



- 150 IOPS
- RAID10 IOPS  $\approx 4 \times 150 = 600$  IOPS (read)
- IOPS  $\approx 2 \times 150 = 300$  IOPS (write)

## 2) RAID5?3 ???

- 150 IOPS IOPS =  $3 \times 150 = 450$  IOPS
- parity IOPS  $\approx 2 \times 150 = 300$  IOPS (read)
- RAID5 I/O + parity + parity IOPS  $\approx 450 / 4 = 112.5 \rightarrow \approx 112$  IOPS (small random write)

“ 4K

- RAID10: 600 IOPS / 300 IOPS
- RAID5: 300 IOPS /  $\approx 112$  IOPS

RAID10 / RAID5 2.7x

????????????/???

150 MB/s

## RAID10?4??

- $\rightarrow 4 \times 150 = 600$  MB/s (seq read)
- $= 2 \rightarrow 2 \times 150 = 300$  MB/s (seq write)

## RAID5?3??

- $n-1 \rightarrow 2 \times 150 = 300$  MB/s (seq read)

- $2 \times 150 = 300$  full-stripe writes  $\rightarrow 2 \times 150 = 300$   $n-1$   $\rightarrow 2 \times 150 = 300$  **300 MB/s (seq write, full-stripe optimal)**

“ ”

- RAID10:  $600 / 300$  MB/s
- RAID5:  $300 / 300$  MB/s **full-stripe**

RAID10 perfect full-stripe

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- RAID10
- RAID5
- RAID5

?????Rebuild?????/?

- RAID10 4
- RAID5 3

??CPU/????????

- RAID5 parity RAID CPU RAID RAID
- RAID10 CPU

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	4×1.2T 10k RAID10	3×1.2T 10k RAID5
容量	2.4 TB	2.4 TB
4K QD ( )	<b>600 IOPS</b>	300 IOPS
4K Q ( )	<b>300 IOPS</b>	<b>~112 IOPS</b>
( )	<b>600 MB/s</b>	300 MB/s
(full-stripe)	300 MB/s	300 MB/s
	( )	(4x)
CPU/Parity		RAID
	/ / /	/ /

????????????

- RAID10 IO RAID10
- IOPS RAID5 RAID5
- RAID5 RAID5 Windows / mdadm parity CPU RAID5 RAID10

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150 IOPS/ 150 MB/s

- RAID10 ≈ **300 IOPS** vs RAID5 ≈ **112 IOPS** → RAID10 2.7x
- RAID10 ≈ **600 MB/s** vs RAID5 ≈ **300 MB/s** → RAID10 2x

- IOPS/
- / **block size / queue depth** 4K QD32
- RAID5 BBU/ RAID RAID6/RAID10

IOPS/MB/s QD/BS

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