



Milestone Certified Solution



 **NetApp**[®]



E2800

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About NetApp

NetApp® is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate your digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation, and optimize their operations.

NetApp teams with Milestone Systems and the leading surveillance camera suppliers to provide enterprise grade end-to-end surveillance solutions. NetApp E-Series storage is the infrastructure backbone that provides fast, reliable storage and access to high-definition video content when you need it. Leveraging more than 20 years of built-in software innovations in our SANtricity OS, we built our video surveillance solution to be fault-tolerant (delivers greater than 99.999% availability) without sacrificing performance, scalability, or ease of use. NetApp video surveillance solutions have no single point of failure, many of the set-up and maintenance features are wizard driven, and the hardware platforms provide outstanding resiliency. With E-Series, you do not have to be a storage expert to set-up and support your surveillance storage environment. For more information, visit www.netapp.com/vss.

About Milestone Systems

Milestone Systems is a global leader in providing open platform IP video surveillance software. Milestone has provided easy-to-use, powerful video management software in more than 200,000 installations, worldwide.

Milestone XProtect® provides open architecture products that are compatible with more IP cameras, encoders, and digital video recorders than any other manufacturer. Because Milestone provides an open platform, you can integrate today's best business solutions and expand what's possible with future innovations. Visit www.milestonesys.com for more.

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Executive Summary

This report provides detailed certification tests results performed on the NetApp E-Series E2800 Hybrid Storage array while acting as the video storage system for the Milestone XProtect® video management software (VMS) surveillance system. The certification process seeks to confirm that server, storage and network solutions provided by qualified solution partners meet the minimum performance benchmarks to support the Milestone XProtect VMS applications.

Certified Products

- NetApp E-Series Storage
 - E2800 Storage Array with E-Series SANtricity OS Controller Software 11.50.1
- Milestone XProtect Corporate 2019 R1 Corporate
- Milestone XProtect Smart Client 2019 R1

NOTE: Performance of the solution may vary if different XProtect products and/or system components not listed in the tests details are included.

Test Setup

The E-Series E2800 series controllers were tested under multiple scenarios and configurations, and the test systems were configured and installed at a NetApp test laboratory. Additional information on NetApp E-Series E2800 storage systems can be found here: <https://www.netapp.com/us/media/tr-4725.pdf>.

The system topologies tested included one NetApp E2860 storage array, one E2812 storage array, one Microsoft Windows 2019 based server hosting Milestone XProtect Recording server, and one Microsoft Windows 2019 based server hosting Milestone XProtect Management server software. The recording server was attached to the NetApp E2860 storage array and the E@812 storage system in the test environment over two 10Gb iSCSI software initiator connections via a 10Gb switch.

Test Components

Storage arrays:

- NetApp E2860, Dual 10Gb controllers, 16GB RAM, 60 x 7200 RPM Near-Line SAS HDD, two 30-drive Dynamic Disk Pools (DDP)
- NetApp E2812, Dual 10Gb controllers, 16GB RAM, 12 x 7200 RPM Near-Line SAS HDD, in two 4+2 RAID 6 configurations

VMS:

- XProtect Corp 2019 R1 Recording Server –Intel Xeon CPU E5-2670 v3 @ 2.30GHz, 128GB RAM, Windows Server 2019 Datacenter 64-Bit
- XProtect Corp 2019 R1 Management Server –Intel Xeon CPU ES-2699 v3 @ 2.3GHz, 128 GB RAM, Windows Server 2016 Datacenter 64-bit
- XProtect Corp 2019 R1 Smart Client - Intel Xeon CPU ES-2630 v3 @ 2.4GHz, 64 GB RAM, Windows Server 2016 Datacenter 64-bit

Camera Simulator:

- Simulated camera named the Feed Server (Stable FPS) - Intel Xeon CPU ES-2630 v3 @ 2.4GHz, 64 GB RAM, Windows Server 2016 Datacenter 64-bit

Network (camera and storage):

- 2 x 10Gb Ethernet Switches used for Client and Feed networks
- 1 x 10Gb Ethernet Switch used for iSCSI storage network

Test Scenarios

Scenario 1: 800 simulated video streams were used in this test. The E2860 was the tier 1 (primary) storage. Two 30 drive disk pools were created on the storage, each with a single volume mapped to the recording server.

