

# NEXGEN™ S T O R A G E

*Take control of storage performance*



**NETWORKWORLD**  
"2011 Storage Company  
to Watch"



**INFOSTOR**



Cruise control for  
application storage performance.

(QoS comes standard)



# Transition From Speed To Management

2008-2011

SSD + RAID

- Reduce time to market
- Inherent bottlenecks

## Limitations of disk based solid-state architectures

- Write workloads
- RAID overhead
- SAS backplane bottlenecks

## Challenges Not Addressed By All-Solid-State Arrays

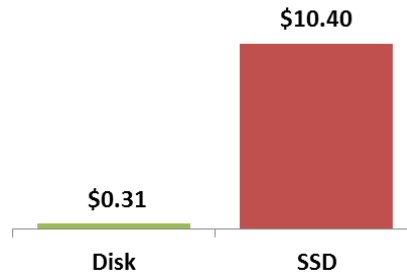
- Reducing Cost
- Migration
- Management

“I need MORE performance” → “I need to MANAGE performance”



# Leveraging Solid-state for Every Workload

- Solid state is fast but expensive\*



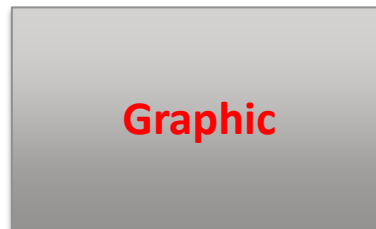
Affordable

- While data continues to grow\*\*



Ability to Migrate

- Vendors focus on the wrong problem
- Performance complexity is accepted
- Innovation to manage performance is absent



Performance QoS



*“The n5 is a very small foot print compared to my existing storage. My existing storage chews up a TON of power, takes up roughly 15U of rack space and costs a fortune every year in maintenance/support. By comparison. The n5 takes up 3U of space and about a 1/3<sup>rd</sup> of the power.”*

