

White Paper

Milestone & Arxys Certification Test Report

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Executive Summary:

This solution certification report contains the results of tests performed on the **Arxys | Shield - Prime** storage platform, integrated with Milestone XProtect Corporate 2017 R3. The goal of these tests was to simulate video surveillance scenarios similar to those seen in the corrections and detention vertical market. In this market high definition video resolutions are required, retention periods are often 180 days and often up to 2 years, and frame rate needs to be sufficient to capture human movement (i.e. 12-15 FPS is minimally acceptable). In addition, correctional facilities can have very high camera counts, and are often collocated with medical facilities, law enforcement facilities, and other highly secure areas, which leads to increased camera count and retention regulations. These certification tests were all high-performance tests, with the goal of finding the maximum number of cameras which the system could support, given the video stream profile that was used.

The **Arxys | Shield - Prime** delivered the highest HD camera counts (2,944) and the highest total throughput (3.6Gb/s) of any storage platform tested to date.

The **Arxys | Shield - Prime** provided highly available (HA) storage resources for both the live and archive databases with no single point of failure and full HA failover, redundancy and double parity data protection. All storage resources were presented to four (4) Milestone recorders via iSCSI and 10Gb/s Ethernet. Three test scenarios that are representative of current and future large correctional facility deployments were tested: 896 full HD cameras recording full motion video, 2048 HD cameras recording video at 20FPS, and lastly 2944 HD cameras recording at 15 FPS. Video files were archived every hour.

Certified Products:

- **Arxys | Shield - Prime**
 - Listed Arxys solutions are certified for use with the entire line of XProtect VMS products





- Milestone XProtect Corporate 2017 R3
 - All Milestone Recording Servers were configured to archive every hour to the **Arxys | Shield - Prime** storage platform.

Test Scenarios:

The load tests which are included in this **Arxys | Shield - Prime** storage and Milestone XProtect certification test included three maximum performance load tests.

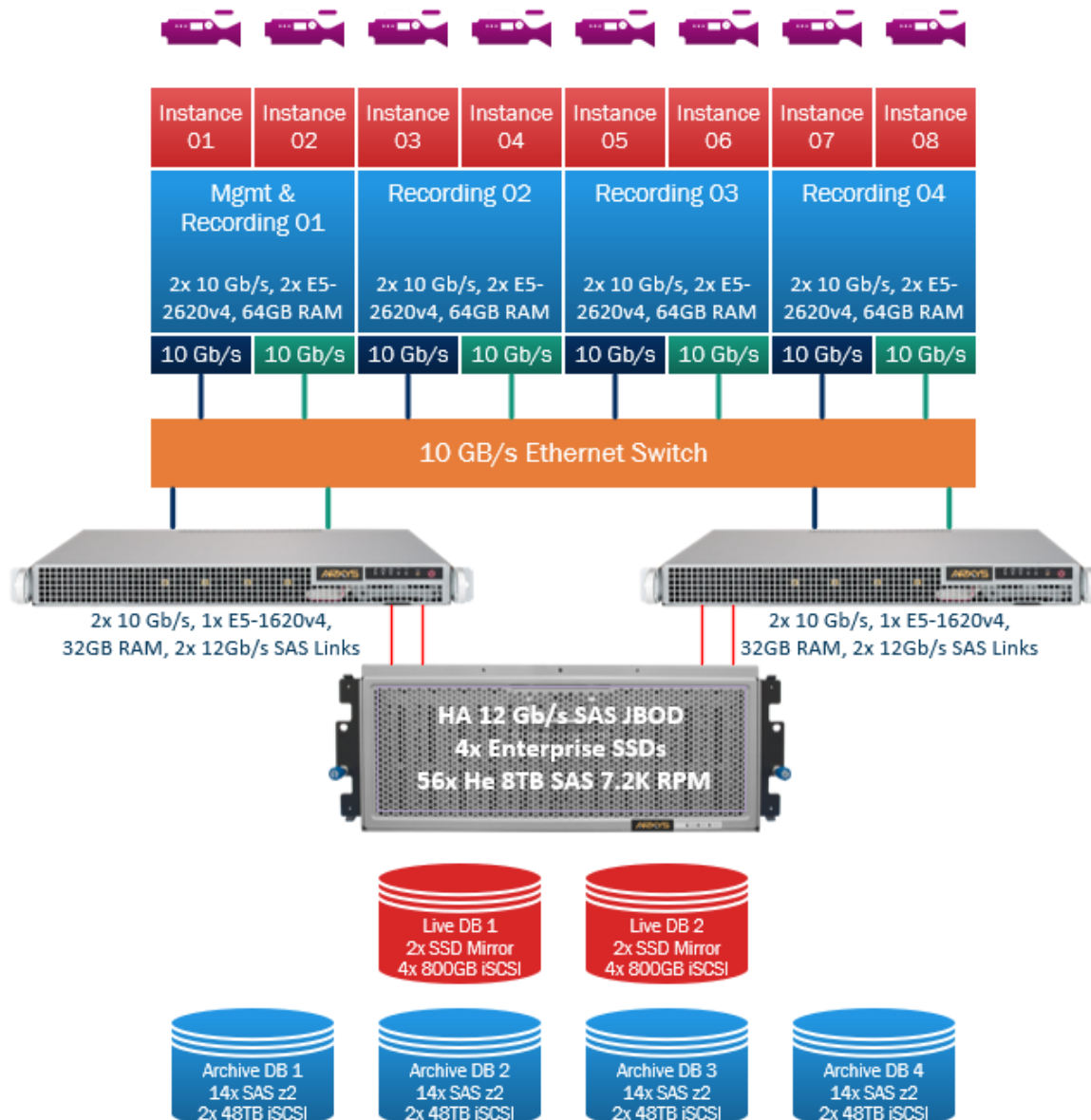
- Maximum performance load test(s)
 - Load testing will seek to determine the maximum amount of video streams that a partner solution can support as a component in an operational XProtect VMS system.
 - The number of video streams, video recording servers, and the video stream profile used in the certification test may all be increased to add stress to the partner solution.
 - Once the system meets a stop criteria, the video stream load will be scaled back to the last known safe level of performance and this level will be judged to be the maximum performance.
 - Stop criteria are: average of 70% CPU utilization or higher on the Recording Servers, Frame Loss of more than 1% of total frames recorded during the test, Archive events which don't complete in the time allotted (1 hr in this test configuration), or Disk Read Latency of more than 200 milliseconds (ms).

