Hewlett Packard Enterprise

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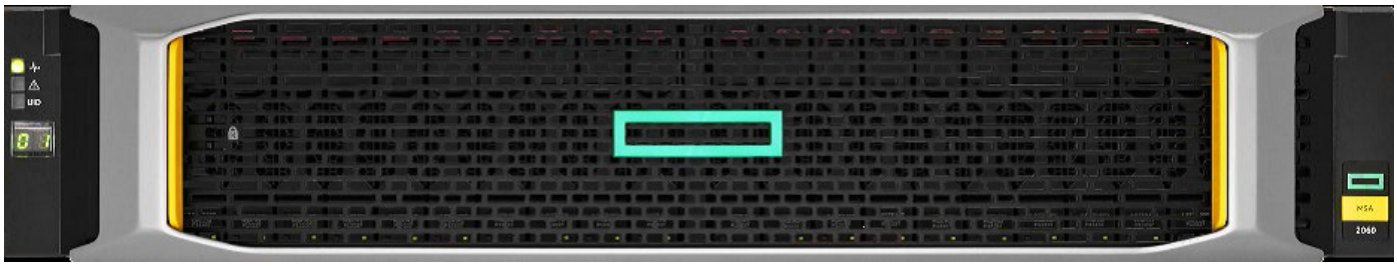
VIDEO SURVEILLANCE VERIFICATION WITH HPE MSA 2060 STORAGE ARRAY AND MILESTONE XPROTECT

Verification Overview



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EXECUTIVE SUMMARY

This paper highlights Hewlett Packard Enterprise activities to achieve Milestone verification for the HPE MSA 2060 storage array with Milestone XProtect® Corporate 2020 R3. The information and recommendations provided in this paper result from experience with a basic Milestone XProtect Corporate environment installed in an HPE lab.

Target audience: This document is intended for solution architects, project managers, storage administrators, and system support personnel involved in planning, designing, and configuring a video surveillance management solution.

INTRODUCTION

Milestone invites vendors to be part of the Milestone Technology Partner Program. This program allows partners to explore how their solutions can work simultaneously with Milestone XProtect video management platform, and further build technology offerings that address specific industry or vertical needs.

Milestone offers various tracks for obtaining verification. For this solution, the Hardware track was followed, The Hardware track is for partners who provide infrastructure technology. The Milestone Systems verification was performed using an HPE MSA 2060 storage array. Milestone Systems provides the license and verification tools to obtain the verification.

SOLUTION COMPONENTS

This section provides the hardware and software components used in this solution.

Hardware

HPE MSA 2060 storage array

An HPE MSA 2060 10GbE iSCSI large form factor (LFF) storage array was used for storing live video data.

HPE MSA 2060 configuration:

- Chassis: HPE MSA 2060 10GbE iSCSI LFF storage array
- Dual hot-swappable active/active 10 Gb iSCSI storage controllers
- Ten HPE MSA 8 TB SAS 12 G Midline 7.2K LFF hard disk drives (HDD)
- RAID 6 disk group was configured using the ten LFF HDDs
- One 63 TB volume was created using the RAID 6 disk group

NOTE

RAID 6 demonstrates the minimum expected performance while also being representative of a small-scale MSA-DP+ configuration. However, when the HPE MSA storage array is configured with 12-128 HDDs, Hewlett Packard Enterprise recommends using the MSA DP+ RAID type. MSA DP+ RAID offers better performance, availability, flexibility, and rebuild time when compared to other disk groups, especially those that employ parity-based RAID schemes.

For more information on RAID schemes, see the HPE MSA Gen6 Virtual Storage Technical Reference Guide.

See hpe.com/storage/msa to further explore the features and benefits of HPE MSA storage.

HPE ProLiant DL380 Gen10 servers

Two HPE ProLiant DL380 Gen10 servers were used for this verification.

One HPE ProLiant DL380 server was used as the Milestone Management Server:

- Two CPU's having 16 cores each
- 384 GB of RAM
- HP Flex Fabric 10 Gb 2-port network card

The other HPE ProLiant DL380 server was used as the Milestone Recording Server:

- Two CPU's having 16 cores each
- 256 GB of RAM
- HP Flex Fabric 10Gb 2-port network card

See hpe.com/us/en/servers/proliant-servers.html to further explore the features and benefits of HPE ProLiant DL servers.

