Enterprise Hardware RAID and Software RAID

WHY CHOOSE ENTERPRISE HARDWARE RAID OVER SOFTWARE RAID ?

Hardware RAID is data protection and application acceleration technology delivered on PCI Express based option cards with related firmware, drivers, utilities and management software. Enterprise hardware RAID cards have onboard capabilities to perform parity generation and RAID recovery operations, as well as data, memory and bus management. Software RAID, a subset of the features delivered in hardware RAID, is usually delivered as part of an operating system and relies on system resources, processors, and memory.

DATA PROTECTION

Hardware RAID firmware resides on the dedicated option card and runs independently of other system resources. Software RAID as part of the operating system (OS), running on system resources will lose access to data and consistency will be compromised any time the OS is compromised, during a crash, blue screen or a system reset.

Hardware RAID also has a number of spare drive features like the ability to assign a hot spare to a specific volume, in addition to supporting globally available hot spares, thus adding another layer of data availability.

	Software RAID	Hardware RAID
Copy Back Hot Spare	No	Yes
Dedicated Hot Spare	No	Yes
Firmware Base Code to Isolate RAID Protection from OS Crashes	No, Driver Based	Yes
Data Recovery from System-level OS Crashes, Panics and Blue Screens	No	Yes
Auto Resume after Power Fail	Rebuild, CC, BGI	RLM, OCE, Rebuild, CC, BGI
Battery Backup Onboard Cache Protection	No	Yes
Encryption Services for SED HDDs	No	Yes
Onboard Cache Protection	No	Yes

Figure 1 Data Protection Features generally available in Hardware RAID Solutions not found in Software RAID

MANAGEABILITY

To minimize storage total cost of ownership (TCO), hardware RAID solutions offer features to install, tune, and modify data protection, capacity and performance parameters as business needs require.

Enterprise hardware RAID solutions offer a consistent set of tools across machines in virtual environments. Software RAID, because it is often part of a guest OS, may have very different features and compatibilities from the other virtual machines (VMs) hosted on a given physical server. Different tools, management options, additional complexities.

Enterprise hardware RAID features such as Online Capacity Expansion (OCE) for adding storage on the fly and RAID Level Migration (RLM), allow storage administrators to change the RAID data protection schemes in real time to meet changing service level requirements. Typically not available in software RAID.

	Software RAID	Hardware RAID
Import RAID Configurations from Different Servers or RAID Controllers	No	Yes
Maintain Failed Drive History	No	Yes
RAID Levels	0/1/10/5	0/1/10/5/50/6/60
RAID Level Migration (RLM)	No	Yes
Online Capacity Expansion (OCE)	No	Yes
Drive Multipath Support	No	Yes
Revertible Hot Spare	No	Yes
External Enclosure Support	No	Yes
SES	No	Yes
Monitor HDD Temperature	No	Yes
Direct Attached LED	No	Yes
Consistent O/S Support Especially in Virtual Machines	No	Yes

Figure 2 Hardware RAID Management features not commonly found in Software RAID offerings.

SCALABILITY

Enterprise hardware RAID solutions offer many features to support the requirements of larger data centers. Simply put enterprise hardware RAID scales. From the number of physical connections available for direct attachment to drives to the number of SAS expanders supported and the number of physical and virtual devices and hot spares, hardware RAID offers the opportunity to start small, but scale rapidly and smoothly when required.

	Software RAID	Hardware RAID
Max Number of Hot Spare Support	8	32
Max Device per Controller	8	up to 240
Max PD for RAID Configuration	8	up to 240
Max Disk Group per Controller	8	16
Max PD per Disk Group	8	32
Max VD per Controller	8	64
Max VD per Disk Group	8	16
Max Number of Hot Spare support	8	32
Max Number of Expanders	0	32

Figure 3 The scalability of enterprise hardware RAID, in contrast to the very limited capacity options in Software.

APPLICATION ACCELERATION

Finally, enterprise hardware RAID offers significant additional capabilities in application acceleration, especially for data I/O intensive environments like On Line Transaction Processing (OLTP), ecommerce, web hosting and digital content. Enterprise hardware RAID is designed to have a measureable impact on end user experience by optimizing I/O using dedicated resources, not consuming the same processor, bus and memory resources that applications are competing for, especially in cloud based, virtual environments. Hardware RAID can support more complex I/O environments with greater queue depths and the ability to handle variable stripe sizes for maximum I/O efficiency, and other important features noted below.

	Software RAID	Hardware RAID
Outstanding I/Os Supported	16	1024
System Processors, Bus and Memory Consumed	Yes	No
Separate Dedicated Resources for RAID Calculations and Data Management	No	Yes
Variable Stripe Size for All VD	64K only	Yes, up to 1MB
Controller Read Ahead Cache Policy	No	Yes
Controller Write Back Cache Policy	No	Yes
SSD Read Caching	No	Yes
SSD Read/Write Caching	No	Yes
Fast Path SSD VD Optimization	No	Yes

Figure 4 Standard and optional features available on hardware RAID to drive I/O performance and accelerate applications

CONCLUSION

Minimize the risk you take when protecting your most valuable assets – your data.

Enterprise hardware RAID can provide certain benefits that businesses running mission-critical applications demand. The advantages of scalability, data protection, manageability and application acceleration distinguish enterprise hardware RAID over software RAID.

LSI
Storage. Networking. **Accelerated.™**

For more information and sales office locations, please visit the LSI web sites at:
www.lsi.com www.lsi.com/channel

North American Headquarters
Milpitas, CA
T: +1.866.574.5741 (within U.S.)
T: +1.408.954.3108 (outside U.S.)

LSI Europe Ltd.
European Headquarters
United Kingdom
T: [+44] 1344.413200

LSI KK Headquarters
Tokyo, Japan
Tel: [+81] 3.5463.7165