## **Robert Samples**

Senior Systems Engineer



**Conventional Storage**

15U



**5X Reduction  
67% Less Power**



3U

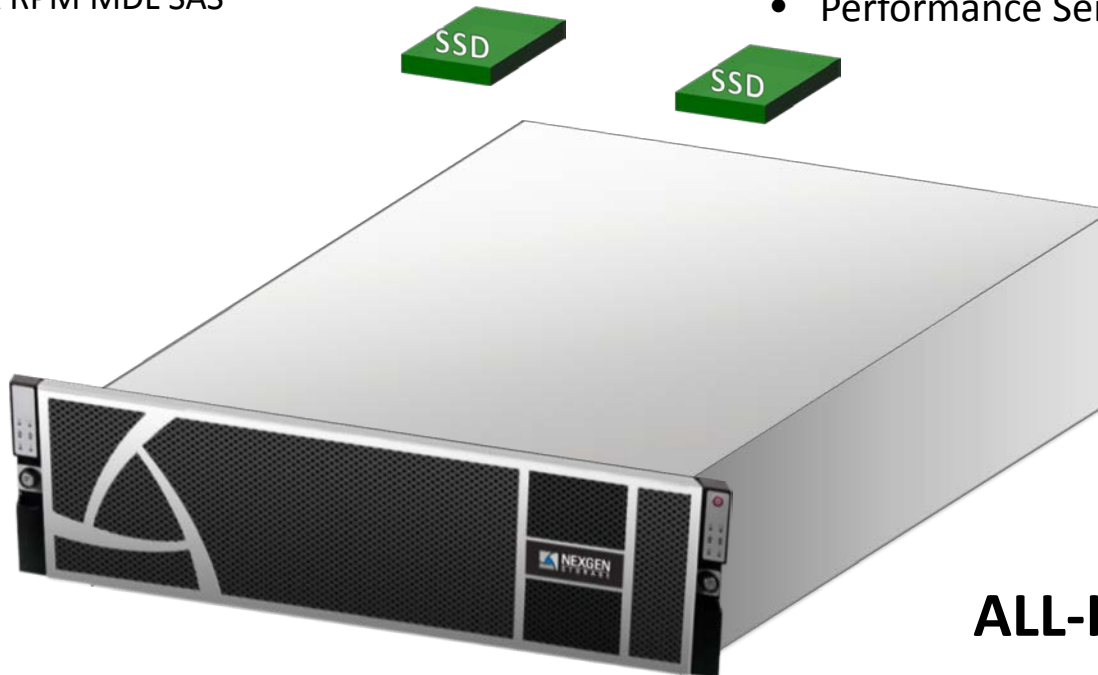


# NexGen n5 Storage System



## ioControl Operating Environment™

- Active-Active for Enterprise High Availability
- Balanced Performance & Capacity
  - PCIe Solid-state
  - 7.2k RPM MDL SAS
- Real-time Dynamic Data Placement
- Inline Data Reduction
- Performance Quality of Service (QoS)
- Performance Service Levels



