6. Implement a bully and ring algorithm. for election leader.

Theory

Election Algorithm

→ In a distributed system, multiple computer (nodes) work together, but they require a leader to coordinate the tasks and make decisions.

→ Election algorithm are methods that automatically choose the leader, especially if the current leader fails.

→ Election algorithm are basically voting system used by the computers

→ There are two types of election algorithm:-
1) Bully algorithm
2) Ring algorithm.

Bully algorithm

The bully algorithm selects the process with the highest ID as the leader.

Algorithm

1. Suppose process P sends a message to the coordinator.
2. If the coordinator does not respond to a message from process P within a time interval T, it is assumed that the coordinator has failed
3. Process P sends an election message to every process with a higher priority number (i.e higher ID)
4. It waits for a response. If no one responds

within time interval T, then process P elects itself as the coordinator.

5. Then it sends a message to all lower priority processes to inform them that it has become the new coordinator.

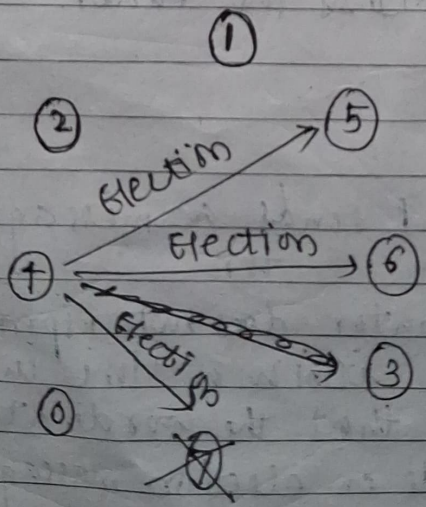
6. If any higher priority process responds, it will take over the election process. That higher process sends election messages to processes with even higher IDs than itself.

7. The process continues until the process with the highest ID is found, which elects itself as the coordinator.

8. The new coordinator then sends a message to all other processes to announce that it is the new leader.

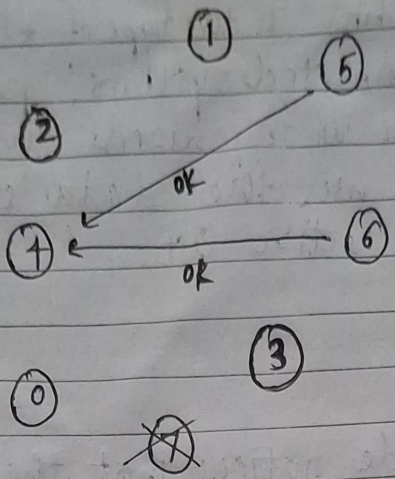
Example

1. The group consists of eight processes, numbered from 0 to 7. Previously process 7 was the coordinator, but it has just crashed. Process 4 is the first one to notice this, so it sends Election messages to all the processes higher than it, namely 5, 6 & 7.

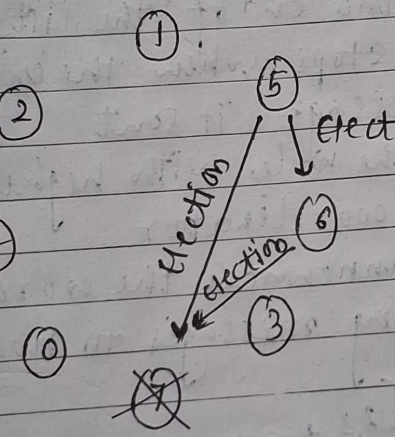


2. Processes 5 and 6 both respond with OK. Upon

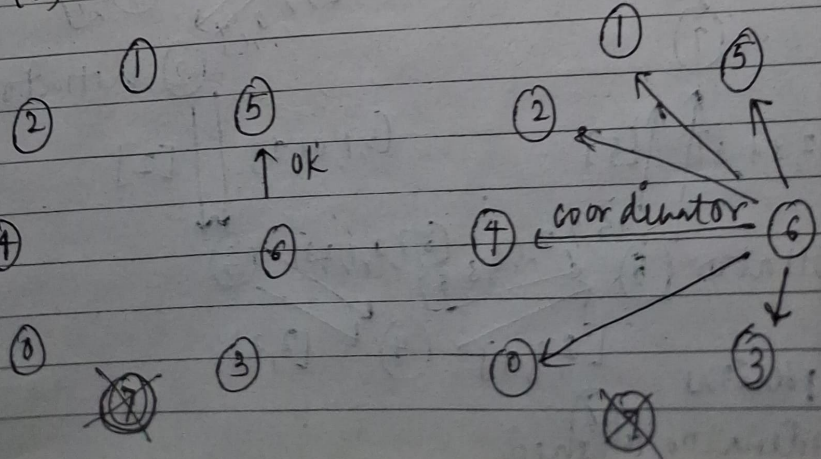
getting the first of these responses 4 knows that its job is over. It knows that one of these will take over and become coordinator.



3. Both 5 and 6 hold elections, each one only sending messages to those processes higher than itself.



4. Process 6 tells 5 that it will take over. At this point 6 knows that 7 is dead & that is (6) winner.



Ring algorithm

→ The ring algorithm is the type of election algorithm used in distributed systems, particularly when processes are organized in a logical ring.
→ Ring algorithm uses the data structure called active list.

Algorithm

When the node notices that the coordinator is dead.

1. Builds and sends election messages to nodes.
2. At every step nodes keeps on adding its own id to the end of the list.
3. The process stops when the initiator receives the message it sent.
4. After this, the node with highest ID is declared to be a coordinator.
5. Initiator announces the coordinator by sending messages to nodes.