

MID-TERM-1 PRACTICE QUESTIONS

BY DISTRIBUTED SYSTEMS

Note: This contains a set of practice questions for the first mid term exam.

1. How does TCP achieve reliable transmission?
2. Write a simple client-server program (psuedo-code) with all the correct system calls. The intent is for you to be able to show how socket connections are established.



4. Write map and reduce functions for multiplying two large matrices.
5. Show that for any two distinct local states s and t , $s \rightarrow t$ implies that there exists a logical clock C such that $C(t) < C(s)$
6. Let there be two groups of processes in a distributed system, each with its own leader. Processes in different groups communicate with each other only through their leaders. How can this feature be exploited in constructing vector clocks?
7. Assume that you have implemented the vector clock algorithm. However, some application needs Lamport's logical clock. Write a function convert that takes as input a vector timestamp and outputs a logical clock timestamp.
8. Given an example to show where direct dependency clocks fail to capture causality.
9. Modify Lamport's mutual exclusion algorithm to support reader-writer locks. That is, multiple concurrent readers are OK as long there are no writers.
10. Extend token-based mutual exclusion to k-mutual exclusion where at most k processes can enter the critical section.
11. Give an example of consistent and inconsistent cut.
12. Can you use vector clocks to design a new consistent snapshot algorithm.
13. Prove monotonicity of color for Chandy-Lamport snapshots: $\forall e_1, e_2: e_1 \rightarrow e_2 \Rightarrow e_1.\text{color} \leq e_2.\text{color}$ where e_1, e_2 are events, $e.\text{color}$ denotes the color of the process when e occurs, and white is less than red.
14. What is/are the safety properties for global snapshots.

Advanced. Last 2 Lec 11 slides