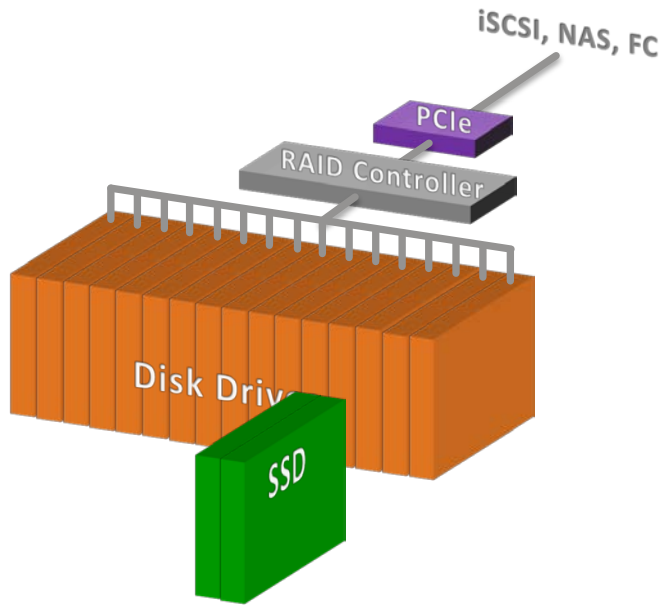
**ALL-IN PRICING**



# PCIe Solid-state Is More Efficient

## Solid-state behind **SAS**

Designed for high latency disk drives

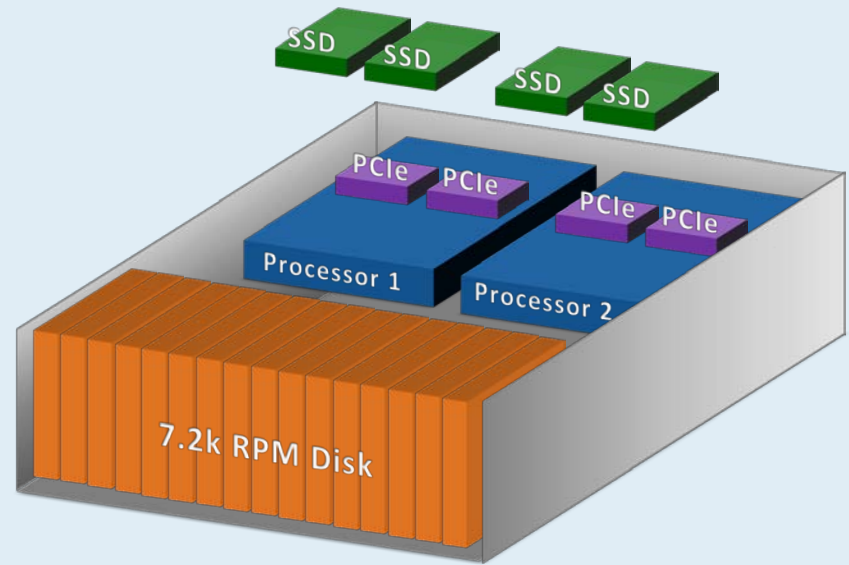


Lower Capacity  
Limited Performance



## Solid-state on **PCIe**

Designed for CPU and RAM, extreme low latency



Maximum Capacity  
Maximum Performance





*“Quote...”*

