

SSD Tips and Tricks: Applications and Operational Considerations

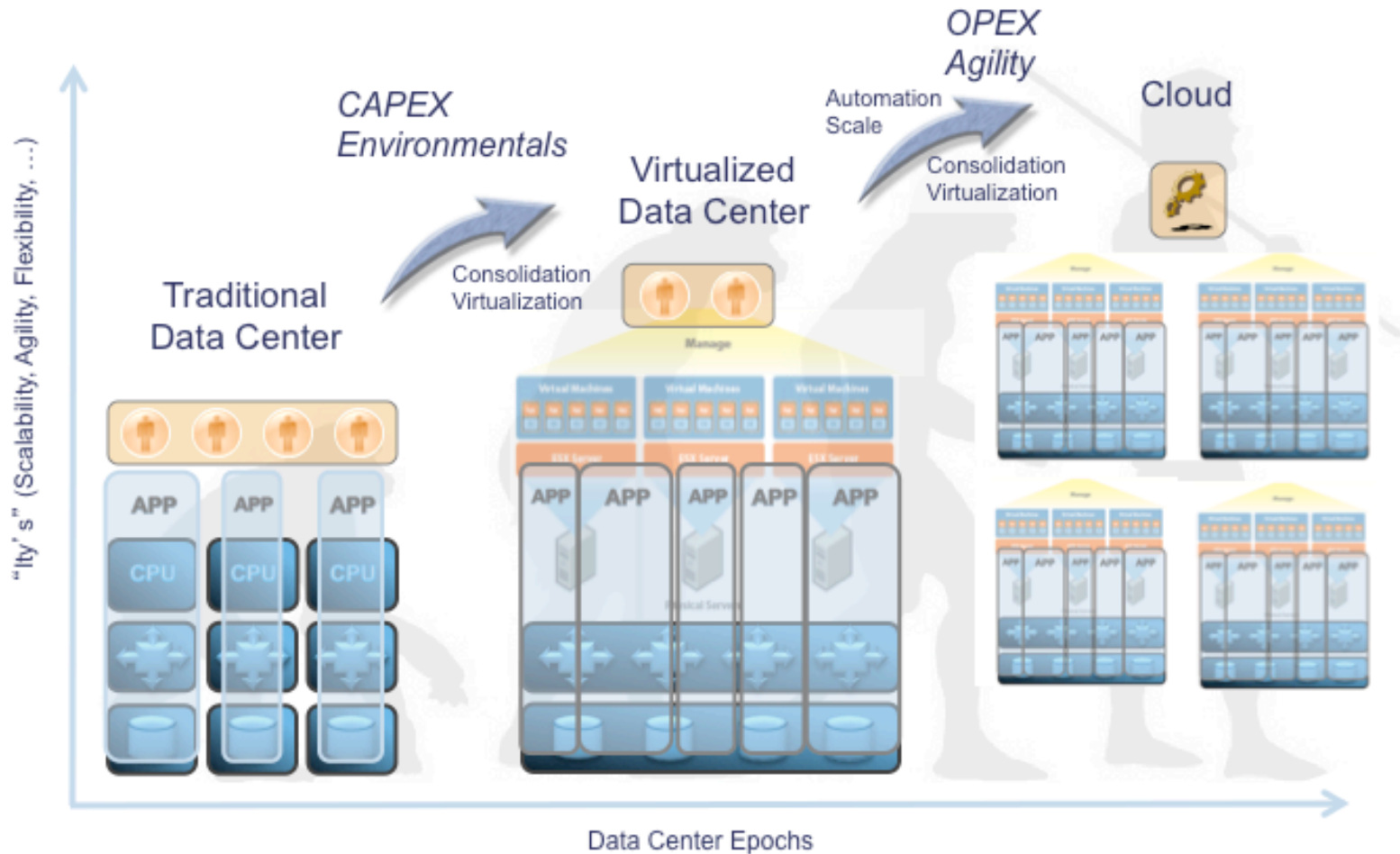
Bruce Moxon
CTO, Systems and Solutions



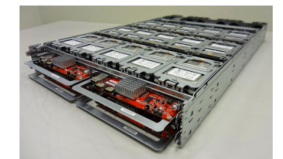
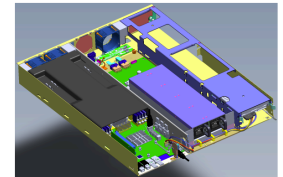
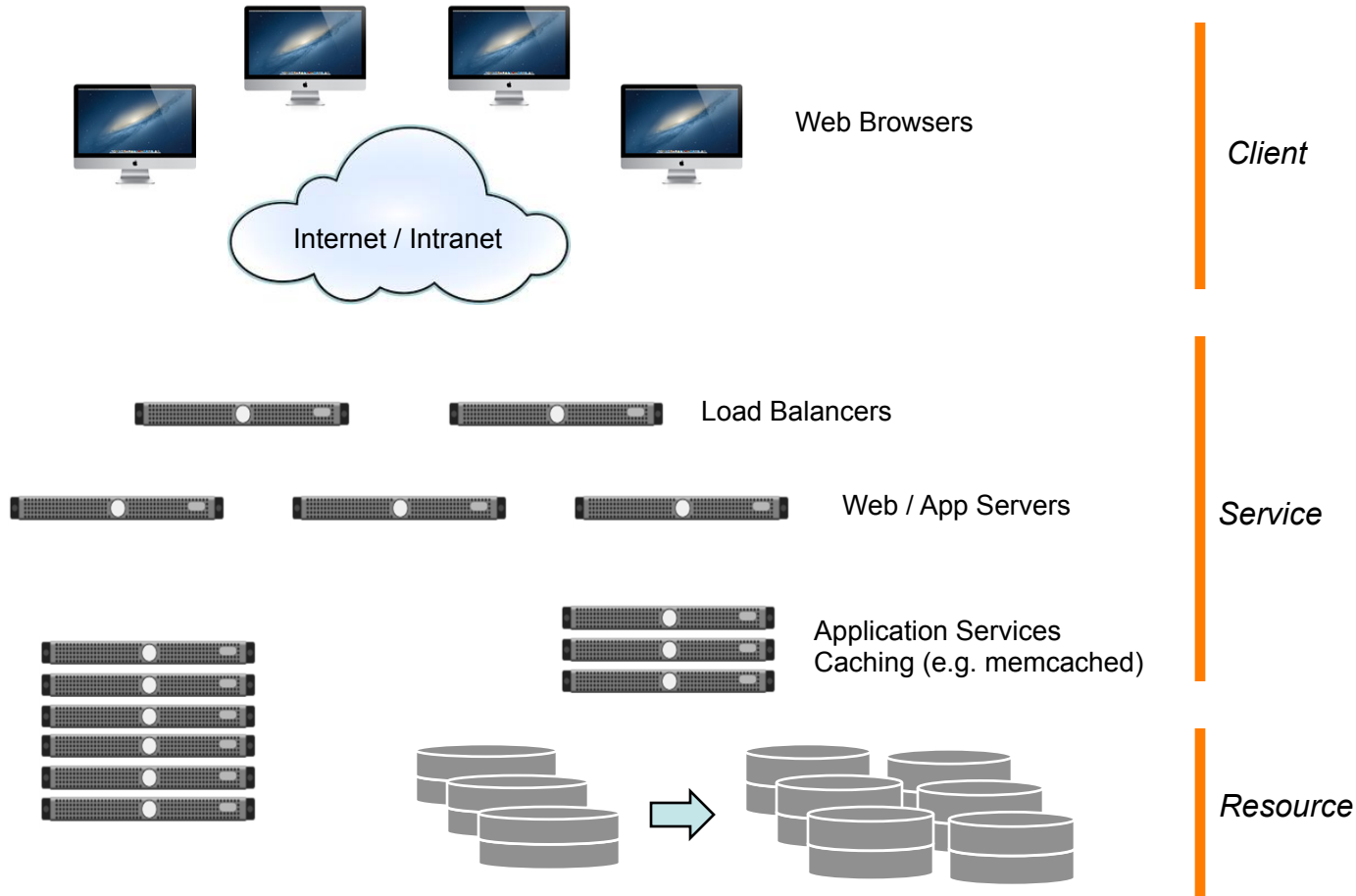
Discussion Outline

- Data Center Evolution
- Solid State Deployment Options
- Predominant Use Cases
- Operational Implications
 - Host-side caching
 - DAS-based primary storage
 - Solid State Arrays
- DAS vs. Cache Comparison
- “Flash 3.0”
 - FOS™ / Key-value Store

