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Sub: Operating system

1) Define Deadlock avoidance, explain Banker's algorithm with an example?

a) Deadlock avoidance: In deadlock avoidance, the request for any resource will be granted if the resulting state of the system doesn't cause deadlock in the system. The state of the system will continuously be checked for safe and unsafe states. In order to avoid deadlocks, the process must tell OS, the maximum number of resources a process can request to complete its execution. The simplest and most useful approach states that the process should declare the maximum number of resources of each type it may ever need. The Deadlock avoidance algorithm examines the resource allocations so that there can never be a circular wait condition. Deadlock avoidance can be done with Banker's

Algorithm.

Bankers algorithm :Banker's Algorithm is resource allocation and deadlock avoidance algorithm which test all the request made by processes for resources, it checks for the safe state, if after granting request system remains in the safe state it allows the request and if there is no safe state it doesn't allow the request made by the process.

Inputs to banker' algorithm: 1. Max need of resources by each process. 2. currently, allocated resources by each process. 3. Max free available resources in the system.

Example for Banker"s algorithm: consider a system that contains five processes P1, P2, P3, P4, P5 and the three resource types A, B and C. Following are the resources types: A has 10, B has 5 and the resource type C has 7 instances.

advantages of bankers algorithm:

1. It contains various resources that meet the requirements of each process.
2. Each process should provide information to the operating system for

upcoming resource requests, the number of resources, and how long the
resources will be held.
disadvantages of bankers algorithm:
1. It requires a fixed number of processes, and no additional processes can
be started in the system while executing the process.
2. The algorithm does no longer allows the processes to exchange its
maximum needs while processing its tasks.
3. Each process has to know and state their maximum resource requirement
in advance for the system.

2) Define Disk Scheduling and explain all Disk Scheduling Algorithms?
Disk scheduling: Disk scheduling is done by operating systems to

schedule I/O requests arriving for the disk. Disk scheduling is also known
as I/O scheduling.
Disk scheduling is important because:
• Multiple I/O requests may arrive by different processes and only one I/O
request can be served at a time by the disk controller. Thus other I/O
requests need to wait in the waiting queue and need to be scheduled.
• Two or more request may be far from each other so can result in greater
disk arm movement.

There are many Disk Scheduling Algorithms but before discussing them
let's have a quick look at some of the important terms:
#Seek time: Seek time is the time taken to locate the disk arm to a specified
track where the data is to be read or write. so the disk

scheduling algorithm
that gives minimum average seek time is better.
#Rotational latency: Rotational Latency is the time taken by the desired
sector of disk to rotate into a position so that it can access the read/write
heads. so the disk scheduling algorithm that gives minimum rotational
latency is better.

#Transfer of time: Transfer time is the time to transfer the data. It depends
on the rotating speed of the disk and number of bytes to be transferred.
#Disk Access Time: Disk Access Time is:
Disk Access Time = Seek Time + Rotational Latency + Transfer Time
#Disk Response Time: Response Time is the average of time spent by a
request waiting to perform its I/O operation. Average Response time is the

response time of the all requests. Variance Response Time is measure of how
individual request are serviced with respect to average response time. So the
disk scheduling algorithm that gives minimum variance response time is
better.

disk scheduling algorithms:

1.fifo: fifo is the simplest of all the Disk Scheduling Algorithms. In
fifo, the requests are addressed in the order they arrive in the disk queue

Advantages:

- Every request gets a fair chance
- No indefinite postponement

Disadvantages:

- Does not try to optimize seek time
- May not provide the best possible service

2.sstf: In sstf (Shortest Seek Time First), requests having shortest seek

time are executed first. So, the seek time of every request is calculated in advance in the queue and then they are scheduled according to their calculated seek time. As a result, the request near the disk arm will get executed first. SSTF is certainly an improvement over FCFS as it decreases the average response time and increases the throughput of system.

Advantages:

- Average Response Time decreases
- Throughput increases

Disadvantages:

- Overhead to calculate seek time in advance
- Can cause starvation for a request if it has higher seek time as compared to incoming requests
- High variance of response time as SSTF favours only some requests

3.scan: In scan algorithm the disk arm moves into a particular direction
and services the requests coming in its path and after reaching the end of
disk, it reverses its direction and again services the request arriving in its
path. So, this algorithm works as an elevator and hence also known as
elevator algorithm As a result, the requests at the midrange are serviced
more and those arriving behind the disk arm will have to wait.