**David Blaisdale**  
IT Director



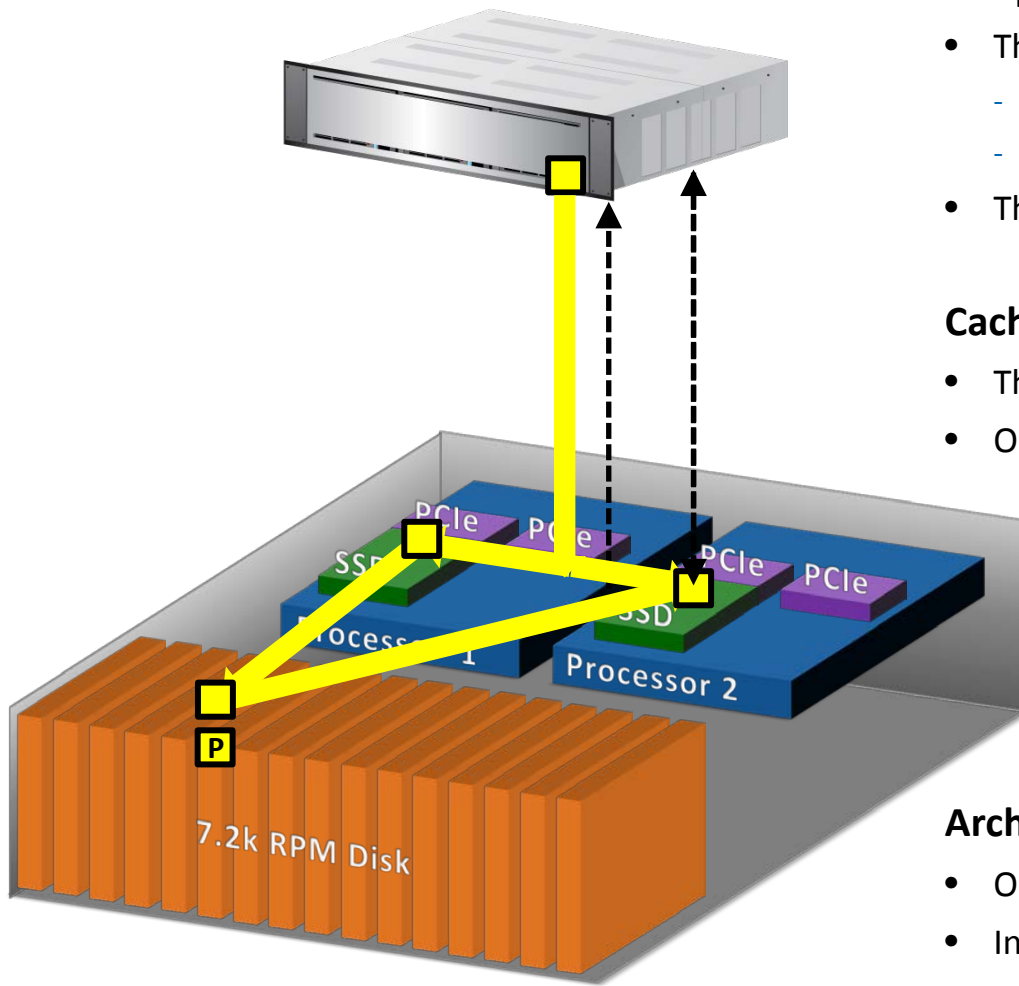
- Image and desktop management
- Caching



- Improved Login Times
- \$73/Desktop



# Leveraging Solid-State for Every Workload



## Tier

- Application sends a block write IOP
- The data block is mirrored
  - Data exists on two PCIe solid-state devices
  - Data is in a highly available state
- The block write IOP is acknowledged

