

## Pure Storage: Affordable High-Performance All-Flash Storage

## **Company Background**

#### An Incredible Team

- Scott Dietzen (CEO): CTO at BEA/WebLogic & President Zimbra
- John Colgrove (CTO): Technical Founder of VERITAS
- Bob Wood (VP, Engineering): NetApp, Decru, Omneon
- Michael Cornwell (Dir, Technology): Flash CTO of Sun, Lead Flash Designer, Apple iPod/iPhone
- Matt Kixmoeller (VP, Products): VP Data Protection, VERITAS
- John Hayes (Chief Architect): Yahoo!, Fortera

#### \$55M Raised from Committed Investors

greylockpartners. SUTTER HILL Aneel Bhusri Mike Speiser

HILLRedpointDeiserSatish Dharmaraj



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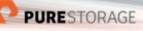
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ORACLE

Google

Diane Greene Mendel Rosenblum



## Why use flash?

#### Flash has major advantages over disk for

- · Virtual machines and virtual desktop infrastructure
- Databases
- Searching

#### Advantages include

- Much faster (sub-millisecond seek time) for reads
- Much lower power
- Thin provisioning: over-allocate, as long as the space isn't actually used
- Result: 200,000+ IOPS in 8U for under 1000 watts!
- But...



## **Making flash efficient and affordable**

#### Flash issues

- Raw flash is more expensive than raw disk
- Writes can be an issue (performance, durability)
- Solution: leverage technologies that disk can't easily support
  - Flash-optimized storage layout: reduce wear-and-tear on flash
  - Deduplication: keep only one copy of a particular block
  - Compression: compress every block
  - Redundancy: calculate parity within an SSD and across SSDs
  - Reliability: checksum every block, and include block number in the calculation
- How well does this work?

RESTORAGE

- Average I/O request serviced in well under 1 ms
- Data reduction of 5:1 for databases, 10-20:1 or more for virtual machines

### Pure Storage Drives Flash Below the Cost of Disk

Disk-Centric Arrays 15K Disk + Flash Cache				
40U	40U	Footprint	8U	5x
~4,500	~5,000	Power Usage (watts)	~1,000	5x
~20,000	~40,000	Sustained Random 4K IOPs	200,000	10x
8-12ms	4-8ms	Average Latency	<1ms	10x
\$5.00	\$7.00	\$/GB Raw	\$21.50	
\$7.00	\$9.00	\$/GB w/RAID	\$25.80	
\$10.00	\$12.00	\$/GB Usable	\$3.00 - \$6.00	2x
\$20.00	\$22.00	Fully-Burdened \$/GB (3-Yr Space/Power/Cooling)	\$7.00	3x

EMC<sup>4</sup>



# Thank You!