SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

SUN MICROSYSTEMS, INC.
SUN STOREDGE™ 6320 (22 TRAY)

SPC-1 V1.6

Submitted for Review: June 4, 2003
Accepted: August 3, 2003

First Edition – June 2003

Trademarks

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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

Sun Microsystems, Inc.
Leah Schoeb
500 Eldorado Blvd. UBRM5-194
Broomfield, CO 80021

May 27, 2003

The SPC Benchmark 1™ results listed below for the Sun StorEdge™ 6320 (22 tray) were produced in compliance with the SPC Benchmark 1™ Onsite Audit requirements.

SPC Benchmark 1™ Results	
Tested Storage Configuration (TSC) Name: Sun StorEdge™ 6320 (22 tray)	
Metric	**Reported Result**
SPC-1 IOPS™	44,805.75
SPC-1 Price-Performance	$15.56/SPC-1 IOPS™
Total ASU Capacity	3,275.980 GB
Data Protection Level	Mirroring
SPC-1 LRT™	3.83 ms
Total TSC Price (including three-year maintenance)	$697,297

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

- A Letter of Good Faith, signed by a senior executive.
- 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).
- Physical verification of the BC/TSC components to match the above diagram.

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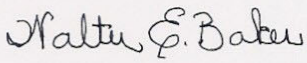
- Listings and commands to configure the BC/TSC.
- The type of Host System including the number of processors and main memory.
- The presence and version number of the Workload Generator on the Host System.
- The TSC boundary within the Host System.
- The execution of each Test, Test Phase, and Test 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 received 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 were no additional audit notes or exceptions.

Respectfully,



Walter E. Baker
SPC Auditor

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LETTER OF GOOD FAITH

Date: 3/24/2003

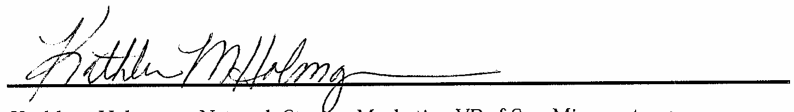
From: Kathleen Holmgen, Network Storage Marketing VP, Sun Microsystems

To: Walter Baker, SPC Auditor, Gradient System

Subject: Letter of Good Faith for the SPC Benchmark-1™ results published on the SE6320 Configuration.

This Letter of Good Faith between Sun Microsystems Corporation ("hereafter known as the Test Sponsor") and the Storage Performance Council (hereafter know 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 SE6320 Configuration. 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 SE6320 Configuration is authentic and accurate.
3. The SE6320 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 SE6320 Configuration 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.



Kathleen Holmgren, Network Storage Marketing VP of Sun Microsystems

Date: 3/24/2003

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Sun Microsystems, Inc. – www.sun.com Leah Schoeb – leah.schoeb@sun.com 500 Eldorado Blvd. UBRM5-194 Broomfield, CO 80021 Phone: (303) 272-3034 FAX: (303) 272-5392
Test Sponsor Alternate Contact	Sun Microsystems, Inc. – www.sun.com Jason Schaffer – jason.schaffer@sun.com 7777 Gate way Blvd. 7 UNWK16 Newark, CA 94560 Phone: (510) 936-2979 FAX: (510) 936-2323
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	June 4, 2003
Date FDR was submitted to the SPC	June 4, 2003
Date the TSC is/was available for shipment to customers	April 7, 2003
Date the TSC completed audit certification	May 27, 2003

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun StorEdge™ 6320 (22 tray)	
Metric	**Reported Result**
SPC-1 IOPS™	44,805.74
SPC-1 Price-Performance	$15.56/SPC-1 IOPS™
Total ASU Capacity	3,275.980 GB
Data Protection Level	Mirroring
SPC-1 LRT™	3.83 ms
Total TSC Price (including three-year maintenance)	$697,297

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 3,275.980 GB. The Total ASU Capacity utilized 100% of the Addressable Storage Capacity. The actual Configured Storage Capacity was 6,694.600 GB, which included the multiple copies of user data required by a Data Protection Level of Mirroring. The Configured Storage Capacity utilized 59.71% of the priced Physical Storage Capacity of 11,211.200 GB.

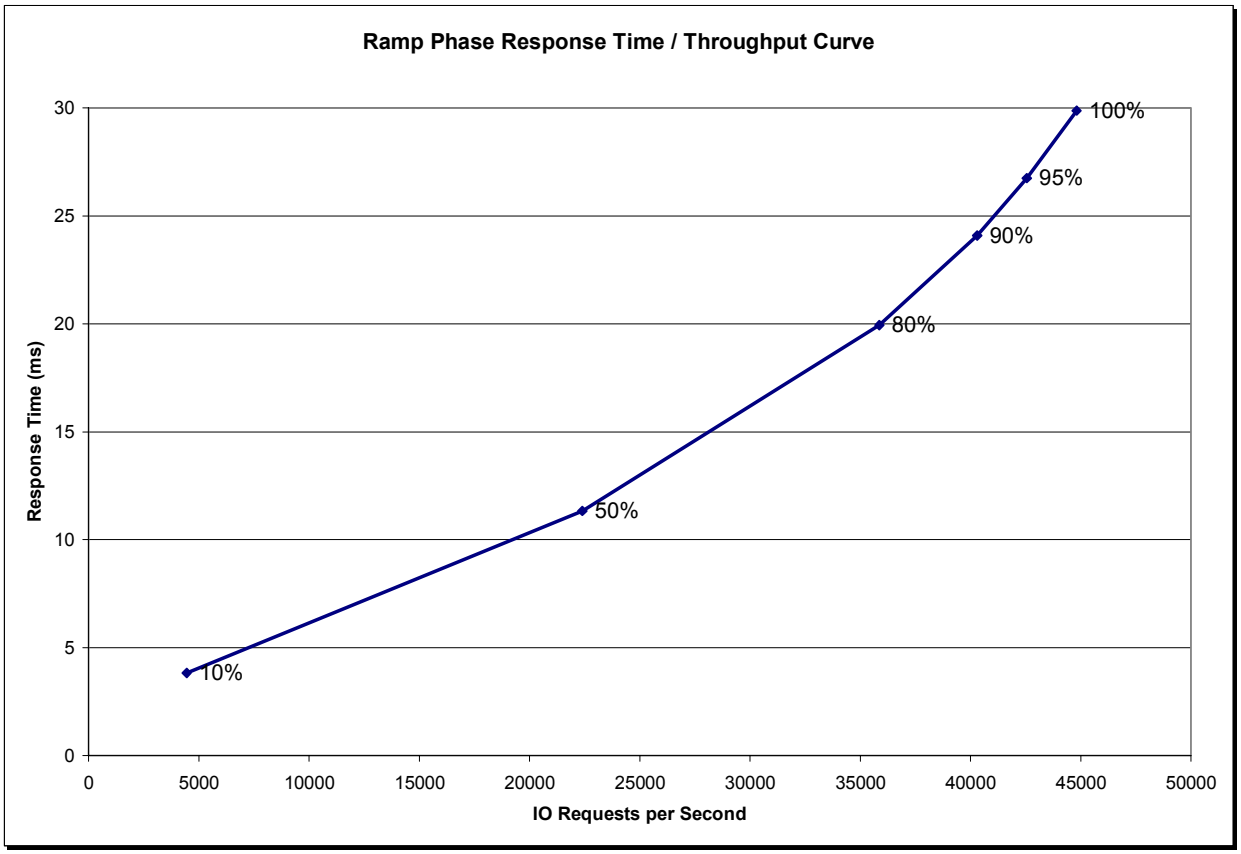
A **Data Protection Level** of Mirroring configures two or more identical copies of user data, maintained on separate disks.

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.



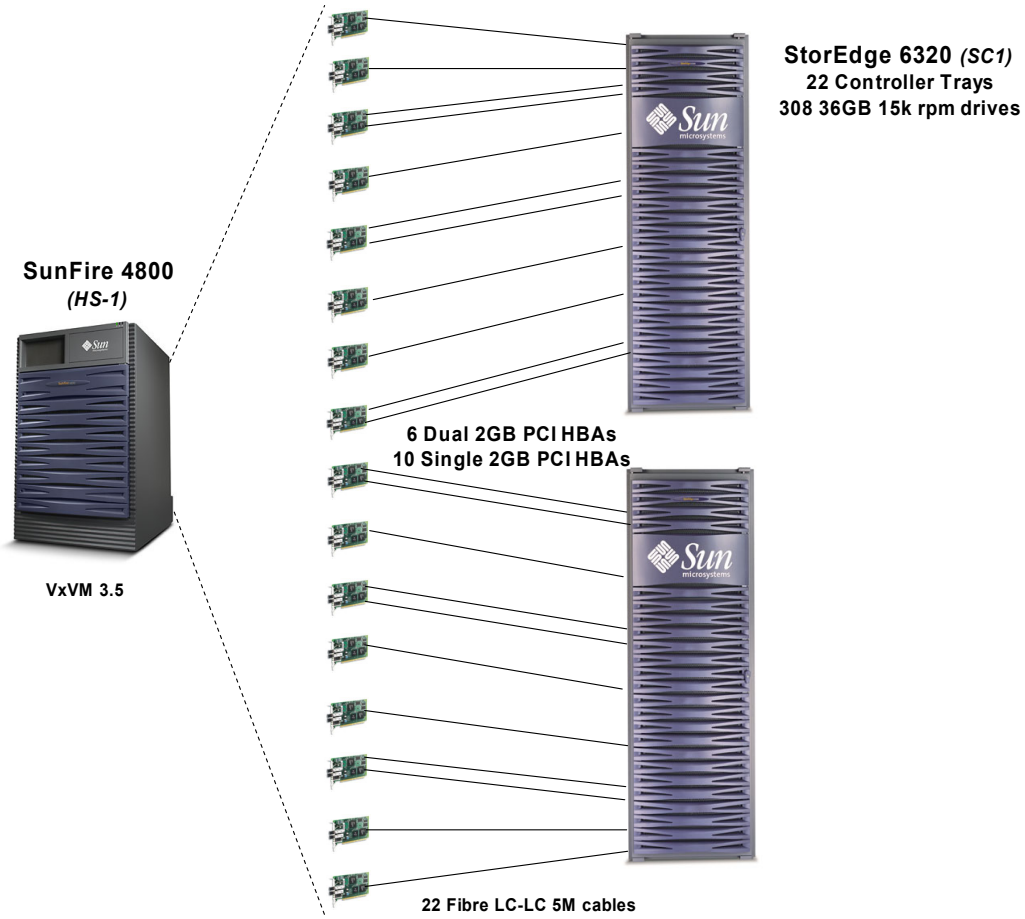
Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	4,451.55	22,392.63	35,876.23	40,297.64	42,551.46	44,805.74
Average Response Time (ms):						
All ASUs	3.83	11.33	19.93	24.09	26.74	29.88
ASU-1	4.24	11.30	19.53	23.54	26.10	29.12
ASU-2	4.06	11.59	19.95	24.01	26.58	29.58
ASU-3	2.85	11.29	20.78	25.28	28.19	31.61
Reads	5.67	12.40	20.12	23.87	26.27	29.11
Writes	2.62	10.64	19.81	24.23	27.06	30.38

Tested Storage Configuration Pricing

Part Number	Description	Quantity	US List Prices Unit	US List Prices Total	Disc.	Final Price
XTA6320–00–1226T06	Sun StorEdge 6320 System	1	$699,500	$699,500	15%	$594,575
	2 cabinets					
	12 Controller Trays					
	12GB Cache Memory					
	36GB/15K Drives	168				
XTA6020R22A1S1008	Sun StorEdge 6020 Array (expansion module)	5				
	2 controller trays					
	36GB/15K Drives	140				
NAVIS-310-1FNS	Sun StorEdge Availability Suite 3.1 (1TB Lic.)	6				
NEMIS-120-3FN9	Sun Enterprise Storage Manager 2.1 (6TB Lic.)	2				
NCSSS-210-9FN9	Sun StorEdge 6000 Family Host Installation CD	1				
W9D-632N12-3G	3-Year System Maintenance Agreement	1	$93,204	$93,204	50%	$46,602
W9D-6020-2-3G		5				
VVMGS-999-3A99	VxVM 3.5 License Tier 3A	1	$14,895	$14,895	35%	$9,682
VVMGS-3A99-3FT	VxVM 3.5 Maintenance Agreement (3 years)	1	$10,584	$10,584	0%	$10,584
X6767A	2Gb PCI Singe FC Network Adapter	10	$2,400	$24,000	35%	$15,600
X6768A	2Gb PCI Dual FC Network Adapter	6	$4,900	$29,400	35%	$19,110
X9733A	5M LC to LC FC Optical Cable	22	$80	$1,760	35%	$1,144
Total				**$873,343**		**$697,297**

Benchmark Configuration/Tested Storage Configuration Diagram



Host System:	Storage System:
Sun Fire™ 4800	Sun StorEdge™ 6320
UID=HS-1	UID=SC-1
12 UltraSPARC™ III 900MHz CPU each 8MB EEC external cache per CPU	22 Controller Trays with 22 Controllers in 11 redundant pairs Each controller has: 1 GB of memory (22 GB total) 400MHZ PowerPC 750 with 1MB L2 cache 2 GB fibre channel interface – front-end 1GB fibre channel interface – back-end with 3 fibre channel loops
12 GB Main Memory	308 – 36.4 GB 15K RPM disk drives 14 disk drives per Controller Tray
Solaris™ 9 update 2	
Veritas Volume Manager 3.5	
10 – 2Gb PCI Single FC Network Adapters 6 – 2Gb PCI Dual FC Network Adapters	
WG	

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 on the Sun Fire™ 4800 Host System for the execution of SPC-1:

```
* Memory allocation parameters
set vxio:voliomem_chunk_size = 1048576
set vxio:voliomem_maxpool_sz = 134217728
* I/O related parameters
set vxio:vol_default_iodelay = 10
set vxio:vol_maxkiocount = 32768
set vxio:vol_maxioctl = 131072
set vxio:vol_maxio = 8192
set vxio:vol_maxspecialio = 10240

* VM related
* scanner I/Os per second page-outs.(default 65536 for E10000)
* set maxpgio = 16384
* # of pages the scanned when freelist falls below lotsfree.
* set to 1/16 to 1/4 RAM up to 1Gb/sec (131072)
*set fastscan = 65536
**Fri Mar 31 16:07:32 PST 2000
* R. McDougall: increase maxpgio to prevent the scanner from limiting writes
set maxpgio = 65536
* R. McDougall: increase fastscan to limit the effect the page scanner
* has on file system throughput
set fastscan = 65536

* increase capability to do 1Mb IOs to *raw* devices, 32MB max.
*set maxphys = 1048576
set maxphys = 4194304

* TCP related
* decrease potential connection backlog by:
* 1. increase connection hash table size, increase if connections are high.
set tcp:tcp_conn_hash_size = 32768
* 2. depth of destination queue (# of messages outbound streams can hold)
```

```
* NOTE: sq_max_size = 0 is unlimited, but uses more kernel memory.
set sq_max_size = 10

* vxvm_START (do not remove)
forceload: drv/vxdmp
forceload: drv/vxio
forceload: drv/vxspec
* vxvm_END (do not remove)
```

The 'blocksize' parameter for the storage controllers was changed from the default of 16K to a value of 64K. That parameter changed was done using the Logical Volume creation script found in the next section of this document.

