March Networks Corporation TEST REPORT

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Version 1.0
06/26/17

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About Seagate Technology

Seagate is the leading expert in scalable storage solutions, developing robust products that enable people and businesses around the world to create, share and preserve their most critical memories and business data. Seagate has been at the cutting edge of storage solutions for over 38 years, starting with the development of the 5 megabyte (MB) ST506 5 ¼" disk drive released in 1980 to a 60 terabyte (TB) solid state drive (SSD) announced in 2016. Seagate is also renowned for its cutting-edge SAN solutions intended to solve today's most challenging storage problems where performance, availability, cost, and ease of use are paramount.

The Seagate RealStor 4005 series used in the March tests can scale to over 1 PB with additional storage arrays. Performance of up to 250,000 Input/output Operations per Second (IOPS) at 1millisecond (ms) latency is possible, along with 7 GigaBytes per second (GBps) sequential reads and 5.5 GBps sequential writes. The Seagate RealStor chassis is capable of supporting a hybrid solution of Hard Disk Drive (HDD) and Solid State Drive (SSD) devices to provide tiered storage for demanding environments.

Seagate creates space for the human experience by innovating how data is stored, shared, and used. Learn more at http://www.seagate.com.

About March Networks Corporation

Founded in the year 2000, March Networks Corporation, as an independent, privately held subsidiary of Infinova Ltd., is a leading provider of intelligent IP video and data solutions for security surveillance, monitoring, analysis, and business applications. It designs, manufactures, and markets high definition digital cameras, digital video recorders, video management system software, and edge encoders and decoders that integrate analog video into an IP-based network. March Networks products are used in banking, retail, transportation including mass transit and freight rail, and government and educational institutions. Headquartered in Ottawa, Canada, March Networks sells products and services through a distribution and partner network in Canada, the United States, the Asia Pacific region, Latin America, Europe, the Middle East, and Africa. Visit https://marchnetworks.com for more information.

Introduction

This report summarizes the results of benchmark tests completed by Seagate Labs in partnership with March Networks Corporation. Test results confirmed that Seagate's solution easily exceeded performance requirements.

- **Performance and Reliability:** Seagate RealStor storage arrays can support over 760 Mbps of video storage at a cumulative 8 percent RAID controller processor usage and with an average 27ms latency.
- **Scalability and Availability:** Seagate RealStor storage arrays can provide RAID 6 configurations with significantly reduced parity calculation overhead and increased performance.
- **Robustness:** Even with the demands of high definition video and high camera count, the Seagate RealStor storage array delivers a high-performance solution with demonstrated 99.999 percent reliability.

Seagate storage solutions ensure outstanding performance and reliability that is consistent with March Networks design recommendations.

Seagates' and March Networks' Solution Architecture

The Seagate Labs test bed consisted of (see Figure 1 *March Networks' Test Bed*):

- Four virtualized Command Recording Servers (CRS) from a major server vendor, each configured with twin 4 core processors and 8 GB of RAM.
- One dedicated Command Enterprise Server (CES) from a major server vendor configured with dual 4 core processors and 16 GB of RAM.
- A VMware vSphere ESXi CRS environment
- Two hundred fifty-six cameras configured with High-Definition (HD) quality and standard H.264 compression.
- Single-tier recording storage with incoming streams directly recorded to the drive set.
- Dedicated internal 10 Gigabit Ethernet (GbE) data network
- One GbE management network with Internet access.
- Eight Gigabit per second (Gbps) Fibre Channel (FC) Storage Area Network (SAN) switch fabric.

Data Protection Methodology

Data was protected with robust drives, expandable storage, and a RAID 6 configuration:

- One Seagate RealStor storage array configured with 24 6 TB SAS 7,200 rpm drives configured for four 27 TB LUNs.
- The drives used in this test bed provided a total user space of 109 TB, and the user space was scalable to 490 TB of storage with additional expansion arrays and configured with 6 TB drives.
- Twenty-seven TB Logical Unit Numbers (LUNs) were configured to support each of the four CRS through an 8 Gbps Fibre Channel switch fabric.

