

CSE 542 Home work assignment 1

Assigned: Tues, Sep 16

Due: Tues, Sep 30, 11:00AM

Late submissions will not be accepted

Individual effort

1. In a store and forward network, a message is passed from the source node to the destination node through some number of intermediate nodes. Each node is provided with as many buffer classes as there are distances (# of hops) being covered by messages passing through. Upon arrival of an incoming message, a buffer from the class i is allocated for the message if it has made i hops so far. When the message has been successfully copied into the buffer, an acknowledgement is sent back to the last sender and a copy of the message is forwarded on toward the final destination. A node can forget about a message and release the buffer holding it when an acknowledgement is received from the next node along the path. If no acknowledgement arrives in a specified amount of time, the message is retransmitted.

Show (informally prove) that the basic idea behind this protocol can be used to avoid deadlock.

2. True or False (you may justify your answer briefly)
 - i) The space overhead for forward-mapped virtual memory page tables depends on the page size and the virtual address space size, but it is independent of the configured size of physical memory
 - ii) For systems with preemptive scheduling, increasing the scheduling quantum is a good way to improve system throughput
 - iii) Giving higher internal priority for the CPU to processes that were recently awakened for I/O completions is likely to improve overall system throughput and response time
3. Consider a computer with five individual resources name R1 R5. Let five processes P1, P5 make requests in order, as follows:
 - i. P1 requests R2
 - ii. P4 requests R3
 - iii. P3 requests R1
 - iv. P2 requests R4
 - v. P5 requests R5
 - vi. P4 requests R2
 - vii. P5 requests R3
 - viii. P3 requests R5
 - ix. P1 requests R1
 - x. P2 requests R2
- b. Assume the resource manager uses the liberal “allocate a requested resource if it is currently free” policy. At the end of the requests, is the allocation safe or unsafe? If

unsafe, is there deadlock and if so at what point did it occur and which processes did it involve?

- c. Instead of a liberal policy, imagine that processes P1 through P5 make advance claims that each needs all resources. If the Banker's algorithm is applied, how could the resources be allocated at the end of the requests?
4. Briefly discuss the strengths and weaknesses of Round Robin scheduling with Shortest Job First (SJF) scheduling with respect to the usual goals of a CPU scheduler. Why do most modern CPU schedulers combine Round Robin with SJF by giving CPU priority to I/O bound jobs?
5. What is priority inversion and why is it bad? Illustrate with an example. Use your example to illustrate one technique that avoids priority inversion
6. Exercise 4.6
7. Exercise 5.2
8. Exercise 6.4
9. Exercise 7.23
10. Exercise 8.3