Intel® RAID

Increased Server Performance & Exceptional Data Protection

Fall – Winter 2014

PCSD
Product Collaboration and Systems Division

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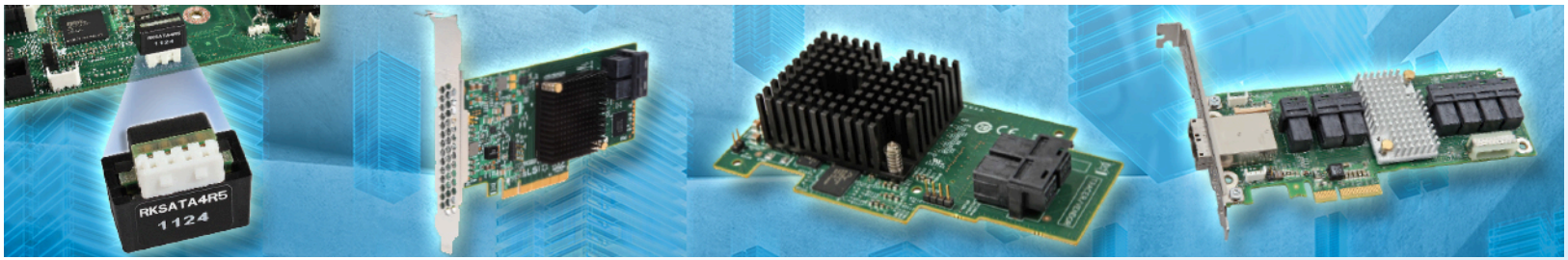
Why Intel RAID?

1. Broadest Portfolio

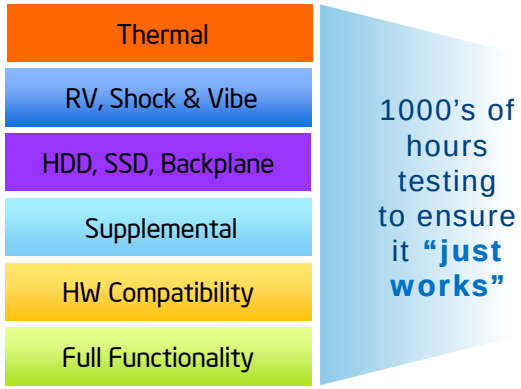


Software RAID | Add-In Cards | Modules | Expanders

Good → Better → Best

2. Full System Validation

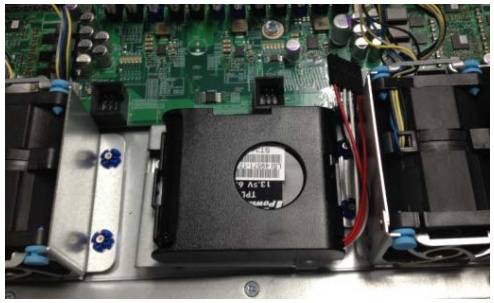
3rd Party RAID



Intel RAID

Why Intel RAID?

3. System Optimizations



Examples:

- Dedicated cache backup location in lower temperature regions allow for longer life expectancy
- Special brackets tested for "shock and vibe"

4. Exceptional Go To Market Support

5. Intel Programs such as AWR and Extended Warranty

No one else offers all this

Product Categories

1. Intel® Embedded Server RAID Technology

- Software RAID included with Intel® Server Boards with key-enabled RAID 5 upgrade options

2. Intel® RAID Controllers (Standard Add-In Card)

- Add-in cards designed to provide a wide variety of RAID solutions for Intel® and 3rd party server boards and systems

3. Intel® Integrated RAID Modules

- Unique mezzanine boards that are designed to add value above that of a standard RAID adapter card for Intel® Server Boards and Systems

4. Intel® RAID Expanders

- System boards designed to be combined with Intel® RAID Controllers or Intel® Integrated RAID Modules to allow for >8 drives in a system

Tailor a perfect solution for your customer

Mainstream Target Market

Architecture of the Majority of Servers

Intelligent RAID-On-Chip (ROC)-based products

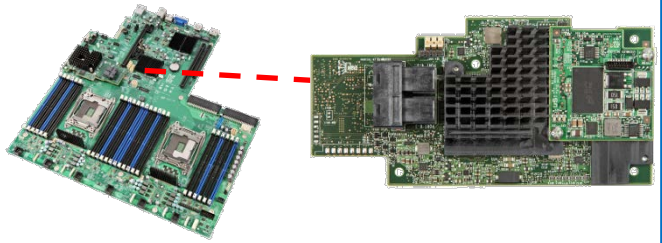
- ROC are the most powerful RAID processors; capable of handling complex RAID parity calculation
- Embedded memory; typically 1GB DDR3
- RAID Levels 0,1,5,**6** and Spans 10,50,**60**
- Best RAID throughput and IOPs
- Best data protection with proven LSI* MegaRAID Technology
- Best tools for management, diagnostics, scale up and scale out