Application software

Milestone Systems XProtect VMS

The XProtect VMS products are video management software designed for installations of all shapes and sizes.

Whether you want to protect your store from vandalism or want to manage a multi-site, high-security installation, XProtect makes it possible. The solutions offer centralized management of all devices, servers, and users, and provide an extremely flexible rule system driven by schedules and events.

The XProtect Corporate VMS consists of the following main components:

- Milestone XProtect Management Server—the center of the installation
- Milestone XProtect Recording Servers
- Milestone XProtect® Management Client
- Milestone XProtect® Smart Client
- Milestone XProtect® Web Client and/or installations of XProtect® Mobile Client if needed

The XProtect environment also includes fully integrated Matrix functionality for distributed viewing of video from any camera in the surveillance environment to any computer with XProtect Smart Client installed. You can install XProtect on virtualized servers or on multiple physical servers in a distributed setup.

Milestone XProtect Corporate Elements

FIGURE 1 illustrates the servers and client systems found in a typical Milestone XProtect deployment. The description of each of the major components follows.

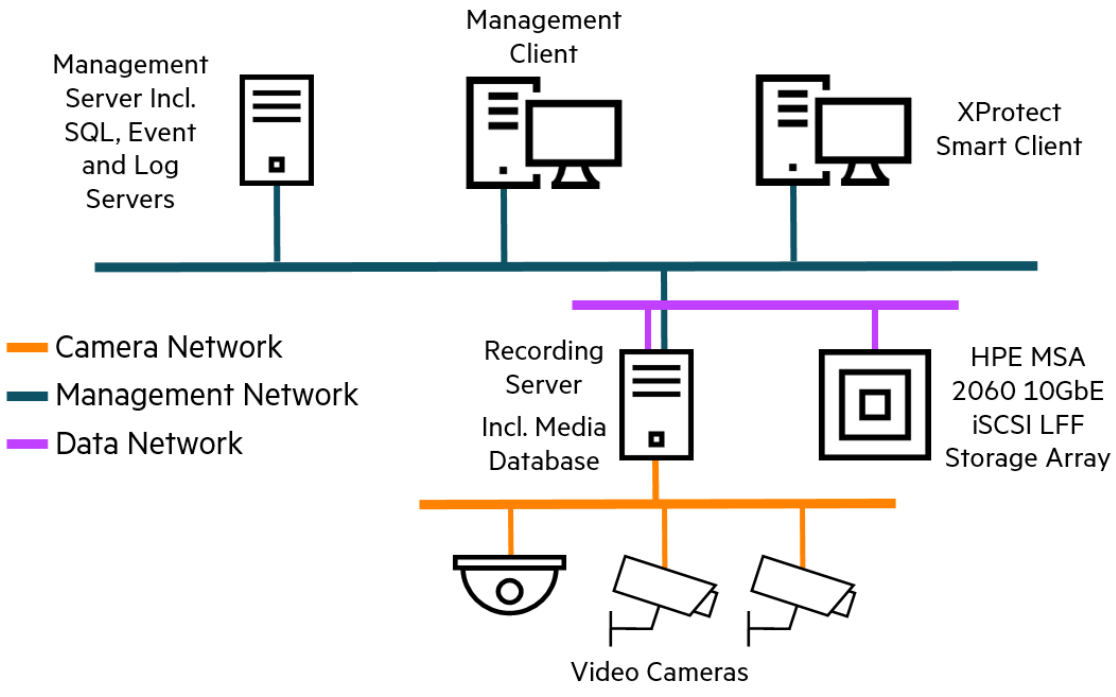

FIGURE 1. Milestone XProtect elements

Management Server

The configuration of the surveillance system is stored in a relational database either on the Management Server or on a separate Microsoft SQL Server on the network. In addition, the Management Server handles user authentication and user rights. To enhance system performance, several Management Servers can be run as a Milestone Federated Architecture hierarchy. It runs as a service and can be installed as an all-in-one appliance or deployed across multiple servers in midsize to larger environments. The Management Server can be installed in a Microsoft Windows cluster environment for high availability.

Recording Server

The Recording Server, built on a native 64-bit Windows implementation, is responsible for recording videos and for communicating with cameras, microphones, speakers, and access control devices. In large installations, more than one Recording Server is often used in the video surveillance environment.

