Ex_01 – RAID Capacity

giovedì 19 marzo 2020 10:56

Consider to have 6 disks, each one with a capacity of 1TB.
What will be to total storage capacity of the system if they are in the following configurations?

a. RAID 0

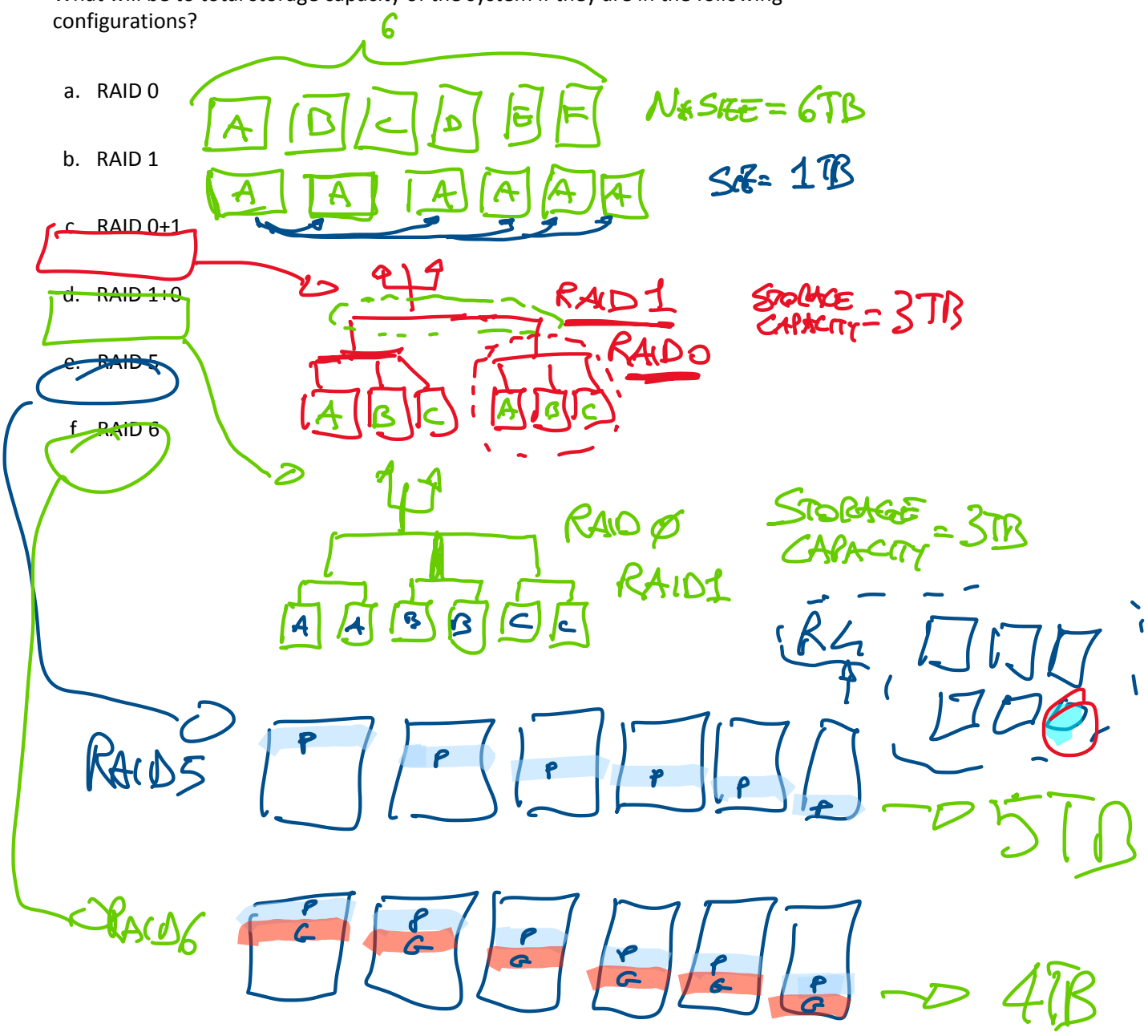
b. RAID 1

c. RAID 0+1

d. RAID 1+0

e. RAID 5

f. RAID 6

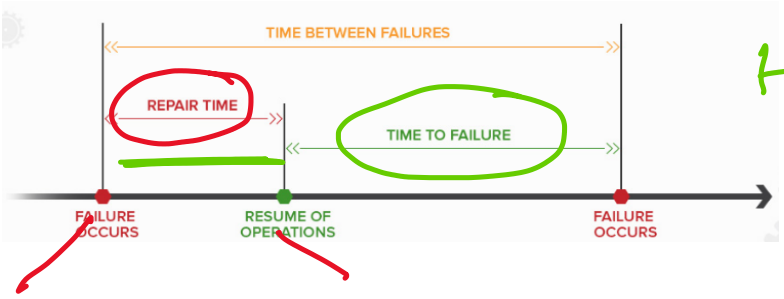


RAID Preliminaries

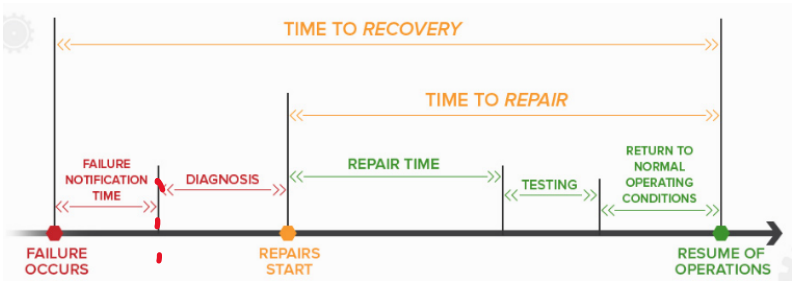
giovedì 19 marzo 2020 10:05

Definitions:

- **RAID** - Redundant Array of Independent Disks
- **MTTDL** –Mean Time To Data Loss
