

CAPACITY PLANNING

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Name of the student

Exercise n. 1

Evaluate the reliability, the steady state availability and the transient safety of a system composed of three CPU (working in parallel and whose output is given by a voter, the output is written in parallel on all the faulty-free busses), one RAID 2 system with seven disks, five busses (working in parallel and whose outputs are given by voters, the output is written in parallel on all the faulty-free busses), one keyboard, one printer and one monitor (the keyboard write in parallel on all the faulty-free busses), with the hypothesis that the faults happen according to an exponential distribution with rate equal to $\lambda_{\text{CPU}}, \lambda_{\text{DISK}}, \lambda_{\text{BUS}}, \lambda_{\text{KEY}}, \lambda_{\text{MON}}, \lambda_{\text{PRI}}, \lambda_{\text{VOTER-CPU}}, \lambda_{\text{VOTER-BUS}}$, with covering factors equal to $C_{\text{CPU}}, C_{\text{DISK}}, C_{\text{BUS}}, C_{\text{KEY}}, C_{\text{MON}}, C_{\text{PRI}}$ (**the covering factor for the voters is equal to one**) 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

A clustered Web server receiving 10 requests per second is connected to a 100-Mbps Ethernet, which is connected to an ISP through a router. The router has a latency of 100 μ sec/packet and connect the Ethernet through a line of 1Gbps. The requests are served by a cluster of 2 identical servers, composed only by a CPU (CPU-S), with the related main memory RAM, and by a file server composed by a CPU (CPU-FS) and by 2 twin disks (i.e. with the same data), all connected directly to the Ethernet. The average file dimension is of 20Kbytes, instead the requests have a dimension of 400 bytes. A workload balancer divides in equal parts the load among the two servers, even for the two disks there is a load balancer, with negligible overhead. Each request needs 20 msec of CPU-S, 10 msec of CPU-FS and 20 msec of DISK. Every component type (CPU, DISK, Ethernet, Router) has a MTTF equal to 100.000 hours and a MTTR equal to 1 hours.

You have

- 1) to evaluate the average service time and the average throughput when all the components are fault-free;
- 2) identify the system performance bottleneck;
- 3) to show the methodology to evaluate the average service time when there is the possibility of faults and recoveries.