SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS ETERNUS3000 MODEL 400

SPC-1 V1.6

Submitted for Review: February 13, 2003
Accepted: April 14, 2003

First Edition – February 2003

Trademarks

Notes

The following terms, used in this document, are defined as:

- Kilobyte (KB) is equal to 1,000 (10^3) bytes.
- Megabyte (MB) is equal to 1,000,000 (10^6) bytes.
- Gigabyte (GB) is equal to 1,000,000,000 (10^9) bytes.
- Terabyte (TB) is equal to 1,000,000,000,000 (10^{12}) bytes.

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AUDIT CERTIFICATION

Fujitsu Limited
Fujitsu Technology Solutions, Inc.
C. A. (Sandy) Wilson
1250 East Arques Ave.
P.O. Box 3470
Sunnyvale, CA 94088-3470

February 13, 2003

The SPC Benchmark 1™ results listed below for the Fujitsu Storage Systems ETERNUS3000 Model 400 were produced in compliance with the SPC Benchmark 1™ Onsite Audit requirements.

SPC Benchmark 1™ Results	
Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS3000 Model 400	
Metric	**Reported Result**
SPC-1 IOPS™	17,545.88
SPC-1 Price-Performance	$37.92/SPC-1 IOPS™
Total ASU Capacity	2,075.52 GB
Data Protection Level	Mirroring
SPC-1 LRT™	1.77 ms
Total TSC Price (including three-year maintenance)	$665,379

The following SPC Benchmark 1™ Onsite Audit requirements were verified:

- A Letter of Good Faith, signed by a senior executive on company letterhead.
- The following Data Repository storage items were verified by information supplied by the Test Sponsor as well as physical inspection:
  - ✓ Physical Storage Capacity and requirements.
  - ✓ Configured Storage Capacity and requirements.
  - ✓ Addressable Storage Capacity and requirements.
  - ✓ Capacity of each Logical Volume and requirements.
  - ✓ Capacity of each Application Storage Unit (ASU) and requirements.
- An appropriate diagram of the Benchmark Configuration (BC)/Tested Storage Configuration (TSC).

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- Physical verification of the BC/TSC components to match the above diagram.
- Listings and commands to configure the BC/TSC.
- The type of Host System including the number of processors and main memory.
- The presence and version number of the Workload Generator on the Host System.
- The TSC boundary within the Host System.
- The execution of each Test, Test Phase, and Test Run was observed and found compliant with all of the requirements and constraints of Clauses 4 and 5 of the SPC-1 benchmark specification.
- The Test Results Files and resultant Summary Results Files produced for each of following were authentic, accurate, and compliant with all of the requirements and constraints of Clauses 4 and 5 of the SPC-1 benchmark specification:
  - ✓ Data Persistence Test
  - ✓ Sustainability Test Phase
  - ✓ IOPS Test Phase
  - ✓ Response Time Ramp Test Phase
  - ✓ Repeatability Test
- There were no differences between the benchmarked TSC and priced TSC.
- The final version of the pricing spreadsheet met all of the requirements and constraints of Clause 8 of the SPC-1 benchmark specification.
- The Full Disclosure Report (FDR) met all of the requirements in Clause 9 of the SPC-1 Benchmark Specification.

Audit Notes:

There are no audit notes or exceptions.

Respectfully,

Walter E. Baker

Walter E. Baker
SPC Auditor

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LETTER OF GOOD FAITH

FUJITSU LIMITED
6-1, Marunouchi 1-chome, Chiyoda-ku, Tokyo 100-8211 Japan
Telephone : 03-3216-3211 Fax : 03-3213-7174

Date: 2003/2/5

From: Yasuo Kurihara, Director, Enterprise System Group

To: Walter E. Baker, SPC Administrator and Auditor, Gradient Systems

Subject: Letter of Good Faith for the SPC Benchmark-1 results published on the Fujitsu Storage System ETERNUS3000 Model 400

This Letter of Good Faith between Fujitsu Limited ("hereafter known as the Test Sponsor") and the Storage Performance Council (hereafter known as the SPC), documents that:

1. Fidelity and candor has been and will be maintained in reporting any anomalies in the SPC Benchmark-1 results, even if not explicitly required for disclosure in the SPC Benchmark-1 specification.

2. No attempt has been or will be made to deceive the SPC Audit Service, SPC, customers, or the public regarding the authenticity or accuracy of SPC Benchmark-1 results on the Fujitsu Storage System ETERNUS3000 Model 400. As such, the SPC-1 Full Disclosure Report that will document SPC Benchmark-1 results (per Clause 10 of the SPC Benchmark-1 Specification) on the Fujitsu Storage System ETERNUS3000 Model 400 is authentic and accurate.

3. The Fujitsu Storage System ETERNUS3000 Model 400 configuration used for reporting SPC Benchmark-1 results, as documented in the Full Disclosure Report (per Clause 10 of the SPC Benchmark-1 Specification), has not been misrepresented to the SPC or SPC Audit Service in any way.

4. SPC Benchmark-1 results on the Fujitsu Storage System ETERNUS3000 Model 400 are compliant with the spirit, intent, and letter of the SPC Benchmark-1.

5. That the SPC Benchmark-1 results do not represent a "Benchmark Special" as documented in Clause 0.2 of the SPC Benchmark-1 specification.

Signed:

Yasuo Kurihara 2/5/2003

Yasuo Kurihara, Director, Enterprise System Group

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Fujitsu Limited – http://storage-system.fujitsu.com/global/ Fujitsu Technology Solutions, Inc. C. A. (Sandy) Wilson – Sandy_Wilson@ftsi.fujitsu.com 1250 East Arques Ave P.O. Box 3470 Sunnyvale, CA 94088-3470 Phone: (916) 434-8593
Test Sponsor Alternate Contact	Fujitsu Limited – http://storage-system.fujitsu.com/global/ Fujitsu Technology Solutions, Inc. John Andoh – John_Andoh@ftsi.fujitsu.com 1250 East Arques Ave P.O. Box 3470 Sunnyvale, CA 94088-3470 Phone: (408) 746-6432 FAX: (408) 942-1725
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Test Sponsor Alternate Contact	Fujitsu Limited – http://storage-system.fujitsu.com/global/ Yasuo Kurihara – kurihara.yasuo@jp.fujitsu.com 1-1, Kamikodanaka 4-chome, Nakahara-ku (Mail No. H0605) Kawasaki 211-8588, Japan Phone: 044-754-3675 FAX: 044-754-3643
Auditor	Storage Performance Council www.storageperformance.org Walter E. Baker AuditService@storageperformance.org 1060 El Camino Real, Suite F Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.6
SPC-1 Workload Generator revision number	V2.1
Date Results were first used publicly	February 13, 2003
Date FDR was submitted to the SPC	February 13, 2003
Date the TSC is/was available for shipment to customers	January 27, 2003
Date the TSC completed audit certification	February 13, 2003

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS3000 Model 400	
Metric	**Reported Result**
SPC-1 IOPSÔ	17,545.88
SPC-1 Price-Performance	$37.92/SPC-1 IOPS™
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Total TSC Price (including three-year maintenance)	$665,379

SPC-1 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-1 benchmark. The Addressable Storage Capacity, which contains the Total ASU Capacity, was 4,027.648. The Total ASU Capacity utilized 51.53% of the Addressable Storage Capacity. The actual Configured Storage Capacity was 8,339.456 GB, which included the multiple copies of user data required by a Data Protection Level of Mirroring. The Configured Storage Capacity utilized 99.94% of the priced Physical Storage Capacity of 8,339.456 GB.

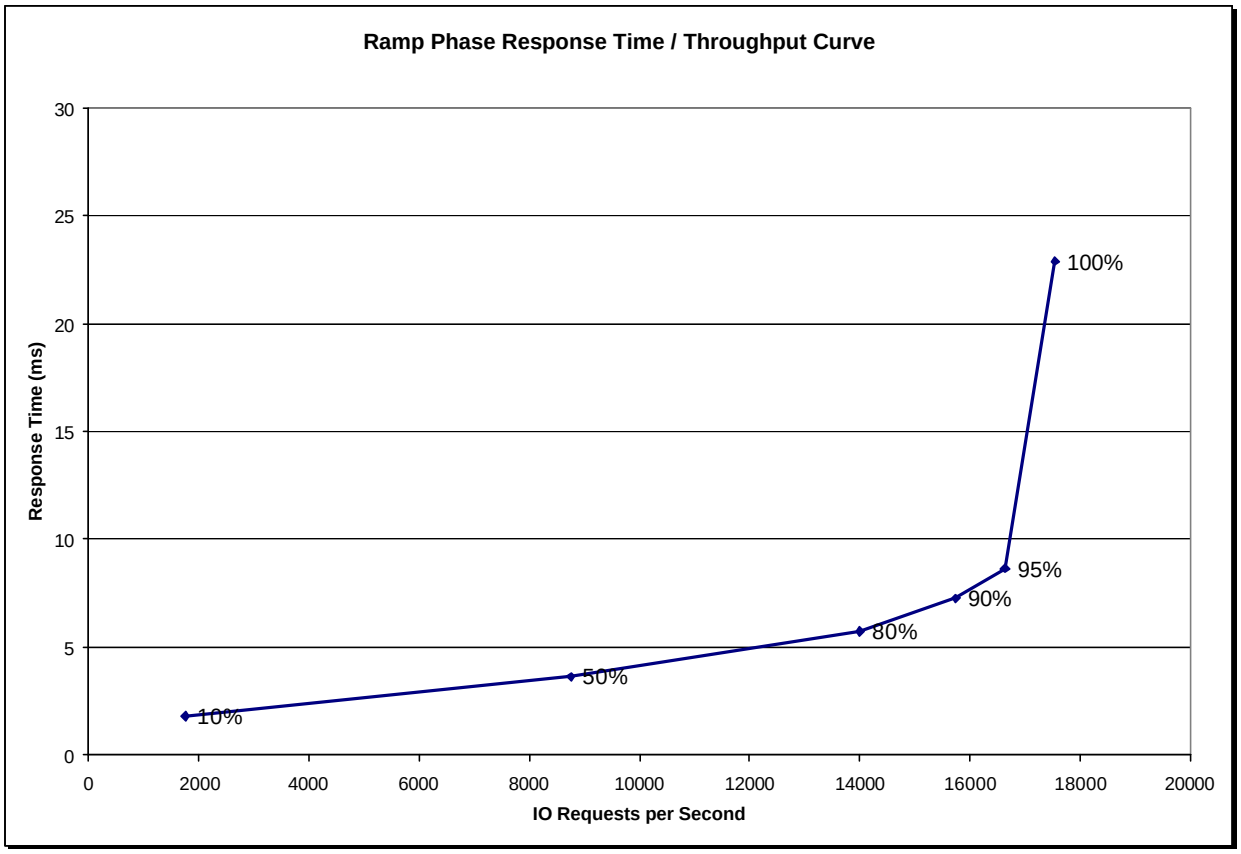
A **Data Protection Level** of Mirroring configures two or more identical copies of user data, maintained on separate disks.

The **SPC-1 LRT™** metric is the Average Response Time measured at the 10% load point, as illustrated on the next page. SPC-1 LRT™ represents the Average Response Time measured on a lightly loaded Tested Storage Configuration (TSC).

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 100% load point cannot exceed 30 milliseconds or the benchmark measurement is invalid.



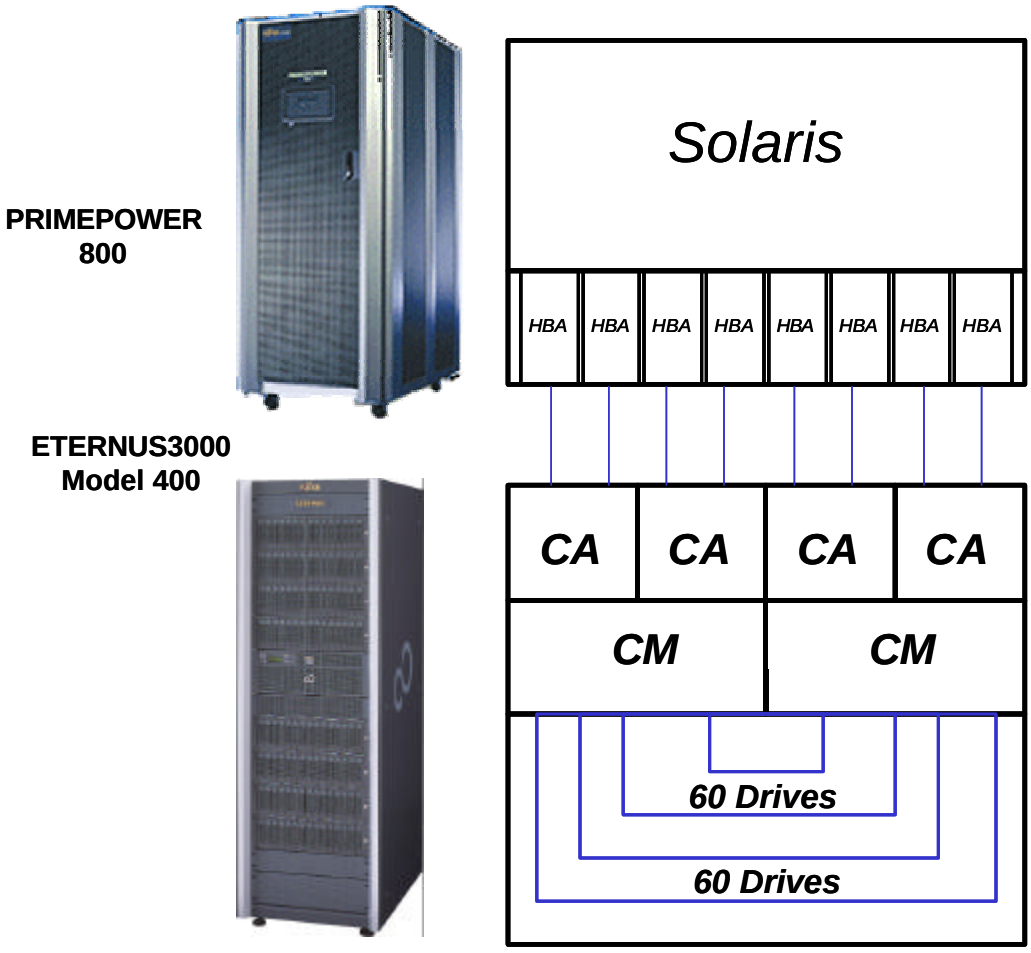
Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	1,750.38	8,751.71	14,005.31	15,743.07	16,640.12	17,545.88
Average Response Time (ms):						
All ASUs	1.77	3.59	5.74	7.24	8.62	22.87
ASU-1	2.21	4.33	6.96	8.84	10.55	26.51
ASU-2	1.65	4.32	7.09	9.20	11.27	29.85
ASU-3	0.90	1.71	2.56	3.00	3.37	12.11
Reads	3.26	6.70	10.91	14.09	17.05	41.41
Writes	0.80	1.56	2.36	2.78	3.13	10.81

Tested Storage Configuration Pricing

	Product Number	Description	Qty	Unit Price	List Price	Sell Price
1	E340S20AU	1 Controller Enclosure 2 Drive Enclosures 2 Controllers 4-Port Host Interfaces 4GB Cache Memory 2 146GB Disk Drives	1		$850,033.33	$595,023.33
2	E300CE1U	2 Drive Enclosures	3			
3	E340CM4	4GB Cache Memory	1			
4	E340CHP4	4-Port Host Interfaces	1			
5	E300CA7H	73GB Disk Drives	118			
6	CBL-MLLB15	Fibre Channel Cable	8	$250.00	$2,000.00	$1,400.00
7	LP9002L	Emulex LP9002 HBA	8	$2,795.00	$22,360.00	$20,124.00
8		3 Year Maintenance	1		$69,760.00	$48,832.00
	Total				$944,153.33	$665,379.33

Benchmark Configuration/Tested Storage Configuration Diagram



Host System:	Storage System:
Fujitsu PRIMEPOWER 800	Fujitsu ETERNUS3000 Model 400
UID=HS-1	UID=SC-1
12 SPARC64GP-IV 675 MHz CPUs each with 128KB L1 Instruction Cache, 128KB L1 Data Cache, 8 MB L2 Cache	Dual Control Modules, each with: 1.26 GHz Pentium 3 CPU 4 GB Cache 2 dual channel FC Host interfaces
20 GB Main Memory	8 – Front side Fibre Channels
Solaris 8	4 – Drive side Fibre Channel Loops
8 - Emulex LP9002L Fibre Channel Host Bus Adapters	8 Drive Enclosure Modules, each with dual FC-AL interfaces 15 Hot Swap drive slots
WG	118 – 73GB disks, 2 - 146GB disks

CONFIGURATION INFORMATION

Benchmark Configuration (BC)/Tested Storage Configuration (TSC) Diagram

Clause 9.2.4.4.1

A one page Benchmark Configuration (BC)/Tested Storage Configuration (TSC) diagram shall be included in the Executive Summary…

The Benchmark Configuration (BC)/Tested Storage Configuration (TSC) is illustrated on page 13 *(Benchmark Configuration/Tested Storage Configuration Diagram).*

Storage Network Configuration

Clause 9.2.4.4.2

If a storage network is employed in the BC/TSC, the FDR shall contain a topology diagram… . This diagram should include, but is not limited to the following components:

1. *Storage Controller and Domain Controllers (see Clause 9.2.4.4.1)*
2. *Host Systems (see Clause 9.2.4.4.1)*
3. *Routers and Bridges*
4. *Hubs and Switches*
5. *HBAs to Host Systems and Front End Port to Storage Controllers*

Additionally the diagram shall:

- *Illustrate the physical connection between components.*
- *Describe the type of each physical connection.*
- *Describe the network protocol used over each physical connection.*
- *The maximum theoretical transfer rate of each class of interconnect used in the configuration.*
- *Correlate with the BC Configuration Diagram in Clause 9.2.4.4.1.*

The Test Sponsor shall additionally supply (referenced in an appendix) a wiring diagram of the physical connections and physical port assignments used in the storage network. The diagram should allow anyone to exactly replicate the physical configuration of the storage network.

The Benchmark Configuration (BC)/Tested Storage Configuration (TSC) was configured with local storage and, as such, did not employ a storage network.

