CASE STUDY NO : 06

Case Study On :- Study of Dead locking distributed system.

Deadlocks in Distributed System -

In a distributed system deadlock can neither be prevended nor avoided as the system is so vast that it is impossible to do so. Therefore, only deadlock detection can be implemented. The techniques of deadlock detection in the distributed system require the following.

Some people make a distinction between two kinds of distributed deadlocks: communication deadlocks and resource deadlocks. A communication deadlocks occurs, for example, when process A is trying to send a message to process B, which in turn is trying to send one to process C, which is trying to send one to A. There are various scenarios in which this situation leads to deadlock, such as buffers being available. A resource deadlock occurs when processes are fighting over exclusive access to I/O devices, files, locks or other resources.

1. The ostrich algorithm (ignore the problem).

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2. Detection (let deadlocks occur, detect them and try recover).

3. Prevention (statically make deadlocks structurally impossible).

4. Avoidance (avoid deadlocks by allocating resources carefully).

Progress -

The method should be able to detect all the deadlocks in the system.

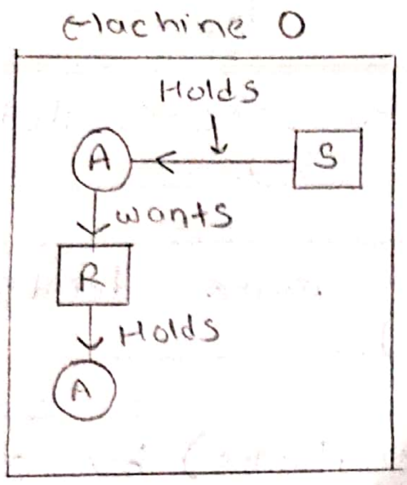
Safety -

The method should not detect false or phantom deadlocks.

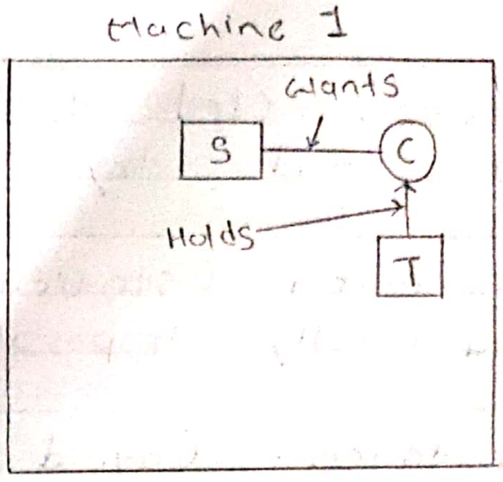
There are three approaches to detect deadlocks in distributed systems. They are as follows:

1. Centralized Deadlock Detection -

In the centralized approach, there is only one responsible resource to detect dead lock. The advantage of this approach is that it is simple and easy to implement, while the drawbacks include excessive workload at one node, single-point failure (that is the



a



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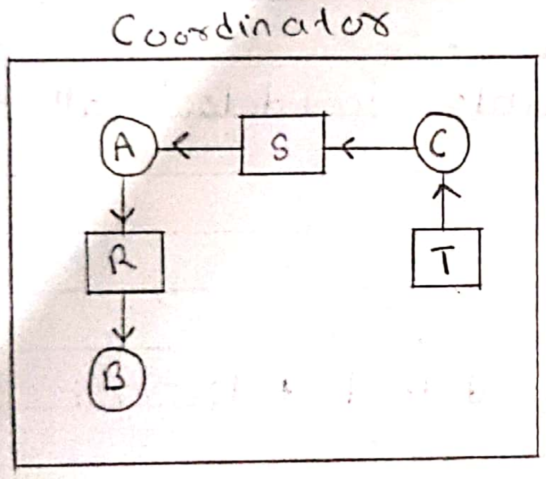

