Flash-y Storage
Increases Productivity and Performance

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Why SAN acceleration?

- Organizations deploy more powerful servers and higher speed networks
- Need to improve the performance of their storage infrastructure to keep up with the highly demanding servers and applications
- Traditional ways to solve storage bottlenecks:
  - First by upgrading their storage infrastructure with higher performance disk FC or SAS
  - Second by adding more disks to match the most demanding IO profile of those supported applications
- Flash represent an opportunity to cost effectively solve storage performance limitations

- Founded 2005 with new management team in spring 2009.
- Toshiba strategic partnership
- Gear6 acquisition June 2010

Mission

Provide Flash Memory Arrays designed for sustained performance and low predictable latency to accelerate critical enterprise applications with the *reliability* and *serviceability* expected in the modern data center.

Virtualized Data Center

High-speed, multi-core computing
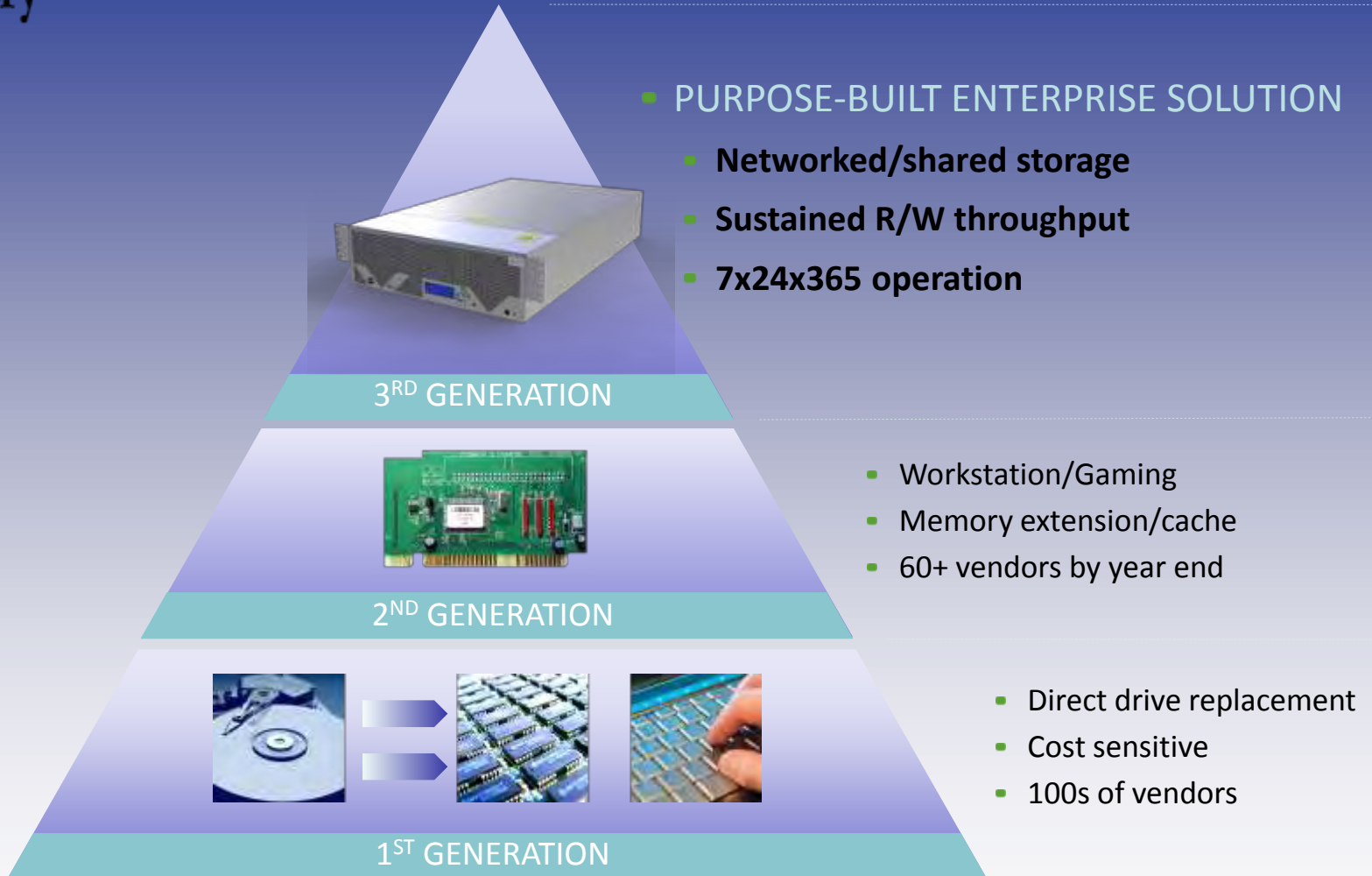
High-speed, low-latency networking

