IBM ServeRAID

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Worldwide Product Manager

IBM ServeRAID Family of Controllers

	ServeRAID- 7e	ServeRAID-7k (Key West)	ServeRAID-6M (Marco)	ServeRAID-6i+ (Sebring)	ServeRAID-4Lx (Neo-Lite)	ServeRAID-7t (Tampa)	AT (Ju
	Cost effect entry data protection and raid performance for the SMB market	High Performance ROMB Implementation of ServeRAID features and functions	High-performance, two-channel Ultra320 SCSI RAID controller for midrange to enterprise servers.	Excellent price/performance in a hardware-based "zero channel" RAID controller for workgroup servers.	Excellent performance, scalability and control for entry-level and midrange storage environments.	Entry Level SATA RAID controller for select xSeries servers.	Ba fun mo ent and
Part number	N/A	71P8642	32P0033 / 02R0988	13N2190	06P5740	71P8648	
PCI slot	N/A	N/A	3.3	3.3	Universal	Universal	
Data transfer interface	SCSI or SATA	Ultra 320 SCSI	Ultra320 SCSI	Ultra320SCSI	Ultra160 SCSI	SATA	
Form factor	N/A		Full size	Half size, low profile	Half size	Half size, low profile	Lo
Processor	No	On Planar	Intel® IOP321 @ 600MHz	Intel IOP321 @ 400MHz	80303 100MHz	80302	
Cache memory	No	Yes	128MB/256MB	128	32	64	
Battery backup	No	Yes	Yes	Yes	No	No	
RAID levels	0,1	0, 1, 5, 1E, 00, 10, 50, 1E0, 5EE	0, 1, 5, 1E, 00, 10, 50, 1E0, 5EE	0, 1, 5, 1E, 00, 10, 50, 1E0, 5EE	0, 1, 5, 1E, 00, 10, 50, 1E0, 5EE	0, 1, 5, 10	
Adapter failover	No	No	Yes	No	Yes	No	
Copy back	No	Yes	Yes	Yes	No	No	No
Flash copy	No	Yes	Yes	Yes	Yes	No	
xSeries ® systems supported	x206, x306, x226, x236, x346	x236, x346	x225, x232, x235, x255, x335 x342, x345, x360 x440, x445	x206, x225, x235, x306, x345, x365	x205, x220, x225, x232, x235, x255, x305, x330, x335, x342, x345, x350, x360, x440, x445	x206, x306	x2
OS support	Microsoft® Windows NT®, Windows® 2000, Windows 2003, Linux, Novell NetWare, IBM OS/2®	Microsoft® Windows NT®, Windows® 2000, Windows 2003, Linux, Novell NetWare, IBM OS/2®	Microsoft® Windows NT®, Windows® 2000, Windows 2003, Linux, Novell NetWare, IBM OS/2®	Microsoft® Windows NT®, Windows® 2000, Windows 2003, Linux, Novell NetWare, IBM OS/2®	Microsoft® Windows NT®, Windows® 2000, Windows 2003, Linux, Novell NetWare, IBM OS/2®	Microsoft® Windows NT®, Windows® 2000, Windows 2003, Linux, Novell NetWare	W
Cluster support	No	No	Yes	No	Yes	No	
Host bus interface- Host bus speed (max)	N/A	N/A	64-bit PCI-X 133MHz	64-bit PCI-X 133MHz	64-bit Universal PCI 66MHz	64-bit Universal PCI 66MHz	
Channels (14 drives per channel)			2	0	1	4 SATA Drives supported	2 (cha
Command line			IPSSEND	IPSSEND	IPSSEND		
Tape drives supported			Limited	Limited	No	No	
Price	Included on	US $499	US $999 / $1,249	US $499	US $ 659	US $399	US

ServeRAID Portfolio Positioning

Price

ServeRAID 6M
2 Channel U320
600MHz IOP
128/256MB BBU
$999/$1249
Enterprise level performance & data protection

ServeRAID 7e
Integrated RAID 0,1
Standard on selected Systems
Cost effective data protection & performance for the SMB market

ServeRAID 4Lx
Single Channel U160
100MHz IOP
64MB Memory
$659
Mid level performance w/ internal & external ports

