**Question:** How Buffering can improve the performance of a Computer system?

**Answer:** If C.P.U and I/O devices are nearly same at speed, the buffering helps in making the C.P.U and the I/O devices work at full speed in such a way that C.P.U and the I/O devices never sit idle at any moment.

Normally the C.P.U is much faster than an input device. In this case the C.P.U always faces an empty input buffer and sits idle waiting for the input device which is to read a record into the buffer.For output, the C.P.U continues to work at full speed till the output buffer is full and then it starts waiting.

Thus buffering proves useful for those jobs that have a balance between computational work and I/O operations. In other cases, buffering scheme may not work well.

**Question:** What are the primary differences between Network Operating System and Distributed Operating System?

**Answer:** Network and Distributed Operating systems have a common hardware base, but the difference lies in software.

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **Network Operating System** | **Distributed Operating System** |
| 1 | A network operating system is made up of software and associated protocols that allow a set of computer network to be used together. | A distributed operating system is an ordinary centralized operating system but runs on multiple independent CPUs. |
| 2 | Environment users are aware of multiplicity of machines. | Environment users are not aware of multiplicity of machines. |
| 3 | Control over file placement is done manually by the user. | It can be done automatically by the system itself. |
| 4 | Performance is badly affected if certain part of the hardware starts malfunctioning. | It is more reliable or fault tolerant i.e distributed operating system performs even if certain part of the hardware starts malfunctioning. |
| 5 | Remote resources are accessed by either logging into the desired remote machine or transferring data from the remote machine to user's own machines. | Users access remote resources in the same manner as they access local resources. |

**Question:** What is the difference between Job and Process?

**Answer:** A process refers to a program under execution. This program may be an application or system program.

Job means an application program and it is not a system program.

**Question:** What are the advantages of multiprogramming?

**Answer:**

It is parallel processing in which multiple programs can run simultaneously

 Advantages of multiprogramming are –

1. **Increased CPU Utilization** − Multiprogramming improves CPU utilization as it organizes a number of jobs where CPU always has one to execute.
2. **Increased Throughput** − Throughput means total number of programs executed over a fixed period of time. In multiprogramming, CPU does not wait for I/O for the program it is executing, thus resulting in an increased throughput.
3. **Shorter Turn around Time** − Turnaround time for short jobs is improved greatly in multiprogramming.
4. **Improved Memory Utilization** − In multiprogramming, more than one program resides in main memory. Thus memory is optimally utilized.
5. **Increased Resources Utilization** − In multiprogramming, multiple programs are actively competing for resources resulting in higher degree of resource utilization.
6. **Multiple Users** − Multiprogramming supports multiple users.

**Question:** What are the differences between Batch processing system and Real Time Processing System?

**Answer:** Following are the differences between Batch processing system and Real Time Processing System.

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **Batch Processing System** | **Realtime Processing System** |
| 1 | Jobs with similar requirements are batched together and run through the computer as a group. | In this system, events mostly external to computer system are accepted and processed within certain deadlines. |
| 2 | This system is particularly suited for applications such as Payroll, Forecasting, Statistical analysis etc. | This processing system is particularly suited for applications such as scientific experiments, Flight control, few military applications, Industrial control etc. |
| 3 | It provides most economical and simplest processing method for business applications. | Complex and costly processing requires unique hardware and software to handle complex operating system programs. |
| 4 | In this system data is collected for defined period of time and is processed in batches. | Supports random data input at random time. |
| 5 | In this system sorting is performed before processing. | No sorting is required. |
| 6 | It is measurement oriented. | It is action or event oriented. |
| 7 | Transactions are batch processed and periodically. | Transactions are processed as and when they occur. |
| 8 | In this processing there is no time limit. | It has to handle a process within the specified time limit otherwise the system fails. |

**Question:** What are the differences between Real Time System and Timesharing System?

**Answer:** Following are the differences between Real Time system and Timesharing System.

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **Real Time System** | **Timesharing System** |
| 1 | In this system, events mostly external to computer system are accepted and processed within certain deadlines. | In this system, many users are allowed to simultaneously share the computer resources. |
| 2 | Real time processing is mainly devoted to one application. | Time sharing processing deals with many different applications. |
| 3 | User can make inquiry only and cannot write or modify programs. | Users can write and modify programs. |
| 4 | User must get a response within the specified time limit; otherwise it may result in a disaster. | User should get a response within fractions of seconds but if not, the results are not disastrous. |
| 5 | No context switching takes place in this system. | The CPU switches from one process to another as a time slice expires or a process terminates. |

**Question:** What are the differences between multiprocessing and multiprogramming?

**Answer:** Following are the differences between multiprocessing and multiprogramming.

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **Multiprocessing** | **Multiprogramming** |
| 1 | Multiprocessing refers to processing of multiple processes at same time by multiple CPUs. | Multiprogramming keeps several programs in main memory at the same time and execute them concurrently utilizing single CPU. |
| 2 | It utilizes multiple CPUs. | It utilizes single CPU. |
| 3 | It permits parallel processing. | Context switching takes place. |
| 4 | Less time taken to process the jobs. | More Time taken to process the jobs. |
| 5 | It facilitates much efficient utilization of devices of the computer system. | Less efficient than multiprocessing. |
| 6 | Usually more expensive. | Such systems are less expensive. |

**Question:** What is a process scheduler? State the characteristics of a good process scheduler?

OR

What is scheduling? What criteria affect the scheduler's performance?

