

Scaleable Intelligent Video Server System

<i>Title</i>	SIVSS Integration-ready Switch Hardware Platform Quality Assurance Report
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1 Introduction

This document records the Quality Assurance assessment of the Xyratex IOSS product performance as required in the SIVSS (Scaleable Intelligent Video Server System) Work Package D5.1:

- **Finished IOSS hardware platform compatible with SIVSS requirement specified previously (m30)”**

1.1 Scope

This document is intended to confirm the functionality and performance of a specific configuration as defined in the above referenced document.

1.2 Objective

The Quality Assurance role at the current stage of the IOSS product development is to specifically determine whether the IOSS product, within the defined systems environment, is capable of achieving data transfer rates exceeding an “Aggregate Required Bandwidth” of **520MBytes** together with network transparency through the IOSS product.

1.3 Quality Assurance Test Entry Criteria

QA TEST ENTRY REQUIREMENTS	REQD DATE	RESULT
<ul style="list-style-type: none"> • SIVSS Test System Definition Document 	9Aug06	Available
<ul style="list-style-type: none"> • Server: <ul style="list-style-type: none"> Supermicro 3U chassis with X7DB8 motherboard StarGen PCIe / ASI controller card AS/Infiniband connection cable to remote IOSS 	21Aug06 21Aug06 21Aug06	Available Available Available
<ul style="list-style-type: none"> • Operating Systems and Software: <ul style="list-style-type: none"> Redhat Enterprise Linux 4 Windows 2003 Server SP1 Stargen Kestrel card (PCIe) Atto SCSI card (PCIe) – Not configured QLogic QLA 2632 driver LAN / Internet Connection 	21Aug06 21Aug06 21Aug06 21Aug06 21Aug06 21Aug06	Available Available Available Available Available Available
<ul style="list-style-type: none"> • IOSS Product: <ul style="list-style-type: none"> Four 4Gb Qlogic HBA Express Modules AS/Infiniband connection port Configuration connection port (10/100) 	21Aug06 21Aug06 21Aug06	Available Available Available
<ul style="list-style-type: none"> • Storage Products: <ul style="list-style-type: none"> Two Sumo storage enclosures Operation Mode 3 (Dual controller JBOD) Hitachi Deskstar (Kurofune II) SATA drives 8 x 500GB Disks per controller (Max=32) Switch settings definition 	21Aug06 21Aug06 21Aug06 21Aug06	Available Available Available Available
<ul style="list-style-type: none"> • Hardware Bringup: <ul style="list-style-type: none"> StarGen adapter card load HBA Driver load – Green LED indicators Sumo Disk visibility from Server 	21Aug06 21Aug06 21Aug06	Available Available Available
<ul style="list-style-type: none"> • Performance Measurement Software Tools: <ul style="list-style-type: none"> Storage performance – LINUX Xyratex XPERF Storage performance - Windows IOMETER Agilent PCIe Analyser 	21Aug06 21Aug06 21Aug06	Available Available Available

1.4 Quality Assurance Test Exit Criteria

QA TEST EXIT REQUIREMENTS	CMPLT DATE	RESULT
<ul style="list-style-type: none"> • Windows 2003 Server Disk management status of Basic/Unallocated IOMETER Sequential Read execution 	7Sep06 7Sep06	PASS PASS
<ul style="list-style-type: none"> • LINUX LVM (Logical Volume Manager) status XPERF sequential Read/Write execution 	7Sep06 7Sep06	PASS PASS
<ul style="list-style-type: none"> • PCI Express Analysis Link Utilization Link Efficiency Average payload length Throughput 	7Sep06 7Sep06 7Sep06 7Sep06	PASS PASS PASS PASS

2 Executive Summary

The key measurement of “Aggregate Required Bandwidth” for the Server/IOSS/Sumo storage system has been demonstrated in both Windows 2003 Server and Linux RedHat Operating Systems, in a standard individual disk drive configuration for sequential read or sequential write operations, to be of the order of a maximum of 735/750 MBytes/Sec respectively.

Hence, not only has the required performance minimum of 520MB/s (which would allow ingest and display of a minimum HDTV film) has been exceeded but the required total bandwidth of 726MB/s (which would represent ingest, playback and archive simultaneously) has additionally been achieved.

Typically, the optimum performance was achieved beyond a transfer block size of 32KBytes. Performance above this knee point tended to be flat.

Additionally, the I/Os per Sec (IOPS) are plotted and demonstrate the reduced IOPS at large transfer blocks.

See:

[Windows 2003 Server Performance – IOMETER](#)
[Linux RedHat – XPerf Performance Measurements](#)

Independent measurement of the bandwidth utilization and throughput of the PCIe link was monitored using an Agilent PCIe Analyser and a throughput of 735 MBytes was confirmed and correlated with the results obtained from both Windows IOMETER and Linux XPerf.

See:

[Windows 2003 Server – PCIe Analyser Screenshot](#)

2.1 System Observations

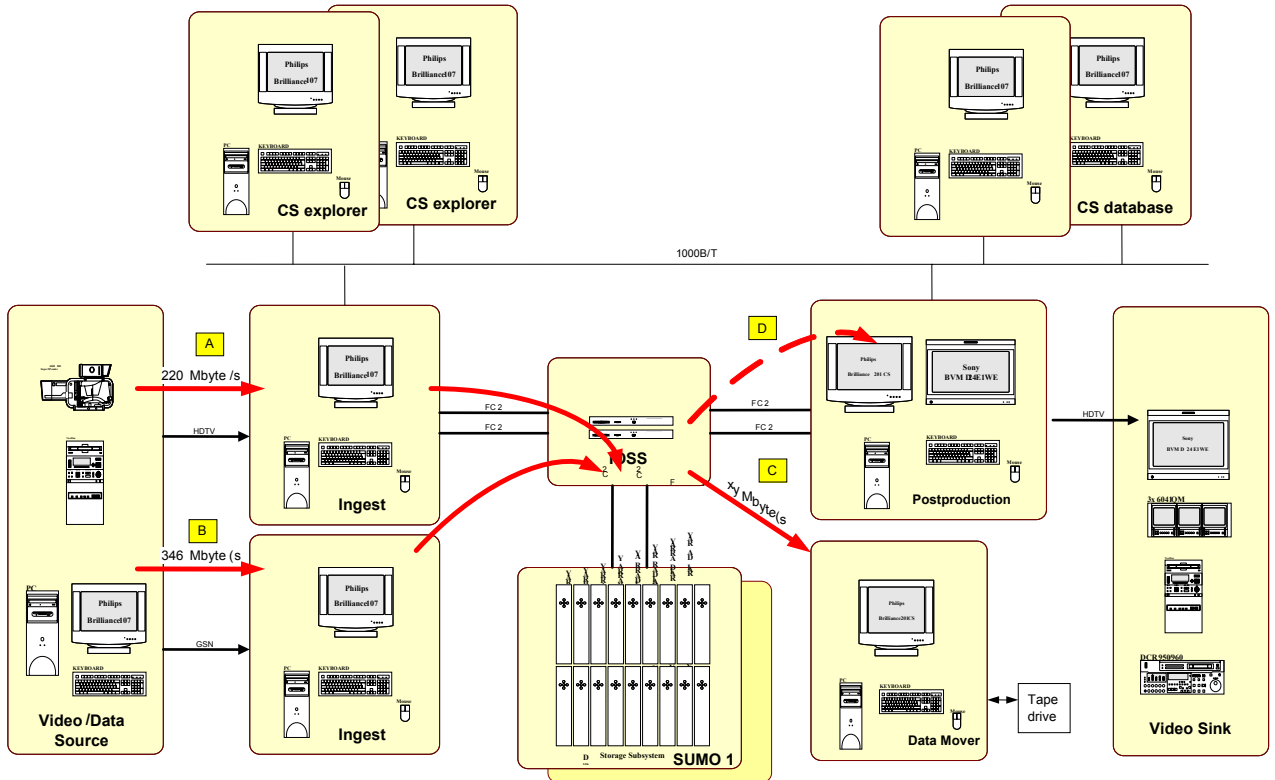
The disk drive configuration was reported by both operating systems as consisting of 64 storage devices whereas there were a total of 32 physical drives in the two Sumo storage products. This was as a result of all four HBAs being connected to one server so that each drive is seen twice. In a real system two HBAs would be bound to one server and two to the other. However, as a result of the required configuration it was determined that the potential configuration of a single Raid #0 environment was not able to be built due to operating system limitations.

The limitation identified for Linux RedHat was a maximum storage capacity of 4 Terra Bytes. The OS Local Volume Manager (LVM) crashed at the point of adding the 24th 500GB disk drive prior to attempting to build the Raid #0 array. The limitation identified for Windows 2003 Server was a maximum of 32 disk drives.

3 Requirements of SIVSS Program

The diagram below shows a typical configuration of the SIVSS platform. It consists of ingest sources A and B, with playout sinks C and D. These inputs and outputs are connected to the storage, a pair of Sumo enclosures by the I/O Sub System (IOSS), which manages and combines the data from each source and aggregates it to the storage. The speeds shown for the data flows are:

- A. 220MB/s for camera ingest
- B. 346MB/s for film scanner ingest
- C. 160MB/s for backup
- D. 220MB/s for post production



3.1 Bandwidth Calculations

The picture looks at typical bandwidth involved in a video storage environment. The actual bandwidths of the data involved are dictated by the physical properties of the data. The table below lists the bandwidths of common applications. Highlighted in yellow is the filmscanner ingest data rate, which represents a worst case single source for the SIVSS platform.

# active samples	# of active lines	# of bits	# of streams	frame rate	Net data rate max.	Format	Application
1920	1080	10	2	24-30	1.244Gb/s	YCrCb 422	274M
1920	1080	10	2	50-60	2.488Gb/s	YCrCb 422	372M
1920	1080	12	3	1-30	2.239Gb/s	RGB 444	Camera
2048	1080	12	3	48	3.822Gb/s	XYZ 444	Display
2048	1080	12	3	1-60	4.778Gb/s	RGB 444	Camera
2048	1756	10	3	24	2.761Gb/s	RGB 444	filmscanner
4096	2160	12	3	24	7.644Gb/s	XYZ 444	Display
4096	2160	12	3	1-30	9.555Gb/s	RGB 444	Camera
...							
4096	2160	12	3	1-60	19.110Gb/s	RGB 444	Camera
4096	3512	16	3	10	6.905Gb/s	RGB 444	filmscanner

Table 1: Bandwidth Requirements for Production Applications

In addition to the video data rates, is the backup rate available to the tape drive. For the purpose of these calculations, this is set at 160MB/s.

For the SIVSS postproduction ingest part the most important Video/Audio sources are

- ◆ 2K real-time filmscanner (2048 x 1756)
- ◆ Vide server ingest (2048x1556x4)
- ◆ Digital HDTV Video camera (1920 x 1080, up to 150 frames/sec)
- ◆ Digital film camera (2048 x 1080)

Taking as an example for SIVSS ingest data rate for the film scanner is defined as follows:

Each frame has a resolution of 2K coded in the three components R, G and B where each component is coded with at least 10bits. The Film Frames are transmitted with a rate of 24 frames per second. The required bandwidth is calculated according to

$$BW = \text{pixel_per_line} * \text{lines_per_image} * (\text{approx. } 3 * 10\text{bit}) * \text{frame_rate}$$

$$BW = 2048 * 1756 * 4\text{Byte} * 24 \text{ frames/sec}$$

$$BW = 346 \text{ MByte/sec}$$

(Because of computer-systems are byte oriented we have chosen the nearest Byte number to 3x10bit which is 4Bytes)

3.2 Test criteria

Having examined the data types used in the SIVSS program, It is now possible to determine the performance requirements of the completed system. The table below examines typical uses.

