

Современные подсистемы хранения данных

Ноябрь 2012,

Зейников Александр, Менеджер по развитию бизнеса LSI



Accelerate.

Agenda

- LSI positioning and IT trends
- MegaRAID and HBA historical overview
 - LSI market position with MR and HBA
 - Performance
 - PCI-e 2.0 6Gbit/s cards
 - MR Dual core cards
 - PCI-e 2.0 HBAs
 - PCI-e 3.0 MR
 - PCI-e 3.0 HBA
- LSI Nytro product portfolio
 - Nytro Warp Drive
 - Nytro XD
 - Nytro MR
- LSI HA DAS
- SAS Switch

LSI Benefiting from Numerous Inflections



Social Platforms

The new consumer portal (shopping, email, entertainment)
Enterprise increasingly adapting for e-collaboration



Smart Clients & Mobile Internet

Rise of smart phones, tablets and other intelligent clients
Connectivity explosion reshaping the network



Video

Rapid proliferation across consumer and enterprise platforms
Massive increase in storage capacity and network bandwidth



Big Data

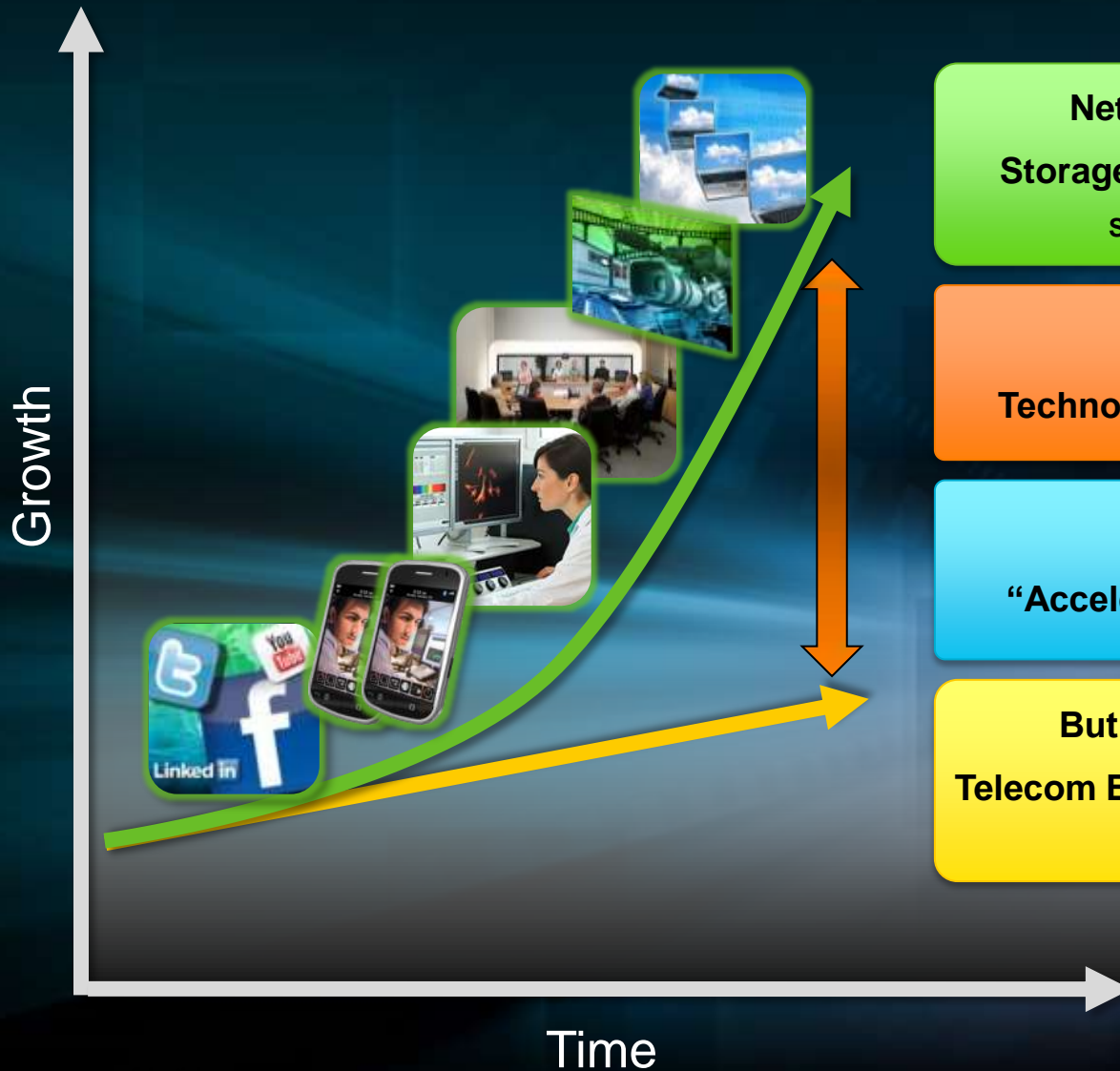
Collection & real time analysis of massive amounts of data
Datacenter architecture evolving to support Big Data analytics



Cloud

Rapid evolution of DCs for TCO, agility & growing demand
Clouds of all shapes, sizes, and business models

The Result: The “Data Deluge” Gap



2011-2015

Network Traffic CAGR ~ 32%
Storage Capacity Needs CAGR ~50%

Source: Cisco VNI 2011, IDC 2011

“Bridging the Gap”
Technology Scaling e.g., Moore’s law



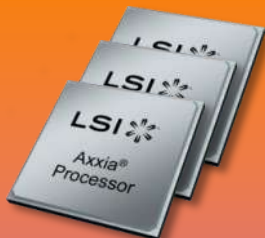
“Acceleration Through Intelligence”

But...IT Spending CAGR ~ 5%
Telecom Equipment Spending CAGR ~ 7%

Source: Gartner Dec 2011

Broad Product Offerings: Silicon and Software Solutions

Networking



Axxia™ Standard Product Family



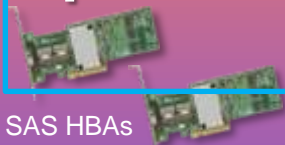
Custom Silicon



Software

2015 SAM = \$4.6B
'11-'15 SAM CAGR = 12%

Server & Storage Connectivity



SAS HBAs

MegaRAID HBAs



Software

2015 SAM = \$2.4B
'11-'15 SAM CAGR = 8%

HDD



2015 SAM = \$4B
'11-'15 SAM CAGR = 10%

Flash



PCIe® Flash Adapters



Software

2015 SAM = \$2.8B
'11-'15 SAM CAGR = 31%

Advancing server storage performance through SAS and data protection leadership

Source: LSI estimates

LSI 2015 SAM = \$13.8B, '11-'15 CAGR = 13%

Контроллеры LSI:

MegaRAID®

HBA (Host Bus Adapters)



Accelerate.

Scott Cleland,
Sr. Manager, LSI

LSI Server Storage Advantages

LSI Leadership

- OEM and technology Leadership
- Continuing to lead SAS innovation
- Broadest family of SAS products
- Driving interoperability, low risk, TTM

Highlights

- >287M SAS ports shipped
- 5 million MegaRAID installs
- 9 of 10 top OEMs using LSI 6Gb/s SAS RoCs and MegaRAID software
- 10 of 10 top OEMs using LSI 6Gb/s SAS IOCs for SAS connectivity