Enterprise Data Center Evolution



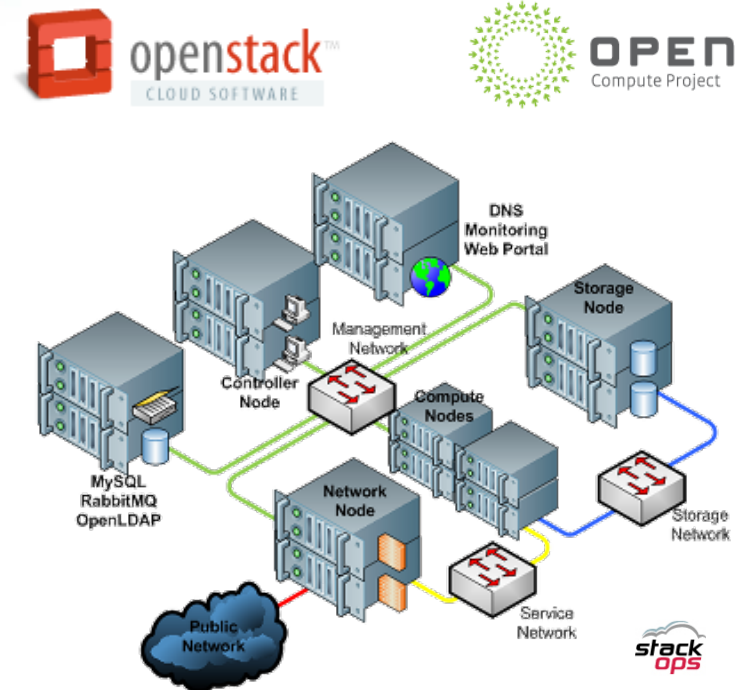
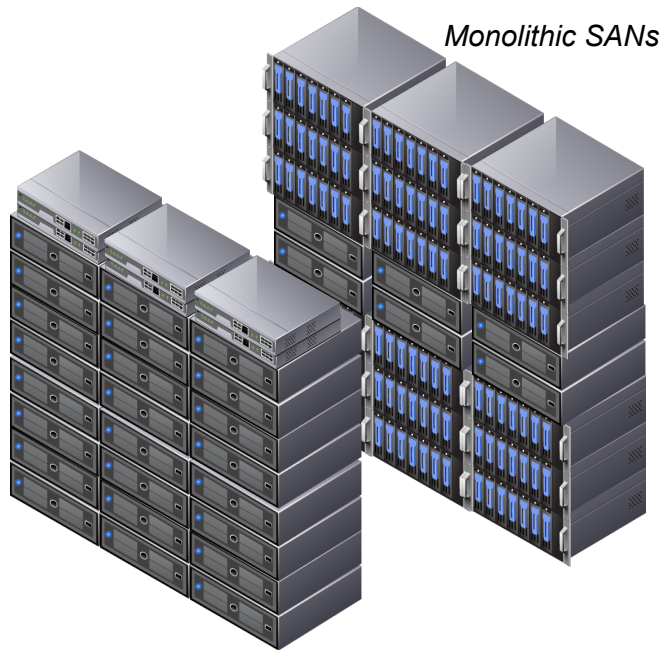
Scale-out, HPC, and HyperScale Data Centers



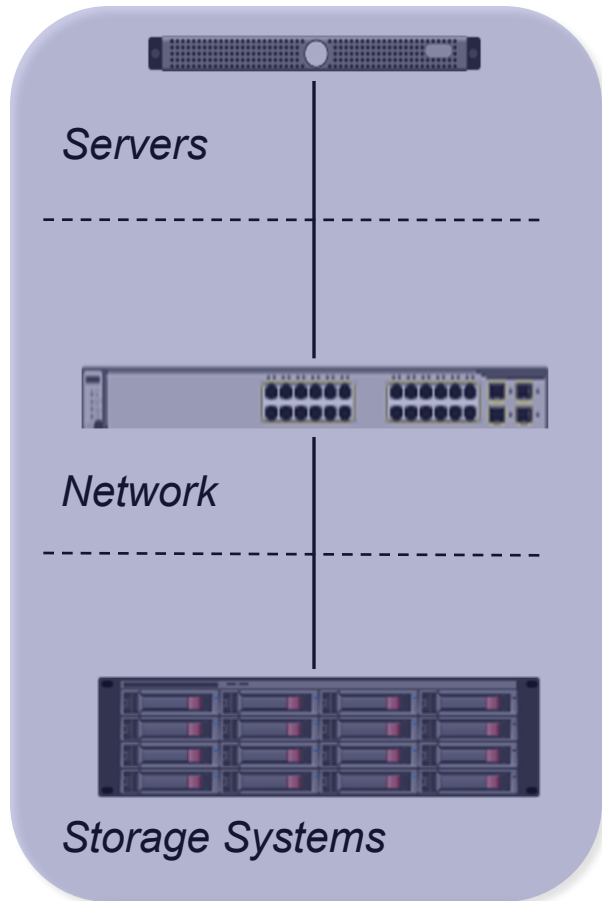
Cloud Architectures and SAN Disaggregation

Traditional and Virtualized
Data Centers

Cloud Architecture
Data Centers



Solid State Deployment Options



- High Performance, Low Latency DAS
- SAN / DAS Cache (incl. Controllers)
- Alternative Flash Access Methods

- Shared Network Caching (NAS / SAN)

- Controller Cache
- Tiered Storage (Hybrid LUNs)
- High Performance Storage Pools
- All Solid State Arrays

