiates execution of the next job
- At the end of the batch, it performs batch termination process and awaits the initiation of the next batch by the operator..

Batch monitor.....

- The main function of a batch processing system is to automatically keep executing the jobs in a batch. This is the important <u>task</u> of a batch processing system i.e. performed by the <u>'Batch Monitor</u>' resided in the low end of main memory.
- This task can be classified into 3 fns.
 - 1.scheduling
 - 2.m/y mgmt
 - 3.sharing &protection

Batch os....

- Batch monitor performs a FCFS scheduling.
- the computer operator can perform some amt of job scheduling by using some criteria like priority.
- In batch os, m/y is divided into 2 at any time-the s/m area & the user area.
- In order to provide max.space to the user pgm,an overlay structure is used to store the monitor pgm in the s/m area.
- The resident portion of the monitor is permanently situated in the m/y,while the transient parts are loaded into the transient area.

Batch os



advantages

- Greater Potential for resource utilization and throughput.
- Repeated jobs are done fast in batch systems without user interaction.
- You don't need special hardware and system support to input data in batch systems.
- Best for large organizations but small organizations can also benefit from it.
- Batch systems can work offline so it makes less stress

Advantages....

- Sharing of batch system for multiple users.
- The idle time batch system is very less.
- You can assign specific time for the batch jobs so when the computer is idle it starts processing the batch jobs i.e. at night or any free time.
- The batch systems can manage large repeated work easily.

Advantages...

• Processor consumes good time while processing that mean it knows which job to process next. In real time systems we don't have expectation time of how long the job is and what is estimated time to complete it. But in batch systems the processor knows how long the job is as it is queued.

disadvantages

- Higher turnaround time
- Under-utilization of the s/m resources
- Allows no interaction b/w user & executing pgm.

Multiprogramming os

- Multiprogramming :interleaved execution of 2 or more different &indept pgms by the same computer.
- <u>Goal:</u> to improve the s/m utilization by exploitting the concurrency b/w the CPU &

the I/O sub-s/m.

The basic idea is that while i/o sub s/m is busy with an i/o operation for one user job,the cpu can execute another user job.

- While one pgm is witing for i/o transfer, the CPU is given to another pgm in the m/y, which is ready to utilize it.
 - Since the operating spead of the CPU is much higher than that of the I/O operations, the CPU can allocate time to several pgms instyead of remaining idlewhen one is busy with i/o operations.
- Thus it is possible for several users to share the time of the CPU.





In co-operation of multi-programming in a s/m requires the following additional h/w and s/w features:

- Large m/y
- m/y protection
- Pgm status preservation
- Proper job mix

Types of multipgming s/ms

- Multiprogramming s/m
- Cooperative multitasking
- Preemptive multitasking
- Mulithreading
- Multiprocessing s/m

Multiprogramming s/m

- 1960
- In a multiprogramming system there are one or more programs loaded in main memory which are ready to execute. Only one program at a time is able to get the CPU for executing its instructions.
- goal of multiprogramming is to keep the CPU busy as long as there are processes ready to execute.



 Multiprocessing sometimes refers to executing multiple processes (programs) at the same time. In fact, multiprocessing refers to the *hardware* (i.e., the CPU units) rather than the *software* (i.e., running processes).

multitasking

- Multitasking has the same meaning of multiprogramming but in a more general sense, as it refers to having multiple (programs, processes, tasks, threads) running at the same time.
- This term is used in modern operating systems when multiple tasks share a common processing resource (e.g., CPU and Memory).
- At any time the CPU is executing one task only while other tasks waiting their turn.

Preemptive multitasking

 Preemptive multitasking is a type of multitasking that allows computer programs to share operating systems (OS) and underlying hardware resources. It divides the overall operating and computing time between processes, and the switching of resources between different processes occurs through predefined criteria.