Host System Configuration

Clause 9.2.4.4.3

The FDR shall minimally contain, for each Host System running the Workload Generator, a listing of the following:

1. *Number and type of CPUs.*
2. *Main memory capacity.*
3. *Cache memory capacity.*
4. *Number and type of disk controllers or Host Bus Adapters.*

The details of the Host System configuration may be found on 13 *(Benchmark Configuration / Tested Storage Configuration Diagram).*

Customer Tuning Parameters and Options

Clause 9.2.4.5.1

All Benchmark Configuration (BC) components with customer tunable parameter and options that have been altered from their default values must be listed in the FDR. The FDR entry for each of those components must include both the name of the component and the altered value of the parameter or option.

The following settings were made in the Solaris "/etc/system" control file information for execution of the Workload Generator on the PRIMEPOWER 800:

```
forceload: drv/clone

* Begin FJSVssf (do not edit)
set ftrace_atboot = 1
set kmem_flags = 0x100
set kmem_lite_maxalign = 8192
* End FJSVssf (do not edit)
forceload:     drv/FJSVpanel
forceload:     drv/se
forceload:     drv/fjmse

set maxphys = 8388608
```

The following parameters in "lpfc.conf" were changed from their default values to control the operation of the Emulex Fibre Channel HBAs for accessing the ETERNUS3000 Storage System:

```
*****************Set Bindings to Port WWNs*********************
   fcp-bind-WWPN="210000e000a80009:lpfc0t0",
                 "220000e000a80009:lpfc1t0",
                 "230000e000a80009:lpfc2t0",
                 "240000e000a80009:lpfc3t0",
                 "250000e000a80009:lpfc4t0",
                 "260000e000a80009:lpfc5t0",
                 "270000e000a80009:lpfc6t0",
                 "280000e000a80009:lpfc7t0";

***********Set to recognize only devices with Binding*********
automap=0;

*************Set LUN Queue Depth******************
lun-queue-depth=70;

*************Set Target Queue Depth*************
tgt-queue-depth=128;

*************Set Loop scanning low to high ALPAs**********
scan-down=0;

********Set Topology 1) P to P (Fabric), 2) Loop
topology=6;
```

Tested Storage Configuration (TSC) Description

Clause 9.2.4.5.2

The FDR must include sufficient information to recreate the logical representation of the TSC. In addition to customer tunable parameters and options (Clause 4.2.4.5.3), that information must include, at a minimum, a diagram and/or description of the following:

- *All physical components that comprise the TSC. Those components are also illustrated in the Benchmark Configuration (BC) diagram in Clause 9.2.4.4.1 and, if applicable, the Storage Network Configuration Diagram in Clause 9.2.4.4.2.*
- *The logical representation of the TSC, configured from the above components that will be presented to the Workload Generator.*

In addition the FDR may include listings of scripts and/or commands used to configure the physical components that comprise the TSC.

The following entries in "sd.conf" were defined to enable the Emulex Fibre Channel HBAs for accessing the LUNs defined in the ETERNUS3000:

```
name="sd" parent="lpfc" target=0 lun=0;
name="sd" parent="lpfc" target=0 lun=1;
name="sd" parent="lpfc" target=0 lun=2;
name="sd" parent="lpfc" target=0 lun=3;
name="sd" parent="lpfc" target=0 lun=4;
name="sd" parent="lpfc" target=0 lun=5;
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name="sd" parent="lpfc" target=0 lun=177;
name="sd" parent="lpfc" target=0 lun=178;
name="sd" parent="lpfc" target=0 lun=179;
name="sd" parent="lpfc" target=0 lun=180;
name="sd" parent="lpfc" target=0 lun=181;
name="sd" parent="lpfc" target=0 lun=182;
name="sd" parent="lpfc" target=0 lun=183;
name="sd" parent="lpfc" target=0 lun=184;
name="sd" parent="lpfc" target=0 lun=185;
name="sd" parent="lpfc" target=0 lun=186;
name="sd" parent="lpfc" target=0 lun=187;
name="sd" parent="lpfc" target=0 lun=188;
name="sd" parent="lpfc" target=0 lun=189;
name="sd" parent="lpfc" target=0 lun=190;
name="sd" parent="lpfc" target=0 lun=191;
name="sd" parent="lpfc" target=0 lun=192;
name="sd" parent="lpfc" target=0 lun=193;
name="sd" parent="lpfc" target=0 lun=194;
name="sd" parent="lpfc" target=0 lun=195;
name="sd" parent="lpfc" target=0 lun=196;
name="sd" parent="lpfc" target=0 lun=197;
name="sd" parent="lpfc" target=0 lun=198;
name="sd" parent="lpfc" target=0 lun=199;
name="sd" parent="lpfc" target=0 lun=200;
name="sd" parent="lpfc" target=0 lun=201;
name="sd" parent="lpfc" target=0 lun=202;
name="sd" parent="lpfc" target=0 lun=203;
```

```
name="sd" parent="lpfc" target=0 lun=204;
name="sd" parent="lpfc" target=0 lun=205;
name="sd" parent="lpfc" target=0 lun=206;
name="sd" parent="lpfc" target=0 lun=207;
name="sd" parent="lpfc" target=0 lun=208;
name="sd" parent="lpfc" target=0 lun=209;
name="sd" parent="lpfc" target=0 lun=210;
name="sd" parent="lpfc" target=0 lun=211;
name="sd" parent="lpfc" target=0 lun=212;
name="sd" parent="lpfc" target=0 lun=213;
name="sd" parent="lpfc" target=0 lun=214;
name="sd" parent="lpfc" target=0 lun=215;
name="sd" parent="lpfc" target=0 lun=216;
name="sd" parent="lpfc" target=0 lun=217;
name="sd" parent="lpfc" target=0 lun=218;
name="sd" parent="lpfc" target=0 lun=219;
name="sd" parent="lpfc" target=0 lun=220;
name="sd" parent="lpfc" target=0 lun=221;
name="sd" parent="lpfc" target=0 lun=222;
name="sd" parent="lpfc" target=0 lun=223;
name="sd" parent="lpfc" target=0 lun=224;
name="sd" parent="lpfc" target=0 lun=225;
name="sd" parent="lpfc" target=0 lun=226;
name="sd" parent="lpfc" target=0 lun=227;
name="sd" parent="lpfc" target=0 lun=228;
name="sd" parent="lpfc" target=0 lun=229;
name="sd" parent="lpfc" target=0 lun=230;
name="sd" parent="lpfc" target=0 lun=231;
name="sd" parent="lpfc" target=0 lun=232;
name="sd" parent="lpfc" target=0 lun=233;
name="sd" parent="lpfc" target=0 lun=234;
name="sd" parent="lpfc" target=0 lun=235;
name="sd" parent="lpfc" target=0 lun=236;
name="sd" parent="lpfc" target=0 lun=237;
name="sd" parent="lpfc" target=0 lun=238;
name="sd" parent="lpfc" target=0 lun=239;
name="sd" parent="lpfc" target=0 lun=240;
name="sd" parent="lpfc" target=0 lun=241;
name="sd" parent="lpfc" target=0 lun=242;
name="sd" parent="lpfc" target=0 lun=243;
name="sd" parent="lpfc" target=0 lun=244;
name="sd" parent="lpfc" target=0 lun=245;
name="sd" parent="lpfc" target=0 lun=246;
name="sd" parent="lpfc" target=0 lun=247;
name="sd" parent="lpfc" target=0 lun=248;
name="sd" parent="lpfc" target=0 lun=249;
name="sd" parent="lpfc" target=0 lun=250;
name="sd" parent="lpfc" target=0 lun=251;
name="sd" parent="lpfc" target=0 lun=252;
name="sd" parent="lpfc" target=0 lun=253;
name="sd" parent="lpfc" target=0 lun=254;
name="sd" parent="lpfc" target=0 lun=255;
```

The following scripts (**listdisks.sh**, **partdisks.sh**, and **slicedisks.sh**) and commands were used to create the logical representation of the TSC used in the benchmark measurement for the Eternus3000 Storage system.

1) **listdisks.sh**

   The **listdisks.sh** script is used to create a list of disks to be partitioned into slices by the Solaris **format** command.

2) **partdisks.sh**

   The **partdisks.sh** script calls the **slicedisks.sh** script to format, partition, and label disks using a disk list (created with **listdisks.sh**) and a **format** command file.

3) **slicedisks.sh**

   The **slicedisks.sh** script is used to format, partition, and label disks using a disk list (created with **listdisks.sh**) and a **format** command file.

4) **cmd1390m**

   This file contains the list of the commands used by the **format** command to create partitions (of size 1390m/b) for disks configured for ASU1 storage.

5) **cmd6480m**

   This file contains the list of the commands used by the **format** command to create partitions (of size 6480 m/b) for disks configured for ASU2 storage.

6) **cmd4170m**

   This file contains the list of the commands used by the **format** command to create partitions (of size 4170 m/b) for disks configured for ASU3 storage.

7) **labelcmd**

   This file contains the list of the commands used by the **format** command to label a disk.

Listed below are the actual script contents and commands.

```
-------------------------
1)  listdisks.sh
-----------------------

#!/bin/sh
#
#
# listdisks.sh
# A shell script to create a disk list for the partdisk.sh script


#  Remove the old disk list files

rm -r /SPC1_E3000A/SPC1SCRIPTS/c3.format.log
rm -r /SPC1_E3000A/SPC1SCRIPTS/c4.format.log
rm -r /SPC1_E3000A/SPC1SCRIPTS/c5.format.log
rm -r /SPC1_E3000A/SPC1SCRIPTS/c6.format.log
rm -r /SPC1_E3000A/SPC1SCRIPTS/c7.format.log
rm -r /SPC1_E3000A/SPC1SCRIPTS/c8.format.log
rm -r /SPC1_E3000A/SPC1SCRIPTS/c9.format.log
rm -r /SPC1_E3000A/SPC1SCRIPTS/c10.format.log

rm /SPC1_E3000A/SPC1SCRIPTS/formatok
rm /SPC1_E3000A/SPC1SCRIPTS/formaterr


#  Create the new disk list file


ls /dev/rdsk/c3*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c3.disk.list
ls /dev/rdsk/c4*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c4.disk.list
ls /dev/rdsk/c5*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c5.disk.list
ls /dev/rdsk/c6*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c6.disk.list
ls /dev/rdsk/c7*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c7.disk.list
ls /dev/rdsk/c8*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c8.disk.list
ls /dev/rdsk/c9*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c9.disk.list
ls /dev/rdsk/c10*s2 |sed 's/\/dev\/rdsk\///g'| sed 's/s2//g'>/SPC1_E3000A/SPC1SCRIPTS/c10.disk.list


------------------------------------------------------------
```

---
2) partdisks.sh

```
#!/bin/sh
#
# WARNING: This script will destroy all data on the disk.
# USE AT YOUR OWN RISK
#
# partdisks.sh
# A shell script to format, partition, and label disks using a disk list and
a format
# command file


rm /SPC1_E3000A/SPC1SCRIPTS/c3.slice.log/c3.disks.1390m
rm /SPC1_E3000A/SPC1SCRIPTS/c4.slice.log/c4.disks.1390m
rm /SPC1_E3000A/SPC1SCRIPTS/c5.slice.log/c5.disks.1390m
rm /SPC1_E3000A/SPC1SCRIPTS/c6.slice.log/c6.disks.1390m
rm /SPC1_E3000A/SPC1SCRIPTS/c7.slice.log/c7.disks.1390m
rm /SPC1_E3000A/SPC1SCRIPTS/c8.slice.log/c8.disks.1390m
rm /SPC1_E3000A/SPC1SCRIPTS/c9.slice.log/c9.disks.1390m
rm /SPC1_E3000A/SPC1SCRIPTS/c10.slice.log/c10.disks.1390m


rm /SPC1_E3000A/SPC1SCRIPTS/c3.slice.log/c3.disks.4170m
rm /SPC1_E3000A/SPC1SCRIPTS/c4.slice.log/c4.disks.4170m
rm /SPC1_E3000A/SPC1SCRIPTS/c5.slice.log/c5.disks.4170m
rm /SPC1_E3000A/SPC1SCRIPTS/c6.slice.log/c6.disks.4170m
rm /SPC1_E3000A/SPC1SCRIPTS/c7.slice.log/c7.disks.4170m
rm /SPC1_E3000A/SPC1SCRIPTS/c8.slice.log/c8.disks.4170m
rm /SPC1_E3000A/SPC1SCRIPTS/c9.slice.log/c9.disks.4170m
rm /SPC1_E3000A/SPC1SCRIPTS/c10.slice.log/c10.disks.4170m

rm /SPC1_E3000A/SPC1SCRIPTS/c3.slice.log/c3.disks.6480m
rm /SPC1_E3000A/SPC1SCRIPTS/c4.slice.log/c4.disks.6480m
rm /SPC1_E3000A/SPC1SCRIPTS/c5.slice.log/c5.disks.6480m
rm /SPC1_E3000A/SPC1SCRIPTS/c6.slice.log/c6.disks.6480m
rm /SPC1_E3000A/SPC1SCRIPTS/c7.slice.log/c7.disks.6480m
rm /SPC1_E3000A/SPC1SCRIPTS/c8.slice.log/c8.disks.6480m
rm /SPC1_E3000A/SPC1SCRIPTS/c9.slice.log/c9.disks.6480m
rm /SPC1_E3000A/SPC1SCRIPTS/c10.slice.log/c10.disks.6480m

./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c3.disk.list /SPC1_E3000A/SPC1SCRIPTS/c3.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd
./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c4.disk.list /SPC1_E3000A/SPC1SCRIPTS/c4.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd
./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c5.disk.list /SPC1_E3000A/SPC1SCRIPTS/c5.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd
./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c6.disk.list /SPC1_E3000A/SPC1SCRIPTS/c6.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd
./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c7.disk.list /SPC1_E3000A/SPC1SCRIPTS/c7.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd
./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c8.disk.list /SPC1_E3000A/SPC1SCRIPTS/c8.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd
./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c9.disk.list /SPC1_E3000A/SPC1SCRIPTS/c9.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd
./slicedisks.sh /SPC1_E3000A/SPC1SCRIPTS/c10.disk.list /SPC1_E3000A/SPC1SCRIPT S/c10.slice.log /SPC1_E3000A/SPC1SCRIPTS/labelcmd

------------------------------------------------------------
```

```
-------------------------
3)  slicedisks.sh
-------------------------

#!/bin/sh
#
# WARNING: This script will destroy all data on the disk.
# USE AT YOUR OWN RISK
#
# slicedisks.sh
# A shell script to format, partition, and label disks using a disk list and
a format
# command file

case $# in
0) echo "Usage: $0 disklist log_directory commandfile" 1>&2; exit 2 ;;
1) echo "Usage: $0 disklist log_directory commandfile" 1>&2; exit 2 ;;
2) echo "Usage: $0 disklist log_directory commandfile" 1>&2; exit 2 ;;
esac


# Define the Disk List file
DISK_LIST=$1
# Define where the logfiles directory is
LOG_DIR=$2
# Define the location of the format command file
FMT_CMD=$3

#
# Make the log directory
mkdir -p $LOG_DIR
#

# Iterate through the disk list
for DISKS in `cat $DISK_LIST`
do

# Run the format command


SLICE=`echo $DISKS |sed 's/\/dev\/rdsk\///g' | sed 's/s2//g' | sed 's/c[0-9]*//g' | sed 's/t[0-9]*//g' | sed 's/d//g'`
BUS=`echo $DISKS |sed 's/\/dev\/rdsk\///g' | sed 's/s2//g' | sed 's/t[0-9]*//g' | sed 's/d[0-9]*//g'`


case $SLICE in
      0|16|32|48|64|80|96|112|128|144|160|176|192|208|224|240|  \
      1|17|33|49|65|81|97|113|129|145|161|177|193|209|225|241|  \
      2|18|34|50|66|82|98|114|130|146|162|178|194|210|226|242|  \
      3|19|35|51|67|83|99|115|131|147|163|179|195|211|227|243|  \
      4|20|36|52|68|84|100|116|132|148|164|180|196|212|228|244| \
      5|21|37|53|69|85|101|117|133|149|165|181|197|213|229|245| \
  6|22|38|54|70|86|102|118|134|150|166|182|198|214|230|246)
```

```
        echo "$SLICE" >> $LOG_DIR/$BUS.disks.1390m
 format -f /SPC1_E3000A/SPC1SCRIPTS/cmd1390m -l $LOG_DIR/slice_log.$DISKS.1390m $DISKS
      ;;
      9|25|41|57|73|89|105|121|137|153|169|185|201|217|233|249|  \
      10|26|42|58|74|90|106|122|138|154|170|186|202|218|234|250| \
      11|27|43|59|75|91|107|123|139|155|171|187|203|219|235|251| \
      12|28|44|60|76|92|108|124|140|156|172|188|204|220|236|252| \
      13|29|45|61|77|93|109|125|141|157|173|189|205|221|237|253| \
      14|30|46|62|78|94|110|126|142|158|174|190|206|222|238|254| \
      15|31|47|63|79|95|111|127|143|159|175|191|207|223|239|255)
        echo "$SLICE" >> $LOG_DIR/$BUS.disks.4170m
 format -f /SPC1_E3000A/SPC1SCRIPTS/cmd4170m -l $LOG_DIR/slice_log.$DISKS.4170m $DISKS
      ;;
      7|23|39|55|71|87|103|119|135|151|167|183|199|215|231|247|  \
      8|24|40|56|72|88|104|120|136|152|168|184|200|216|232|248)
            echo "$SLICE" >> $LOG_DIR/$BUS.disks.6480m
 format -f /SPC1_E3000A/SPC1SCRIPTS/cmd6480m -l $LOG_DIR/slice_log.$DISKS.6480m $DISKS
      ;;


      *)
        echo "$SLICE" >> $LOG_DIR/$BUS.sliceerr
        ;;
esac

done

sort -n -o $LOG_DIR/$BUS.disks.1390m $LOG_DIR/$BUS.disks.1390m
sort -n -o $LOG_DIR/$BUS.disks.4170m $LOG_DIR/$BUS.disks.4170m
sort -n -o $LOG_DIR/$BUS.disks.6480m $LOG_DIR/$BUS.disks.6480m



------------------------------------------------------------------------------
----------------------------------------------
This section contains the listings of the command files.

-------------------------
 4) cmd1390m
-------------------------

par
print
0
root
wm
1
1390m
1
swap
wm
175
1390m
```

```
3
unassigned
wm
349
1390m
4
unassigned
wm
523
1390m
5
unassigned
wm
697
1390m
6
usr
wm
871
1390m
7
unassigned
wm
0
0m
pr
label
quit
quit

-------------------------
 5) cmd6480m
-----------------------

par
print
0
root
wm
1
6480m
1
swap
wm
0
0.0g
3
unassigned
wm
0
0.0g
4
unassigned
```

```
wm
0
0.0g
5
unassigned
wm
0
0.0g
6
usr
wm
0
0.0g
7
unassigned
wm
0
0.0g
pr
label
quit
quit

-------------------------
 6) cmd4170m
-----------------------

par
print
0
root
wm
1
4170m
1
swap
wm
523
4170m
3
unassigned
wm
0
0m
4
unassigned
wm
0
0.0g
5
unassigned
wm
0
```

```
0.0g
6
usr
wm
0
0.0g
7
unassigned
wm
0
0.0g
pr
label
quit
quit

-------------------------
 7) labelcmd
-----------------------

label
```

DATA REPOSITORY

Definitions

Physical Storage Capacity: The formatted capacity of all storage devices physically present in the Tested Storage Configuration (TSC).