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 Perl script, invoked as **T4-Setup-raid1-spc-201unsperPP.pl <name of Partner Pair>**, was used to create the volumes and luns used in this SPC-1 measurement. Those luns were used by the Veritas Volume Manager to instantiate the Application Storage Units (ASUs) accessed by the SPC-1 Workload Generator. A description of the process used to instantiate the ASUs follows this script.

```
#!/opt/cbe/SUPPORT-PKGS/perl/bin/perl
# @(#)T4-Setup_Luns.pl  1.1 02/08/16
# Copyright 2002, Sun Microsystems, Inc. All rights reserved.

##############################################################################
#
# Sun Proprietary/Confidential Code
#
# Author:       Kris Houghton 77166
#
# File:         T4-Setup_Luns.pl
#
# Description: Setup T4's to have 2 new volumes and 4 new volumes T4 pair.
#              Create luns with read/write permissions for all wwn's.
#
#      Syntax: T4-Setup_Luns <T4name>
#
#                Open T4 telnet session
#                Check for 2.01.00 version
#                Check for enable_volslice
#                Unmount all volumes
#                Remove all volumes
#                Create new volumes
#                Mount all volumes
#                Create 2 25gb luns for each volume with rw permissions
#
#     History: 08/13/02 - hkris - Created Script
#              10/04/02 - hkris - Commented out OUT lines and cleaned up
#              12/04/02 - hkris - Added version test for 2.01.03
#              01/15/03 - hkris - Added version test for 3.0.0
#
# Copyright 2002, Sun Microsystems, Inc. All rights reserved.
#
##############################################################################

   @dt = `date`;
```

```
   print @dt;

# Check for Arguments ( t4 disk array ) & die if none

   if ( $ARGV[0] eq "" ) { print "You need a name of a T4 disk array \n"; exit; }

# Set username & password for telnet

   use Net::Telnet ();

   $username = "root";
   $passwd = "";
#       $adminname = "sun";
#       $adminpasswd = "arrayservice";

print "Opening $ARGV[0] telnet session ... \n";

   $t = new Net::Telnet (Timeout => 7200, Prompt => '/:\/:|\[N\]:|Continue ?
\[N\]:/');
   $t->open("$ARGV[0]");
   $t->login($username, $passwd);

#  open(OUT,">T4-Setup.out");

# Get T4 version

   @tx = $t->cmd("ver");
     #$sz = @tx; print "Size of Array = $sz \n";
     print "$tx[2]";
     @chk = split(/\s+/,$tx[2]);
     $verchk = $chk[2];

     if ( $verchk eq "2\.01\.00" ) { print "version = 2.01.00 \n";
     } elsif ( $verchk eq "2\.01\.03" ) { print "version = 2.01.03 \n";
     } elsif ( $verchk eq "3\.0\.2" )   { print "version = 3.0.2 \n";
     } else {
        print " This firmware version $verchk Can't create luns \n";
        exit;
     }
# Check to see if T4 enable_volslice is on / off

#  @tx = $t->cmd("sys list");
#    for $u ( @tx ) {
#     if ( $u =~ /enable_volslice/ ) {
#       if ( $u =~ /off/ ) { print "$u";
#         print " Can't create luns with this feature off \n";
#       exit; }
#      print "$u";
#     }
#    }

# vol list; vol unmount; vol remove

   @tx = $t->cmd("vol list");
     #$sz = @tx; print "Size of Array = $sz \n";
     for $line ( @tx ) {
      @chk = split(/\s+/,$line);
      if ( $chk[1] >= 1 ) {
        print "vol unmount $chk[0] \n";
        @unm = $t->cmd("vol unmount $chk[0]");
        print "vol remove $chk[0] \n";
      # @rmv = $t->cmd("vol remove $chk[0]");
         if ( $verchk eq "2\.01\.00" ) { @rmv = $t->cmd("vol -y remove $chk[0]"); }
```

```
          if ( $verchk eq "3\.0\.2" )   { @rmv = $t->cmd("vol -y remove $chk[0]"); }
        }
      } # end for

# Check to see if T4 partner pair

   @tx = $t->cmd("port list");
     $pp = "single";
     for $u ( @tx ) {
       #print "$u\n";
      if ( $u =~ /u2p1/ ) { $pp = "pair"; }
     }

# Create volumes for t4's and Luns
#
        print "Changing Blocksize to 64K \n";
        @tx = $t->cmd("sys blocksize 64k");

    print "vol add v0 data u1d1-7 raid 1 \n";
      @tx = $t->cmd("vol add v0 data u1d1-7 raid 1");
       #print "Create v0 @tx\n";
      @tx = $t->cmd("vol list");
       print "vol init v0 sysarea \n";
      @tx = $t->cmd("vol init v0 sysarea");
       print "vol init v0 data \n";
      if ( $verchk eq "2\.01\.00" ) { @tx = $t->cmd(".vol init v0 fast"); @answer =
$t->cmd("y"); }
      if ( $verchk eq "3\.0\.2" )   { @tx = $t->cmd("vol init v0 data rate 16");
@answer = $t->cmd("y"); }
       print "vol mount v0\n";
      @tx = $t->cmd("vol mount v0");
       print "vol list v0\n";
      @tx = $t->cmd("vol list v0");
       print "$tx[2]";
      @vl = split(/\s+/,$tx[2]);
#   print OUT "vol add v0 data u1d1-7 raid 1  Capacity = $vl[1]$vl[2]\n";
      @tx = $t->cmd("volslice create s0 -z 17.1gb v0");
      @tx = $t->cmd("volslice create s1 -z 17.1gb v0");
      @tx = $t->cmd("volslice create s2 -z 17.1gb v0");
      @tx = $t->cmd("volslice create s3 -z 17.1gb v0");
      @tx = $t->cmd("volslice create s4 -z 7.7gb v0");
      @tx = $t->cmd("lun perm all_lun rw all_wwn");
#
    print "vol add v1 data u1d8-14 raid 1 \n";
     @tx = $t->cmd("vol add v1 data u1d8-14 raid 1");
      #print "Create v1 @tx\n";
     @tx = $t->cmd("vol list");
      print "vol init v1 sysarea \n";
     @tx = $t->cmd("vol init v1 sysarea");
      print "vol init v1 data \n";
     if ( $verchk eq "2\.01\.00" ) { @tx = $t->cmd(".vol init v1 fast"); @answer =
$t->cmd("y"); }
     if ( $verchk eq "3\.0\.2" )   { @tx = $t->cmd("vol init v1 data rate 16");
@answer = $t->cmd("y"); }
      print "vol mount v1\n";
     @tx = $t->cmd("vol mount v1");
      print "vol list v1\n";
     @tx = $t->cmd("vol list v1");
      print "$tx[2]";
     @vl = split(/\s+/,$tx[2]);
#   print OUT "vol add v1 data u1d5-8 raid 5 standby u1d9   Capacity =
$vl[1]$vl[2]\n";
      @tx = $t->cmd("volslice create s5 -z 17.1gb v1");
```

```
      @tx = $t->cmd("volslice create s6 -z 17.1gb v1");
      @tx = $t->cmd("volslice create s7 -z 17.1gb v1");
      @tx = $t->cmd("volslice create s8 -z 17.1gb v1");
      @tx = $t->cmd("volslice create s9 -z 7.7gb v1");
      @tx = $t->cmd("lun perm all_lun rw all_wwn");
#
  if ( $pp eq "pair" ) { # Partner Pair Only

    print "vol add v2 data u2d1-7 raid 1 \n";
      @tx = $t->cmd("vol add v2 data u2d1-7 raid 1");
       #print "Create v2 @tx\n";
      @tx = $t->cmd("vol list");
       print "vol init v2 sysarea \n";
      @tx = $t->cmd("vol init v2 sysarea");
       print "vol init v2 data \n";
#     @tx = $t->cmd("vol init v2 data"); @answer = $t->cmd("y");
      if ( $verchk eq "2\.01\.00" ) { @tx = $t->cmd(".vol init v2 fast"); @answer =
$t->cmd("y"); }
      if ( $verchk eq "3\.0\.2" )   { @tx = $t->cmd("vol init v2 data rate 16");
@answer = $t->cmd("y"); }
       print "vol mount v2\n";
      @tx = $t->cmd("vol mount v2");
       print "vol list v2\n";
      @tx = $t->cmd("vol list v2");
       print "$tx[2]";
      @vl = split(/\s+/,$tx[2]);
#   print OUT "vol add v2 data u2d1-4 raid 5 standby u2d9   Capacity =
$vl[1]$vl[2]\n";
      @tx = $t->cmd("volslice create s10 -z 17.1gb v2");
      @tx = $t->cmd("volslice create s11 -z 17.1gb v2");
      @tx = $t->cmd("volslice create s12 -z 17.1gb v2");
      @tx = $t->cmd("volslice create s13 -z 17.1gb v2");
      @tx = $t->cmd("volslice create s14 -z 7.7gb v2");
      @tx = $t->cmd("lun perm all_lun rw all_wwn");
#
    print "vol add v3 data u2d8-14 raid 1 \n";
     @tx = $t->cmd("vol add v3 data u2d8-14 raid 1");
      #print "Create v3 @tx\n";
     @tx = $t->cmd("vol list");
      print "vol init v3 sysarea \n";
     @tx = $t->cmd("vol init v3 sysarea");
      print "vol init v3 data \n";
     if ( $verchk eq "2\.01\.00" ) { @tx = $t->cmd(".vol init v3 fast"); @answer =
$t->cmd("y"); }
     if ( $verchk eq "3\.0\.2" )   { @tx = $t->cmd("vol init v3 data rate 16");
@answer = $t->cmd("y
"); }
      print "vol mount v3\n";
     @tx = $t->cmd("vol mount v3");
      print "vol list v3\n";
     @tx = $t->cmd("vol list v3");
      print "$tx[2]";
     @vl = split(/\s+/,$tx[2]);
#   print OUT "vol add v3 data u2d5-8 raid 5 standby u2d9   Capacity =
$vl[1]$vl[2]\n";
      @tx = $t->cmd("volslice create s15 -z 17.1gb v3");
      @tx = $t->cmd("volslice create s16 -z 17.1gb v3");
      @tx = $t->cmd("volslice create s17 -z 17.1gb v3");
      @tx = $t->cmd("volslice create s18 -z 17.1gb v3");
      @tx = $t->cmd("volslice create s19 -z 7.7gb v3");
      @tx = $t->cmd("lun perm all_lun rw all_wwn");

  } # End of Partner Pair Only
```

```
   @tx = $t->cmd("vol stat");
    $sz=@tx;
     for ( $i=0; $i < $sz; $i++ ) {
      if ( $i > 0 ) { print "$tx[$i]"; }
     }

   @tx = $t->cmd("volslice list");
    $sz=@tx;
     for ( $i=0; $i < $sz; $i++ ) {
      if ( $i > 0 ) { print "$tx[$i]"; }
     }

#  close(OUT);

   @dt = `date`;
   print @dt;

exit
```

The Veritas volumes were created using the VxVM graphical interface. There were three (3) disk pools created, which were labeled 'asu1', 'asu2', and 'asu3'. Both 'asu1 and 'asu2' were each allocated eighty-eight (88) disks (luns from the controller). Forty-four (44) disks (luns) were allocated to 'asu3'. The default 128k stripe size was used with 88 columns for 'asu1' and 'asu2' and 44 columns for 'asu'3'.

One (1) volume per disk pool was created to utilize the entire capacity of each disk pool to create the following three (3) volumes: 'asu1-vol1', 'asu2-vol1', and 'asu3-volu1'. Those volumes were used in the SPC-1 configuration file to implement ASU1, ASU2, and ASU3 for the benchmark measurement.

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.

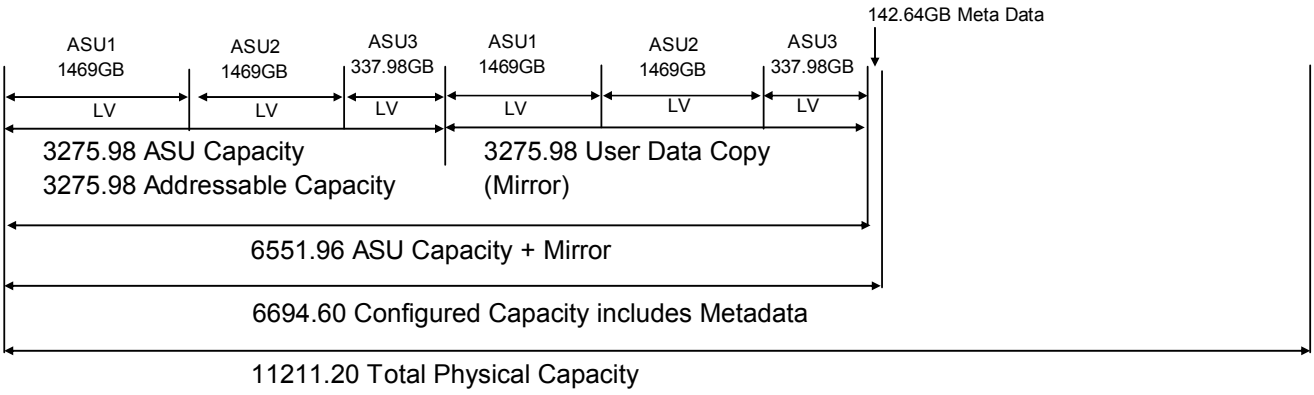
Logical Volume: The division of Addressable Storage Capacity into individually addressable logical units of storage used in the SPC-1 benchmark. Each Logical Volume is implemented as a single, contiguous address space.

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).



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)	3,275.980
Addressable Storage Capacity	Gigabytes (GB)	3,275.980
Configured Storage Capacity	Gigabytes (GB)	6,694.600
Physical Storage Capacity	Gigabytes (GB)	11,211.20

The Total ASU Capacity of 3,275.980 GB utilized 100% of the Addressable Storage Capacity. The Configured Storage Capacity of 6,694.600 GB, which included the multiple copies of user data required by a Data Protection Level of Mirroring, utilized 59.71% of the priced Physical Storage Capacity of 11,211.200 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 (1,469.000 GB)	**ASU-2 (1,469.000 GB)**	**ASU-3 (337.980 GB)**
1 Logical Volume 1,469.000 GB per Logical Volume	1 Logical Volume 1,469.000 GB per Logical Volume	1 Logical Volume 337.980 GB per 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.

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.

```
java –Xmx2048m –Xss1024k metrics –b 896 –s 600
```