High-speed, low latency solid-state storage

NO Mechanical Disks!!!
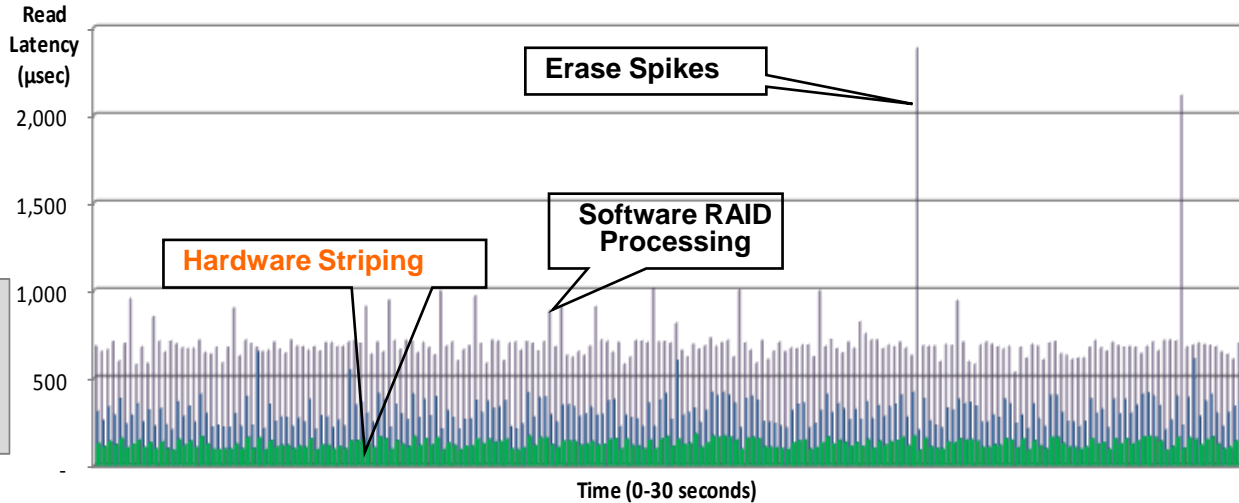
Solid-state to match compute and network price/performance

Evolving Performance Storage
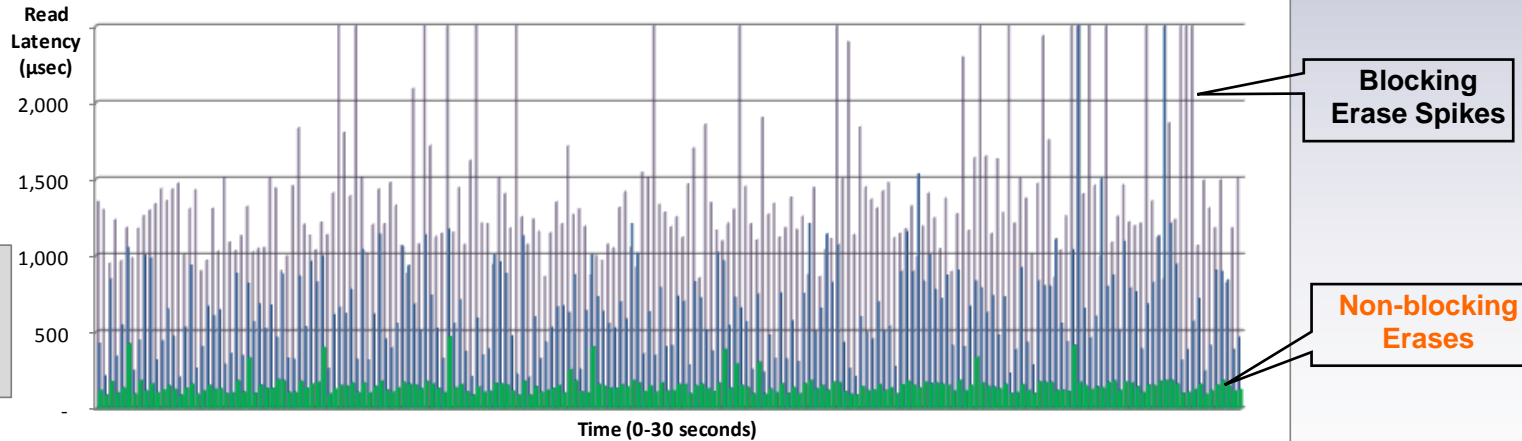
PURPOSE-BUILT ENTERPRISE SOLUTION