ServeRAID 6i+
Zero Channel U320
400 MHz IOP
128MB BBU
$499
Mid level performance and data protection in ZCR

ServeRAID 7k
256MB BBU
RAID Enabler
$449
ROMB implemented RAID
No PCI slot required

Performance

ServeRAID Performance Comparision

	ServeRAID 7e Measured Performance ***(2 drives)***	**ServeRAID 7k Measured Performance** ***(19 drives)***	**ServeRAID 6i+ Measured Performance (19 drives)**	**ServeRAID 6M Measured Performance** ***(28 drives)***
16K OLTP (aligned, 67/33% reads/writes,100% random,RAID 5, @ 15ms, 16K stripe)	385 IO/sec** (RAID 1)	2,641 IO/sec*	2,600 IO/sec*	3,042 IO/sec*
512 Byte Out of Cache (1 drive, RAID 0, 8K stripe)	N/A	22,440 IO/sec	21,300 IO/sec	24,200 IO/sec
64K **100% Sequential Reads** (RAID 0, 64K stripe)	91 MB/sec** (RAID 1)	479 MB/sec	447 MB/sec	447 MB/sec
64K **100% Sequential Writes** (RAID 0, 64K stripe)	66 MB/sec** (RAID 1)	405 MB/sec	293 MB/sec	259 MB/sec

*Performance is limited by drives. As drives technology increases Adapter Performance will scale accordingly.
**Performance is drive limited and is on par with other ServeRAID adapters in an two drive RAID 1 configuration

ServeRAID Advantages

- **Copyback-** Restores the Array to it's original layout after the replacement of a failed drive.
- **Performance Enhancement RAID Levels-** Alongwith industry standard RAID Levels, ServeRAID controll offer IBM exclusive RAID 1E & RAID 5EE
  - **RAID 1E-** Allows more efficient utilization of disk drives
  - **RAID 5EE**- Puts hot-spare to work to improve performance (Not Available on ServeRAID-5i)
- **Flashcopy-** Application for tape backup, software application test, or image rollout (Not Available on ServeRAID-5i)
- **Failover**- Allows 2 adapters to have access to the same storage. If one adapter fails, the other adapter ta over the storage (on Windows NT only)
- **Hot Swap Rebuild**- When a bad hard drive is replaced, the new hard drive is automatically detected and
- **Identify Drives-** Allows the user to blink the hard drive identify light from a user interface
- **Logical Drive Migration-** Allows the user to change Raid levels, expand logical drives, and expand arrays while allowing access to the migrating drive
- **Global Hot Spare** - Define common hot spare for multiple arrays.
- **Data Consistency**- Stripe lock table used to keep Raid parity consistent in case of power loss
- **Clustering / High Availability-** Allows 2 systems to have access to the same storage, if one system fails

ServeRAID Controllers Competitive Positioning

	IBM	HP Compaq	Dell
Performance	**ServeRAID 6M** ▸ 2ch (2int/2ext), U320 ▸ 133MHz PCI-X ▸ 128 / 256MB, Battery $ 999 / $1249	**Smart Array 6404** ▸ 4ch (2int/4ext), U320 ▸ 133MHz PCI-X ▸ 256MB, battery $1999	**PERC 3/QC** ▸ 4ch (2int/4ext), U160 ▸ 66MHz PCI ▸ 128MB, battery $1,099
Mainstream	**ServeRAID 4Lx** ▸ 1ch (1int/1ext,U160 ▸ 66MHz PCI ▸ 32MB, Battery ▸ not upgradeable $659	**Smart Array 6402** ▸ 2ch (2int/2ext), U320 ▸ 133MHz PCI-X ▸ 128-MB, battery $1,299	**PERC 4/DC** ▸ 2ch (2int/2ext), U320 ▸ 66MHz PCI ▸ 128MB, battery ▸ not upgradeable $999
Entry	**ServeRAID-6i** ▸ Zero Channel ▸ PCI-X 133MHz ▸ 128MB, battery $499	**Smart Array 641/ 642** ▸ 1 or 2ch U320 ▸ 133MHz PCI-X ▸ 64MB upgrade to 128MB/Batt $ 599 / $699	**PERC 4/SC** ▸ 1ch (1int/1ext), U320 ▸ 66MHz PCI ▸ 64MB, no battery ▸ not upgradeable $299/$499 (1U)
Integrated	**ServeRAID-7k** ▸ RoMB Based ▸ 256MB, battery $449	**Smart Array 5i Plus** ▸ 2ch (1int/1ext), U160 ▸ 33MHz PCI ▸ 64MB, no battery $300	**PERC4/Di** ▸ 2ch (2int/1ext), U320 ▸ 128MB, battery $299/449(1U)
	They have several other adapters		They have several other adapters

