# SPC BENCHMARK 1C™

## EXECUTIVE SUMMARY

# LSI CORPORATION
## LSI MEGARAID SAS 8888ELP *(15 DISKS)*

### SPC-1C™ V1.1

**Submitted for Review:  December 10, 2008**
**Submission Identifier:  C00007**

## EXECUTIVE SUMMARY

### Test Sponsor and Contact Information

| Test Sponsor and Contact Information | |
|---|---|
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### Revision Information and Key Dates

| Revision Information and Key Dates | |
|---|---|
| **SPC-1C Specification revision number** | V1.1 |
| **SPC-1C Workload Generator revision number** | V1.0 |
| **Date Results were first used publicly** | December 10, 2008 |
| **Date the FDR was submitted to the SPC** | December 10, 2008 |
| **Date the TSC is available for shipment to customers** | currently available |
| **Date the TSC completed audit certification** | December 8, 2008 |

### Tested Storage Product (TSP) Description

The  MegaRAID  SAS  **8888ELP**,  a  second  generation  SAS  RAID  product,  addresses  the business  demands  of  data  availability,  data  protection,  and  performance.   The  adapter features  the  LSI  SAS  1078,  an  I/O  storage  engine  that  performs  data  protection,  data checking,  and  data  restoration.   The  adapter  employs  selectable  connectors,  enabling  it  to serve  three  deployment  scenarios:  two  internal,  two  external,  or  one  of  each.   Up  to  240 disks  can  be  attached ,  all  SAS,  all  SATA,  or  a  combination  of  both.   A  RAID  data  cache  of 512  MB  is  available  with  two  battery  backup  options.   The  adapter  uses  a  500  MHz  Power PC  embedded  processor,  667  MHz  data  cache,  8  lanes  of  PCI  express,  and  eight  3  Gb/s  SAS links  to  provide  class-leading  I/O  performance.   RAID  levels  0,  1,  5,  and  6  are  configurable, as  are  RAID  spans  10,  50,  and  60.

## Summary of Results

| SPC-1C Results | |
|---|---|
| **Tested Storage Product:**  LSI MegaRAID SAS 8888ELP *(15 disks)* | |
| **Metric** | **Reported Result** |
| **SPC-1C IOPS™** | 2,698.37 |
| **Total ASU Capacity** | 183.511 GB |
| **Data Protection Level** | Protected *(RAID-5)* |
| **Total Price – Priced Storage Configuration** | $7,113.13 |

**SPC-1C IOPS™** represents the maximum I/O Request Throughput at the 100% load point.

**Total ASU** (Application Storage Unit) **Capacity** represents the total storage capacity read and written in the course of executing the SPC-1C benchmark.

A **Data Protection Level** of **Protected** *(RAID-5)* provides data protection by distributing check data corresponding to user data across multiple disks in the form of bit-by-bit parity.

## Storage Capacities and Relationships

The Tested Storage Configuration (TSC) must be configured so that there is either no Unused Storage or that the sum of Total ASU Capacity and storage required for data protection equals 50% (+-1 GiB) of the Physical Storage Capacity. This configuration meets the 50% requirement as documented below:

> 550.559 GB *(Physical Storage Capacity)* * 0.5 = 275.280 GB
>
> 183.551 GB *(Total ASU Capacity)* + 91.756 GB *(data protection)* = 275.267 GB

