



Wasabi Storage Builder® for IP-SAN and WasabiRAID®

Delivering low-cost, highly-secure iSCSI Storage

In addition to supporting RAID controller cards from industry-leading vendors, Wasabi Storage Builder® for IP-SAN includes WasabiRAID®. WasabiRAID is a kernel level RAID driver optimized for Wasabi Storage Builder for IP-SAN. It is compatible with any type of hard drive supported by Storage Builder for IP-SAN – including SATA, SATA II, and SAS. WasabiRAID can also be used in conjunction with RAID controllers to stripe across or mirror their RAID arrays, enabling increased performance and higher levels of data protection. WasabiRAID:

- Protects critical data
- Leverages the power of state-of-the-art CPU's for superior performance
- Lowers storage system hardware cost
- Works with SATA, SATA II, and SAS hard disks
- Delivers flexibility and scalability

WasabiRAID enables production of high-performance IP-SAN storage systems that are secure, robust, and reliable at a lower cost per terabyte (TB). A RAID controller can contribute as much 25% of the total bill of materials (BOM) for a storage system. WasabiRAID eliminates the need for a RAID controller by enabling the use of hard drives that are plugged into supported disk controllers on the motherboard, or by using an add-in HBA such as those based on the Marvell 88SX60xx disk controller chip.

WasabiRAID is a powerful RAID engine that leverages the speed of modern processors to deliver maximum performance while protecting critical data. WasabiRAID supports RAID Levels 0, 1, 10, 5, 50, and spanning. Nested RAID levels can be created by incorporating logical disks created with a RAID HBA. Features such as hot spares and background rebuilds maximize system uptime and minimize windows of vulnerability in the event of a hard disk failure.

Cost Savings with WasabiRAID

In today's competitive marketplace one needs every possible advantage. By deploying IP-SAN solutions using WasabiRAID hardware, BOM costs can be lowered by 15% or more. The two examples below show the cost saving that can be achieved.

Example One

In this example the hard disks are plugged into the SATA ports on the motherboard, resulting in significant savings.

- Intel 3000 chipset-based motherboard
- 3.4 GHz Pentium 4 CPU
- 2 GB 667MHz DDR2 RAM
- 1U Rackmount chassis
- (4) 500GB Hard Disks

4-Hard Drive (2TB Raw Capacity)	RAID Controller	WasabiRAID
Hard Drive Cost	\$600	\$600
RAID HBA/SATA Controller	\$300	n/a
Total Disk Subsystem Cost	\$900	\$600
Total System Hardware Cost (disk subsystem + chassis, motherboard, memory)	\$1,850	\$1,550
Cost per TB:	\$925	\$775

Example Two

In this example a low-cost 8-port SATA II non-RAID disk controller is installed in the system and four of the onboard SATA II ports are used, providing support for 12 hard disks.

- Intel 5000 chipset-based motherboard
- 2.0 GHz Xeon CPU
- 4 GB 667MHz ECC Fully-buffered DDR2 RAM
- 2U Rackmount chassis with redundant hot-swappable power supplies
- (12) 500 GB Hard Disks

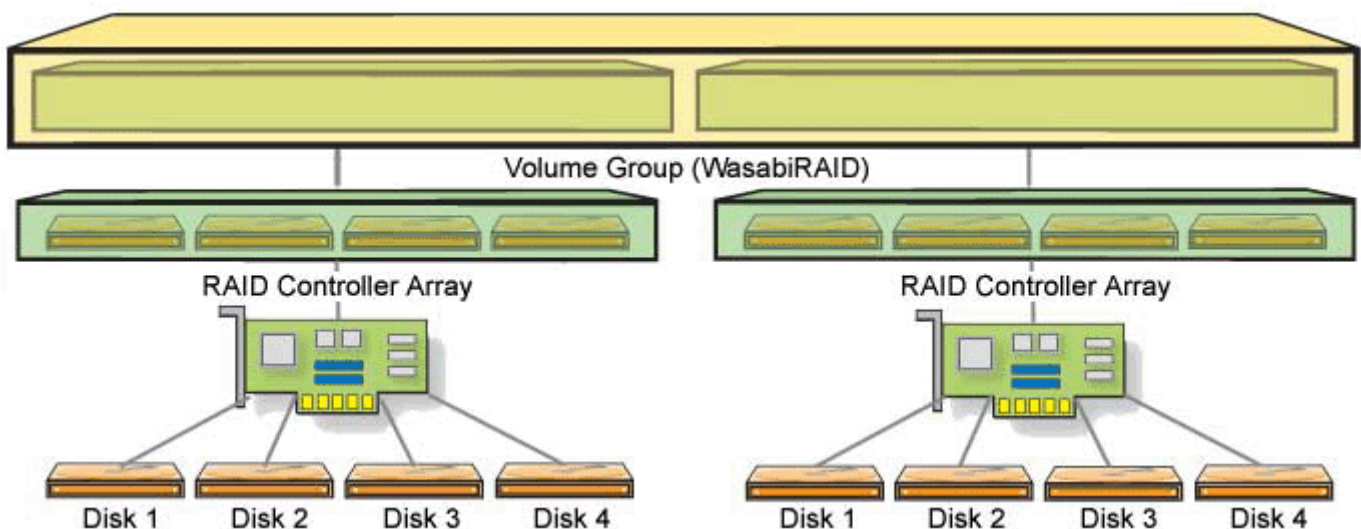
12-Hard Drive (6 TB Raw Capacity)	RAID Controller	WasabiRAID
Hard Drives	\$1,800	\$1,800
RAID HBA/SATA Controller	\$650	\$100
Total Disk Subsystem Cost	\$2,450	\$1,900
Total System Hardware Cost (disk subsystem + chassis, motherboard, memory)	\$4,750	\$4200
Cost per TB:	\$792	\$700