Sustainability Test Results File

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

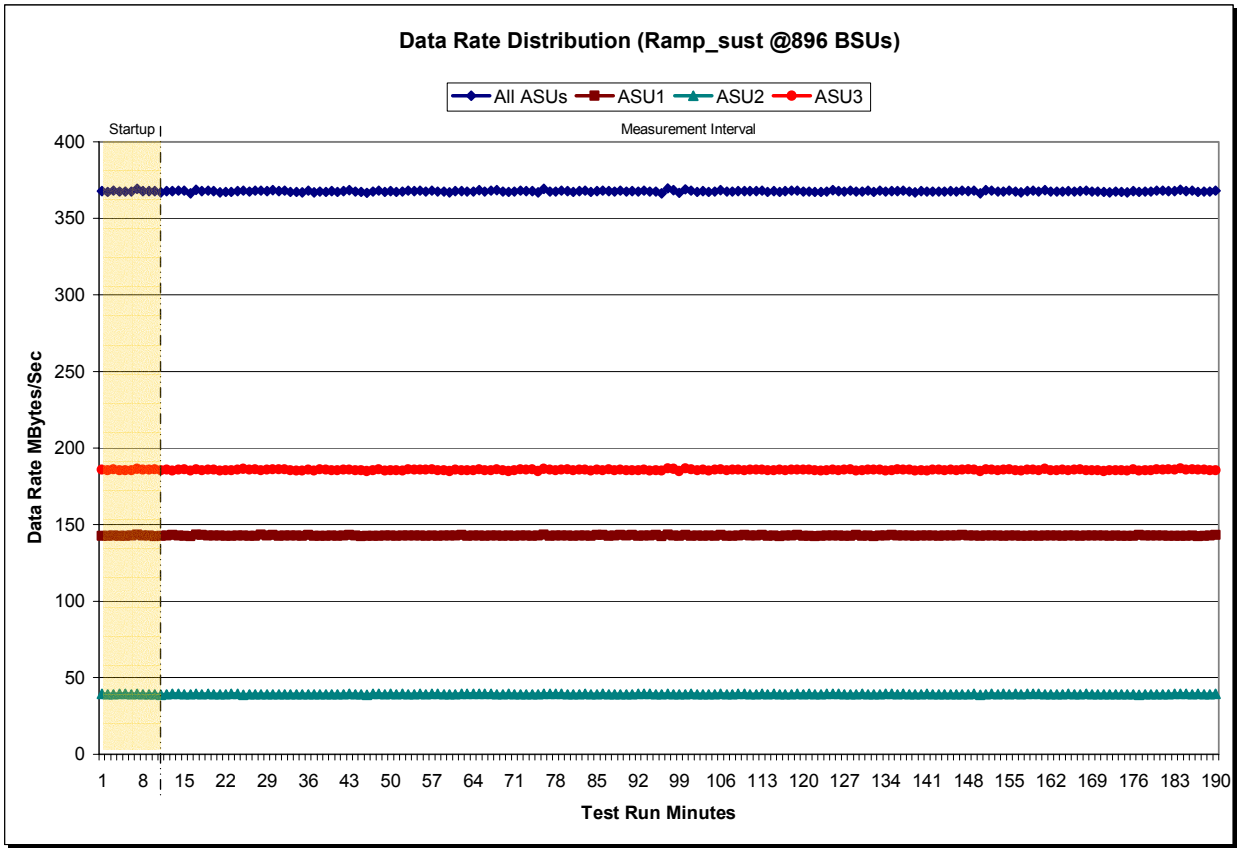
Sustainability Test Results File

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

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	17:53:45	18:03:45	0-9	0:10:00
Measurement Interval	18:03:45	21:03:45	9-189	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	367.76	142.56	39.36	185.84	63	367.51	142.70	39.32	185.49	126	367.45	142.69	39.14	185.62
1	367.22	142.64	39.16	185.42	64	368.19	142.73	39.35	186.11	127	367.96	142.69	39.30	185.98
2	368.17	142.75	39.30	186.11	65	367.47	142.65	39.32	185.50	128	367.38	143.05	39.14	185.19
3	367.34	142.55	39.33	185.47	66	367.90	142.95	39.37	185.58	129	367.36	142.60	39.35	185.42
4	367.35	142.64	39.37	185.34	67	368.27	142.93	39.20	186.14	130	367.97	142.93	39.20	185.84
5	367.58	142.79	39.28	185.51	68	367.52	142.68	39.24	185.60	131	367.24	142.21	39.20	185.83
6	369.18	143.40	39.46	186.32	69	367.15	142.73	39.48	184.94	132	368.03	142.91	39.29	185.82
7	367.70	142.89	39.20	185.61	70	367.47	142.59	39.28	185.59	133	367.35	142.94	39.33	185.08
8	367.65	142.70	39.12	185.83	71	368.04	142.76	39.19	186.09	134	367.80	143.02	39.33	185.46
9	367.63	142.33	39.30	185.99	72	367.73	142.86	39.20	185.67	135	367.86	142.81	39.15	185.90
10	366.99	142.45	39.02	185.52	73	367.80	142.66	39.21	185.92	136	368.03	142.95	39.42	185.65
11	367.63	142.75	39.25	185.63	74	367.02	142.73	39.27	185.02	137	367.60	142.78	39.17	185.66
12	367.69	143.14	39.37	185.18	75	369.13	143.28	39.57	186.28	138	366.99	142.68	39.14	185.17
13	368.00	142.88	39.31	185.82	76	367.58	142.53	39.34	185.70	139	367.66	142.91	39.17	185.58
14	367.93	142.66	39.30	185.98	77	367.55	142.81	39.35	185.40	140	367.59	142.92	39.41	185.25
15	366.33	142.20	39.08	185.05	78	368.10	142.84	39.46	185.80	141	367.58	142.71	39.26	185.62
16	368.70	143.35	39.32	186.03	79	367.82	142.76	39.14	185.92	142	367.51	142.67	39.11	185.73
17	367.75	143.00	39.26	185.48	80	367.06	142.45	39.16	185.45	143	367.48	142.70	39.30	185.48
18	368.08	142.87	39.34	185.87	81	367.71	142.76	39.31	185.64	144	367.71	142.82	39.20	185.70
19	367.69	142.81	39.23	185.65	82	367.90	142.74	39.37	185.79	145	367.32	142.73	39.13	185.46
20	366.95	142.74	39.13	185.09	83	367.27	142.69	39.30	185.28	146	367.91	143.01	39.22	185.69
21	367.29	142.59	39.25	185.45	84	367.87	142.99	39.25	185.62	147	367.83	142.82	39.11	185.90
22	367.14	142.51	39.32	185.31	85	367.97	143.08	39.47	185.43	148	367.95	142.84	39.34	185.76
23	367.70	142.73	39.32	185.66	86	367.76	142.64	39.17	185.95	149	366.33	142.51	38.99	184.84
24	368.17	142.91	38.99	186.27	87	367.43	142.76	39.25	185.42	150	368.20	142.88	39.30	186.02
25	367.54	142.57	39.27	185.71	88	368.08	143.04	39.30	185.74	151	367.93	142.87	39.32	185.74
26	367.91	142.64	39.22	186.05	89	367.59	142.87	39.28	185.44	152	367.50	142.72	39.23	185.56
27	368.04	143.40	39.17	185.47	90	367.79	143.13	39.29	185.37	153	367.52	142.55	39.35	185.62
28	367.70	142.81	39.23	185.66	91	367.32	142.54	39.38	185.40	154	368.02	142.85	39.18	186.00
29	368.25	143.00	39.15	186.10	92	368.06	142.86	39.50	185.70	155	367.53	142.71	39.32	185.50
30	367.78	142.65	39.13	186.00	93	367.47	142.73	39.51	185.23	156	366.91	142.52	39.19	185.20
31	368.00	142.87	39.08	186.05	94	367.60	143.02	39.24	185.33	157	367.76	142.51	39.43	185.83
32	367.30	142.73	39.11	185.46	95	366.23	142.13	39.04	185.06	158	368.09	142.95	39.41	185.74
33	367.29	142.78	39.21	185.30	96	369.46	143.41	39.32	186.74	159	367.60	142.66	39.40	185.54
34	366.82	142.62	39.02	185.18	97	368.38	142.93	39.19	186.26	160	368.26	142.80	39.28	186.19
35	367.95	143.03	39.11	185.82	98	366.49	142.48	39.13	184.88	161	367.54	142.85	39.29	185.41
36	366.94	142.56	39.17	185.21	99	368.94	143.06	39.28	186.60	162	367.55	142.96	39.14	185.44
37	367.58	142.58	39.09	185.92	100	367.95	142.59	39.41	185.96	163	367.38	142.49	39.08	185.81
38	367.30	142.51	39.17	185.63	101	367.29	142.71	39.03	185.55	164	367.65	142.76	39.35	185.54
39	367.68	142.84	39.25	185.60	102	367.75	142.66	39.27	185.82	165	367.52	142.76	39.13	185.63
40	367.11	142.61	39.09	185.41	103	367.11	142.90	39.13	185.09	166	367.76	142.53	39.23	186.01
41	367.88	142.79	39.21	185.88	104	367.35	142.49	39.21	185.65	167	367.93	142.95	39.51	185.46
42	368.31	143.22	39.39	185.70	105	368.44	143.01	39.37	186.06	168	367.60	142.81	39.28	185.51
43	367.60	142.87	39.23	185.49	106	367.36	142.67	39.14	185.55	169	367.48	142.84	39.24	185.40
44	367.14	142.39	39.27	185.47	107	367.54	142.52	39.17	185.86	170	367.13	142.83	39.30	185.00
45	366.54	142.60	39.01	184.93	108	367.81	142.76	39.42	185.63	171	366.98	142.44	39.19	185.35
46	367.40	142.60	39.35	185.45	109	367.86	143.04	39.47	185.36	172	367.45	142.76	39.23	185.47
47	368.04	142.63	39.36	186.05	110	367.86	142.76	39.24	185.86	173	367.13	142.41	39.28	185.43
48	367.22	142.77	39.30	185.15	111	367.65	142.76	39.20	185.69	174	366.99	142.51	39.21	185.28
49	367.67	142.81	39.44	185.42	112	368.16	143.04	39.31	185.81	175	367.83	142.61	39.21	186.01
50	367.13	142.42	39.17	185.54	113	367.11	142.66	39.08	185.37	176	367.20	142.99	39.02	185.18
51	367.42	142.83	39.31	185.28	114	367.70	142.74	39.37	185.59	177	367.53	142.74	39.30	185.49
52	368.09	142.72	39.23	186.14	115	367.26	142.38	39.23	185.65	178	367.53	142.96	39.11	185.46
53	367.77	142.96	39.14	185.67	116	367.73	142.97	39.21	185.56	179	368.13	142.95	39.18	186.00
54	368.02	142.82	39.36	185.83	117	367.91	142.91	39.23	185.77	180	367.92	142.97	39.25	185.70
55	367.54	142.54	39.16	185.84	118	368.15	143.05	39.31	185.79	181	367.85	142.68	39.20	185.97
56	368.09	142.80	39.39	185.90	119	367.48	142.55	39.23	185.70	182	367.71	142.56	39.44	185.71
57	367.46	142.67	39.32	185.48	120	367.60	142.49	39.33	185.78	183	368.49	142.60	39.36	186.53
58	367.45	142.71	39.29	185.44	121	367.03	142.36	39.20	185.47	184	367.68	142.49	39.38	185.81
59	366.92	142.76	39.19	184.97	122	367.05	142.69	39.20	185.16	185	368.07	142.92	39.15	186.00
60	367.76	142.91	39.04	185.81	123	367.50	142.73	39.33	185.43	186	367.28	142.35	39.32	185.62
61	367.88	143.06	39.39	185.43	124	368.26	142.85	39.53	185.88	187	367.43	142.50	39.15	185.78
62	367.39	142.63	39.42	185.33	125	367.89	142.97	39.41	185.51	188	367.46	142.89	39.25	185.32
										189	368.00	143.07	39.37	185.56