The Right Balance of Performance, Features and Price

Mainstream Intelligent RAID

Recommended Products

1. For Intel Servers with Storage I/O Connectors



Intel® Integrated RAID Module RMS3CC080/040

- LSI 3108 ROC
- 8 and 4 port models available
- Unique mezzanine form factor preserves add-in card slot in a 1U/2U system
- Optional MFBU

$590 MSRP (8P model)

2. For All Other Servers

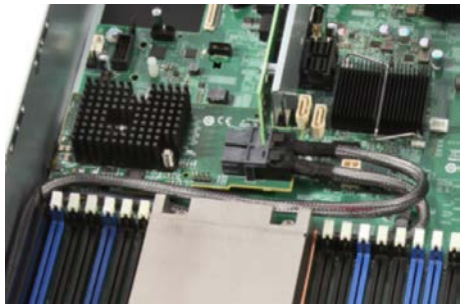
Intel® RAID Controller RS3DC080/040

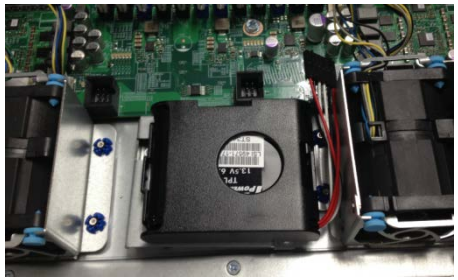
- LSI 3108 ROC
- 8 and 4 port models available
- MD2 PCIe low profile form factor
- Optional MFBU

$645 MSRP (8P model)

Mainstream Intelligent RAID

System Optimizations





Wildcat Pass Storage I/O Connector

- Allows for RAID while preserving standard PCIe add-in card slots

Maintenance Free Backup Unit

- Dedicated location in lower temperature regions allow for longer life expectancy
- Special brackets tested for “shock and vibe”

Multiple Cable Kits

- Multiple lengths and end types allow for perfect fit in Intel server systems
- Tight bend radii and gold plated connectors deliver high quality

Mainstream Intelligent RAID

Cache backup and MFBU operation

"Write-Back" Cache

- Host writes IO data to RAID adapter, RAID adapter stores data in DRAM (cache), RAID adapter acknowledges write has completed *before* the data has been transferred from RAID adapter's DRAM (cache) to the physical disks.

RAID Maintenance Free Backup Module

- Holds controller cache alive during a power outage long enough to copy "dirty" cache to flash memory. When power is restored, dirty cache is written back to controller cache and then flushed to the physical disks.

"Supercap Aging" and the Learn Cycle

- As a Supercap ages, its Capacitance *decreases* and its Effective Series Resistance (ESR) *increases*. A Learn Cycle detects these changes, and allows the RMFBU to increase charging voltage which extends the life of the SuperCap pack. If the SuperCap pack fails the learn cycle, it is declared bad and the system is notified of the failure via RWC2 background service (snmp, event log notification, email).

High IOPs

Databases and Virtual Server Applications

SSD Cache-based products

- Adds "Supersized" cache to ROC products allowing reads and writes optimization for hard drive-based RAID arrays
- Random writes are sequenced for faster transfer to hard drives
- Hot data is held in cache for quick reads
- Database performance acceleration of 5 to 10X typical
- Performance acceleration of 2 to 5X for many other applications (see backup for details)
- Rebuild in 20% of standard time typical
- Easy to use with near "plug and play" set up

Streamline Random IOPs for up to Ten Times Performance

High IOPs
Recommended Products

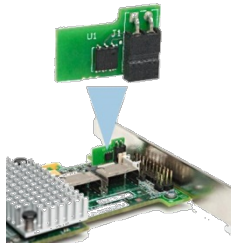
1. All-in-one

Intel® RAID SSD Cache Controller RCS25ZB040

- Up to 1TB embedded NAND
- NAND can be partitioned (to use portion for OS/application and remainder for cache)
- Elastic Cache feature optimizes NAND use by mirroring writes, but not reads

$1130 MSRP (256GB NAND model)