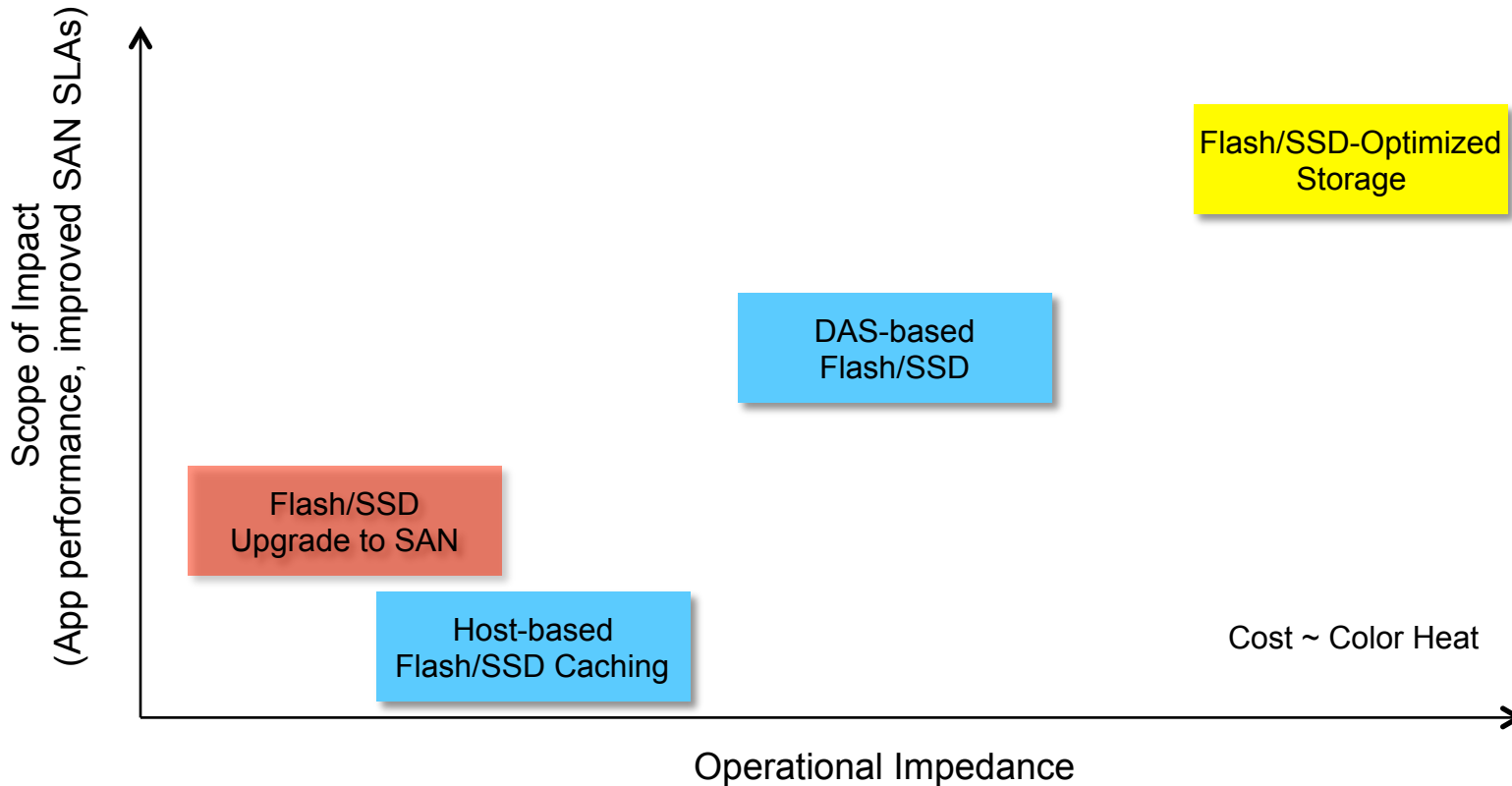
Predominant Use Cases

Use Case	Benefit
Transactional Databases	Improved performance, reduced query latency; virtualization/consolidation enabler
Server Virtualization / Cloud	Increased consolidation factors and per-server performance
VDI	Reduced infrastructure cost (\$/VDI); boot storm elimination
BI / DW / Analytics (including Hadoop, NoSQL, "in memory" analytics)	Decreased query response time; increased concurrency and throughput
Media	Realtime access to high demand shared assets
High Performance Computing	Accelerating a wide range of I/O-intensive HPC applications

