Network Technologies

Let us consider a Web server software that fails at the *failure rate* γ_p, running on a machine (node) that fails independently at the failure rate γ_m. An automatic failure detection mechanism based on polling is installed. Assume that the mean time to detect server process failure is $1/\delta_p$ and the mean time to detect machine failure is $1/\delta_m$. When the machine is detected to have failed, the server process is started on a spare machine, if available. The mean time needed for the server process to be started on the spare machine is $1/\tau_m$. When only the server process is detected to have failed, it is automatically restarted on the same machine. The mean restart time of the server software is $1/\tau_p$. Typically, $\tau_p > \tau_m$. There is a small probability (1 – c) that the process restart on the same machine is unsuccessful, in which case it is started on the spare machine, if available. Such a scheme of automatic start (or restart) after failures is also called “cold replication”. Whenever a machine has crashed, a more elaborate recovery with rate μ is required. Particularly, there is a single recovery facility.

The Web server is considered available when the server process as well as the machine it is running on are up. Evaluate the steady- state availability of the server, assuming that no further failures can occur after a failure of either the process or the machine until it has been dealt with.