The goal of this test suite was to record as much data as possible to the Seagate RealStor storage array given hardware availability during each test phase, and test for latency and throughput as it relates to storage processor utilization. There were four test phases in this test suite that ranged from 10 drives per recorder to 64 drives per recorder with no failures.

Camera Configuration

Two hundred fifty-six cameras were configured in three categories:

Category 1:

- 64 cameras
- 14 frames per second (fps)
- H.264 compression
- 720p HD resolution
- Approximately 3.1 Mbps per camera stream

Categories 2:

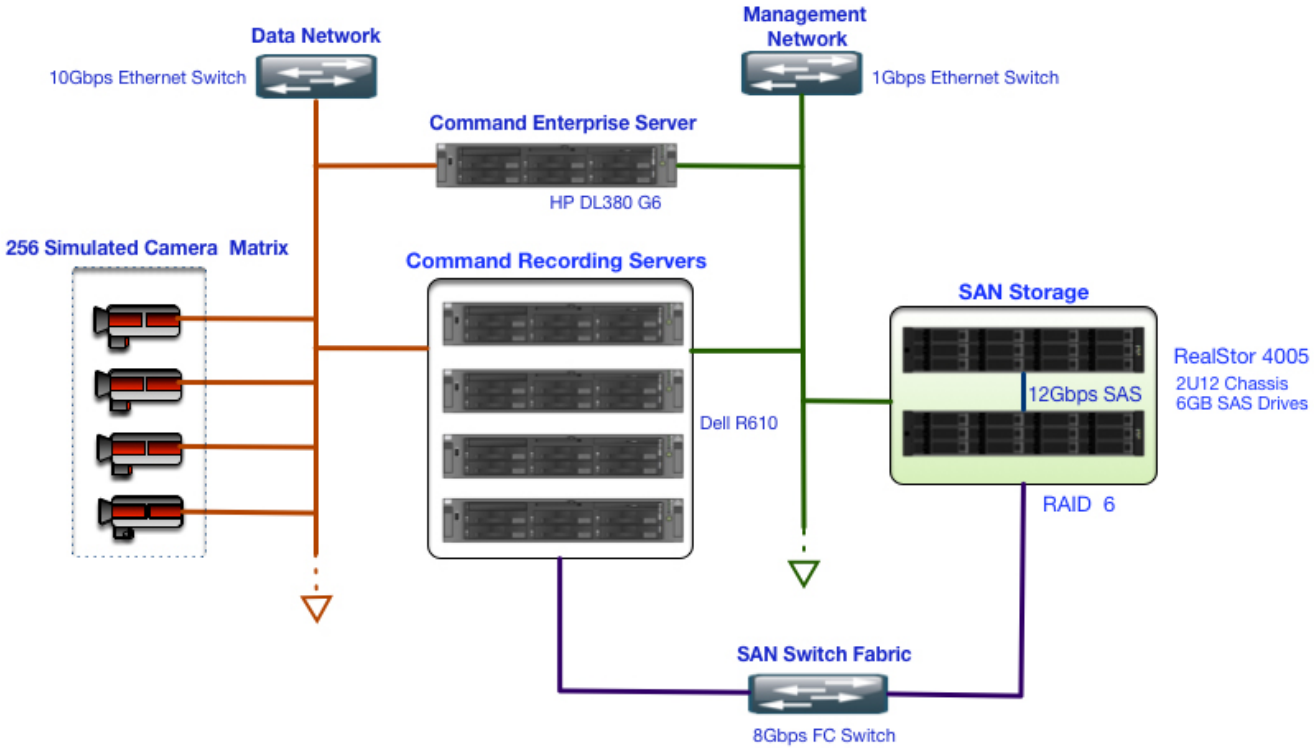
- 128 cameras
- 25 fps
- H.264 compression
- 720p HD resolution
- Approximately 4.0 Mbps per camera stream

Category 3:

- 64 cameras
- 25 fps
- H.264 compression
- 720p HD resolution
- Approximately 1.0 Mbps per camera stream

This camera configuration represents optimal video content clarity in use cases with variable but constant motion, and where high definition with standard H.264 compression is required.