Common Theme: Increased Performance Density

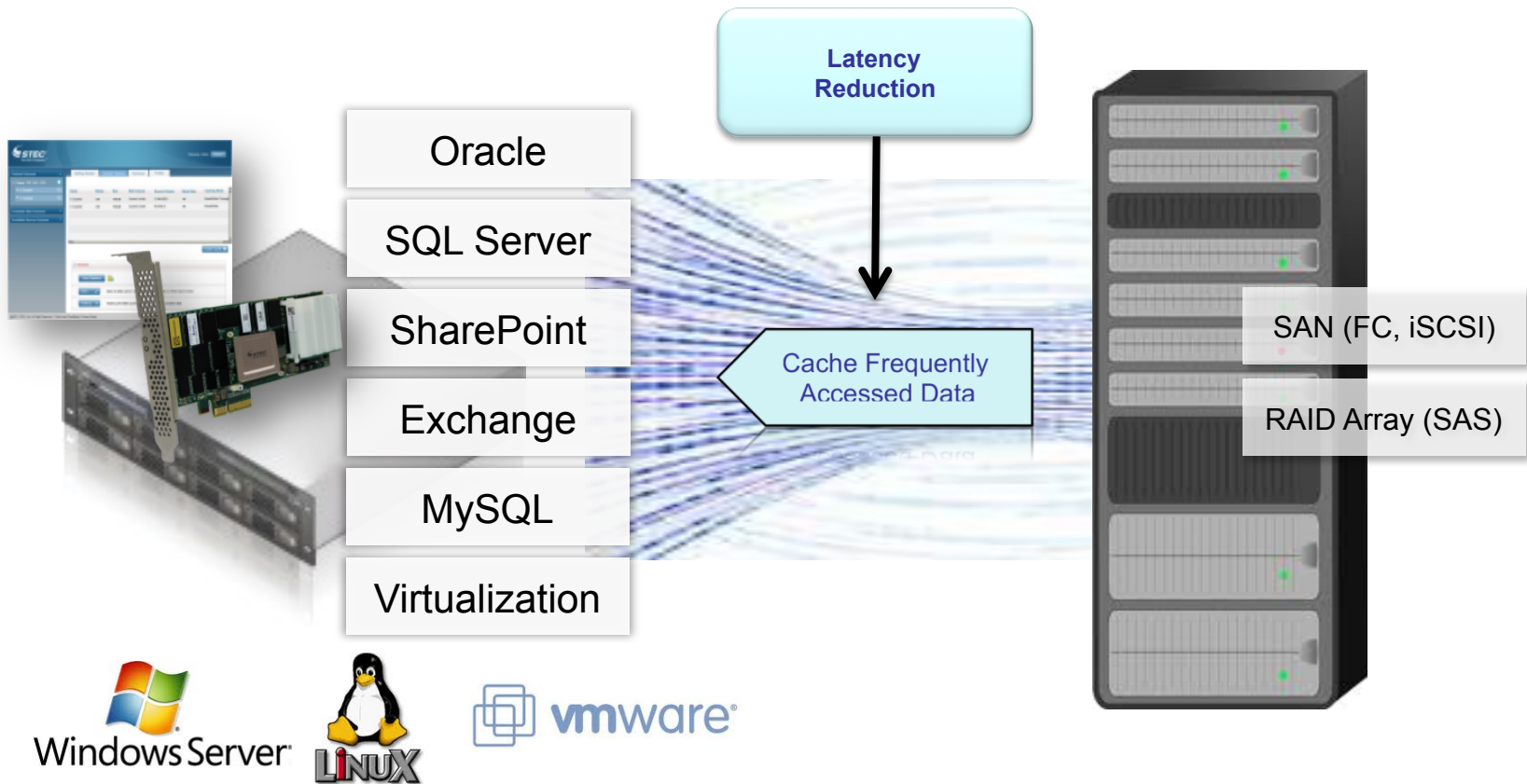
Increase in *Consolidation Factors*
Reduction in *Performance Sprawl*