Server Storage

LSI SAS ROC

SAS HBA and MegaRAID

LSI SAS Controller

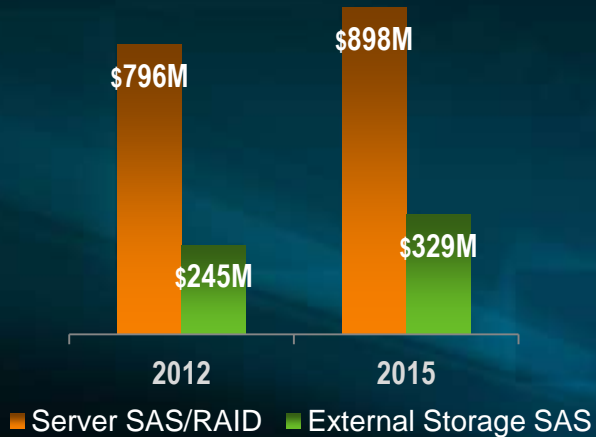
Serial Attached SCSI

Higher Performance
Lower Power
Lower Cost
Greater Density

LSI SAS

Market Leader Continuing to Gain Share

LSI SAS Market Opportunity



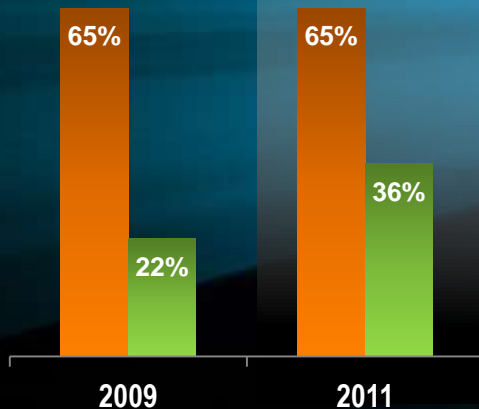
Share Gain Opportunities

Intel Romley Servers

Channel Growth

12Gb SAS Transition

LSI Share of Market



All Key Server/Storage OEM's using LSI SAS & MegaRAID Solutions



IBM



CISCO

ORACLE

NEC



HITACHI

TERADATA

lenovo

EMC²

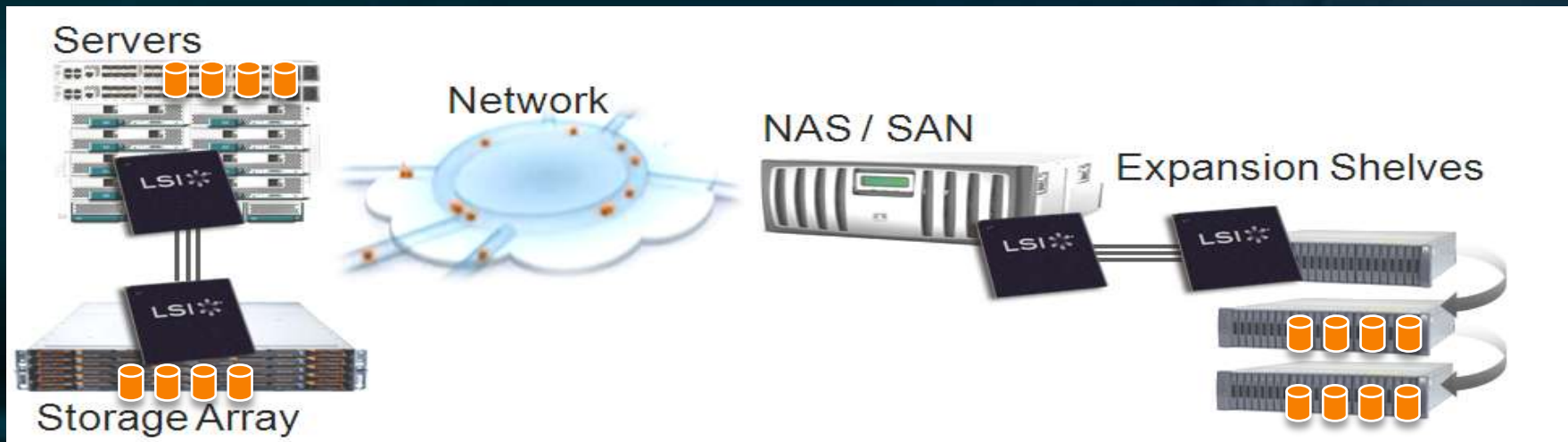
NetApp



Storage. Networking. Accelerated.