- **Networked/shared storage**
- **Sustained R/W throughput**
- **7x24x365 operation**

3RD GENERATION

- Workstation/Gaming
- Memory extension/cache
- 60+ vendors by year end

2ND GENERATION

- Direct drive replacement
- Cost sensitive
- 100s of vendors

1ST GENERATION

Latency spikes in the Enterprise

Latency vs. Time 10% Load

- Other SSDx4 RAID 0
- Other SSD - No RAID
- Violin Flash RAID

Read Latency (µsec)

Erase Spikes

Software RAID Processing

Hardware Striping

Time (0-30 seconds)

Latency vs. Time 90% Load

- Other SSDx4 RAID 0
- Other SSD - No RAID
- Violin Flash RAID

Read Latency (µsec)

Blocking Erase Spikes

Non-blocking Erases

Time (0-30 seconds)

Violin 3000 Series

Flash VIMMs

- 10TB Density in 3U
  - 20TB+ in Q3
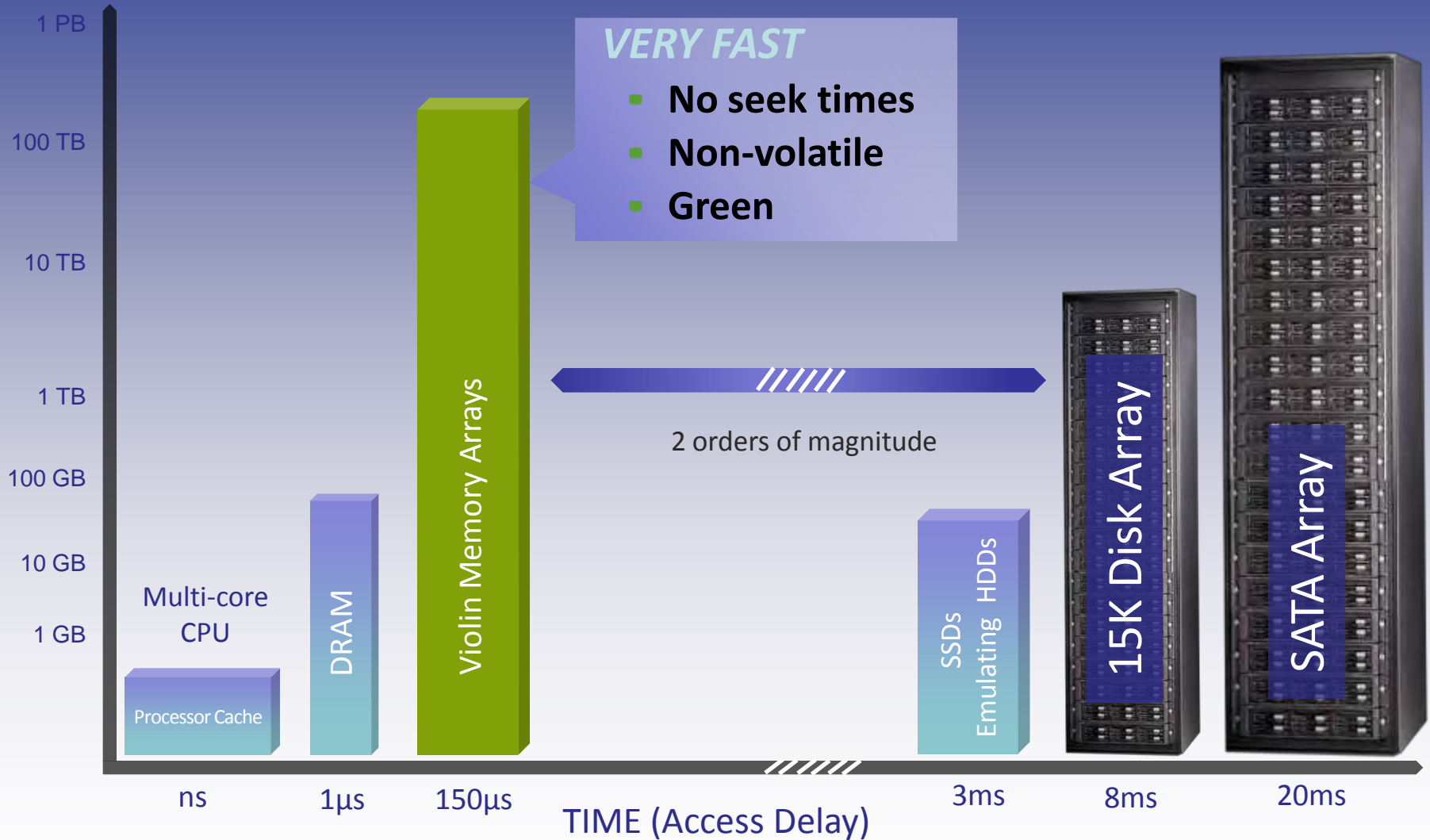- SLC, MLC and DRAM VIMMs
- Sustained Write IOPS