  - Mean time until drive failures cause data loss in the array
- **MTBF** – Mean Time Between Failures
  - is the mean time between hard disk failures.
- **MTTF** – Mean Time To Failure
  - mean time before a disk has a failure
  - 1/MTTF is called Failure Rate



- **MTTR** – Mean Time To Recover (or Repair)
  - Mean time to rebuild redundancy in the array.



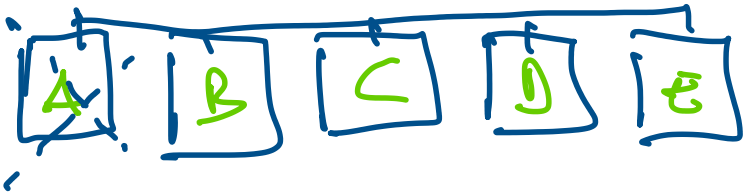
Ex_02 – RAID 0

mercoledì 4 marzo 2020 11:46

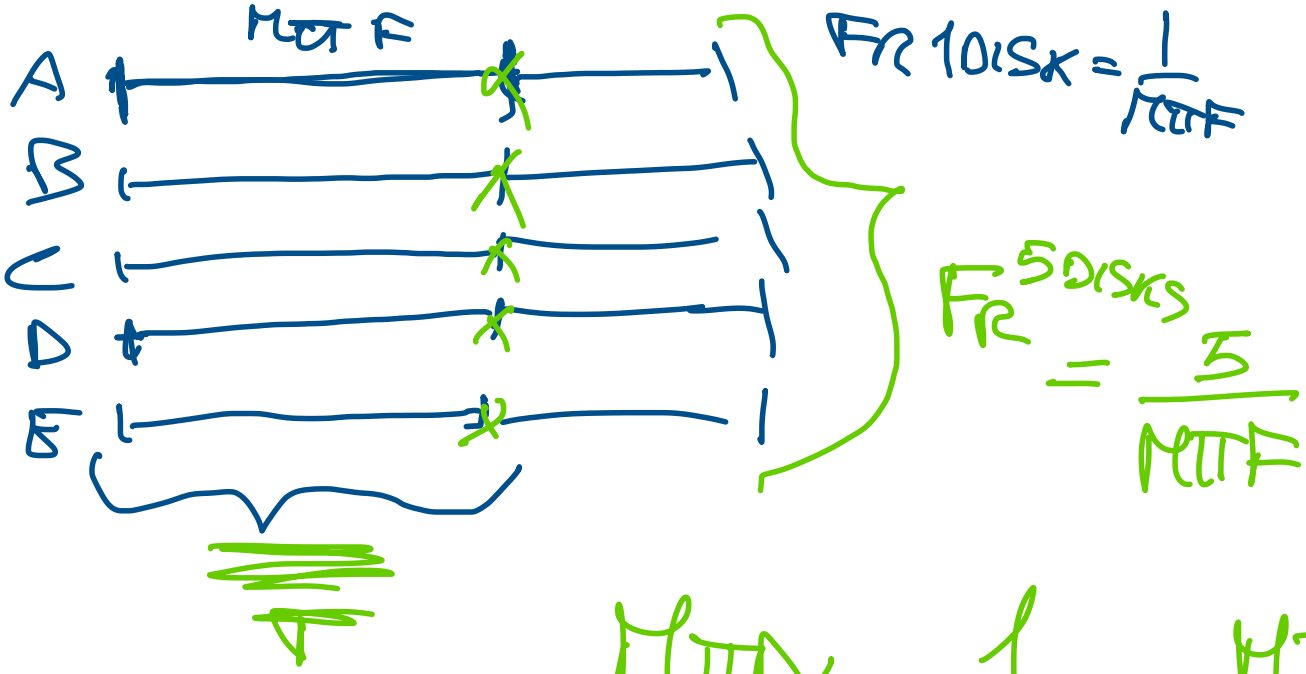
Consider the following RAID 0 setup:

