All Flash Storage Sparing to Improve Endurance
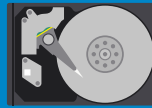
Eduardo Mattos Duarte

HPE 3PAR WW Product Manager

What is sparing?

RAID group   **Hot spare**
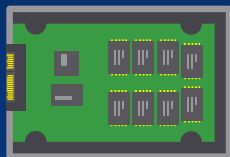
| Spinning disks	Solid State Drives
Prone to random failure	Prone to wear-out
Drives are either healthy or fail entirely	Drives can partially fail
Dedicated hot spares guarantee space to rebuild	Dedicated hot spares are worst form of protection
Spare disks are performance inefficient	Feature better system-level integration options

SSDs are different

Solid State Drive anatomy

SSDs reserve a fixed amount of raw NAND flash as overprovisioned space

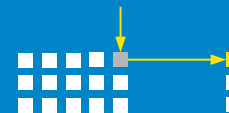The remaining space is 'user' space and is available to be written to

Raw NAND flash

User space

OP space
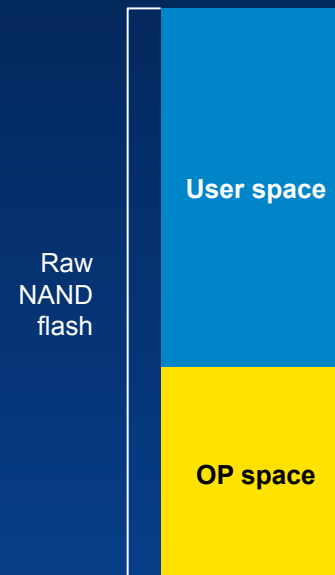
What does overprovisioning space do?

Wear levelling

Replace dead cells

Absorb overwrites

Drive-level overprovisioning introduces new optimization possibilities

Truly optimizing for flash

OP space	Spare space	Free space	User space
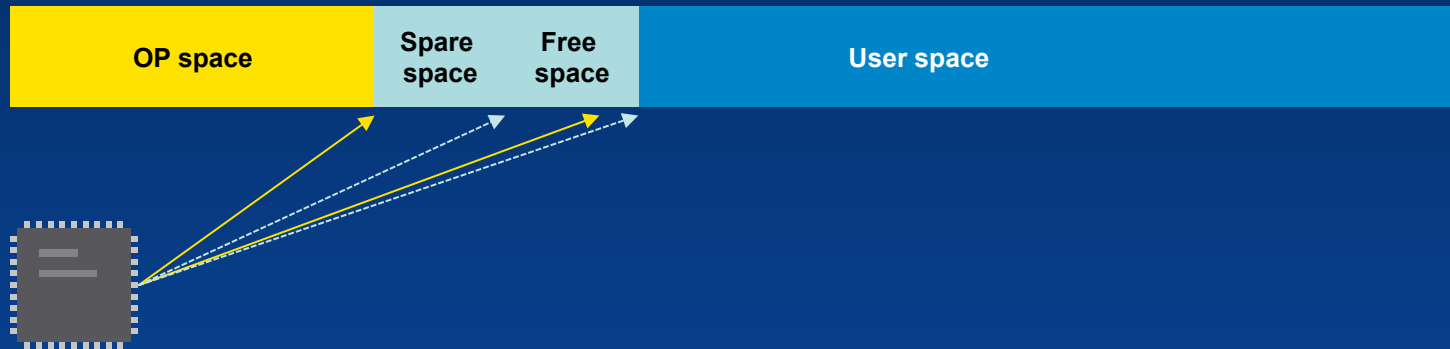
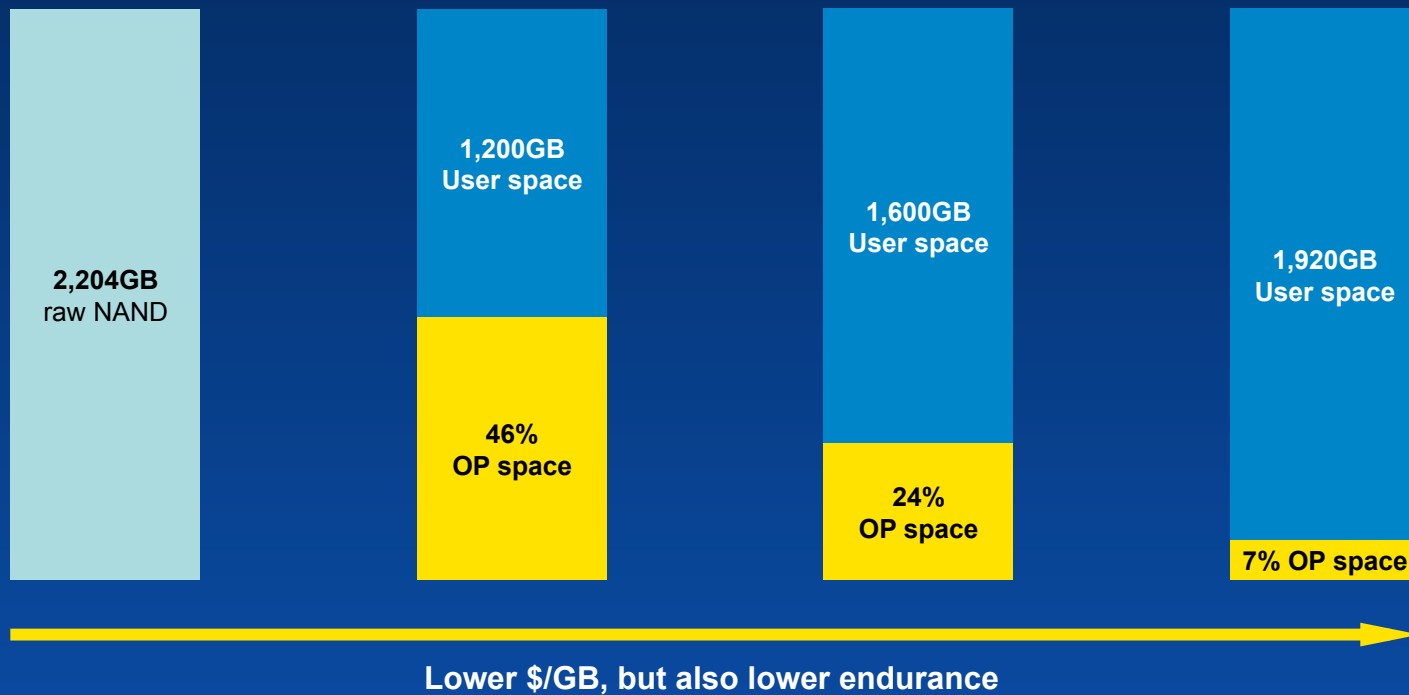**Integration with the SSD's processor allows the storage system to:**