Advantages:

- High throughput
- Low variance of response time
- Average response time

Disadvantages:

- Long waiting time for requests for locations just visited by disk arm

4. cscan: In scan algorithm, the disk arm again scans the

path that
has been scanned, after reversing its direction. So, it may be possible
that too many requests are waiting at the other end or there may be zero
or few requests pending at the scanned area.
These situations are avoided in cscan algorithm in which the disk arm
instead of reversing its direction goes to the other end of the disk and starts
servicing the requests from there. So, the disk arm moves in a circular
fashion
Advantages:
• Provides more uniform wait time compared to SCAN
5.look: It is similar to the SCAN disk scheduling algorithm except for the
difference that the disk arm in spite of going to the end of the disk goes only
to the last request to be serviced in front of the head and then reverses its

direction from there only. it prevents the extra delay which occurred due to
unnecessary traversal to the end of the disk.
6.clook: As look is similar to scan algorithm, in similar way, CLOOK
is similar to csscan disk scheduling algorithm. In CLOOK, the disk arm
inspite of going to the end goes only to the last request to be serviced in front
of the head and then from there goes to the other end's last request. Thus, it
also prevents the extra delay which occurred due to unnecessary traversal to
the end of the disk.
7)rss: It stands for random scheduling and just like its name it is nature.
It is used in situations where scheduling involves random attributes such as
random processing time, random due dates, random weights, and stochastic

machine breakdowns this algorithm sits perfect. which is why it is usually
used for and analysis and simulation.

8)lifo: In lifo (Last In, First Out) algorithm, newest jobs are serviced
before the existing ones i.e. in order of requests that get serviced the job that
is newest or last entered is serviced first and then the rest in the same order.

Advantages:

- Maximizes locality and resource utilization

Disadvantages:

- can seem a little unfair to other requests and if new requests keep
coming in, it cause starvation to the old and existing ones.

3) Explain about page replacement algorithms?

page replacement algorithm: In virtual Memory

Management,
Page Replacement Algorithms play an important role. The main objective of
all the page replacement policies is to decrease the maximum number of page
fault.
page fault- It is basically a memory error, and it occurs when the
current programs attempt to access the memory page for mapping into
virtual address space, but it is unable to load into the physical memory then
this is referred to as Page fault.
Page Replacement Algorithm: This algorithm helps to decide which pages
must be swapped out from the main memory in order to create a room for the
incoming page. This Algorithm wants the lowest page-fault rate.
Various Page Replacement algorithms used in the Operating system are as

follows:

#FIFO Page Replacement Algorithm: It is a very simple way of Page replacement and is referred to as First in First Out. This algorithm mainly replaces the oldest page that has been present in the main memory for the longest time.

- This algorithm is implemented by keeping the track of all the pages in the queue.
- As new pages are requested and are swapped in, they are added to the tail of a queue and the page which is at the head becomes the victim.
- This is not an effective way of page replacement but it can be used for small systems.

Advantages

- This algorithm is simple and easy to use.

- fifo does not cause more overhead.

Disadvantages

- This algorithm does not make the use of the frequency of last time

rather used it just replaces the Oldest Page.

- There is an increase in page fault as page frames increases.
- The performance of this algorithm is the worst.

#Lifo Page Replacement Algorithm: This Page Replacement algorithm

stands for "Last In First Out". This algorithm works in a similar way to the

LIFO principle.

- In this, the newest page is replaced which is arrived at last in the

primary memory

- This algorithm makes use of the stack for monitoring all the pages

#LRU Page Replacement Algorithm: This algorithm stands for "Least recent

used" and this algorithm helps the Operating system to search those pages
that are used over a short duration of time frame.
· The page that has not been used for the longest time in the main
memory will be selected for replacement.
· This algorithm is easy to implement.
· This algorithm makes use of the counter along with the even-page
Advantages:
· It is an efficient technique.
· with this algorithm, it becomes easy to identify the faulty pages that
are not needed for a long time.
· It helps in Full analysis.
Disadvantages:
· It is expensive and has more complexity.
· There is a need for an additional data structure.
#Optimal Page Replacement Algorithm: This algorithm mainly replaces the

page that will not be used for the longest time in the future. The practical implementation of this algorithm is not possible.

- Practical implementation is not possible because we cannot predict in advance those pages that will not be used for the longest time in the future.
- This algorithm leads to less number of page faults and thus is the best-known algorithm

Also, this algorithm can be used to measure the performance of other algorithms.

Advantages:

- This algorithm is easy to use.
- This algorithm provides excellent efficiency and is less complex.
- For the best result, the implementation of data structures is very easy