**Answer:** Scheduling can be defined as a set of policies and mechanisms which controls the order in which the work to be done is completed. The scheduling program which is a system software concerned with scheduling is called the scheduler and the algorithm it uses is called the scheduling algorithm.

Various criteria or characteristics that help in designing a good scheduling algorithm are:

* **CPU Utilization** − A scheduling algorithm should be designed so that CPU remains busy as possible. It should make efficient use of CPU.
* **Throughput** − Throughput is the amount of work completed in a unit of time. In other words throughput is the processes executed to number of jobs completed in a unit of time. The scheduling algorithm must look to maximize the number of jobs processed per time unit.
* **Response time** − Response time is the time taken to start responding to the request. A scheduler must aim to minimize response time for interactive users.
* **Turnaround time** − Turnaround time refers to the time between the moment of submission of a job/ process and the time of its completion. Thus how long it takes to execute a process is also an important factor.
* **Waiting time** − It is the time a job waits for resource allocation when several jobs are competing in multiprogramming system. The aim is to minimize the waiting time.
* **Fairness** − A good scheduler should make sure that each process gets its fair share of the CPU.

**Question:** What is Shortest Remaining Time, SRT scheduling?

**Answer:** Shortest Remaining Time, SRT is a preemptive scheduling. In SRT, the process with smallest runtime to complete (i.e remaining time) is scheduled to run next, including new arrivals. In SRT, a running process may be preempted by new process with shorter estimated run time. It keeps track of the elapsed service time of the running process and handles occasional preemption.

Consider the following 4 jobs

|  |  |  |
| --- | --- | --- |
| **Job** | **Arrival Time** | **Burst Time** |
| 1 | 0 | 7 |
| 2 | 1 | 4 |
| 3 | 3 | 9 |
| 4 | 4 | 5 |

The schedule of the SRT is as follows:



Job1 is started at time 0, being only job in queue. Job 2 arrives at time 1. The remaining time for job 1 is larger (6 time units) than the time required by job2 (4 time units), so job 1 is preempted and job2 is scheduled. The average turnaround time for the above is:

|  |  |
| --- | --- |
| **Job** | **Turn Around Time** |
| 1 | 16-0 = 16 |
| 2 | 5-1 = 4 |
| 3 | 25-3 = 22 |
| 4 | 10-4 = 6 |
|  | **48** |

The average turnaround time is 48/4=12 time unit.

Advantage

Average turnaround time is less.

Disadvantage

Sometime a running process which is being almost completed is preempted because a new job with very small runtime arrives. It is not really worth doing.

**Question:** What are the different principles which must be considered while selection of a scheduling algorithm?

**Answer:** The objective/principle which should be kept in view while selecting a scheduling policy are the following −

1. **Fairness** − All processes should be treated the same. No process should suffer indefinite postponement.
2. **Maximize throughput** − Attain maximum throughput. The largest possible number of processes per unit time should be serviced.
3. **Predictability** − A given job should run in about the same predictable amount of time and at about the same cost irrespective of the load on the system.
4. **Maximum resource usage** − The system resources should be kept busy. Indefinite postponement should be avoided by enforcing priorities.
5. **Controlled Time** − There should be control over the different times −
   * Response time
   * Turnaround time
   * Waiting time

The objective should be to minimize above mentioned times.

**Question:** Shown below is the workload for 5 jobs arriving at time zero in the order given below −

|  |  |
| --- | --- |
| **Job** | **Burst Time** |
| 1 | 10 |
| 2 | 29 |
| 3 | 3 |
| 4 | 7 |
| 4 | 12 |

Now find out which algorithm among FCFS, SJF And Round Robin with quantum 10, would give the minimum average time.

**Answer:** For FCFS, the jobs will be executed as:



|  |  |
| --- | --- |
| **Job** | **Waiting Time** |
| 1 | 0 |
| 2 | 10 |
| 3 | 39 |
| 4 | 42 |
| 5 | 49 |
|  | **140** |

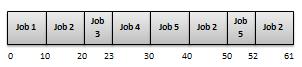
The average waiting time is 140/5=28.

For SJF (non-preemptive), the jobs will be executed as:

|  |  |
| --- | --- |
| **Job** | **Waiting Time** |
| 1 | 10 |
| 2 | 32 |
| 3 | 0 |
| 4 | 3 |
| 5 | 20 |
|  | **65** |

The average waiting time is 65/5=13.

For Round Robin, the jobs will be executed as:



|  |  |
| --- | --- |
| **Job** | **Waiting Time** |
| 1 | 0 |
| 2 | 32 |
| 3 | 20 |
| 4 | 23 |
| 5 | 40 |
|  | **115** |

The average waiting time is 115/5=23.

Thus SJF gives the minimum average waiting time.

**Processes:**

https://www.tutorialspoint.com/operating\_system/os\_processes.htm

**Scheduling Algorithms:**

https://www.tutorialspoint.com/operating\_system/os\_process\_scheduling\_algorithms.htm

**Process** **Scheduling:**

<https://www.tutorialspoint.com/operating_system/os_process_scheduling.htm>