2. Detached SSD (separate from RAID card)



Intel® RAID SSD Cache Key AXXRPFKSSD2

- Upgrades Mainstream RAID products to allow for off-the-shelf SSD to be used as SSD Cache
- Flexible for use with a broad range of SSD
- Does not allow for partitioning of SSD nor Elastic Cache

$230 MSRP

High Drive Count

Expand arrays >8 drives without sacrificing performance

Expander-based Products

- An Expander is basically a "switch" that sends and receives data from a high number of devices
- An Expander needs to be teamed with a 4 or 8 port RAID controller (add-in card or module)
- One Expander typically services 24 to 32 drives; Expanders can be daisy chained for up to 128 drives per a single RAID controller
- **SAS-3 Expanders multiplex 6Gb/s inputs and send them to a SAS-3 RAID card at 12Gb/s**
- Total solution is typically lower cost than a high port count RAID add-in card (ex. Save $300 on 24-drive solution)

Expander Board	
Sales	
Performance	**
Data Protection	**
Management	**
Price	

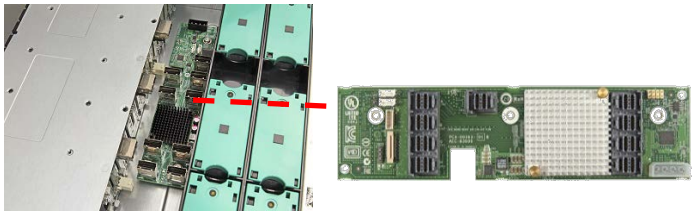
** Dependent on RAID controller teamed with the expander board

Best
Better
Good

A Better Alternative to High Port Count RAID Add-In Cards

High Drive Count
Recommended Products

1. Intel 2U system with up to 24 x 2.5 drives

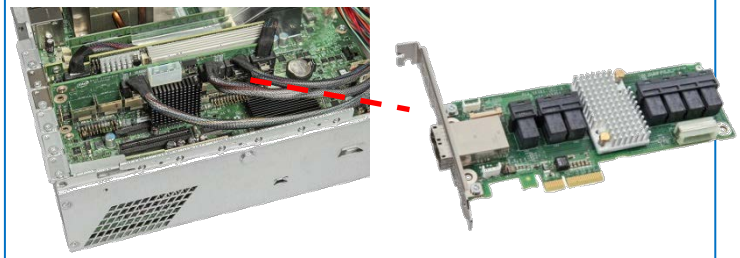


Intel® RAID Expander RES3TV360

- 36 total ports; 8 in and 28 out
- Mid-plane form factor mounts between drive bays and fans in Intel 2U systems
- Includes short cables to connect expander board to drive backplane

$380 MSRP

2. Low profile 2U slot, all other systems and JBOD



Intel® RAID Expander RES3FV288

- 36 total ports; 8 in and 20 out internal plus 8 out external
- PCIe MD2 low profile form-factor
- x4 PCIe connector for power; also can be wall mounted with 4-pin power
- Includes 2 short cables

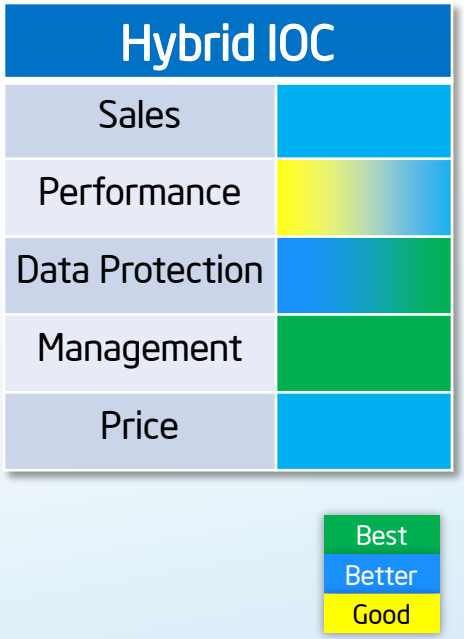
$380 MSRP

Small and Medium Business (Mid-Tier)

Business-critical servers suited to a lower budget

Hybrid I/O Controller (IOC) Based Products

- Less powerful processor than ROC, but…
- Plenty of performance for a small number of hard drives (4 to 6)
- Hardware RAID 0,1,10 with option for Hybrid RAID 5,50 (Hybrid RAID is firmware based, but requires Xeon and 128MB server memory resources)
- Same management tools and capabilities as Mainstream (ROC-based) products
- Priced $200 to $400 below Mainstream