Alter the amount of fixed overprovisioning space

Pass sparing space back to the SSD's controller
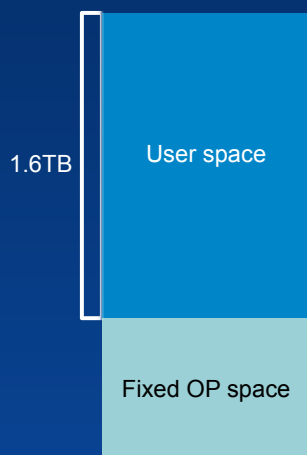
Pass free space back to the SSD's controller

Better approach, more usable GB

2,204GB raw NAND

1,200GB User space

46% OP space

1,600GB User space

24% OP space

1,920GB User space

7% OP space

Lower $/GB, but also lower endurance

A new approach to sparing

Traditional deployment
High-OP space drive

1.6TB
User space
Fixed OP space

Standard deployment uses drives with large amounts of OP space to provide performance and endurance at high cost

Adaptive Sparing
HPE 3PAR Low-OP space drive

1.92TB
User space
Free Space
Spare space
Fixed OP space
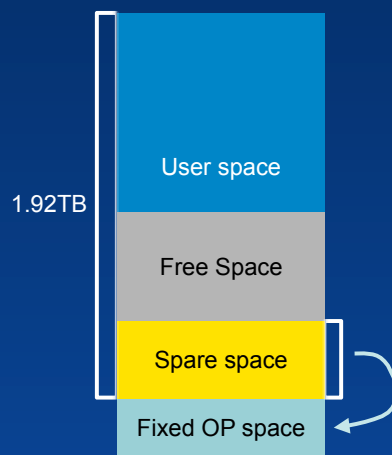
Adaptive Sparing gives the drive access to 3PAR spare space for overprovisioning, increasing endurance and performance

Adaptive Sparing 2.0
HPE 3PAR Low-OP space drive

1.92TB
User space
Free Space
Spare space
Fixed OP space
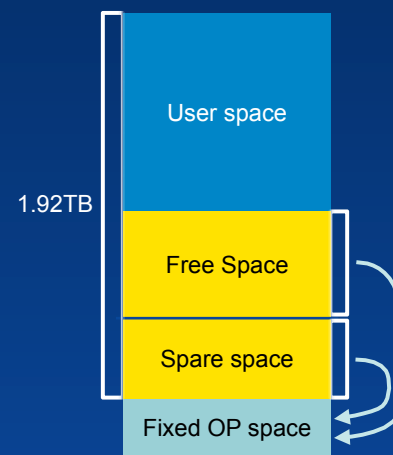
Adaptive Sparing 2.0 works with Adaptive Sparing by also giving the drive access to free system space for overprovisioning