SAS in the Datacenter Evolution

Upgrading the Storage Infrastructure



IOPs
60% with LSI 4th gen
SAS ROC architecture

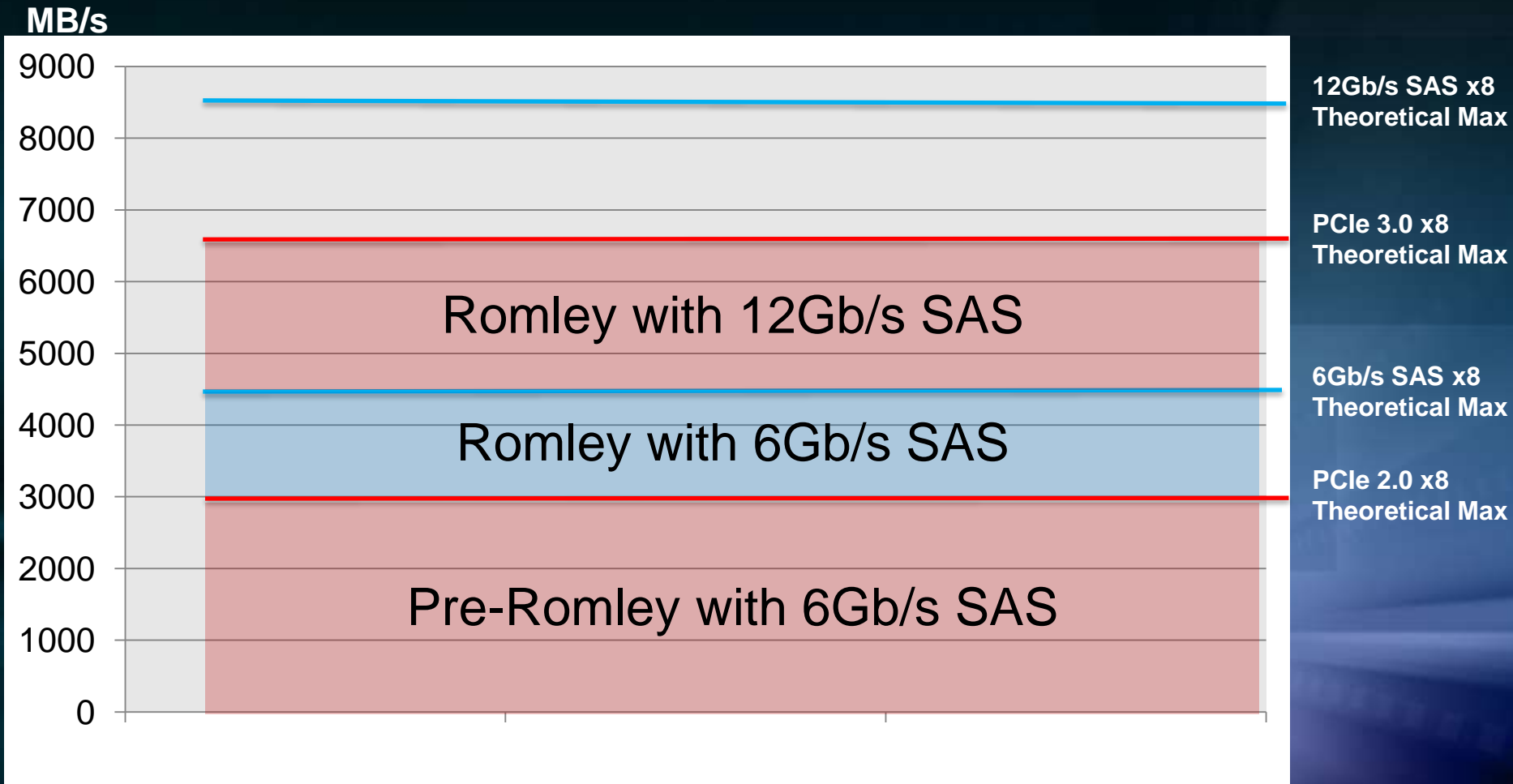
Latency
Major reduction with
LSI FCS

Throughput
100% with LSI DataBolt
And 6Gb/s drives

Future Proof
For 12Gb/s SAS
SSDs and drives

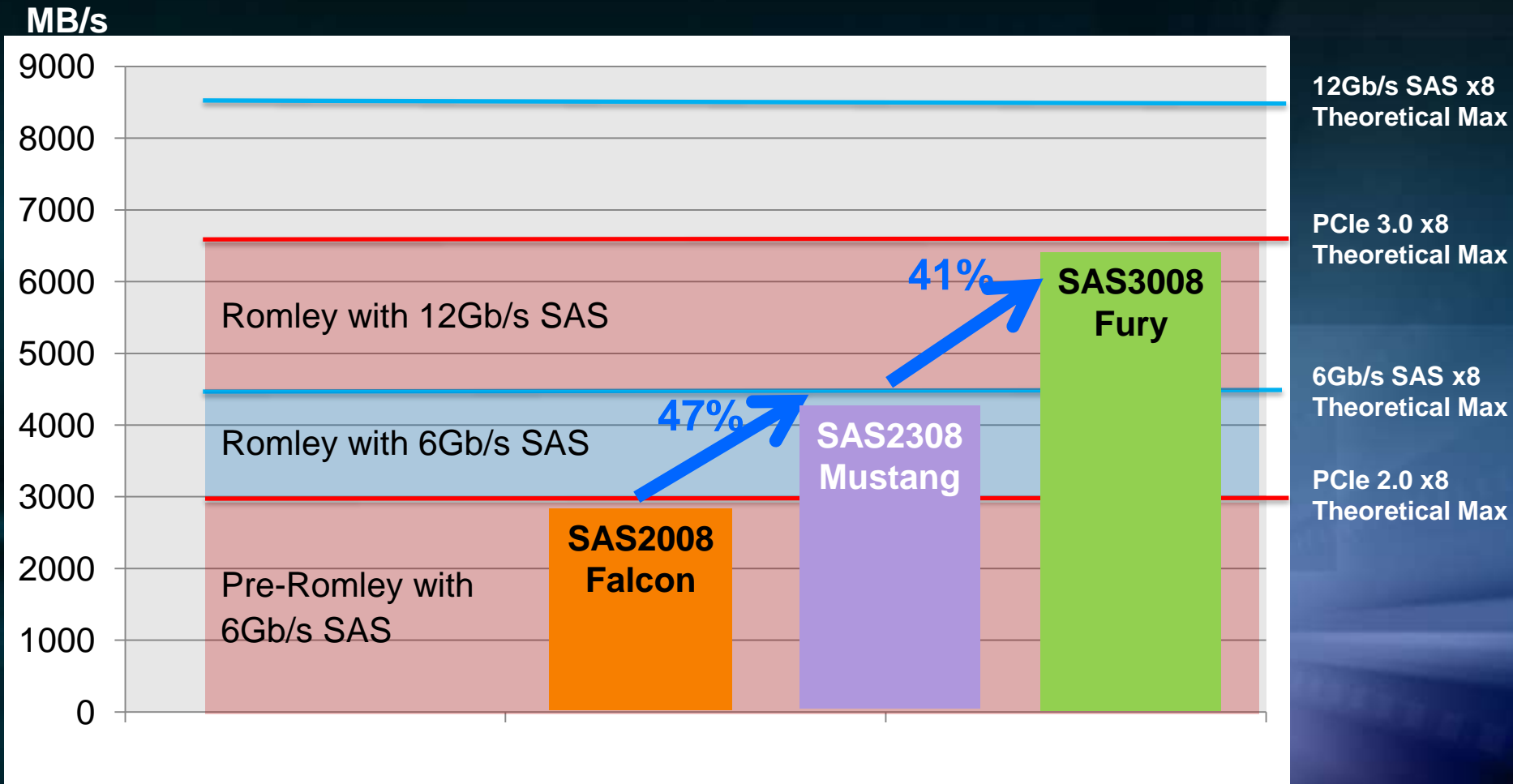
Accelerating the Datacenter with 12Gb/s SAS

Maximum Throughput Limiters in Servers











12G SAS required to take advantage of PCIe Gen3 throughput

Maximum Throughput Limiters in Servers



12Gb/s SAS is required to take full advantage of PCIe 3.0 performance

LSI Enterprise RAID Product Positioning

	Economical Data Protection	Fast Storage in Demanding Multi-Streaming Applications	Leading Performance in IOPS Applications	Accelerated Platforms for the Cloud
				
Продукт	MegaRAID 9240	Zware 9650, 9750	MegaRAID 9260, 9280	MegaRAID 9265/66, 9285, 9270/71, 9286
Позиционирование	Защита данных начального уровня (low-cost HW-RAID5)	Для поточных SATA и SAS приложений, направленных на обработку больших объемов данных	Традиционный IT и платформы с SSD	Экстремальные нагрузки, управление большими массивами с SSD
Приложения	Для серверов начального уровня	Видеонаблюдение, цифровой пост-	OLTP и крупные IT инфраструктуры	Облака, Web 2.0
				

MegaRAID 6Gb Adapter Portfolio

Liberator

Thunderbolt

HPC

Battery

Supercap

Battery

Supercap or Battery



9260-16i / 9280-16i4e, 24i4e



9280-4i4e

9260-4i / 8i

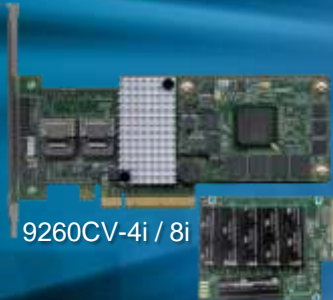


9261-4i / 8i



9240-4i / 8i

Value / Performance



9260CV-4i / 8i

PCI-E 2.0 -> PCI-E 3.0
(9270/71/86)



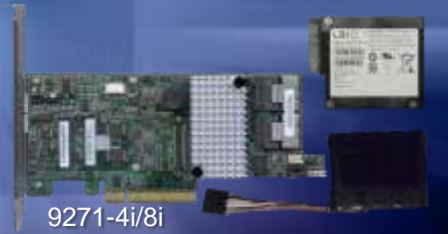
9285-8e



9265-8i



9286-8e +
CVM01



9271-4i/8i

Entry

LSI MegaRAID PCIe 2.0 SATA+SAS 6G RAID

- Four to Twenty-Eight SATA+SAS ports
- 6Gb/s throughput per port
- LSI SAS2108 RAID-on-Chip (ROC)
 - 800MHz PowerPC®
- Low-profile MD2 form factor (6.6" X 2.536") eight ports; full height HPC
- x8 PCI Express 2.0 host interface
- 512MB DDRII cache (800MHz)
- Optional battery backup unit
- Connect up to 128 or 240 SATA, SAS, SSD devices
- RAID levels 0, 1, 5, 6, 10, 50 and 60
- Online Capacity Expansion (OCE)
- Online RAID Level Migration (RLM)
- SSD support with SSD Guard™
- CacheCade, FastPath, Recovery and SafeStore ready



Marketing Name	Int Ports	Ext Ports
MegaRAID 9240-4i Single/Kit	4	0
MegaRAID 9240-8i Single/Kit	8	0
MegaRAID 9260-4i Single/Kit	4	0
MegaRAID 9261-8i Single	8	0
MegaRAID 9280-4i4e Single	4	4
MegaRAID 9280-8e Single/Kit	0	8
MegaRAID 9260-16i Single	16	0
MegaRAID 9280-16i4e Single	16	4
MegaRAID 9280-24i4e Single	24	4
MegaRAID 9260CV-4i Single/Kit	4	0
MegaRAID 9260CV-8i Single/Kit	8	0

Performance Metrics			
RAID Level	SDTR Read MB/s	SDTR Write MB/s	IOPs
0	2880	3000	147000
5/6	2880	1360	147000

LSI MegaRAID Dual Core SATA+SAS 6G RAID

- Eight internal SATA+SAS ports
 - Two mini-SAS SFF-8087 x4 connectors
- Eight external SATA+SAS ports
 - Two mini-SAS SFF-8088 x4 connectors
- 6Gb/s throughput per port
- LSI SAS2208 RAID-on-Chip (ROC)
 - X2 800MHz PowerPC®
- Low-profile MD2 form factor (6.6" X 2.536")
- x8 PCI Express 2.0 host interface
- 1GB DDRIII cache (1333MHz)
- Optional battery backup unit
 - LSIiBBU09 (remote connect)
 - CacheVault support (9266 and 9285CV ONLY)
- Connect up to 128 or 240 SATA, SAS, SSD devices
- RAID levels 0, 1, 5, 6, 10, 50 and 60
- SSD support with SSD Guard™
- CacheCade, FastPath, Recovery and SafeStore ready



Performance Metrics PCI e 2.0			
RAID Level	SDTR Read MB/s	SDTR Write MB/s	IOPs
0	3200	3000	465000
5/6	3000	2700	465000

Marketing Name	Int Ports	Ext Ports
MegaRAID 9265-8i Single/Kit LSIiBBU09 option only	8	0
MegaRAID 9285-8e Single LSIiBBU09 option only	0	8
*MegaRAID 9266-8i Single/Kit LSIiBBU09 or CV option	8	0
*MegaRAID 9285CV-8e Single CV option only on new SKU	0	8

Released for February 2012

LSI HBA PCIe 2.0 SATA+SAS 6G HBA

- 6Gb/s data transfer rate per port
- 4,8,and 16-port SFF8087/8088 Mini-SAS connector(s)
- X4 and X8 PCI Express 2.0 host interface
- MD2 low-profile form-factor design
- Maximum power usage of 9W
- Integrated RAID 0, 1, 1E, and 10
- Connects to SAS and SATA HDDs, SSDs, and tape drives
- Support for up to 1024 physical devices*
- Fusion-MPT architecture can achieve more than 500,000 I/Os per second (*9205)
- Consistency Check**
- Hot Spare Support**
- SMART error detection
- PowerPC 440 @533MHz
- Supports all major operating systems



Marketing Name	Int Ports	Ext Ports	IOC	Performance		# Devices Supported**
				K IOps	MBs	
HBA 9211-4i Single/Kit	4	0	SAS2008	160	1600	256
HBA 9211-8i Single/Kit	8	0	SAS2008	320	3200	256
HBA 9201-16i Single	16	0	SAS2116	430	3200	512
HBA 9212-4i4e Single/Kit	4	4	SAS2008	320	3200	256
HBA 9200-8e Single	0	8	SAS2008	320	3200	512
HBA 9201-16e Single	0	16	SAS2116	430	3200	512
HBA 9205-8e Single***	0	8	SAS2308	550	3200	1024

*Adapter Dependant

**IR/IT Dependant

***Dual Channel

And PCI-e 3.0?