WasabiRAID Delivers Flexibility

WasabiRAID works at the Volume Groups level in the Storage Builder for IP-SAN product. WasabiRAID can be used with single hard disks as well as with RAID arrays created with a RAID HBA.

Using WasabiRAID with Multiple Single Hard Disks

WasabiRAID enables the creation of RAID arrays, even if there is no RAID controller in the system. WasabiRAID can use multiple single disks and group them together to provide fault tolerance and increased performance.

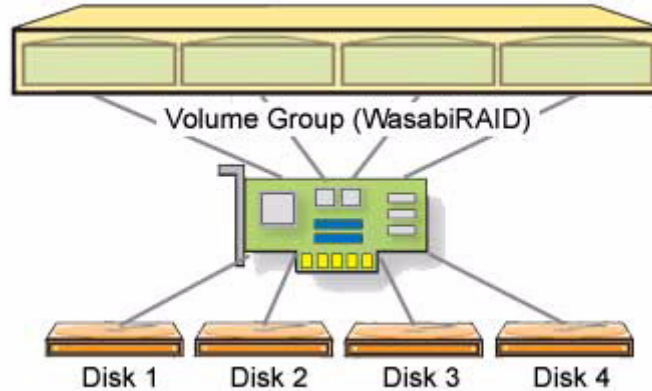


Using WasabiRAID with RAID Controller Arrays

Since WasabiRAID can be used with RAID controller arrays, this presents some interesting possibilities to increase performance and reliability.

As an example, there are 2 RAID controllers with each RAID controller having a RAID 5 array. Each RAID array is operating at the Volume Unit level and is available for use as a member of a Volume Group. You could then create a RAID 0 or a RAID 1 Volume Group comprised of both of Volume Units. This effectively creates a RAID 50 or RAID 51 Volume Group, with the RAID 5 coming from the RAID controllers and the RAID 0 or RAID 1 coming from WasabiRAID. With a RAID 51 configuration, not only would data be protected from a hard disk failure in either or both of the RAID 5 arrays, the data would also be protected in the event that one of the arrays completely failed, or one of the controllers stopped functioning.

RAID 50 leverages the disk protection of RAID 5 and combines that with RAID 0, which enhances performance by splitting data evenly across each of the RAID 5 arrays so that data can be written to and read from each array in parallel. This configuration can withstand failure of one drive within each RAID array without losing data. However, if either of the controllers were to fail, then all of the data on the RAID 50 volume would be lost.



Although the example given above uses WasabiRAID 0 or 1 over RAID 5 arrays, any WasabiRAID level that can be used with multiple single disks can also be used with multiple RAID controller arrays.

Specifications

RAID Levels	0, 1, 10, 5, 50, span
Supported Hard Disk Types	Serial ATA (SATA), SATA II, Serial Attached SCSI (SAS)
Multiple Logical Disks	Supports multiple arrays over a common set of drives or RAID controller arrays
Stripe Depth Sizes	8K, 16K, 32K, 64K, 128K, and 256K (256K not supported with RAID 5 or 50)
Hot Spare	Degraded array automatically rebuilds to a global hot spare
Quick Initialization	Full read/write access while array initialization is in progress
Auto-Rebuild	Automatically rebuilds a degraded array to a hot spare or when a new drive is added
Background Rebuilds	Full read/write access during rebuild and verification operations
Rebuild Watermark	Resume of rebuild from where it left off if unexpectedly interrupted
Supported RAID Controllers	3ware 8000 and 9000 series, LSI Logic MegaRAID SATA and SAS, Intel® RAID controllers
Supported Disk Controllers	Marvell 88SX60xx /88SX50xx, Intel ICHx/6300ESB31244, nVidia nForce 2200

Wasabi Systems

Wasabi Systems is the leader in embedded operating systems and networked storage software. The Wasabi Certified BSD OS is the same network operating system found in devices such as switches and routers that power the world’s networking backbone. Wasabi Storage Builder for iSCSI and Storage Builder for NAS leverage Wasabi Certified BSD and Wasabi RAID to deliver world-class storage systems that are fast, robust, and reliable.

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