Figure 1: March Networks' Test Bed



Test Summary

Performance monitoring data of an average of the four servers is shown in Table 1. This table details the number of cameras supported by each virtualized recording server, an average write latency of 25 milliseconds at the server, and an average disk write speed of 24.5 MBps which is 203 Mbps. Table 2 shows an average 4 percent CPU load for each of the two Seagate RealStor RAID controllers, or a total of 8 percent per RAID system.

Figure 2 is a screen shot of one of the four camera simulation workloads used during the March testing effort. Figures 3 through 5 represent snapshots of performance monitoring counters for one of the four servers in a single test period. And figures 6 and 7 are performance storage management console screen shots for controller and volume performance.

Table 1: Average Test performance

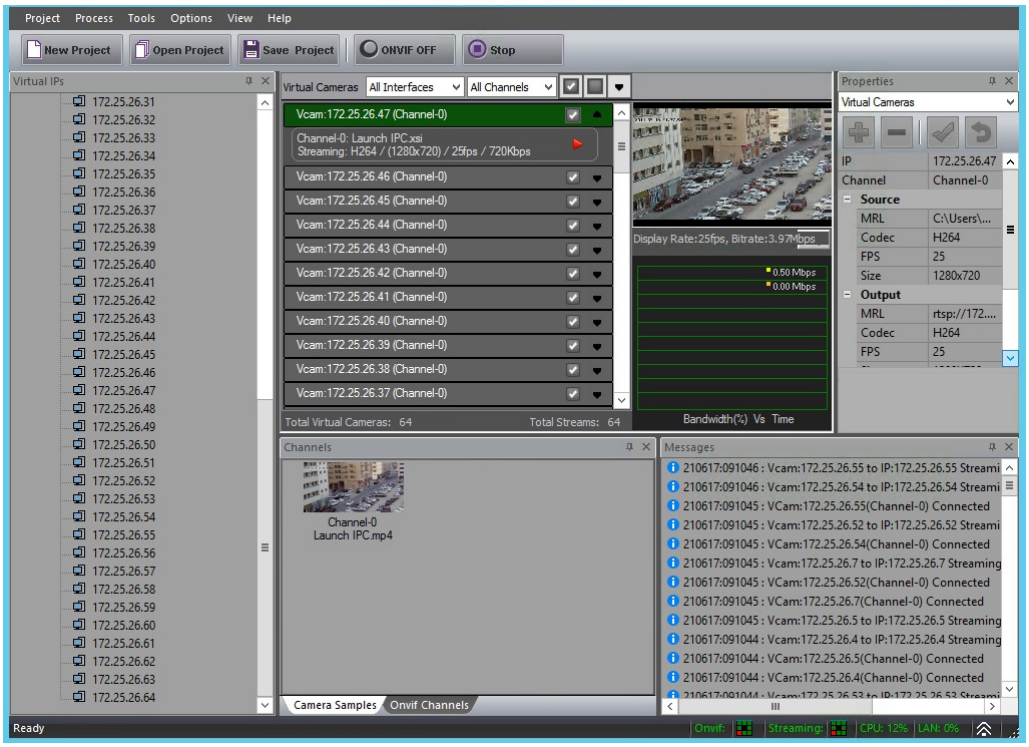
March Command Recorders	1	2	3	4	Total	Average
Total Cameras Under Test	64	64	64	64	256	64
Frame Size (fps)	14	25	25	25	N/A	N/A
Bit Rate (Mbps)	2.96	3.97	0.96	4.01	11.90	2.98
Total Bit Rate (Mbps) at camera	189.44	254.08	61.44	258.56	763.52	190.88
Av Disk Sec/Write (Write Latency)	0.027	0.035	0.036	0.002	0.100	0.025
Av. Disk Write Bytes/Sec (MBps)	24.9	32.3	32.3	8.3	N/A	24.5

Table 2: Seagate RealStor 4005 performance

Seagate RealStor Performance	
Av. CPU Load (%) per controller	4
Av. IOPS	64
Host Port A1 B/s (MBps)	38
Host Port B0 B/s (MBps)	56
Av. Write Response (millisecond)	27
Av. Read Response (millisecond)	6

Doo Technologies' XSG Video Surveillance Camera Simulator was used to propagate multiple video surveillance samples in introducing ONVIF video streams to each Command Recorder Server.