No.	Modes used	Aggregated BW (MB/sec)	Goal	Duration (Min.)	Comment
1	A	220 write	24 fps	20	HDTV video ingest from camera (1920x1080x4)
2	B	346 write	24fps	20	Image data ingest from server (2048x1756x4)
3	C	220 read	24fps	20	Playout single channel
4	D	160 read			Tape backup
5	E	300 write	24fps	20	Image data ingest from server (2048x1556x4)
6	A + B	220 readwrite, 246write	24 fps	20	Ingest two channelssingle channel and playback with backup
7	A, C + D	220 write, 380 read	24 fps	20	Ingest single channel and playback with backup
8	B, C + D	346 write, 380 read	24/24 fps	20	Ingest single channel and playback with backup
9	E + C	300 write, 220 read	24/24 fps	20	Ingest single channel and playback

For the purposes of this test, the separate read and write performance can be combined to provide an aggregate throughput requirement that varies from 466MB/s to 726MB/s from the options above. The table indicates that the worst case scenario, option 8, involves three simultaneous process and requires 726MB/s of total bandwidth through the storage platform. As a minimum the storage platform must be capable of ingesting a film, while performing post production. This would at the lower ingest rate specified by mode E, be as listed in option 9, be 520MB/s.

3.3 Test Limitations

This section of the SIVSS platform qualification is to prove the system capability of both hardware and software involved in the data flow. The aim of the test therefore, is to prove that the storage bandwidth for random data of reasonable size block length can achieve the requirements of the video servers. Thus the testing is limited to the chosen operating system, the file system and the device drivers used in the final test. The actual ingest, display and backup servers were also used to ensure the performance was realistic given available processing capability. However, the actual ingest and playback programs will be tested both on their test beds and in the final evaluation test.

For this reason, it is impossible to re-create mixed read and write scenarios from the test tools available and so for the purpose of these test, separate read and write test were performed. As the IOSS, operating system and file systems are not sensitive to read/write differences, the combined performance can be taken as a midpoint between the worst case read and write performances.

3.4 Summary

The requirement for successful completion of the SIVSS program from a storage and switch perspective is to provide a performance of a minimum of 520MB/s, which would allow ingest and display of a minimum HDTV film. Unqualified success would be to support a total bandwidth of 726MB/s, which would represent ingest, playback and archive simultaneously.

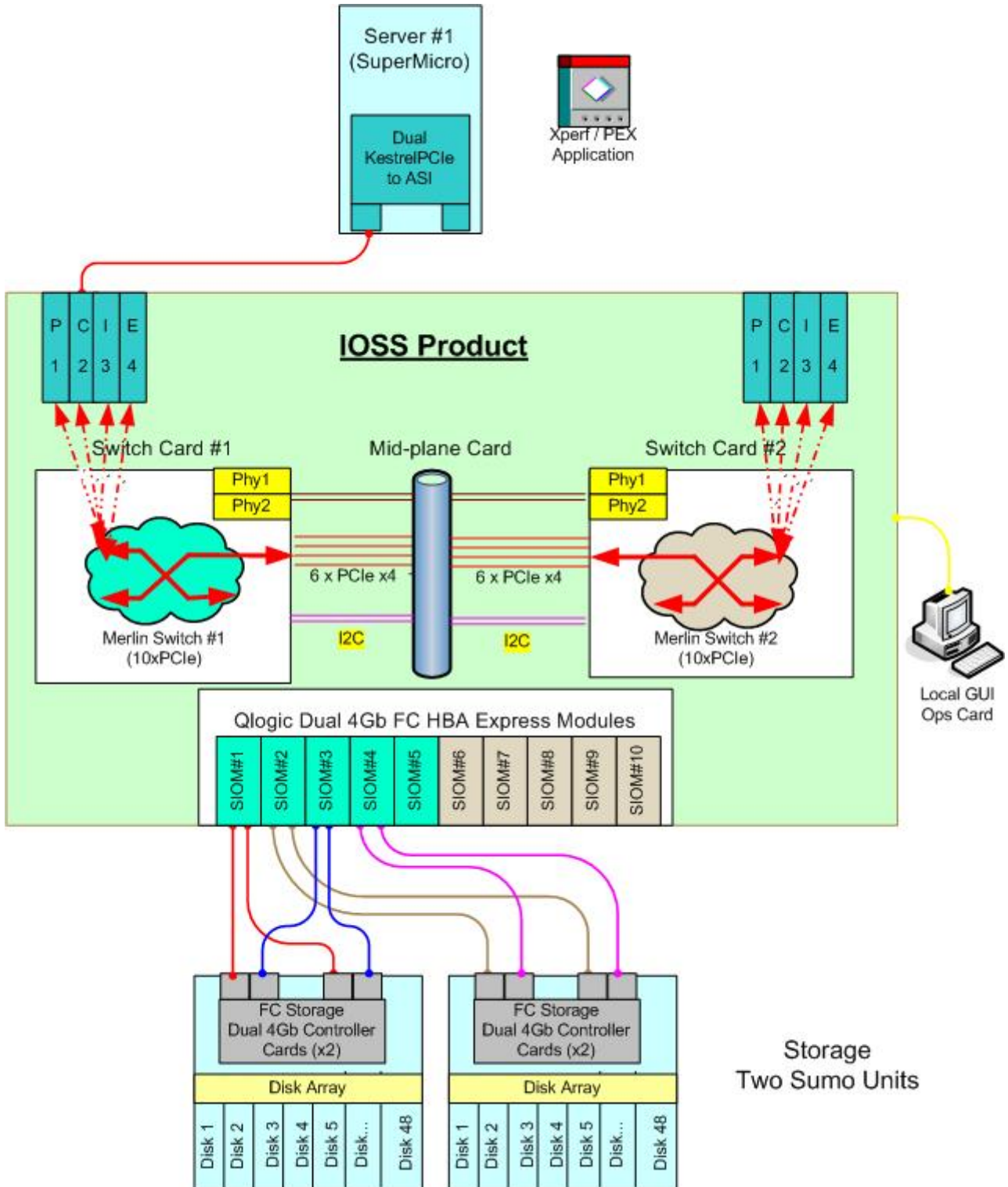
The scalable part beyond the current capability is met by the capability of IOSS to add a second switch and additional ports. However, this would also require additional storage and so for test purposes is covered by the general DVT capability of IOSS and SUMO, rather than a specific test for SIVSS.

4 System Connectivity

4.1 IOSS Single Server Connectivity

Initial bring up of the product is necessary to successfully configure the hardware to enable a data path between the Server PC and the storage product. This path mapping is achieved using the IOSS GUI Utility.

< PC Server → PCIe → Kestrel HBA → AS cable → IOSS Product → PCIe → Express Module → Storage product >



4.2 SIVSS Configuration

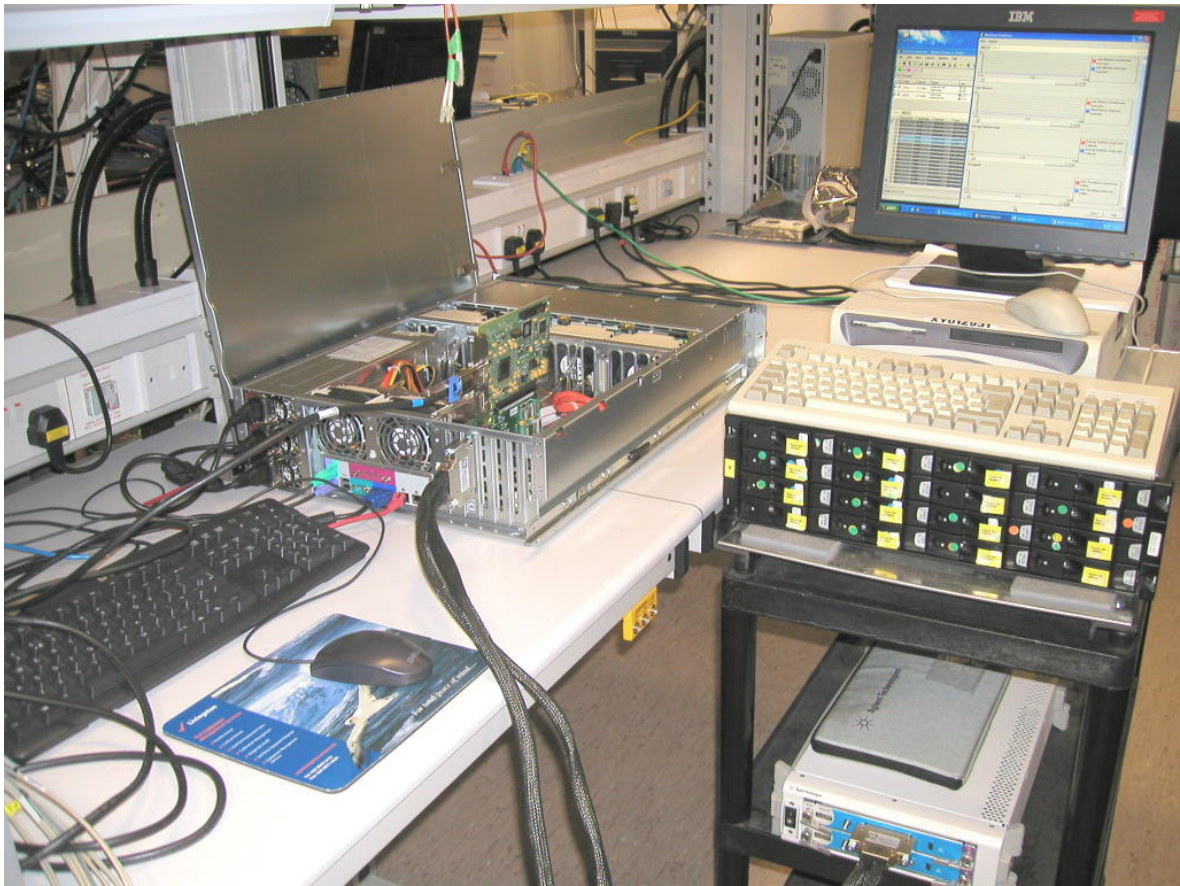
Error! Objects cannot be created from editing field codes.