SQL Server

The Management Server, Event Server, and Log Server use SQL databases on one or two SQL Server installations to store, configuration, alarms, events, and log messages. The Milestone XProtect installer includes Microsoft SQL Server Express, which is a free edition of SQL Server. For very large systems or systems with many transactions to and from the SQL databases, Milestone recommends that you use a Microsoft SQL Server Standard or Microsoft SQL Server Enterprise edition of the SQL Server on a dedicated computer on the network and on a dedicated hard disk drive that is not used for other purposes. Installing the SQL Server on its own drive improves the entire system performance.

Event Server

The Event Server handles tasks related to events, alarms, maps, and any third-party developed plug-ins that need to access system events. All data handled by the Event Server are stored in the same SQL Server the Management Server uses.

Log Server

The Log Server is responsible for storing all log messages for the entire system. The system supports three types of logs:

- System log—log errors, warnings, and information, or a combination of these
- Audit log—client user activity in addition to login and administration logs
- Rule log—logs based on specific events

The Log Server uses the same SQL Server as the Management Server and is typically installed on the same server as the Management Server but can be installed on a separate server if the Management or Log Server performance needs to be improved.

Media Database

Video and audio recordings as well as related metadata is stored in the Milestone dedicated high-performance Media Database, which is optimized for storing and retrieving the recordings.

The Media Database supports various unique features, such as tiered multi-stage archiving, video grooming, encryption, and adding a digital signature to the recordings.

The Media Database supports a tiered storage architecture with “Live” recording database and the “Archive” databases distributed across different storage systems and technologies, making it possible to design and optimize the storage solution for performance (recording), size (retention), and cost.

XProtect Management Client

The Management Client is a feature-rich administration client for configuration and day-to-day management of all parts of the system. It is designed to run remotely and is typically installed on the surveillance system administrator's workstation. It is available in several languages.

XProtect Smart Client

The XProtect Smart Client enables operator access to live and recorded video as well as other key surveillance system features, such as export of recordings for use as evidence. The very feature-rich XProtect Smart Client is the main client for the VMS offering a full set of advanced features. It is designed for day-to-day use by dedicated operators and is installed on each operator’s computer. The XProtect Smart Client has tabs dedicated to different tasks: live monitoring, playback, Sequence Explorer for investigation, alarm management, and monitoring the state of the system servers, cameras, and storage. Add-on products and third-party integrations can incorporate additional tabs providing a dedicated user interface for their functions.

Milestone StableFPS device driver

Milestone provides solution partners with a load test tool, StableFPS device driver. This device driver, developed by Milestone Systems, is used by solution partners to test the performance of their product in an XProtect environment.

The StableFPS driver is a normal multichannel device driver used when adding physical multi-channel cameras or a video server to a Milestone XProtect system. The main differences are the StableFPS device driver uses recorded video to emulate system, network, and storage load.

The StableFPS driver is installed on each XProtect Recording Server. Each StableFPS install can have between 1 and 200 video channels, which are set during the installation of the StableFPS device driver. Several video files are copied to the Recording Server during the install. These videos are used by the driver to simulate live video streams being received by the Recording Server.

FACTORS THAT DETERMINE FRAME SIZE AND CAMERA RATES

The rate at which data is streamed to the Recording Server directly affects the storage subsystem. There are several factors that affect the amount of recording data that a given camera will stream to the video Recording Server. Key factors include:

- Video resolution—specified as the number of pixels per frame, influences the clarity of details in the image.
- Frames per second—the recording speed influences the smoothness of any motion in the image.
- Color depth—determines the number of bits per pixel; 24-bit color means 24 bits per pixel; black and white recording is 1 bit per pixel.
- Codec—compression/decompression algorithm, which produces the resulting bit rate sent to the Recording Server.

Live data is not compressed when it is captured. The cameras or video encoders must perform some type of compression on the live data before sending it over the network to the Recording Server. Some common codecs are JPEG, MPEG-4, H.264, and H.265. Within these codecs, depending upon the camera hardware, the user can control various parameters to tailor the resulting bit rate of the data transmitted while maintaining the desired quality.

What bit rate do I need?