Sustainability – Data Rate Distribution Graph

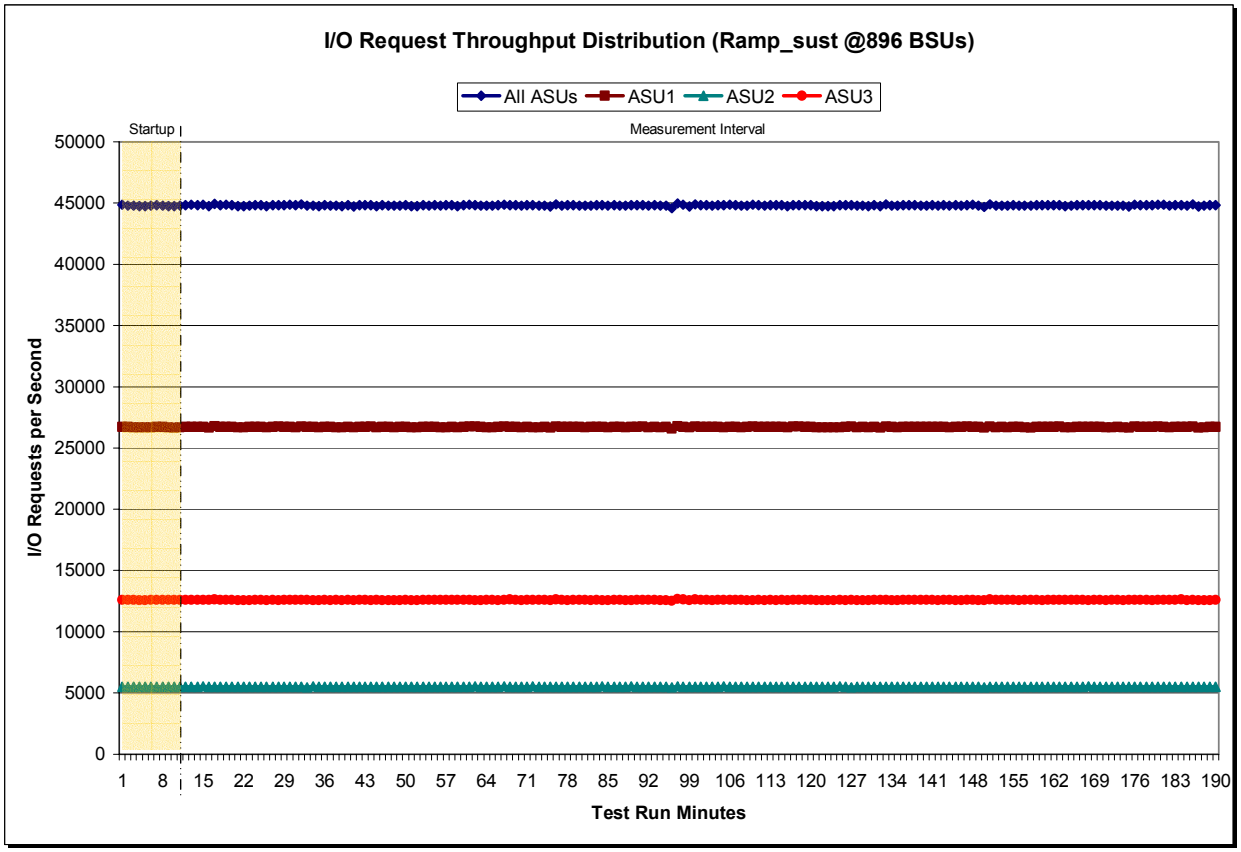


Sustainability – I/O Request Throughput Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	17:53:45	18:03:45	0-9	0:10:00
Measurement Interval	18:03:45	21:03:45	10-189	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	44,838.02	26,719.27	5,521.72	12,597.03	63	44,795.78	26,680.53	5,508.65	12,606.60	126	44,819.78	26,736.25	5,489.52	12,594.02
1	44,794.73	26,720.02	5,492.25	12,582.47	64	44,788.45	26,673.90	5,517.82	12,596.73	127	44,771.62	26,683.42	5,516.90	12,571.30
2	44,792.90	26,680.43	5,518.58	12,593.88	65	44,798.72	26,708.58	5,510.65	12,579.48	128	44,763.82	26,697.45	5,491.18	12,575.18
3	44,744.60	26,662.70	5,513.08	12,568.82	66	44,843.48	26,731.83	5,529.47	12,582.18	129	44,754.47	26,661.58	5,513.45	12,579.43
4	44,744.42	26,676.13	5,506.57	12,561.72	67	44,824.42	26,702.50	5,497.20	12,624.72	130	44,803.65	26,702.10	5,505.52	12,596.03
5	44,767.78	26,666.88	5,516.62	12,584.28	68	44,809.47	26,702.97	5,509.03	12,597.47	131	44,739.03	26,641.38	5,508.20	12,589.45
6	44,821.45	26,703.25	5,515.17	12,603.03	69	44,763.27	26,670.37	5,520.47	12,572.43	132	44,875.68	26,763.72	5,501.77	12,610.20
7	44,783.02	26,698.55	5,499.97	12,584.50	70	44,830.00	26,711.27	5,514.60	12,604.13	133	44,794.80	26,705.28	5,520.35	12,569.17
8	44,761.28	26,674.95	5,493.70	12,592.63	71	44,799.30	26,680.80	5,528.08	12,590.42	134	44,765.53	26,690.13	5,509.52	12,565.88
9	44,743.50	26,644.30	5,509.72	12,589.48	72	44,772.38	26,684.88	5,493.00	12,594.50	135	44,824.57	26,715.33	5,522.28	12,586.95
10	44,770.38	26,675.03	5,500.73	12,594.62	73	44,793.88	26,697.22	5,508.70	12,587.97	136	44,833.48	26,715.25	5,515.78	12,602.45
11	44,828.37	26,715.20	5,513.12	12,600.05	74	44,708.70	26,653.10	5,496.75	12,558.85	137	44,825.05	26,709.22	5,515.93	12,599.90
12	44,841.23	26,719.82	5,521.90	12,599.52	75	44,892.42	26,746.80	5,518.18	12,627.43	138	44,778.10	26,694.72	5,499.75	12,583.63
13	44,826.47	26,714.15	5,510.70	12,601.62	76	44,792.93	26,692.78	5,518.00	12,582.15	139	44,794.78	26,698.03	5,508.33	12,588.42
14	44,855.80	26,713.08	5,536.65	12,606.07	77	44,803.62	26,710.00	5,516.82	12,576.80	140	44,813.38	26,709.90	5,520.48	12,583.00
15	44,732.22	26,650.67	5,493.77	12,587.78	78	44,818.65	26,715.88	5,514.02	12,588.75	141	44,788.08	26,702.63	5,511.58	12,573.87
16	44,924.45	26,778.50	5,521.80	12,624.15	79	44,794.25	26,693.93	5,499.78	12,600.53	142	44,810.38	26,701.73	5,516.83	12,591.82
17	44,818.18	26,692.12	5,519.52	12,606.55	80	44,770.20	26,675.18	5,511.62	12,583.40	143	44,780.92	26,684.27	5,507.85	12,588.80
18	44,842.65	26,715.33	5,517.83	12,609.48	81	44,787.88	26,702.37	5,515.13	12,570.38	144	44,806.45	26,715.85	5,515.82	12,574.78
19	44,800.23	26,708.58	5,502.63	12,589.02	82	44,808.42	26,699.05	5,522.43	12,586.93	145	44,768.05	26,706.53	5,491.53	12,569.98
20	44,745.70	26,677.02	5,502.20	12,566.48	83	44,808.07	26,708.92	5,526.30	12,572.85	146	44,830.43	26,732.85	5,506.13	12,591.45
21	44,756.32	26,662.15	5,520.05	12,574.12	84	44,769.15	26,690.62	5,511.02	12,567.52	147	44,845.95	26,725.10	5,514.70	12,606.15
22	44,784.03	26,693.30	5,514.77	12,575.97	85	44,812.40	26,709.15	5,514.90	12,588.35	148	44,781.85	26,706.88	5,510.68	12,564.28
23	44,815.53	26,702.57	5,519.23	12,593.73	86	44,794.80	26,697.97	5,503.77	12,593.07	149	44,689.73	26,649.63	5,485.08	12,555.02
24	44,805.23	26,710.78	5,491.98	12,602.47	87	44,763.97	26,673.80	5,515.43	12,574.73	150	44,872.72	26,735.52	5,503.37	12,633.83
25	44,762.40	26,662.93	5,519.25	12,580.22	88	44,828.28	26,725.32	5,526.43	12,576.53	151	44,788.07	26,691.10	5,512.45	12,584.52
26	44,826.98	26,712.77	5,513.95	12,600.27	89	44,800.85	26,697.70	5,520.28	12,582.87	152	44,779.25	26,695.05	5,492.02	12,592.18
27	44,825.07	26,748.00	5,500.47	12,576.60	90	44,830.10	26,743.42	5,504.17	12,582.52	153	44,790.13	26,687.70	5,516.63	12,585.80
28	44,814.63	26,707.92	5,505.05	12,601.67	91	44,788.55	26,678.83	5,510.40	12,599.32	154	44,818.45	26,720.65	5,502.37	12,595.43
29	44,843.82	26,724.62	5,514.58	12,604.62	92	44,818.28	26,711.07	5,519.80	12,587.42	155	44,785.42	26,713.80	5,513.65	12,557.97
30	44,798.97	26,686.32	5,511.67	12,600.98	93	44,774.12	26,681.07	5,520.80	12,572.25	156	44,766.57	26,665.08	5,506.95	12,594.53
31	44,877.35	26,747.67	5,513.60	12,616.08	94	44,783.22	26,698.10	5,513.17	12,571.95	157	44,763.02	26,645.47	5,513.77	12,603.78
32	44,797.57	26,711.20	5,486.50	12,599.87	95	44,578.72	26,562.73	5,473.05	12,542.93	158	44,820.42	26,723.03	5,513.52	12,583.87
33	44,793.18	26,703.40	5,527.42	12,562.37	96	44,965.45	26,783.13	5,525.83	12,656.48	159	44,810.33	26,712.77	5,522.55	12,575.02
34	44,760.62	26,689.78	5,495.55	12,575.28	97	44,844.27	26,710.42	5,503.65	12,630.20	160	44,811.73	26,695.73	5,521.58	12,594.42
35	44,813.13	26,718.53	5,506.57	12,588.03	98	44,718.00	26,669.52	5,497.67	12,550.82	161	44,802.35	26,698.77	5,513.97	12,589.62
36	44,774.93	26,703.48	5,502.60	12,568.85	99	44,875.05	26,743.00	5,505.85	12,626.20	162	44,834.35	26,736.15	5,509.88	12,588.32
37	44,763.40	26,677.43	5,497.05	12,588.92	100	44,809.22	26,693.57	5,516.10	12,599.55	163	44,750.52	26,657.72	5,506.80	12,586.00
38	44,758.83	26,672.75	5,510.13	12,575.95	101	44,809.43	26,698.42	5,505.30	12,605.72	164	44,794.00	26,689.70	5,518.10	12,586.20
39	44,815.68	26,705.58	5,501.63	12,608.47	102	44,782.97	26,694.03	5,510.03	12,578.90	165	44,814.75	26,698.32	5,514.27	12,602.17
40	44,724.33	26,667.62	5,500.65	12,556.07	103	44,803.15	26,694.98	5,513.90	12,594.27	166	44,805.55	26,704.13	5,515.48	12,585.93
41	44,801.07	26,707.07	5,500.52	12,593.48	104	44,800.97	26,666.27	5,526.63	12,608.07	167	44,810.48	26,700.02	5,531.58	12,578.88
42	44,827.93	26,724.45	5,504.37	12,599.12	105	44,840.12	26,706.38	5,521.40	12,612.33	168	44,804.25	26,700.92	5,505.45	12,597.88
43	44,814.93	26,730.80	5,507.22	12,576.92	106	44,817.45	26,703.78	5,511.88	12,601.78	169	44,806.08	26,712.05	5,501.45	12,592.58
44	44,760.15	26,677.28	5,501.83	12,581.03	107	44,774.93	26,672.62	5,497.72	12,604.60	170	44,766.23	26,685.55	5,518.32	12,562.37
45	44,802.00	26,716.40	5,516.18	12,569.42	108	44,777.05	26,699.57	5,507.65	12,569.83	171	44,769.65	26,674.58	5,509.60	12,585.47
46	44,778.27	26,695.93	5,502.43	12,579.90	109	44,835.82	26,747.05	5,509.72	12,579.05	172	44,782.92	26,698.62	5,495.28	12,589.02
47	44,776.62	26,685.97	5,509.67	12,580.98	110	44,801.55	26,716.17	5,494.17	12,591.22	173	44,765.03	26,681.27	5,509.43	12,574.33
48	44,773.02	26,696.13	5,504.25	12,572.63	111	44,776.07	26,693.03	5,509.38	12,573.65	174	44,723.67	26,651.30	5,490.82	12,581.55
49	44,820.00	26,702.27	5,523.72	12,594.02	112	44,827.25	26,704.80	5,523.38	12,599.07	175	44,845.83	26,730.15	5,504.13	12,611.55
50	44,753.57	26,672.35	5,505.68	12,575.53	113	44,798.50	26,708.02	5,516.33	12,574.15	176	44,827.92	26,726.75	5,501.05	12,600.12
51	44,759.12	26,681.15	5,513.80	12,564.17	114	44,809.90	26,707.00	5,513.83	12,589.07	177	44,820.43	26,716.97	5,519.30	12,584.17
52	44,799.87	26,701.47	5,505.88	12,592.52	115	44,752.53	26,671.10	5,502.40	12,579.03	178	44,801.33	26,720.90	5,503.80	12,576.63
53	44,781.35	26,699.15	5,495.80	12,586.40	116	44,833.60	26,738.38	5,507.22	12,588.00	179	44,843.78	26,730.77	5,513.27	12,599.75
54	44,811.43	26,693.95	5,516.02	12,601.47	117	44,830.68	26,735.12	5,503.78	12,591.78	180	44,835.00	26,717.22	5,517.98	12,599.80
55	44,776.33	26,678.20	5,508.67	12,589.47	118	44,821.27	26,716.83	5,515.50	12,588.93	181	44,795.43	26,690.23	5,505.87	12,599.33
56	44,801.32	26,683.40	5,510.68	12,607.23	119	44,798.82	26,692.03	5,512.63	12,594.15	182	44,812.68	26,705.08	5,512.70	12,594.90
57	44,821.10	26,715.88	5,505.63	12,599.58	120	44,757.42	26,670.98	5,509.15	12,577.28	183	44,831.60	26,695.72	5,515.35	12,620.53
58	44,757.77	26,669.07	5,505.60	12,583.10	121	44,752.58	26,680.47	5,500.97	12,571.15	184	44,781.75	26,693.10	5,518.62	12,570.03
59	44,799.75	26,703.03	5,498.47	12,598.25	122	44,759.73	26,683.87	5,499.78	12,576.08	185	44,871.23	26,748.43	5,524.10	12,598.70
60	44,846.62	26,737.80	5,509.60	12,599.22	123	44,761.83	26,686.80	5,507.55	12,567.48	186	44,725.92	26,642.33	5,509.92	12,573.67
61	44,828.38	26,733.27	5,526.35	12,568.77	124	44,816.43	26,683.43	5,536.08	12,596.92	187	44,773.95	26,691.63	5,510.75	12,571.57
62	44,776.47	26,695.97	5,509.48	12,571.02	125	44,816.08	26,726.75	5,515.13	12,574.20	188	44,815.60	26,727.32	5,508.90	12,579.38
										189	44,819.48	26,725.45	5,506.93	12,587.10
										Average	44,798.76	26,700.37	5,510.21	12,588.19

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	0.003	0.001	0.002	0.001	0.005	0.002	0.003	0.001