Scenario 2: 800 simulated video streams were used in this test. The E2812 was the tier 1 storage. Two 4+2 RAID 6 volume groups were created on the storage, each with a single volume mapped to the recording server.

Scenario 3: 400 simulated video cameras were used in this test. The recording server wrote to the tier 1 storage volumes which were provided by the E2812. The video was then archived to the E2860.

In all test scenarios, the simulated video streams used were configured as follows:

- 30 frames per second (FPS)
- H.264 video codec
- Image resolution was 1920x1080 (2.1 Megapixel / 1080p / 6Mbit/s)

The testing topology is shown below for each scenario:

Figure 1: Scenario 1, E2860 as Tier-1 Storage

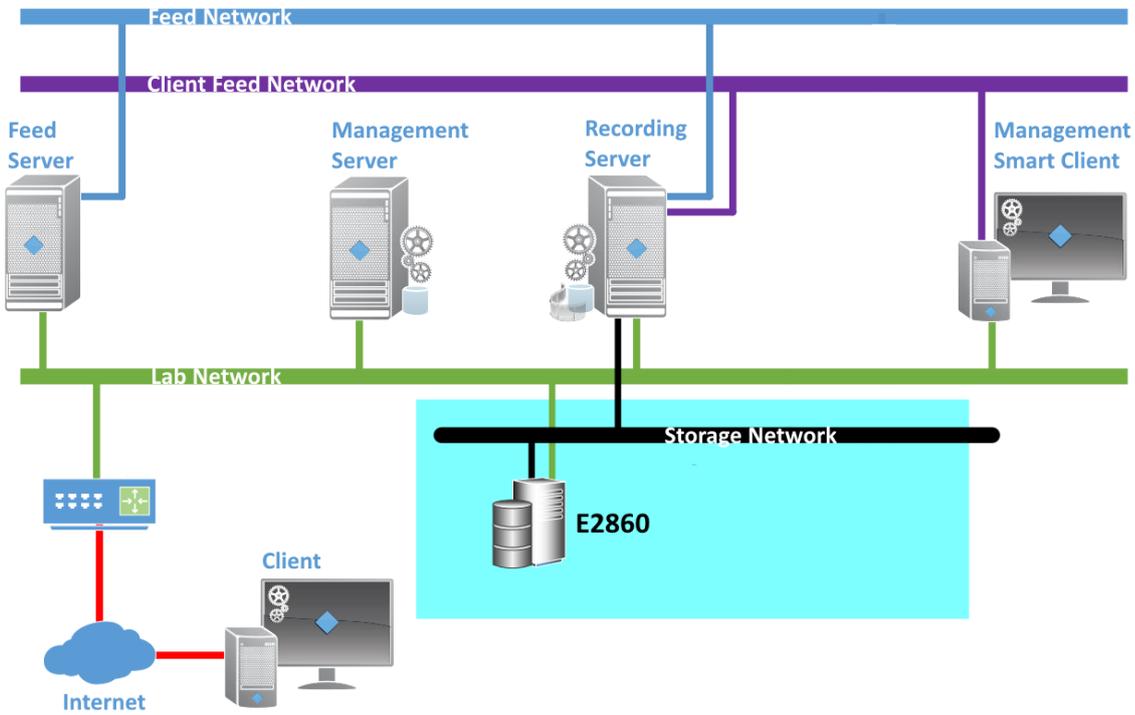


Figure 2: Scenario 2, E2812 as Tier-1 Storage

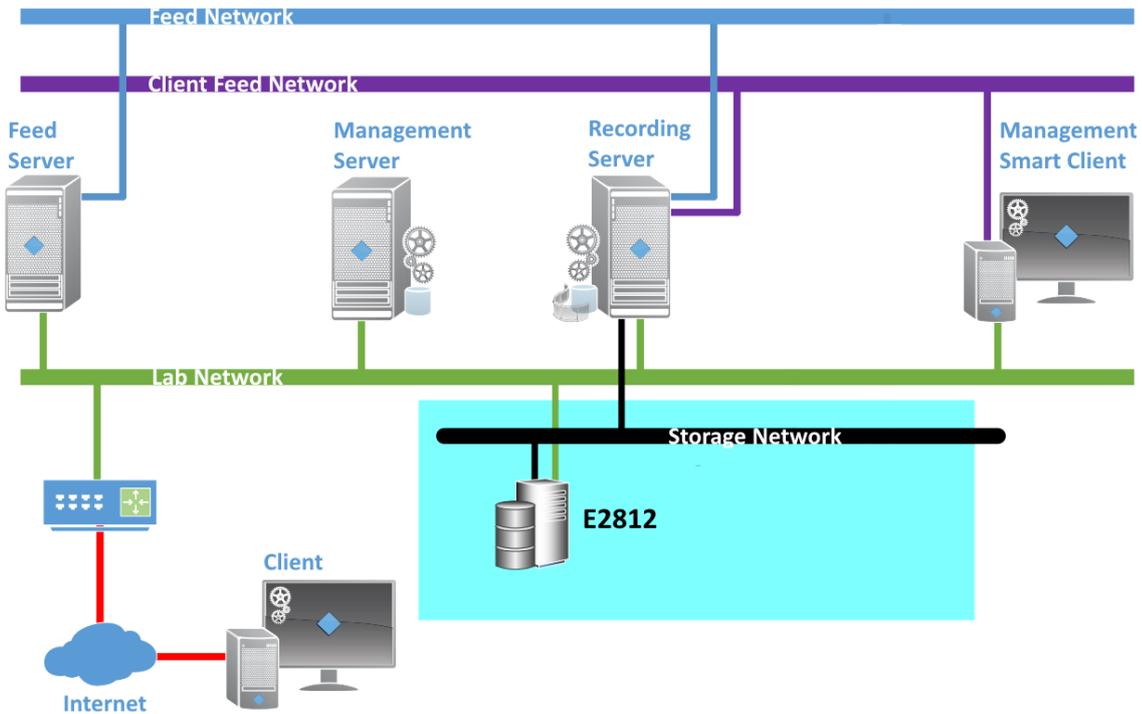


Figure 3: Scenario 3, E2812 as Tier-1, E2860 as Tier-2

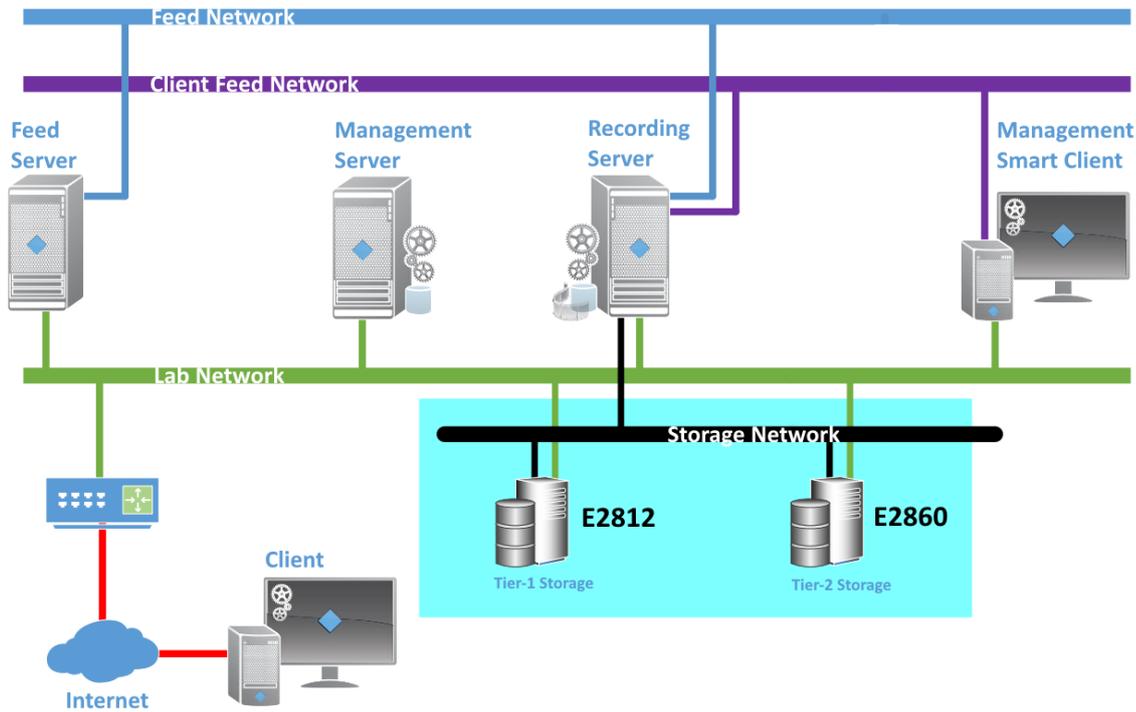


Figure 4: Recording Server Settings - Camera Groups

The screenshot shows the 'Recording Server' interface. On the left, a tree view shows 'Recording Servers' > 'ictm0805h11-RS3' > 'StableFPS (192.168.100.169)' with 12 camera entries. On the right, the 'Properties' window for 'StableFPS' is open, showing the following settings:

General	
000 Cleanup runtime (remote path) files	Yes
000 Data output path	
000 Frames per second	30
000 Input trigger frequency (seconds)	1
000 Remote path	\\192.168.100.69\NR
000 Synchronize first streams	No
100 VideoCodec	H264
102 VideoH264Files	1920_1080_Stripes_6Mbit
301 MetadataBoundingBoxFiles	Choose value
303 MetadataMotionFiles	Choose value

Performance Results / Features Tested Described

The first and second test case scenarios provide performance results with 800 cameras recording to two volumes (400 cameras per volume) on a single E2800 storage system in two configurations. The third scenario tested both E2800 storage system configurations with the E2812 configured as tier 1 storage and the E2860 as the archive storage. Each array had two volumes presented to the recording host. In all scenarios the E2860 had two 30-drive disk pools, each with a single volume mapped to the recording host and the E2812 had two 4+2 RAID 6 volume groups each with a single volume mapped to the recording host. There were four recording server instances running from the single recording host and each instance was run for a 12-hour period. The resulting data was collected using the Windows performance monitor on the recording server for each test run, and all tests completed successfully with no dropped frames or other issues. The figures and tables that follow show the throughput for one storage volume, the write latency to that volume, and the combined recorded metrics averaged over the 12-hour period for each scenario.

Figure 5: Scenario 1 – E2860, 800 Cameras Throughput

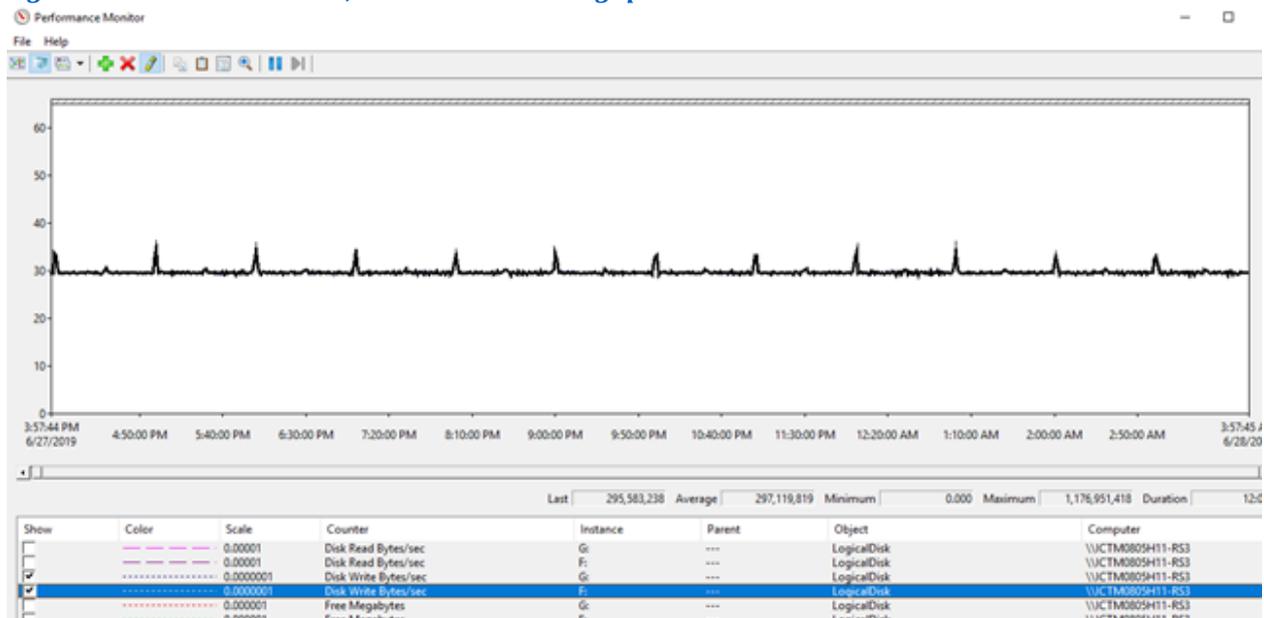


Figure 6: Scenario 1 – E2860, 800 Cameras Write Latency, Avg Disk Sec/Write



Table 1 provides a consolidated view of the test results using the E2860 system for the recording test case in scenario 1.