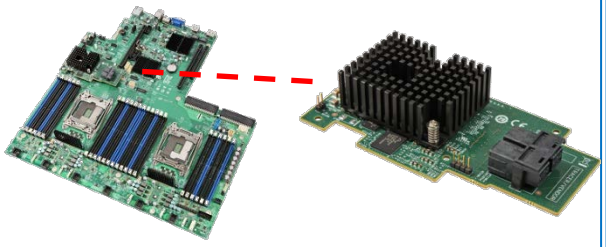


Advanced Management for Ease of Use and Flexibility

Small and Medium Business

Recommended Mid-Tier RAID Products

1. For Intel Servers with Storage I/O Connectors



Intel® Integrated RAID Module RMS3HC080

- LSI 3008 I/O Controller
- 8 port internal
- Advanced RAID and JBOD modes
- Unique mezzanine form factor preserves add-in card slot in a 1U/2U system

$300 MSRP

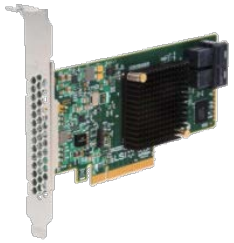
2. For Cottonwood Pass SAS Server Boad

Intel® RAID Premium Feature Key AXXRPFKHY5

- Enables Hybrid RAID 5/50 capabilities with Cottonwood SAS server board
- RAID 5 allows for better use of drive capacity and higher performance for many solutions vs. RAID 1/10

$125 MSRP

3. For all other servers



Intel® RAID Controller RS3WC080

- LSI 3008 I/O Controller
- 8 port internal
- **Approximately 3 times better performance than RS2WC080 for 8 x 6Gb/s target devices**
- Advanced management

$315 MSRP

Entry-level

OS Mirroring or JBOD (Pass-through SAS) mode typical

Entry I/O Controller (IOC) Based Products

- Low performance processor and limited management features
- Hardware RAID 0,1,1E and JBOD mode
- Lowest priced hardware RAID option
- Often used for mirroring an OS or for attaching SAS drives to a server that does not require intelligent hardware RAID functionality

Basic RAID Capability for Budget Oriented Solutions

Entry-Level

Top OS Mirror and JBOD Mode Products

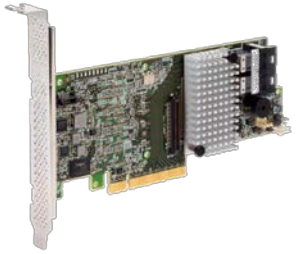
1. For Intel Servers with Storage I/O Connectors

Intel® Integrated RAID Module RMS3JC080

- LSI 3008 I/O Controller
- 12Gb/s SAS 3.0 compliant
- Unique mezzanine form factor preserves add-in card slot in a 1U/2U system