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 –Xmx2048m –Xss1024k metrics –b 896 –s 600
```

IOPS Test Results File

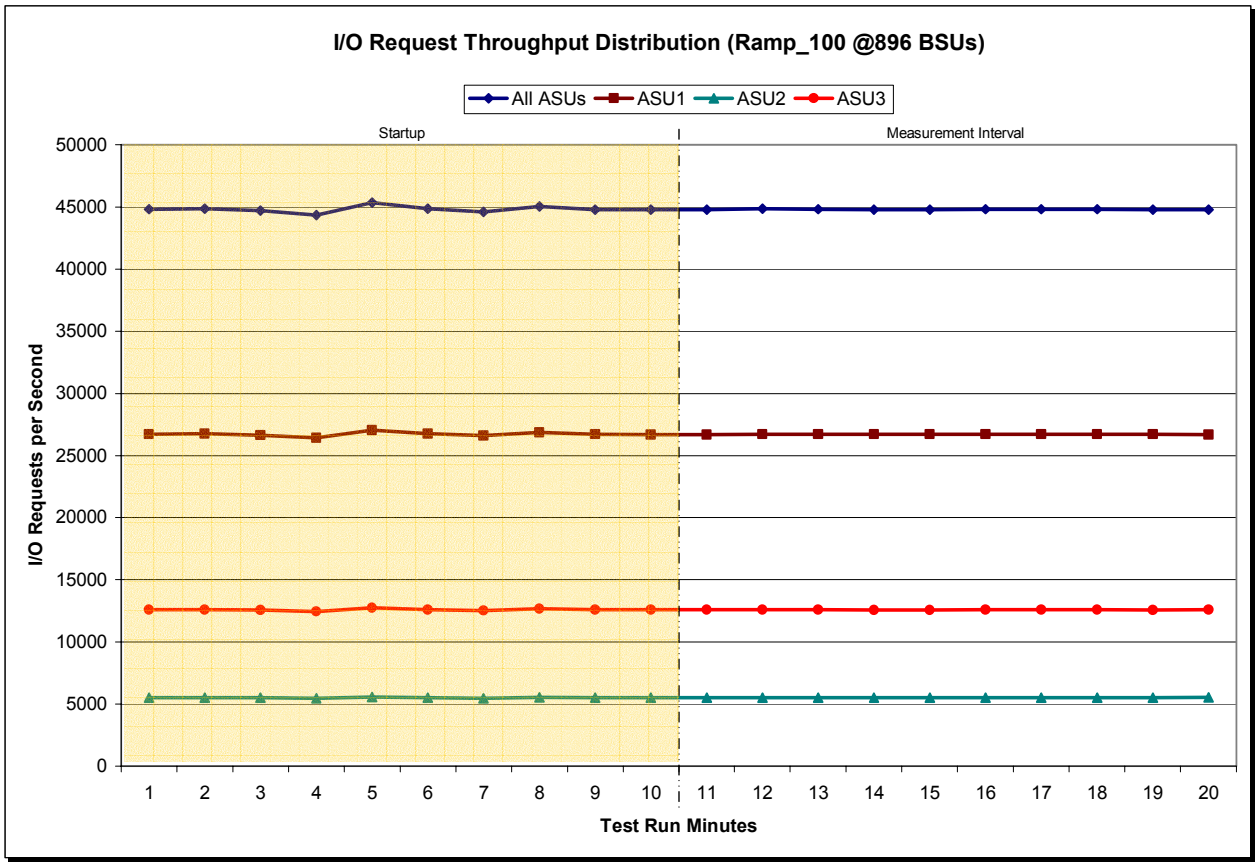
A link to the test results file generated from the IOPS Test Run is listed below.

IOPS Test Results File

IOPS Test Run – I/O Request Throughput Distribution Data

896 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:04:49	21:14:50	0-9	0:10:01
Measurement Interval	21:14:50	21:24:50	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	44,832.60	26,724.23	5,514.55	12,593.82
1	44,844.28	26,734.28	5,518.72	12,591.28
2	44,707.23	26,648.60	5,512.28	12,546.35
3	44,346.48	26,417.33	5,456.53	12,472.62
4	45,349.20	27,020.98	5,575.62	12,752.60
5	44,848.35	26,762.35	5,496.28	12,589.72
6	44,600.73	26,594.43	5,480.78	12,525.52
7	45,027.88	26,839.08	5,527.32	12,661.48
8	44,794.68	26,693.08	5,492.55	12,609.05
9	44,775.83	26,689.08	5,504.38	12,582.37
10	44,781.97	26,680.15	5,515.02	12,586.80
11	44,851.18	26,721.12	5,517.15	12,612.92
12	44,813.42	26,722.25	5,505.75	12,585.42
13	44,787.12	26,705.95	5,517.50	12,563.67
14	44,778.02	26,693.87	5,516.60	12,567.55
15	44,811.08	26,697.90	5,520.32	12,592.87
16	44,817.87	26,710.47	5,507.78	12,599.62
17	44,831.67	26,720.47	5,517.40	12,593.80
18	44,797.92	26,713.75	5,513.60	12,570.57
19	44,787.20	26,675.90	5,529.63	12,581.67
Average	44,805.74	26,704.18	5,516.08	12,585.49

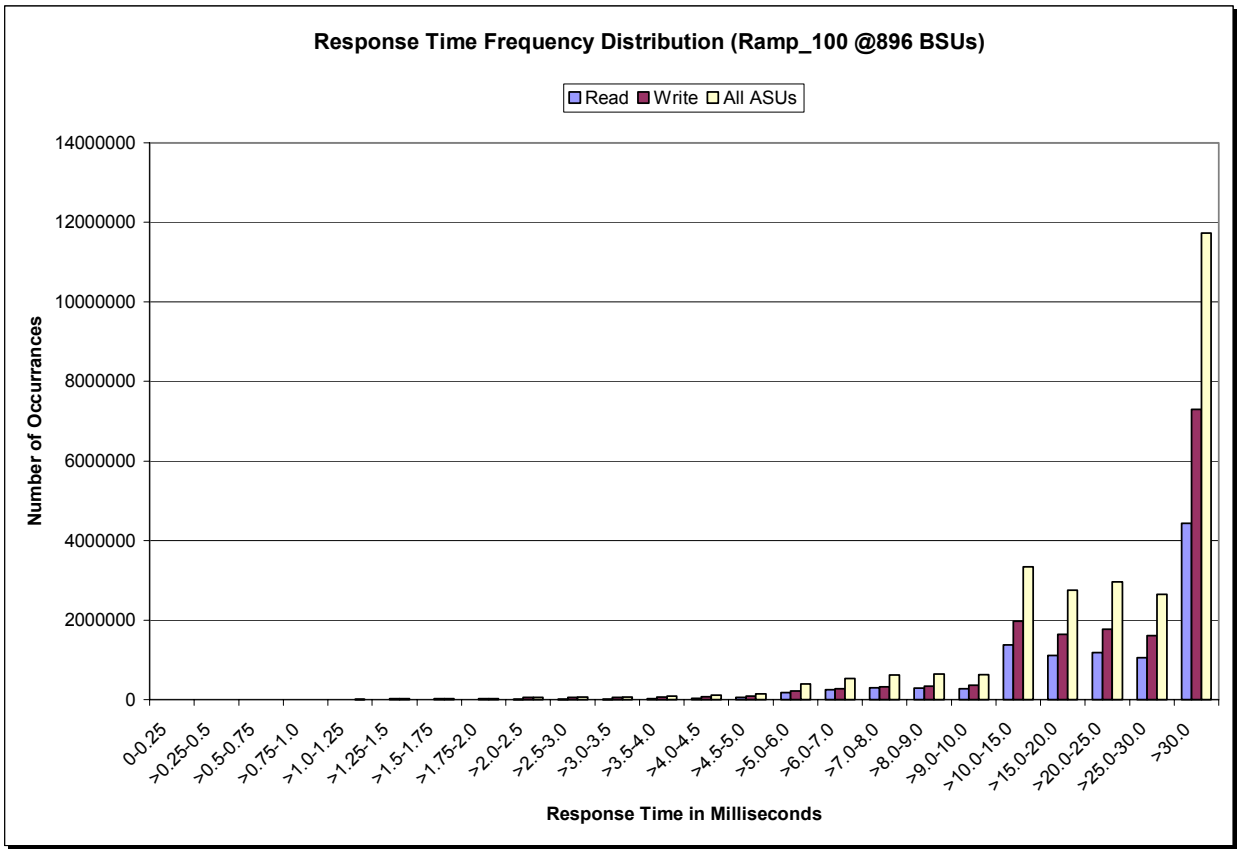
IOPS Test Run – I/O Request Throughput Distribution Graph



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	13	3,706	4,949	3,680	2,901	2,475	2,555
Write	0	-	-	3	4,796	21,451	24,234	25,024
All ASUs	0	13	3,706	4,952	8,476	24,352	26,709	27,579
ASU1	0	9	2,940	3,893	5,850	13,980	14,001	14,226
ASU2	0	4	766	1,059	1,447	3,304	3,314	3,315
ASU3	0	-	-	-	1,179	7,068	9,394	10,038
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	6,251	8,731	13,121	21,550	36,410	55,328	177,590	255,962
Write	52,275	53,719	57,527	63,285	74,000	86,995	219,580	278,151
All ASUs	58,526	62,450	70,648	84,835	110,410	142,323	397,170	534,113
ASU1	30,495	33,195	39,058	50,029	68,630	92,249	263,253	355,963
ASU2	6,945	7,370	8,147	9,341	11,882	15,328	45,734	65,229
ASU3	21,086	21,885	23,443	25,465	29,898	34,746	88,183	112,921
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	301,712	291,227	273,043	1,370,356	1,109,487	1,182,618	1,048,391	4,430,685
Write	322,546	347,914	363,247	1,968,956	1,642,540	1,773,281	1,605,713	7,293,907
All ASUs	624,258	639,141	636,290	3,339,312	2,752,027	2,955,899	2,654,104	11,724,592
ASU1	412,224	408,919	399,661	2,069,639	1,678,082	1,783,790	1,578,179	6,703,365
ASU2	79,490	85,525	83,784	422,959	343,333	362,703	323,735	1,424,749
ASU3	132,544	144,697	152,845	846,714	730,612	809,406	752,190	3,596,478

IOPS Test Run –Response Time Frequency Distribution Graph

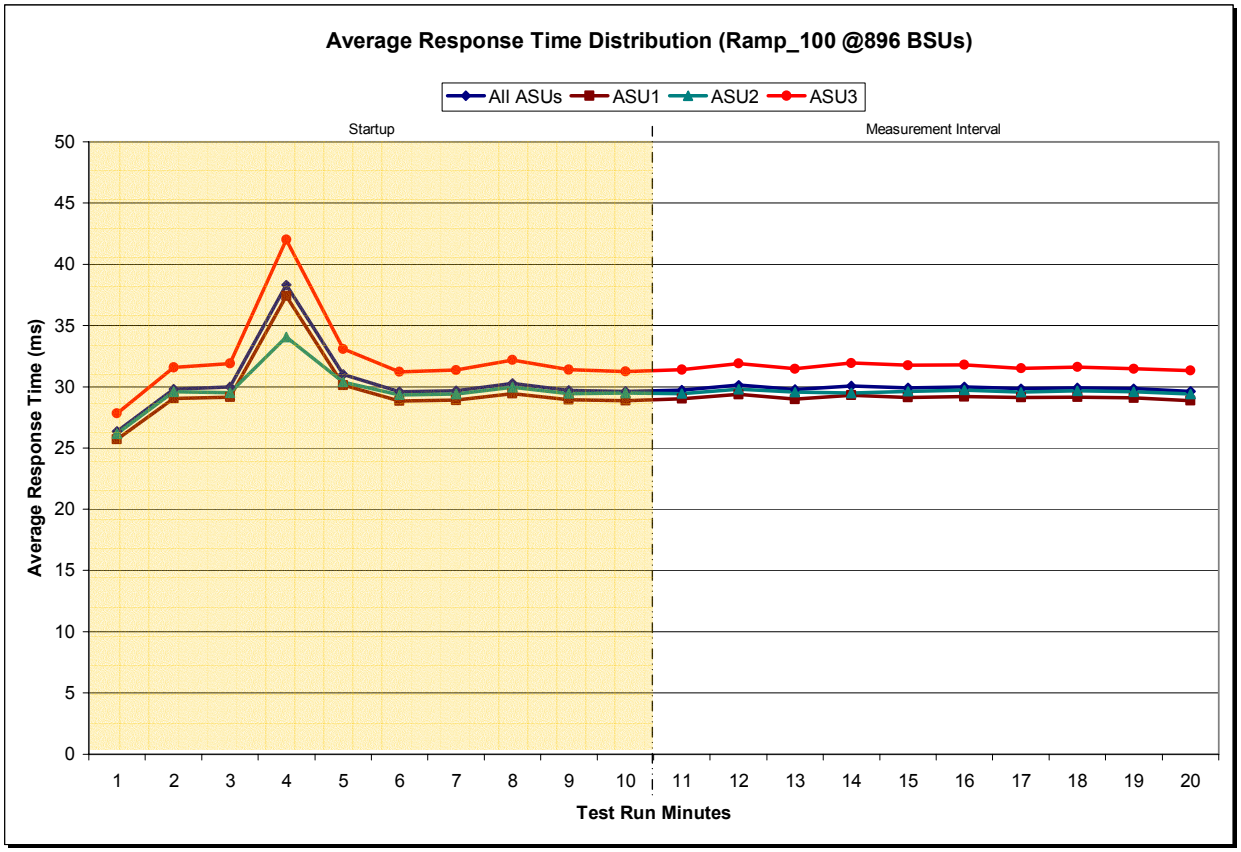


IOPS Test Run – Average Response Time (ms) Distribution Data

896 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:04:49	21:14:50	0-9	0:10:01
Measurement Interval	21:14:50	21:24:50	10-19	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	26.36	25.72	26.16	27.83
1	29.82	29.04	29.60	31.57
2	29.97	29.16	29.53	31.88
3	38.29	37.41	34.07	42.00
4	30.99	30.14	30.37	33.09
5	29.58	28.85	29.35	31.22
6	29.67	28.91	29.43	31.37
7	30.28	29.45	29.96	32.20
8	29.69	28.94	29.44	31.39
9	29.61	28.87	29.46	31.25
10	29.73	29.00	29.45	31.41
11	30.14	29.37	29.81	31.91
12	29.76	28.99	29.55	31.46
13	30.06	29.29	29.47	31.94
14	29.92	29.12	29.63	31.73
15	29.98	29.18	29.72	31.78
16	29.84	29.11	29.54	31.51
17	29.90	29.14	29.64	31.61
18	29.83	29.10	29.58	31.47
19	29.63	28.88	29.42	31.31
Average	29.88	29.12	29.58	31.61

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
26,881,885	15,157,293	11,724,592

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	0.035	0.2810	0.0700	0.2100	0.0180	0.0701	0.0351	0.2809
COV	0.003	0.001	0.003	0.001	0.003	0.002	0.002	0.001

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 –Xmx2048m –Xss1024k metrics –b 896 –s 600

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 - 896 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:04:49	21:14:50	0-9	0:10:01
Measurement Interval	21:14:50	21:24:50	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	44,832.60	26,724.23	5,514.55	12,593.82
1	44,844.28	26,734.28	5,518.72	12,591.28
2	44,707.23	26,648.60	5,512.28	12,546.35
3	44,346.48	26,417.33	5,456.53	12,472.62
4	45,349.20	27,020.98	5,575.62	12,752.60
5	44,848.35	26,762.35	5,496.28	12,589.72
6	44,600.73	26,594.43	5,480.78	12,525.52
7	45,027.88	26,839.08	5,527.32	12,661.48
8	44,794.68	26,693.08	5,492.55	12,609.05
9	44,775.83	26,689.08	5,504.38	12,582.37
10	44,781.97	26,680.15	5,515.02	12,586.80
11	44,851.18	26,721.12	5,517.15	12,612.92
12	44,813.42	26,722.25	5,505.75	12,585.42
13	44,787.12	26,705.95	5,517.50	12,563.67
14	44,778.02	26,693.87	5,516.60	12,567.55
15	44,811.08	26,697.90	5,520.32	12,592.87
16	44,817.87	26,710.47	5,507.78	12,599.62
17	44,831.67	26,720.47	5,517.40	12,593.80
18	44,797.92	26,713.75	5,513.60	12,570.57
19	44,787.20	26,675.90	5,529.63	12,581.67
Average	44,805.74	26,704.18	5,516.08	12,585.49

95% Load Level - 851 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:25:20	21:35:21	0-9	0:10:01