- n = 5 disks
- MTTR = 8 hours
- MTTF(one disk) = 1600 day

The MTTDL will be:



RAID 0 → 1 DISK



$$MTTDL = \frac{1}{FR} = \frac{MTTF}{5}$$

$$= 320 \text{ DAYS}$$

Quiz_1 – RAID 0

mercoledì 4 marzo 2020 17:44

A system administrator has decided to use a stock of disks characterized by:

MTTF = 800 days
MTTR = 20 days

The target lifetime of the system is 3 years;
The maximum number of disks that could be used in RAID 0 to have a MTTDataLoss larger than the system lifetime is:

1. 1 disk
2. None
3. 2 disks - since RAID 0 requires at least two disks
4. 800/20 = 40 disks
5. None of the other options

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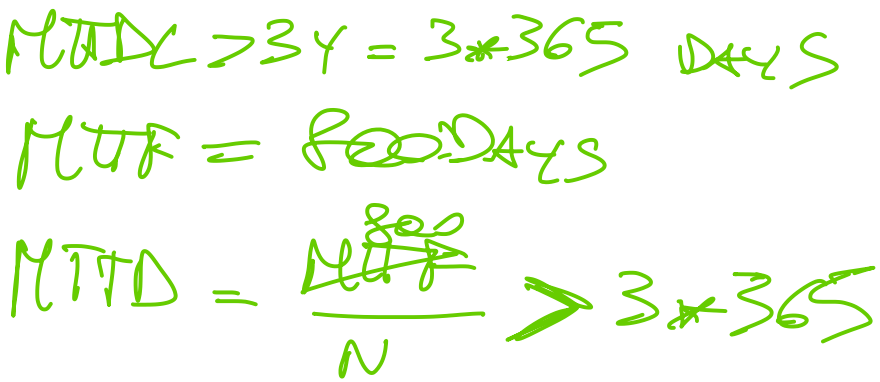