4.2.1 Sumo Disk Enclosure Configuration

- **Single FC/SATA controller – Mode 3**
 - Configuration switches:
 - 1, 2, 3, 5, 6, 12 = X
 - 4 = OFF (No HA mode)
 - 7, 8 = ON, OFF (Force 2Gbps)
 - 9, 10 = OFF, OFF (Mode 3)
 - 11 = as req'd (audible alarm disable)
- **Dual I/O modules**
 - One port of each I/O module is connected to each HBA – see diagram above
- **16 x 500GB Hitachi Deskstar (Kurofune II) SATA drives – direct dock.**
 - These must be installed in 2 groups.
 - Sumo #1 should have the enclosure ID Switch set = 1 for drive numbers 0 – 15
 - Sumo #2 should have the enclosure ID Switch set = 2 for drive numbers 24 – 39

4.3 Physical Connections

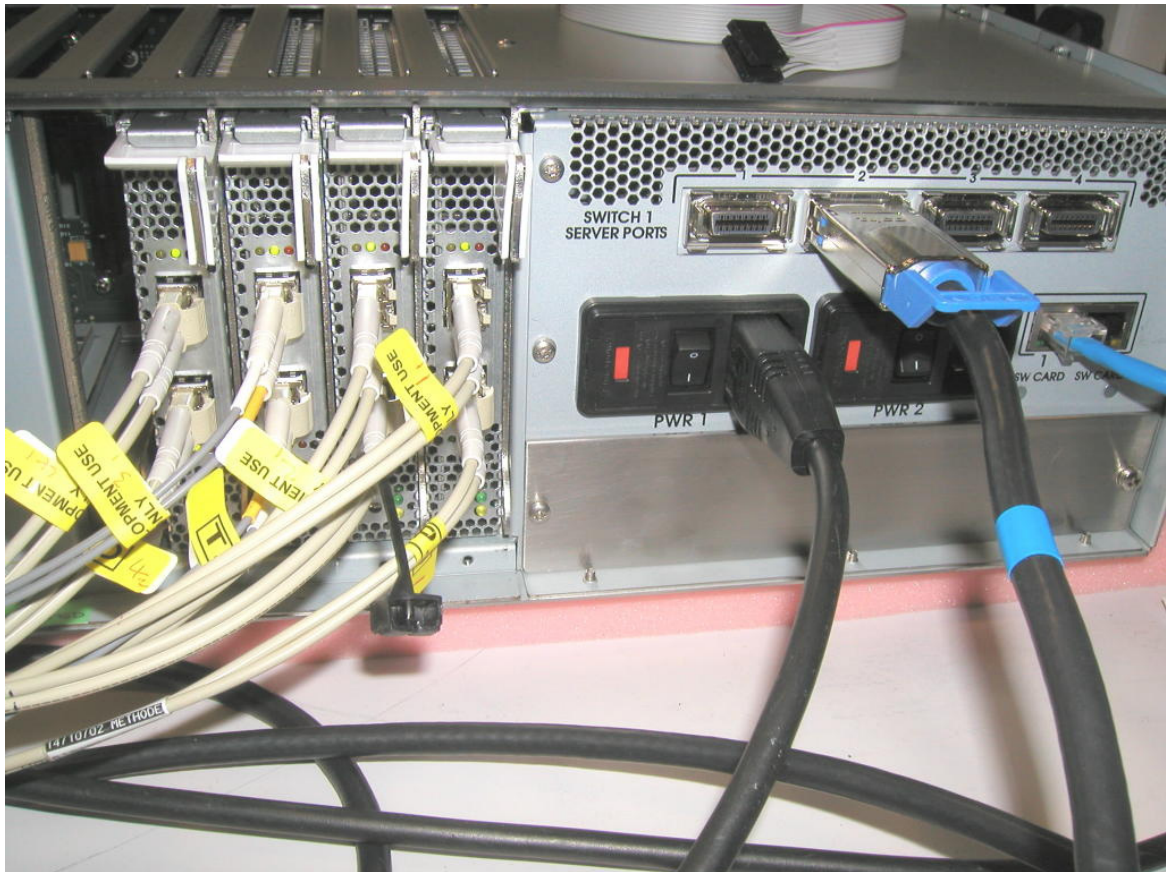
4.3.1 Server and Agilent PCIe Analyser



4.3.2 IOSS and Sumo Rack



4.3.3 IOSS Express Module Connection To Sumo Storage Units



5 Performance Measurements

5.1 Windows 2003 Server Performance – IOMETER

IOMETER Version: 2004.07.30

A series of PCIe bandwidth performance tests were executed which consisted of sequential reads with an increasing block size. The tests were initiated with a initial settling time of 5 seconds and a measurement taken over 10 seconds for each of the following block sizes:

0.5,1,2,4,8,16,32,64,128,256,512,1024,2048K Bytes.

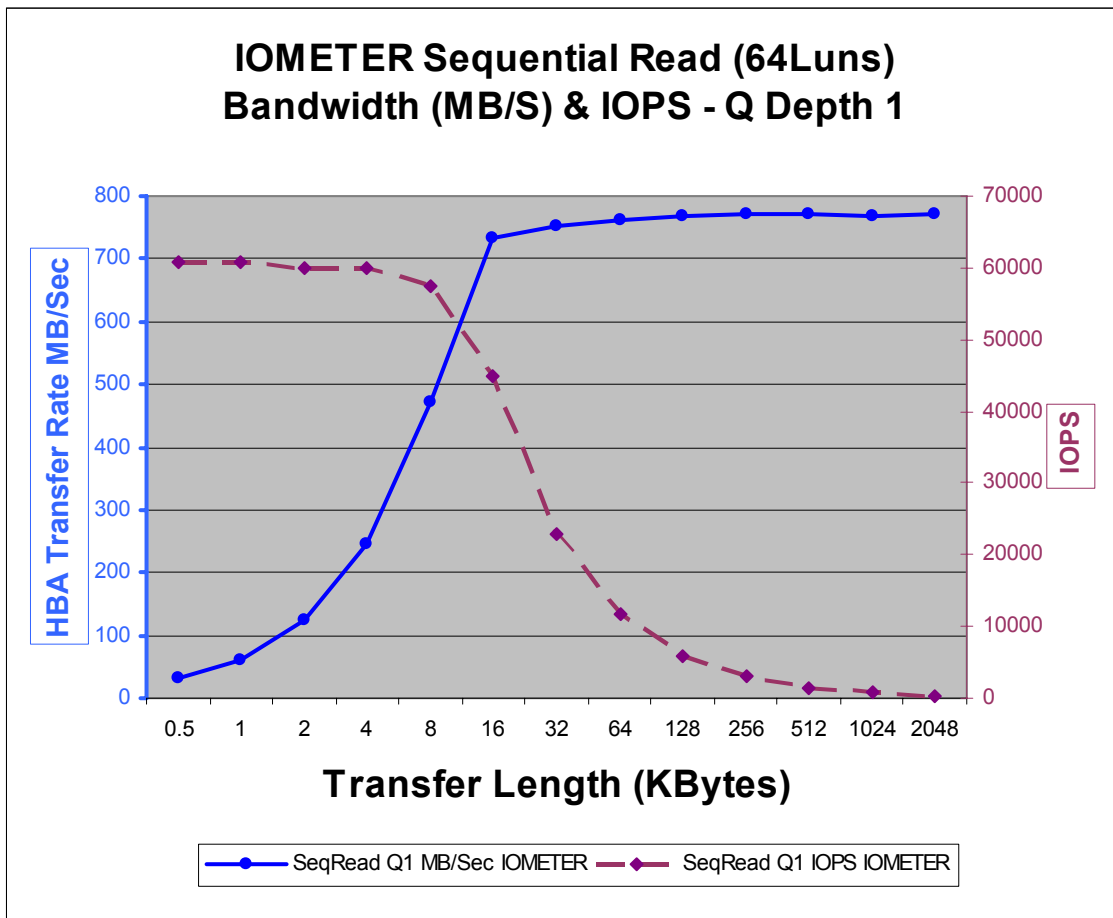
The resulting measurements were imported into an Excel spreadsheet and displayed graphically.

In addition, a separate analysis of the true data transfer rate across the PCIe/ASI interface was executed using an Agilent PCIe Analyser. The analyser adapter card used was a “Passthrough” card plugged directly into the server PCIe motherboard slot. The Kestrel PCIe/ASI adapter card was then plugged into the top of the Agilent Passthrough card and the AS cable attached to the adapter as shown in the later screenshots.

The result of the sequential read performance measurements at the high block sizes were:

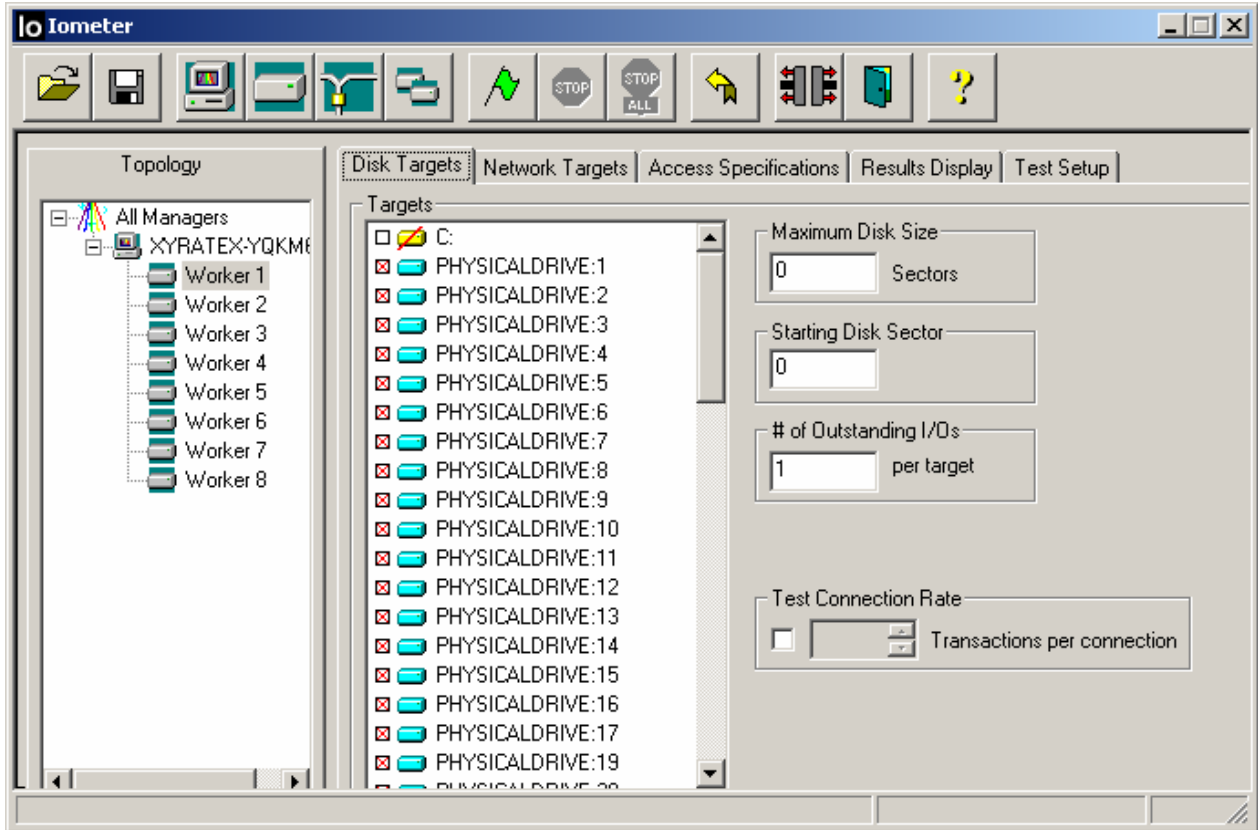
IOMETER recorded a typical throughput of approx 734MB/Sec
 Agilent PCIe Analyser recorded a typical throughput of 735MB/Sec