Bit rate is the product of the frame rate multiplied by the frame size (resolution multiplied by color depth). The final bit rate transmitted by any given camera is highly dependent upon your requirements for the quality of the recorded material captured from a given scene. Not all recording environments necessarily need the highest resolution nor the highest frame rates transmitted 24 hours a day. A small office, store, or playground might need only a general view of the scene without detailed motion; therefore, a lower resolution and lower frame rate can suffice for this type of environment. A warehouse or a production facility might need to capture more details in background elements and some general movement in the scene and might need only medium resolution and frame rates. Highly dynamic scenes or the need to capture fine details of small objects will require the highest resolution and frame rates. Monitoring people and their movement in public transportation hubs, stadiums, or arenas will require different frame rates depending on your purpose. Monitoring for general crowd control will be different from monitoring for individual recognition or identification. To reduce the need for continuous recording from a given scene, Milestone XProtect supports creating triggers for when to start or stop recording and allows you to set up a recording schedule per camera.

How Milestone XProtect stores data on disk

Milestone XProtect writes the data to the recording storage location into multiple directories. A directory is created per camera, per hour. Data is written into the directory in multiple files—each 16 MB in size. The number of these files per directory is directly related to the recording rate for the given camera. This method limits the amount of data that must be repaired in the event of a server failure/restart to only the last hour. This means there is no restriction on how large of a LUN you use for the recording data.

NOTICE

Milestone cautions that when the Recording Server service is running, it is very important that Windows Explorer or other programs do not access Media Database files or folders associated with your system setup. If they do, it is likely that the Recording Server cannot rename or move relevant media files. This could bring the Recording Server to a halt. For this reason, it is recommended to disable Windows from indexing the video storage locations and to disable any virus scanning of the video storage locations.

RECORDING SERVER STORAGE

A Recording Server is a system where the Milestone Recording Server software is installed. At installation time, you must specify the IP address of the Management Server that will manage this Recording Server. You must also specify the path to the default location for the recording data. This is the location where the live video feeds will be stored. Every Recording Server must be configured with its own default location. When the Recording Server first comes online, it must be authorized at the Management Server; this verifies the connection between these two servers.

When cameras are added to a Recording Server, they are assigned to a device group. Each Recording Server may be configured to support multiple camera device groups and cameras can be assigned to these individual groups. Each device group can be configured with its own

unique recording properties. However, it is important to remember that all device groups on a given Recording Server share the same storage location.

Recording data is a constant write workload, which can be predicted based on the recording rate per camera multiplied by the number of cameras configured. Real-time analysis of live data or forensic analysis of the recorded data places a heavy read workload on the recording location. See the HPE MSA Storage Arrays Best Practices for guidance on how to configure HPE MSA storage arrays.

Factors affecting recording storage capacity

Retention time and maximum size, as illustrated in FIGURE 2, are two important parameters that affect the utilization of the capacity reserved for storing live recording data. These values can be modified for a given recording server through the Management Client. The settings are dynamic. It is recommended to limit total capacity utilization to around 80% to provide the additional overhead needed to manage files when a disk-full condition is reached or to provide additional space for motion detection analysis.

Retention time

The retention time specifies how long the live video data will remain in the recording location before one of two actions is taken. Recordings older than the specified retention time will be deleted unless an archive location has been configured. If an archive has been configured, then those video files, which have exceeded the retention time on the recording location, will be migrated automatically by Milestone XProtect to the archive location. The value of retention time can be specified in hours or days.

Maximum size

This is the value in gigabytes (GB) of the maximum amount of data to save in the recording location. If this location becomes full, the oldest videos will be deleted.

HPE MSA 2060 volume

The 63 TB volume was presented to the HPE DL380 Gen 10 server configured as a Milestone XProtect Recording Server. The volume was initialized in Windows Device Manager as the F: volume.

NOTE

When formatting a volume, Milestone recommends setting the Windows allocation unit size to 64K. This will significantly improve performance when writing live video data to the recording location.

FIGURE 2 shows the properties of the recording storage location. The HPE MSA 2060 volume, configured as F: on the Recording Server, is selected in the **Path** field. This is where the video data was stored.

