

RAID recovery – Parity analysis

Applied after

- zero analysis
- mirror analysis

help to detect JBOD, RAID 0, RAID 1, RAID 10
and to catch a hotspare disk

What is calculated

- Percent of even blocks in disk set

Parity tests for

- full disk set
- all combinations with one disk excluding

Theory of parity

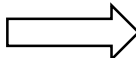
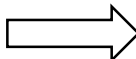
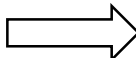
Parity is a special function calculated over data blocks

XOR function is used

- $P = A \text{ XOR } B$

$A \text{ XOR } B \text{ XOR } P = 0$  row of [A, B, P] is even

XOR function properties

- $A \text{ XOR } B = B \text{ XOR } A$  no need to know the parity location
- $A \text{ XOR } A = 0$  mirrors are always even
- $A \text{ XOR } 0 = A$  blank disks litter the parity analysis

Parity analysis

Parity tests are calculated for

- full disk set
- all combinations with one disk excluding

Results can be

- typical – regular RAID 5
- complex – RAID 6

Parity tests					
Combination	Disk 0	Disk 1	Disk 2	Disk 3	Parity
Include all	+	+	+	+	100.0%
Exclude #0	-	+	+	+	0.6%
Exclude #1	+	-	+	+	0.6%
Exclude #2	+	+	-	+	0.6%
Exclude #3	+	+	+	-	0.5%

Parity analysis

Complex cases

Full disk set	One disk excluding	RAID level
100% parity	100% parity	Blank disk(s) in the set
100% parity	0% parity	No only full RAID 5 but RAID 6 (Promise) as well
1/N parity	0% parity	Certain RAID 6 with missing disk
0% parity	1/N parity	Certain full RAID 6