Flash RAID

- Spike-Free latency
- 80% Flash Efficient
  - vs. 50% for RAID-1
- Fail-in-place
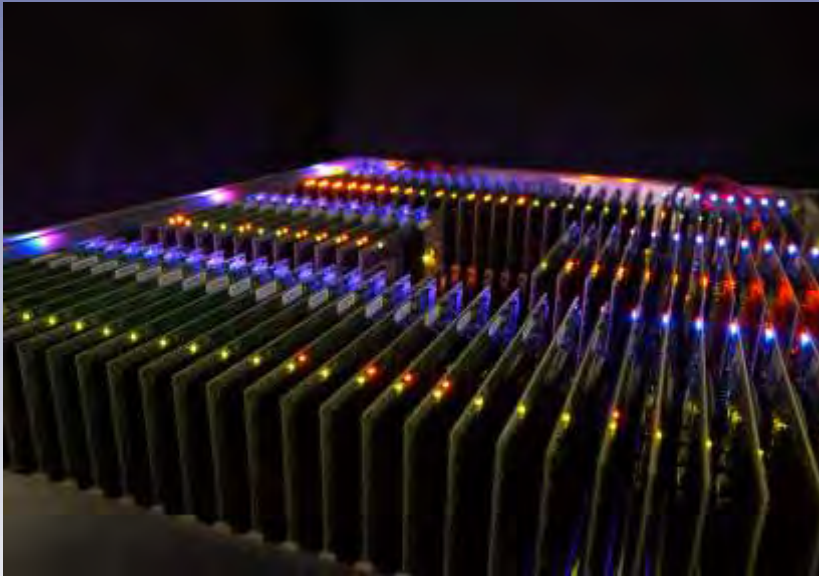- Hot-swap capability
- 99.999% Availability

Flash Networking

- Sub 100µsec latency
- PCIe x4/x8, 8 Gbit/s FC
- 10GbE: iSCSI & FCoE

New Memory Array Tier

VERY FAST
- **No seek times**
- **Non-volatile**
- **Green**

1 PB

100 TB

10 TB

1 TB

100 GB

10 GB

1 GB

2 orders of magnitude

Multi-core CPU

Processor Cache

DRAM

Violin Memory Arrays

SSDs Emulating HDDs

15K Disk Array

SATA Array

ns   1μs   150μs   3ms   8ms   20ms

TIME (Access Delay)

Flash Memory Array

High Capacity & Low Latency

- Application acceleration 5 – 50x
- Simpler external systems

Sustainable Performance

- Run servers at higher IOPS load
- Server compression
  - More with less
  - Less licenses required
- Shrink datacenter footprint
  - Both physical & power