LSI MegaRAID SAS+SATA Controllers

- MegaRAID SAS 9270-8i
 - MegaRAID SAS 9271-4i
 - MegaRAID SAS 9271-8i
 - MegaRAID SAS 9271-8iCC
 - MegaRAID SAS 9286-8e
 - MegaRAID SAS 9286CV-8e
 - MegaRAID SAS 9286CV-8eCC
- New SSD-Optimized SKUs - LSI® MegaRAID® CacheCade® Pro 2.0 and MegaRAID Fast Path Ready
 - “CC” family of 6Gb/s MegaRAID controllers ship standards with CacheCade Pro 2.0 and Fast Path software enabled out of the box.
 - Proven interoperability with the latest server platforms based on the PCI Express 3.0 specification



MegaRAID PNs

	Ordering Part Number	Product Description
MegaRAID SAS 9271-4i (SGL)	LSI00328	4-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII
MegaRAID SAS 92714i (KIT)	LSI00329	4-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII
MegaRAID SAS 9271-8i (SGL)	LSI00330	8-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII
MegaRAID SAS 9271-8i (KIT)	LSI00331	8-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII
MegaRAID SAS 9270-8i (SGL)	LSI00326	8-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII
MegaRAID SAS 9270-8i (KIT)	LSI00327	8-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII
MegaRAID SAS 9286-8e (SGL)	LSI00322	8-Port Ext., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII, CacheVault
MegaRAID SAS 9271-8iCC (SGL)	LSI00334	8-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII, CC Pro inc
MegaRAID SAS 9286CV-8e (SGL)	LSI00333	8-Port Ext., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII, CacheVault
MegaRAID SAS 9286CV-8eCC (SGL)	LSI00335	8-Port Ext., 6Gb/s SATA+SAS, PCIe 3.0, 1GB DDRIII, CacheVault, CC Pro inc
LSICVM01	LSI00297	CacheVault Accessory kit for 9271-4i and 9271-8i
LSIiBBU09	LSI00279	BBU for 9270, 9271 and 9286 Series

PCIe Gen 3.0 SATA+SAS 6G HBA

- 6Gb/s data transfer rate per port
- 4 and 8 port SFF8087/8088 Mini-SAS connector(s)
- 16 port external new SFF8644 HD Mini-SAS
- X8 PCI Express 3.0 host interface
- MD2 low-profile form-factor design
- Maximum power usage of 15W
- Integrated RAID with internal connectivity 0, 1, 1E, and 10
- Connects to SAS and SATA HDDs, SSDs, and tape drives
- Support for up to 1024 physical devices
- Fusion-MPT architecture can support up to 700,000 I/Os per second
- Supports major operating systems
 - Windows
 - Linux
 - Oracle
 - FreeBSD
 - 3rd party MAC Driver Available



Marketing Name	Int Ports	Ext Ports
HBA 9207-4i4eSingle/Kit	4	4
HBA 9207-8i Single/Kit	8	0
HBA 9207-8e Single	0	8
HBA 9206-16e Single	0	16

HBA PNs

	Ordering Part Number	Product Description
SAS 9207-8e (SGL)	LSI00300	8-Port Ext., 6Gb/s SATA+SAS, PCIe 3.0, HBA
SAS 9207-8i (SGL)	LSI00301	8-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, HBA
SAS 9207-8i (KIT)	LSI00302	8-Port Int., 6Gb/s SATA+SAS, PCIe 3.0, HBA Kit w/ cable
SAS 9207-4i4e (SGL)	LSI00303	4-Port Int., 4-Port Ext., 6Gb/s SATA+SAS, PCIe 3.0, HBA
SAS 9207-4i4e (KIT)	LSI00304	4-Port Int., 4-Port Ext., 6Gb/s SATA+SAS, PCIe 3.0, HBA Kit w/ cable

MegaRAID Advanced Software Options

- LSI MegaRAID SafeStore
 - Local SED Encryption Key Management
 - Simple to use and Low Cost
 - Secure Erase
 - Federal Opportunities
- LSI MegaRAID Recovery
 - PIT snaps
 - Disaster Event Restore or Rollback
 - Break Mirror for Offsite or data copy
- LSI MegaRAID CacheCade
 - SSD Read/Write Caching
 - Hot spot app acceleration
 - Lowest \$/IO and \$/GB
- LSI MegaRAID FastPath
 - Highest IOPS
 - Optimized for SSD connect
 - Reduce controller bottlenecks
 - Up to 465K IOPS



Marketing Name	Controller	Value
LSI MegaRAID SafeStore	MegaRAID 6G	Security
LSI MegaRAID Recovery	MegaRAID 6G	PIT Backup
LSI MegaRAID CacheCade Pro 2.0	MegaRAID 6G	SSD caching
LSI MegaRAID FastPath 1.0	MegaRAID 6G	IOPS performance

CacheCade Pro 2.0 – Read/Write Caching

- Physical Hardware Keys & Electronic Licenses
- Accelerate I/O intensive Applications over hard drive only configurations

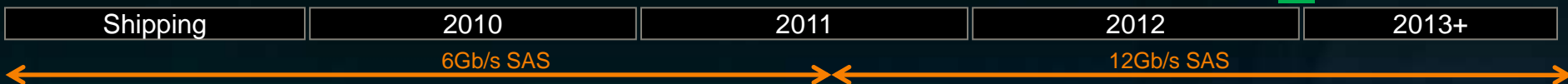
Applications	CacheCade 1.1 Improvement	CacheCade Pro 2.0 Improvement
Microsoft SQL Server	356%	1251%
Web Server Simulation	374%	533%
MySQL OLTP Server	77%	150%
Microsoft Exchange	5%	163%

- Reduce TCO by up to 82%
 - Use fewer disk drives
 - Avoid the cost and complexity of short stroking, managing hybrid arrays, application upgrades or tuning
 - Save power and maintenance costs
- Compatible with all MegaRAID OS Drivers



DAS RAID Adapter Roadmap

Concept
Definition
In Development
Sampling
Production



SAS2108 Liberator
 DDR2-800MHz; 512MB
 PCIe 2.0, 6Gb/s SAS
 MegaRAID / iBBU08

- 9260-4i/8i: 1-int x4, Vert
- 9261-4i/8i: 1-int x4, Horz
- 9280-8e: 2-ext x4
- 9280-4i4e: 1-int x4, 1-ext x4



SAS2208 Thunderbolt
 DDR3-1333MHz: 1GB
 PCIe 2.0, 6Gb/s SAS
 MegaRAID / iBBU09

- 9265-8i: 2-int x4, Vert.
- 9285-8e: 2-ext x4

MegaRAID / CacheVault

- 9265CV-8i: 2-int x4, Vert
- 9266-8i: 2-int x4, Horz
- 9285CV-8e: 2-ext x4

SAS3108 Invader
 DDR3-1866MHz; 2GB
 PCIe3.0, 12Gb/s SAS
 MegaRAID
 iBBU09 / CacheVault

- 9360-8i: 2-HD int. x4 Horz
- 9360-4i: 1-HD int. x4 Horz
- 9361-8i: 2-HD int. x4 Vert
- 9362-8i: 2-HD int. x4 Horz.
- 9380-4i4e: 1HD int, 1-HD ext
- 9380-8e: 2-HD ext.