## Cache (Writes and Reads)

- The redundant copy is moved to disk
- Original copy in solid-state used for writes/reads

## Processor/PCIe Solid-State Offline

- Data is rebuilt using redundant copy

## Archive

- Original copy evicted from solid-state
- Infrequently accessed blocks stored on disk

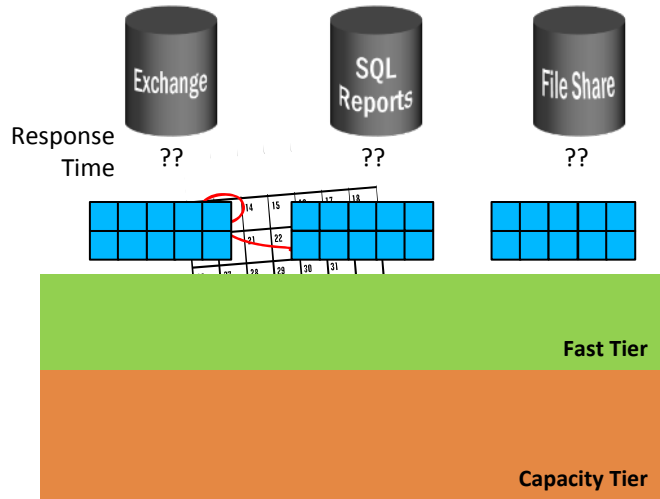




# Dynamic Data Placement For Best Price/Performance

## Automated tiering

Good performance at a lower \$/GB



Reactive Automation

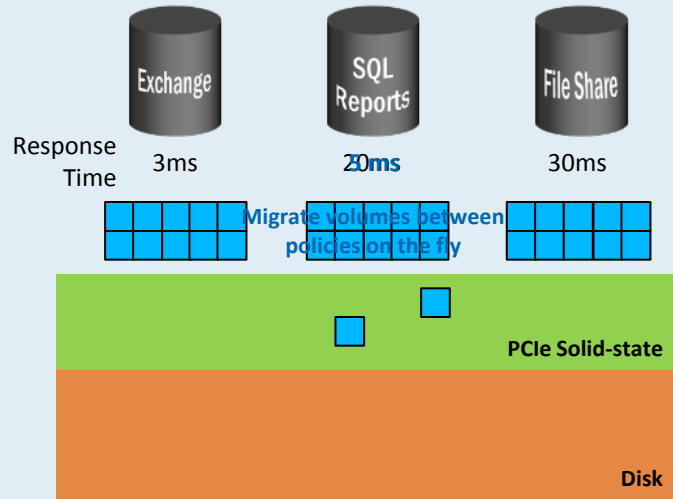


After-The-Fact  
Complex



## Dynamic Data Placement

Best price/performance ratio



Real-Time Decision Factors

- Current performance
- QoS setting
- Dedupe ratio
- Last accessed & frequency

Proactive  
Simple



# Data Reduction For Lowest \$/GB

## Deduplication

Designed for backup, forces trade-offs

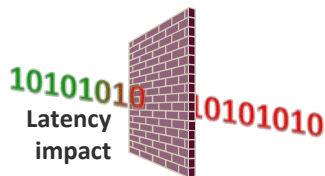
### Post Process

- Buy extra capacity
- Impacts performance



### Inline

- Requires resources, impacts latency
- Not acceptable for primary storage



### All solid-state w/ dedupe

- Doesn't Improve \$/GB



Reduces Performance, or  
Costs Around \$10/GB



## Data Reduction

Designed for primary storage

### Fully integrated into the data path

- All volumes are 100% deduped at create



### Inline data reduction

- Pattern matching leverages 48 cores of processing
- Immediate utilization impact
- QoS controlled to eliminate performance impact



### Default thin provisioning for all volumes

- Improved capacity utilization

No Performance Impacts  
Lower \$/GB



*“Users are seeing much improved login times, reports run faster from our business apps. But the best thing, is it allows me as a IT guy, to do stuff in the middle of the day without having to worry that it’s going to impact end users.”*

