CS138 Homework Assignment 2

Due: 11:59pm, March 18, 2008

1. Your computer has just sync'd with an NTP server and has discovered that its clock is 4 seconds fast. Assuming the clock is to be adjusted to the correct time within 10 seconds and a clock interrupt occurs every millisecond, explain how this is done. Note that how this is done has nothing to do with NTP, which merely supplies the correct time.

2. 24.248.56.68 is an IP address.

    a. What DNS name has this as at least one of its associated addresses? (Hint: use the nslookup command on Linux — do a "man nslookup" to discover how to use it. In particular, you'll want to run it interactively and use the "set query=ptr" command to look for ptr records.)

    b. To determine the answer to part a, you used nslookup. What name servers were contacted to do this lookup? Assume the query was iterative (and thus starts at the root). (Hint, consider the "set query=ns" command.)

3. Consider a nonblocking primary-backup protocol (slide VIII-43) used to guarantee sequential consistency in a distributed data store. Does such a data store always provide read-your-writes consistency (slide X-46)? [This is problem 7-17 from Tanenbaum and Van Steen.]

4. Slide XI-13 describes what happens both when a replica manager sends a gossip message and when it receives a gossip message. However, the last part of the pseudo code for receiving a gossip message (given below) is wrong (it might run forever). Please supply a corrected version.

- while there exists request r in rm_j.log such that
  r.u.prev ≤ rm_j.val.ts
    - update val (by applying r.u.op)
    - rm_j.val.ts = merge(rm_j.val.ts, r.TS)

5. In the simplified version of Isis discussed in class, it is assumed that processes fail "cleanly" in that they cease to respond once they've failed and they never come back up again. Another type of failure is the network partition, in which the network interconnecting a process group splits into two non-communicating pieces (each containing a subset of the original process group) that will eventually come back together. For the following questions, assume the process groups are peer groups (slide XII-4).

    a. Explain what Isis (as discussed in class) would do in the event of a network partition followed sometime later by the network's coming back together.

    b. Describe how it might be modified so as to minimize problems caused by network partitions and reconnections.