SAS2108 Liberator
 DDR2-800MHz; 512MB
 PCIe 2.0, 6Gb/s SAS
 MegaRAID / CacheVault

- 9260CV-4i/8i: 1-int x4 Vert



SAS2208 Thunderbolt
 DDR3-1333MHz: 1GB
 PCIe 3.0, 6Gb/s SAS
 MegaRAID / CacheVault

- 9270-8i: 2-int. x4, Vert.
- 9271-4i/8i: 1or 2-int. x4, Horz.
- 9271-8iCC 2-int, CC bundle
- 9286-8e: 2-ext. x4
- 9286CV-8e: 2-ext. x4
- 9286CV-8eCC 2-ext, CC Bundle

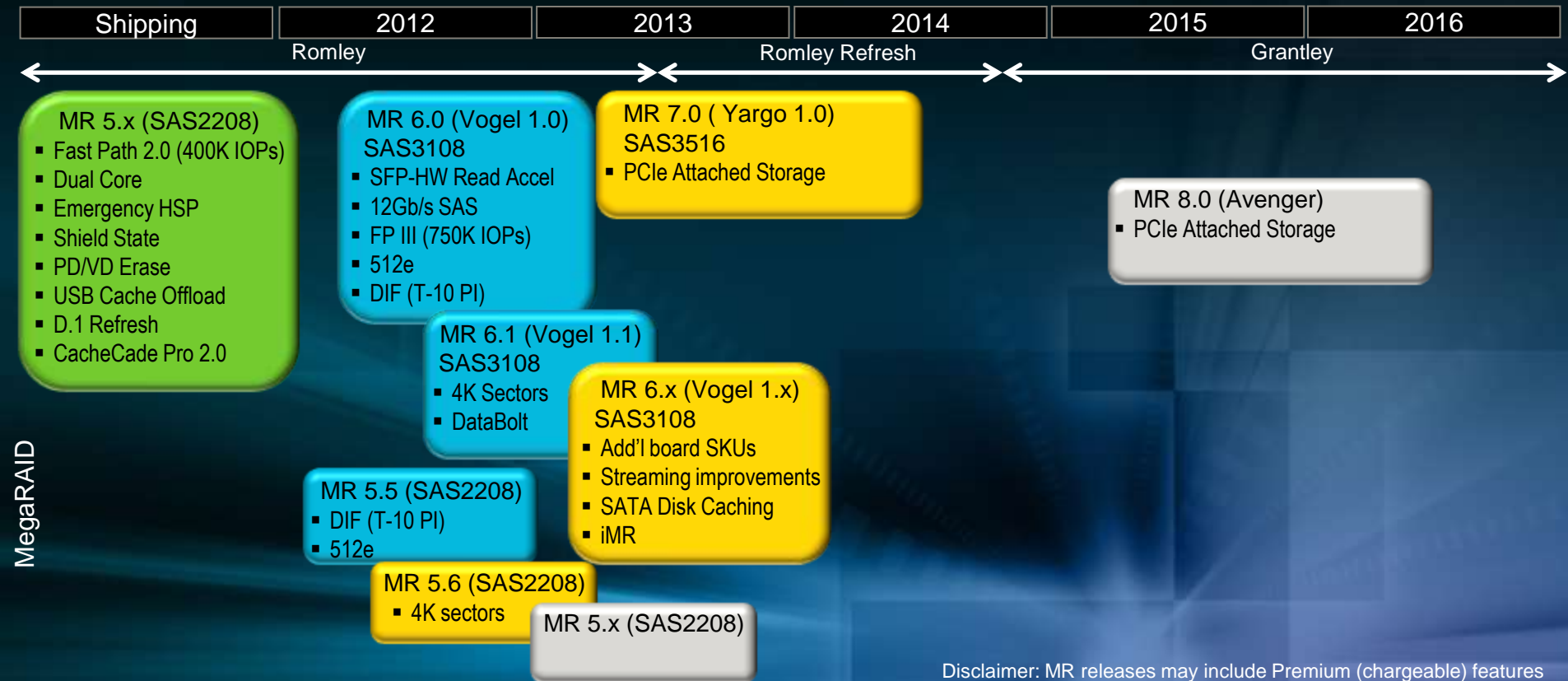
SAS2108/SAS2X36
 DDR2- 800MHz: 512MB
 PCIe 2.0, 6Gb/s SAS
 MegaRAID / iBBU08

- 9260-16i: 4-int x4, Vert
- 9280-16i4e: 4-int x4, Horz
- 9280-24i4e: 4-int x4, Vert
 2 -int x4 Horz, 1-ext x4.

DAS RAID On Chip Roadmap

Left edge=A0 samples
Right edge=LSI GCA

Concept
Definition
In Development
Sampling
Production

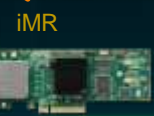


Disclaimer: MR releases may include Premium (chargeable) features

DAS Host Bus Adapter Roadmap



Shipping	2010	2011	2012	2013+
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SAS2008 Falcon
 PCIe 2.0, 6Gb/s SAS
 iMR : RAID 0/1/5/10

- 9240-4i: 1- int x4, Vert
- 9240-8i: 2- int x4, Vert

SAS3008 Fury
 PCIe 3.0, 12Gb/s SAS
 iMR: RAID 0/1/5/10/50

- 9340-4i: 1- int HD x4, Vert
- 9340-8i: 2- int HD x4, Vert
- 9341-4i: 1-int HDx4, Horz.
- 9341-8i: 2-int HDx4, Horz

IT & IR

SAS2008 Falcon
 PCIe 2.0, 6Gb/s SAS
 IT & IR: RAID 0/1/1E/10

- 9200-8e: 2-ext x4
- 9210-8i: 2-int x4, Vert
- 9211-4i: 1-int x4, Horz, x4 PCIe
- 9211-8i: 2-int x4, Horz
- 9212-4i4e: 1-ext x4/4-int x1, Horz
- 9202-16e: 4-ext HD x4, x16 PCIe

SAS2308 Mustang
PCIe 2.0, 6Gb/s SAS
 IT

- 9205-8e: 2-ext x4

SAS2308 Mustang
 PCIe 3.0, 6Gb/s SAS
 IT & IR: RAID 0/1/1E/10

- 9207-8i: 2-int x4, Horz
- 9207-4i4e: 1-ext x4, 1-int x4, Horz
- 9207-8e: 2-ext x4
- 9206-16e: 4-ext HD x4, x8 PCIe

SAS2116 Meteor
 PCIe 2.0, 6Gb/s SAS
 IT

- 9201-16i: 4-int x4, Horz
- 9201-16e: 4-ext x4

SAS3008 Fury
 PCIe 3.0, 12Gb/s SAS
 IT & IR: RAID 0/1/1E/10

- 9300-8e: 2-ext HD x4
- 9310-8i: 2-int HD x4, Vert
- 9311-4i4e: 1-ext HD x4, 1-int x4
- 9311-8i: 2-int HD x4, Horz
- 9300-16e: 4-ext HD x4, x8 PCIe
- 9311-16i: 4-int HD x4, x8 PCIe
- 9311-4i: 1-int HD x4, Horz
- 9301-16e: 4-int HD x4, x16 PCIe

A nighttime photograph of a multi-lane highway with light trails from cars. The background shows a city skyline with lit-up buildings. The text is overlaid on the image.

LSI Nytro™

Application Acceleration

FAST

SMART

EASY

LSI Nytro™ Application Acceleration Architecture

Nytro WarpDrive

Nytro XD
Nytro WarpDrive + XD Caching SW

Nytro MegaRAID

Application

I/O

Operating System

Nytro XD Software

App Data

Cold Data

Hot Data

Cold Data

Intelligent Caching Stores Hot Data

SAS • FC • iSCSI

DAS

LSI Product

THE **Smarter** WAY
TO FASTER™

LSI Nytro WarpDrive PCIe Flash Adapter

The Easy, Affordable Solid State Upgrade for Servers



- High performance PCIe Solid State Storage
- Low latency and a low CPU burden
- Designed to maximize transactional I/O performance
 - Online transaction processing web serving
 - Data analytics and warehousing
 - Data mart and data mining
 - High-performance computing

Fast

- 2X Performance of the Previous Generation
- 93% Latency reduction & 6x transactional improvement
- 1.6 Gb/s for Sequential R/W with HH card, almost double that for FH

Smart

- DuraWrite™ Technology
 - Accelerates writes
 - Extends data life
- Embedded Processor
- Frees host CPU and memory to run applications
- R.A.I.S.E™. technology

Easy

- In the box drivers for most operating systems
- Preconfigured for max performance, endurance and usable capacity
- Wide range of storage capacities