Architecture:

Arxys | Shield-Prime high-density storage servers are designed for large enterprise security installations. Advanced Read-Write caching, high-performance enterprise grade Helium SAS dual port drives and 128 bit ZFS technology deliver leading edge performance with efficiency. The combination of high throughput & advanced data protection makes the Shield Prime Storage Servers ideal for IP video streaming and archiving where performance, scalability and guaranteed evidence protection are crucial.

HGST Helium SAS 12GB/s Enterprise HDD's were used for archiving. HGST Enterprise SAS SSD's were used for the live database. Data protection in the form of double parity on the archive data and mirroring on the live data provided by the Arxys | Sentio Software Defined Storage platform.

Four Microsoft Windows Server 2012 R2 based systems were utilized. Each system had Milestone XProtect recording services installed. The recording services were configured to run two instances, in other words each hardware platform ran two recording services in parallel for a total of eight recording services. One of the systems also had the full Milestone management service installed and configured.



Storage Configuration:

Arxys | Shield-Prime was run in active/active mode. Each **Arxys | Shield-Prime** node managed one live database and two archive database volumes. Each live database volume resides on a mirrored pair of 12 Gb/s SAS Enterprise Class solid state drives. Each mirrored pool is divided into four iSCSI targets with roughly 800GB of usable storage per Milestone recorder instance.

Each of the two archive database volumes per **Arxys | Shield-Prime** node reside on a double parity protected storage pool consisting of fourteen 8 TB SAS (12 Gb/s) enterprise hard disk drives. Each storage pool is divided into two iSCSI targets with roughly 48TB of usable storage each. There is a total of eight, 48TB iSCSI targets, one per Milestone recorder instance.

<u>Storage Pool</u>	<u>Disk Type</u>	<u>Number of Disks</u>	<u>Protection Type</u>	<u>iSCSI Target</u>	<u>Capacity</u>	<u>Description</u>
Pool 1	SAS SSD	2	Mirror	Target 0	800GB	Live DB Rec Server 1, instance 1
				Target 1	800GB	Live DB Rec Server 2, instance 3
				Target 2	800GB	Live DB Rec Server 3, instance 5
				Target 3	800GB	Live DB Rec Server 4, instance 7
Pool 2	SAS SSD	2	Mirror	Target 4	800GB	Live DB Rec Server 1, instance 2
				Target 5	800GB	Live DB Rec Server 2, instance 4
				Target 6	800GB	Live DB Rec Server 3, instance 6
				Target 7	800GB	Live DB Rec Server 4, instance 8
Pool 3	SAS 7.2K HDD	14	Double Parity	Target 8	48TB	Archive DB Rec Server 1, instance 1
				Target 9	48TB	Archive DB Rec Server 3, instance 5
Pool 4	SAS 7.2K HDD	14	Double Parity	Target 10	48TB	Archive DB Rec Server 2, instance 3
				Target 11	48TB	Archive DB Rec Server 4, instance 7
Pool 5	SAS 7.2K HDD	14	Double Parity	Target 12	48TB	Archive DB Rec Server 1, instance 2
				Target 13	48TB	Archive DB Rec Server 3, instance 6
Pool 6	SAS 7.2K HDD	14	Double Parity	Target 14	48TB	Archive DB Rec Server 2, instance 4
				Target 15	48TB	Archive DB Rec Server 4, instance 8

