Tutorial I

1. What are the major consequences of a distributed system? Explain the characteristic features of a distributed system.

2. What are the major roles of middleware systems? Explain different distribution transparency in detail.

3. Why do we need Interprocess communication? Explain different IPC mechanisms in distributed systems.

4. How is synchronous communication different from asynchronous communication? Explain the variations of client server model.

5. What are the similarities and dissimilarities between RPC and RMI? Explain the term distributed object, remote object, remote interface, proxy and skeleton.

6. How does traditional RPC lack access transparency? Explain the detail of RPC semantics in the presence of failure? What are the mechanisms to handle orphan messages?

7. Explain the architecture of Remote Method Invocation. What are the different invocation semantics of RMI?

8. List and explain a few applications, why those applications use blocking and non-blocking message passing systems. In which situation can we use asynchronous RPC?

9. Why is it difficult to synchronize things in a distributed system? How accuracy is maintained in Berkeley clock synchronization algorithm?

10. What is clock synchronization? What is drift rate? Explain NTP and Cristian's algorithm for distributed clock synchronization.

11. Why is computer clock synchronization necessary? Describe the design requirements for a system to synchronize the clocks in a distributed system.

12. What do you mean by partial order, total order and causal order of messages? In Lamport's logical clock: a => b implies Lamport_timestamp (a) < Lamport_timestamp (b) but Lamport_timestamp (a) < Lamport_timestamp (b) doesn't imply a => How does this problem solve? Explain with algorithm and examples.

13. Differentiate concurrent events and causal events? How is the logical clock different from physical clock? How do we enforce the global ordering requirement in a distributed environment (without a common clock)?

14. What are the basic requirements for the distributed mutual exclusion? Explain Suzuki Kasami Algorithms for distributed mutual exclusion.

15. Differentiate token based mutual exclusion algorithm and non-token based mutual exclusion algorithm. Compare Lamports and Ricart Agarwala algorithm for distributed mutual exclusion.

16. In Ricart-Agrawala token based mutual exclusion algorithm: Explain various states used with state transition diagrams. How does any process find out if there is a pending request? Illustrate with examples.

17. List various token based and non-token based mutual exclusion algorithms. Also compare them according to the number of messages passing in order to execute per critical section.

18. Describe the need for an election algorithm. Explain Chang and Robert's (ring based) election algorithm with suitable examples.

19. Why is replication required in a distributed system? Explain five phases performing a request by the replication manager.

20. What is fault, failure and fault tolerance? Explain active and passive replication.

21. Explain the different approaches of fault tolerance. Explain cold failover, warn failover and hot failover.

22. What are the different types of failure models? In distributed systems where messages are asynchronous and failures can be Byzantine, we have to use at least n = 3m + 1 replicas in total to tolerate m faulty replicas. Show that this bound is tight, i.e., that n ≥ 3m + 1 must hold in order for the system to work properly.

23. What is sub transaction and distributed transaction? Explain the two-phase commit and three-phase commit algorithm.

24. What is forward and backward recovery? Explain naïve snapshot algorithm.

25. What is flat transaction and nested transaction? Explain the concepts of Lost update protocol, Inconsistence retrieval problem, serial equivalence and conflict operation with an appropriate example.

26. What is the Atomic commitment protocol? Explain the locking rule for two phase locking.

27. What is phantom Deadlock? Explain different deadlock detection algorithms in distributed system.

28. Differentiate communication deadlock with resource deadlock. Explain, how deadlock is occurred in message communication?

29. What is mutual waiting? Explain Timestamped based deadlock prevention Scheme.

30. Mention the Centralized and Distributed deadlock detection algorithm. Differentiate between Path-pushing and Edge-chasing algorithms with examples.

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