Configured Storage Capacity: This capacity includes the Addressable Storage Capacity and any other storage (parity disks, hot spares, etc.) necessary to implement the Addressable Storage Capacity.

Addressable Storage Capacity: The total storage (sum of Logical Volumes) that can be read and written by application programs such as the SPC-1 Workload Generator.

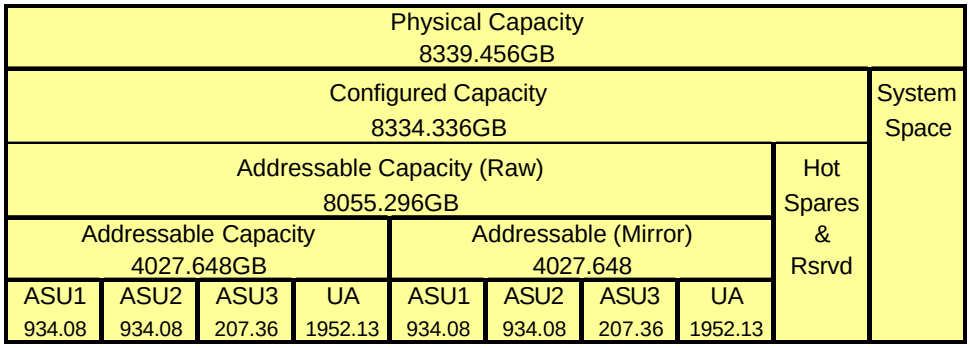
Logical Volume: The division of Addressable Storage Capacity into individually addressable logical units of storage used in the SPC-1 benchmark. Each Logical Volume is implemented as a single, contiguous address space.

Application Storage Unit (ASU): The logical interface between the storage and SPC-1 Workload Generator. The three ASUs (Data, User, and Log) are typically implemented on one or more Logical Volume.

Total ASU Capacity: The total storage capacity read and written in the course of executing the SPC-1 benchmark.

Storage Capacities and Relationships

The various storage capacities configured in the benchmark result are illustrated below (not to scale).



The storage designated by 'UA' is unused. The storage designated by 'Rsrvd' and 'System Space' is storage overhead required in order to configure the Tested Storage Configuration.

Storage Hierarchy Capacity

Clause 9.2.4.6.1

A table illustrating the size of key components of the Storage Hierarchy shall be included in the FDR.

Storage Hierarchy Capacity		
Storage Hierarchy Component	**Units**	**Capacity**
Total ASU Capacity	Gigabytes (GB)	2,075.520
Addressable Storage Capacity	Gigabytes (GB)	4,027.648
Configured Storage Capacity	Gigabytes (GB)	8,334.336
Physical Storage Capacity	Gigabytes (GB)	8,339.456

The Total ASU Capacity of 2,075.520 utilized 51.53% of the Addressable Storage Capacity of 4,027.648. The Configured Storage Capacity of 8,334.336, which included the multiple copies of user data required by a Data Protection Level of Mirroring, utilized 99.94% of the priced Physical Storage Capacity of 8,339.456 GB.

Logical Volume Capacity and ASU Mapping

Clause 9.2.4.6.2

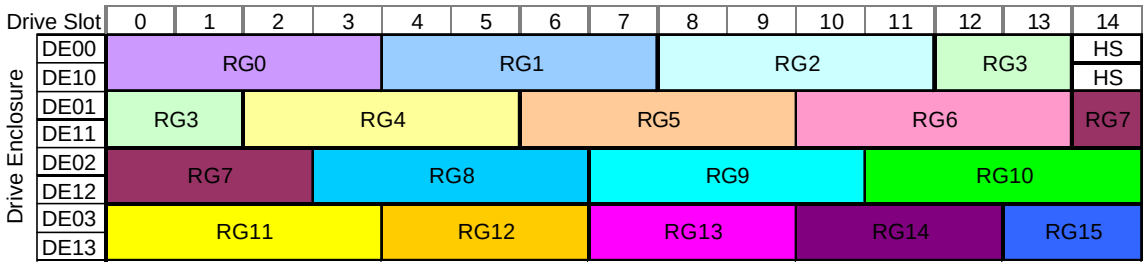
A table illustrating the capacity of each ASU and the mapping of Logical Volumes to ASUs shall be provided in the FDR. Logical Volumes shall be sequenced in the table from top to bottom per its position in the contiguous address space of each ASU. The capacity of each Logical Volume shall be stated. … In conjunction with this table, the Test Sponsor shall provide a complete description of the type of data protection (see Clause 2.4.5) used on each Logical Volume.

Logical Volume Capacity and Mapping		
ASU-1 (934.08 GB)	**ASU-2 (934.08 GB)**	**ASU-3 (207.36 GB)**
672 Logical Volume 1.39GB per Logical Volume (1.39 GB used/Logical Volume)	224 Logical Volume 4.17 GB per Logical Volume (4.17 GB used/Logical Volume)	32 Logical Volume 6.48 GB per Logical Volume (6.48 GB used/Logical Volume)

The Data Protection Level used for all Logical Volumes was Mirroring as described on page 10. See "ASU Configuration" in the **IOPS Test Results File** for more detailed configuration information.

Assignment of RAID Groups, LUNs and Slices

RAID Group Assignments, each divided into 16 LUNs, for a total of 256 LUNs



The RAID Groups and LUN assignments are set up through a series of actions on the GUI Management Interface (GRMgr). The task of setting up the configuration for each customer is provided as part of the base system price by Fujitsu. Different techniques are applied, depending upon the needs of the customer. This configuration reflects the customary techniques that are applied when a high performance requirement dominates the customer environment. Other techniques are applied when the primary requirement is for maximum capacity. In the case of high performance, it is customary to define 16 LUNs within each RAID Group, with 16 RAID Groups arranged in RAID0+1 configurations. RAID0+1 Groups are formed with 2, 3, or 4 drive pairs in a striped set. One set of the drives is in one Drive Enclosure (DE), ant the mating set is in another DE. A special case exists for the RAID Group that includes the drives (0-3) in DE0. These drives have reduced configurable capacity, due to reserved system space on each of these four drives. When these drives are mated with others in a RAID0+1 configuration, the other drives also have reduced space available. This results in RAID Group 0 being somewhat smaller than the other 4+4 groups. This loss of space, along with the reservation of two Hot Spare drives, accounts for the difference between the Configurable Capacity, and the Raw Addressable Capacity shown in the Storage Capacity Diagram.

The 256 LUNs, resulting from the high performance arrangement, are then often divided into slices within the Solaris environment to enable spreading the load more uniformly across all of the disk drives. Usually, an evaluation is made, using the performance monitor facility (GRPM) within the ETERNUS300, of the access patterns demanded by the application, and some minor adjustments in LUN assignments made, to enhance the performance. This basic installation service is a standard part of the Fujitsu offering of this product and the same services have been applied to the arrangement of the storage, and assignment of the LUNs within this configuration for the SPC-1 Benchmark.

SPC-1 BENCHMARK EXECUTION RESULTS

Definitions

Average Response Time: *The sum of the Response Times for all Measured I/O Requests divided by the total number of Measured I/O Requests.*

I/O Request Throughput: *The total number of Measured I/O requests in an SPC-1 Test Run divided by the duration of the Measurement Interval in seconds.*

Measurement Interval: *The finite and contiguous time period, after the Tested Storage Configuration (TSC) has reached Steady State, when data is collected by a Test Sponsor to generate an SPC-1 test result or support an SPC-1 test result.*

Steady State: *The consistent and sustainable throughput of the TSC. During this period the load presented to the TSC by the Workload Generator is constant. Comment: Steady Stated is achieved only after caches in the TSC have filled and as a result the I/O Request throughput of the TSC has stabilized.*

Test: *A collection of Test Phases or Test Runs sharing a common objective.*

Test Phase: *A collection of one or more SPC-1 Test Runs sharing a common objective and intended to be run in a specific sequence.*

Test Run: *The execution of SPC-1 for the purpose of producing or supporting an SPC-1 test result. SPC-1 Test Runs may have a finite and measured Ramp-Up period, Start-Up period, Shut-Down period, and Ramp-Down period as illustrated in the Figure 5-1 below. All SPC-1 Test Runs shall have a Steady State period and a Measurement Interval.*

Sustainability Test Phase

Clause 5.4.2.1

The Sustainability Test Phase consists of one Test Run at the 100% load point with a Measurement Interval of three (3) hours. The intent is to demonstrate a sustained maximum I/O Request Throughput as well as insuring the Tested Storage Configuration (TSC) has reached steady state prior to measuring the maximum I/O Request Throughput (SPC-1™ IOPS).

The reported I/O Request Throughput of the Sustainability Test Run must be within 5% of the reported SPC-1™ IOPS primary metric. The Average Response Time measured in Sustainability Test Run cannot exceed thirty (30) milliseconds.

Clause 9.2.4.7.1

For the Sustainability Test Phase the FDR shall contain:

1. *A Data Rate Distribution (data table and graph).*
2. *I/O Request Throughput Distribution (data table and graph).*
3. *The human readable Test Run Results File produced by the Workload Generator.*
4. *A listing or screen image of all input parameters supplied to the Workload Generator.*
5. *The Measured Intensity Multiplier for each I/O stream.*
6. *The variability of the Measured Intensity Multiplier, as defined in Clause 5.3.13.3.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, and Response Time Ramp Test Runs are listed below.

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java –Xmx512m metrics -b 351
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Sustainability Test Results File

A link to the test results file generated from the Sustainability Test Run is listed below.

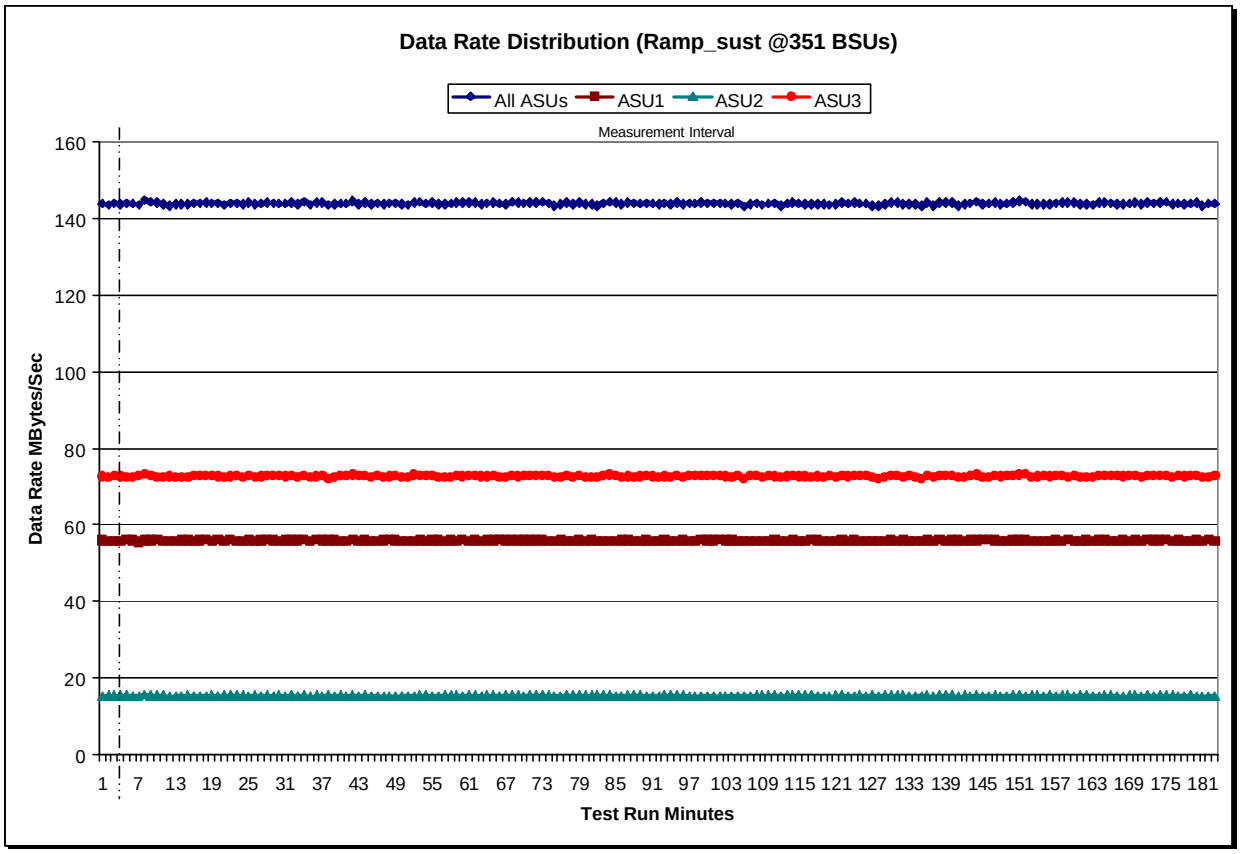
Sustainability Test Results File

Sustainability – Data Rate Distribution Data *(MB / second)*

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	13:02:40	13:05:40	0-2	0:03:00
Measurement Interval	13:05:40	16:05:52	3-182	3:00:12

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	143.97	55.96	15.38	72.64	60	144.33	55.87	15.40	73.06	120	143.84	55.87	15.50	72.47
1	143.69	55.73	15.50	72.45	61	144.33	56.03	15.50	72.80	121	144.35	56.03	15.44	72.88
2	144.13	55.80	15.53	72.80	62	143.91	55.90	15.38	72.63	122	143.98	55.88	15.37	72.72
3	143.92	55.73	15.46	72.73	63	144.08	55.97	15.39	72.71	123	144.23	55.97	15.31	72.95
4	144.06	56.05	15.46	72.55	64	144.39	56.01	15.41	72.97	124	144.02	55.78	15.40	72.83
5	143.98	56.03	15.36	72.60	65	143.94	56.12	15.37	72.45	125	143.98	55.77	15.35	72.86
6	143.64	55.52	15.37	72.75	66	143.77	55.93	15.46	72.37	126	143.58	55.84	15.43	72.31
7	144.90	56.00	15.61	73.29	67	144.43	55.94	15.46	73.03	127	143.43	55.88	15.32	72.24
8	144.43	56.01	15.46	72.95	68	144.22	56.04	15.50	72.68	128	143.88	55.87	15.47	72.53
9	144.19	56.15	15.41	72.62	69	144.14	56.01	15.30	72.83	129	144.32	55.93	15.40	72.98
10	143.86	55.87	15.47	72.52	70	144.24	55.95	15.43	72.86	130	144.17	55.85	15.50	72.83
11	143.58	55.67	15.22	72.69	71	144.24	55.93	15.41	72.90	131	143.91	56.00	15.46	72.46
12	143.76	55.91	15.34	72.50	72	144.39	56.02	15.51	72.86	132	143.90	55.85	15.19	72.86
13	143.85	55.98	15.34	72.53	73	144.12	55.89	15.42	72.81	133	143.70	55.80	15.28	72.61
14	143.89	56.01	15.40	72.48	74	143.51	55.61	15.36	72.54	134	143.41	55.85	15.33	72.23
15	144.12	55.85	15.36	72.91	75	143.84	56.00	15.31	72.54	135	144.26	55.99	15.48	72.80
16	144.11	55.94	15.33	72.84	76	144.22	55.86	15.45	72.91	136	143.56	55.77	15.19	72.60
17	144.32	56.13	15.36	72.83	77	143.77	55.88	15.49	72.40	137	144.38	56.08	15.42	72.88
18	144.05	55.74	15.47	72.85	78	144.28	55.99	15.48	72.81	138	144.37	55.85	15.46	73.06
19	144.05	56.10	15.29	72.67	79	143.77	55.75	15.43	72.58	139	144.31	55.98	15.54	72.78
20	143.68	55.83	15.44	72.41	80	143.75	55.95	15.46	72.34	140	143.51	55.94	15.24	72.33
21	144.12	56.07	15.39	72.66	81	143.56	55.83	15.43	72.30	141	143.76	55.80	15.41	72.55
22	144.11	55.91	15.44	72.76	82	144.13	55.88	15.45	72.80	142	144.09	55.97	15.37	72.76
23	143.76	55.82	15.50	72.44	83	144.43	55.91	15.40	73.12	143	144.57	55.98	15.41	73.19
24	144.25	55.98	15.34	72.92	84	144.17	55.92	15.36	72.89	144	143.85	56.08	15.29	72.48
25	143.90	55.82	15.47	72.61	85	143.74	55.97	15.36	72.42	145	143.93	56.09	15.36	72.48
26	144.00	56.02	15.31	72.67	86	144.23	55.94	15.55	72.74	146	144.21	56.03	15.44	72.75
27	144.23	56.05	15.38	72.81	87	144.07	55.92	15.60	72.55	147	143.80	55.83	15.31	72.65
28	144.13	55.98	15.31	72.85	88	143.97	55.86	15.44	72.67	148	143.95	55.70	15.31	72.95
29	143.94	55.69	15.40	72.85	89	144.13	56.02	15.36	72.76	149	144.24	55.97	15.43	72.83
30	144.03	55.97	15.37	72.69	90	144.00	55.92	15.36	72.72	150	144.63	56.00	15.48	73.15
31	144.26	56.00	15.40	72.85	91	143.78	55.85	15.31	72.62	151	144.53	55.94	15.35	73.24
32	143.88	55.97	15.35	72.56	92	144.10	55.96	15.42	72.72	152	143.79	55.80	15.48	72.51
33	144.52	56.09	15.45	72.98	93	143.81	55.79	15.45	72.57	153	143.74	55.71	15.38	72.64
34	143.69	55.90	15.19	72.60	94	144.18	55.88	15.39	72.91	154	143.89	55.78	15.35	72.76
35	144.19	56.08	15.40	72.71	95	143.88	56.04	15.46	72.38	155	143.80	55.71	15.45	72.64
36	144.20	55.93	15.29	72.98	96	144.10	55.80	15.38	72.92	156	144.09	55.93	15.36	72.80
37	143.62	56.01	15.46	72.15	97	143.96	55.82	15.26	72.89	157	144.20	55.88	15.40	72.92
38	143.77	55.97	15.32	72.47	98	144.19	56.10	15.32	72.77	158	144.20	56.24	15.43	72.53
39	143.94	55.76	15.43	72.75	99	144.16	55.94	15.36	72.86	159	144.17	55.87	15.29	73.01
40	144.01	55.91	15.27	72.83	100	144.13	55.94	15.28	72.91	160	143.86	55.80	15.44	72.62
41	144.71	56.10	15.42	73.19	101	144.10	56.04	15.25	72.80	161	143.92	55.94	15.43	72.55
42	143.91	55.79	15.30	72.82	102	143.94	55.98	15.27	72.69	162	143.69	55.79	15.31	72.59
43	144.19	55.95	15.42	72.82	103	143.72	55.97	15.32	72.44	163	144.35	56.02	15.35	72.98
44	143.75	55.84	15.37	72.55	104	144.06	55.88	15.34	72.84	164	144.17	55.96	15.40	72.81
45	144.16	55.81	15.35	72.99	105	143.34	55.87	15.36	72.11	165	144.07	55.89	15.39	72.79
46	143.78	55.96	15.26	72.56	106	143.91	55.83	15.33	72.75	166	143.93	55.76	15.37	72.80
47	144.15	56.15	15.37	72.63	107	144.15	55.90	15.41	72.84	167	143.90	55.95	15.26	72.69
48	144.08	55.97	15.25	72.85	108	143.67	55.82	15.45	72.41	168	143.98	55.74	15.39	72.86
49	143.80	55.88	15.32	72.61	109	144.01	55.74	15.48	72.79	169	144.25	55.96	15.41	72.88
50	143.68	55.81	15.36	72.51	110	144.12	55.95	15.53	72.63	170	143.75	55.81	15.34	72.60
51	144.23	55.75	15.37	73.11	111	143.39	55.65	15.29	72.44	171	144.37	56.11	15.50	72.76
52	144.41	55.97	15.41	73.03	112	144.01	55.81	15.55	72.65	172	144.07	56.01	15.30	72.76
53	144.01	55.73	15.39	72.89	113	144.28	55.96	15.44	72.88	173	144.25	55.97	15.51	72.77
54	144.31	55.98	15.28	73.05	114	144.00	55.90	15.43	72.68	174	144.48	56.11	15.47	72.90
55	143.74	55.95	15.29	72.51	115	143.90	55.79	15.43	72.68	175	143.80	55.83	15.46	72.51
56	143.84	55.87	15.42	72.56	116	143.93	56.04	15.42	72.46	176	144.04	55.94	15.27	72.83
57	144.00	56.00	15.42	72.58	117	143.88	55.93	15.31	72.64	177	143.82	55.83	15.33	72.65
58	144.21	55.88	15.46	72.86	118	143.74	55.89	15.35	72.50	178	143.99	55.84	15.41	72.75
59	144.19	56.21	15.31	72.67	119	143.67	55.68	15.23	72.76	179	144.24	55.95	15.37	72.93
										180	143.58	55.86	15.24	72.48
										181	143.99	56.08	15.32	72.59
										182	143.98	55.80	15.27	72.91

