Achieve Maximum Performance with LSI™ MegaRAID® Technology

System Builders Guide to a Top-Performing 6Gb/s Solution

Customers who need top performance for intensive computing applications can benefit by migrating to a full end-to-end 6Gb/s ecosystem. LSI 6Gb/s SATA+ SAS MegaRAID technology is a crucial part of the storage solution and provides superior I/O performance for high-end applications. The speed of the controller can be up to twice as fast as its predecessors, delivering more reads and writes. LSI 6Gb/s MegaRAID technologies provide scalable performance in larger capacity arrays and enhance system efficiencies. You can connect more hard drives through a single controller and benefit from the combined drive throughput to achieve a higher level of performance.

Solutions for Common Applications

The superior read/write performance of the LSI 6Gb/s MegaRAID solution makes it ideally suited for a broad range of application workloads, from data center applications such as web servers and database servers to more compute-intensive applications such as cloud computing and the clustered systems used with high-performance computing.

- **Cloud Computing:** Customers who offer highly-scalable and virtual resources need reliable and high performing solutions. They will benefit from being able to deliver more data in and out of the cloud.
- **Web Servers:** A large number of users access these storage servers at all times of the day. Always-on access is critical, along with speed of reads and writes. Top of the line performing systems is a business requirement to support the users that rely on these systems.
- **Database Servers:** Customers who build and maintain servers that run database programs can benefit from migration to 6Gb/s. They can boost the retrieval of specific information from their massive set of data.

Optimize LSI 6Gb/s MegaRAID Performance

LSI 6Gb/s RAID controller cards and the LSI 6Gb/s SATA+SAS expander achieved read rates of up to 2,500MB/sec and write rates of up to 3,000MB/sec in a recent system test. To achieve these results, LSI 6Gb/s MegaRAID was the storage solution for a full test 6Gb/s ecosystem.

The full test solution included LSI, Seagate and Supermicro 6Gb/s technologies. Together, these leading brands form a powerful end-to-end 6Gb/s channel solution – one of the first of its kind. Major performance advantages across the board are available for your customers.

This LSI 6Gb/s MegaRAID test system guide presents a measurement summary of the read and write throughput observed with various RAID levels, and offers performance tuning tips for different types of processing scenarios.
LSI 6G MegaRAID Test System
The LSI 6Gb/s MegaRAID test system, which runs on Windows Server 2003, was configured to include essential components from LSI, Supermicro and Seagate.

System Configuration
Supermicro 6Gb/s SAS 216 chassis with an internal expander. The expander is a Supermicro BPN-SAS2-216L board rev 1.01, based on a LSI chip.
- Supermicro motherboard X8DT3-7, board rev 1.02, based on the Intel® 5520 (Tylersburg) Chipset
- AMI BIOS build date 07/18/09. AMI BIOS Core Ver 08.00.15
- Dual Xeon CPU E5520 @2.27 GHz
- 2x2GB ECC DRAM

MegaRAID SAS 9260-8i PCIe RAID controller with two four lane cables to the LSI based Supermicro internal expander.

Two disk drives were used for this demonstration. We found no performance differences between them.
- Seagate SAS 2.0 6Gb/s 68GB 2.5”form factor drives ST973452SS
- Seagate SAS 2.0 6Gb/s 73GB SED 2.5”form factor drives ST9735S2S

The OS used was Microsoft Windows Server 2003 R2 Enterprise Edition with Service Pack 2 running on a separate SATA drive connected to a SATA interface on the motherboard.

Read/Write Test Results
The results are based on a single machine observation, visually transcribed 15 seconds into the test, after a 0 second ramp time. Stripe size for RAID 0 and RAID 5: 256 KB. Stripe size for RAID 6: 64 KB. Strip size for RAID 10: 1 MB.

<table>
<thead>
<tr>
<th>RAID Type</th>
<th>Workload</th>
<th>Read</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID 0</td>
<td>1MB sequential reads, 1MB sequential writes</td>
<td>2510 MB/sec (256k_WB_NORA)</td>
<td>3005 MB/sec (256k_WT_NORA)</td>
</tr>
<tr>
<td>RAID 5</td>
<td>64KB sequential reads, 64KB sequential writes</td>
<td>2510 MB/sec (256k_WB_NORA)</td>
<td>1344 MB/sec (256k_WB_NORA)</td>
</tr>
<tr>
<td>RAID 6</td>
<td>64KB sequential reads, 64KB sequential writes</td>
<td>2510 MB/sec (256k_WB_NORA)</td>
<td>1295 MB/sec (256k_WB_NORA)</td>
</tr>
<tr>
<td>RAID 10</td>
<td>1MB sequential reads, 1MB sequential writes</td>
<td>2392 MB/sec (256k_WB_NORA)</td>
<td>1497 MB/sec (256k_WT_NORA)</td>
</tr>
</tbody>
</table>

Legend:
64k = 64K virtual stripe size
256k = 256K virtual disk stripe size
WT = write cache “write through” setting
WB = write cache “write back” setting
NORA = read cache, “no read ahead” setting

Top Tuning Tips for Best I/O Performance
Use these tips to achieve the maximum I/O performance with the LSI 6Gb/s MegaRAID hardware.

1. Configure Sequential Access Patterns: To achieve maximum sustained MegaRAID controller throughput, use sequential access patterns in the range of 64 KB to 1 MB. Use random access patterns in the range of 0.5 KB to 8 KB.

2. Connect More Drives: To achieve maximum performance, connect enough drives to saturate the MegaRAID controller. Use 12 drives or more to see performance scale.

3. Use Adaptive Read Policy: This policy should be used for all configurations and directs the controller to use read-ahead if the two most recent disk access occurred in sequential sectors. If all read requests are random, the algorithm automatically changes to No Read Ahead while still evaluating all requests for possible sequential operation. LSI does not recommend using the Always Read Ahead policy.

4. Write Policy: Write-Through With the Write-through caching strategy, data is written to disk before a completion status is returned to the host operating system. This is considered more secure, because a power failure is less likely to cause undetected drive write data loss. LSI recommends using the Write-through policy for RAID 0, RAID 1, and RAID 10 configurations with streaming or sequential data reads, because it can avoid copying data into a cache.

5. Write Policy: Write-Back With the Write-back caching strategy, a completion status is sent to the host operating system as soon as data is written to the RAID cache. Data is written to the disk when it is forced out of the controller cache memory. Write-back is more efficient in environments with “bursty” write activity.

6. Cache Policy: Direct I/O recommended for all RAID level configurations.

Build Today
You can build high-performing 6Gb/s systems solutions by mirroring a system like the LSI 6Gb/s MegaRAID Test System. With LSI, Seagate, and Supermicro 6Gb/s systems components, customers can get the performance they seek for high computing applications.

For more information email david.graas@lsi.com or visit lischannelgateway.com.