Figure 2: Camera Simulator Categories 2,3



The average disk bytes/write shown in Figure 3 displays the average size of the individual disk requests (I/O size) in bytes for the capture interval. The average size in this case is 4.35 MB per interval.

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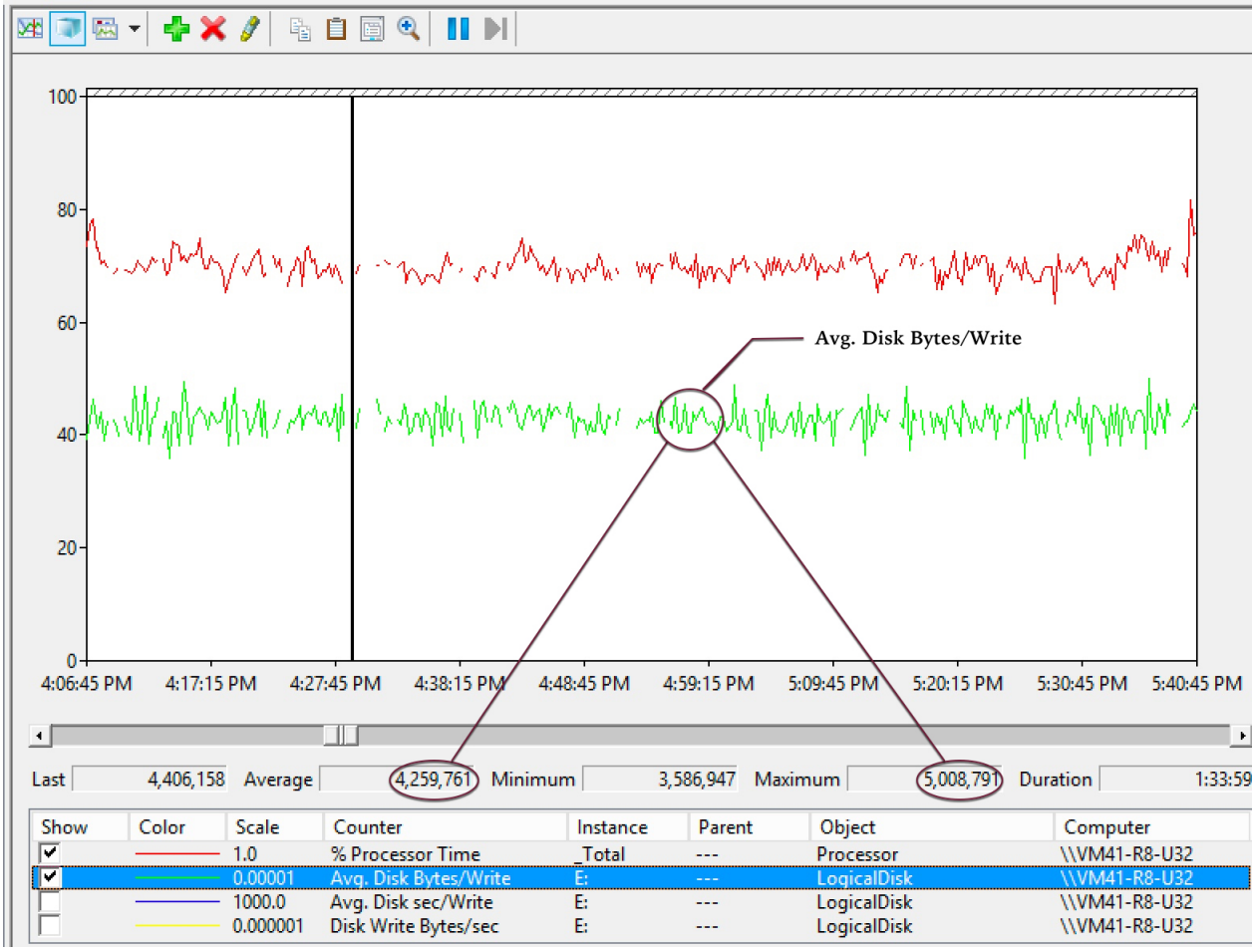
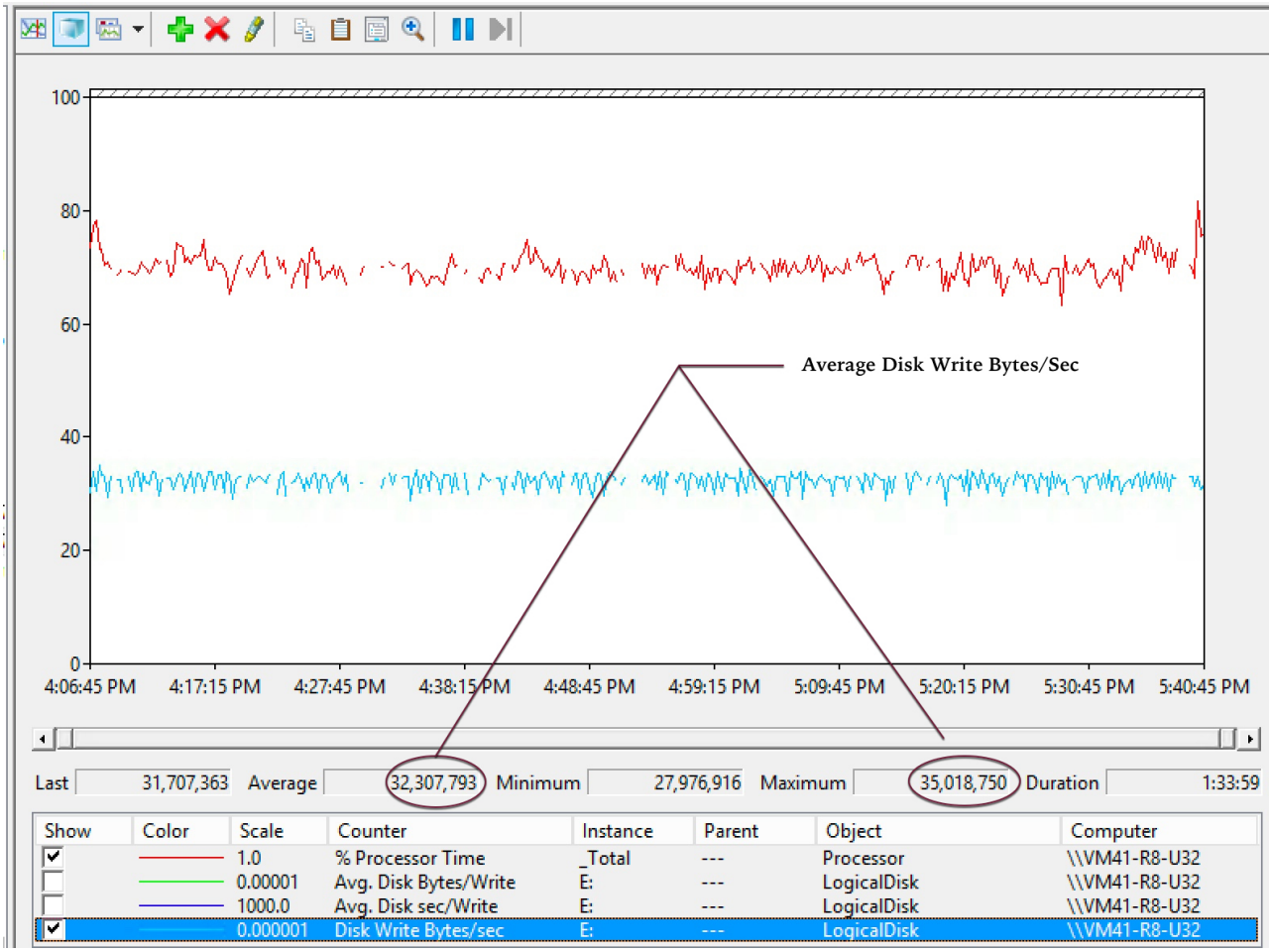
Figure 3: Average Disk Bytes Write