How to use Memory Arrays

- Performance Storage
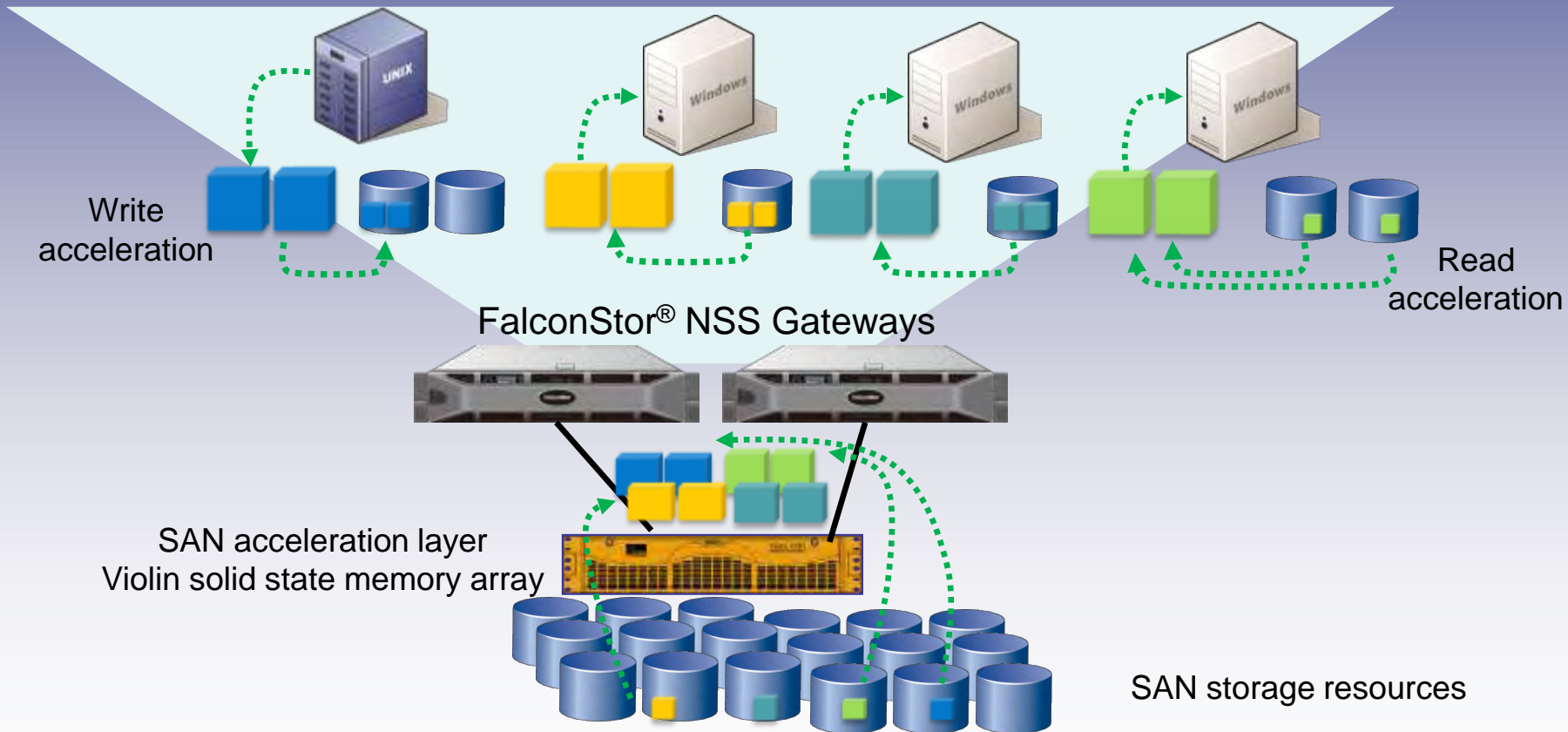- "In memory" operations
- Very fast cache