Sustainability – Data Rate Distribution Graph

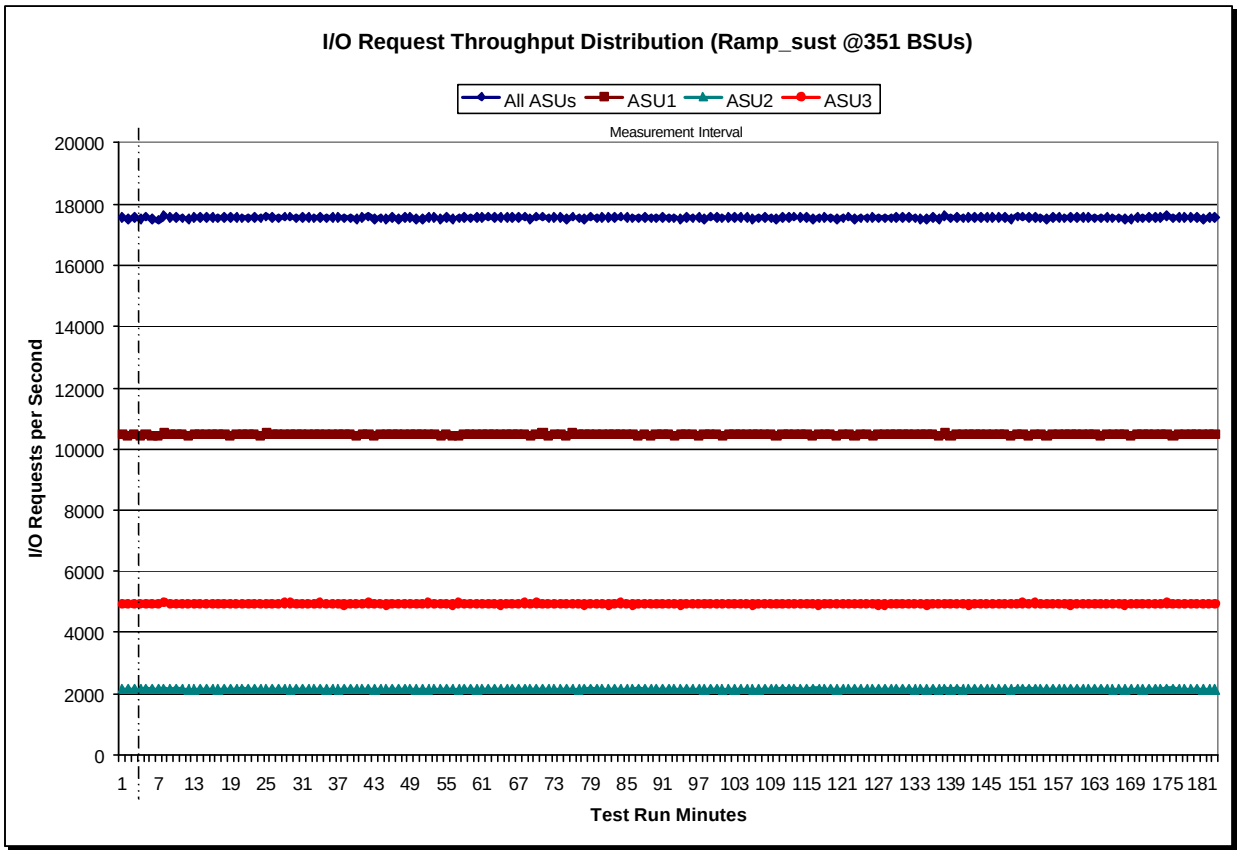


Sustainability – I/O Request Throughput Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	13:02:40	13:05:40	0-2	0:03:00
Measurement Interval	13:05:40	16:05:52	3-182	3:00:12

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	17,549.38	10,457.83	2,161.10	4,930.45	60	17,564.35	10,468.22	2,161.52	4,934.62	120	17,542.32	10,458.65	2,165.30	4,918.37
1	17,513.23	10,438.47	2,155.47	4,919.30	61	17,581.15	10,484.43	2,165.55	4,931.17	121	17,575.00	10,472.52	2,159.28	4,943.20
2	17,570.33	10,476.92	2,162.52	4,930.90	62	17,566.80	10,471.63	2,164.82	4,930.35	122	17,528.43	10,442.03	2,159.87	4,926.53
3	17,528.45	10,439.93	2,155.03	4,933.48	63	17,547.55	10,465.63	2,165.00	4,916.92	123	17,534.37	10,447.92	2,156.13	4,930.32
4	17,581.70	10,472.38	2,168.22	4,941.10	64	17,551.05	10,451.32	2,165.78	4,933.95	124	17,543.60	10,446.83	2,155.20	4,941.57
5	17,509.10	10,434.72	2,155.85	4,918.53	65	17,558.93	10,482.12	2,154.62	4,922.20	125	17,545.32	10,445.32	2,155.70	4,944.30
6	17,478.10	10,404.58	2,154.80	4,918.72	66	17,549.82	10,464.07	2,160.62	4,925.13	126	17,542.63	10,469.68	2,159.93	4,913.02
7	17,629.27	10,497.78	2,167.07	4,964.42	67	17,582.63	10,473.00	2,161.32	4,948.32	127	17,536.47	10,469.17	2,154.97	4,912.33
8	17,572.73	10,482.17	2,158.02	4,932.55	68	17,524.18	10,437.15	2,159.98	4,927.05	128	17,540.47	10,459.23	2,159.65	4,921.58
9	17,550.40	10,461.28	2,168.35	4,920.77	69	17,577.85	10,466.63	2,163.55	4,947.67	129	17,562.62	10,455.80	2,163.77	4,943.05
10	17,543.25	10,449.87	2,158.55	4,934.83	70	17,583.05	10,493.42	2,161.95	4,927.68	130	17,555.85	10,451.10	2,166.40	4,938.35
11	17,523.12	10,441.07	2,149.08	4,932.97	71	17,542.40	10,443.32	2,166.45	4,932.63	131	17,562.90	10,473.55	2,163.48	4,925.87
12	17,559.78	10,474.72	2,151.05	4,934.02	72	17,573.23	10,478.28	2,163.95	4,931.00	132	17,534.90	10,449.90	2,147.87	4,937.13
13	17,559.98	10,465.93	2,160.45	4,933.60	73	17,564.57	10,465.57	2,163.42	4,935.58	133	17,528.32	10,447.08	2,154.45	4,926.78
14	17,569.83	10,483.27	2,155.33	4,931.23	74	17,515.97	10,431.07	2,158.65	4,926.25	134	17,507.18	10,450.07	2,151.20	4,905.92
15	17,549.27	10,453.00	2,154.53	4,941.73	75	17,579.33	10,496.90	2,161.00	4,921.43	135	17,572.88	10,476.30	2,164.43	4,932.15
16	17,543.02	10,459.85	2,148.82	4,934.35	76	17,544.72	10,459.87	2,147.85	4,937.00	136	17,515.75	10,442.92	2,145.48	4,927.35
17	17,559.68	10,468.02	2,160.02	4,931.65	77	17,519.88	10,447.08	2,158.03	4,914.77	137	17,612.12	10,501.05	2,167.73	4,943.33
18	17,547.80	10,440.88	2,165.42	4,941.50	78	17,583.30	10,474.48	2,170.32	4,938.50	138	17,536.82	10,441.63	2,151.93	4,943.25
19	17,550.42	10,465.68	2,156.80	4,927.93	79	17,539.95	10,455.98	2,164.93	4,919.03	139	17,551.62	10,454.78	2,171.55	4,925.28
20	17,540.03	10,447.15	2,167.18	4,925.70	80	17,551.33	10,467.13	2,160.47	4,923.73	140	17,536.57	10,451.35	2,150.30	4,934.92
21	17,541.20	10,446.65	2,161.90	4,932.65	81	17,552.80	10,474.02	2,161.67	4,917.12	141	17,550.43	10,479.33	2,165.22	4,905.88
22	17,571.63	10,472.55	2,166.92	4,932.17	82	17,546.13	10,453.43	2,160.28	4,932.42	142	17,550.17	10,472.03	2,154.05	4,924.08
23	17,538.32	10,445.22	2,161.77	4,931.33	83	17,586.12	10,466.63	2,161.78	4,957.70	143	17,565.12	10,471.85	2,159.03	4,934.23
24	17,596.02	10,490.00	2,161.48	4,944.53	84	17,562.53	10,461.42	2,164.53	4,936.58	144	17,547.38	10,474.83	2,153.95	4,918.60
25	17,555.47	10,463.10	2,160.40	4,931.97	85	17,535.73	10,459.82	2,158.97	4,916.95	145	17,560.42	10,467.53	2,164.70	4,928.18
26	17,536.45	10,449.70	2,155.58	4,931.17	86	17,538.77	10,442.40	2,173.15	4,923.22	146	17,554.28	10,471.40	2,161.63	4,921.25
27	17,576.47	10,468.97	2,160.37	4,947.13	87	17,562.83	10,462.57	2,165.40	4,934.87	147	17,548.67	10,460.07	2,157.00	4,931.60
28	17,584.57	10,483.80	2,149.57	4,951.20	88	17,533.07	10,442.28	2,163.43	4,927.35	148	17,509.60	10,422.22	2,146.37	4,941.02
29	17,530.88	10,453.33	2,155.73	4,921.82	89	17,544.62	10,447.38	2,154.30	4,942.93	149	17,590.58	10,478.18	2,170.77	4,941.63
30	17,550.72	10,461.13	2,153.67	4,935.92	90	17,549.40	10,465.88	2,155.77	4,927.75	150	17,579.32	10,466.88	2,164.73	4,947.70
31	17,564.47	10,460.85	2,158.40	4,945.22	91	17,537.13	10,458.42	2,154.18	4,924.53	151	17,555.23	10,440.68	2,168.70	4,945.85
32	17,540.25	10,461.73	2,159.63	4,918.88	92	17,543.80	10,439.57	2,161.13	4,943.10	152	17,566.85	10,453.85	2,164.55	4,948.45
33	17,553.98	10,449.38	2,157.88	4,946.72	93	17,525.87	10,452.37	2,161.82	4,911.68	153	17,531.23	10,448.85	2,153.75	4,928.63
34	17,544.60	10,467.32	2,148.67	4,928.62	94	17,564.58	10,471.50	2,156.62	4,936.47	154	17,521.20	10,430.18	2,159.60	4,931.42
35	17,564.75	10,476.35	2,162.80	4,925.60	95	17,532.15	10,451.42	2,163.17	4,917.57	155	17,546.28	10,459.33	2,161.98	4,924.97
36	17,554.97	10,462.55	2,149.78	4,942.63	96	17,546.13	10,440.30	2,162.23	4,943.60	156	17,570.53	10,468.07	2,156.80	4,945.67
37	17,536.73	10,455.05	2,164.50	4,917.18	97	17,528.78	10,450.05	2,142.80	4,935.93	157	17,534.88	10,456.73	2,155.33	4,922.82
38	17,541.58	10,466.87	2,154.40	4,920.32	98	17,582.50	10,486.43	2,159.90	4,936.17	158	17,556.27	10,482.97	2,156.37	4,916.93
39	17,527.52	10,442.75	2,158.52	4,926.25	99	17,564.67	10,474.55	2,156.00	4,934.12	159	17,556.03	10,463.17	2,153.75	4,939.12
40	17,565.47	10,466.65	2,154.82	4,944.00	100	17,537.85	10,445.30	2,150.37	4,942.18	160	17,548.47	10,456.88	2,162.92	4,928.67
41	17,599.22	10,484.73	2,160.92	4,953.57	101	17,568.37	10,473.43	2,155.68	4,939.25	161	17,545.93	10,451.08	2,155.30	4,939.55
42	17,528.65	10,446.10	2,146.95	4,935.60	102	17,560.15	10,486.02	2,149.68	4,924.45	162	17,539.13	10,447.32	2,161.83	4,929.98
43	17,539.27	10,454.92	2,153.35	4,931.00	103	17,547.15	10,460.45	2,158.97	4,927.73	163	17,534.53	10,445.42	2,157.90	4,931.22
44	17,528.15	10,455.78	2,156.38	4,915.98	104	17,560.15	10,465.08	2,160.90	4,934.17	164	17,566.87	10,470.27	2,166.55	4,930.05
45	17,546.13	10,448.97	2,153.25	4,943.92	105	17,509.82	10,451.35	2,151.50	4,906.97	165	17,534.48	10,449.48	2,151.78	4,933.22
46	17,529.25	10,448.05	2,157.48	4,923.72	106	17,535.43	10,455.33	2,150.37	4,929.73	166	17,542.17	10,455.28	2,154.12	4,932.77
47	17,550.75	10,457.77	2,157.17	4,935.82	107	17,552.40	10,460.90	2,157.45	4,934.05	167	17,512.07	10,451.98	2,150.82	4,909.27
48	17,554.93	10,453.23	2,158.22	4,943.48	108	17,540.53	10,455.42	2,164.20	4,920.92	168	17,516.37	10,435.78	2,154.82	4,925.77
49	17,520.85	10,454.10	2,141.95	4,924.80	109	17,517.78	10,430.37	2,159.58	4,927.83	169	17,553.78	10,456.88	2,161.37	4,935.53
50	17,530.00	10,456.52	2,152.58	4,920.90	110	17,551.70	10,462.45	2,170.48	4,918.77	170	17,537.42	10,452.17	2,150.37	4,934.88
51	17,557.90	10,459.53	2,151.83	4,946.53	111	17,546.55	10,455.78	2,157.73	4,933.03	171	17,565.90	10,471.23	2,159.07	4,935.60
52	17,566.03	10,458.60	2,161.98	4,945.45	112	17,582.72	10,466.87	2,174.03	4,941.82	172	17,546.85	10,460.67	2,161.95	4,924.23
53	17,524.92	10,431.15	2,155.73	4,938.03	113	17,564.15	10,469.05	2,162.88	4,932.22	173	17,563.92	10,466.58	2,166.12	4,931.22
54	17,558.83	10,460.70	2,158.12	4,940.02	114	17,546.03	10,452.48	2,160.15	4,933.40	174	17,605.42	10,488.17	2,168.70	4,948.55
55	17,507.65	10,443.23	2,156.02	4,908.40	115	17,528.78	10,441.40	2,169.05	4,918.33	175	17,533.70	10,444.42	2,167.30	4,921.98
56	17,537.10	10,435.87	2,150.93	4,950.30	116	17,535.68	10,456.42	2,168.53	4,910.73	176	17,561.55	10,463.37	2,156.42	4,941.77
57	17,550.42	10,460.80	2,155.63	4,933.98	117	17,563.88	10,473.00	2,158.93	4,931.95	177	17,545.32	10,450.43	2,156.37	4,938.52
58	17,544.58	10,453.98	2,156.53	4,934.07	118	17,544.43	10,457.05	2,160.23	4,927.15	178	17,564.88	10,468.07	2,163.97	4,932.85
59	17,569.07	10,486.45	2,148.83	4,933.78	119	17,527.83	10,444.95	2,151.08	4,931.80	179	17,572.37	10,469.28	2,162.25	4,940.83
										180	17,527.63	10,448.00	2,149.35	4,930.28
										181	17,547.63	10,457.12	2,152.45	4,938.07
										182	17,550.48	10,457.43	2,151.28	4,941.77
										Average	17,549.75	10,459.28	2,158.72	4,931.75

Sustainability – I/O Request Throughput Distribution Graph



Sustainability – Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.0053	0.0016	0.0034	0.0019	0.0071	0.0033	0.0052	0.0017

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

IOPS Test Phase

Clause 5.4.2.2

The IOPS Test Phase consists of one Test Run at the 100% load point with a Measurement Interval of ten (10) minutes. The IOPS Test Phase immediately follows the Sustainability Test Phase without any interruption or manual intervention.