Measurement Interval	21:35:21	21:45:21	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	42,592.70	25,380.02	5,234.93	11,977.75
1	42,591.23	25,389.10	5,260.07	11,942.07
2	42,555.07	25,364.32	5,231.48	11,959.27
3	42,596.50	25,410.23	5,230.63	11,955.63
4	42,564.85	25,381.10	5,235.43	11,948.32
5	42,384.05	25,277.57	5,202.23	11,904.25
6	42,706.00	25,475.80	5,245.12	11,985.08
7	42,476.87	25,313.75	5,222.00	11,941.12
8	42,577.98	25,394.55	5,235.37	11,948.07
9	42,536.93	25,359.27	5,238.93	11,938.73
10	42,516.20	25,355.67	5,231.95	11,928.58
11	42,532.52	25,351.52	5,232.35	11,948.65
12	42,546.02	25,343.58	5,240.68	11,961.75
13	42,604.33	25,416.42	5,236.83	11,951.08
14	42,569.50	25,362.75	5,234.47	11,972.28
15	42,520.95	25,326.52	5,227.80	11,966.63
16	42,563.33	25,365.95	5,228.62	11,968.77
17	42,555.00	25,366.20	5,224.67	11,964.13
18	42,529.98	25,329.55	5,246.28	11,954.15
19	42,576.77	25,392.63	5,217.47	11,966.67
Average	42,551.46	25,361.08	5,232.11	11,958.27

90% Load Level - 806 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:45:49	21:55:50	0-9	0:10:01
Measurement Interval	21:55:50	22:05:50	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	40,337.87	24,029.52	4,970.97	11,337.38
1	40,296.45	23,993.58	4,957.05	11,345.82
2	40,337.10	24,018.65	4,973.73	11,344.72
3	40,265.92	24,002.40	4,956.18	11,307.33
4	40,353.77	24,059.08	4,974.43	11,320.25
5	40,288.38	24,003.80	4,965.77	11,318.82
6	40,285.07	24,002.45	4,956.62	11,326.00
7	40,289.68	24,013.45	4,966.48	11,309.75
8	40,280.25	24,006.88	4,955.43	11,317.93
9	40,319.12	24,037.10	4,960.17	11,321.85
10	40,335.12	24,039.72	4,963.42	11,331.98
11	40,307.73	24,038.60	4,960.90	11,308.23
12	40,311.57	24,022.42	4,958.50	11,330.65
13	40,271.33	23,979.25	4,965.22	11,326.87
14	40,242.57	23,988.47	4,949.97	11,304.13
15	40,278.25	24,031.80	4,948.20	11,298.25
16	40,319.07	24,019.82	4,965.43	11,333.82
17	40,305.28	24,050.10	4,957.47	11,297.72
18	40,299.40	24,042.90	4,940.15	11,316.35
19	40,306.03	24,008.68	4,951.67	11,345.68
Average	40,297.64	24,022.18	4,956.09	11,319.37

80% Load Level - 716 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	22:06:15	22:16:16	0-9	0:10:01
Measurement Interval	22:16:16	22:26:16	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	35,837.48	21,357.30	4,416.87	10,063.32
1	35,756.83	21,316.77	4,391.57	10,048.50
2	35,769.73	21,324.60	4,415.00	10,030.13
3	35,786.45	21,318.20	4,407.70	10,060.55
4	35,769.98	21,330.88	4,396.02	10,043.08
5	35,732.40	21,312.25	4,385.87	10,034.28
6	35,790.20	21,339.43	4,406.72	10,044.05
7	35,821.65	21,363.53	4,398.15	10,059.97
8	32,177.45	19,194.68	3,961.12	9,021.65
9	38,707.35	23,052.43	4,764.58	10,890.33
10	36,510.38	21,769.90	4,484.18	10,256.30
11	35,778.20	21,314.00	4,399.47	10,064.73
12	35,777.67	21,327.83	4,394.68	10,055.15
13	35,841.67	21,363.98	4,402.33	10,075.35
14	35,800.45	21,342.70	4,400.25	10,057.50
15	35,834.77	21,361.42	4,414.13	10,059.22
16	35,819.15	21,361.72	4,390.18	10,067.25
17	35,804.93	21,332.35	4,396.75	10,075.83
18	35,836.15	21,368.57	4,408.43	10,059.15
19	35,758.95	21,295.02	4,400.65	10,063.28
Average	35,876.23	21,383.75	4,409.11	10,083.38

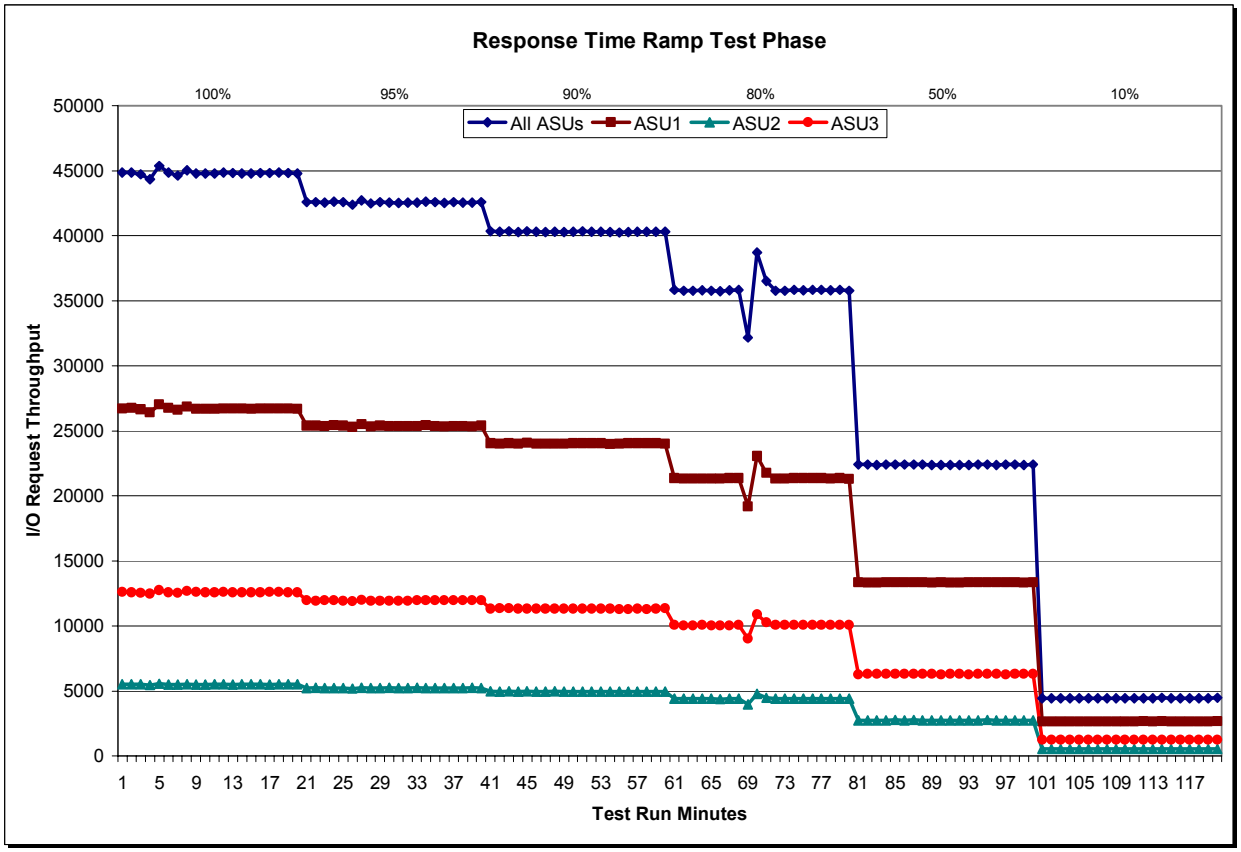
50% Load Level - 448 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	22:26:39	22:36:40	0-9	0:10:01
Measurement Interval	22:36:40	22:46:40	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	22,404.33	13,359.28	2,760.08	6,284.97
1	22,396.05	13,330.93	2,759.60	6,305.52
2	22,371.85	13,332.57	2,739.90	6,299.38
3	22,408.88	13,355.30	2,761.55	6,292.03
4	22,422.95	13,355.98	2,764.23	6,302.73
5	22,402.63	13,348.92	2,755.60	6,298.12
6	22,421.87	13,356.47	2,769.65	6,295.75
7	22,399.97	13,362.73	2,748.08	6,289.15
8	22,380.92	13,332.05	2,748.47	6,300.40
9	22,382.00	13,348.80	2,750.57	6,282.63
10	22,382.68	13,334.52	2,753.28	6,294.88
11	22,380.43	13,335.73	2,745.47	6,299.23
12	22,370.62	13,343.82	2,745.15	6,281.65
13	22,399.63	13,342.53	2,753.23	6,303.87
14	22,406.08	13,343.58	2,771.70	6,290.80
15	22,385.22	13,355.92	2,736.77	6,292.53
16	22,399.95	13,367.77	2,744.38	6,287.80
17	22,409.28	13,358.57	2,754.35	6,296.37
18	22,389.77	13,333.50	2,756.20	6,300.07
19	22,402.62	13,356.02	2,751.40	6,295.20
Average	22,392.63	13,347.20	2,751.19	6,294.24

10% Load Level - 89 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	22:46:55	22:56:56	0-9	0:10:01
Measurement Interval	22:56:56	23:06:56	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	4,455.35	2,657.22	548.52	1,249.62
1	4,437.68	2,638.63	549.92	1,249.13
2	4,439.57	2,649.25	546.97	1,243.35
3	4,449.13	2,653.03	548.42	1,247.68
4	4,451.17	2,654.65	549.37	1,247.15
5	4,456.05	2,654.78	546.75	1,254.52
6	4,455.30	2,649.77	549.88	1,255.65
7	4,452.82	2,655.23	549.48	1,248.10
8	4,450.40	2,654.85	545.10	1,250.45
9	4,431.60	2,644.83	548.88	1,237.88
10	4,447.03	2,655.08	547.93	1,244.02
11	4,451.37	2,661.55	541.52	1,248.30
12	4,451.48	2,652.08	541.62	1,257.78
13	4,468.70	2,666.10	549.07	1,253.53
14	4,456.95	2,657.55	547.02	1,252.38
15	4,442.78	2,649.92	545.05	1,247.82
16	4,454.38	2,652.67	548.77	1,252.95
17	4,439.42	2,640.97	553.75	1,244.70
18	4,441.42	2,644.20	543.15	1,254.07
19	4,461.95	2,661.73	545.75	1,254.47
Average	4,451.55	2,654.19	546.36	1,251.00

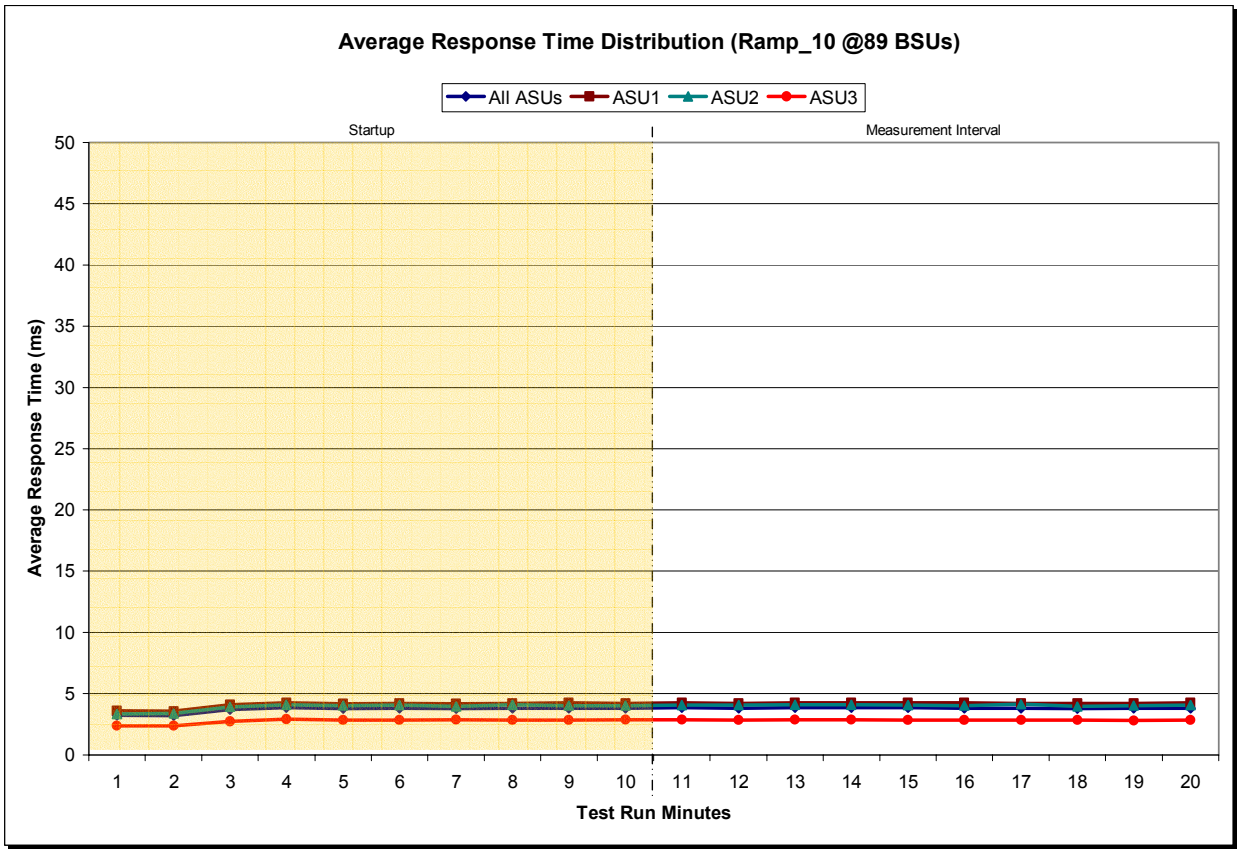
Response Time Ramp Distribution (IOPS) Graph



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