5.1.1 Windows 2003 Server – IOMETER Performance Graph

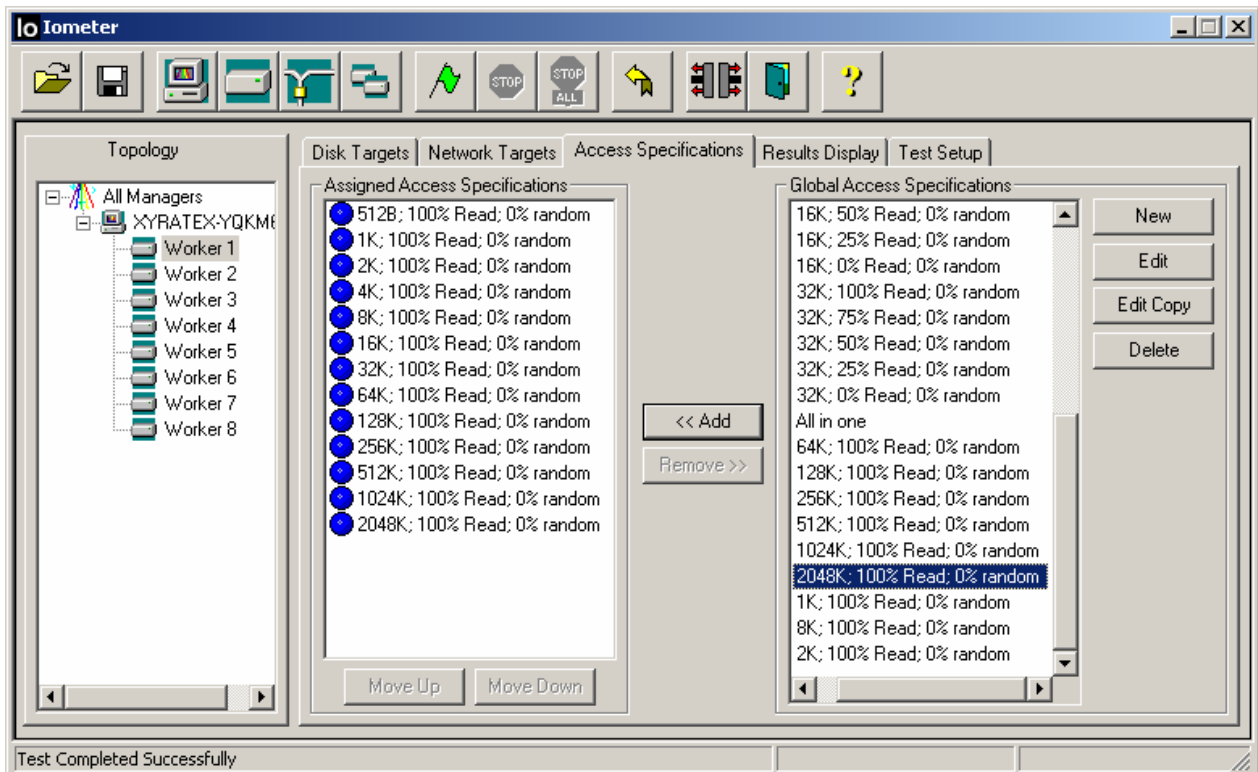


5.1.2 Windows 2003 Server – IOMETER Screenshots

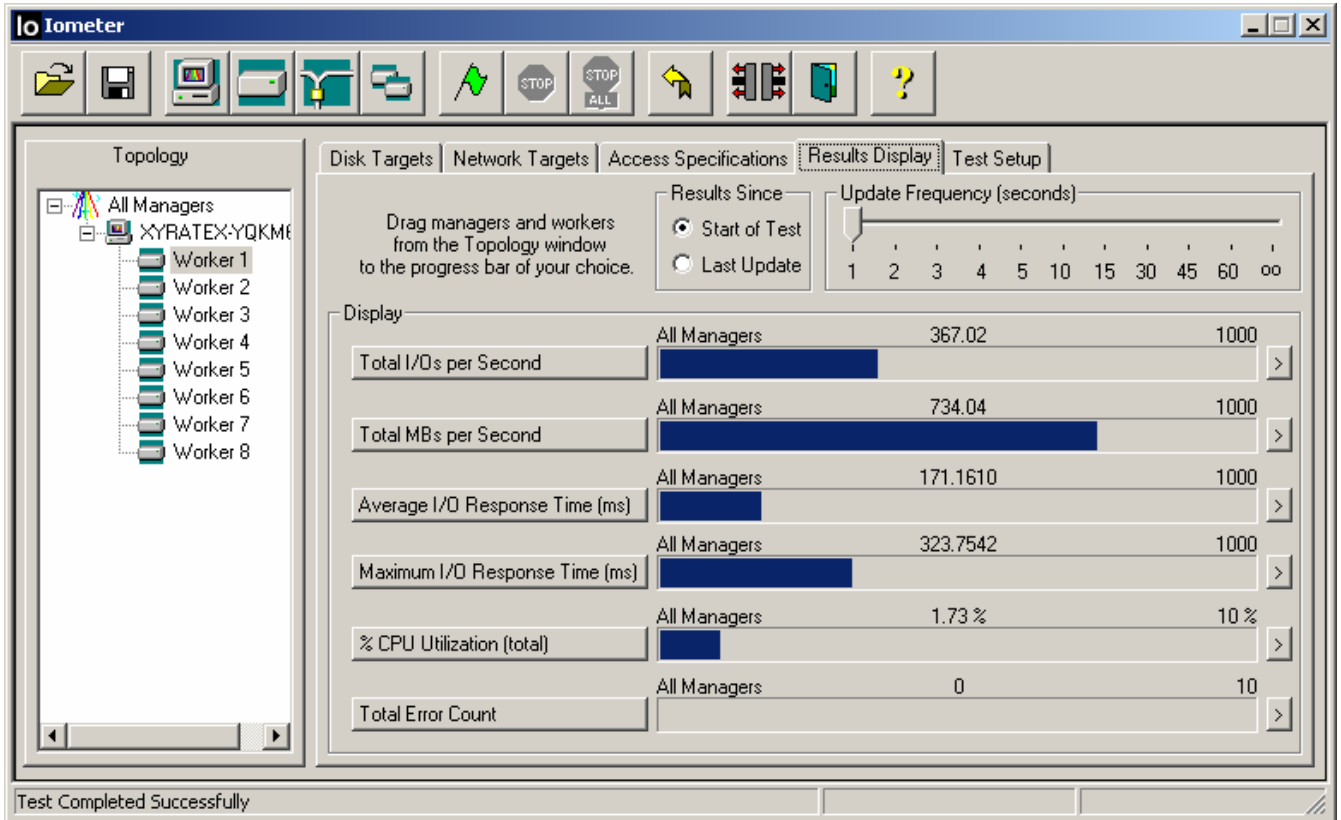
Physical Drive Targets – Physical Drive #1 to #64



Test scenarios - Block sizes from 512 up to 204K Bytes



Measurement Result – Final Block Size of 2048 Bytes



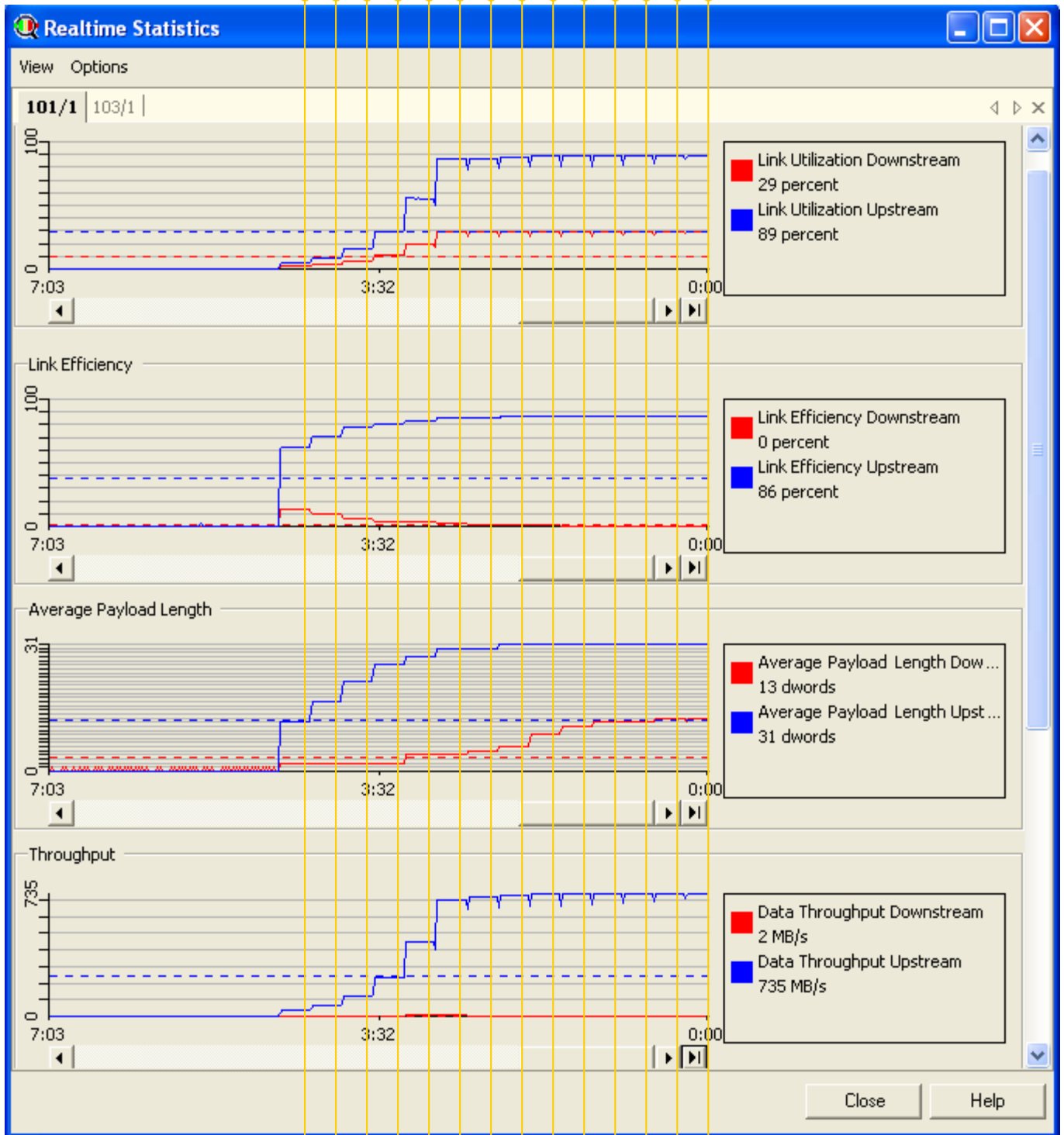
5.1.3 Windows 2003 Server – PCIe Analyser Screenshot

The Agilent PCIe Analyser in line with the Kestrel PCIe/As adapter in the server motherboard was set to record the following real time statistics:

- Link Utilization
- Link Efficiency
- Average payload length
- Throughput

Note that each of steps in the statistics correlates to one of the 14 increasing block size test parameters:

0.5 1 2 4 8 16 32 64 128 256 512 1024 2048 4096 KBytes



5.2 Linux RedHat – XPerf Performance Measurements

XPerf is a Xyratex proprietary performance measurement tool for Linux operating systems. As in IOMETER, a series of disk drive system bandwidth performance tests were executed with increasing block sizes of:

0.5,1,2,4,8,16,32,64,128,256,512,1024,2048K Bytes.