The IOPS Test Run generates the SPC-1 IOPS™ primary metric, which is computed as the I/O Request Throughput for the Measurement Interval of the IOPS Test Run.

The Average Response Time is computed for the IOPS Test Run and cannot exceed 30 milliseconds. If the Average Response Time exceeds the 30 millisecond constraint, the measurement is invalid.

Clause 9.2.4.7.2

For the IOPS Test Phase the FDR shall contain:

1. *I/O Request Throughput Distribution (data and graph).*
2. *A Response Time Frequency Distribution.*
3. *An Average Response Time Distribution.*
4. *The human readable Test Run Results File produced by the Workload Generator.*
5. *A listing or screen image of all input parameters supplied t the Workload Generator.*
6. *The total number of I/O Requests completed in the Measurement Interval as well as the number of I/O Requests with a Response Time less than or equal to 30 milliseconds and the number of I/O Requests with a Response Time greater than 30 milliseconds.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, and Response Time Ramp Test Runs are listed below.

```
java –Xmx512m metrics -b 351
```

IOPS Test Results File

A link to the test results file generated from the IOPS Test Run is listed below.

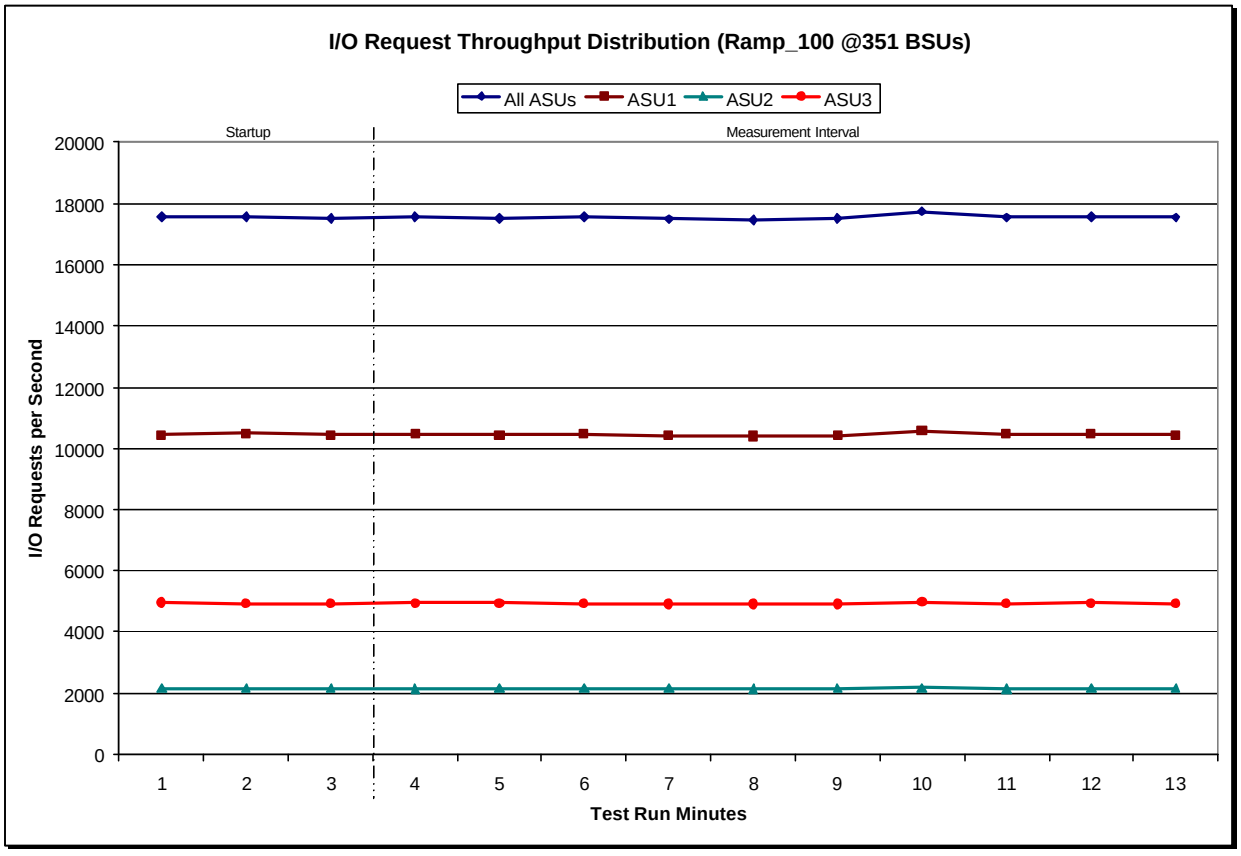
IOPS Test Results File

IOPS Test Run – I/O Request Throughput Distribution Data

351 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	16:16:59	16:20:00	0-2	0:03:01
Measurement Interval	16:20:00	16:30:11	3-12	0:10:11

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	17,548.97	10,443.12	2,153.43	4,952.42
1	17,553.43	10,476.22	2,158.23	4,918.98
2	17,518.13	10,438.05	2,154.80	4,925.28
3	17,550.92	10,465.95	2,150.12	4,934.85
4	17,530.55	10,440.07	2,155.33	4,935.15
5	17,558.48	10,465.68	2,161.68	4,931.12
6	17,491.53	10,427.20	2,153.77	4,910.57
7	17,452.15	10,396.32	2,142.28	4,913.55
8	17,502.02	10,430.98	2,155.53	4,915.50
9	17,734.77	10,570.25	2,181.10	4,983.42
10	17,539.13	10,463.47	2,150.85	4,924.82
11	17,567.63	10,473.07	2,156.83	4,937.73
12	17,531.63	10,443.80	2,160.63	4,927.20
Average	17,545.88	10,457.68	2,156.81	4,931.39

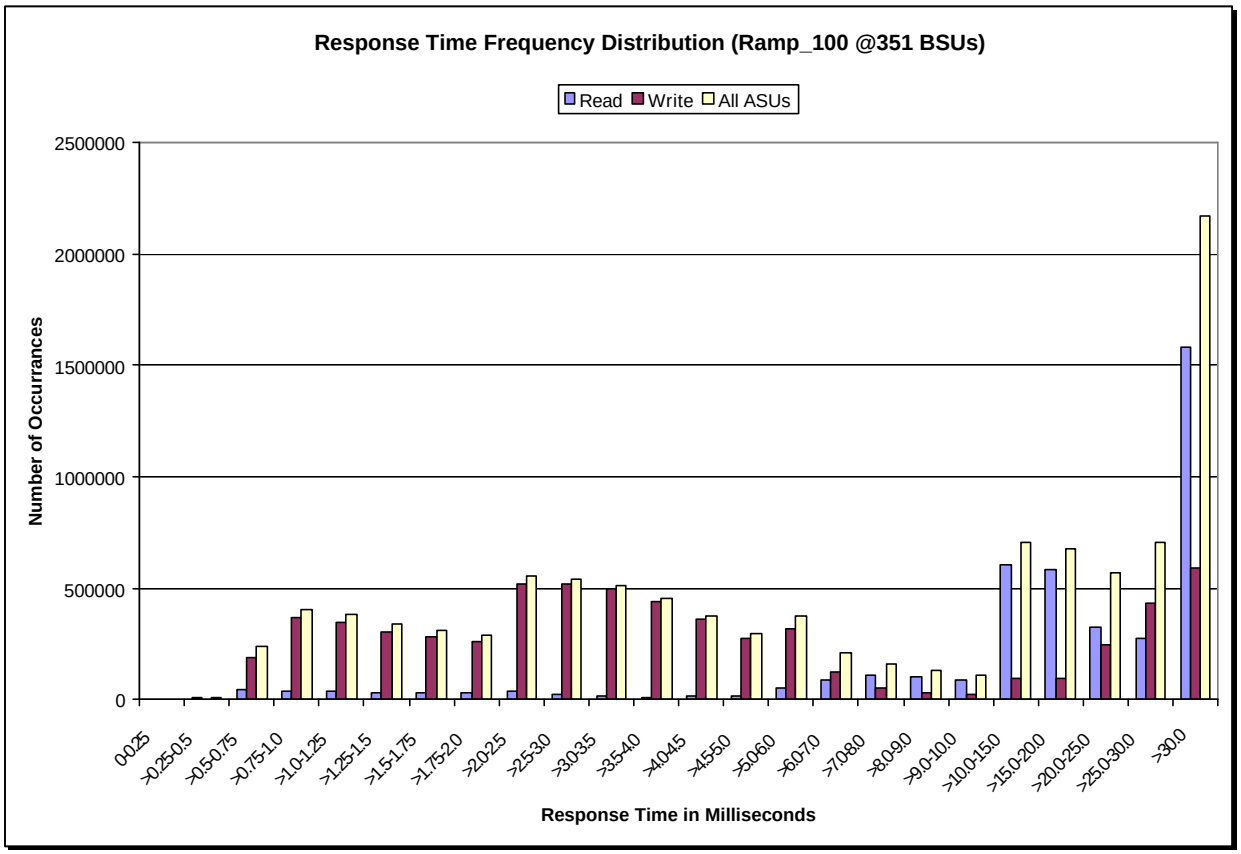
IOPS Test Run – I/O Request Throughput Distribution Graph



IOPS Test Run – Response Time Frequency Distribution Data

Response Time (ms)	0-0.25	>0.25-0.5	>0.5-0.75	>0.75-1.0	>1.0-1.25	>1.25-1.5	>1.5-1.75	>1.75-2.0
Read	0	12,243	43,978	39,386	34,886	32,712	31,145	27,643
Write	0	592	192,792	368,754	347,808	306,933	278,400	261,366
All ASUs	0	12,835	236,770	408,140	382,694	339,645	309,545	289,009
ASU1	0	10,338	144,731	220,454	194,031	168,008	151,918	140,545
ASU2	0	2,307	33,078	51,786	46,607	39,804	36,479	33,568
ASU3	0	190	58,961	135,900	142,056	131,833	121,148	114,896
Response Time (ms)	**>2.0-2.5**	**>2.5-3.0**	**>3.0-3.5**	**>3.5-4.0**	**>4.0-4.5**	**>4.5-5.0**	**>5.0-6.0**	**>6.0-7.0**
Read	38,723	21,082	13,608	11,932	13,265	17,010	53,580	88,056
Write	518,924	519,268	500,073	439,460	362,602	276,280	318,724	123,276
All ASUs	557,647	540,350	513,681	451,392	375,867	293,290	372,304	211,332
ASU1	264,859	251,918	235,265	200,555	162,923	122,452	155,870	111,115
ASU2	62,556	59,105	54,912	46,680	36,773	27,114	30,174	15,574
ASU3	230,232	229,327	223,504	204,157	176,171	143,724	186,260	84,643
Response Time (ms)	**>7.0-8.0**	**>8.0-9.0**	**>9.0-10.0**	**>10.0-15.0**	**>15.0-20.0**	**>20.0-25.0**	**>25.0-30.0**	**>30.0**
Read	110,407	104,412	84,690	607,622	584,712	325,541	274,406	1,580,077
Write	52,101	29,738	25,092	95,652	94,385	242,875	432,107	589,018
All ASUs	162,508	134,150	109,782	703,274	679,097	568,416	706,513	2,169,095
ASU1	111,995	101,306	82,933	565,560	542,745	392,099	439,448	1,503,408
ASU2	14,652	14,930	12,755	91,530	95,059	77,791	96,085	314,729
ASU3	35,861	17,914	14,094	46,184	41,293	98,526	170,980	350,958

IOPS Test Run –Response Time Frequency Distribution Graph

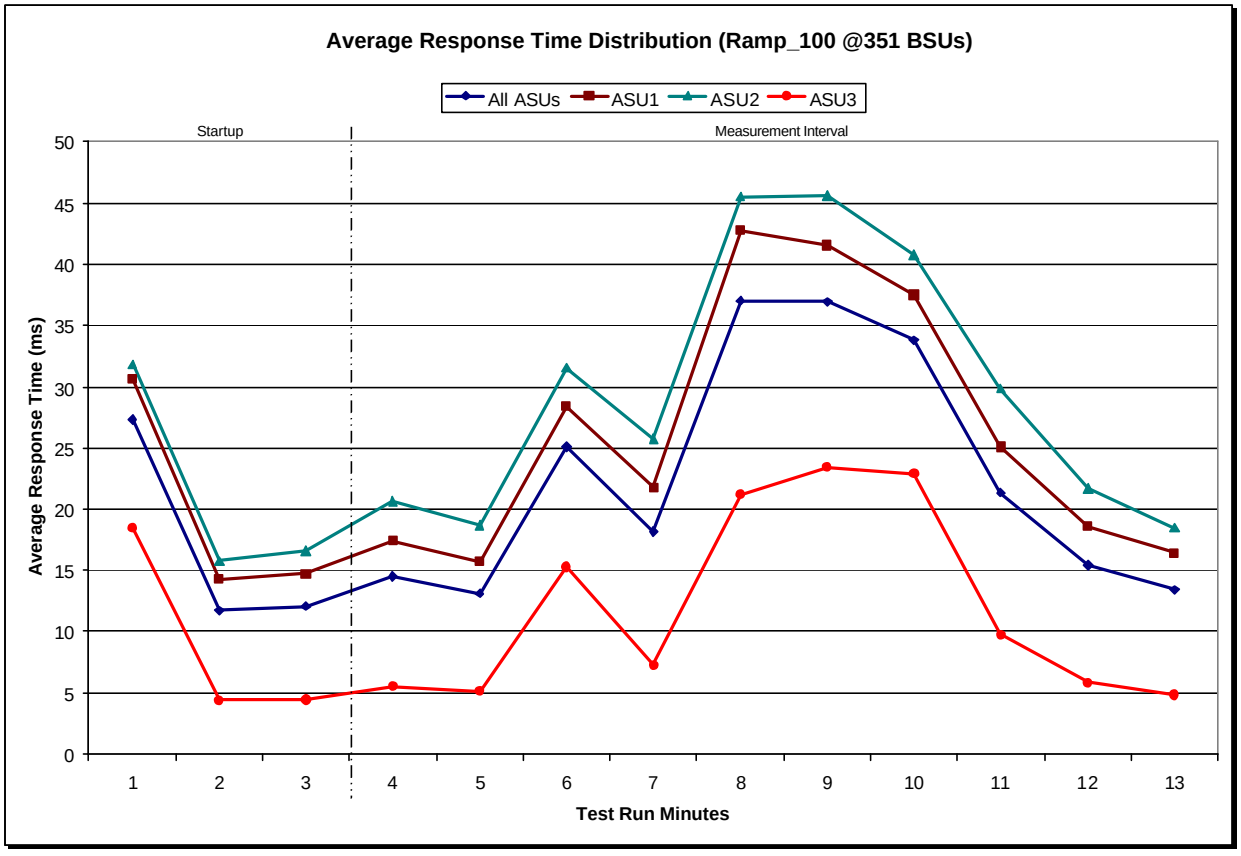


IOPS Test Run – Average Response Time (ms) Distribution Data

351 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	16:16:59	16:20:00	0-2	0:03:01
Measurement Interval	16:20:00	16:30:11	3-12	0:10:11

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	27.31	30.60	31.82	18.42
1	11.69	14.28	15.78	4.38
2	12.05	14.71	16.56	4.44
3	14.46	17.40	20.63	5.54
4	13.12	15.74	18.67	5.14
5	25.06	28.35	31.54	15.25
6	18.18	21.76	25.75	7.26
7	37.04	42.77	45.54	21.20
8	36.95	41.54	45.58	23.42
9	33.79	37.48	40.77	22.89
10	21.35	25.06	29.85	9.77
11	15.39	18.60	21.68	5.84
12	13.40	16.40	18.47	4.82
Average	22.87	26.51	29.85	12.11

IOPS Test Run – Average Response Time (ms) Distribution Graph



IOPS Test Run – I/O Request Information

I/O Requests Completed in the Measurement Interval	I/O Requests Completed with Response Time = or < 30 ms	I/O Requests Completed with Response Time > 30 ms
10,527,529	10,306,293	2,169,095

IOPS Test Run – Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2810	0.0699	0.2101	0.0180	0.0699	0.0350	0.2811
COV	0.0046	0.0015	0.0031	0.0018	0.0080	0.0025	0.0065	0.0010

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

Response Time Ramp Test Phase

Clause 5.4.2.3

The Response Time Ramp Test Phase consists of five Test Runs, one each at 95%, 90%, 80%, 50%, and 10% of the load point (100%) used to generate the SPC-1 IOPS™ primary metric. Each of the five Test Runs has a Measurement Interval of ten (10) minutes. The Response Time Ramp Test Phase immediately follows the IOPS Test Phase without any interruption or manual intervention.

The five Response Time Ramp Test Runs, in conjunction with the IOPS Test Run (100%), demonstrate the relationship between Average Response Time and I/O Request Throughput for the Tested Storage Configuration (TSC) as illustrated in the response time/throughput curve on page 11.

In addition, the Average Response Time measured during the 10% Test Run is the value for the SPC-1 LRT™ primary metric. That value represents the Average Response Time of a lightly loaded TSC.

Clause 9.2.4.7.3

The following content shall appear in the FDR for the Response Time Ramp Phase:

1. *A Response Time Ramp Distribution.*
2. *The human readable Test Run Results File produced by the Workload Generator for each Test Run within the Response Time Ramp Test Phase.*
3. *For the 10% Load Level Test Run (SPC-1 LRT™ metric) an Average Response Time Distribution.*
4. *A listing or screen image of all input parameters supplied to the Workload Generator.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, and Response Time Ramp Test Runs are listed below.

java –Xmx512m metrics -b 351

Response Time Ramp Test Results File

A link to each test result file generated from each Response Time Ramp Test Run list listed below.

95% Load Level

90% Load Level

80% Load Level

50% Load Level

10% Load Level

Response Time Ramp Distribution (IOPS) Data

The five Test Runs that comprise the Response Time Ramp Phase are executed at 95%, 90%, 80%, 50%, and 10% of the Business Scaling Unit (BSU) load level used to produce the SPC-1 IOPS™ primary metric. The 100% BSU load level is included in the following Response Time Ramp data tables and graphs for completeness.