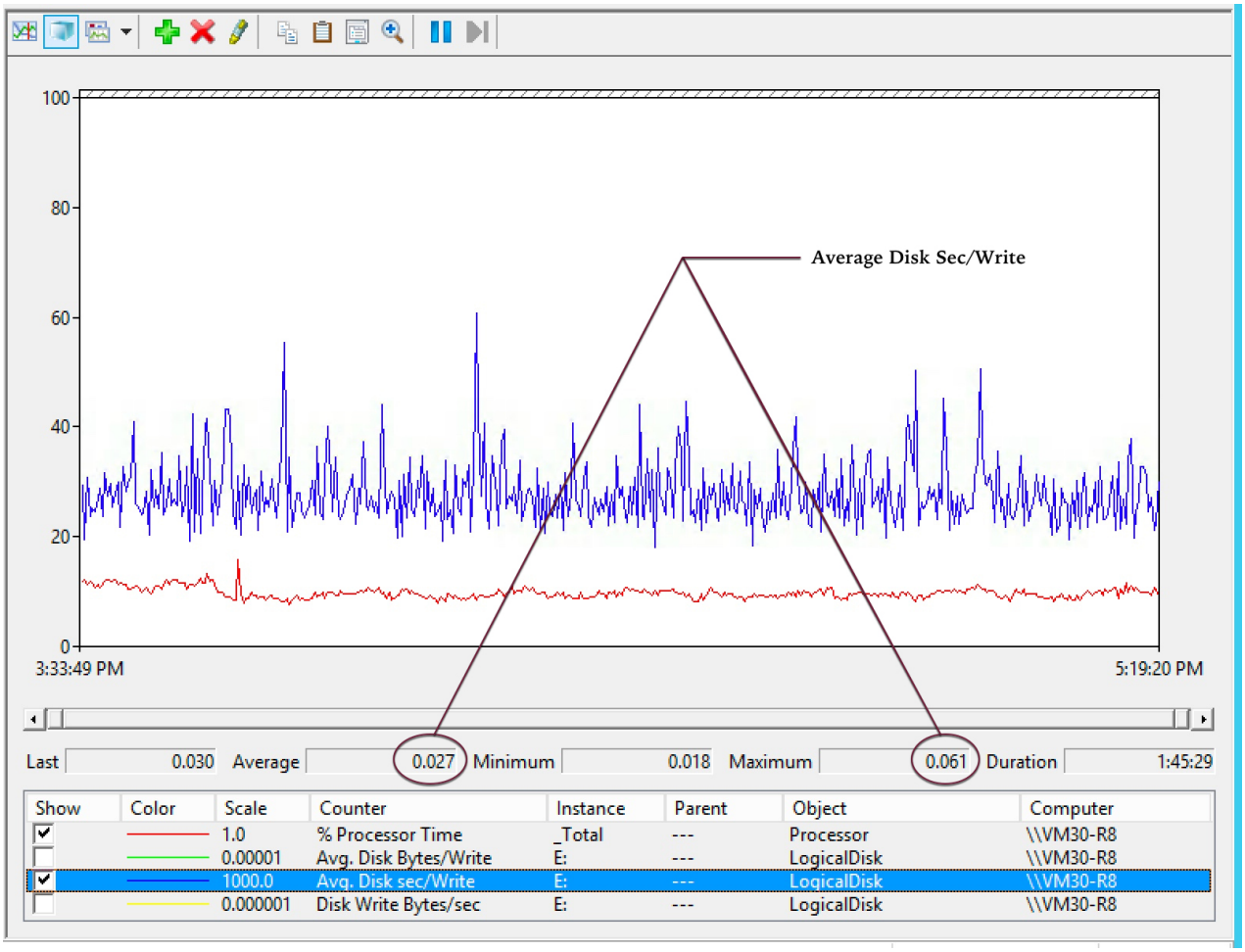
The average disk write in bytes per second show the number of Bytes sent to the SAN storage by the Command Recorder Server in one second. Figure 4 shows a 32MB video stream sent to the storage system in one second.