ServeRAID 7k RAID Controller

Announce: ***08/03/04*** ***GA:*** ***09/04***

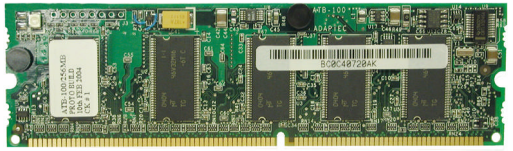
Positioning

- The ServeRAID-7k is a full function RAID solution for x236 and x346 mainstream systems. It provides a battery backed memory DIMM to the system based RAID components.

Key Messages

- ROMB key for specific xSeries Servers.
- Offers superior ServeRAID performance, optimized for ROMB based xSeries servers.
- Delivers unmatched, industry proven IBM reliability and quality

Features and Functions



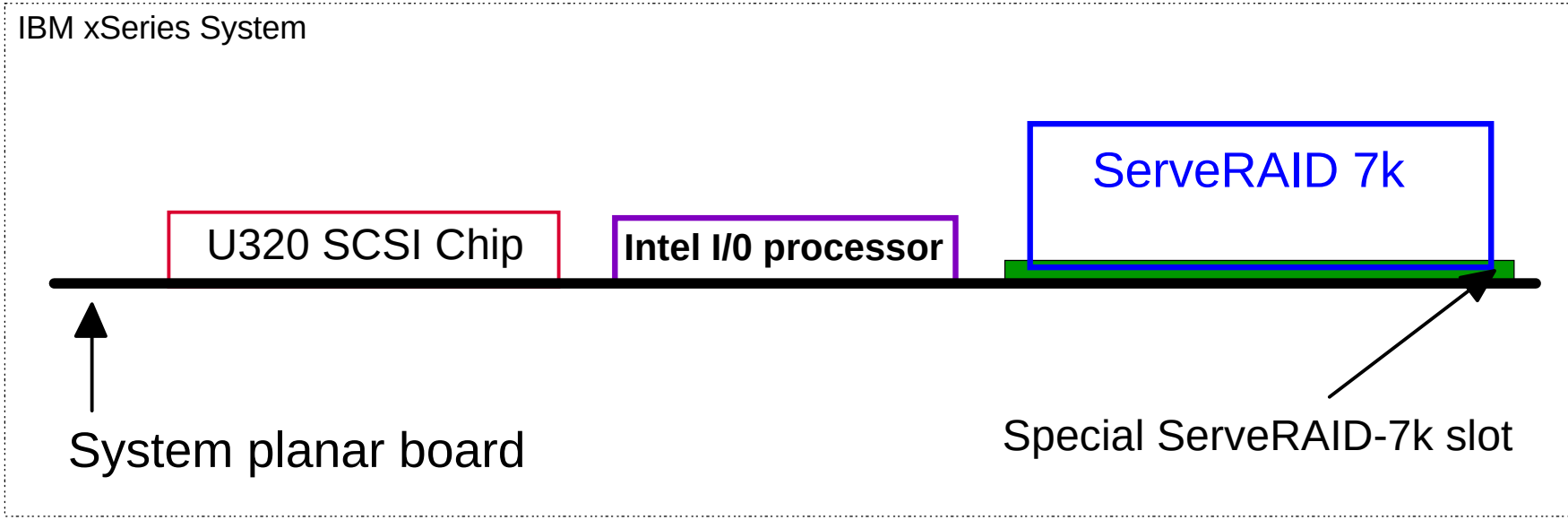
- 256MB DDR1 333MHz memory
- Supports Intel IOP332
- Supports Adaptec 7901/7902 SCSI Controllers.
- 36 hours battery life (worst case)
- Offers choice of full RAID levels for maximum availability and performance - RAID Levels 0, 00, 1, 1E, 10, 5, 5EE, 1E0, 50
- Supports x236 & x346 servers

Competitive Advantage

- ServeRAID Manager: RAID configuration and monitoring software for powerful, easy-to-use RAID common management tool across your ServeRAID controllers reduces total cost of ownership.