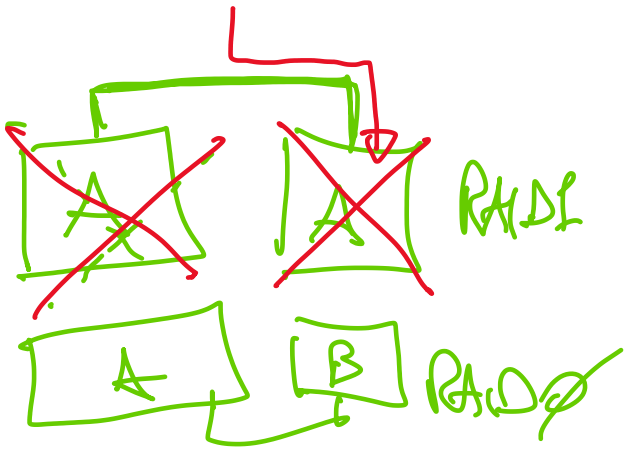
Ex_03 - RAID1

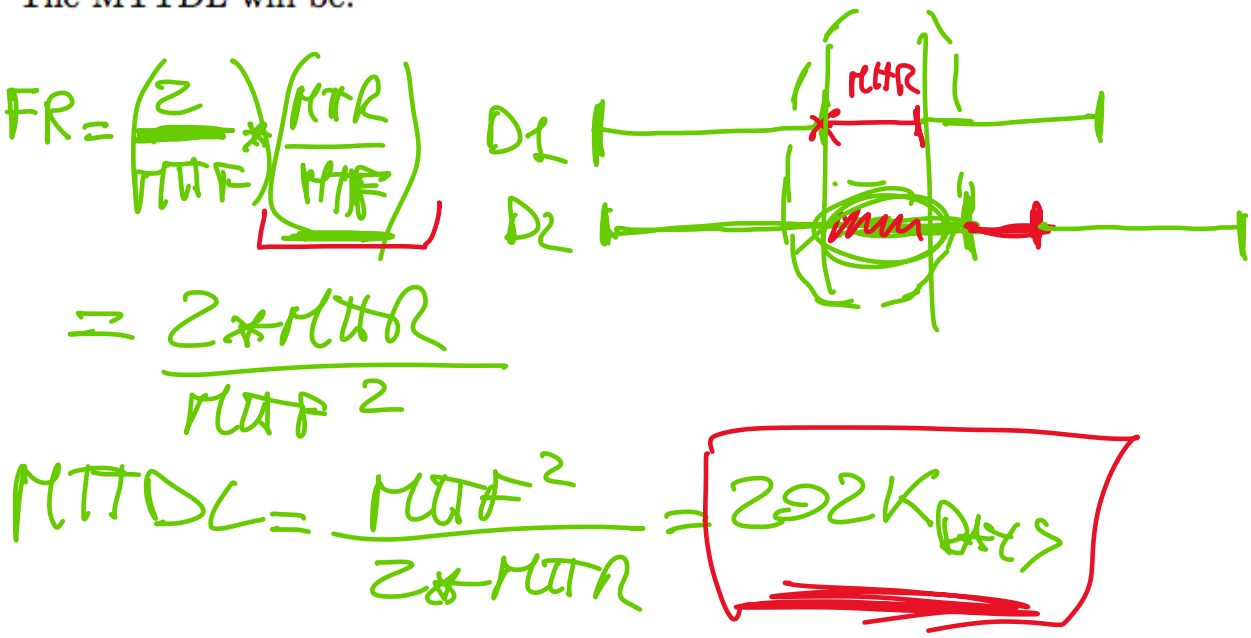
mercoledì 4 marzo 2020 11:33

Consider the following RAID 1 setup:

- n = 2 disks
- MTTR = 8 days
- MTTF(one disk) = 1800 day

The MTTDL will be:





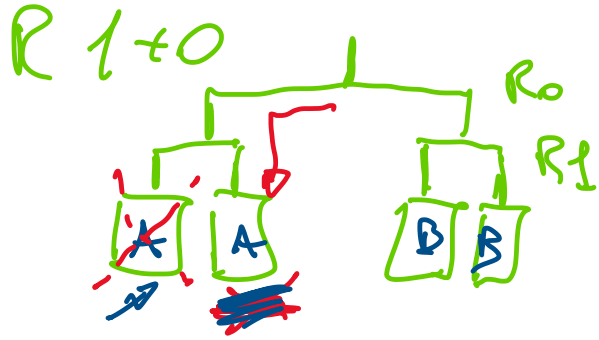
Ex_04 – RAID 1+0

mercoledì 4 marzo 2020 11:45

Consider 2 groups (RAID 0) of 2 disks each (RAID 1), for a total of 4 disks in configuration RAID 1+0:

