

RAID - Recovery Process

Parity Disk Usage

RAID L3 Recovery Example

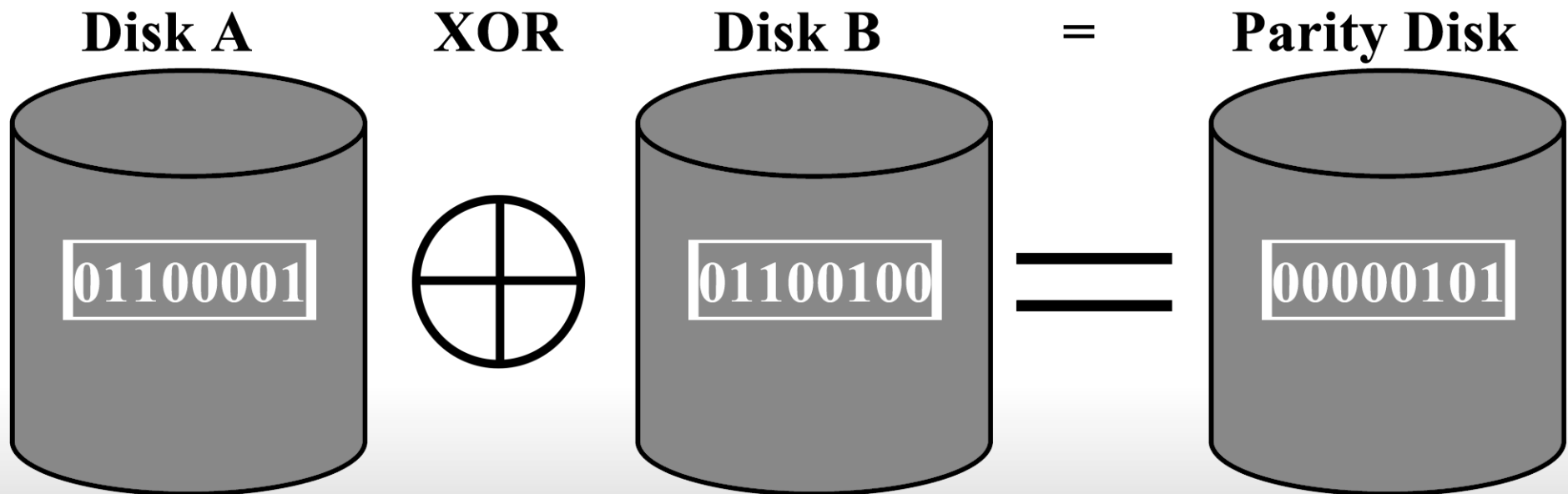
- Usage of 3 disks
- 2 disks for data storage, named Disk A and Disk B
- 1 as parity disk

- Q: How to recover Disk B information whether it fails?

The techniques that are about to be used can be applied to arbitrary number of disks for data storage.

Parity Generator

A parity bit is 1 if the amount of the corresponding 1-bits of Disk A and Disk B is even (Even Parity)



Recovery Using Parity

- Iff we know which disk has failed, then we can recover its data using the parity disk.
- Assumption: if $X \wedge Y = Z$, then $X \wedge Z = Y$ (\wedge stands for XOR)
- Proof:

$$\begin{aligned} X \wedge Z &= X \wedge (X \wedge Y) \\ &= (X \wedge X) && \text{,by xor's associativity rule} \\ &= 0 \wedge Y && \text{,by } k \wedge k = 0 \text{ property} \\ &= Y && \text{,by } k \wedge 0 = k \text{ property} \end{aligned}$$

Thus if we apply xor between the parity disk and the non-failed disk we can retrieve the information of the failed disk

Final Recovery Schema