$245 MSRP

2. For Other Servers



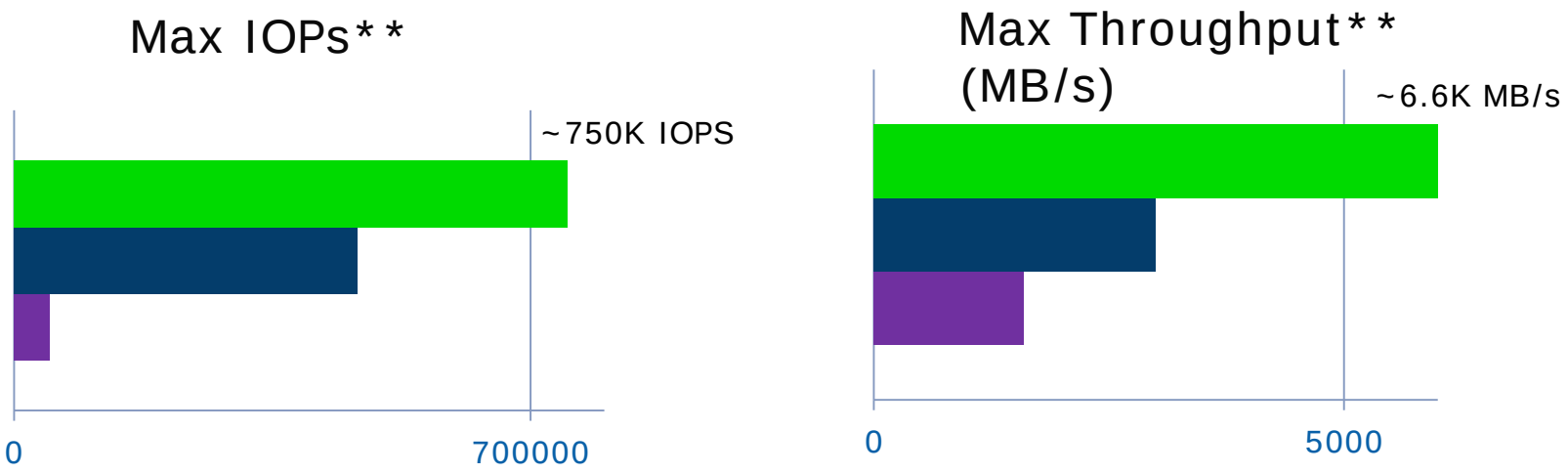
Intel® RAID Controller RS3UC080

- LSI 3008 I/O Controller
- 12Gb/s SAS 3.0 compliant
- Up to 1M IOPs in JBOD mode

$265 MSRP

RS3 RAID 5 Read Performance

ROC-based Products



= RS3 Family (12G SAS-3 ROC Products)

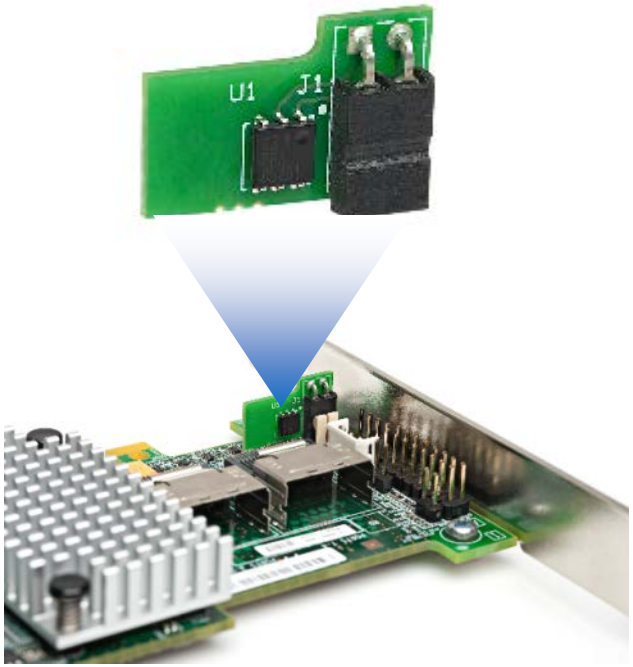
= Intel RS25 ROC Family (RMS25CB080)

= Intel SAS 1.0 ROC (SRCSASJV)

**Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit http://www.intel.com/performance/resources/limits.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104