100% Load Level - 351 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	16:16:59	16:20:00	0-4	0:03:01
Measurement Interval	16:20:00	16:30:11	5-14	0:10:11

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	17,548.97	10,443.12	2,153.43	4,952.42
1	17,553.43	10,476.22	2,158.23	4,918.98
2	17,518.13	10,438.05	2,154.80	4,925.28
3	17,550.92	10,465.95	2,150.12	4,934.85
4	17,530.55	10,440.07	2,155.33	4,935.15
5	17,558.48	10,465.68	2,161.68	4,931.12
6	17,491.53	10,427.20	2,153.77	4,910.57
7	17,452.15	10,396.32	2,142.28	4,913.55
8	17,502.02	10,430.98	2,155.53	4,915.50
9	17,734.77	10,570.25	2,181.10	4,983.42
10	17,539.13	10,463.47	2,150.85	4,924.82
11	17,567.63	10,473.07	2,156.83	4,937.73
12	17,531.63	10,443.80	2,160.63	4,927.20
Average	17,545.88	10,457.68	2,156.81	4,931.39

95% Load Level - 333 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	16:32:09	16:35:10	3	0:03:01
Measurement Interval	16:35:10	16:45:21	10.2	0:10:11

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	16,629.13	9,907.38	2,046.72	4,675.03
1	16,633.75	9,924.80	2,042.87	4,666.08
2	16,621.80	9,913.12	2,044.22	4,664.47
3	16,646.22	9,904.80	2,053.83	4,687.58
4	16,612.20	9,897.32	2,043.97	4,670.92
5	16,654.22	9,929.43	2,048.62	4,676.17
6	16,643.00	9,913.78	2,053.95	4,675.27
7	16,633.97	9,910.42	2,047.33	4,676.22
8	16,653.28	9,906.65	2,058.10	4,688.53
9	16,654.27	9,911.78	2,055.67	4,686.82
10	16,641.37	9,919.38	2,044.47	4,677.52
11	16,632.15	9,914.42	2,040.30	4,677.43
12	16,630.50	9,923.25	2,042.50	4,664.75
Average	16,640.12	9,913.12	2,048.87	4,678.12

90% Load Level - 315 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	16:47:01	16:50:02	3	0:03:01
Measurement Interval	16:50:02	17:00:13	10.2	0:10:11

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	15,789.02	9,409.32	1,939.50	4,440.20
1	15,767.62	9,414.77	1,930.40	4,422.45
2	15,758.33	9,390.57	1,941.43	4,426.33
3	15,765.32	9,394.45	1,946.13	4,424.73
4	15,710.12	9,364.33	1,928.48	4,417.30
5	15,738.97	9,384.77	1,937.72	4,416.48
6	15,745.92	9,368.98	1,940.83	4,436.10
7	15,762.22	9,397.55	1,932.00	4,432.67
8	15,745.38	9,387.17	1,936.63	4,421.58
9	15,737.62	9,385.45	1,931.70	4,420.47
10	15,777.05	9,393.73	1,939.43	4,443.88
11	15,709.17	9,368.43	1,932.63	4,408.10
12	15,738.95	9,393.75	1,934.07	4,411.13
Average	15,743.07	9,383.86	1,935.96	4,423.25

80% Load Level - 280 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	17:01:50	17:04:51	3	0:03:01
Measurement Interval	17:04:51	17:15:01	10.2	0:10:10

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	13,998.40	8,350.10	1,716.27	3,932.03
1	14,017.27	8,361.68	1,716.92	3,938.67
2	13,990.62	8,333.83	1,725.65	3,931.13
3	13,996.40	8,341.02	1,720.55	3,934.83
4	13,996.82	8,348.57	1,717.53	3,930.72
5	14,001.77	8,343.65	1,732.40	3,925.72
6	14,016.15	8,359.72	1,711.38	3,945.05
7	14,006.57	8,332.67	1,725.62	3,948.28
8	13,993.90	8,358.93	1,712.08	3,922.88
9	14,010.25	8,355.67	1,722.03	3,932.55
10	14,009.38	8,356.87	1,714.00	3,938.52
11	14,005.32	8,351.52	1,722.20	3,931.60
12	14,016.53	8,351.33	1,729.78	3,935.42
Average	14,005.31	8,349.99	1,720.76	3,934.56

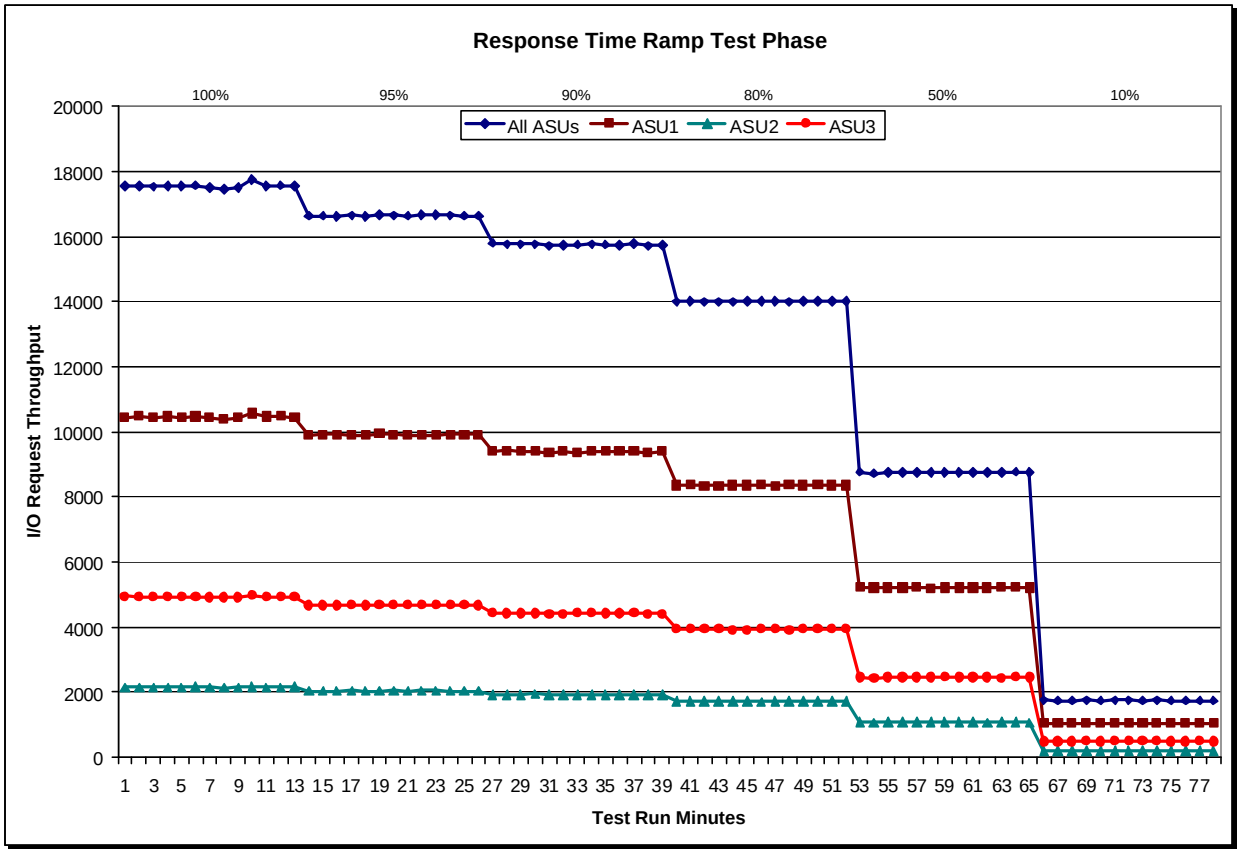
50% Load Level - 175 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	17:16:34	17:19:35	3	0:03:01
Measurement Interval	17:19:35	17:29:42	10.1	0:10:07

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	8,762.93	5,223.05	1,076.78	2,463.10
1	8,724.90	5,213.48	1,073.02	2,438.40
2	8,738.72	5,205.07	1,076.18	2,457.47
3	8,754.87	5,212.00	1,081.35	2,461.52
4	8,759.88	5,221.42	1,079.65	2,458.82
5	8,741.83	5,201.17	1,083.07	2,457.60
6	8,755.23	5,204.53	1,080.18	2,470.52
7	8,746.90	5,208.22	1,081.50	2,457.18
8	8,748.92	5,212.28	1,077.75	2,458.88
9	8,752.20	5,216.27	1,074.07	2,461.87
10	8,744.33	5,222.17	1,079.12	2,443.05
11	8,768.43	5,219.35	1,076.73	2,472.35
12	8,744.48	5,212.37	1,075.53	2,456.58
Average	8,751.71	5,212.98	1,078.90	2,459.84

10% Load Level - 35 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	17:31:13	17:34:14	3	0:03:01
Measurement Interval	17:34:14	17:44:19	10.1	0:10:05

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	1,752.50	1,043.57	217.83	491.10
1	1,747.27	1,042.57	216.42	488.28
2	1,745.57	1,040.05	214.20	491.32
3	1,757.87	1,049.48	213.78	494.60
4	1,741.83	1,036.62	213.27	491.95
5	1,752.45	1,042.90	213.65	495.90
6	1,756.78	1,046.25	214.50	496.03
7	1,750.80	1,041.27	214.80	494.73
8	1,753.88	1,041.67	214.45	497.77
9	1,746.35	1,044.50	213.08	488.77
10	1,746.80	1,041.85	219.25	485.70
11	1,752.18	1,042.10	214.72	495.37
12	1,744.82	1,042.98	211.18	490.65
Average	1,750.38	1,042.96	214.27	493.15

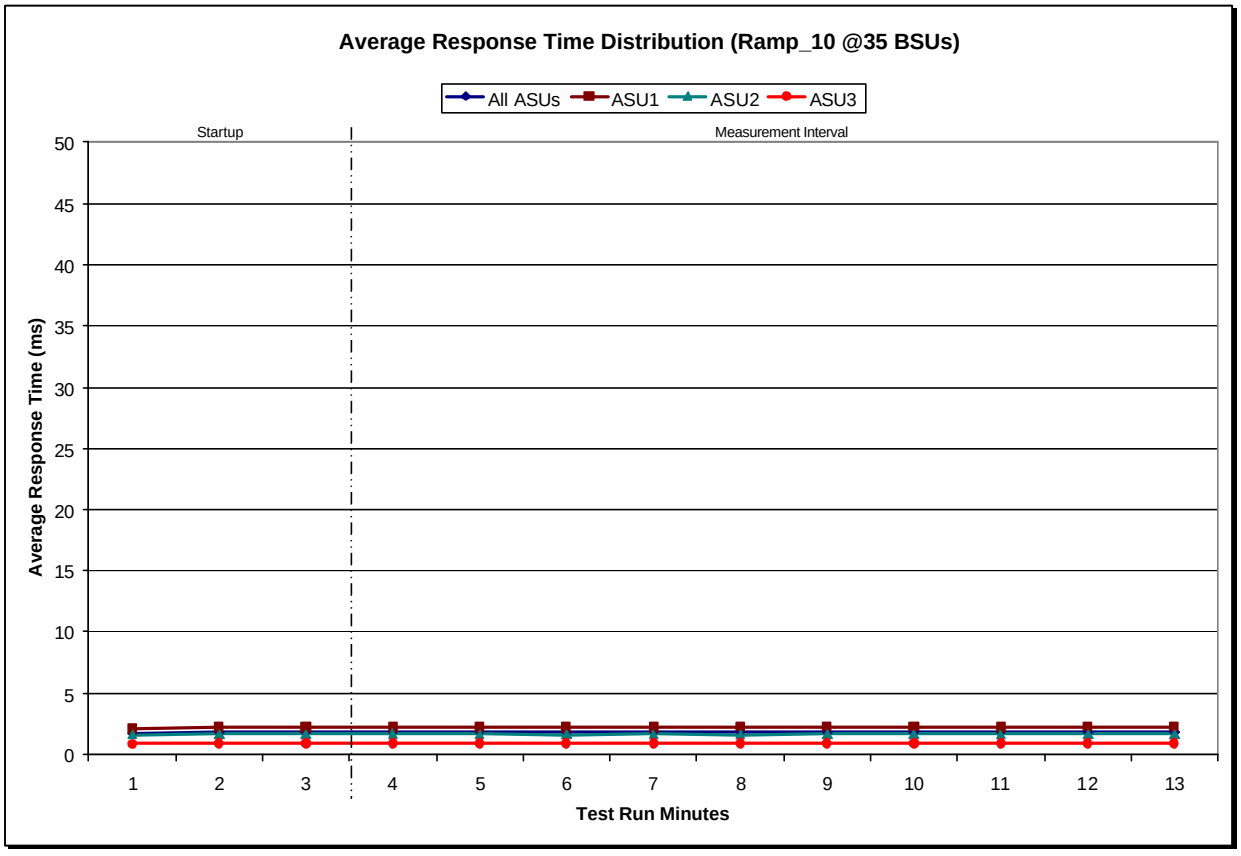
Response Time Ramp Distribution (IOPS) Graph



SPC-1 LRT™ Average Response Time (ms) Distribution Data

35 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	17:31:13	17:34:14	3	0:03:01
Measurement Interval	17:34:14	17:44:19	10.1	0:10:05
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.67	2.06	1.63	0.88
1	1.76	2.18	1.67	0.89
2	1.76	2.19	1.65	0.89
3	1.77	2.19	1.70	0.90
4	1.75	2.18	1.66	0.89
5	1.76	2.20	1.63	0.89
6	1.76	2.19	1.64	0.90
7	1.77	2.22	1.63	0.89
8	1.78	2.22	1.67	0.90
9	1.78	2.22	1.64	0.89
10	1.77	2.20	1.65	0.89
11	1.77	2.22	1.66	0.89
12	1.78	2.22	1.64	0.90
Average	1.77	2.21	1.65	0.90

SPC-1 LRT™ Average Response Time (ms) Distribution Graph



SPC-1 LRT™ (10%) – Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2811	0.0700	0.2097	0.0177	0.0698	0.0350	0.2817
COV	0.0161	0.0042	0.0121	0.0052	0.0229	0.0135	0.0178	0.0060

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

Repeatability Test

Clause 5.4.3

The Repeatability Test demonstrates the repeatability and reproducibility of the SPC-1 IOPS™ and SPC-1 LRT™ primary metrics generated in earlier Test Runs.

There are two identical Repeatability Test Phases. Each Test Phase contains two Test Runs. Each of the Test Runs will have a Measurement Interval of no less than ten (10) minutes. The two Test Runs in each Test Phase will be executed without interruption or any type of manual intervention.

The first Test Run in each Test Phase is executed at the 10% load point. The Average Response Time from each of the Test Runs is compared to the SPC-1 LRT™ primary metric. Each Average Response Time value must be less than the SPC-1 LRT™ primary metric plus 5%.

The second Test Run in each Test Phase is executed at the 100% load point. The I/O Request Throughput from the Test Runs is compared to the SPC-1 IOPS™ primary metric. Each I/O Request Throughput value must be greater than the SPC-1 IOPS™ primary metric minus 5%. In addition, the Average Response Time for each Test Run cannot exceed 30 milliseconds.

If any of the above constraints are not met, the benchmark measurement is invalid.

Clause 9.2.4.7.3

The following content shall appear in the FDR for each Test Run in the two Repeatability Test Phases:

1. *A table containing the results of the two Repeatability Test Phases. The content, appearance, and format of the table are specified in Table 9-11.*
2. *An I/O Request Throughput Distribution (data and graph).*
3. *An Average Response Time Distribution (data and graph).*
4. *The human readable Test Run Results File produced by the Workload Generator.*
5. *A listing or screen image of all input parameters supplied to the Workload Generator.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Repeatability Test Runs are listed below.

java –Xmx512m repeat1 -b 351
java –Xmx512m repeat2 -b 351

Repeatability Test Results File

The values for the SPC-1 IOPS™, SPC-1 LRT™, and the Repeatability Test measurements are listed below.

	SPC-1 IOPS™	SPC-1 LRT™
Primary Metrics	*17,545.88*	*1.77*
Repeatability Test Phase 1	17,556.06	1.75
Repeatability Test Phase 2	17,554.17	1.76

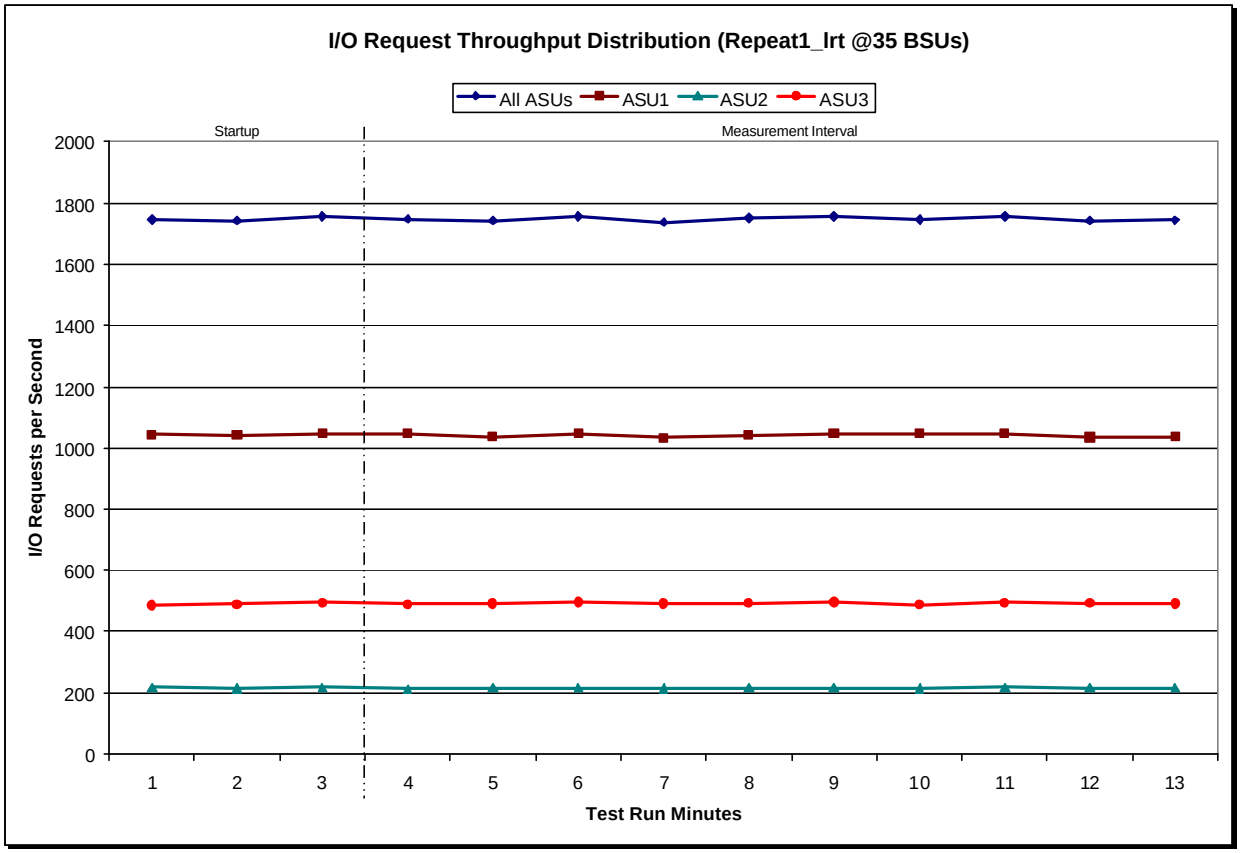
A link to the test result file generated from each Repeatability Test Run list is listed below.