- MTTR = 3 days
- MTTF(one disk) = 1400 day

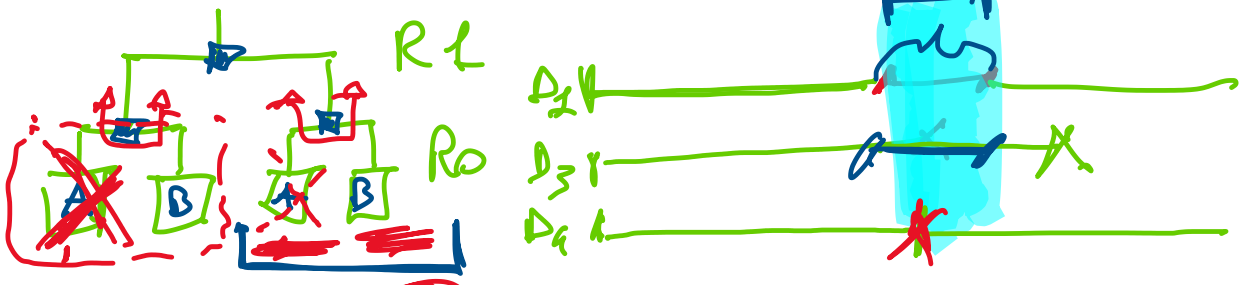
The MTTDL will be:



$$F_R = \frac{N}{MTTF} * \left(\frac{1}{MTTF} * MTTR\right)$$

$$= \frac{MTTF^2}{N * MTTR} = \frac{1400^2}{3 \times 4} \approx 163K$$

THE SAME BUT RAID 1



$$FR = \frac{N}{MTTF} * \left(\frac{2}{MTTF} * MTTR\right)$$

$$MTTDL_{RAID1} = \frac{MTTF^2}{N * MTTR * 2} = MTTDL_{1+0} * \frac{1}{2} = 81.5K$$

Ex_05 – RAID 0+1

mercoledì 4 marzo 2020 11:33

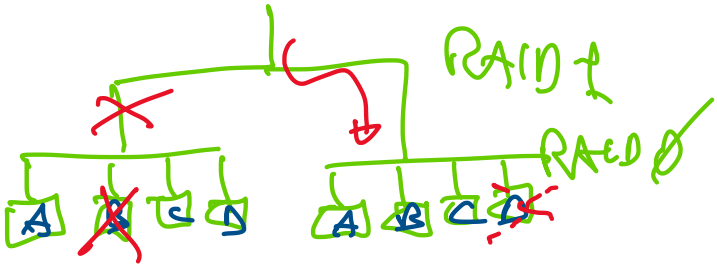
Consider 2 groups (RAID 1) of 4 disks each (RAID 0), for a total of 8 disks in configuration RAID 0+1:

- MTTR = 4 days
- MTTF(one disk) = 2200 days

$N = 2 \times 4 = 8$ DISKS

$G = 4$ DISKS

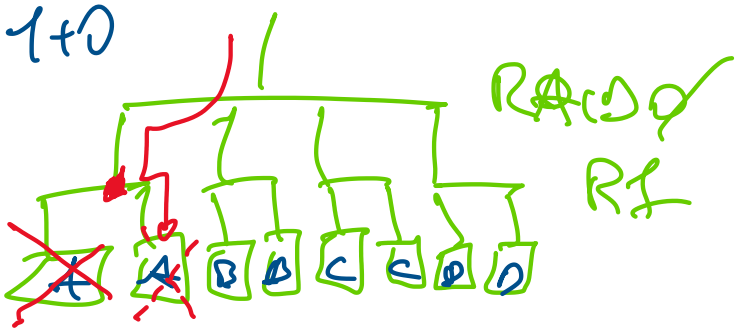
The MTTDL will be:



$$FR = \frac{N}{MTTF} \times \left(\frac{G}{MTTF} \times MTTR \right) =$$

$$MTTDL = \frac{MTTF^2}{N * G * MTTR} = \frac{2200^2}{8 * 4 * 4} \simeq 37.8K \text{ DAYS}$$

THE SAME 1+0



$$FR = \frac{N}{MTTF} * \left(\frac{1}{MTTF} * MTTR \right) =$$

$$MTTDL_{1+0} = \frac{MTTF^2}{N * MTTR} = MTTDL_{0+1} * G$$

Quiz_2 - RAID 0 + 1

mercoledì 4 marzo 2020 18:31

A system administrator has decided to use a stock of disks characterized by:

MTTF = 800 days

MTTR = 20 days

The target lifetime of the system is 3 years;

The maximum number of disks that could be used in RAID 01 to have a MTTDL larger than the system lifetime is:

1. No more than 58 disks
2. No more than 7 disks
3. At least 8 disks
4. No more than 6 disks
5. None of the other options

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