CS167 Homework Assignment 4

Due: 11:59pm, April 30, 2025

1. [34%] Tenex was an operating system for DEC PDP-10 computers used the late ’60s and early ’70s. It had a number of features, including one that allowed user processes to provide functions to be invoked (in user mode) after each of their page faults. It stored passwords in plain text (i.e., unencrypted) in a file that was adequately protected. A user could supply his or her password not only when logging in, but also from a program so as to switch from one protection domain to another. The system code that checked for a correct password would do so one character at a time, moving from left to right, stopping when it encountered an incorrect character. It was soon discovered that in time proportional to the length of the password one could figure out any user’s password. Explain how.

2. [66%] NFS v2 and v3 systems allow clients to “hard mount” remote file systems, so that in the event of a server crash (or network outage), clients repeatedly retry RPC calls until the server (or network) comes back up. If clients held locks on any of the server’s files, the network lock manager (NLM) protocol recovers these locks for them. Note that if a client places a system call on a file in a hard-mounted file system, the system call will not fail with a time-out error, even if the server crashes and takes a long time to restart.

    a. [33%] Assume that all RPC calls are to idempotent procedures and that the only possible failure is a server crash (i.e., clients don’t crash and the network is well behaved). Other than timing issues, will server crashes have any adverse effects on clients (assuming the server comes back up)? Explain. You may assume that neither clients nor server are overloaded.

    b. [33%] Now suppose all clients and servers are interconnected by a single network: it’s either working and connecting all parties, or is down and is connecting none of them. It can switch from up to down or vice versa at any moment. Will it be the case that server crashes have any adverse effects on clients? Explain.