Deployment Options and Operational Implications



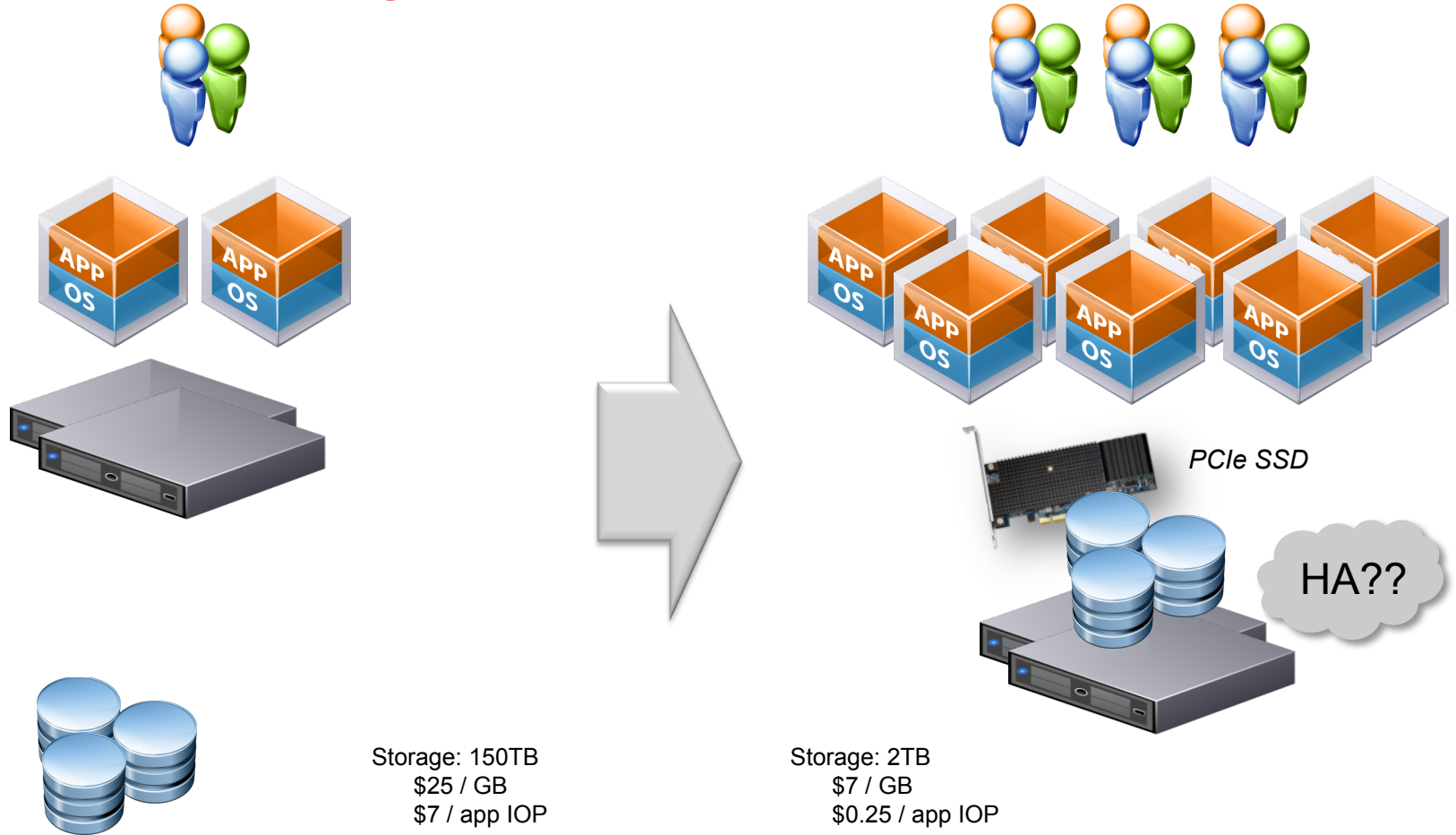
- Migration
- HA
- New Management Tools
- New Operational Procedures (backup, replication)

Host-side Caching



- Accelerates Applications
- Extends the Capabilities of the SAN

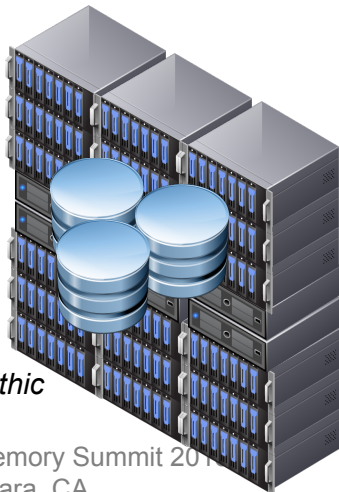
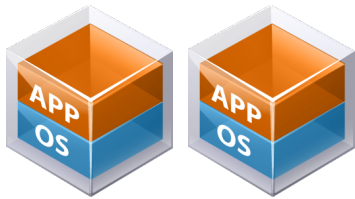
Solid State as Host-based Primary Storage



Monolithic
SAN

Flash Memory Summit 2013
Santa Clara, CA

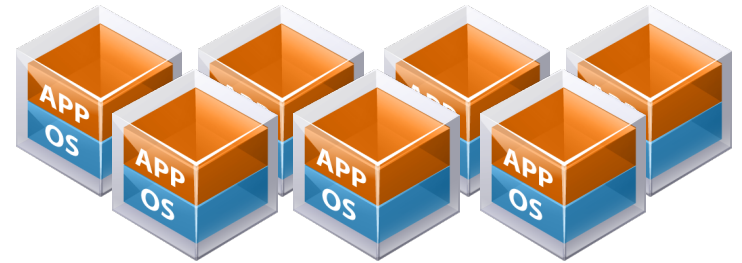
Solid State Arrays (including SDS)