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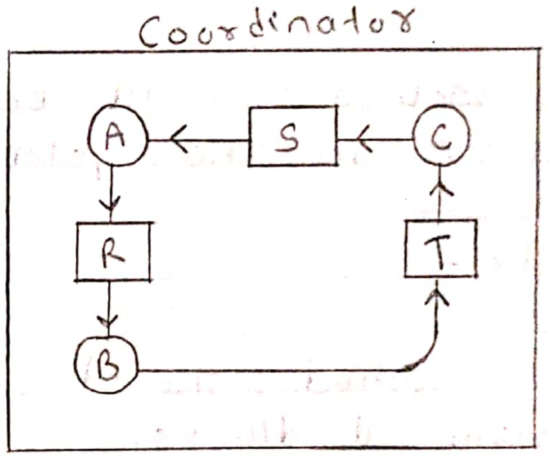

d

a) Initial resource graph for machine 0.
b) Initial resource graph for machine 1.
c) The coordinator's view of the world.
d) The situation after the dealyed message

whole system is dependend on one node if that node fails the whole system crashes) which in turns makes the system less reliable.

Unlike the centralized case, where all the information is automatically available in the right place, in a distributed system it has to be send there explicitly. Each machine maintains the graph for its own processes and resources. Several possibilities exist for getting it there. First, whenever an arc is added or deleted from the resource graph, a message can be send to the coordinator providing the update. Second periodically, every process can send a list of arcs added or deleted since the previous update. This method requires fewer messages than the first one. Third, the coordinator can ask for information when it needs it.

2. Distributed Deadlock Detection.

In the distributed approach different nodes work together to detect deadlocks. No single point failure (that is the whole system is dependent on one node if that node fails the whole system crashes) as the workload is equally divided among all nodes. The speed of deadlock detection also increases.

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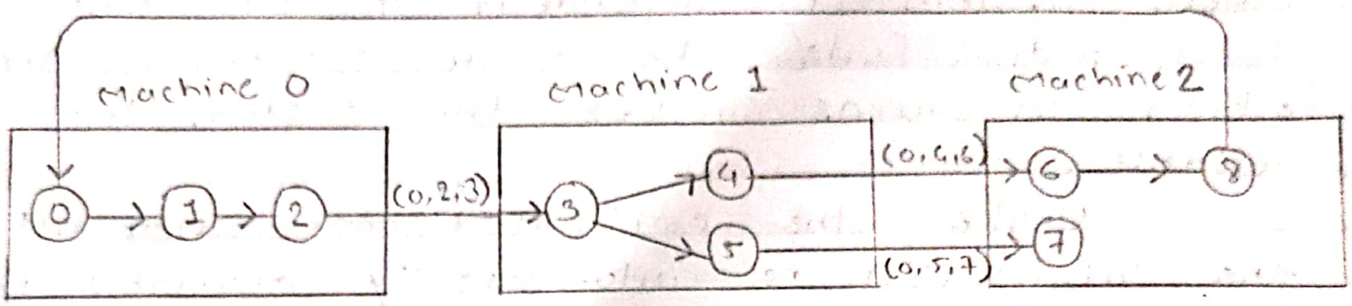

The Chandy - Misra- Haas distributed deadlock detection algorithm

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Many distributed deadlock detection algorithms have been published. Surveys of the subject are given in Knapp (1987) and Singhal (1989). Let us examine a typical one here, the Chandy - Misra - Haas algorithm (Chandy et al., 1983). In this algorithm, process are allowed to request multiple resources (e.g. locks) at once, instead of one at a time. By allowing multiple request simultaneously, the growing phase of transaction can be speeded up considerably. The consequence of this change to the model is that a process may now wait on two or more resources simultaneously.

3. Hierarchical Deadlock Detection -

This approach is the most advantageous It is the combination of both centralized and distributed approaches of deadlock detection in a distributed system. In this approach, some selected nodes or clusters of nodes are responsible for deadlock detection and these selected nodes are controlled by a single node.

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