ServeRAID-7k

ROMB based architecture, implementing TBBU module to enable complete hardware-based RAID solutions.



ServeRAID 7k Competitive Position

Differentiation	ServeRAID 7k	Dell PERC 4/Di
Form Factor	DDR1 Memory TBBU	Integrated (ROMB) + enabler kit
Scope (Servers)	x236, x346	1650, 2650, 2550, 4400
# SCSI Channels (Int/Ext)	Zero	Planar 2/0
Failover	No	No
RAID Levels Supported	0, 1, 5, 5EE, 1E, 00, 10, 50, 1E0	0, 1, 5, 10
FlashCopy	Yes	No
Clustering Support	No	No
OS Support	Windows 2000, NT, 2003; UnixWare, OpenServer, Linux, NetWare, OS/2	Windows 2000, 2003, NT; Linux, NetWare
Processor	N/A	Xeon
PCI Bus	N/A	N/A
SCSI Technology	Ultra320	Ultra320
Cache Size	256MB	128MB
Battery Backed Cache	Yes	Yes
Web Price	$449	$299/ $449

ServeRAID 6M

Announce:* *07/01/03 ***GA:* *07/25/03***

Positioning

- The ServeRAID-6M is a high performance, two channel Ultra320 SCSI RAID controller solution for midrange to enterprise servers. Featuring a 64-bit, 133 MHz PCI-X interface, ServeRAID-6M brings the performance and fault tolerance of RAID to high data availability applications.

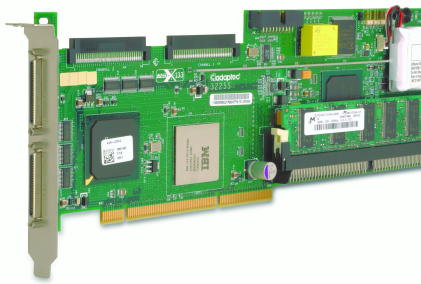
Key Messages

- Dual Ultra320 channels provide higher bandwidth for storage connection in xSeries Servers.
- Offers superior ServeRAID performance, optimized for PCI-X based xSeries servers.
- Consistent software and data compatibility with previous generations of ServeRAID controllers for easy data migration and upgradeability.
- Delivers unmatched, industry proven IBM reliability and quality

Enterprise RAI solution for increased data protection and server availabil

Features and Functions

- 2 Internal / 2 External Ultra320 SCSI Channels
- 128MB or 256MB ECC Write Back Cache with Battery backup capability.
- 133MHz, 64Bit PCI-X Design
- Offers choice of 9 RAID levels for maximum availability and performance - RAID Level 0, 00, 1, 10, 1E, 1E0, 5, 50 & new and improved RAID level 5EE
- Full Length, full height card design with Notch for installation in 3U server systems
- Uses Intel IOP321 600MHz processor based on Intel XScale Technology



Competitive Advantage

- ServeRAID Manager RAID configuration and monitoring software for powerful, easy-to-use RAID common management tool across your ServeRAID controllers reduces total cost of ownership.

ServeRAID 6i+

Announce:* *03/16/04 ***GA:* *03/26/04***

Positioning

- The ServeRAID 6i+ Controller provides the best performance and capacity for workgroup xSeries Servers, where hardware RAID is needed at an entry level price.