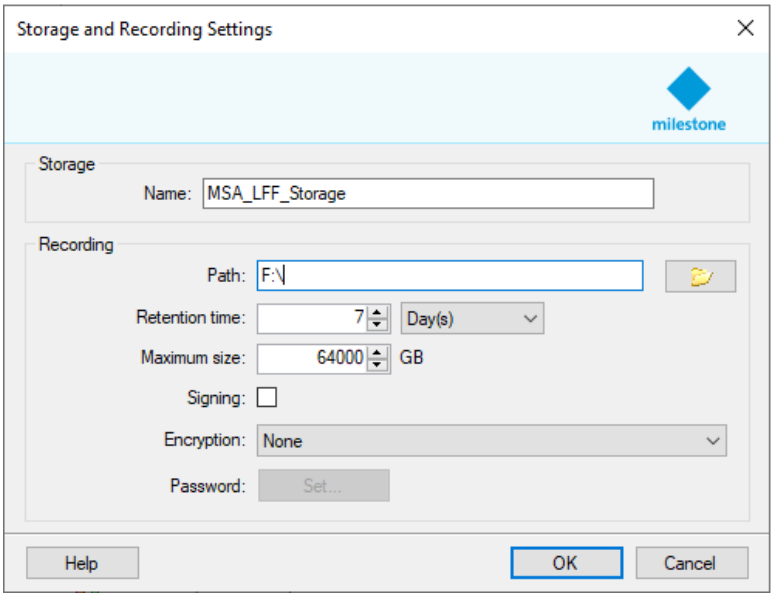

FIGURE 2. XProtect "Storage and Recording Settings"

MILESTONE VERIFICATION PROCESS

The verification process is used by solution partners to test their product while running Milestone XProtect VMS with a given number of simulated cameras. The process generates proof of a stable XProtect environment. For the verification, Milestone suggests using a 1920x1080 8 Mb/second video at a frame rate of 30 frames per second (FPS). No motion detection was used for our testing.

Verification testing

The targets and limits for the test to pass the verification are:

- H264 for VideoCodec
- Camera 1920x1080 8 Mb
- 30 frames per second (FPS)
- The system must record video constantly—no motion detection.
- The environment must run in a stable state for a minimum of seven days.
- Microsoft Windows Performance Monitor must be active and log the specified counters for the duration of the test.
- The limits expected from a stable system:
  - Network loads, both receiving and sending, should not exceed 70% of available bandwidth.
  - Processor load should not exceed 70%.
  - Percent Committed bytes should not exceed 70%.
  - Disk latency, reading or writing, should not exceed 200 milliseconds.
  - Medias lost/sec should not exceed 1%.

Verification environment overview

The Milestone XProtect Management Server and XProtect Recording Server were installed on separate HPE ProLiant DL380 servers. An HPE MSA 2060 10GbE iSCSI LFF storage array was used to present a volume to the XProtect Recording Server. This volume served as the destination for live video recordings The Milestone Stable FPS device driver was also installed on the XProtect Recording Server. This device driver uses recorded video to emulate system, network, and storage load.

The verification environment consisted of the following key components, shown in FIGURE 3.

HPE ProLiant DL380 server configured as the Milestone XProtect Management Server

The system ran Windows Server 2019 Standard Edition and Milestone XProtect Management Server software was installed as an all-in-one appliance, which installed the Management Server, Microsoft SQL Server Express, Event Server, and Log Server. The install also included the Management Client and Smart Client software. The server was configured with one 10GbE network interface and had one assigned static IP address, which was connected to the management network.

HPE ProLiant DL380 server configured as the Milestone XProtect Recording Server

The system ran Windows Server 2019 Standard Edition and Milestone XProtect Recording Server software was installed. The Milestone StableFPS device driver was also installed on this server. The server was configured with one dual port 10GbE network interface card. Each port was assigned a static IP address. These connections supported access to the volume presented from the HPE MSA 2060 storage array via the iSCSI connections. These connections also supported management functions between this server and the Milestone XProtect Management Server.

FIGURE 3 provides a high-level architectural view of the server and storage setup deployed in the HPE lab for conducting the verification test.