Premium Features

Enabling SSD Cache, Disk Encryption Mgt & High Availability

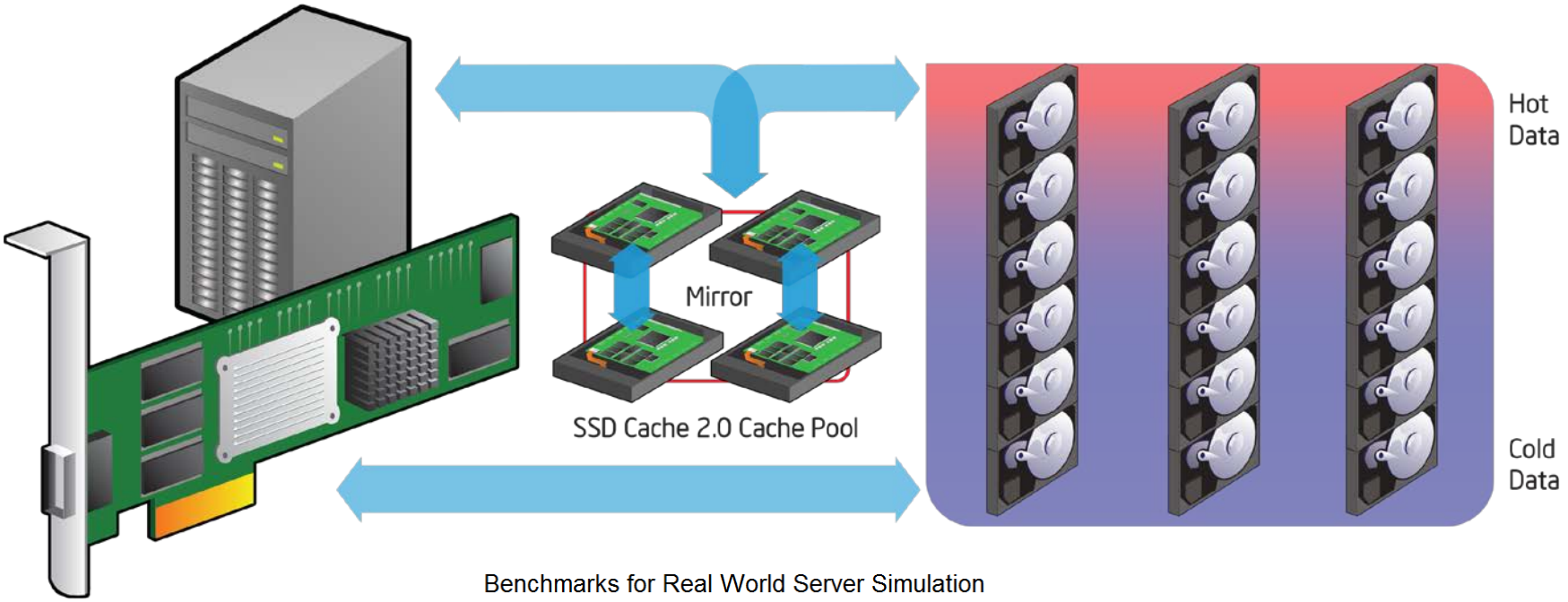


Ready to go in minutes:

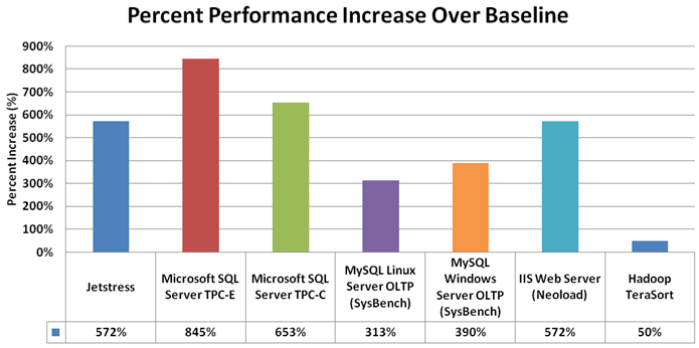
1. Add Premium Feature Key to Intel SAS-2 Mainstream or Scalable Performance RAID card
2. Connect appropriate devices (drives or JBOD)
3. Configure as appropriate in Intel RAID Web Console**

** Special firmware must be flashed onto the RAID product for High Availability. See instructions that ship with the High Availability upgrade kit.

SSD Cache

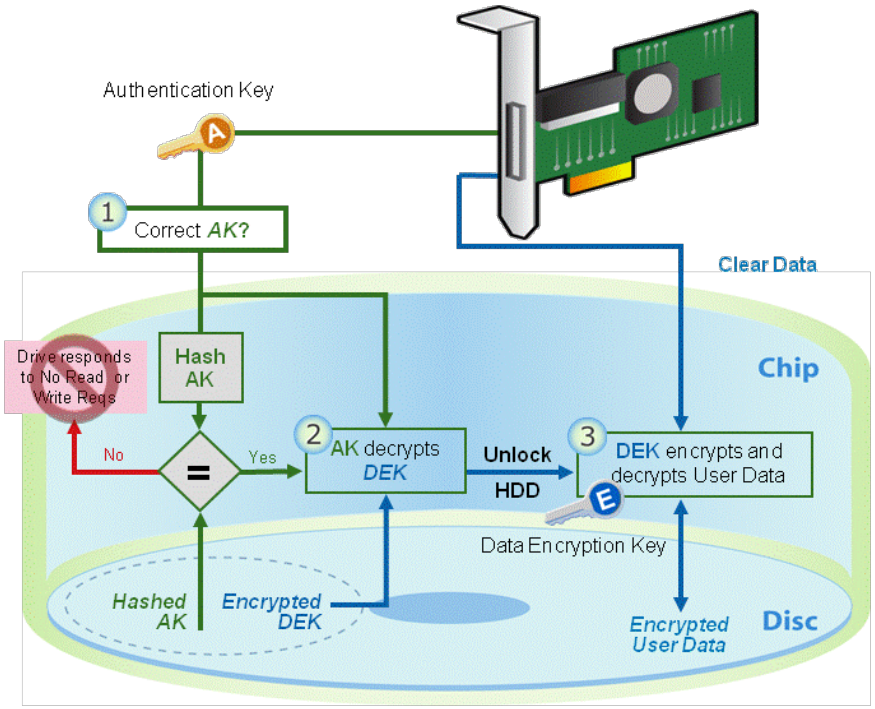


Benchmarks for Real World Server Simulation



Upgrade Key allows for SSD benefits without a full array of SSD

Disk Encryption Management



- **Auto-Lock**
  - The drive locks, and the data is secured, the moment a drive is removed from a system
  - Makes data unreadable and useless to anyone who is not authorized to access it
- **Instant Erase**
  - <1 second sanitization of hard drive data for secure disposal or reuse of drive

