



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



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?**
 - 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	15K Disk + Flash Cache	
40U	40U	Footprint
~4,500	~5,000	Power Usage (watts)
~20,000	~40,000	Sustained Random 4K IOPs
8-12ms	4-8ms	Average Latency
\$5.00	\$7.00	\$/GB Raw
\$7.00	\$9.00	\$/GB w/RAID
\$10.00	\$12.00	\$/GB Usable
\$20.00	\$22.00	Fully-Burdened \$/GB (3-Yr Space/Power/Cooling)

PURESTORAGE		
8U	5x	Footprint
~1,000	5x	Power Usage (watts)
200,000	10x	Sustained Random 4K IOPs
<1ms	10x	Average Latency
\$21.50		\$/GB Raw
\$25.80		\$/GB w/RAID
\$3.00 - \$6.00	2x	\$/GB Usable
\$7.00	3x	Fully-Burdened \$/GB (3-Yr Space/Power/Cooling)





Thank You!