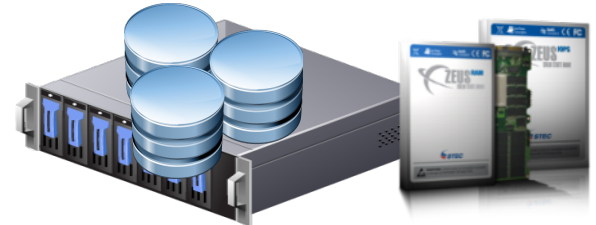
Monolithic SAN

Flash Memory Summit 2014
Santa Clara, CA

Storage: 150TB
\$25 / GB
\$7 / app IOP

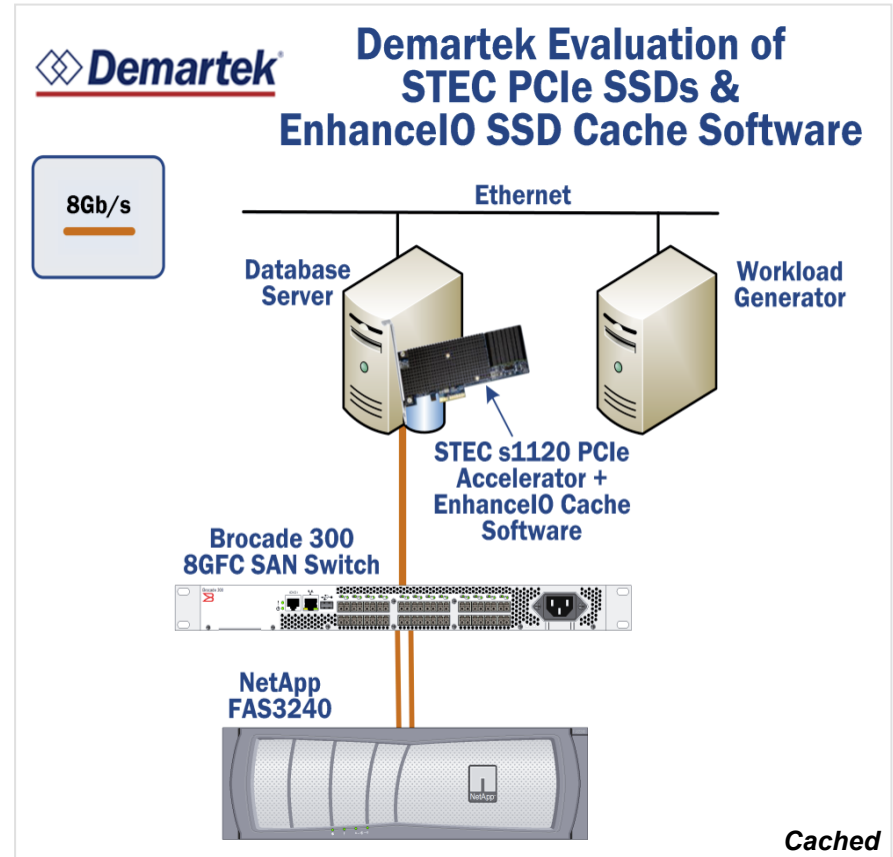
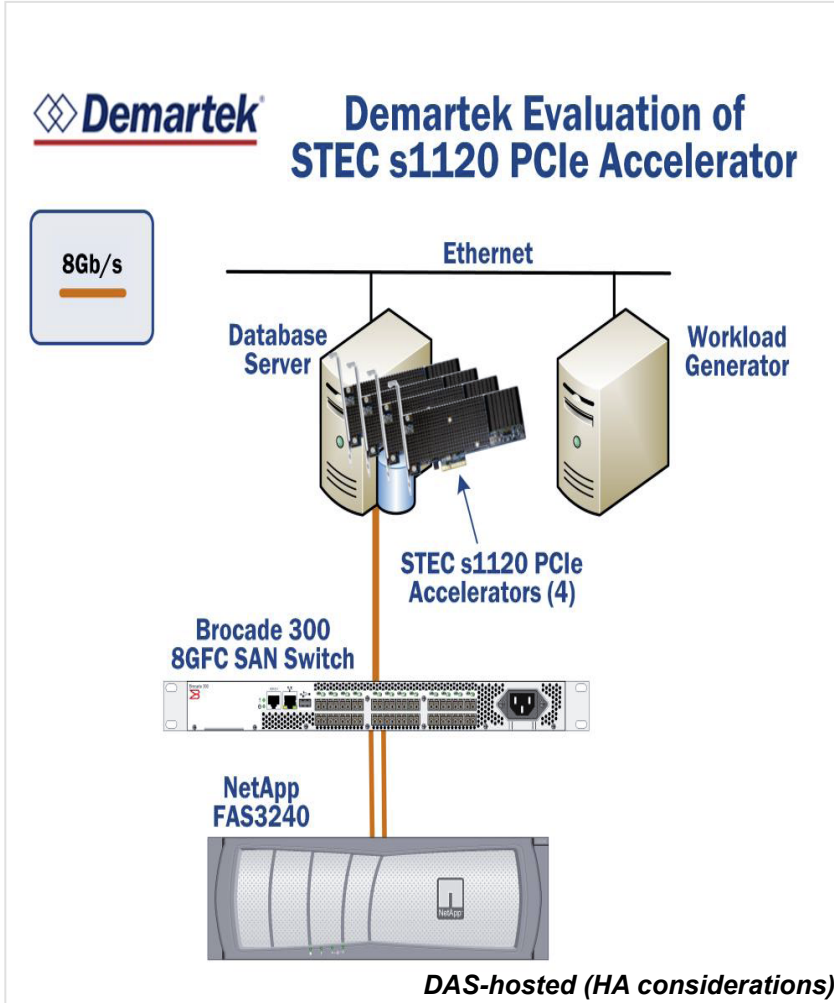