Significantly Reduce the Chance of Data Being Compromised

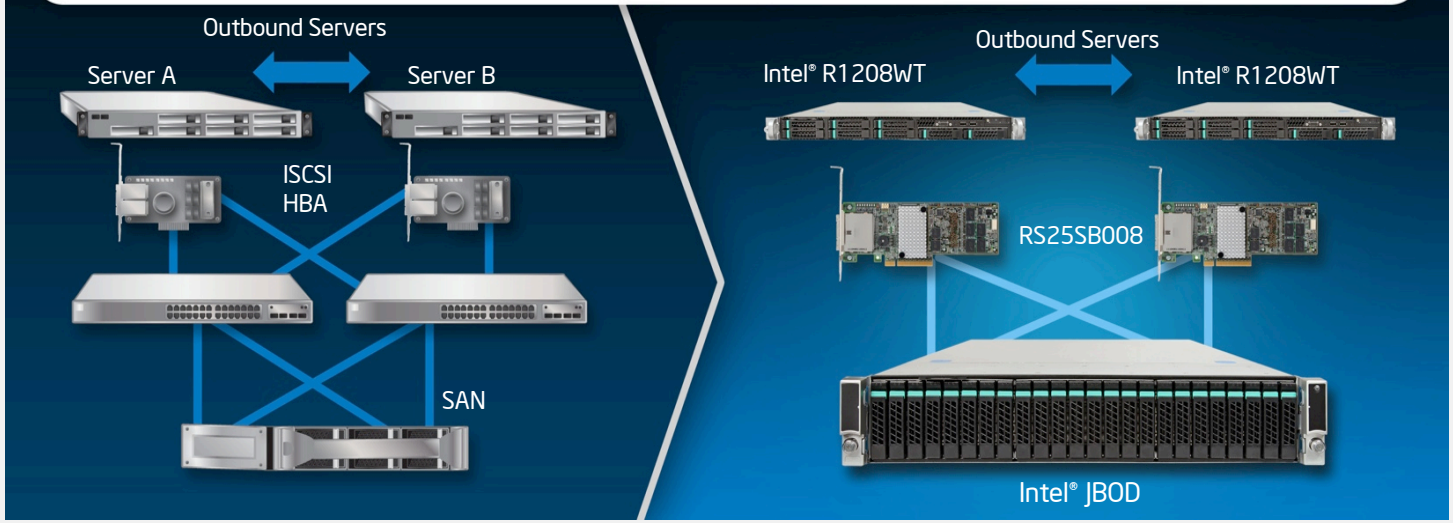
High Availability

SAN Storage Based Solution

Two Servers + SAN + External Storage
Two External RAID Controllers
Complex set-up configuration and interoperability, expensive cables, etc.
Decent performance and latency

Intel RAID High Availability Solution

Two Intel Servers* + JBOD
Two Intel RAID High Availability Controllers
DAS simplicity
Lower latency and higher performance



A simpler, less expensive alternative to protect against server failure

For more information...

www.intel.com/go/RAID

Backup Information

Backup content is included in the following slides...

Naming Convention

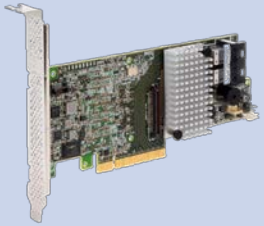
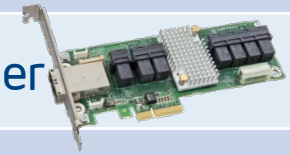
Intel®	Integrated RAID Module	R	M	S	3	C	C	0	8	0

Brand Prefix	Intel®
Suffix Suffix	RAID Controller, Integrated RAID Module, Expander, or RAID SSD Cache Controller
Type	R = Standard Add-In Card RM = Module RE = Expander RC = SSD Cache
Architecture	S3 = SAS-3; T3 = SATA-3
Codename	CC = Coffee Canyon
Internal Ports	08 for 8 ports
External Ports	0 for 0 ports