Cooperative multitasking

• Cooperative multitasking is a multitasking technique that enables two or more programs to cooperatively share the processing time and resources of the host processor. In this technique the programs in the processing queue must equally allocate the processors resources within each other.

Multithreading

- Multithreading is an execution model that allows a single process to have multiple code segments (i.e., *threads*) run concurrently within the "context" of that process.
- Multiple threads of a single process can share the CPU in a single CPU system or (purely) run in parallel in a multiprocessing system

multi-processing

 multi-processing refers to the ability of a system to support more than one processor at the same time. Applications in a multi-processing system are broken to smaller routines that run independently. The operating system allocates these threads to the processors improving performance of the system.

Time sharing s/ms

- Provides fast response time to interactive users of a computer s/m.
- Response time: submission to result reporting.
- To provide this, time sharing supervisor should ensure that no pgm should be allowed to monopolize the CPU. 2 provisions are made to ensure this:



- Pgms are not assigned fixed priorities
- A pgm can only consume a limited amt of CPU time .(10-20 ms)this short period of time –time slice.
- RR scheduling and time sharing are used to implement these provisions.(all pgms get equal opportunity to execute in the CPU)
- The CPU is forcibly turn back from the process if its time slice expires.(pgm preemption)



- The preempted pgm is put at the end of the scheduling list and a new pgm is selected.
- If a pgm does not consume its time slice the time sharing super visor simply put at the end of the scheduling list and schedules another pgm.

advantages

- advantages of Timesharing operating systems are following:
- Provide advantage of quick response.
- Avoids duplication of software Reduces CPU idle time

Disadvantages

- Disadvantages of Timesharing operating systems are following:
- Problem of reliability
- Question of security and integrity of user programs and data
- Problem of data communication





- In above figure the user 5 is active but user 1, user 2, user 3, and user 4 are in waiting state whereas user 6 is in ready status.
- As soon as the time slice of user 5 is completed, the control moves on to the next ready user i.e. user 6. In this state user 2, user 3, user 4, and user 5 are in waiting state and user 1 is in ready state. The process continues in the same way and so on.

- The time-shared systems are more complex than the multiprogramming systems. In time-shared systems multiple processes are managed simultaneously which requires an adequate management of main memory so that the processes can be **swapped in or swapped out** within a short time.
- <u>Swapping</u>:operation of temporarily transferring pgms from the main m/y to the disk storage and back is called swapping.
- It involves writing pgms instructions and data area on to the disk storage .once a pgm is completely swapped out, the m/y area allocated to it becomes free and can be allocated to a previously swapped out process.(now in ready state).
- After being swapped in,the process is placed at the end of the scheduling list.

REAL TIME OS

- The time taken by the system to respond to an input and display of required updated information is termed as the **response time**
- A real-time operating system must have well-defined, fixed time constraints, otherwise the system will fail. For example, Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

Real time os

- primary objective:to meet the scheduling deadline.
- Secondary objective: user convience & resource utilization.
- Real time os provides:
- (1) multitasking within an appln
- (2) priority driven/deadline oriented scheduling
- (3)pgmr defined interrupts

MULTIPROCESSOR S/M

2 approaches to process management

- master slave configuration
- symmetrical multiprocessors
- <u>master slave configuration</u>
- It favours centralized process mgmt.
- Only the master process executes the os routines and performs all ctrl functions in the s/m.
- thus the master decides which process is to execute on which processor and for how long.
- The slave processors simply perform the tasks detailed to them by the master.

Multiprocessor s/m

- Advantage: simplicity
- Disadvantages: poor reliability and Poor scalability
- poor reliability(failure of master process)
- Poor scalability(load on the master process increases the no of processors.

symmetrical multiprocessors

- Processors are identical in their ability to perform ctrl functions.
- Any processor can perform a control fn.
- A h/w processor selection logic is activated whenever an interrupt occurs in the s/m.
- The logic determines which processor should handle the interrupt.
- This arrangement permits a malfunctioning processor to be isolated easily