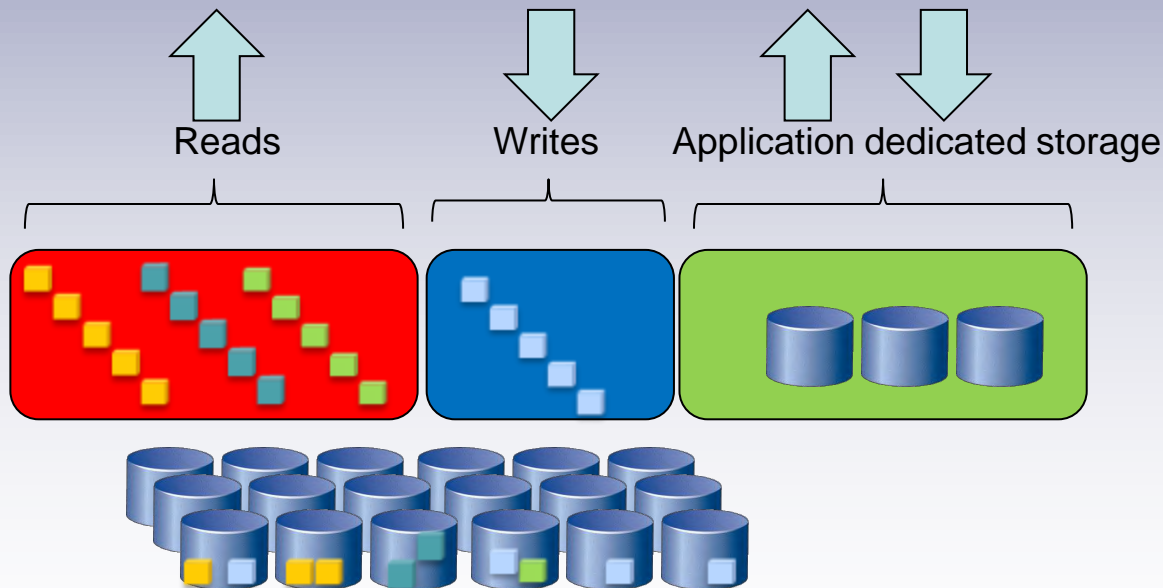# FalconStor SAN Acceleration

FalconStor® NSS SAN Accelerator

- Solid state memory is leveraged as cache
- Intelligent, predictable acceleration to all SAN resources

Write acceleration

Read acceleration

FalconStor® NSS Gateways

SAN acceleration layer
Violin solid state memory array

SAN storage resources

Enabling SAN and Application Acceleration

- Flexible deployment models:
  - Hosted application data on SSD
  - HotZone for SAN reads acceleration
  - SafeCache for SAN writes acceleration

Reads   Writes   Application dedicated storage

FalconStor HotZone: Read Acceleration

- **FalconStor Solution:**
  - Intelligent read acceleration with solid state memory translates to <u>massive</u> ROI
  - Policy-driven management: simple to configure, lasting benefits, adapts to your environment
  - Solid state now makes financial sense
    - Most frequently accessed data is the most easily accessed data
    - Avoid buying 50x the solid state capacity you need to accelerate the most commonly accessed data

Read enhancement
-- HotZone

"Hot" disk sectors identified and moved to solid state layer
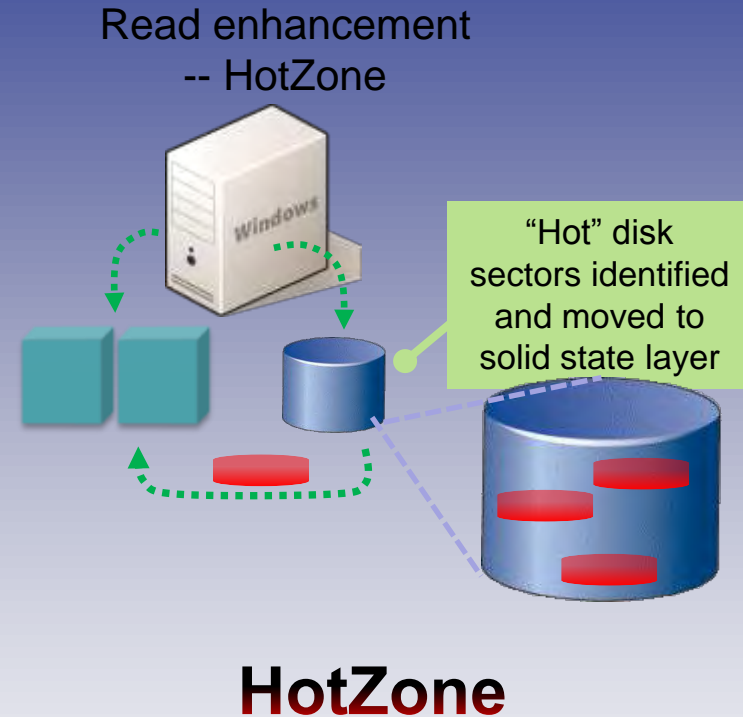
HotZone