89 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	22:46:55	22:56:56	0-9	0:10:01
Measurement Interval	22:56:56	23:06:56	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	3.24	3.61	3.36	2.39
1	3.20	3.56	3.37	2.37
2	3.71	4.11	3.93	2.75
3	3.86	4.26	4.09	2.90
4	3.79	4.18	4.03	2.84
5	3.81	4.21	4.06	2.85
6	3.79	4.19	3.96	2.87
7	3.82	4.23	4.10	2.84
8	3.82	4.23	4.02	2.86
9	3.81	4.21	4.04	2.86
10	3.84	4.24	4.06	2.88
11	3.82	4.23	4.06	2.86
12	3.83	4.23	4.10	2.88
13	3.84	4.25	4.09	2.87
14	3.84	4.26	4.06	2.84
15	3.83	4.25	4.04	2.85
16	3.82	4.22	4.14	2.83
17	3.80	4.22	3.98	2.83
18	3.81	4.23	4.02	2.82
19	3.83	4.24	4.07	2.85
Average	3.83	4.24	4.06	2.85

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	0.351	0.2810	0.0702	0.2099	0.0180	0.0700	0.0347	0.2810
COV	0.011	0.003	0.008	0.003	0.015	0.009	0.010	0.003

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 –Xmx2048m –Xss1024k repeat1 –b 896 –s 600

java –Xmx2048m –Xss1024k repeat1 –b 896 –s 600

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	*44,805.74*	*3.83*
Repeatability Test Phase 1	44,805.19	3.83
Repeatability Test Phase 2	44,796.81	3.83

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)

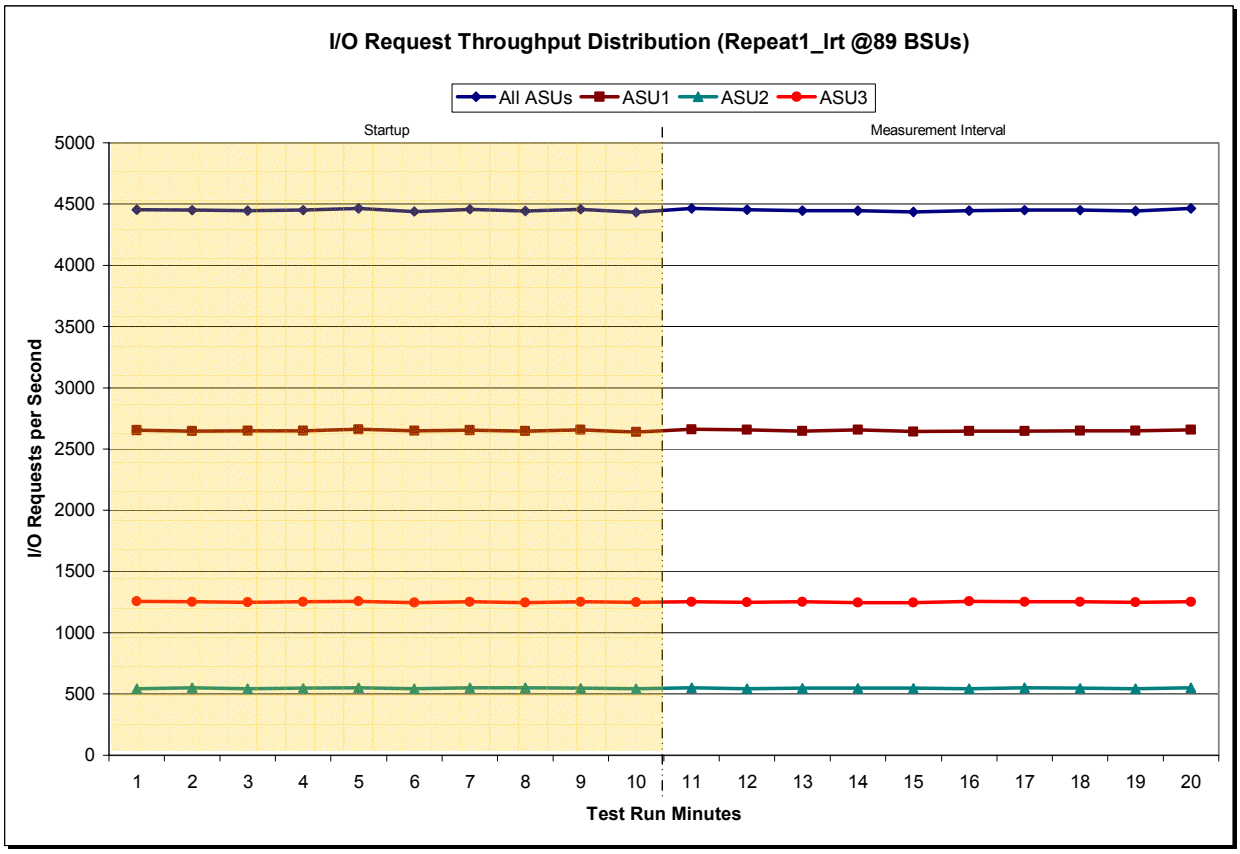
Repeatability Test Phase 2, Test Run 1 (LRT)

Repeatability Test Phase 2, Test Run 2 (IOPS)

Repeatability 1 LRT – I/O Request Throughput Distribution Data

89 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	23:07:24	23:17:24	0-9	0:10:00
Measurement Interval	23:17:24	23:27:24	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	4,453.62	2,652.93	543.85	1,256.83
1	4,448.90	2,646.47	549.87	1,252.57
2	4,446.83	2,650.85	545.15	1,250.83
3	4,450.93	2,650.22	548.33	1,252.38
4	4,465.33	2,659.20	550.07	1,256.07
5	4,439.25	2,650.53	542.20	1,246.52
6	4,456.12	2,651.75	550.20	1,254.17
7	4,442.92	2,646.80	550.12	1,246.00
8	4,455.90	2,658.17	546.83	1,250.90
9	4,432.98	2,639.52	544.52	1,248.95
10	4,462.77	2,660.27	549.87	1,252.63
11	4,452.02	2,656.83	544.37	1,250.82
12	4,446.20	2,646.62	547.32	1,252.27
13	4,446.80	2,654.83	547.07	1,244.90
14	4,433.65	2,640.43	547.78	1,245.43
15	4,447.02	2,647.53	544.07	1,255.42
16	4,448.85	2,646.40	549.07	1,253.38
17	4,449.42	2,650.20	546.35	1,252.87
18	4,440.43	2,648.37	544.48	1,247.58
19	4,463.20	2,657.02	552.12	1,254.07
Average	4,449.04	2,650.85	547.25	1,250.94

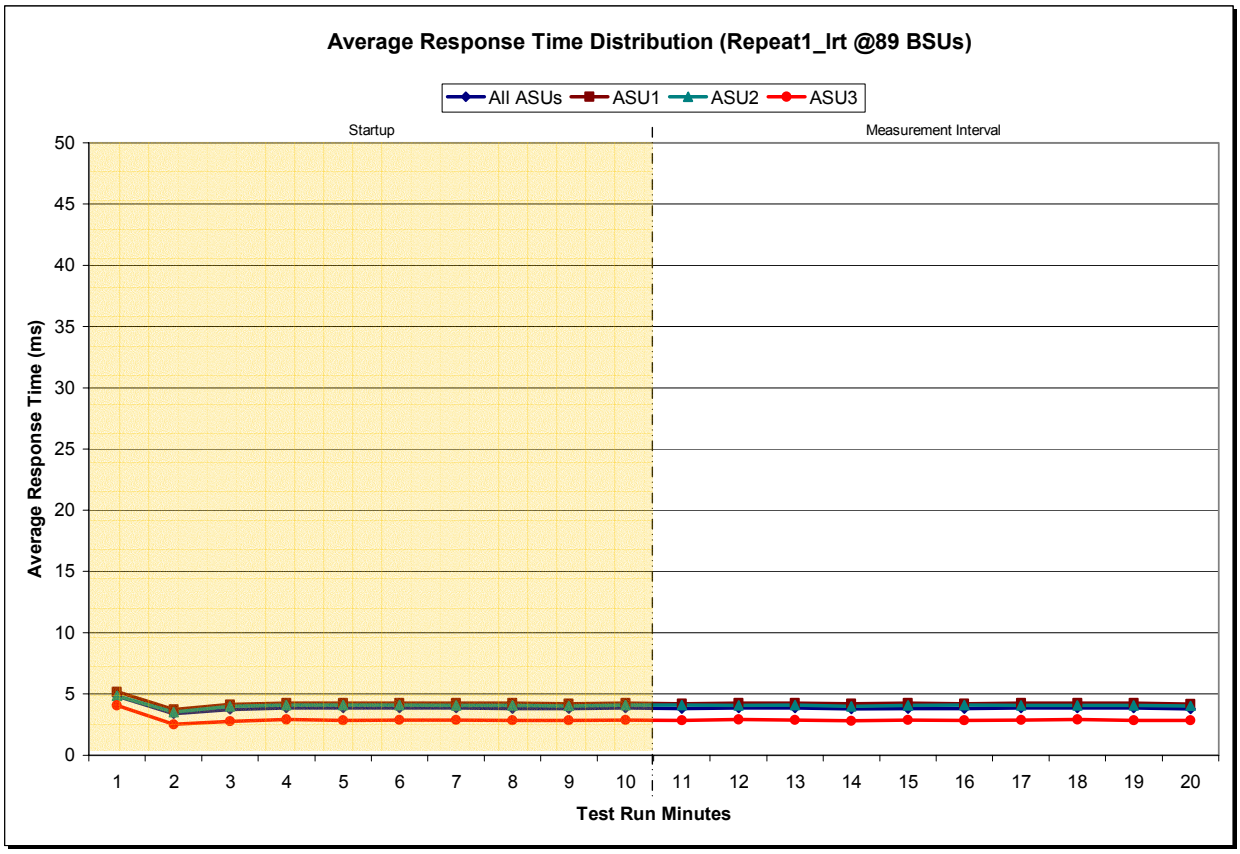
Repeatability 1 LRT – I/O Request Throughput Distribution Graph



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

89 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	23:07:24	23:17:24	0-9	0:10:00
Measurement Interval	23:17:24	23:27:24	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	4.83	5.18	4.84	4.08
1	3.37	3.75	3.52	2.52
2	3.75	4.15	4.00	2.79
3	3.84	4.23	4.09	2.90
4	3.84	4.25	4.09	2.86
5	3.85	4.24	4.11	2.89
6	3.84	4.24	4.08	2.88
7	3.83	4.24	4.08	2.85
8	3.80	4.22	4.01	2.84
9	3.85	4.25	4.12	2.88
10	3.82	4.22	4.12	2.84
11	3.85	4.24	4.06	2.91
12	3.84	4.26	4.09	2.86
13	3.78	4.19	4.00	2.81
14	3.83	4.23	4.08	2.87
15	3.82	4.22	4.11	2.86
16	3.84	4.25	4.06	2.89
17	3.86	4.27	4.07	2.90
18	3.83	4.26	4.06	2.84
19	3.78	4.18	4.03	2.84
Average	3.83	4.23	4.07	2.86

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

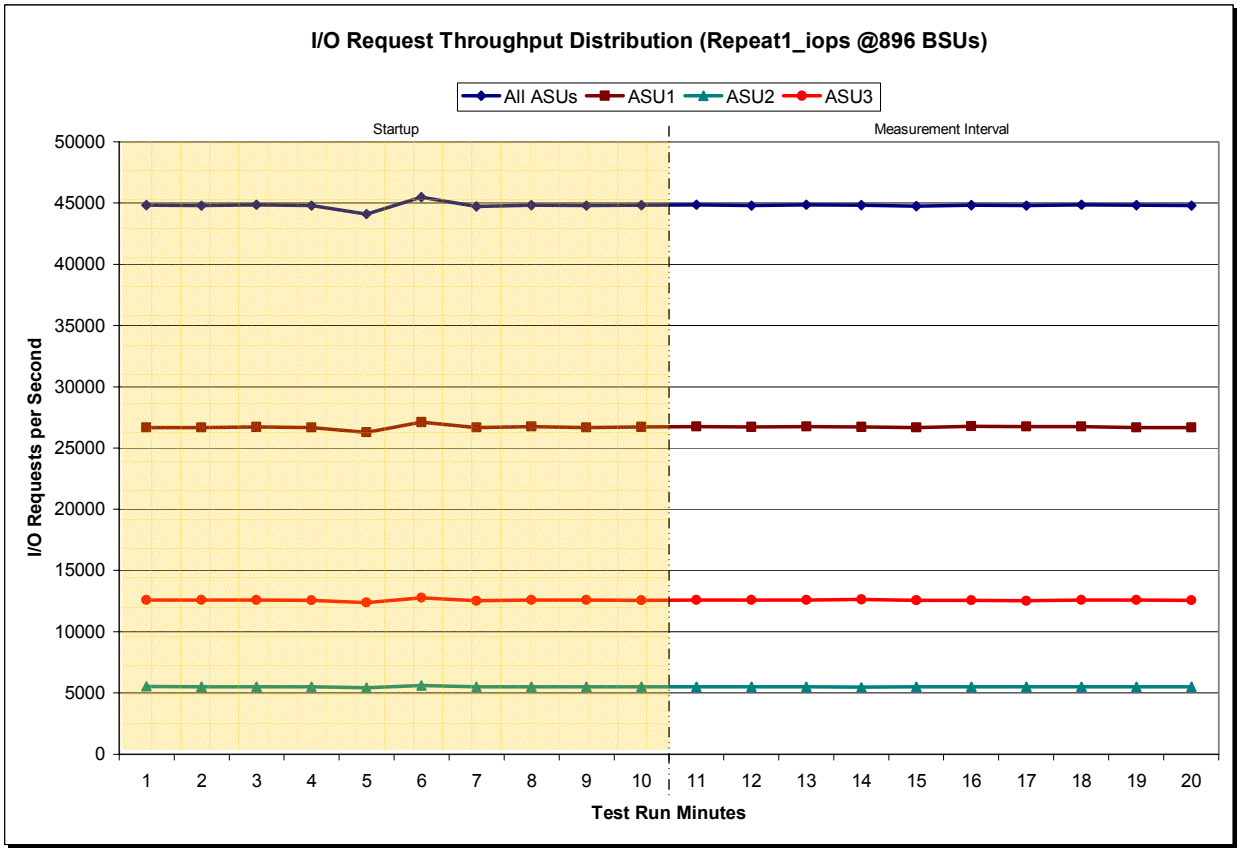


Repeatability 1 IOPS – I/O Request Throughput Distribution Data

896 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	23:27:51	23:37:52	0-9	0:10:01
Measurement Interval	23:37:52	23:47:53	10-19	0:10:01

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	44,814.05	26,691.27	5,525.93	12,596.85
1	44,784.68	26,676.50	5,515.38	12,592.80
2	44,834.82	26,720.92	5,511.23	12,602.67
3	44,763.98	26,683.17	5,512.90	12,567.92
4	44,110.27	26,291.15	5,428.85	12,390.27
5	45,480.32	27,108.67	5,599.47	12,772.18
6	44,712.13	26,661.52	5,506.40	12,544.22
7	44,829.60	26,732.33	5,503.03	12,594.23
8	44,777.07	26,670.27	5,509.18	12,597.62
9	44,807.23	26,721.57	5,507.00	12,578.67
10	44,846.45	26,741.63	5,507.53	12,597.28
11	44,797.78	26,696.98	5,518.18	12,582.62
12	44,839.30	26,737.92	5,511.12	12,590.27
13	44,817.65	26,699.60	5,486.17	12,631.88
14	44,739.90	26,660.13	5,514.13	12,565.63
15	44,833.93	26,764.95	5,504.72	12,564.27
16	44,773.05	26,730.88	5,506.62	12,535.55
17	44,839.95	26,729.80	5,508.47	12,601.68
18	44,799.58	26,678.60	5,519.18	12,601.80
19	44,764.33	26,682.62	5,512.05	12,569.67
Average	44,805.19	26,712.31	5,508.82	12,584.07

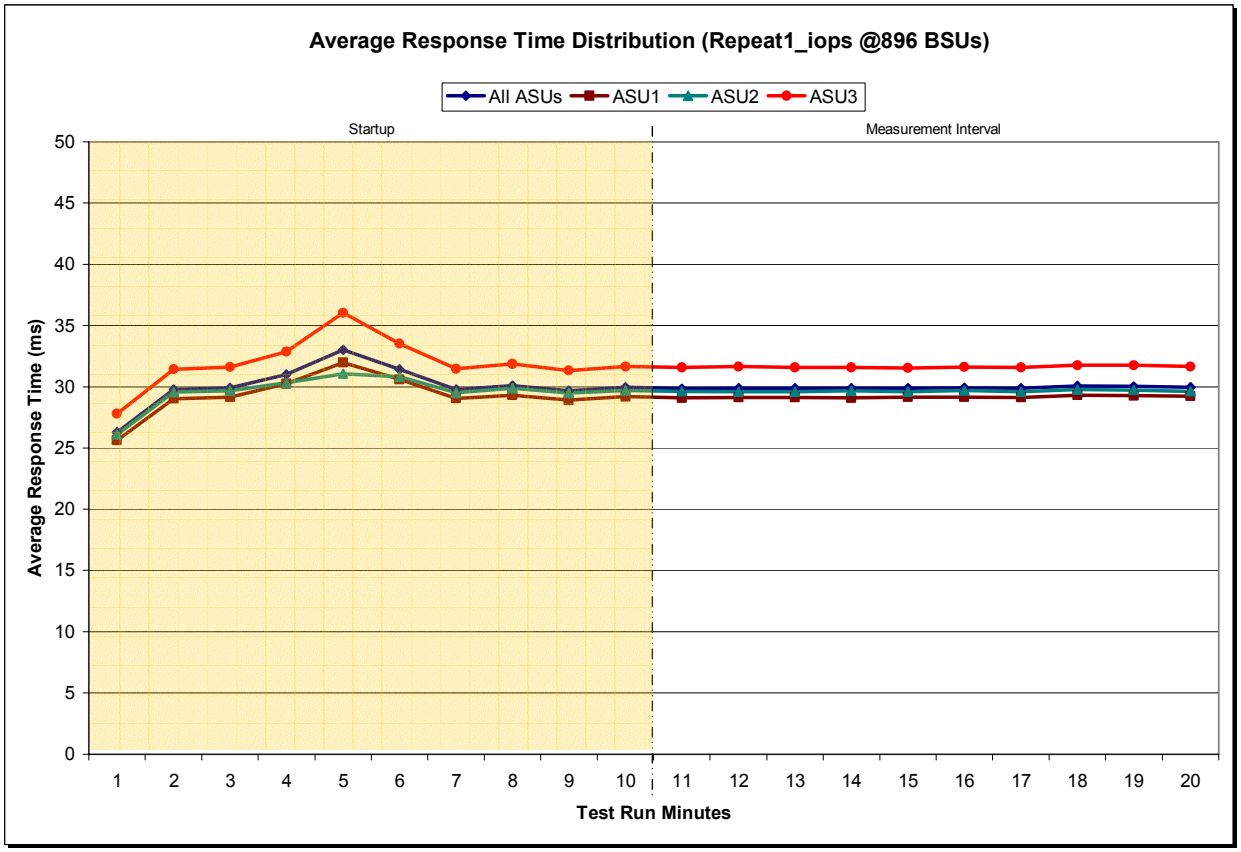
Repeatability 1 IOPS – I/O Request Throughput Distribution Graph



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

896 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	23:27:51	23:37:52	0-9	0:10:01
Measurement Interval	23:37:52	23:47:53	10-19	0:10:01
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	26.29	25.62	26.08	27.77
1	29.77	29.03	29.55	31.44
2	29.92	29.16	29.68	31.62
3	30.99	30.24	30.30	32.88
4	33.00	31.96	31.08	36.03
5	31.44	30.59	30.82	33.50
6	29.78	29.04	29.52	31.46
7	30.09	29.30	29.89	31.85
8	29.67	28.92	29.49	31.32
9	29.94	29.19	29.71	31.65
10	29.85	29.08	29.62	31.56
11	29.88	29.12	29.60	31.63
12	29.86	29.11	29.61	31.56
13	29.86	29.09	29.65	31.58
14	29.88	29.16	29.60	31.54
15	29.91	29.17	29.68	31.60
16	29.88	29.14	29.60	31.58
17	30.05	29.31	29.78	31.74
18	30.01	29.25	29.74	31.74
19	29.95	29.22	29.62	31.65