Key Messages

- The ServeRAID 6i+ integrated RAID controller is an intelligent RAID controller offering hardware based RAID for increased data protection and server availability.
- ServeRAID 6i+ provides RAID 5 functionality by taking control of the U320 SCSI chip on the motherboard.
- Provides investment protection by supporting Ultra320 and Ultra160 Hard Drive Mixed configurations.
- Consistent software and data compatibility with all other ServeRAID products for easy data migration.
- Delivers unmatched, industry proven IBM reliability and quality

Features and Functions

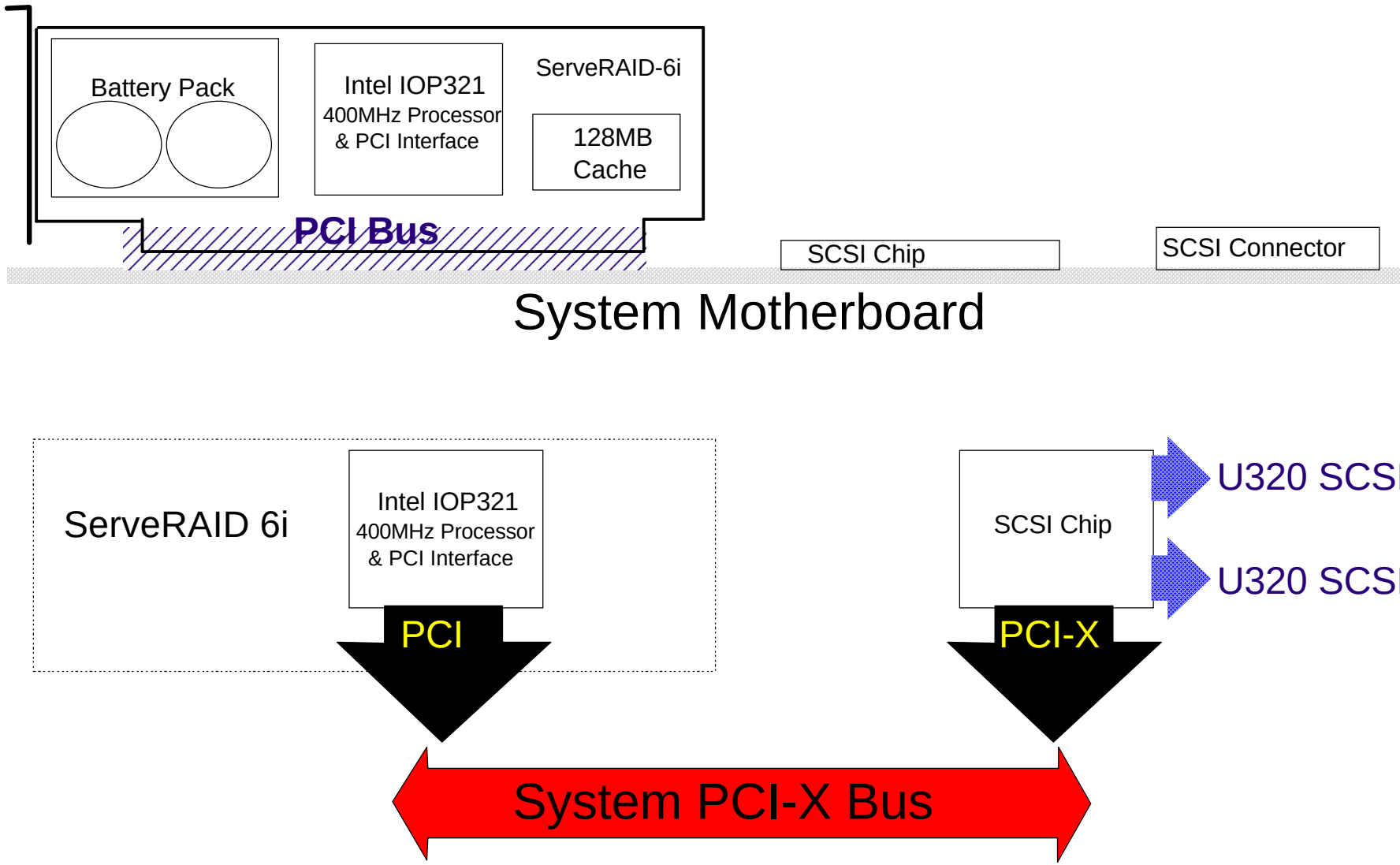
- 128MB ECC Write Back Cache with Battery backup capability.
- 133MHz PCI-X adapter
- Supports standard RAID 0, 1, 5 & IBM exclusive RAID 1E & 5EE level for optimized storage capacity.