LSI Nytro™ WarpDrive Product Roadmap

•Left edge=A0 samples
•Right edge=LSI GCA

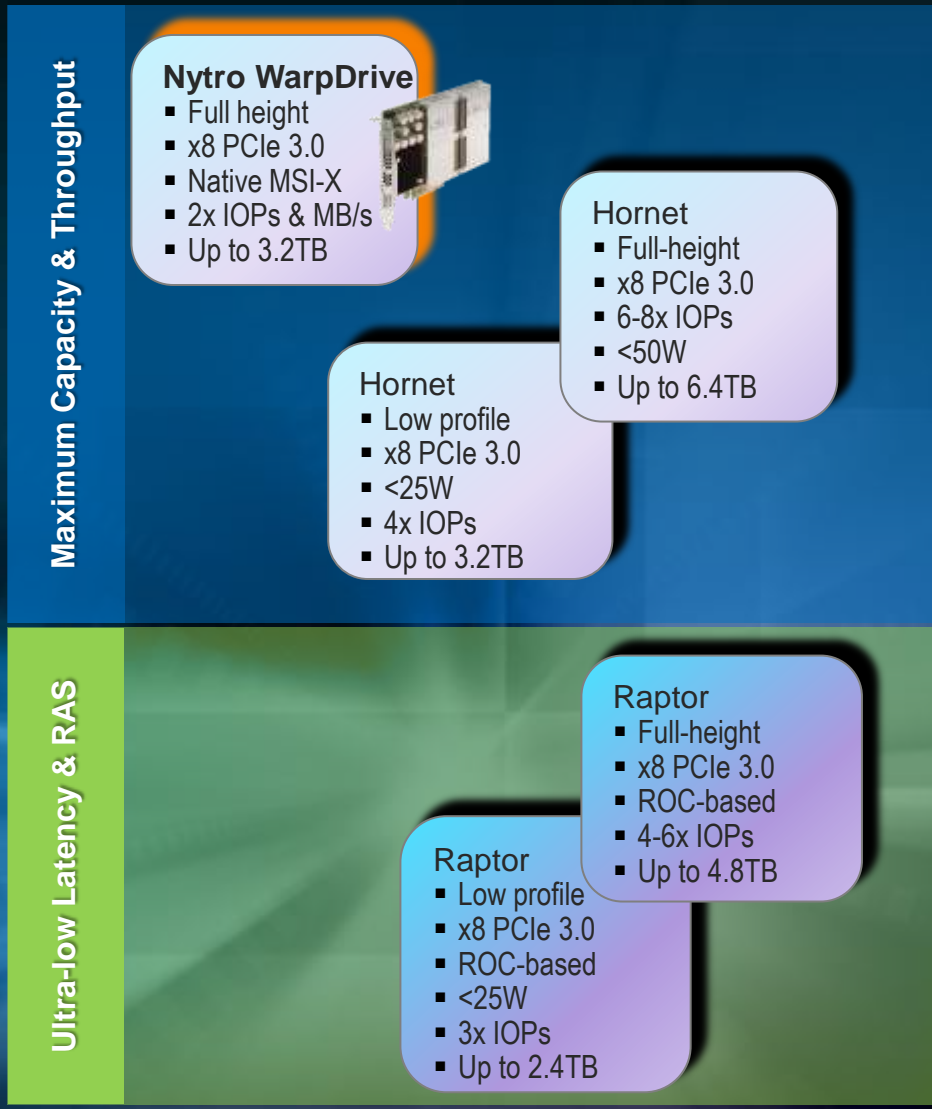
Grey	Concept
Black	Definition
Blue	In Development
Orange	Sampling
Green	Production

2012 | 2013



Nytro WarpDrive

- Low profile
- x8 PCIe 2.0
- eMLC: 400GB to 1.6TB
- S LC: 200GB to 400GB



Two architectures: Each optimized for application pain-points

Pricing and SKUs

Product	Ordering Part Number	Product Description	Price
Nytro NWD-WLP4-200	LSI00323	The Nytro NWD-WLP4-200, low profile, small form factor PCIe 2.0 enterprise NAND flash card	\$4,995.00
Nytro NWD-WLP4-400	LSI00324	The Nytro NWD-WLP4-400, low profile, small form factor PCIe 2.0 enterprise NAND flash card	\$9,995.00
Nytro NWD-BLP4-400	LSI00318	The NWD-BLP4-400, low profile, small form factor PCIe 2.0 enterprise NAND flash card	\$5,195.00
Nytro NWD-BLP4-800	LSI00319	The Nytro NWD-BLP4-800, low profile, small form factor PCIe 2.0 enterprise NAND flash card	\$8,795.00
Nytro NWD-BLP4-1600	LSI00320	The Nytro NWD-BLP4-1600, low profile, small form factor PCIe 2.0 enterprise NAND flash card	\$16,795.00
Nytro NXD-BLP4-400	LSI00325	The NXD-BLP4-400, low profile, small form factor PCIe 2.0 enterprise NAND flash card and caching software	\$5,195.00



NyTRO MegaRAID Card Accelerate Your DAS



Key Features

- Complete solution for acceleration of SAS connected Storage.
- Provides SAS connectivity, RAID protection and read and write caching software.
- Includes embedded solid state storage directly on card for extreme performance and improved manageability
- Automatic, dynamic classification of "hot" data

Fast

- 10X performance improvement over HDDs only
- 75% improvement in array rebuild times

Smart

- Migrates "hot" data from disk to flash
- Combines flash for performance and disk for capacity
- Supports read and write caching

Easy

- Automatic self-starting and self-configuring
- Zero administrative overhead
- Transparent to Applications, File system, OS and device drivers

Seamless, Plug-n-Play Flash Acceleration for DAS

Nytro MegaRAID Card Channel Product



Product Contents

One Nytro MegaRAID card

Full height and low profile brackets,
USB stick with documentation

Optional SuperCap kit for DRAM cache protection

SKUs	Host Interface	Flash Capacity
NMR 8100-4i	x8 PCIe 3.0	100GB
NMR 8110-4i	x8 PCIe 3.0	200GB
NMR 8120-4i	x8 PCIe 3.0	800GB

2012

2013



Nytro MegaRAID 1.0

- Up to 30x perf improvement
- Rebuild Acceleration
- Secure Cache
- MegaRAID Data protection
- No battery required, optional
- Complete management suite
- Windows, Linux, VMware & Solaris

NMR8100/8110/8120

- Low profile (HHHL)
- x8 PCIe 3.0
- x4 Internal SAS ports
- 100G, 200G and 800G on board flash

Nytro MR 1.5

- Elastic cache
- Predictive hinting
- Advanced rebuild acceleration
- Thermal management
- Virtual Cache (for greater usable cache capacity (e.g. 3x advantage))

NMR8200/8210

- Low profile (HHHL)
- x8 PCIe 3.0
- x4 External SAS ports
- 200G and 800G on board flash

NMR9210

- FHHL, x8 PCIe 3.0
- Up to x16 SAS ports
- Up to 2 TB on board Flash

Nytro XM2

- Advanced predictive hinting
- De-duplication
- Advanced rebuild acceleration
- High Availability
- Cluster support (CSV)

NMR83x0

- Low profile (HHHL)
- x8 PCIe 3.0
- x4 12G SAS ports

NMR93x0

- FHHL
- x8 PCIe 3.0
- Up to x16 SAS ports

Transparent application acceleration with Data Protection



SHARABLE, SCALABLE, CONTINUOUS

ILSI HA-DAS

September 2012



Accelerate.