SAN, NAS, HA-DAS

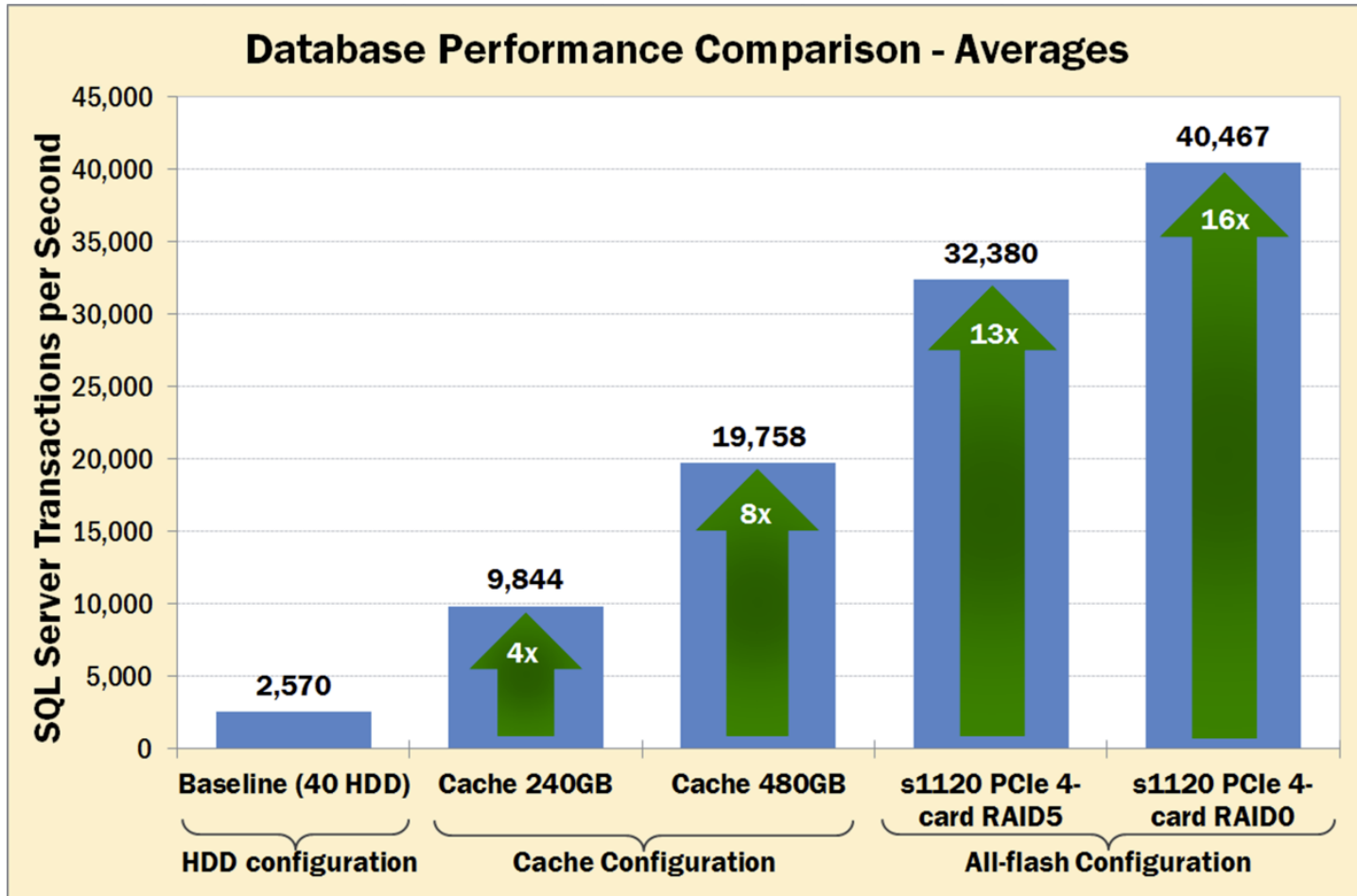


Storage: 6TB
\$8 / GB
\$0.15 / app IOP

Database Acceleration



Database Acceleration



“Flash 3.0”

- Flash technology presents new opportunities for *application optimizations* in the data path
 - Random access media
 - Near-memory latency at near-disk cost
- These will be optimally delivered through new device abstractions better-matched to device characteristics
 - Memory abstractions
 - Object abstractions
 - Flash Object Store™
- Natural extension to *Storage Class Memory*