Competitive Advantage

- ServeRAID Manager RAID configuration and monitoring software for powerful, easy-to-use RAID management across your storage assets

Affordable RA solution for increased dat protection an server availabi

ServeRAID 6i+ ZCR Implementation



ServeRAID-7t S-ATA RAID Controller

Announce: 03/16/04 ***GA: 04/20/04***

Positioning

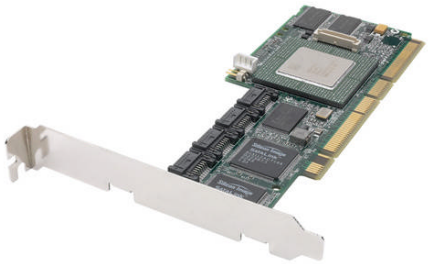
- The ServeRAID-7t is a four port S-ATA RAID controller solution for entry level servers. It is a universal PCI card featuring dedicated I/O processor and a SATA Chip.

Key Messages

- Four port SATA Controller for storage connection in xSeries Servers.
- Offers superior ServeRAID performance, optimized for SATA based xSeries servers.
- Delivers unmatched, industry proven IBM reliability and quality

Features and Functions

- 4 SATA ports and associated cabling
- 64MB SDRAM Cache.
- Universal PCI Design
- Offers choice of RAID levels for maximum availability and performance - RAID Level 0, 1, 10, 5
- MD2 card design with Notch for installation in 3U server systems
- Uses Intel 80302 processor



Competitive Advantage

- ServeRAID Manager: RAID configuration and monitoring software for powerful, easy-to-use RAID common management tool across your ServeRAID controllers reduces total cost of ownership.

IBM ServeRAID 7t SATA Controller Competitive Position

	ADAPTEC	LSI	3WARE	IBM
	SATA Raid 2410SA	MegaRaid SATA 150-4	Escalade 8506	ServeRAID 7t SATA Controller
Feature				
size	low profile	half size PCI	half length	MD2 small form
RAID levels	0,1,10,5,JBOD	0,1,10, 5	0,1,10,5,JBOD	0,1,10,5 w/ hot spare JBOD
Bus	64-bit/66MHz PCI	64-bit/66MHz PCI	64-bit/66MHz PCI	64-bit/66MHz PCI
Ports	4	4	4	4
Data Transfer Rate	1.5 Gbps	1.5 Gbps	1.5Gbps	1.5Gbps
Memory	64MB	64MB	none	64MB
OS/s	WS03, W2k, WXP	WS03, W2k, WXP, NT	WS03, W2k, WXP	WS03, W2k, WXP
	RH, SuSE, SCO	RH, Novell	RH, SuSE	RH, SuSE, SCO
Price	$351	$395	$373-$410	$399

ServeRAID 7e

Important information

- This is not sold as an xSeries Option

Positioning

- Entry level software RAID 0 and 1 solution using the existing SCSI or SATA components on the system planar. Ideal for customers needing basic data protection or improved performance.

Key Message

- Integrated RAID solution for either SCSI or SATA entry xSeries servers.
- Delivers unmatched, industry proven IBM reliability and quality.

Competitive Advantage

- ServeRAID Manager RAID Configuration and Monitoring Software for powerful, easy-to-use common RAID management tool across your ServeRAID controllers reduces total cost of ownership.

Why Buy IBM ServeRAID Controllers ?

Promise of Value

"You have made a business choice in IBM servers. Data protect and availability is essential to success. The purchase of IBM qualified and warranted hardware is at the heart of that investment. Therefore, you expect the best and IBM seeks to fulfill those expectations with high quality and high performance RAID Controlle

John S Fitzgerald

Product Marketing Manager

Investment Protection

IBM provides investment protection by offering

- ✓ Life Cycle Management
- ✓ Qualification & Verification Testing
- ✓ Quality Control / Manufacturing
- ✓ Service & Support

On the family of ServeRAID Controllers

Why Buy IBM ServeRAID Controllers ?