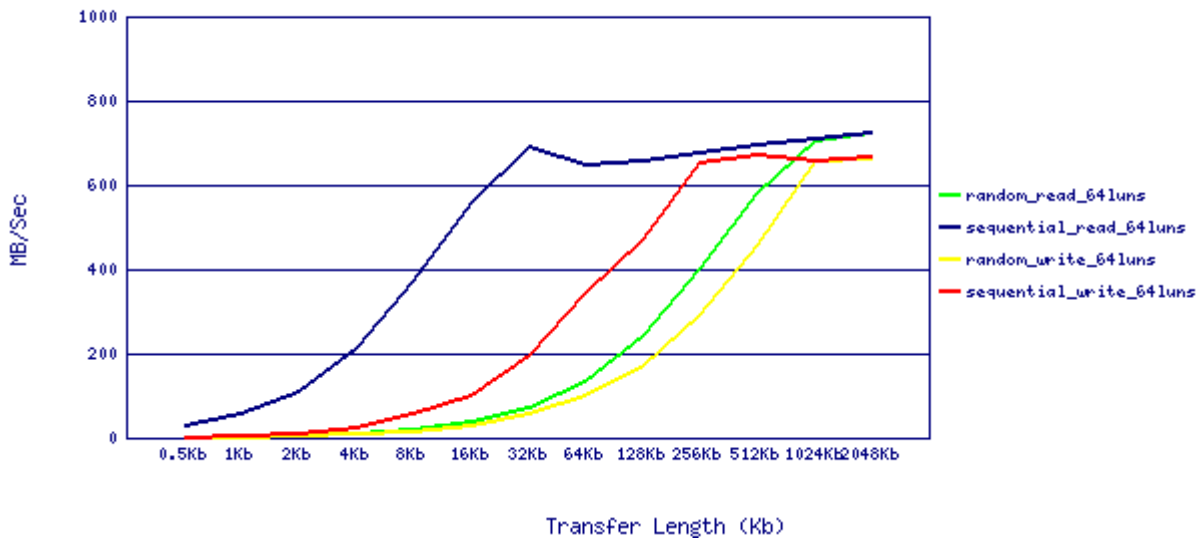
Four types of data access are executed for each of the above block sizes:

- a) Sequential Read
- b) Sequential Write
- c) Random Read
- d) Random Write

The tests are initiated and have a settling time of 5 seconds after which an average transfer rate is measured over a period of 10 seconds (extended periods of time do not provide any significant change in performance in this environment). The resulting measurements are replicated below:

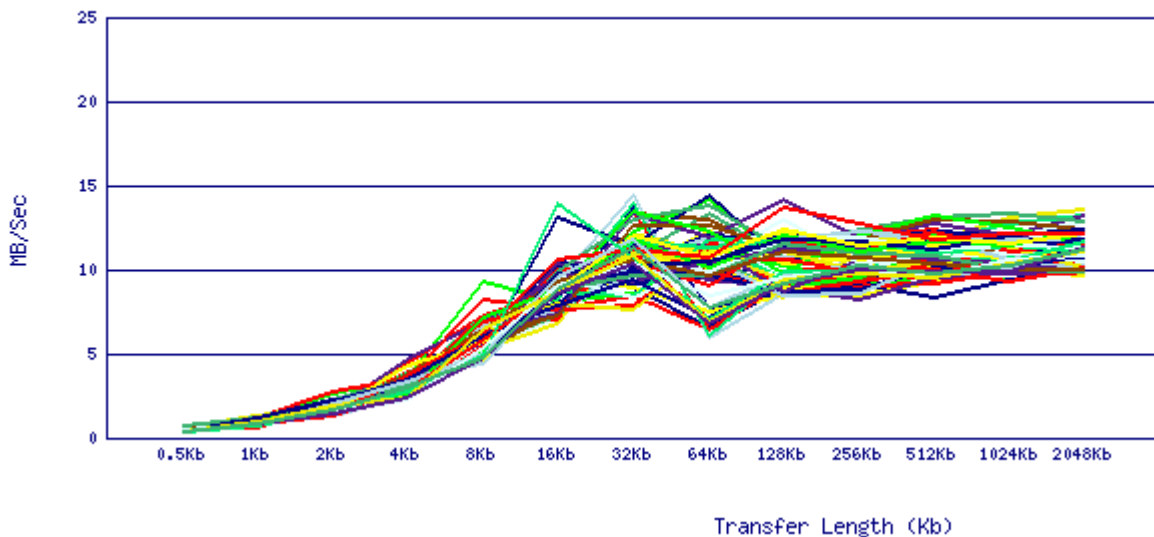
5.2.1 XPerf Composite System Performance

