Deadlocks Review

Instructor: Wei Feng

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Questions?

- What are four conditions must exist in order for deadlock to occur?

For a set of processes to be deadlocked: (1) at least one resource must remain in a non-sharable mode, (2) a process must hold at least one resource and be waiting to acquire additional resources held by other processes, (3) resources in the system cannot be preempted, and (4) a circular wait has to exist between processes.

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Questions?

- What are the four strategies to deal with deadlock?

(1) An operating system may just ignore the problem and pretend that deadlocks can never occur.

(2) A system may allow a deadlock to occur, detect it, and recover from it.

(3) A system may perform dynamic avoidance for deadlocks by careful resource allocation.

(4) A deadlock can be prevented by structurally negating one of the four required conditions.

Questions?

- How might an operating system attack the 1st, 2nd, 3rd, 4th condition necessary for deadlock in order to prevent the problem of deadlock?

Condition	Approach
Mutual exclusion	Spool everything
Hold and wait	Request all resources initially
No preemption	Take resources away
Circular wait	Order resources numerically

More details

- Spool everything: making resource sharable
- Request all resources initially: requiring processes to request all of their resources at the same time.
- No preemption: The operating system may forcibly deallocate resources from deadlocked processes thus attacking the condition of no preemption.
- Order resources numerically: impose a total ordering of all resource types, and to require that each process requests resources in an increasing order of enumeration. This can be Order resources numerically: impose a total ordering of all resource types, and to require that each process requests resources in an increasing order of enumeration. This can be accomplished by assigning each resource type a unique integer number to determine whether one precedes another in the ordering.

Questions?

- What is the difference between deadlock prevention and deadlock avoidance?

Deadlock prevention is a set of methods for ensuring that at least one of the necessary conditions for deadlock cannot hold. Deadlock avoidance requires that the operating system be given, in advance, additional information concerning which resources a process will request and use during its lifetime.

Questions?

- A computer has six tape drives, with n processes competing for them. Each process may need up to two drives. For which values of n is the system guaranteed to be deadlock free? Explain

Answer

- If n <= 3, then clearly there can be no deadlock, since even in the worst case, if 3 processes all simultaneously get a tape drive, there is still enough to go around. But note that even for n = 5, there can't be any deadlock. In the worst case scenario with n = 5, all five will get one tape drive, and there is still an extra that can be given to any single process. That process would then finish, freeing up two tape drives for the remaining four, etc. Alternatively, just create a banker's algorithm table with 5 processes, max=2 for each of them, and check that no possible allocations of six tape drives will be unsafe. So n < 6 is our final answer.