# D-Link System, Inc.™
# xStack Storage DSN-Series SAN Arrays
## Performance Test with Intel 32GB Solid State Drives
**Rev. A**

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# Overview

The xStack Storage product line (DSN-1100/2100/3200/3400) uses a high-speed RISC processor allowing full line speeds to be maintained for each of their respective host network interfaces.

The purpose of this set of tests is to determine the full speed supported by a single volume created on a RAID-0 volume spanning four standard spindle-based hard drives vs. the same test scenario with four Intel X25-E solid state hard drives.

An Apple X Serve server is directly attached to a DSN-1100 by means of an iSCSI connection comprised of four trunked 1GbE Ethernet connections, and the test results observed. The theoretical maximum raw speed should be approximately 425 MB/s, but the test software will drop this figure to a lower level due to overhead of test data transfer. The testing software used is AJA Video Systems - System Test-Video Frame Sweep.

Tests were conducted with four drives configured as a single RAID-0 stripe for maximum speed.

# Performance for each Drive Type

**- Intel X25-E 32GB SATA Solid State Drive**

Maximum Sustained Read and Write Bandwidth Access Type MB/s
Sequential Read up to 250
Sequential Write up to 170

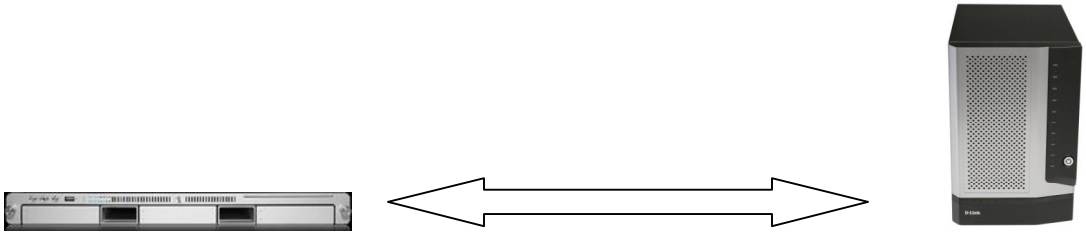
**- Hitachi 160GB DeskStar HDD**

Sustained data rate 32.9 to 67.8 MB/s

# Testing Environment

iSCSI Initiator
-Studio Network Solutions globalSAN iSCSI Initiator

Benchmarking Tool
- AJA System Test – Video Frame Sweep




Machine: Apple X Serve
Operating System: Apple OSX 10.5.7
Processor: Quad-Core Intel(R) Xeon(TM) "Nehalem" CPU 2.66GHz
Memory: 3,096 MB RAM (1066 MHz DDR3)
Two (2) built-in Broadcom 1GbE ports
Intel Pro 1000 MT Dual Port 1GbE Server adapter

**Figure 1**

D-Link DSN-1100
with firmware 2.6.0.23

4 x 1GbE ports

RAID-O Stripe Over Four Drives
Single Volume

Test drives #1:
160GB Hitachi DeskStar HDD (x 4)
Part # T7K250

Test drives #2:
32GB Intel X25-E 32GB SATA Solid State Drive (x 4)
Part # SSDSA2SH032G1

# Testing Results

## 160GB Hitachi Deskstar HDDs

**128MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 89.0 | 100.8 |
| 812.0 | 104.1 | 101.8/ |
| 912.0 | 98.4 | 100.1 |
| 1080.0 | 100.9 | 97.0 |
| 1800.0 | 102.3 | 101.0 |
| 2400.0 | 101.6 | 99.2 |
| 4052.0 | 102.5 | 102.1 |
| 5400.0 | 102.5 | 75.2 |
| 8100.0 | 98.4 | 75.8 |

**256MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 135.6 | 132.3 |
| 812.0 | 154.5 | 114.3 |
| 912.0 | 172.7 | 111.9 |
| 1080.0 | 190.7 | 122.6 |
| 1800.0 | 177.9 | 115.1 |
| 2400.0 | 138.7 | 132.9 |
| 4052.0 | 222.9 | 111.6 |
| 5400.0 | 166.9 | 124.0 |
| 8100.0 | 231.1 | 119.5 |

**512MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 132.2 | 132.0 |
| 812.0 | 149.4 | 114.6 |
| 912.0 | 187.8 | 113.9 |
| 1080.0 | 187.6 | 122.2 |
| 1800.0 | 174.3 | 115.5 |
| 2400.0 | 234.3 | 133.4 |
| 4052.0 | 234.7 | 119.6 |
| 5400.0 | 217.8 | 123.2 |
| 8100.0 | 248.0 | 120.2 |