rate combined data

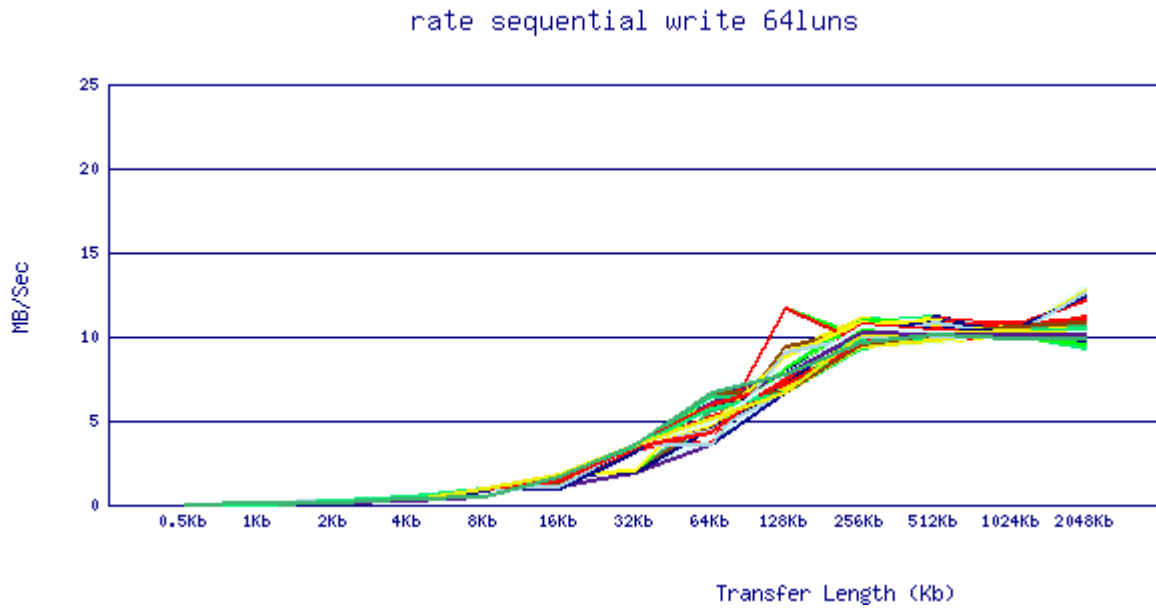


5.2.2 XPerf Individual Disk Drive SeqRead Performance Spread

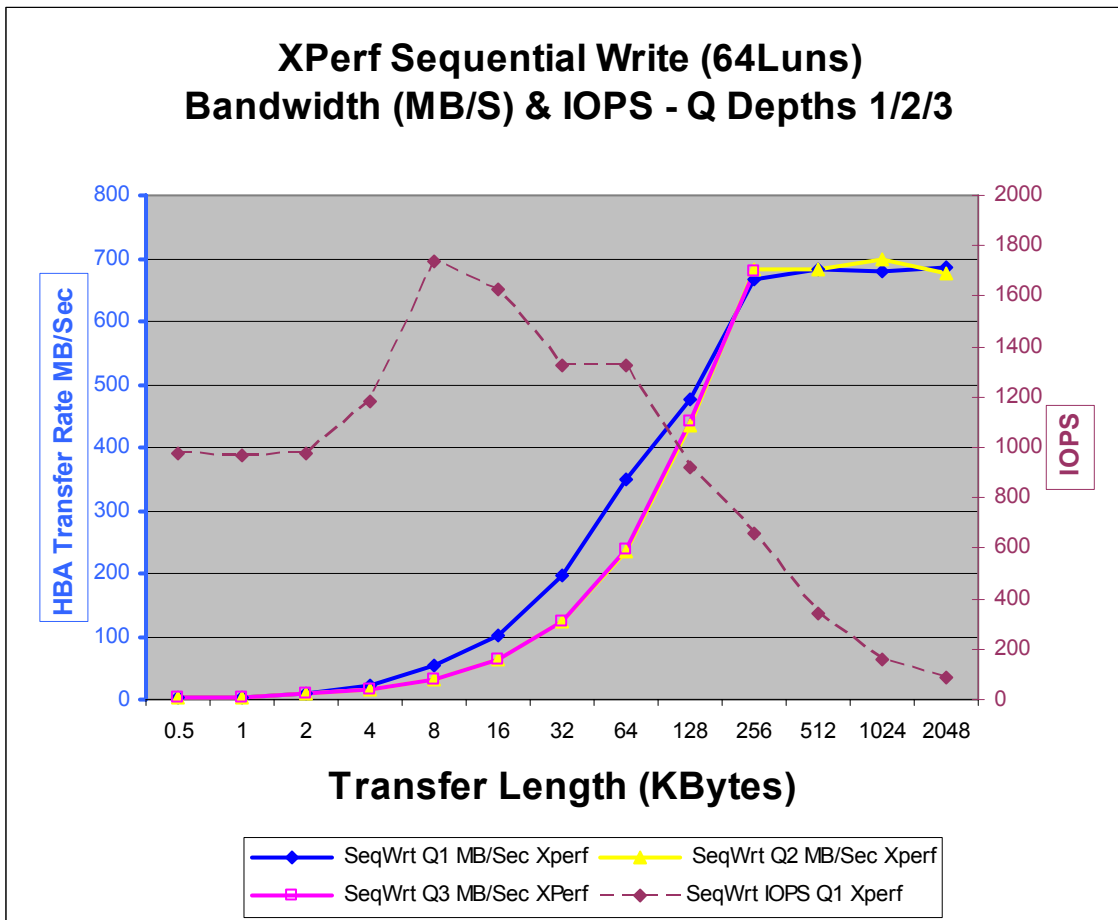
rate sequential read 64luns



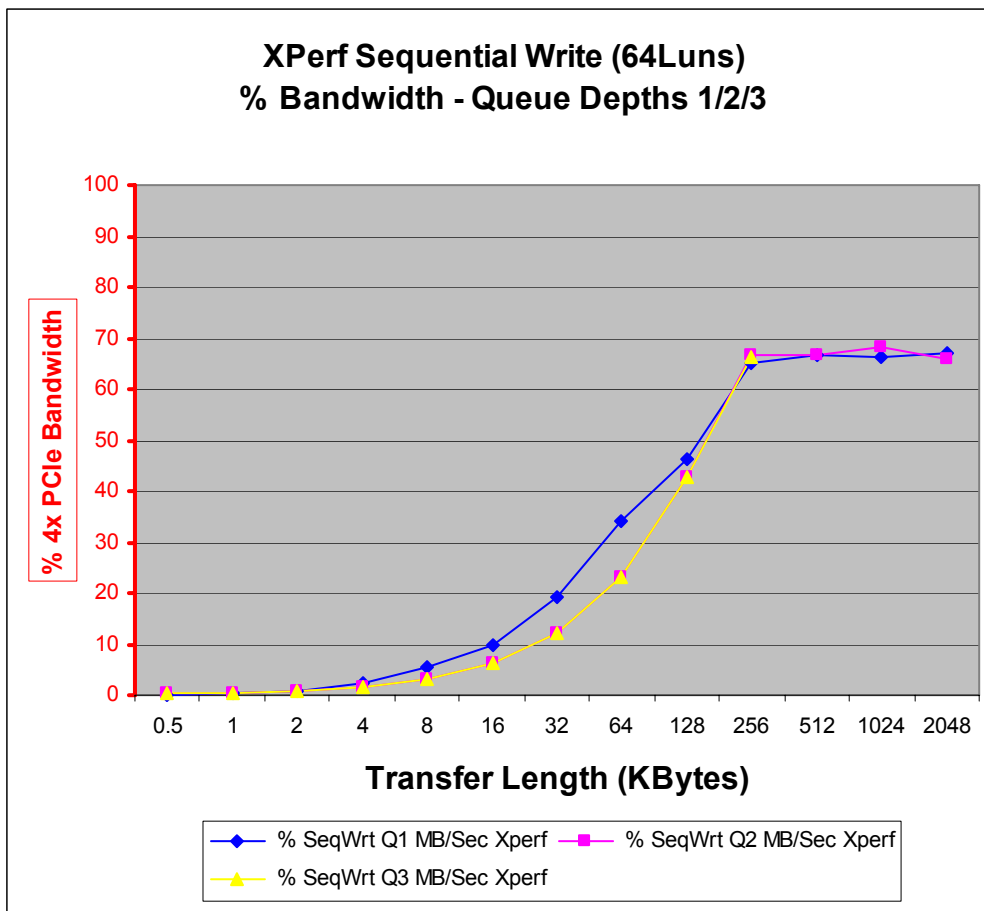
5.2.3 XPerf Individual Disk Drive SeqWrite Performance Spread



5.2.4 XPerf Composite System Performance – Queue Depths 1/2/3

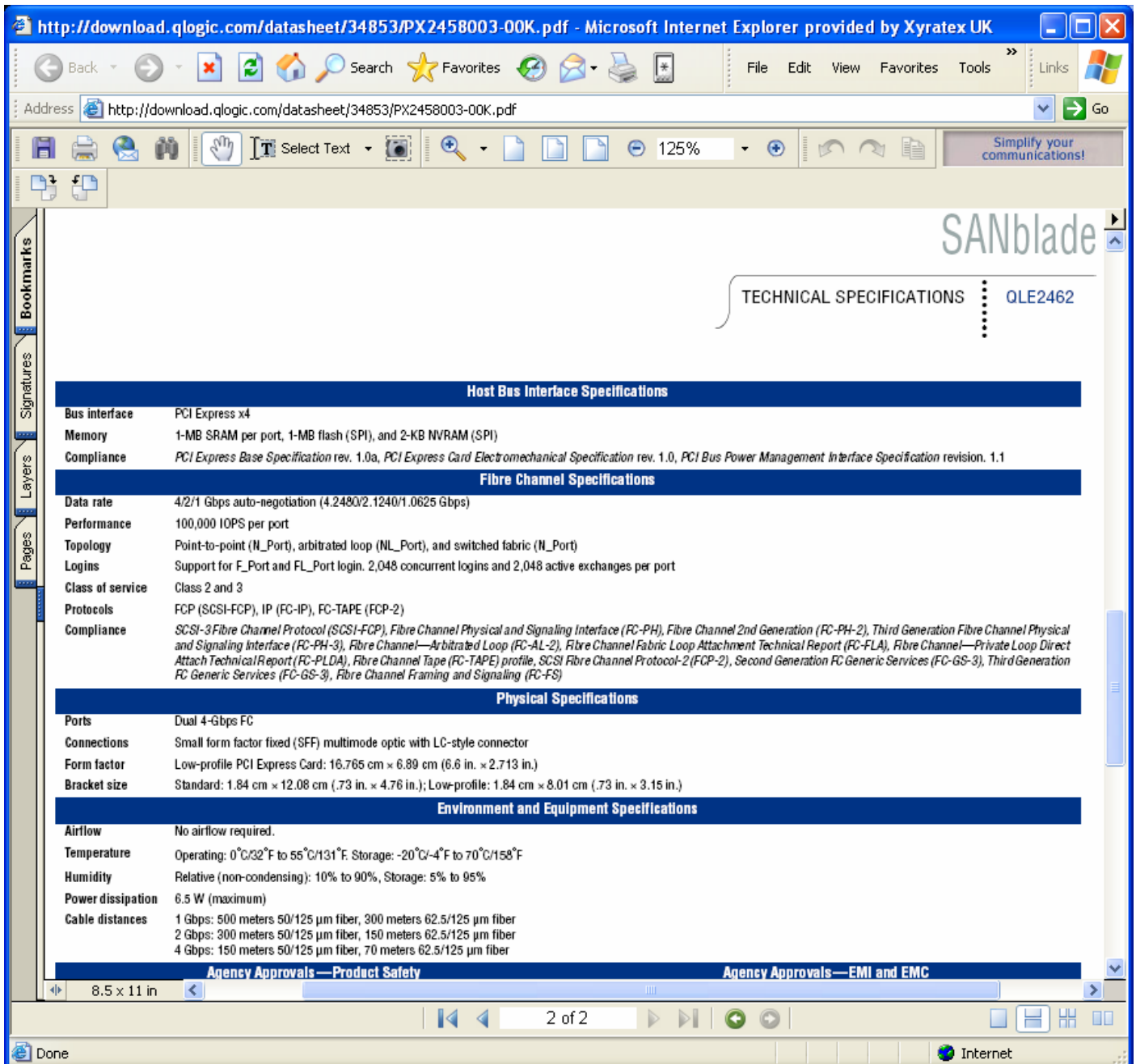


5.2.5 XPerf Composite System Bandwidth – Queue Depths 1/2/3



6 Specifications & Execution Notes/Logs

6.1 PCIe QLogic Dual 4Gb HBA Specification



http://download.qlogic.com/datasheet/34853/PX2458003-00K.pdf - Microsoft Internet Explorer provided by Xyratex UK

Address: http://download.qlogic.com/datasheet/34853/PX2458003-00K.pdf

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SANblade

TECHNICAL SPECIFICATIONS QLE2462

Host Bus Interface Specifications	
Bus interface	PCI Express x4
Memory	1-MB SRAM per port, 1-MB flash (SPI), and 2-KB NVRAM (SPI)
Compliance	PCI Express Base Specification rev. 1.0a, PCI Express Card Electromechanical Specification rev. 1.0, PCI Bus Power Management Interface Specification revision. 1.1

Fibre Channel Specifications	
Data rate	4/2/1 Gbps auto-negotiation (4.2480/2.1240/1.0625 Gbps)
Performance	100,000 IOPS per port
Topology	Point-to-point (N_Port), arbitrated loop (NL_Port), and switched fabric (N_Port)
Logins	Support for F_Port and FL_Port login. 2,048 concurrent logins and 2,048 active exchanges per port
Class of service	Class 2 and 3
Protocols	FCP (SCSI-FCP), IP (FC-IP), FC-TAPE (FCP-2)
Compliance	SCSI-3 Fibre Channel Protocol (SCSI-FCP), Fibre Channel Physical and Signaling Interface (FC-PH), Fibre Channel 2nd Generation (FC-PH-2), Third Generation Fibre Channel Physical and Signaling Interface (FC-PH-3), Fibre Channel—Arbitrated Loop (FC-AL-2), Fibre Channel Fabric Loop Attachment Technical Report (FC-FLA), Fibre Channel—Private Loop Direct Attach Technical Report (FC-PLDA), Fibre Channel Tape (FC-TAPE) profile, SCSI Fibre Channel Protocol-2 (FCP-2), Second Generation FC Generic Services (FC-GS-3), Third Generation FC Generic Services (FC-GS-3), Fibre Channel Framing and Signaling (FC-FS)

Physical Specifications	
Ports	Dual 4-Gbps FC
Connections	Small form factor fixed (SFF) multimode optic with LC-style connector
Form factor	Low-profile PCI Express Card: 16.765 cm × 6.89 cm (6.6 in. × 2.713 in.)
Bracket size	Standard: 1.84 cm × 12.08 cm (.73 in. × 4.76 in.); Low-profile: 1.84 cm × 8.01 cm (.73 in. × 3.15 in.)

Environment and Equipment Specifications	
Airflow	No airflow required.
Temperature	Operating: 0°C/32°F to 55°C/131°F. Storage: -20°C/-4°F to 70°C/158°F
Humidity	Relative (non-condensing): 10% to 90%, Storage: 5% to 95%
Power dissipation	6.5 W (maximum)
Cable distances	1 Gbps: 500 meters 50/125 µm fiber, 300 meters 62.5/125 µm fiber 2 Gbps: 300 meters 50/125 µm fiber, 150 meters 62.5/125 µm fiber 4 Gbps: 150 meters 50/125 µm fiber, 70 meters 62.5/125 µm fiber

Agency Approvals—Product Safety Agency Approvals—EMI and EMC

8.5 x 11 in 2 of 2

Done Internet

6.2 Bandwidth Test Execution Setup

6.2.1 Server PC Hardware Configuration

```
%config = ( 'enc_serial' => '20000050cc100031,20000050cc1006bc',
'cpu' => '8 x Intel(R) Xeon(TM) CPU 3.00GHz ',
'tools' => '060901',
'enclosure_id' => '2,1',
'hostname' => 'rio-test',
'hostos' => 'Linux 2.6.9-22.ELsmp i686 i686',
'ses targets' => 'XYRATEX RA4835-F2-S4 (Mode3, 1 by 16 Jbod) (fw=0600) x 4, XYRATEX RA4835-
F2-S4 (Mode3, 1 by 16 Jbod) (fw=0300) x 4',
'hbas' => 'QEM2462 (driver=8.01.00b5-rh2,fw=4.00.09,serial=D01713) x 2, QEM2462
(driver=8.01.00b5-rh2,fw=4.00.09,serial=D01395) x 2, QEM2462 (driver=8.01.00b5-rh2,fw=4.00.09,serial=D01791)
x 2, QEM2462 (driver=8.01.00b5-rh2,fw=4.00.09,serial=D01407) x 2',
'drives' => 'HDS72505 OKLA360 (fw=A51A) x 64',
'short_hostname' => 'rio-test',
'mem' => '4146820 Kb',
'drivecap' => '64 x 500.1Gb ',
'ipaddress' => '10.0.57.200
192.168.0.1');
```