Table 1: Scenario 1 Performance Results – E2860

E2860 - 2 x Disk Pools - 800 Cameras	
Recording Servers (RS)	1 x x86_64 Server Windows 2019
RS %Processor Avg	24%
Cameras	800
FPS	30
Codec	H264
Video File	1920_1080_Stripes_6Mbit
Live Storage	E2860
Feed Servers	1
Byte/sec (Feed net)	615,820,072
Media/sec (total FPS)	23,998.51
Live disks	2 x 10TB Windows volumes - F, G
F: Write Bytes/sec	297,119,819.09
F: Sec/write (Latency)	0.004
G: Write Bytes/sec	297,122,851.84
G: Sec/write (Latency)	0.004
Live Disks Write Total (Bytes/sec)	594,242,670.93

Figure 7: Scenario 2 - E2812, 800 Cameras Throughput



Figure 8: Scenario 2 - E2812, 800 Cameras Write Latency, Avg Disk Sec/Write

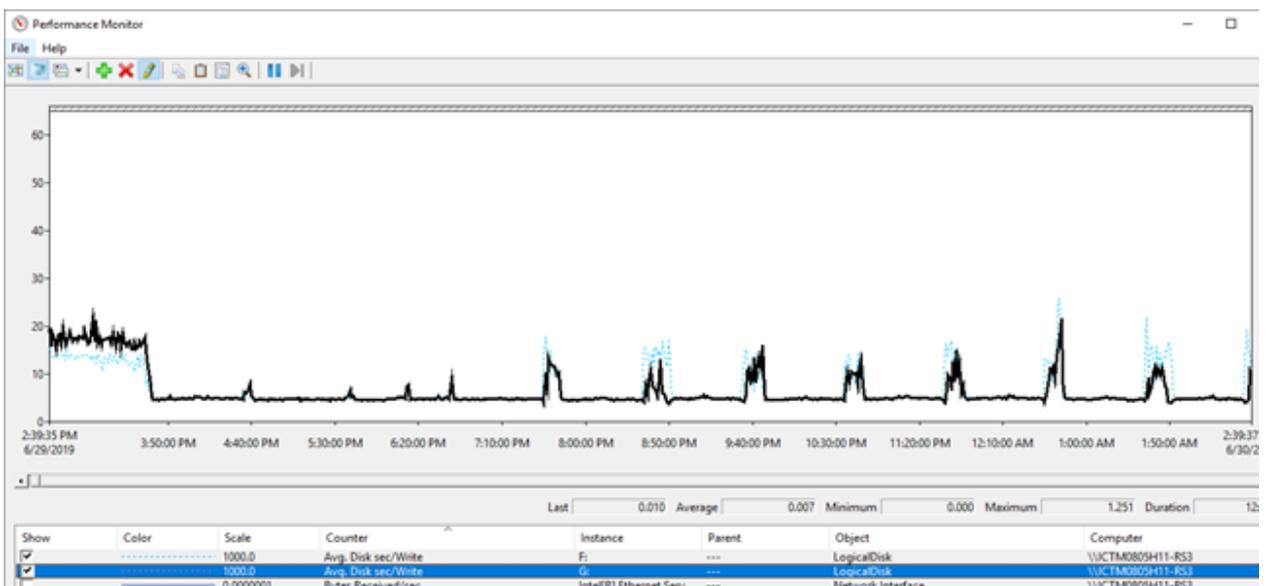


Table 2 provides a consolidated view of the test results using the E2812 system for the recording test case in scenario 2.

Table 2: Performance Results Scenario 2 - E2812

E2812 - 2 x RAID 6 Volume Groups - 800 Cameras	
Recording Servers (RS)	1 x x86_64 Server - Windows 2019
RS %Processor Avg	28%
Cameras	800
FPS	30
Codec	H264
Video File	1920_1080_Stripes_6Mbit
Live Storage	E2812
Feed Servers	1
Byte/sec (Feed net)	615,885,739
Media/sec (total FPS)	23,978.36
Live disks	2 x 10TB Windows volumes - F, G
F: Write Bytes/sec	296,977,146.23
F: Sec/write (Latency)	0.007
G: Write Bytes/sec	296,887,948.38
G: Sec/write (Latency)	0.007
Live Disks Write Total (Bytes/sec)	593,865,094.60

Note the total write throughput and latency were very similar for both the 60 drive configuration and the 12 drive configuration. Since latency with NL-SAS drives can easily exceed 20ms, the results show that in both cases, the systems are not operating at their maximum capable throughput. This becomes more important as the workload changes to a combination of writes and reads associated to the archiving test case in scenario 3.