Repeatability Test Phase 1, Test Run 1 (LRT)
Repeatability Test Phase 1, Test Run 2 (IOPS)
Repeatability Test Phase 2, Test Run 1 (LRT)
Repeatability Test Phase 2, Test Run 2 (IOPS)

Repeatability 1 LRT – I/O Request Throughput Distribution Data

35 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	17:46:18	17:49:18	0-2	0:03:00
Measurement Interval	17:49:18	17:59:23	3-12	0:10:05
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1,746.03	1,044.13	216.88	485.02
1	1,742.95	1,040.42	212.67	489.87
2	1,756.63	1,045.00	217.05	494.58
3	1,748.43	1,046.43	211.83	490.17
4	1,742.72	1,035.63	216.02	491.07
5	1,757.03	1,046.23	215.53	495.27
6	1,738.32	1,033.08	214.83	490.40
7	1,751.35	1,041.92	216.33	493.10
8	1,755.05	1,044.65	215.63	494.77
9	1,747.30	1,045.75	213.77	487.78
10	1,755.52	1,045.55	216.72	493.25
11	1,742.48	1,033.93	216.27	492.28
12	1,743.43	1,036.45	215.30	491.68
Average	1,748.16	1,040.96	215.22	491.98

Repeatability 1 LRT – I/O Request Throughput Distribution Graph

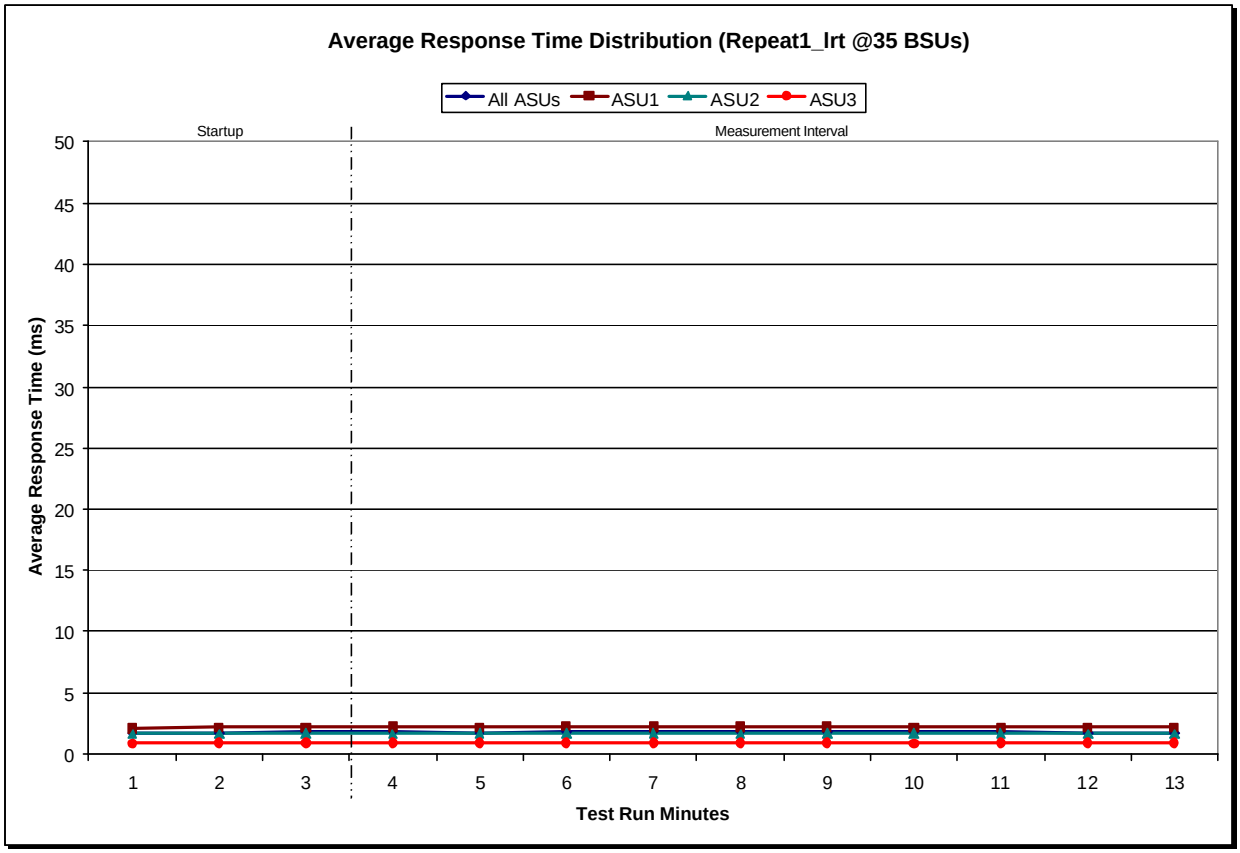


Repeatability 1 LRT –Average Response Time (ms) Distribution Data

35 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	17:46:18	17:49:18	0-2	0:03:01
Measurement Interval	17:49:18	17:59:23	3-12	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	1.67	2.05	1.66	0.87
1	1.73	2.14	1.65	0.88
2	1.75	2.17	1.70	0.88
3	1.75	2.18	1.67	0.88
4	1.74	2.16	1.69	0.88
5	1.78	2.22	1.70	0.89
6	1.77	2.20	1.70	0.88
7	1.76	2.20	1.65	0.88
8	1.76	2.19	1.68	0.89
9	1.75	2.17	1.68	0.88
10	1.75	2.17	1.69	0.89
11	1.73	2.15	1.65	0.89
12	1.73	2.15	1.65	0.88
Average	1.75	2.18	1.68	0.88

Repeatability 1 LRT –Average Response Time (ms) Distribution Graph

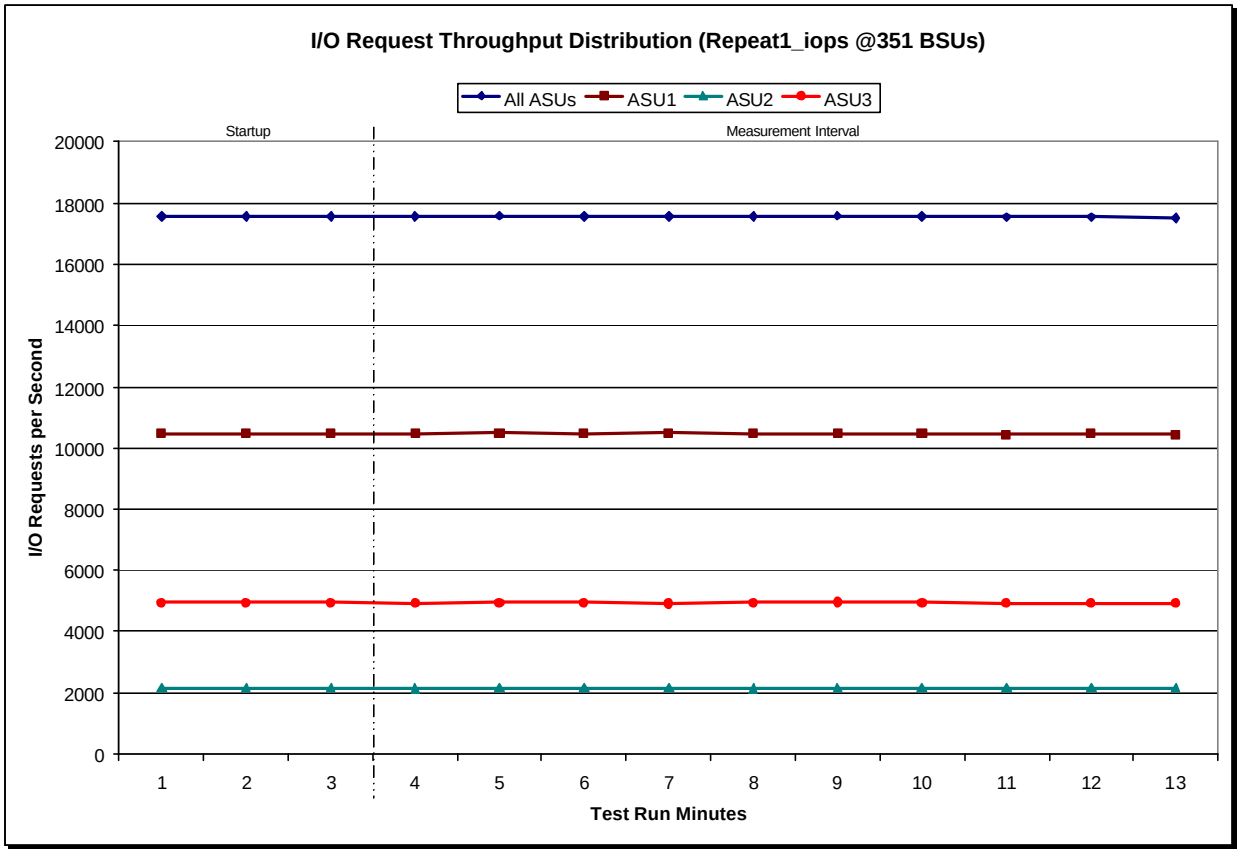


Repeatability 1 IOPS – I/O Request Throughput Distribution Data

351 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	18:01:01	18:04:02	0-2	0:03:01
Measurement Interval	18:04:02	18:14:13	3-12	0:10:11

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	17,556.33	10,457.52	2,162.17	4,936.65
1	17,565.70	10,469.73	2,163.40	4,932.57
2	17,569.65	10,465.13	2,158.87	4,945.65
3	17,552.88	10,472.73	2,151.23	4,928.92
4	17,575.92	10,478.85	2,162.23	4,934.83
5	17,562.20	10,467.43	2,159.63	4,935.13
6	17,563.93	10,489.23	2,157.68	4,917.02
7	17,557.92	10,463.78	2,150.37	4,943.77
8	17,573.98	10,459.40	2,163.43	4,951.15
9	17,567.15	10,472.92	2,161.70	4,932.53
10	17,538.03	10,445.13	2,162.22	4,930.68
11	17,543.83	10,451.43	2,163.17	4,929.23
12	17,524.73	10,435.67	2,164.48	4,924.58
Average	17,556.06	10,463.66	2,159.62	4,932.79

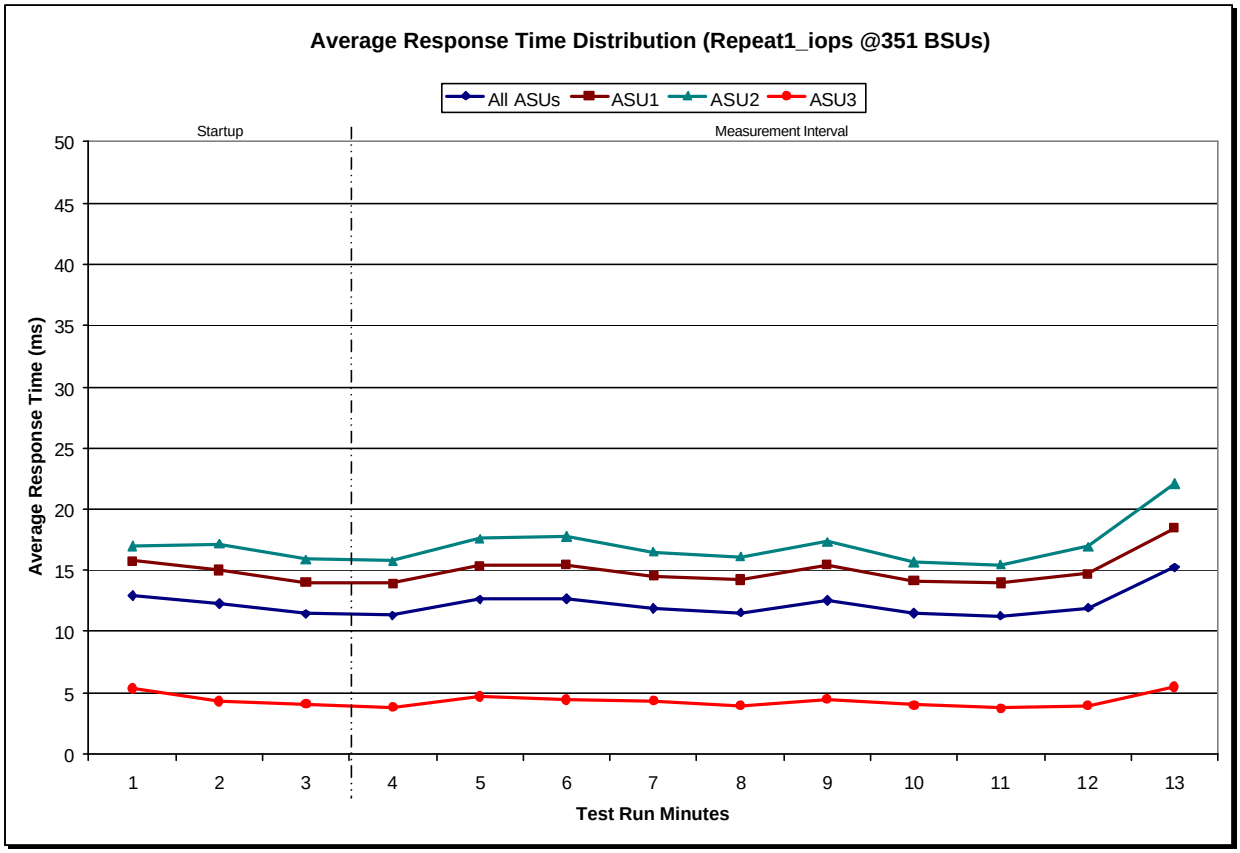
Repeatability 1 IOPS – I/O Request Throughput Distribution Graph



Repeatability 1 IOPS –Average Response Time (ms) Distribution Data

351 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	18:01:01	18:04:02	0-2	0:03:01
Measurement Interval	18:04:02	18:14:13	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	12.97	15.76	16.95	5.32
1	12.26	15.01	17.16	4.28
2	11.43	14.00	15.87	4.05
3	11.31	13.92	15.78	3.82
4	12.64	15.36	17.60	4.67
5	12.66	15.49	17.74	4.42
6	11.91	14.53	16.52	4.31
7	11.55	14.20	16.11	3.97
8	12.57	15.44	17.32	4.45
9	11.48	14.15	15.68	3.99
10	11.27	13.96	15.47	3.75
11	11.97	14.72	16.92	3.96
12	15.23	18.42	22.05	5.47
Average	12.26	15.02	17.12	4.28

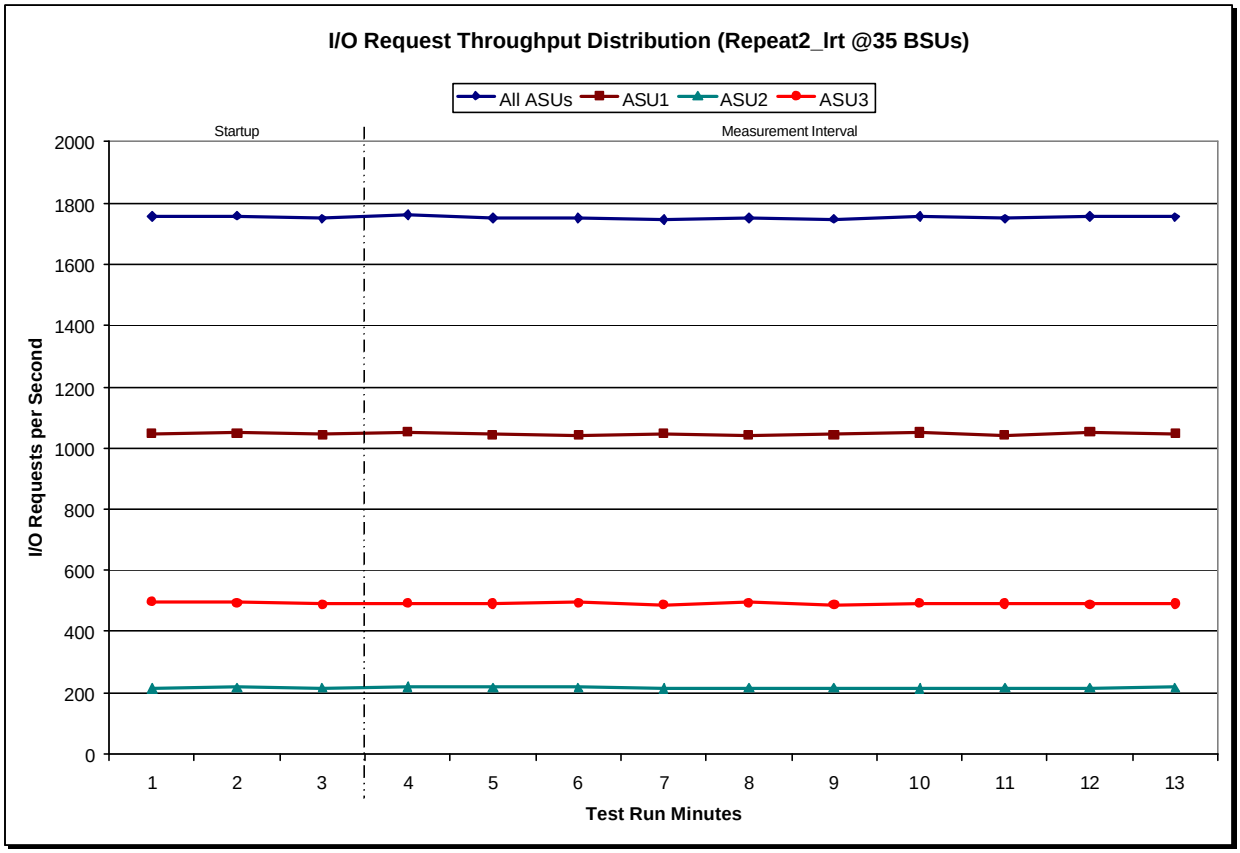
Repeatability 1 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 2 LRT – I/O Request Throughput Distribution Data