Grantley generation codename transition: Beach to Canyon (XB → XC)

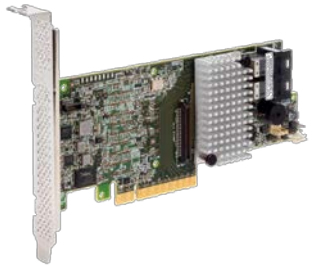
- Example: RS25DB080 → RS3DC080
- More details on transition slide (Page 25)

Grantley Transition Guidance
Beach to Canyon (XB to XC**)

Type	Romley	Grantley
Integrated RAID 	RMS25CB080	RMS3CC080
	RMS25CB040	RMS3CC040
	RMS25JB080	RMS3HC080 or RMS3JC080
	RMS25JB040	RMS25JB040
Add-In Controller Card 	RS25SB008	RS3SC008
	RMS25AB080	RS3DC080
	RMS25DB080	RS3DC080
	RS2BL040	RS3DC040
	RS2WC080	RS3WC080
Expander 	RES2SV240	RES3FV288
SAS RAID Key 	RKSAS8R5	RMS3JC080 or RS3UC080

**RED TEXT indicates exceptions to this "rule of thumb"

Mainstream and Scalable Performance Add-In Cards

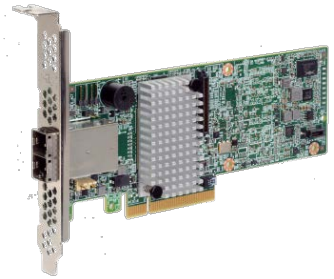


RS3DC080

- 8 Internal Ports
- LSI 3108 ROC
- 1GB DDR3 1866MHZ
- Advanced Mgt
- Use for RAID 5,6 within the server

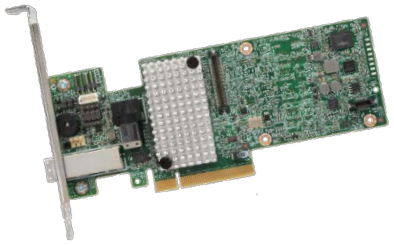
RS3DC040

- 4 Internal Ports
- LSI 3108 ROC
- 1GB DDR3 1866MHz
- Advanced Mgt
- Use for RAID 5 in 1U 3.5" drive-based or half-width systems



RS3SC008

- 8 External Ports
- LSI 3108 ROC
- 1GB DDR3 1866MHz
- Advanced Mgt
- Use to for RAID 5,6 within JBOD storage (Virtual RBOD)



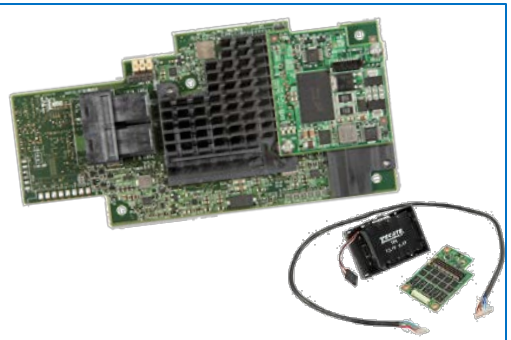
RS3MC044

- 4I & 4E Ports
- LSI 3108 ROC
- 1GB DDR3 1866MHz
- Advanced Mgt
- Use for high flexibility w/ RAID inside and external to server

Add Maintenance Free Backup Unit AXXRMFBU4 to any of the above products for cache backup

12G SAS-3 with up to 750M IOPs in RAID mode

Integrated RAID Modules



RMS3CC080/040

- 8 or 4 Internal Ports
- LSI 3108 ROC
- Use for intelligent RAID 0,1,5,6,10,50,60 while preserving add-in card slot in 1U or 2U system

RMS3HC080

- 8 Internal Ports
- LSI 3008 IOC
- Use for advanced management with RAID 0,1,10 and Hybrid RAID 5/50 in 1U or 2U system

RMS3JC080

- 8 Internal Ports
- LSI 3008 IOC
- Use for simple RAID 0,1,1E or JBOD mode while preserving add-in card slot in 1U or 2U system

Preserve an add-in card slot and offer cost savings

Expanders

RES3FV288

- 28 internal and 4 external ports
- Low profile form factor
- Power from PCIe slot or 4-pin power connector
- Allows RAID card performance optimization

RES3TV360

- 36 total ports
- Mid-plane form factor
- Power from 4-pin power connector
- Allows RAID card performance optimization

Bandwidth aggregation allows 12G performance with 6G devices