Figure 4: Average Disk Write Bytes per Second



Write latency is measured in disk seconds per write, which is the average time in seconds the disk transfers takes to complete. Figure 5 shows a latency of 27 milliseconds per write sequence.

Figure 5: Avg Disk sec/Write



Two fully redundant RealStor LX RAID controllers were used in this test bed. Figure 6 shows the CPU load and IOPS for each RAID controller.

Figure 6: Storage RAID Controller Performance Data

Current Data

Current data samples show the most recent data samples updated every 30 seconds.

Sample Time: 2017-06-15 18:46:11

Total Duration of All Data Samples: 12 seconds

Showing 1 to 2 of 2 entries

ID	CPU Load	B/s	IOPS	Read Cache Hit Ratio (%)	Write Cache Hit Ratio (%)
controller_A	5	36.6157MiB	70	0.80%	0.04%
controller_B	3	48.6611MiB	57	0.79%	0.08%

Volume performance data is shown in Figure 7. Each volume was mapped to a Logical Unit Number (LUN) and represented to each Command Recorder Server as a physical disk. Two RAID 6 (10 +2) RAID sets were used to generate the four volumes.

Figure 7: RealStor Storage System Performance Data by Volume

Current Data

Current data samples show the most recent data samples updated every 30 seconds.

Sample Time: 2017-06-15 18:46:11

Total Duration of All Data Samples: 11 seconds

Show 10 Showing 1 to 4 of 4 entries

Name	IOPS	B/s	Read Cache Hit Ratio (%)	Write Cache Hit Ratio (%)	Write Cache Space	Write Cache Percentage	Read-Ahead Operations	Small Destages	Full Stripe Write Destages
R7-1-LX3-6TB_Vol 1	31	26.9687 MiB	0.79%	0.09%	83	9	4231	703297	482678
R7-1-LX3-6TB_Vol 2	38	32.8227 MiB	0.69%	0.08%	127	14	2133	833053	602861
R7-LX3-6TB_VOL1	34	29.3667 MiB	0.93%	0.03%	167	19	302	680505	4018169
R7-LX3-6TB_Vol 2	47	6885.000KiB	0.76%	0.05%	46	5	10391	436495	1952654

Certified Products

- RealStor RAID storage platform
- March Networks' Command Enterprise Surveillance product line

Key Findings

Based on conclusive test results, Seagate Technology's RealStor Storage Platform is a highly qualified and scalable storage solution for March Network's video surveillance installations because it reliably meets large video storage requirements with little to no performance impact. The test data confirms that performance goals were easily met, and the system under test exceeded competitive results. The storage solution stored continual movement, high definition, H.264-compressed video without stressing the system.

Test results exceeded performance benchmarks because the Seagate RealStor storage platform proved capable of supporting over 760 Mbps throughput with less than 28 ms latency and with under 8 percent RAID storage processor load.

The results of this test show that the RealStor storage platform is capable of supporting 5,000 Mbps with a RAID storage controller processor utilization of less than 50 percent. In other words, a single RealStor storage platform is capable of supporting more than 1,200 cameras, with each streaming 25 fps, 720p HD, H.264 compressed video content. Performance will vary directly with the type and number of storage devices. IOPS will improve with the introduction of SSDs and with an increase in the number of HDDs in either a hybrid or full All Flash Array (AFA) configuration.

These test results coupled by Seagate's ability to provide a complete solution, including Seagate drives, drive controllers, and enclosures with multiple I/O options, sets it apart from the competition. With this system, integrators and end-users can have complete confidence that high availability, reliability, and performance will be delivered in a comprehensive, standards-based solution.

seagate.com

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