Milestone Configuration:

All Milestone application systems shared the same hardware:

- Dual Intel Xeon E5-2620v4 Processor
- 64 GB of system memory
- 2x SATA SSDs in RAID 1 for OS and applications
- 2x Intel based 10Gb/s Ethernet Ports
- 1x iSCSI connection to the **Arxys | Shield – Prime** Live DB 1 (~800GB)
- 1x iSCSI connection to the **Arxys | Shield – Prime** Live DB 2 (~800GB)
- 1x iSCSI connection to two different **Arxys | Shield – Prime** Archive DB volumes (~48TB each)

Archiving was configured to occur every hour on the hour.

Test Results:

Each of the three tests scenarios detailed below were measured to be in a state of healthy long-term operations by Milestone engineers, as a part of the Solution Certification test process. This means that the **Arxys | Shield – Prime** storage solution and Milestone XProtect VMS combined to provide a high-performance video surveillance system, which can operate continuously without dropping frames, overloading the CPU, or causing laggy video review performance in all three scenarios. The system delivered exceptional high throughput and number of cameras supported at HD resolutions and high frame rates.

Scenario 1:

Total of 896 Cameras (3.6+ Gbps camera bandwidth) – 4X Recording Server, 1X Management Server, 1X **Arxys | Shield - Prime** storage

Milestone XProtect Corporate 2017 R3 (11.3a)

- 224 cameras per Recording Server with the following video stream profile
 - 1920x1080 resolution
 - H.264
 - 30 FPS
 - Approximately 4.2 Mbps stream size
- 925 Mbps network bandwidth per Recording Server, 3.6+ Gbps total
- 209 MBps disk throughput to **Arxys | Shield - Prime** storage, 835 MBps total

Scenario 2:

Total of 2048 Cameras (over 2100 Mbps camera bandwidth) – 4X Recording Server, 1X Management Server, 1X **Arxys | Shield - Prime** storage

Milestone XProtect Corporate 2016 R3 (10.2b)

- 512 cameras with the following video stream profile per Recording Server
 - 1280x720 resolution
 - H.264
 - 20 FPS
 - Approximately 1.1 Mbps stream size
- 542 Mbps network bandwidth per Recording Server, 2166 Mbps total
- 68 MBps disk throughput to **Arxys | Shield - Prime** storage, 272 MBps total

Scenario 3:

Total of 2944 Cameras (over 2200 Mbps camera bandwidth) – 4X Recording Server, 1X Management Server, 1X **Arxys | Shield - Prime** storage

Milestone XProtect Corporate 2016 R3 (10.2b)

- 736 cameras per Recording Server with the following video stream profile
 - 1280x720 resolution
 - H.264
 - 15 FPS
 - Approximately 778 Kbps stream size
- 573 Mbps network bandwidth per Recording Server, 2292 Mbps total
- 72 MBps disk throughput to **Arxys | Shield - Prime** storage, 288 MBps total

Conclusion:

The **Arxys | Shield – Prime** storage solution is a certified solution for use with Milestone XProtect VMS products. Designed to provide highly scalable, flexible, redundant storage with a focus on the corrections and detention vertical market, Arxys solutions are proven to perform at an extremely high level with Milestone XProtect. All three tests which were included in the Milestone Solution Certification battery of tests were successful, ultimately certifying that the Arxys solution can provide a highly reliable storage location for over 3 Gbps of camera bandwidth in storage, and over 3000 total cameras.

The **Arxys | Shield - Prime** delivered the absolute highest HD camera counts (2,944) and the highest total throughput (3.6Gb/s) of any storage platform tested to date.

The following table contains a summary of performance for each of the three scenarios:

Test Scenario	Total # of Cams	Stream Size	Camera Bandwidth per Recorder Server	Disk I/O per Recorder Server	CPU Utilization	Camera Bandwidth 4x Recorder Servers	Disk I/O 4x Recorder Servers	Frames Lost %
1 – 1080p 30 FPS	896	4.2 Mbps	925 Mbps	209 MBps	19.29%	3692 Mbps	835 MBps	0.003%
2 – 720p 20 FPS	2048	1.1 Mbps	542 Mbps	68 MBps	10.24%	2166 Mbps	272 MBps	0%
3 – 720p 15 FPS	2944	778 Kbps	573 Mbps	72 MBps	11.62%	2292 Mbps	288 MBps	0%



Milestone Systems is a leading provider of open platform video management software; technology that helps the world see how to ensure safety, protect assets and increase business efficiency. Milestone enables an open platform community that drives collaboration and innovation in the development and use of network video technology, with reliable and scalable solutions that are proven in more than 150,000 sites worldwide. Founded in 1998, Milestone is a stand-alone company in the Canon Group.