**1,024MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 136.9 | 132.1 |
| 812.0 | 153.5 | 114.8 |
| 912.0 | 189.3 | 112.9 |
| 1080.0 | 200.5 | 122.8 |
| 1800.0 | 178.1 | 116.5 |
| 2400.0 | 226.4 | 132.5 |
| 4052.0 | 237.3 | 118.7 |
| 5400.0 | 237.9 | 123.6 |
| 8100.0 | 228.4 | 119.1 |

## 32GB Intel X25-E SATA SSDs

**128MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 185.7 | 139.5 |
| 812.0 | 229.6 | 119.1 |
| 912.0 | 263.5 | 119.8 |
| 1080.0 | 279.6 | 126.6 |
| 1800.0 | 279.1 | 125.2 |
| 2400.0 | 334.2 | 143.8 |
| 4052.0 | 330.8 | 126.3 |
| 5400.0 | 364.7 | 132.3 |
| 8100.0 | 370.3 | 129.8 |

**256MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 173.1 | 139.5 |
| 812.0 | 222.7 | 121.1 |
| 912.0 | 273.3 | 119.5 |
| 1080.0 | 276.6 | 130.7 |
| 1800.0 | 293.2 | 124.2 |
| 2400.0 | 296.7 | 141.3 |
| 4052.0 | 362.6 | 128.9 |
| 5400.0 | 230.8 | 133.5 |
| 8100.0 | 360.8 | 130.3 |

**512MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 184.5 | 139.2 |
| 812.0 | 213.2 | 121.2 |
| 912.0 | 241.2 | 120.2 |
| 1080.0 | 272.6 | 132.2 |
| 1800.0 | 264.9 | 125.3 |
| 2400.0 | 300.8 | 141.4 |
| 4052.0 | 351.6 | 129.3 |
| 5400.0 | 338.7 | 134.1 |
| 8100.0 | 312.8 | 128.9 |

**1,024MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 182.0 | 138.0 |
| 812.0 | 211.4 | 122.1 |
| 912.0 | 242.9 | 120.4 |
| 1080.0 | 271.6 | 131.4 |
| 1800.0 | 281.3 | 125.1 |
| 2400.0 | 333.4 | 143.2 |
| 4052.0 | 346.2 | 130.0 |
| 5400.0 | 327.7 | 135.7 |
| 8100.0 | 351.3 | 130.9 |

## 160GB Hitachi Deskstar HDDs

**2,048MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 135.9 | 130.2 |
| 812.0 | 152.6 | 114.9 |
| 912.0 | 180.6 | 113.6 |
| 1080.0 | 187.9 | 123.1 |
| 1800.0 | 187.2 | 115.8 |
| 2400.0 | 227.5 | 132.1 |
| 4052.0 | 228.7 | 119.5 |
| 5400.0 | 223.8 | 123.6 |
| 8100.0 | 220.2 | 118.8 |

**4,096MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 137.8 | 124.0 |
| 812.0 | 153.4 | 114.1 |
| 912.0 | 190.7 | 113.6 |
| 1080.0 | 184.6 | 119.5 |
| 1800.0 | 187.5 | 114.5 |
| 2400.0 | 227.6 | 128.2 |
| 4052.0 | 239.2 | 119.6 |
| 5400.0 | 223.2 | 121.2 |
| 8100.0 | 223.5 | 118.9 |

## 32GB Intel X25-E SATA SSDs

**2,048MB payload**

| Frame Size KB | Sweep MB/sec | |
|---|---|---|
| 684.0 | 185.0 | 139.0 |
| 812.0 | 217.3 | 121.7 |
| 912.0 | 255.4 | 121.0 |
| 1080.0 | 264.1 | 131.7 |
| 1800.0 | 283.4 | 124.7 |
| 2400.0 | 337.0 | 143.2 |
| 4052.0 | 350.4 | 130.2 |
| 5400.0 | 343.8 | 135.1 |
| 8100.0 | 343.5 | 130.5 |

**4,096MB payload**

| Frame Size KB | Sweep MB/sec Read | Write |
|---|---|---|
| 684.0 | 186.1 | 138.8 |
| 812.0 | 215.9 | 121.6 |
| 912.0 | 251.6 | 120.9 |
| 1080.0 | 271.3 | 131.1 |
| 1800.0 | 284.6 | 125.2 |
| 2400.0 | 336.0 | 142.6 |
| 4052.0 | 348.7 | 130.3 |
| 5400.0 | 340.9 | 134.9 |
| 8100.0 | 355.6 | 130.3 |

# AJA-System Test: Video Video Frame Sweep

**Abstract:** this is a series of Disk Read/Write tests that automatically tests with each of the available video frame sizes. The results are shown in graphical form and as a text table.

-Payload FileSize: the total amount of data that will be written and read in each test. Larger file sizes will make the test(s) longer, but in some cases may more accurately show true disk performance when a drive has its own hardware cache.

-Video Frame Size: the amount of data that will be written or read in each I/O transaction. The list contains most of the standard broadcast video frame sizes and formats.