Investment Protection

Life Cycle Quality Management

- Backwards compatability

Qualification & Verification

- Full design review on every new offering
- ServeRAID software to best take advantage of xSeries performance and reliability characteristics
- Simulation of varied geographical conditions around the world
- Designed to work specifily with xSeries Servers & IBM Director
- ServerProven tested

Service & Support

- World Wide network of Service & Support
- Single point of contact
- Enlists Support of Engineers and Programmers
- Convenience of a single limited warranty
- Provide software updates

ServeRAID Roadmap

6/16/

	Current	3Q04	4Q04	1Q05
Performance	**Marco - 6M** 2 Ch U320 SCSI RAID 128MB or 256MB 600MHz, PCI-X 133, GA 7/03			
Mainstream	**Sebring - 6i+** Zero ch U320 SCSI RAID 128MB GA 4/04 **Tampa - 7t** 4 port SATA RAID PCI 66MHz GA 4/04 **Sarasota - 5i** Zero ch U160 SCSI RAID 128 MB GA 7/02 **Neo-Lite - 4Lx** 66 Mhz, U160 GA 5/01 **Kendall** U320 SCSI PCI-X GA 4/03 **U160 SCSI Card**	**ServeRAID 7k** ROMB Enabler 2 ch U320 PCI-X 133 Lindsey; 256MB Ann 8/3, SS 8/27 EOL 8 / 04	EOL 12 / 04 **Kendall refresh** U320 SCSI All Systems 4Q04	**Avon Park - 8i** SAS/SATA Zero Ch RAID

Project Status Legend

Pre-Charter (no box)
Chartered - in Concept Phase
Concept Exit - in Plan Phase
Committed - in Develop Phase

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ServeRAID Roadmap (Con't)

	1Q05	2Q05	3Q05	4Q05	1H06
Performance					**Orlando** SAS / SATA RAID PCI-E
Mainstream	**Avon Park** **SAS / SATA** **Zero Channel RAID** **PCI-X**	**SAS Adapter** for - SATA Tape Drives - SAS Storage Array			**Key Biscayne** SAS ROMB Enabler DDR2
Entry					**Key Largo** Basic RAID 0, 1, 1 ROMB Enabler

Project Status Legend

Pre-Charter (no box)
Chartered - in Concept Pl
Concept Exit - in Plan Pha
Committed - in Develop P
Shipped

System Compatability

	SCSI				
System	**Standard with**	**Add**	**to Do**	**Add**	**To Do**
x206	Software RAID 0, 1	ServeRAID 6i+	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x225	Hardware RAID 1	ServeRAID 6i+	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x226	Software RAID 0,1	ServeRAID 6i+	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x235	Hardware RAID 1	ServeRAID 6i+	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x236	Software RAID 0,1,10	ServeRAID 7k	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x255	Hardware RAID 1			ServeRAID 6M	Full Hardware RAID & Clustering
x306	Software RAID 0, 1	ServeRAID 6i+	Full Hardware RAID		
x335	Hardware RAID 1			ServeRAID 6M	Full Hardware RAID & Clustering
x336	Hardware RAID 1	ServeRAID 6i+	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x345	Hardware RAID 1	ServeRAID 6i+	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x346	Software RAID 0,1,10	ServeRAID 7k	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x365	Hardware RAID 1	ServeRAID 6i+	Full Hardware RAID	ServeRAID 6M	Full Hardware RAID & Clustering
x445	Hardware RAID 1			ServeRAID 6M	Full Hardware RAID & Clustering
x450	Hardware RAID 1			ServeRAID 6M	Full Hardware RAID & Clustering
x455	Hardware RAID 1			ServeRAID 6M	Full Hardware RAID & Clustering
	SATA				
System	**Standard with**	**Add**	**to Do**		
x206	Software RAID 0, 1	ServeRAID 7t	Hardware RAID 0,1 ,5,10		
x226	Software RAID 0,1	ServeRAID 7t	Hardware RAID 0,1, 5,10		
x306	Software RAID 0, 1	ServeRAID 7t	Hardware RAID 0, 1		

Resources

http://www.pc.ibm.com/ww/eserver/xseries/scsi_raid.html

http://publib-b.boulder.ibm.com/Redbooks.nsf/
9445fa5b416f6e32852569ae006bb65f/
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John S Fitzgerald/Raleigh