35 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	18:16:13	18:19:13	0-2	0:03:00
Measurement Interval	18:19:13	18:29:18	3-12	0:10:05
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1,756.17	1,046.45	213.53	496.18
1	1,757.58	1,047.57	216.80	493.22
2	1,749.82	1,044.22	216.37	489.23
3	1,762.05	1,051.60	218.53	491.92
4	1,751.80	1,043.55	217.30	490.95
5	1,752.28	1,041.63	216.78	493.87
6	1,746.62	1,045.98	212.40	488.23
7	1,751.37	1,040.73	216.10	494.53
8	1,748.55	1,044.18	216.60	487.77
9	1,756.18	1,049.38	214.97	491.83
10	1,749.43	1,041.58	216.70	491.15
11	1,756.78	1,051.15	216.38	489.25
12	1,754.25	1,046.00	216.73	491.52
Average	1,752.93	1,045.58	216.25	491.10

Repeatability 2 LRT – I/O Request Throughput Distribution Graph

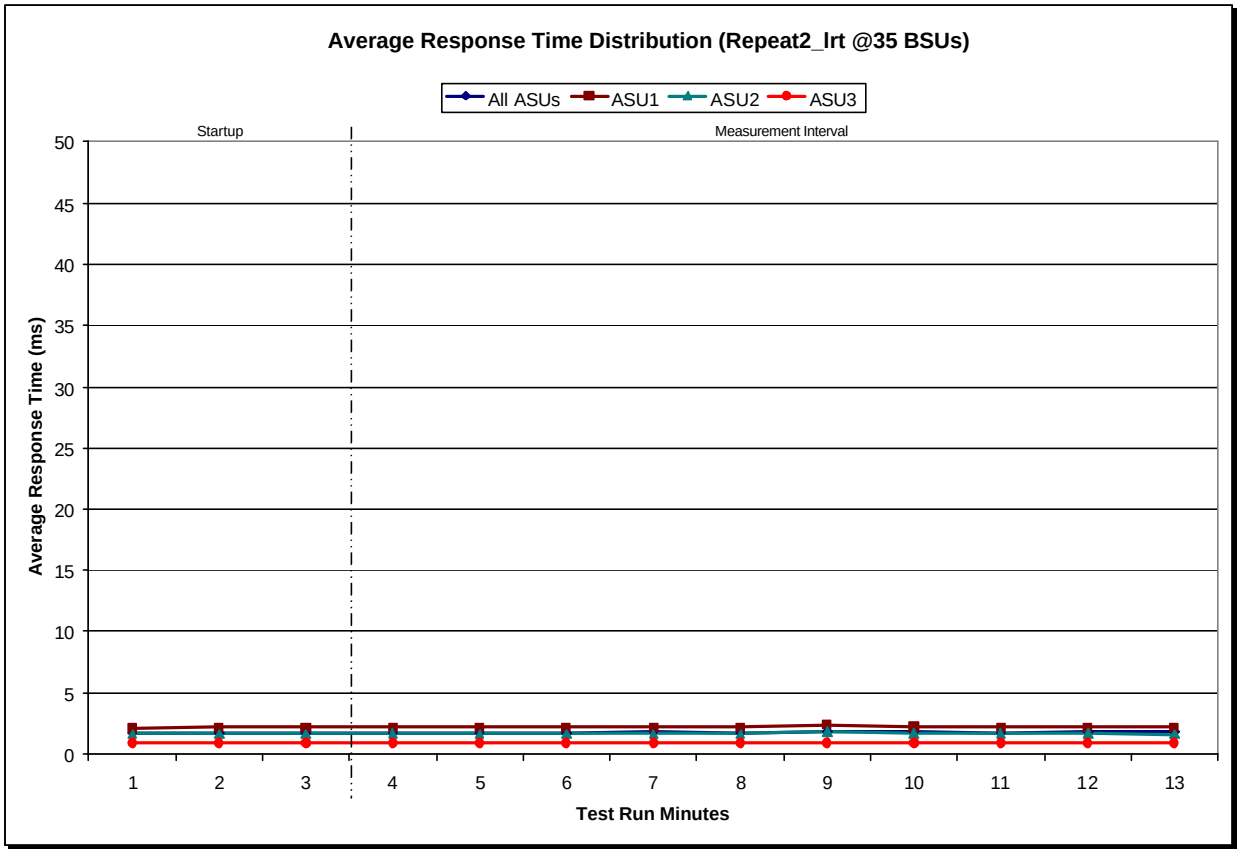


Repeatability 2 LRT –Average Response Time (ms) Distribution Data

35 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	18:16:13	18:19:13	0-2	0:03:01
Measurement Interval	18:19:13	18:29:18	3-12	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	1.67	2.04	1.66	0.89
1	1.74	2.14	1.65	0.91
2	1.74	2.15	1.67	0.90
3	1.74	2.15	1.68	0.90
4	1.74	2.15	1.66	0.90
5	1.74	2.16	1.65	0.90
6	1.75	2.16	1.66	0.90
7	1.74	2.16	1.64	0.90
8	1.89	2.37	1.79	0.90
9	1.76	2.18	1.69	0.90
10	1.74	2.15	1.68	0.90
11	1.76	2.17	1.68	0.90
12	1.75	2.18	1.61	0.90
Average	1.76	2.18	1.67	0.90

Repeatability 2 LRT –Average Response Time (ms) Distribution Graph

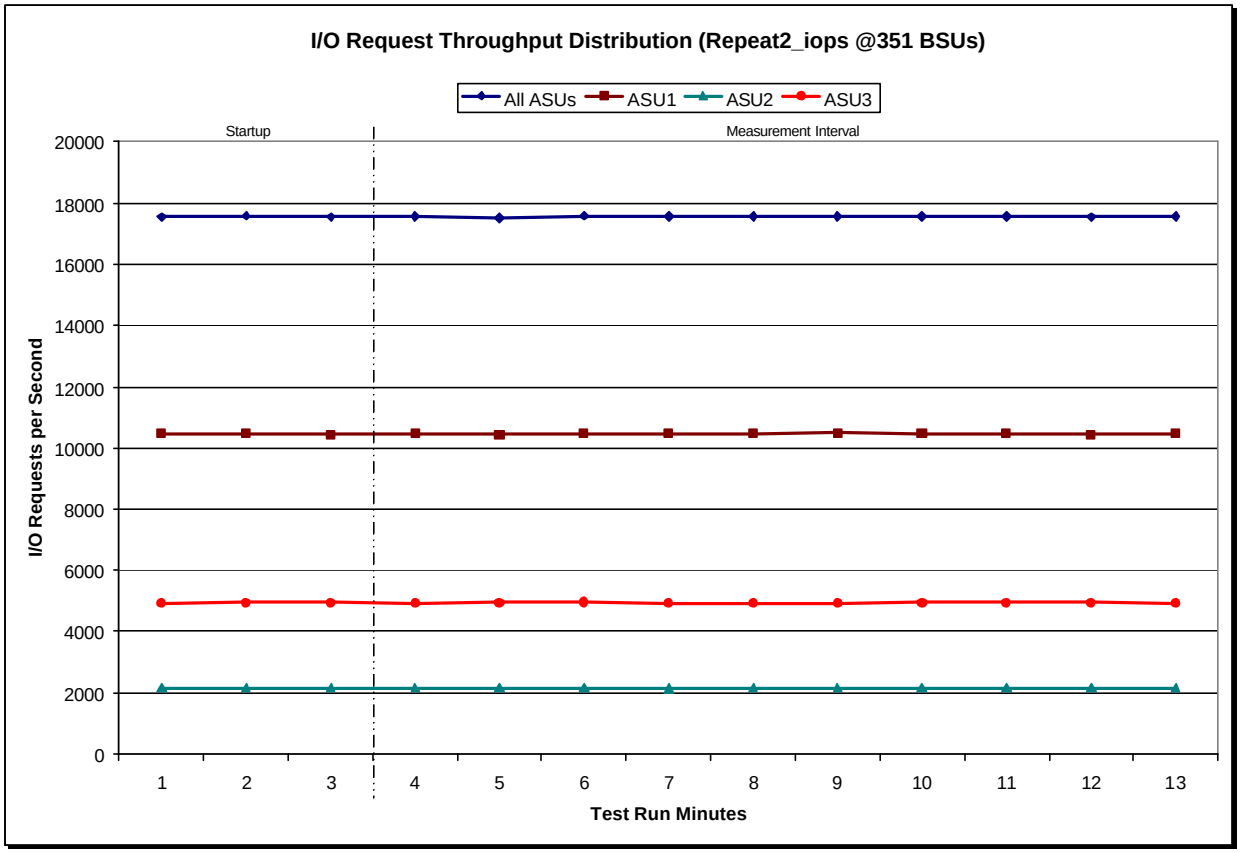


Repeatability 2 IOPS – I/O Request Throughput Distribution Data

351 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	18:30:58	18:33:59	0-2	0:03:01
Measurement Interval	18:33:59	18:44:11	3-12	0:10:12

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	17,532.75	10,452.37	2,157.23	4,923.15
1	17,574.07	10,468.38	2,161.68	4,944.00
2	17,531.77	10,436.00	2,153.28	4,942.48
3	17,559.62	10,468.78	2,161.48	4,929.35
4	17,530.00	10,436.30	2,155.30	4,938.40
5	17,576.68	10,460.55	2,164.95	4,951.18
6	17,550.48	10,471.82	2,151.07	4,927.60
7	17,558.38	10,474.68	2,160.63	4,923.07
8	17,557.32	10,476.48	2,162.88	4,917.95
9	17,550.92	10,459.67	2,157.13	4,934.12
10	17,563.53	10,465.30	2,153.82	4,944.42
11	17,531.27	10,433.38	2,156.55	4,941.33
12	17,563.53	10,473.78	2,159.93	4,929.82
Average	17,554.17	10,462.08	2,158.38	4,933.72

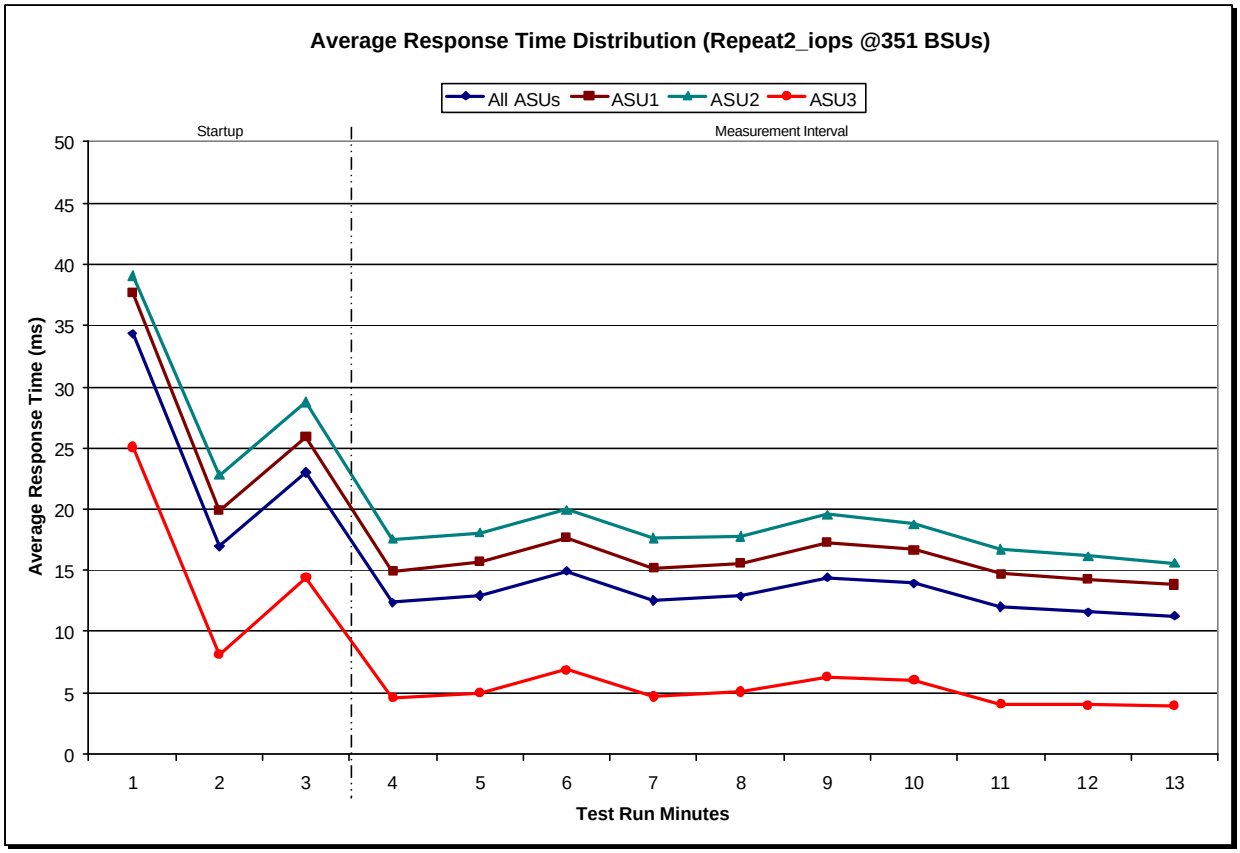
Repeatability 2 IOPS – I/O Request Throughput Distribution Graph



Repeatability 2 IOPS –Average Response Time (ms) Distribution Data

351 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	18:30:58	18:33:59	0-2	0:03:01
Measurement Interval	18:33:59	18:44:11	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	34.30	37.67	39.10	25.04
1	16.92	19.87	22.78	8.09
2	23.00	25.87	28.76	14.44
3	12.35	14.94	17.55	4.57
4	12.98	15.69	18.09	5.02
5	14.93	17.69	19.96	6.89
6	12.53	15.19	17.63	4.67
7	12.89	15.57	17.75	5.06
8	14.45	17.23	19.55	6.29
9	13.94	16.68	18.74	6.02
10	11.97	14.73	16.71	4.07
11	11.61	14.26	16.16	4.01
12	11.27	13.81	15.58	3.97
Average	12.89	15.58	17.77	5.06

Repeatability 2 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 1 (LRT)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0347	0.2804	0.0698	0.2106	0.0181	0.0701	0.0349	0.2814
COV	0.0108	0.0041	0.0103	0.0066	0.0225	0.0090	0.0113	0.0036

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

Repeatability 1 (IOPS)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.0048	0.0017	0.0035	0.0024	0.0047	0.0032	0.0061	0.0017

Repeatability 2 (LRT)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0351	0.2817	0.0702	0.2094	0.0180	0.0704	0.0349	0.2802
COV	0.0147	0.0058	0.0129	0.0061	0.0184	0.0088	0.0111	0.0044

Repeatability 2 (IOPS)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0349	0.2811	0.0700	0.2100	0.0180	0.0700	0.0350	0.2811
COV	0.0078	0.0020	0.0043	0.0019	0.0081	0.0046	0.0063	0.0022

Data Persistence Test

Clause 6

The Data Persistence Test demonstrates the Tested Storage Configuration (TSC):

- *Is capable of maintain data integrity across a power cycle.*
- *Ensures the transfer of data between Logical Volumes and host systems occurs without corruption or loss.*

The SPC-1 Workload Generator will write 16 block I/O requests at random over the total Addressable Storage Capacity of the TSC for ten (10) minutes at a minimum of 25% of the load used to generate the SPC-1 IOP™ primary metric. The bit pattern selected to be written to each block as well as the address of the block will be retained in a log file.

The Benchmark Configuration will be shutdown and restarted using a power off/power on cycle at the end of the above sequence of write operations. In addition, any caches employing battery backup must be flushed/emptied.

The SPC-1 Workload Generator will then use the above log file to verify each block written contains the correct bit pattern.

Clause 9.2.4.8

The following content shall appear in this section of the FDR:

1. *A listing or screen image of all input parameters supplied to the Workload Generator.*
2. *For the successful Data Persistence Test Run, able illustrating key results. The content, appearance, and format of this table are specified in Table 9-12. Information displayed in this table shall be obtained from the Test Run Results File referenced below in #3.*
3. *For the successful Data Persistence Test Run, the human readable Test Run Results File produced by the Workload Generator.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Data Persistence Test are listed below.

java –Xmx512m persist1 -b 351

java –Xmx512m persist2

Data Persistence Test Results File

A link to each test result file generated from each Data Persistence Test is listed below.

Persistence 1 Test Results File

Persistence 2 Test Results File

Data Persistence Test Results

Data Persistence Test Results	
Data Persistence Test Run Number: 1	
Total Number of Logical Blocks Written	41,721,280
Total Number of Logical Blocks Verified	38,317,616
Total Number of Logical Blocks that Failed Verification	0
Time Duration for Writing Test Logical Blocks	10 minutes
Size in Bytes of each Logical Block	512
Number of Failed I/O Requests in the process of the Test	0

In some cases the same address was the target of multiple writes, which resulted in more Logical Blocks Written than Logical Blocks Verified. In the case of multiple writes to the same address, the pattern written and verified must be associated with the last write to that address.

TESTED STORAGE CONFIGURATION (TSC) AVAILABILITY DATE

Clause 9.2.4.9

The FDR shall state: "The Tested Storage Configuration, as documented in this Full Disclosure Report will be available for shipment to customers on MM DD YY." Where Tested Storage Configuration is the TSC Configuration Name as described in Clause 9.2.4.3.3 and MM is month, DD is the day, and YY is the year of the date that the configuration, as documented, is available for shipment to customers.

The Fujitsu Storage Systems ETERNUS3000 Model 400, as documented in this Full Disclosure Report became available for customer purchase and shipment on January 27, 2003.

PRICING INFORMATION

Clause 9.2.4.11

A statement of the respective calculations for pricing must be included.

Pricing information may found in the Tested Storage Configuration Pricing section on page 12.

ANOMALIES OR IRREGULARITIES

Clause 9.2.4.10

The FDR shall include a clear and complete description of any anomalies or irregularities encountered in the course of executing the SPC-1 benchmark that may in any way call into question the accuracy, verifiability, or authenticity of information published in this FDR.

There were no anomalies or irregularities observed during the SPC-1 Onsite Audit of the Fujitsu Storage Systems ETERNUS3000 Model 400.