Figure 9: Scenario 3 – E2812 Tier-1, E2860 Tier-2, 400 Cameras Throughput with Archiving

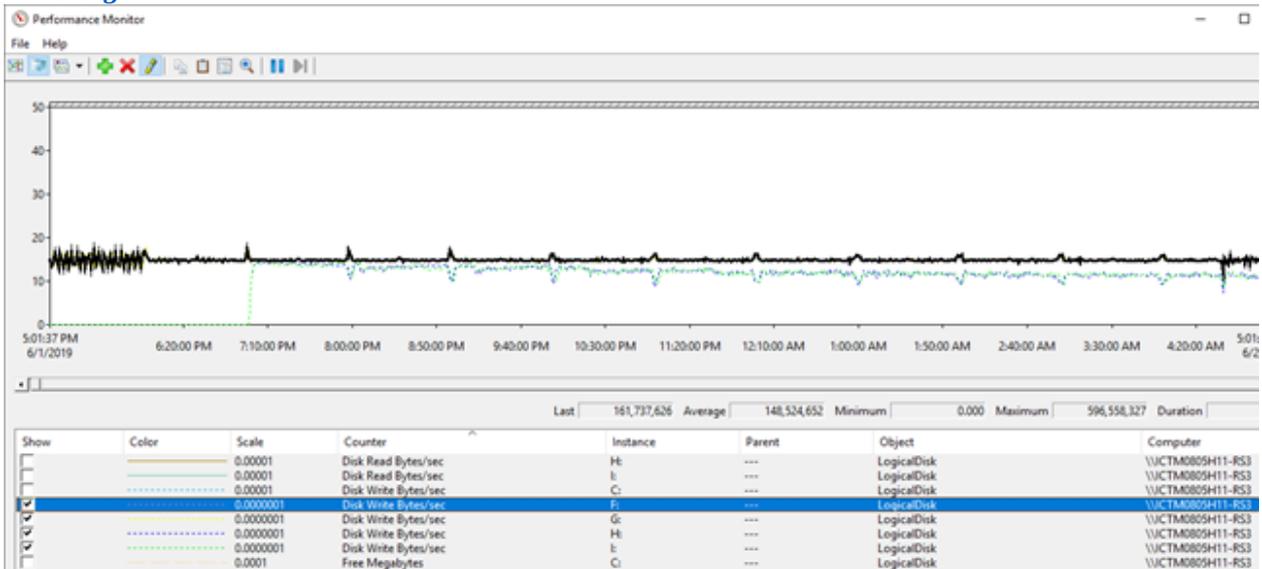


Figure 10: Scenario 3 – E2812 Tier-1, E2860 Tier-2, 400 Cameras Write Latency, Avg Disk Sec/Write

