

Tutorial 5

Synchronisation

1. Name at least three sources of delay that can be introduced between WWV broadcasting the time and the processors in a distributed system setting their internal clocks.
2. What clock synchronisation algorithms do you know? Compare them. Give an example distributed application which needs synchronised clocks.
3. To achieve totally-ordered multicasting with Lamport timestamps, is it strictly necessary that each message is acknowledged?
4. What is the difference between total-ordering and causal ordering of messages?
5. Ricart and Agrawala's algorithm (mutual exclusion) has the problem that if a process has crashed and does not reply to a request from another process to access resources, the lack of response will be interpreted as denial of permission. A solution is that all requests be answered immediately to make it easy to detect crashed processes. Are there any circumstances where even this method is insufficient? Discuss.
6. A distributed system may have multiple, independent resources. Imagine that process 0 wants to access resource A and process 1 wants to access resource B. Can Ricart and Agrawala's algorithm lead to deadlocks? Explain your answer.
7. In the centralised approach to mutual exclusion, upon receiving a message from a process releasing its exclusive access to the critical region it was using, the coordinator normally grants permission to the first process in the queue. Give another possible algorithm for the coordinator.
8. Suppose that two processes simultaneously detect that the coordinator crashed and both decide to hold an election using the bully algorithm. What happens?
9. Many distributed algorithms require the use of a coordinating process. To which extent can such algorithms actually be considered distributed?
10. How do the coordination algorithms in wireless networks differ from the traditional election algorithms?