**Robert Samples**  
Senior Systems Engineer



- Improved Login Times for VDI
- Faster Reporting
- System Maintenance Does Not Impact Users



# Managing Performance Requires QoS

## Configuring SAN performance

Applications share all performance



<b>Capacity</b>	250 GB	500 GB	900 GB
<b>Performance</b>			

Shared resources = contention



Unpredictable  
Inefficient



## Quality of Service

Set QoS based each application's need

**TOTAL SYSTEM**  
**100,000 IOPS**

**REMAINING**  
**40,000 IOPS**



<b>Capacity</b>	250 GB	500 GB	900 GB
<b>Performance</b>			

Eliminate resource contention with QoS

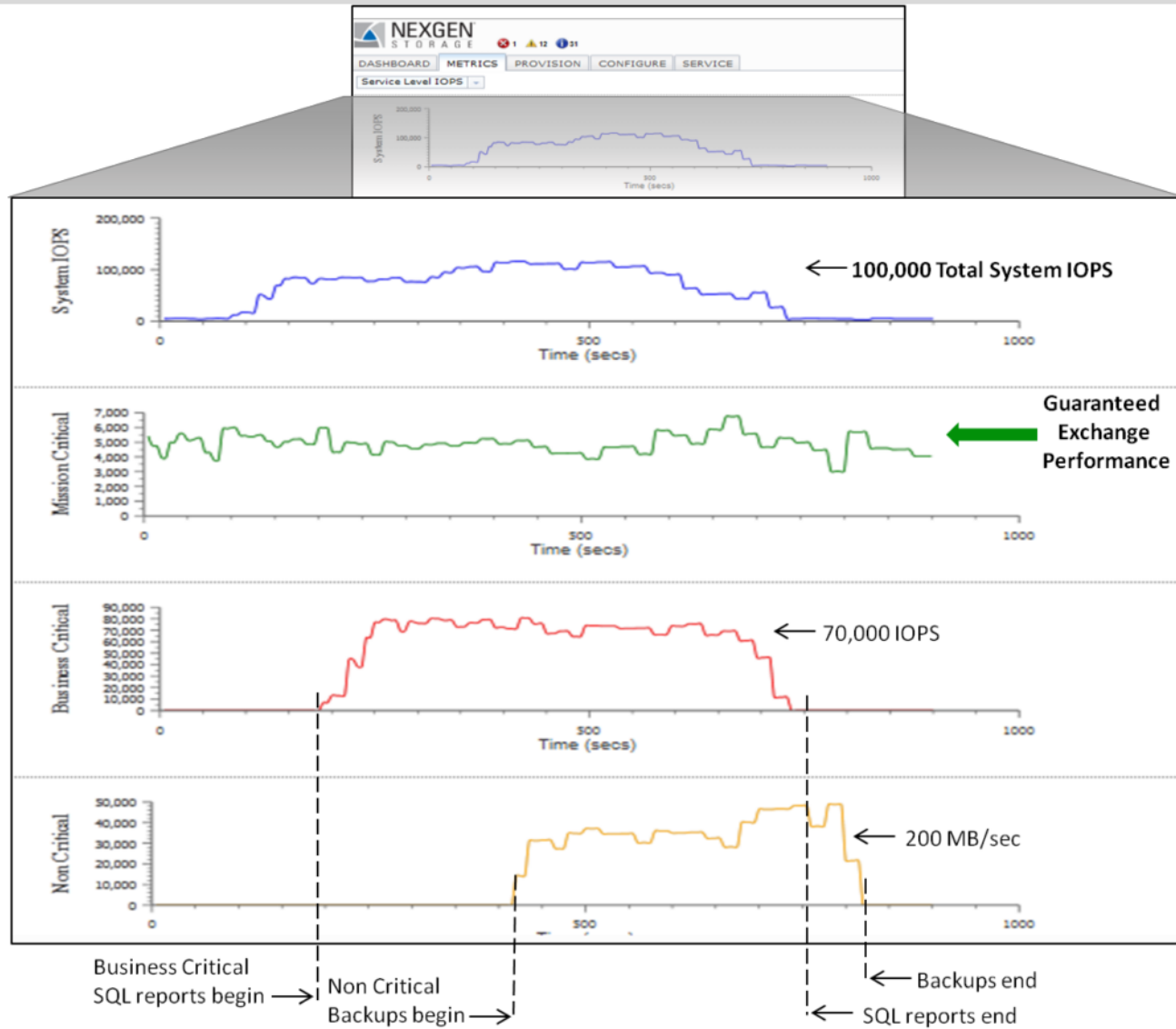


Managed  
Optimized



# Quality of Service in Action

Figure 6. ioControl in Action



# Service Levels For Total Control

## Degraded mode impacts

No control or priority over performance levels

- COMPONENT FAILURE!
- SYSTEM UPGRADE!
- REBUILD PROCESS!