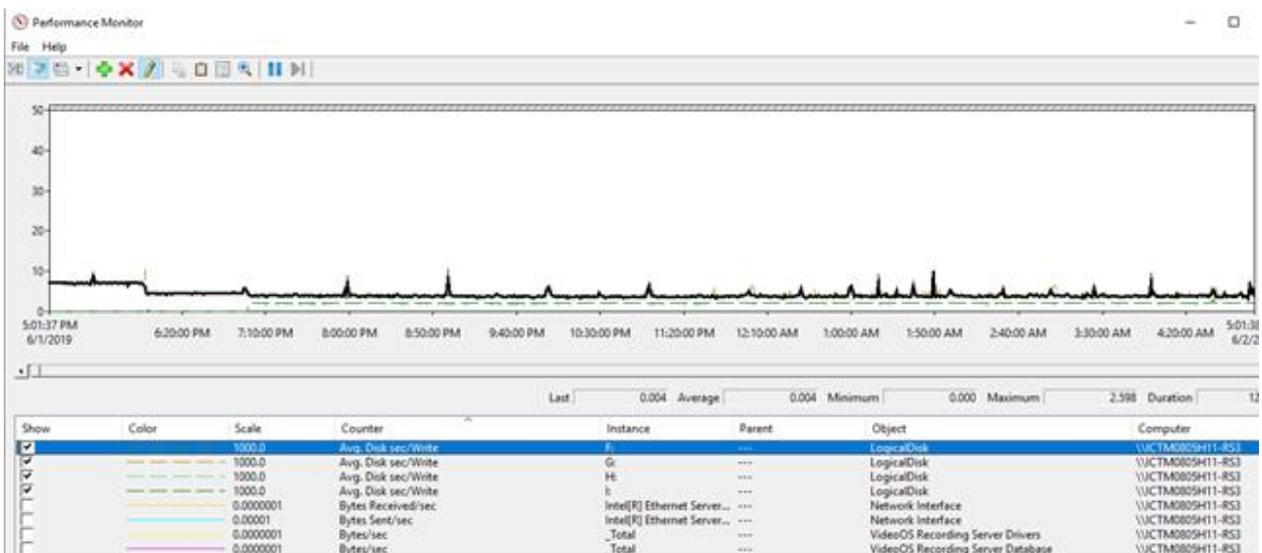


Table 3 provides a consolidated view of the test results for the recording and archiving test case in scenario 3.

Table 3: Performance Results Scenario 3 - E2812 Live, E2860 Archive

E2812 Live - E2860 Archive - 400 Cameras	
Recording Servers (RS)	1 x x86_64 Server Windows 2019
RS %Processor Avg	6.39%
Cameras	400
FPS	30
Codec	H264
Video File	1920_1080_Stripes_6Mbit
Live Storage	E2812
Archive Storage	E2860
Feed Servers	1
Byte/sec (Feed net)	307,958,306
Media/sec (total FPS)	11,993.81
Live disks	2 x 10TB Windows volumes - F, G
Archive disks	2 x 25TB Windows volumes - H, I
F: Write Bytes/sec	148,524,652
F: Sec/write (Latency)	0.004
G: Write Bytes/sec	148,540,000
G: Sec/write (Latency)	0.004
Live Disks Write Total (Bytes/sec)	297,064,652
F: Read Bytes/sec	142,523,393
F: Sec/read (Latency)	0.046
G: Read Bytes/sec	142,723,424
G: Sec/read (Latency)	0.045
Live Disks Read Total (Bytes/sec)	285,246,817
H: Write Bytes/sec	101,390,030
H: Sec/write (Latency)	0.002
I: Write Bytes/sec	101,523,657
I: Sec/write (Latency)	0.002
Arch Disks Write Total (Bytes/sec)	202,913,687

Conclusion

The NetApp E2800 storage system is an excellent choice as the storage and archive target for the Milestone XProtect video management software. The test results confirm that the E-Series E2800 series storage system is a flexible and scalable storage solution, providing consistent, high throughput and low latency with both the entry level 12-drive system and the 60-drive large capacity shelf. In both cases, the systems were configured with the minimum HA host interface connectivity and iSCSI sessions, and we used 7,200 RPM NL-SAS drives for both live recording of 800 simulated camera streams and to record 400 camera streams while archiving 400 streams to a second E2800 storage system. In multiple test scenarios, the E2800 storage system consistently outperformed certification requirements, achieving high levels of data throughput with consistently low latency. This testing, performed over extended periods, confirmed that disk speed was not a significant bottleneck, even for the 12-drive system. Both E-Series arrays had remaining performance headroom by adding additional drives or by adding additional host links and associated iSCSI sessions. As a result, integrators and end users designing, installing, and operating Milestone surveillance systems integrated with E-Series storage systems can have confidence that the systems will be easy to deploy and will reliably record and archive your surveillance video – no special settings required.

Resources

Solution Brief—Milestone and NetApp

<http://www.netapp.com/us/media/ds-3373.pdf>

The advantages of simple, reliable block storage in video surveillance environments - White Paper

<http://www.netapp.com/us/media/wp-7240.pdf>

Introduction to Video Surveillance Solutions with NetApp E-Series Storage - TR-4196

<http://www.netapp.com/us/media/tr-4196.pdf>

Planning and Design Considerations - TR-4197

<http://www.netapp.com/us/media/tr-4197.pdf>

Dynamic Disk Pools - TR-4652

<https://www.netapp.com/us/media/tr-4652.pdf>