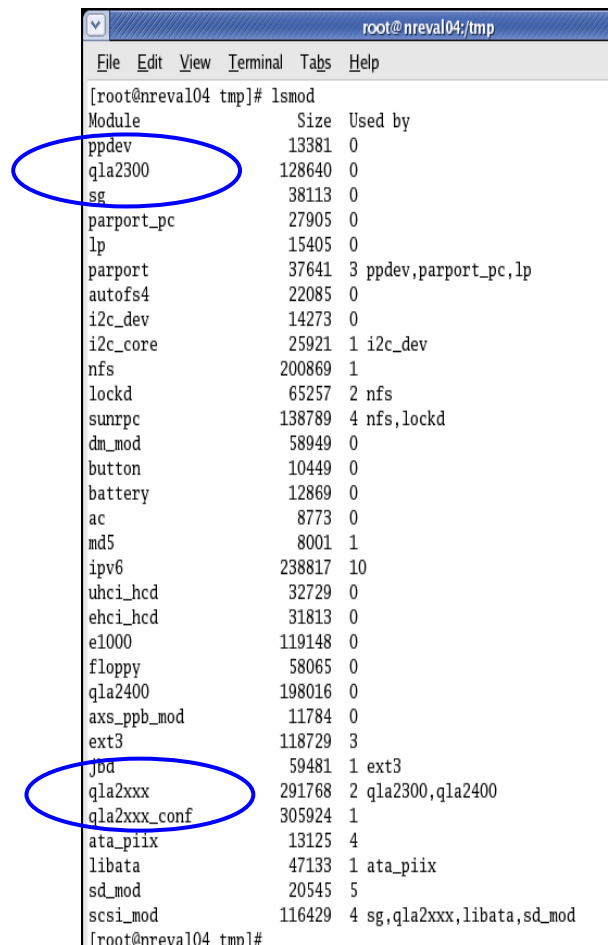
6.2.2 Server PC Software Configuration

Redhat Linux 2.6.9-11.ELsmp i686

Access to the "Jester" LAN drive (10.0.54.115)

6.2.3 Hardware Driver Configuration

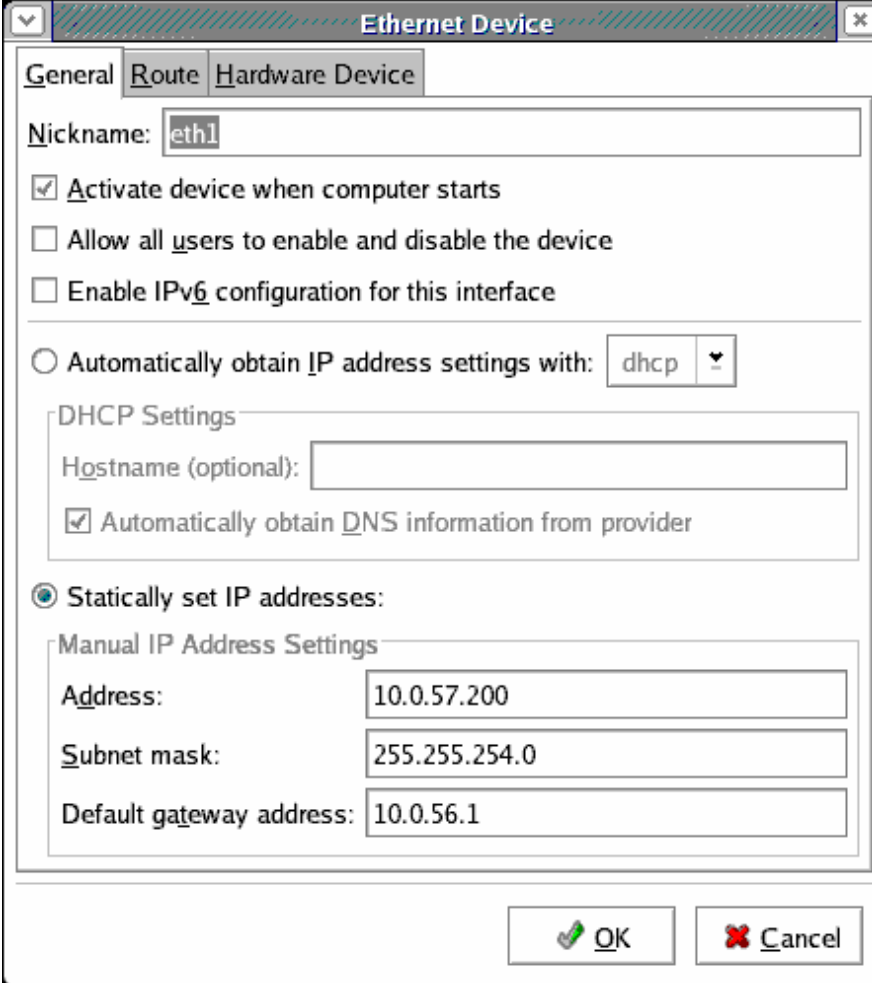
- On power up open terminal window.
- Load QLA driver by entering `<modprobe qla2300>`
- View loaded drivers by entering `<lsmod>`
- Ensure QLA2xxx driver has been loaded as follows:



```
root@nreval04/tmp
File Edit View Terminal Tabs Help
[root@nreval04 tmp]# lsmod
Module                Size  Used by
ppdev                 13381  0
qla2300               128640  0
sg                    38113  0
parport_pc           27905  0
lp                    15405  0
parport               37641  3 ppdev,parport_pc,lp
autofs4               22085  0
i2c_dev               14273  0
i2c_core              25921  1 i2c_dev
nfs                   200869  1
lockd                 65257  2 nfs
sunrpc               138789  4 nfs,lockd
dm_mod                58949  0
button                10449  0
battery               12869  0
ac                    8773  0
md5                   8001  1
ipv6                  238817  10
uhci_hcd              32729  0
ehci_hcd              31813  0
e1000                 119148  0
floppy                58065  0
qla2400               198016  0
axs_ppb_mod           11784  0
ext3                  118729  3
jbd                   59481  1 ext3
qla2xxx               291768  2 qla2300,qla2400
qla2xxx_conf          305924  1
ata_piix              13125  4
libata                47133  1 ata_piix
sd_mod                20545  5
scsi_mod              116429  4 sg,qla2xxx,libata,sd_mod
[root@nreval04 tmp]#
```

6.2.4 Environment Setup

The server must have a static network IP address as follows:



Ensure DNS hostname is recognised by TMS server (10.0.54.115).

Mount “Test” environment from ESTEEM as follows:

- a) `mkdir /test`
- b) `mount 10.0.54.115:/test /test`
- c) `/test/scripts/setup_host`

NB:- This should print out numerous test system status messages

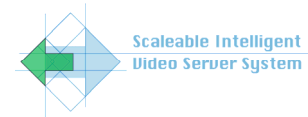
To activate the test environment “Logout” and “LogIn” or run:
`./test/setupenv`

6.2.5 Select Xyratex SUMO disks

Test with queue depth = 1 and transfer lengths from 1 to 2048Kb

- a) `cd /tmp`
- b) `rescan`
- c) `list_scsi | grep -i KVN | awk '{print$1}' > ioss_disks`
- d) `cat ioss_disks` (displays drives selected for test)
- e) version 060901 (current version of xperf)
- f) `xperf -t 10 -q 1 -x 1,2,4,8,16,32,64,128,256,512,1024,2048,4096 -f ioss_disks`

Results will be stored in /tmp folder as pdf and html files.



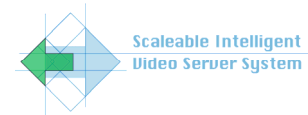
6.2.6 XPerf Execution Log File

```

Logfile /tmp/snap_060907_1243_pid1160.log opened on Thu Sep 7 12:43:48 2006 Debug Level = 127
Thu Sep 7 12:43:48 2006: Running script: /test.root/tools/snap -t host
Thu Sep 7 12:43:48 2006: exec_cmd: executing version | grep "you are using version"
Thu Sep 7 12:43:48 2006: exec_cmd: return code 0
Thu Sep 7 12:43:48 2006: exec_cmd: you are using version 060901 of the test tools from
/test/releases/testtools/xtt-tools-060901
Thu Sep 7 12:43:48 2006: Collecting devices
Thu Sep 7 12:43:48 2006: exec_cmd: executing list_cemi
Thu Sep 7 12:44:12 2006: exec_cmd: return code 0
Thu Sep 7 12:44:12 2006: exec_cmd: sg0 Serial_no=20000050cc1006bc Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=03 fw_b=03
Thu Sep 7 12:44:12 2006: exec_cmd: sg9 Serial_no=20000050cc1006bc Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=03 fw_b=03
Thu Sep 7 12:44:12 2006: exec_cmd: sg18 Serial_no=20000050cc100031 Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=06 fw_b=06
Thu Sep 7 12:44:12 2006: exec_cmd: sg27 Serial_no=20000050cc100031 Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=06 fw_b=06
Thu Sep 7 12:44:12 2006: exec_cmd: sg36 Serial_no=20000050cc1006bc Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=03 fw_b=03
Thu Sep 7 12:44:12 2006: exec_cmd: sg45 Serial_no=20000050cc1006bc Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=03 fw_b=03
Thu Sep 7 12:44:12 2006: exec_cmd: sg54 Serial_no=20000050cc100031 Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=06 fw_b=06
Thu Sep 7 12:44:12 2006: exec_cmd: sg63 Serial_no=20000050cc100031 Vend=XYRATEX Prod=RA4835-F2-S4
fw_a=06 fw_b=06
Thu Sep 7 12:44:12 2006: spec = [ANSI]Thu Sep 7 12:44:12 2006: setting [verbose] => [2]Thu Sep 7 12:44:12
2006: setting [spec] => [ANSI]Thu Sep 7 12:44:12 2006: setting [no_pl_fix] => [1]Thu Sep 7 12:44:12 2006:
setting [pagecode] => [1]Thu Sep 7 12:44:12 2006: changing [pagecode]Thu Sep 7 12:44:12 2006: setting
[device] => [/dev/sg18]Thu Sep 7 12:44:12 2006: calling [DecodePage1]Thu Sep 7 12:44:12 2006: setting
[pagecode] => [1]Thu Sep 7 12:44:12 2006: changing [pagecode]Thu Sep 7 12:44:12 2006: reading SES dataThu
Sep 7 12:44:12 2006: Using func ReadPage1Thu Sep 7 12:44:12 2006: DBG: pc=[0x1] len=[]
Thu Sep 7 12:44:12 2006: exec_cmd: executing xscsi -c rd -d /dev/sg18 --pagecode 0x1 -o --pcv 1 --
allocation_length ffff -fcp_dl ffff
Thu Sep 7 12:44:12 2006: exec_cmd: return code 0
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: XScsi(c) Xyratex 2003,2004 | Authors: P.Backhouse / G.Foster
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: command: ReceiveDiagnosticResults
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: cdb: 1c 01 01 ff ff 00
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: Requesting 65535 bytes of parameter data
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: fcp_dl: 0xffff
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: Raw sense:00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: status: good
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: FC Driver reports underrun of requested frame size of 65535 by 65427 only
dumping 108 bytes
Thu Sep 7 12:44:12 2006: exec_cmd:
Thu Sep 7 12:44:12 2006: exec_cmd: data: 01 00 00 68 00 00 00 14 00 00 09 3c 20 00 00 50 cc 10 00 31 58
59 52 41 54 45 58 20 52 41 34 38 33 35 2d 46 32 2d 53 34 20 20 20 20 30 36 30 36 4f 50 53 34 39 36 36 37 30
30 30 30 30 30 30 0b 00 00 00 00 00 00 00 00 00 03 01 30 00 00 02 03 00 00 03 03 00 00 04 05 00 00 06 01 00 00 07
02 00 00 0c 01 00 00 80 02 00 00 83 02 00 00
Thu Sep 7 12:44:12 2006: exec_cmd: executing sg_inq /dev/sg18
Thu Sep 7 12:44:12 2006: exec_cmd: return code 0
Thu Sep 7 12:44:12 2006: exec_cmd: standard INQUIRY:
Thu Sep 7 12:44:12 2006: exec_cmd: PQual=0, Device_type=13, RMB=0, ANSI version=4, [full version=0x04]
Thu Sep 7 12:44:12 2006: exec_cmd: AERC=0, TrmTsk=0, NormACA=0, HiSUP=0, Resp data format=2, SCCS=0
Thu Sep 7 12:44:12 2006: exec_cmd: BQue=1, EncServ=1, MultiP=0, MChngr=0, ACKREQQ=0, Addr16=0
Thu Sep 7 12:44:12 2006: exec_cmd: RelAdr=0, WBus16=0, Sync=0, Linked=0, TranDis=0, CmdQue=0
Thu Sep 7 12:44:12 2006: exec_cmd: Clocking=0x0, QAS=0, IUS=0
Thu Sep 7 12:44:12 2006: exec_cmd: length=96 (0x60) Peripheral device type: enclosure services device
Thu Sep 7 12:44:12 2006: exec_cmd: Vendor identification: XYRATEX
Thu Sep 7 12:44:12 2006: exec_cmd: Product identification: SES Processor
Thu Sep 7 12:44:12 2006: exec_cmd: Product revision level: 0600
Thu Sep 7 12:44:12 2006: exec_cmd: Product serial number: IMS6805131625E6
Thu Sep 7 12:44:12 2006: spec = [ANSI]Thu Sep 7 12:44:12 2006: setting [verbose] => [2]Thu Sep 7 12:44:12
2006: setting [spec] => [ANSI]Thu Sep 7 12:44:12 2006: setting [no_pl_fix] => [1]Thu Sep 7 12:44:12 2006:
setting [pagecode] => [1]Thu Sep 7 12:44:12 2006: changing [pagecode]Thu Sep 7 12:44:12 2006: setting
[device] => [/dev/sg0]Thu Sep 7 12:44:12 2006: calling [DecodePage1]Thu Sep 7 12:44:12 2006: setting

