CAPACITY PLANNING

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Name of the student

Exercise n. 1

Evaluate the reliability and the steady state availability of a system composed of five CPU (working in parallel and whose output is given by a voter), one RAID 2 system with seven disks, two bus system (working in parallel and whose outputs are given by voters), one keyboard, one printer and one monitor, assuming that the faults happen according to an exponential distribution with rate equal to λ_{CPU}, λ_{DISK} , λ_{BUS} , λ_{kEY} , λ_{MON}, λ_{PRI}, $\lambda_{VOTER\text{-}CPU}$, $\lambda_{VOTER\text{-}BUS}$, and with the same repair rate (μ) for all kind of components. A single "repair technician for component type" is available and the repair rate is independently by the number of fault occurrences of the same type.
N.B. Advice: evaluate each global index analyzing by single sub system.

Exercise n. 2

Evaluate the service time to transmit a TCP segment (20.000 bytes) over an Ethernet LAN given that: 18 byte (overhead) are for the frame Ethernet header, 1.500 bytes (max data area) and 100 Mbyte/sec (bandwidth).
N.B Advice: draw the frames showing the number of bytes for each field

Exercise n. 3

Evaluate the average response time and throughput for a system composed of a 3 paralle servers with a unique finite queue (at most 5 users in the system), with a finite number of users (number of users equal 8), given that the thinking time for each user is exponentially distributed with the average equal to 200 sec and the service time is exponentially distributed with the average service time equal to 1 sec.

Exercise

A Web site receives 100 requests per second. These requests are served by a cluster of 10 identical servers. A workload balancer divides in equal parts the load among the servers. Every request needs 30 ms of CPU and 5 I/O requests to a disk, the time for each I/O is 10 ms. Every server can manage at most 3 users at the same time and has a MTTF equal to 2.000 hours for the disk and a MTTF equal to 20.000 hours for the CPU and a MTTR for both kind of devices equal to 20 hours.
Calculate the average service time, the average throughput and the percentage of requests refused.
N.B Advice: After having showing the methodology, you have to evaluate at least the average service time, the average throughput and the percentage of requests refused when all the servers are fault-free.