The following diagram documents the various storage capacities, used in this benchmark, and their relationships.
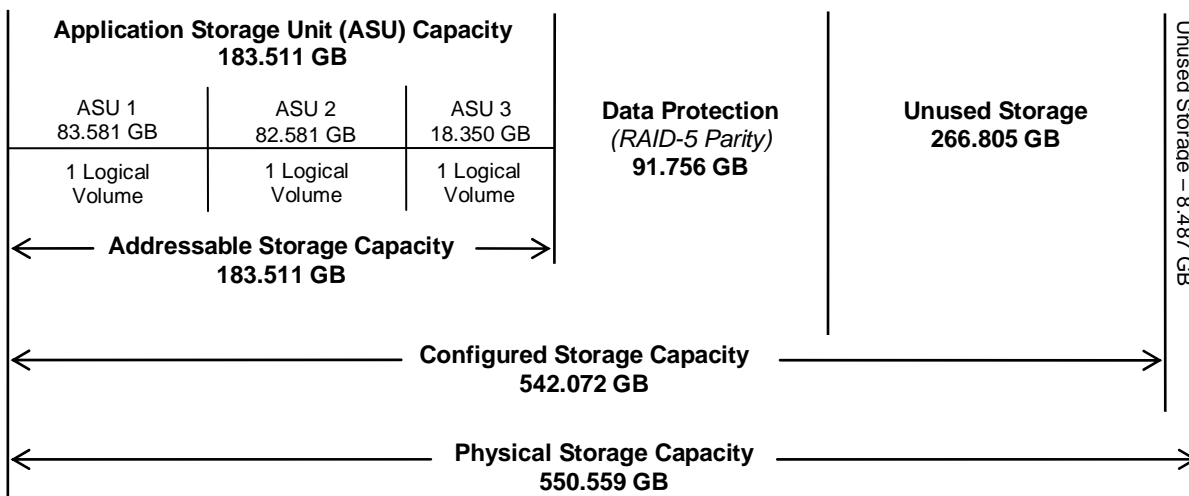
## Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.
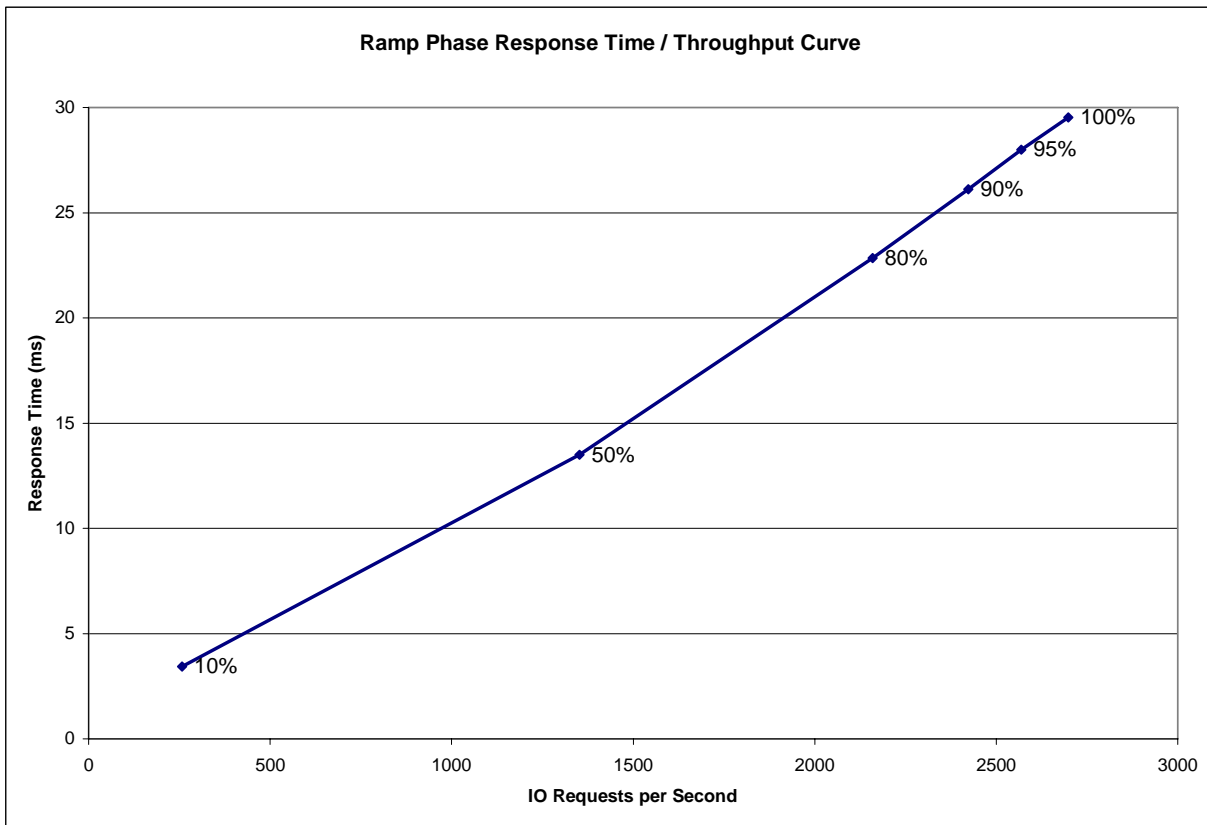