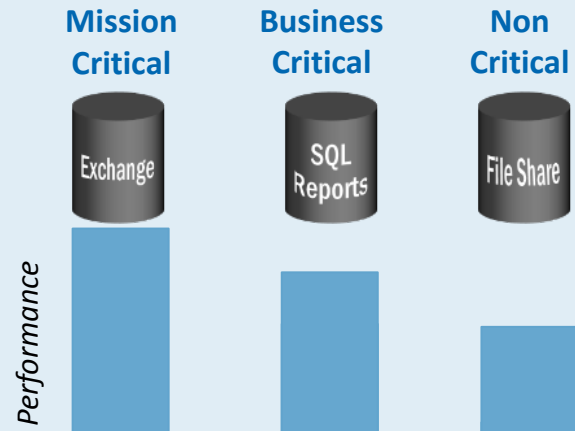
No Priority  
No Control



## Quality of Service

Prioritized performance in degraded mode operation

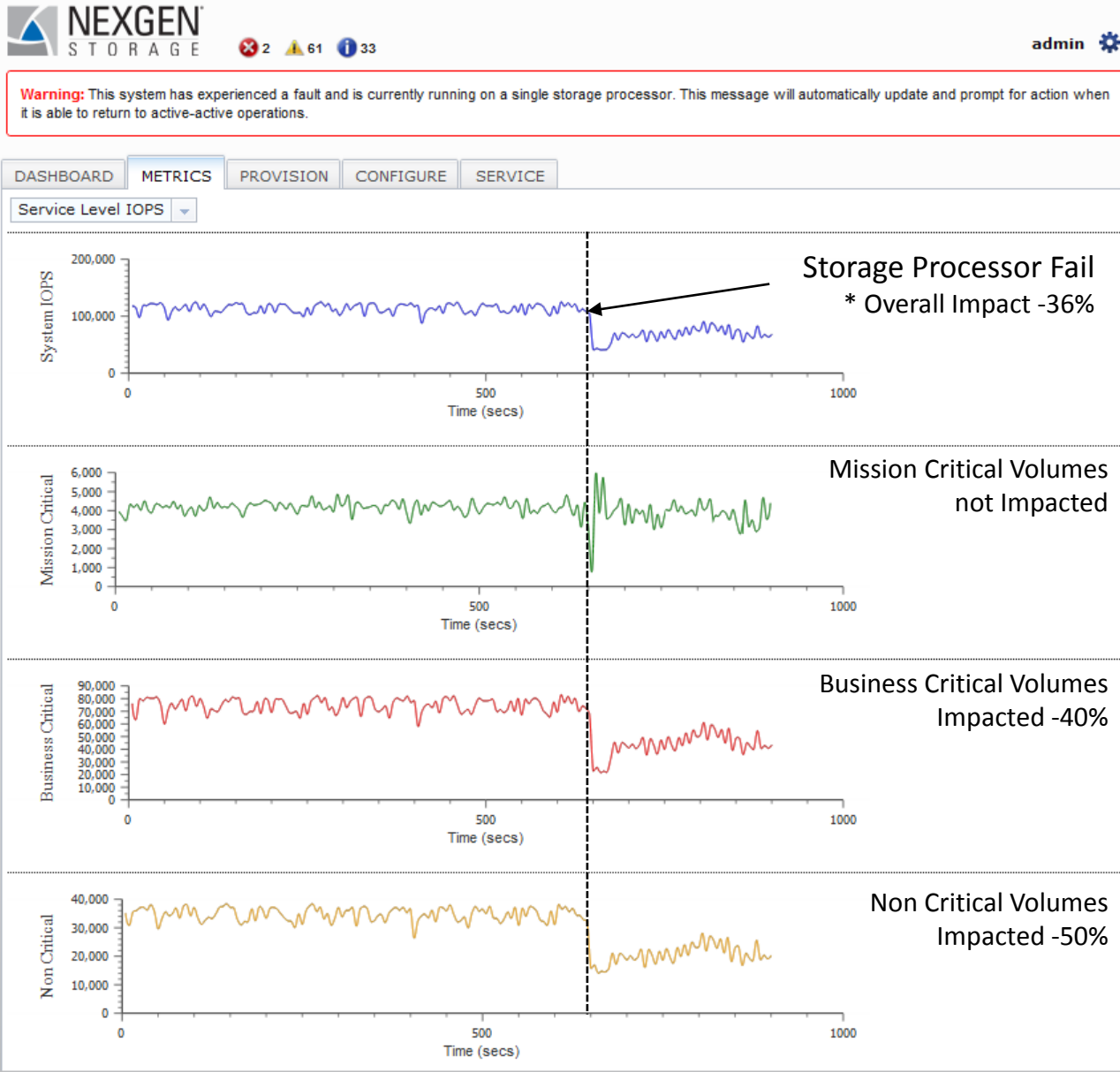
- COMPONENT FAILURE!
- SYSTEM UPGRADE!
- REBUILD PROCESS!



**Prioritized  
Total Control**



# Service Levels in Action



- Addressing Cost
- Addressing Migration
- Addressing Management





# Welcome to Storage Election 2012



Vote for the best solid-state storage approach!

[www.storageelection2012.com](http://www.storageelection2012.com)



## Conventional Hybrid aka **Rusty Spindles III**

- Leverage existing investments
- Piece of mind with tried and true architecture
- Use SSD for read cache/ optimize SATA for writes



## All-SSD Arrays aka **Flash Made-off**

- Replace all disk drives with SSD
- More performance than a conventional approach
- Use deduplication to keep \$/GB inline with disk



## PCIe Hybrids with QoS aka **Fusion Powers**


- PCIe solid-state for read and write workloads
- Stale data destaged to disk
- Storage QoS for consistent, predictable performance





# NexGen Storage n5 Series



Model	n5-50	n5-100	n5-150
Solid-state Capacity	770 GB	1,280 GB	2,400 GB
Raw Capacity	16 TB	32 TB	48 TB
IOPS Rating*	50,000	100,000	150,000
Capabilities	 ioControl Operating Environment includes: <ul style="list-style-type: none"> <li>Storage Quality of Service (QoS)</li> <li>Performance Service Levels</li> <li>Dynamic Data Placement</li> <li>Data Reduction</li> </ul>		
Storage Processors	Dual Active-Active		
RAM	48 GB		
Network Interfaces	Data: (4) 10GbE + (8) 1 GbE, iSCSI Management: (4) 1GbE, HTTP		
Hardware Availability	Redundant storage processors Redundant fans Redundant power supplies Redundant network connections Dual port SAS drives		
Support Options	7 day x 24 hour phone support with onsite parts 7 day x 24 hour phone support with next business day parts 5 day x 9 hour phone support with next business day parts		



\*4K 100% random mixed workload from multiple hosts