Average	29.91	29.17	29.65	31.62

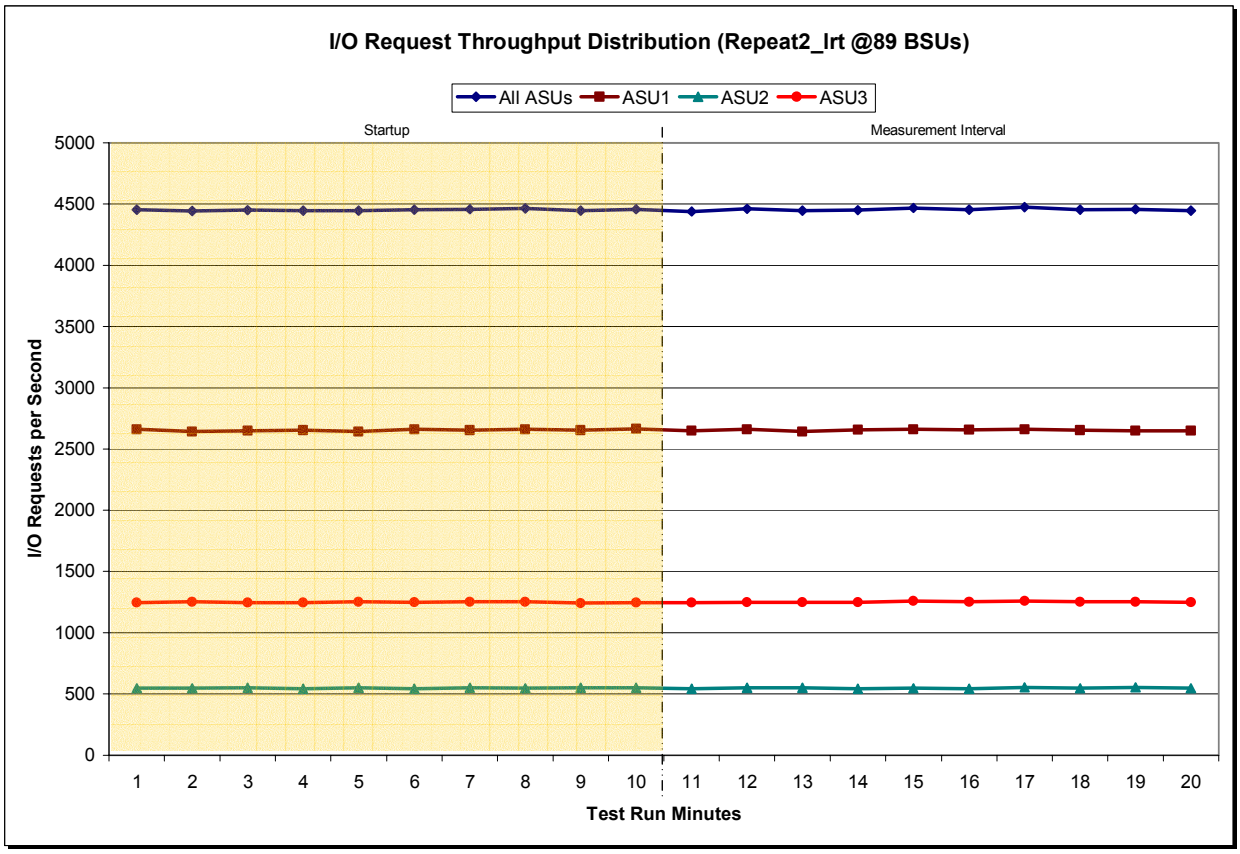
Repeatability 1 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 2 LRT – I/O Request Throughput Distribution Data

89 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	23:48:21	23:58:21	0-9	0:10:00
Measurement Interval	23:58:21	0:08:21	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	4,452.32	2,660.05	548.10	1,244.17
1	4,441.60	2,642.33	547.57	1,251.70
2	4,447.88	2,651.17	551.22	1,245.50
3	4,445.80	2,653.43	545.18	1,247.18
4	4,444.23	2,642.48	549.13	1,252.62
5	4,452.20	2,658.97	543.65	1,249.58
6	4,455.45	2,653.55	550.87	1,251.03
7	4,462.18	2,660.08	548.80	1,253.30
8	4,447.27	2,654.65	551.53	1,241.08
9	4,457.72	2,663.40	549.10	1,245.22
10	4,437.78	2,650.02	543.03	1,244.73
11	4,460.12	2,660.62	550.62	1,248.88
12	4,443.87	2,642.32	551.27	1,250.28
13	4,448.00	2,655.23	543.25	1,249.52
14	4,467.02	2,659.50	547.10	1,260.42
15	4,454.00	2,655.17	545.30	1,253.53
16	4,472.72	2,661.73	552.70	1,258.28
17	4,453.37	2,654.20	546.93	1,252.23
18	4,457.05	2,651.03	552.83	1,253.18
19	4,446.00	2,650.83	547.83	1,247.33
Average	4,453.99	2,654.07	548.09	1,251.84

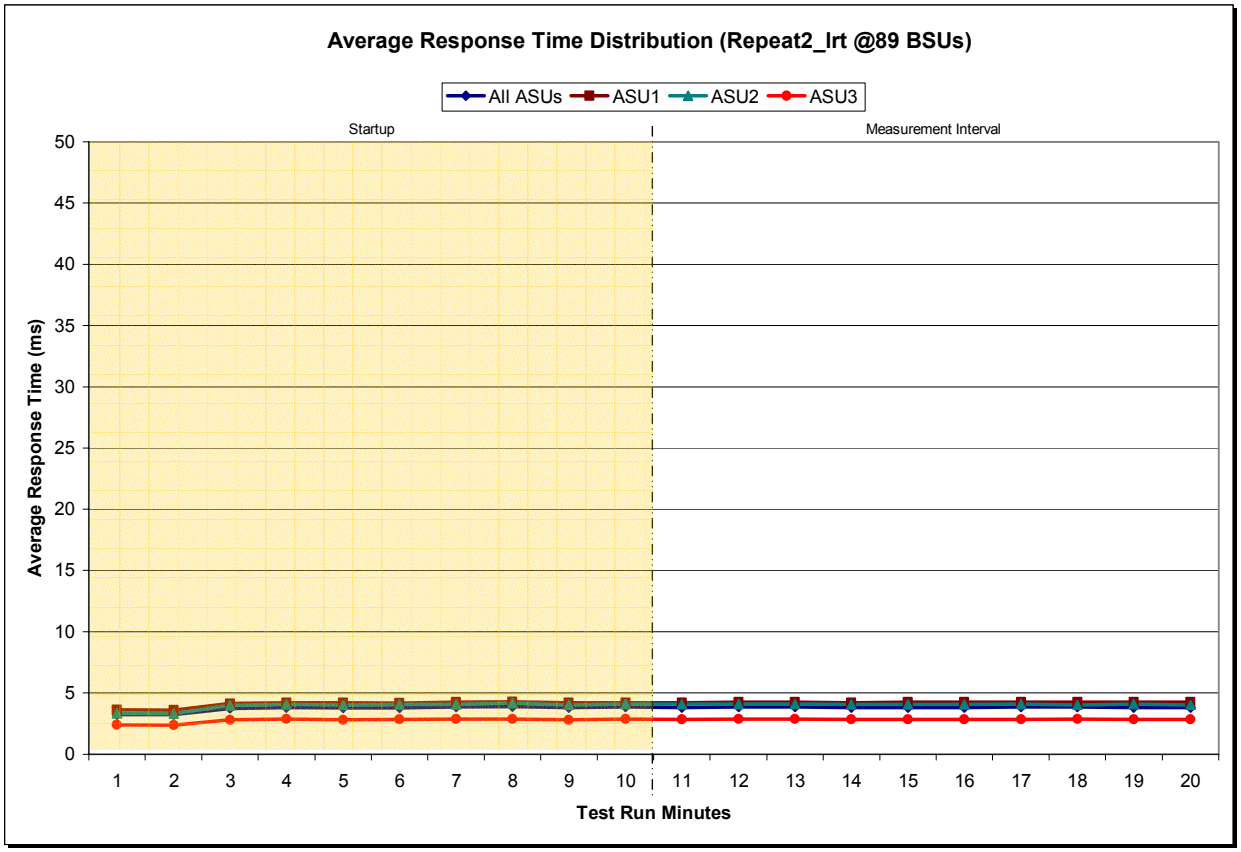
Repeatability 2 LRT – I/O Request Throughput Distribution Graph



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

89 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	23:48:21	23:58:21	0-9	0:10:00
Measurement Interval	23:58:21	0:08:21	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	3.25	3.63	3.35	2.40
1	3.23	3.60	3.33	2.39
2	3.75	4.14	4.01	2.82
3	3.82	4.20	4.08	2.87
4	3.79	4.22	4.02	2.81
5	3.79	4.19	4.06	2.83
6	3.84	4.25	4.07	2.87
7	3.87	4.28	4.17	2.88
8	3.80	4.22	4.02	2.82
9	3.84	4.23	4.11	2.89
10	3.81	4.21	4.09	2.85
11	3.83	4.24	4.09	2.87
12	3.85	4.26	4.10	2.89
13	3.82	4.22	4.08	2.84
14	3.82	4.23	4.08	2.86
15	3.83	4.26	4.07	2.84
16	3.85	4.26	4.12	2.86
17	3.84	4.25	4.03	2.87
18	3.83	4.24	4.10	2.85
19	3.82	4.24	4.05	2.84
Average	3.83	4.24	4.08	2.86

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

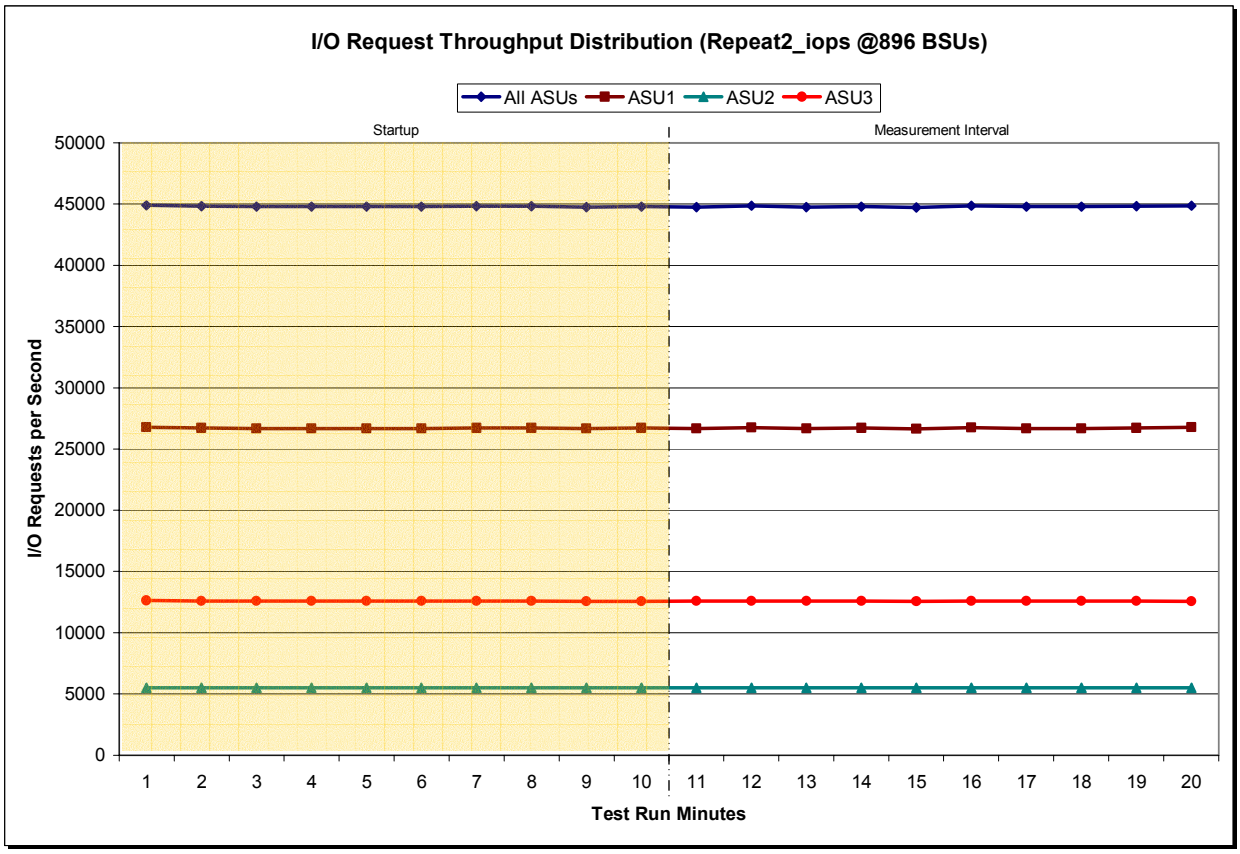


Repeatability 2 IOPS – I/O Request Throughput Distribution Data

896 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	0:08:47	0:18:48	0-9	0:10:01
Measurement Interval	0:18:48	0:28:48	10-19	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	44,888.22	26,764.65	5,505.40	12,618.17
1	44,832.88	26,721.50	5,504.40	12,606.98
2	44,762.93	26,656.00	5,522.48	12,584.45
3	44,795.97	26,684.78	5,513.95	12,597.23
4	44,780.78	26,666.77	5,497.47	12,616.55
5	44,783.22	26,681.17	5,496.78	12,605.27
6	44,802.38	26,696.63	5,513.05	12,592.70
7	44,806.78	26,705.28	5,513.47	12,588.03
8	44,758.18	26,679.72	5,499.68	12,578.78
9	44,792.43	26,714.42	5,506.98	12,571.03
10	44,751.52	26,675.80	5,492.65	12,583.07
11	44,850.22	26,730.88	5,506.53	12,612.80
12	44,757.93	26,672.52	5,498.67	12,586.75
13	44,793.93	26,704.78	5,501.55	12,587.60
14	44,708.07	26,649.38	5,500.63	12,558.05
15	44,860.93	26,747.23	5,516.47	12,597.23
16	44,772.83	26,674.23	5,508.55	12,590.05
17	44,795.92	26,666.50	5,522.30	12,607.12
18	44,832.38	26,725.32	5,524.45	12,582.62
19	44,844.35	26,771.40	5,503.08	12,569.87
Average	44,796.81	26,701.81	5,507.49	12,587.52

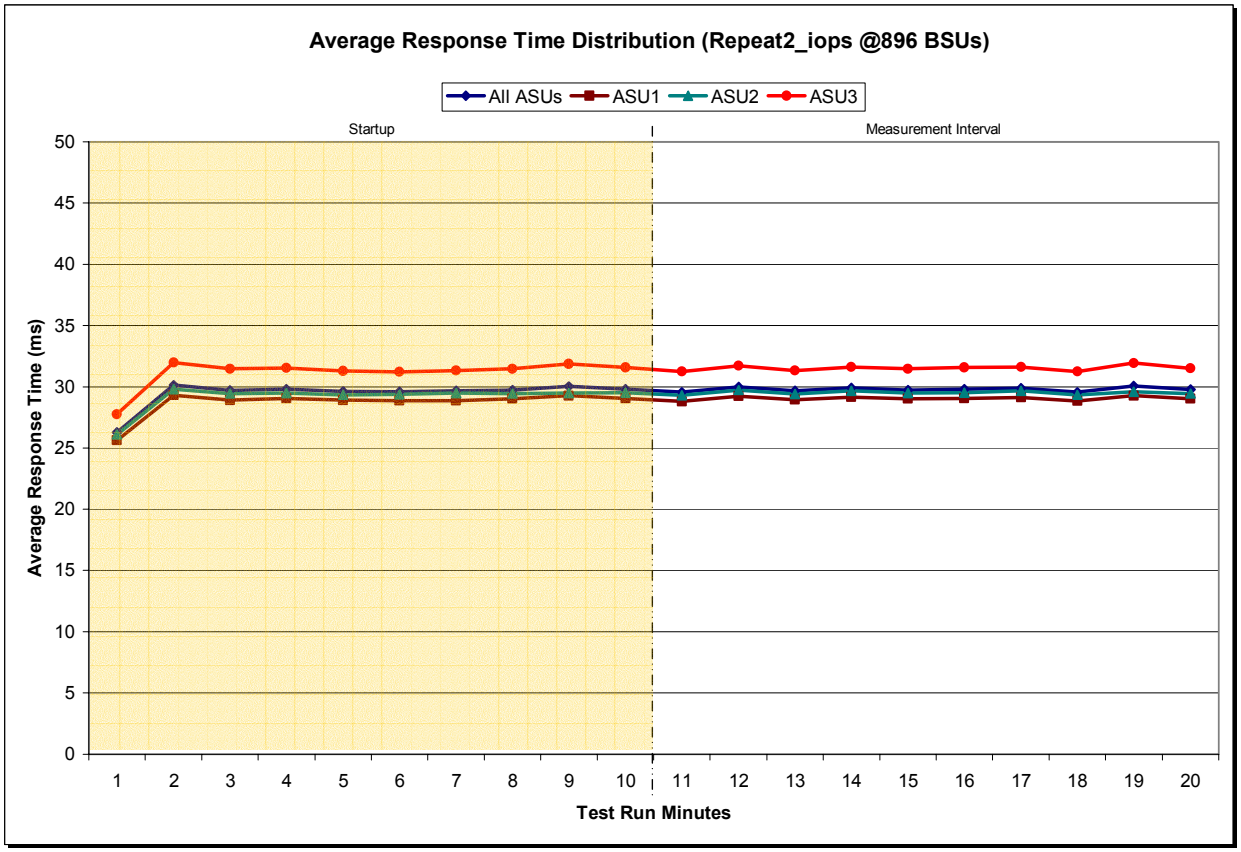
Repeatability 2 IOPS – I/O Request Throughput Distribution Graph



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

896 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	0:08:47	0:18:48	0-9	0:10:01
Measurement Interval	0:18:48	0:28:48	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	26.29	25.64	26.10	27.75
1	30.11	29.30	29.81	31.97
2	29.70	28.92	29.43	31.48
3	29.80	29.05	29.50	31.53
4	29.63	28.91	29.32	31.28
5	29.60	28.89	29.37	31.22
6	29.64	28.89	29.47	31.33
7	29.74	29.00	29.45	31.46
8	30.02	29.27	29.47	31.87
9	29.81	29.05	29.51	31.58
10	29.54	28.79	29.30	31.24
11	30.00	29.24	29.72	31.73
12	29.66	28.93	29.40	31.33
13	29.90	29.15	29.66	31.61
14	29.75	29.00	29.50	31.44
15	29.81	29.06	29.52	31.55
16	29.89	29.13	29.66	31.60
17	29.57	28.83	29.35	31.23
18	30.06	29.28	29.60	31.94
19	29.77	29.02	29.44	31.50
Average	29.80	29.04	29.52	31.52

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	0.0352	0.2807	0.0698	0.2101	0.0180	0.0699	0.0351	0.2812
COV	0.008	0.003	0.008	0.005	0.012	0.007	0.008	0.002

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	0.2811	0.0700	0.2101	0.0181	0.0699	0.0350	0.2809
COV	0.003	0.001	0.002	0.002	0.004	0.002	0.004	0.002

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	0.2808	0.0700	0.2100	0.0181	0.0700	0.0350	0.2811
COV	0.008	0.003	0.008	0.005	0.017	0.008	0.010	0.002

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	0.0351	0.2811	0.0701	0.2099	0.0180	0.0700	0.0350	0.2810
COV	0.002	0.001	0.002	0.002	0.003	0.002	0.002	0.001

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 –Xmx2048m –Xss1024k persist1 –b 910

java –Xmx2048m –Xss1024k 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	65,219,952
Total Number of Logical Blocks Verified	56,855,584
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 Sun StorEdge™ 6320 (22 tray), as documented in this Full Disclosure Report became available for customer purchase and shipment on April 7, 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 Remote Audit of the Sun StorEdge™ 6320 (22 tray).