```

```
[pagecode] => [1]Thu Sep 7 12:44:12 2006: changing [pagecode]Thu Sep 7 12:44:12 2006: reading SES dataThu
Sep 7 12:44:12 2006: Using func ReadPage1Thu Sep 7 12:44:12 2006: DBG: pc=[0x1] len=[]
Thu Sep 7 12:44:12 2006: exec_cmd: executing xscsi -c rd -d /dev/sg0 --pagecode 0x1 -o --pcv 1 --
allocation_length ffff -fcp_dl ffff
Thu Sep 7 12:44:13 2006: exec_cmd: return code 0
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: XScsi(c) Xyratex 2003,2004 | Authors: P.Backhouse / G.Foster
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: command: ReceiveDiagnosticResults
Thu Sep 7 12:44:13 2006: exec_cmd: cdb: 1c 01 01 ff ff 00
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: Requesting 65535 bytes of parameter data
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: fcp_dl: 0xffff
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: Raw sense:00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: status: good
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: FC Driver reports underrun of requested frame size of 65535 by 65427 only
dumping 108 bytes
Thu Sep 7 12:44:13 2006: exec_cmd:
Thu Sep 7 12:44:13 2006: exec_cmd: data: 01 00 00 68 00 00 00 00 00 00 09 3c 20 00 00 50 cc 10 06 bc 58
59 52 41 54 45 58 20 52 41 34 38 33 35 2d 46 32 2d 53 34 20 20 20 20 30 33 30 33 4f 50 53 34 39 36 36 37 30
30 30 30 30 30 07 00 00 00 00 00 00 00 00 03 01 30 00 00 02 03 00 00 03 03 00 00 04 05 00 00 06 01 00 00 07
02 00 00 0c 01 00 00 80 02 00 00 83 02 00 00
Thu Sep 7 12:44:13 2006: exec_cmd: executing sg_inq /dev/sg0
Thu Sep 7 12:44:13 2006: exec_cmd: return code 0
Thu Sep 7 12:44:13 2006: exec_cmd: standard INQUIRY:
Thu Sep 7 12:44:13 2006: exec_cmd: PQual=0, Device_type=13, RMB=0, ANSI version=4, [full version=0x04]
Thu Sep 7 12:44:13 2006: exec_cmd: AERC=0, TrmTsk=0, NormACA=0, HiSUP=0, Resp data format=2, SCCS=0
Thu Sep 7 12:44:13 2006: exec_cmd: BQue=1, EncServ=1, MultiP=0, MChngr=0, ACKREQQ=0, Adr16=0
Thu Sep 7 12:44:13 2006: exec_cmd: RelAdr=0, WBus16=0, Sync=0, Linked=0, TranDis=0, CmdQue=0
Thu Sep 7 12:44:13 2006: exec_cmd: Clocking=0x0, QAS=0, IUS=0
Thu Sep 7 12:44:13 2006: exec_cmd: length=96 (0x60) Peripheral device type: enclosure services device
Thu Sep 7 12:44:13 2006: exec_cmd: Vendor identification: XYRATEX
Thu Sep 7 12:44:13 2006: exec_cmd: Product identification: SES Processor
Thu Sep 7 12:44:13 2006: exec_cmd: Product revision level: 0300
Thu Sep 7 12:44:17 2006: exec_cmd: executing ls -l /proc/scsi/qla*/ * | sort -u
Thu Sep 7 12:44:17 2006: exec_cmd: return code 0
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/2
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/3
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/4
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/5
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/6
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/7
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/8
Thu Sep 7 12:44:17 2006: exec_cmd: /proc/scsi/qla2xxx/9
Thu Sep 7 12:44:17 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/2
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/2
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/2
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01791
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/3
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/3
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/3
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01791
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/4
```



```

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/4

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/4

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01407
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/5

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/5

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/5

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01407
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/6

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/6

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/6

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01395
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/7

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/7

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/7

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01395
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/8

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/8

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/8

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01713
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "QLogic PCI to Fibre Channel Host Adapter for"
/proc/scsi/qla2xxx/9

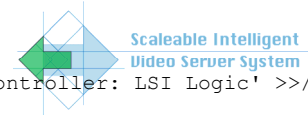
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: QLogic PCI to Fibre Channel Host Adapter for QEM2462:
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Firmware version" /proc/scsi/qla2xxx/9

Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: Firmware version 4.00.09 [IP] , Driver version 8.01.00b5-rh2
Thu Sep 7 12:44:18 2006: exec_cmd: executing grep "Serial#" /proc/scsi/qla2xxx/9

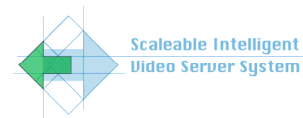
Thu Sep 7 12:44:18 2006: exec_cmd: return code 0
Thu Sep 7 12:44:18 2006: exec_cmd: ISP: ISP2432, Serial# D01713
Thu Sep 7 12:44:18 2006: exec_cmd: executing cat /proc/scsi/mptsas/*
Thu Sep 7 12:44:18 2006: exec_cmd: return code 1
Thu Sep 7 12:44:18 2006: exec_cmd: cat: /proc/scsi/mptsas/*: No such file or directory

```

5.1 SIVSS Integration-ready switch HW platform revB.doc



```
Thu Sep 7 12:44:18 2006: exec_cmd: executing lspci | grep 'RAID bus controller: LSI Logic' >>/dev/null
Thu Sep 7 12:44:18 2006: exec_cmd: return code 1
Thu Sep 7 12:44:18 2006: snap: %config = (
Thu Sep 7 12:44:18 2006: snap:      'enc_serial' => '20000050cc100031,20000050cc1006bc',
Thu Sep 7 12:44:18 2006: snap:      'cpu' => '8 x Intel(R) Xeon(TM) CPU 3.00GHz ',
Thu Sep 7 12:44:18 2006: snap:      'tools' => '060901',
Thu Sep 7 12:44:18 2006: snap:      'enclosure_id' => '2,1',
Thu Sep 7 12:44:18 2006: snap:      'hostname' => 'rio-test',
Thu Sep 7 12:44:18 2006: snap:      'hostos' => 'Linux 2.6.9-22.ELsmp i686 i686',
Thu Sep 7 12:44:18 2006: snap:      'ses_targets' => 'XYRATEX RA4835-F2-S4      (Mode3, 1 by 16 Jbod)
(fw=0600) x 4, XYRATEX RA4835-F2-S4      (Mode3, 1 by 16 Jbod) (fw=0300) x 4',
Thu Sep 7 12:44:18 2006: snap:      'hbas' => 'QEM2462 (driver=8.01.00b5-
rh2,fw=4.00.09,serial=D01713) x 2, QEM2462 (driver=8.01.00b5-rh2,fw=4.00.09,serial=D01395) x 2, QEM2462
(driver=8.01.00b5-rh2,fw=4.00.09,serial=D01791) x 2, QEM2462 (driver=8.01.00b5-rh2,fw=4.00.09,serial=D01407)
x 2',
Thu Sep 7 12:44:18 2006: snap:      'drives' => 'HDS72505 0KLA360 (fw=A51A) x 64',
Thu Sep 7 12:44:18 2006: snap:      'short_hostname' => 'rio-test',
Thu Sep 7 12:44:18 2006: snap:      'mem' => '4146820 Kb',
Thu Sep 7 12:44:18 2006: snap:      'drivecap' => '64 x 500.1Gb ',
Thu Sep 7 12:44:18 2006: snap:      'ipaddress' => '10.0.57.200
Thu Sep 7 12:44:18 2006: snap: 192.168.0.1'
Thu Sep 7 12:44:18 2006: snap:      );
Logfile closed at Thu Sep 7 12:44:18 2006
```



6.3 Bandwidth Specifications

PCI Express Theoretical Bandwidth		
Bandwidth of x1 encoded PCIe Lane	2.5	Gb/Sec (Unidirectional)
Bandwidth of x1 unencoded PCIe Lane	2	Gb/Sec (Unidirectional)
Bandwidth of x4 unencoded Lane PCIe	8	Gb/Sec (Unidirectional)
Bandwidth available to HBA - MBytes	1024	MB/Sec (Unidirectional)

Qlogic Adapter Specifications - QLE 2462 (Dual 4Gb FC)		
Spec bandwidth of QLogic HBA	849.6	MBps/Port (FDX)
	424.8	MBps per Unidirectional FC link
	849.6	MBps per HBA (Unidirectional)
	6959923	kBps per HBA
Spec IOPS per port (per FC link)	100000	Max IOPS per FC link

SUMO Configuration	
MODEL	: RA 4835-F2-SBD-1
DRIVES	: Hitachi Deskstar SATA HDS725050KLA360
SIZE	: 16 x 500 GByte

7 Revision History

Version	Date	Author
0.1	12Sep06	Mike Cuff
Initial version for review		
0.2	13Sep06	Mike Cuff
Minor textual and graph (axis description) corrected New section referencing SIVSS requirements		