HotZone Benchmarks

- Application: SQL 2008
- Size: 100GB database
- Tool: Benchmark Factory's Standard TPC-C benchmark

- Significant performance gain immediately

- Consistent high performance (response time) even with higher loads
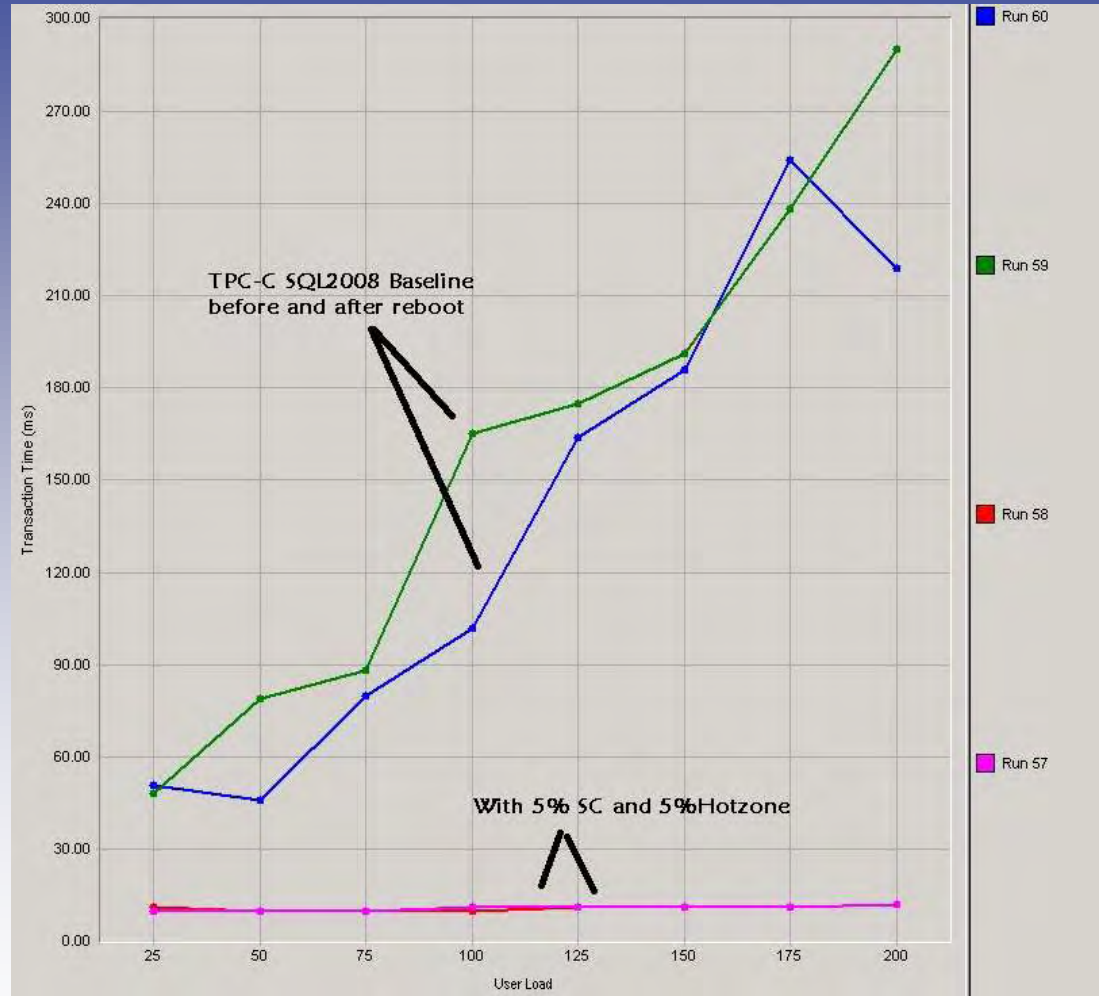
What does this mean?

- Application-specific acceleration
- Global acceleration of any SAN environment
- Cost-effective solid state memory deployment with maximum ROI
- Leverage existing storage infrastructure
- No rip-and-replace or heavy forklift investment
- Extends the life of current implementation for maximum return on assets (ROA)
- Seamless and easy deployment