HA-DAS Clustered X2



Continuous

- Advanced cache coherency
- Automatic failover
- Active - Active



Trust

- MR data protection & error handling



Sharable

- SAS topology management
- Enables DAS sharing across servers

Customer Value



Lower solution cost

- Based on commodity DAS
- > 30% reduction in solution cost
- OpEx savings in power, cooling servicing



Better performance

- Higher performance, lower latency than SAN
- Makes failover latency transparent to the application



Ease of use

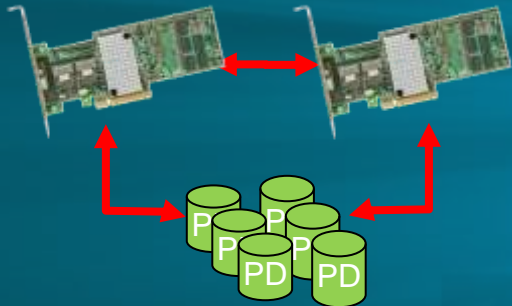
- Near plug and play
- SAS simplicity
- Leverages existing management utilities
- Integrated with MSFT 2012

HA-DAS Clustered X2 Deployment Models

Single Server HA *OEM customers*



Server 1



Converged Server / Storage (CiB) *OEM customers*

Storage
Mode

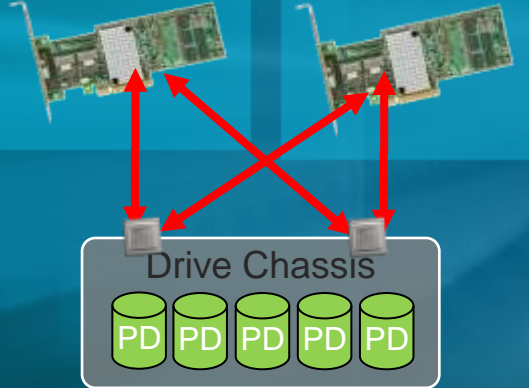
Application
Mode



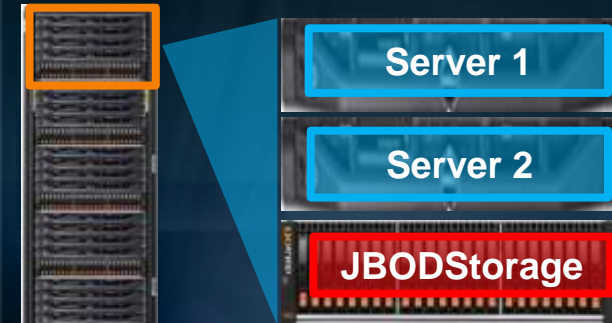
CiB

Server 1

Server 2

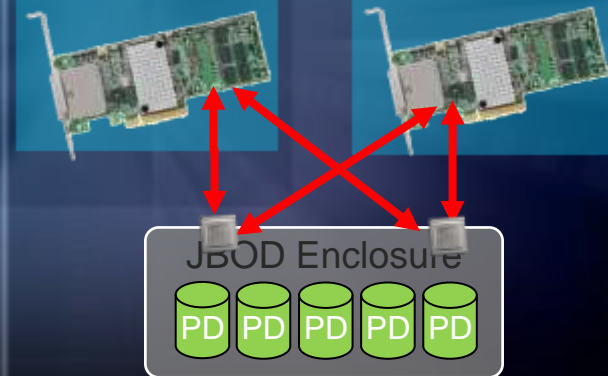


Discrete Server / Storage *OEM and channel customers*



Server 1

Server 2



MSS HA-DAS Roadmap

High Availability Mission-Critical Server Solutions



2011

2012

2013

2014

6Gb/s SAS

12Gb/s SAS

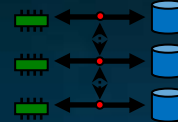
Cluster



HA-DAS 1.0 (Thor)

- Dual Active
- Shared Storage
- Cache Mirroring
- Windows Server 2k8 R2 & Server 8
- Max 96 PDs
- LSI 6G Expanders
- 6G SAS & NL-SAS
- Full Mgmt. App Support
- CiB & Std. Server Cluster

Scale-Out



HA-DAS 2.0 (Hermod)

- Scale-Out (N=4/8/16)
- SAS or PCIe (Dauntless) Interlink
- SRIOV

HA-DAS 1.10 (Modi)

- RHEL Support
- SLES Support

HBA Failover



HA-DAS 1.20 (Thrud)

- HBA Failover (2MRSS)
- MPIO

HA-DAS 1.30 (Magni)

- MR 6.x feature set
- Invader 12G Support
- Cobra 12G Expander Support
- VMware Support
- Electronic Licensing

HA-DAS 1.40 (Loridi)

- HA-DAS on std servers

LSI SAS Switch

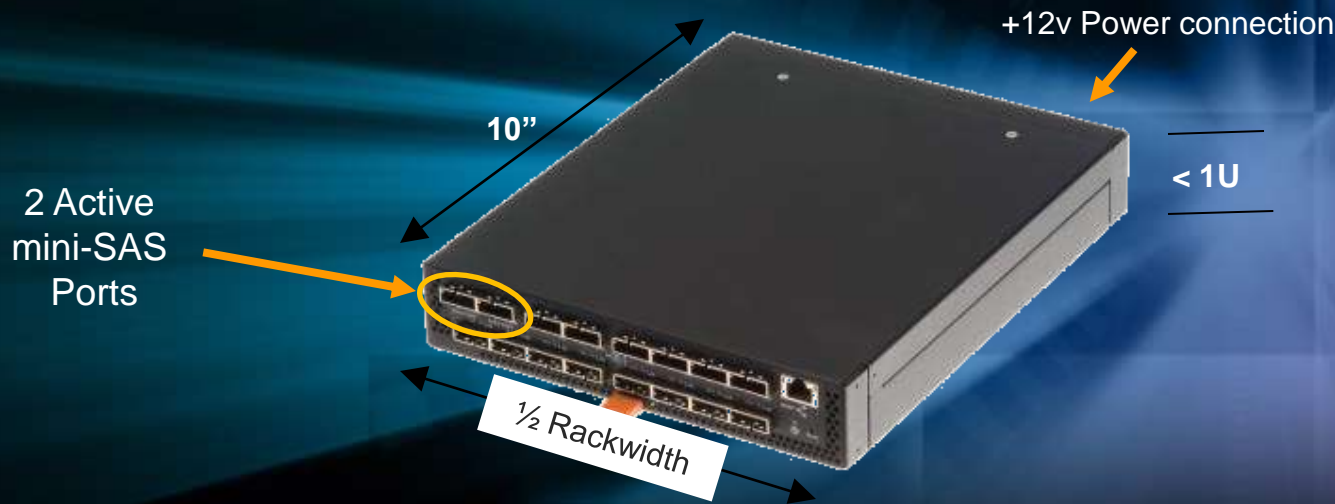
Accelerate.

LSI SAS6160 Switch

- 16 ea x4 SAS 2 ports (24Gb/s per port)
- 16 ea mini-SAS (SFF8088) connectors
 - 2 powered Mini-SAS for Active Cable support
- Activity / Fault LEDs per x4 port
- ½ Rackwidth
 - Two 16-port switches can fit in a 1 U form factor
- Embedded management utility
 - Manages T-10 Zoning, nicknames, etc

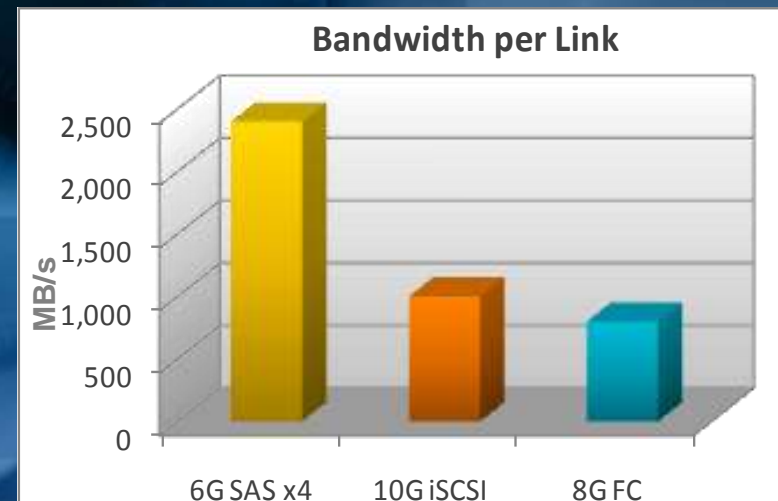
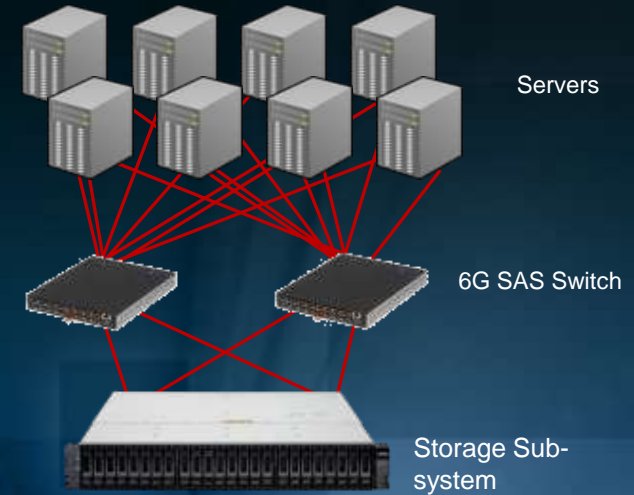