## Response Time – Throughput Data

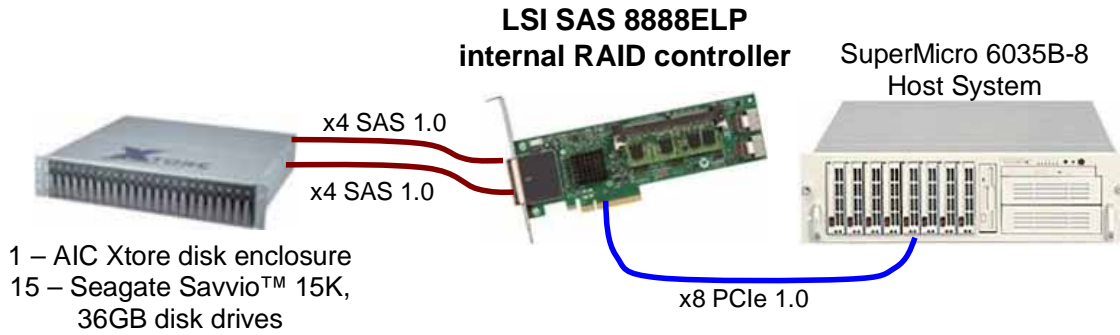| | 10% Load | 50% Load | 80% Load | 90% Load | 95% Load | 100% Load |
|---|---|---|---|---|---|---|
| **I/O Request Throughput** | 257.37 | 1,352.54 | 2,159.01 | 2,423.36 | 2,569.05 | 2,698.37 |
| *Average Response Time (ms):* | | | | | | |
| **All ASUs** | 3.43 | 13.49 | 22.85 | 26.12 | 27.99 | 29.52 |
| **ASU-1** | 4.13 | 15.87 | 26.91 | 30.88 | 33.07 | 34.99 |
| **ASU-2** | 4.19 | 16.98 | 29.41 | 34.34 | 37.32 | 40.23 |
| **ASU-3** | 1.61 | 6.93 | 11.35 | 12.41 | 13.18 | 13.22 |
| **Reads** | 7.28 | 27.77 | 47.30 | 54.50 | 58.41 | 62.02 |
| **Writes** | 0.95 | 4.20 | 6.94 | 7.63 | 8.19 | 8.29 |

## Tested Storage Configuration Pricing *(Priced Storage Configuration)*

| Component Description | Part Number | Qty | Price | Extd Price |
|---|---|---|---|---|
| MegaRAID Adapter | SAS 8888ELP | 1 | 789.99 | 789.99 |
| AIC 24-disk Enclosure | XJ-SA26-224R | 1 | 2,087.14 | 2,087.14 |
| Seagate Savvio 15K.1 disk | ST936751SS | 15 | 276.00 | 4,140.00 |
| External mini SAS Cable | SA-8888-1m | 2 | 48.00 | 96.00 |
| | | | **Total Cost** | 7,113.13 |

## Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

There were no differences between the Tested Storage Configuration and the Priced Storage Configuration.

## Benchmark Configuration/Tested Storage Configuration Diagram

**LSI SAS 8888ELP
internal RAID controller**

SuperMicro 6035B-8
Host System

x4 SAS 1.0

x4 SAS 1.0

1 – AIC Xtore disk enclosure
15 – Seagate Savvio™ 15K,
36GB disk drives

x8 PCIe 1.0

## Benchmark Configuration/Tested Storage Configuration Components

| Host System: | Tested Storage Configuration (TSC): |
|---|---|
| SuperMicro 6035B-8<br>  2 – 2.66 GHz Intel Xeon x5355 processors<br>    32+32 KB L1 cache per core<br>    4 MB L2 cache per die | 1 – **LSI MegaRAID SAS 8888ELP**<br>  internal RAID controller with:<br>   512 MB cache<br>   1 - x8 PCIe 1.0 host connect<br>   2 - x8 3 Gb/s SAS 1.0 disk connect |
| 8 GB main memory | |
| Windows 2003 Enterprise Edition | 1 – AIC Xtore XJ-SA26-224R disk enclosure |
| PCIe 1.0 | 15 – Seagate Savvio™ 15K, 36 GB SAS disks |
| | 2 – x4 external SAS cables |