Sessional Assignment

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Operating System Concepts
Sessional Assignment Spring 2020

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1. Explain the necessary conditions that may lead to a deadlock situation. 2. What are the various methods for handling deadlocks?
2. Is it possible to have a deadlock involving only one single process? Explain your answer.
3. Consider a system consisting of 4 resources of the same type that are shared by 3 processes, each of which needs at most 2 resources. Show that the system is deadlock free.
4. What is a resource allocation graph? How do you obtain a wait-for graph from it? Explain their uses.
5. Can a system detect that some of its processes are starving? If you answer "yes," explain how it can. If you answer "no," explain how the system can deal with the starvation problem.
6. On a disk with 1000 cylinders, number 0 to 999, compute the number of tracks the disk arm must move to satisfy all the requests in the disk queue. Assume the last request serviced was at track 345 and the head is moving toward track 0. The queue in FIFO order contains requests for the following tracks: 123, 847, 692, 475, 105, 376. Perform the computations for the following disk scheduling algorithms:

    - FCFS
    - SSTF

Answer NO 1:

The conditions that may lead to dead-lock are:

- **Mutual Exclusion**
- **Hold and Wait**
- **No Preemption**
- **Circular Wait**

1) Mutual Exclusion: Mutual Exclusion means that at least one resource must be held in a non-sharable mode. When other process request so process will have to wait for the resource to be released.

2) Hold and Wait: Hold and Wait means that process must be simultaneously holding at least one resource and waiting for at least one resource that is currently being held by some other process.

3) No Preemption: No Preemption means that Once a process is holding a resource (i.e. and once the request has been granted), then the resource cannot be taken away from that process until the process voluntarily releases it.

4) Circular wait: Circular wait means that A set of processes {P0, P1, P2, . . ., PN} must exist such that every P [i] is waiting for P[(i + 1) % (N + 1)].

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Part: The various methods for handling deadlocks are:

- **Dead-lock Avoidance**
- **Dead-lock recovery**

- **Ignore the problem all together**

1) Dead-lock Avoidance: Dead-lock Avoidance means that do not allow the system to get into a deadlocked state.

2) Dead-lock recovery: Dead-lock recovery means that Abort a process or preempt some resources when deadlocks are detected.

3) Ignore the problem all together: Ignore the problem all together means that If deadlocks only occur once a year or so, it may be better to simply to reboot the system necessary for to incur the constant overhead and system performance penalties associated with deadlock prevention or detection. This is the approach that both Windows and UNIX take.

4) In order to avoid deadlocks, the system must have additional information about all processes. In particular, the system must know what resources a process will or may request in the future.

5) Deadlock detection is fairly straightforward, but deadlock recovery requires either aborting processes or preempting resources, neither of which is an attractive alternative.

Answer NO 2:

In single process it is not possible to have a dead-lock. In dead-lock there is a circular hold and wait condition between two or more processes so one process cannot hold a resource.

Answer NO 3:

Suppose the system is dead-locked. This implies that each process can hold one resource and have to wait for the other process. There are three processes and four resources, one process can obtain two resources.

Answer NO 4:

A resource allocation graph is a resource which is held by process and in which process waits for a resource of a particular type.

A Wait for graph is that in which we detect deadlock in operating systems and in relational database systems. Wait for graph is to track which other processes a process is currently blocking on. When the process waits for a single resource and it became available. Multiple edges can be represented as a set of conjunctive of different resources.

Answer NO 5:

No, because detection of starvation needs future Knowledge since there is no amount of record-keeping statistics on processes can determine that if it is progressing or not.

Answer NO 6:

FIFO:

The FIFO schedule is 345,123,847,692,475,105 and 376.

Total head movement = (345-123) + (847-123) + (847-692) + (692-475) + (475-105) + (376-105) =1959

SSTF:

The SSTF schedule is 345,376,475,692,847,123 and 105.

Total head movement = (376-345) + (475-376) + (692-475) + (847-692) + (847-123) +(123-105) =1244