Two SAS6160 Switches in a 19" Rack



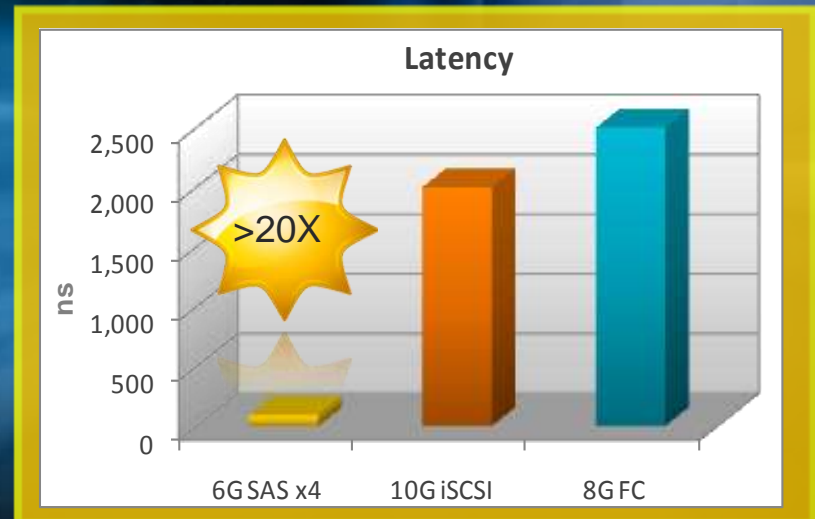
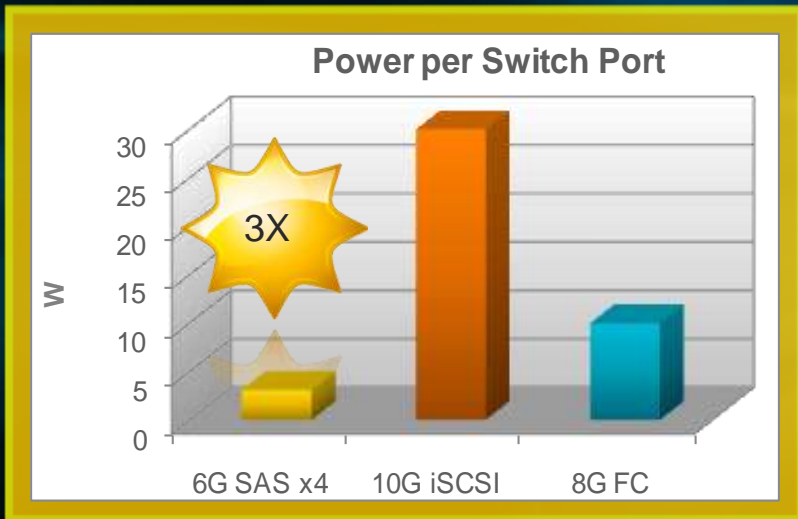
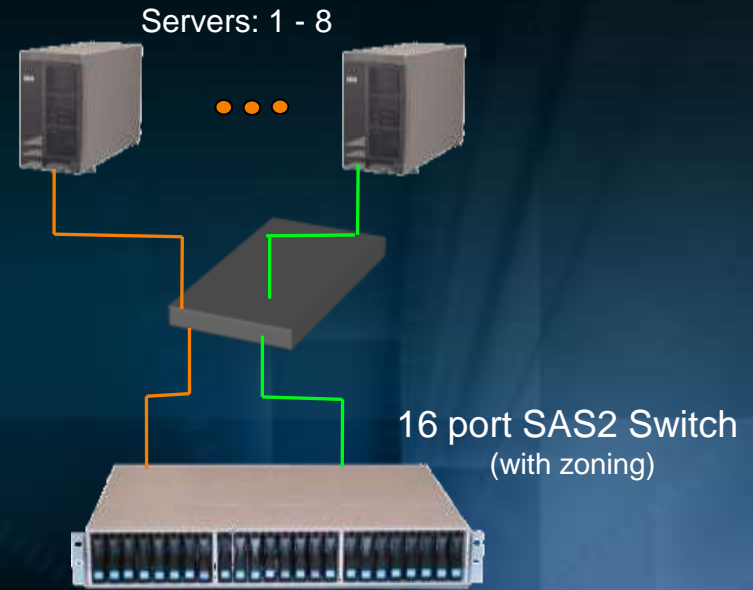
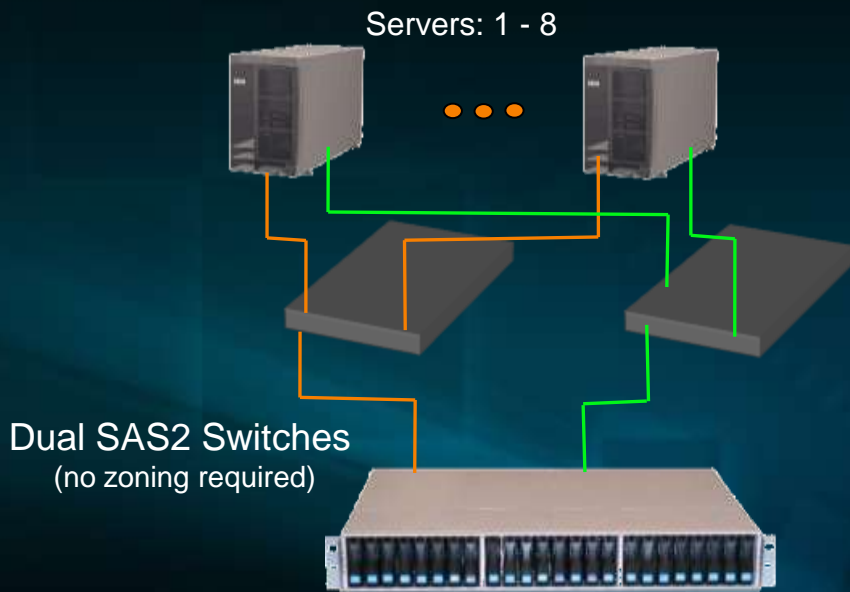
SAN Capabilities with 6Gb/s SAS Switch

- New Level of Functionality for SAS connectivity
 - Cluster-able direct-attach solution
- “Start Small, Grow Big” Scalability
 - Lowers acquisition cost without sacrificing expansion capabilities
- High Performance-value Storage Interconnect
 - 6Gb/s performance per lane
 - Each connection can run at 24Gb/s
- Higher Bandwidth & Lower Latencies in SAS Switched Topologies for greater performance
- Reduce Complexity with Simple Management Software



Compatibility with the 6G SAS switch enables customers to achieve the same consolidation benefits as a FC or IP SAN, at an affordable price

Interface Technology Comparison



*SAN Infrastructure Cost Comparison: SAS, iSCSI, and FC (8 Servers)

Networking 8 Non-Blade Dual Connected Servers - HA

	Qty	6Gb SAS	8Gb FC	10Gb iSCSI
Daughter card	2	*N/A	\$3,198	\$6,396
Cable (~1Meter)	20	\$2,380	\$1,580	\$1,780
Switch	2	\$5,990	\$8,840	\$24,798
HBA's	16	\$3,984	\$18,704	\$20,048
Sub-Total		\$12,354	\$32,322	\$53,022
Ext RAID Controller	2	\$8,799	\$8,799	\$8,799
Total Configuration Cost		\$21,153	\$41,121	\$61,821
% of SAS SAN reference		100%	194%	292%

*Based on

Keep Your Eyes Open for new SAS Switch sales tools

Take advantage of the flexibility of Serial Attached SCSI (SAS) storage

Worried about storing data in a secure, highly available way? Relax! SAS SAN For Dummies shows how SAS-enabled storage is flexible, scalable, affordable, and easy to use from SMB to remote offices, cloud to high density, clusters to virtual, and organizations with big data capacity and performance needs.

- **Data storage needs** — drivers behind data growth
- **Shared storage** — move from dedicated internal to shared storage
- **SAS basics** — elements for creating a shared storage environment
- **SAS usage scenarios** — physical, virtual, cloud, and scale out
- **Advanced topics** — switches, zoning, active cables for scaling and distance



Open the book and find:

- How to overcome data storage challenges in a cost-effective manner
- Using shared storage to address growth needs and budget demands
- How to recognize SAS components and see SAS in action
- Why SAS HBAs, switches, and storage enable scaling with flexibility

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SAS SAN FOR DUMMIES

Learn to:

- Keep up with your company's increasing data storage demands
- Understand SAS architecture, components, capabilities and usage scenarios
- Make informed decisions for dedicated and shared storage



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Greg Schulz is the founder of StorageIO.com.
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Larry Jacob is an LSI Channel Sales Manager.

