

**Assignment 1. RAID Systems 1.**

Given a RAID 5 system with  $d + 1$  disks. Assume an exponential repair for single disks with rate  $1/h$  and a failure rate of  $10^{-6}/h$ . Compare the MTDL value for different values of  $d$ , ranging from 4 to 10 and plot the reliability curves.

**Assignment 2. RAID Systems 2.**

Given a RAID 1 system. Assume an exponential repair for single disks with rate  $1/h$ . Compare the probability of data loss, i.e.  $1 - R(t)$  when the disk life times are 500.000h,  $10^6$ h and  $1.5 \cdot 10^6$ h.

**Assignment 3. Checkpointing 1.**

Assume a task with execution time,  $T$ .  $N$  checkpoints are taken which are equally spaced through the lifetime of that task. The overhead for each checkpoint is  $T_{ov}$  and  $T_{it} = T_{ov}$ . Given that during execution, the task is affected by a total of  $k$  point failures (i.e., failures from which the processor recovers in negligible time).

- What is the maximum execution time of the task?
- Find  $N$  such that this maximum execution time is minimized. It is fine to get a non-integer answer (say  $x$ ): in practice, this will mean that you will pick the better of  $\lfloor x \rfloor$  and  $\lceil x \rceil$ .

**Assignment 4. Checkpointing 2.**

Identify all the consistent recovery lines in the following execution of two concurrent communicating processes as shown in the figure.

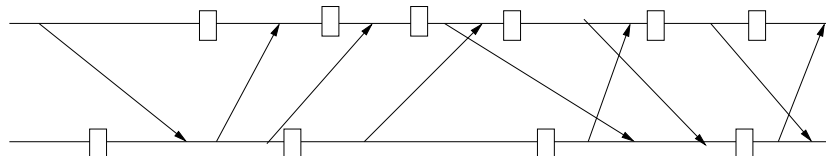


Figure 1: Two processes with checkpointing and communication