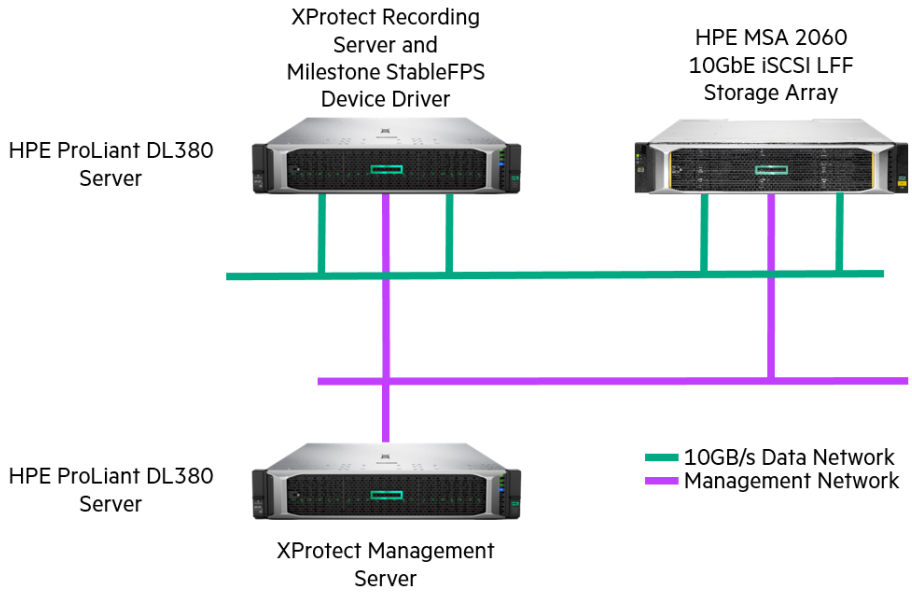

FIGURE 3. High-level architectural view of the verification setup

VERIFICATION RESULTS

Hewlett Packard Enterprise submitted the execution results to Milestone. Milestone confirmed that the HPE MSA 2060 storage array is compatible with Milestone XProtect Corporate 2020 R3 as live recording storage. The verification test was performed using 100 cameras. If additional hard disks are added to the HPE MSA 2060 storage array, more cameras can be added to the environment.

The HPE MSA 2060 storage array meets the recording storage performance requirements for live recording of video data. It preserves the integrity of video data and can be configured to provide video retention for a period of time—meeting organizational, legal, and regulatory requirements.

BEST PRACTICES AND CONFIGURATION GUIDANCE

Camera throughput drives performance

Throughput per camera is the determining factor for the performance and capacity requirements of the solution. Work with the camera vendor to understand the average image size (determined by desired image resolution and compression factor). Milestone offers a storage calculator to estimate disk space and bandwidth usage for your Milestone XProtect installation.

Separate OS and XProtect VMS volumes

With the Recording Server it is important to use separate physical volumes (different partitions on the same disk is not good enough) for the Windows OS and the XProtect VMS recordings.

NOTICE

If the same drive is used for both the Windows OS and XProtect VMS media data, at times Windows will perform various operations that require a large percentage of disk access. This will potentially impact the XProtect VMS recording performance and lead to lost recordings.

Windows search indexing

Windows search indexing can impact recording performance when it indexes the media database files. Therefore, it is recommended to either disable Windows search indexing or change its configuration so it does not index the volumes storing the XProtect VMS media database files.

Virus scan

A virus scan running on the XProtect VMS Recording Server could interfere with recording performance as it scans the volume. For detailed information on how to properly configure virus scan and how to exclude folders and file types, see the XProtect VMS – Administrator manual.

Windows update and maintenance

To ensure proper XProtect VMS operation while keeping Windows properly updated, the following is recommended:

- Windows Update must be configured to download updates, but not automatically install them. Rather, a schedule must be defined for manually installing the updates at a time that minimizes impact on the XProtect VMS operations.
- When the server running the Recording Server requires a reboot or needs to be shut down, or if the XProtect VMS Recording Server needs to be stopped for some reason, it is important to allow the Recording Server service time to close the media databases and stop normally by itself.

NOTICE
The service should never be terminated using the Windows Task Manager as it could leave the media database in a corrupted state.

Use the Windows Performance Monitor for key counters. The Windows Performance Monitor utility is a simple way to observe the workflow on the Recording Server. Counters that were monitored:

- Network interface—bytes received/sec, bytes sent/sec, and current bandwidth
- Processor Information—% Processor Time
- Logical disk (HPE MSA volumes) —average disk sec/read and write, disk read and write bytes/sec, and free megabytes
- Video Recording Server database—bytes/sec, media/sec, and average GOP write time (ms)
- Video Recording Server drivers—bytes/sec and media/sec
- Video Recording Server pipeline—medias in queue and media lost/second

Synchronize server times

It is very important that time be synchronized across all servers in the video surveillance system. For example, the Management Server might not be able to authorize a Recording Server if the clocks on the two systems are not synchronized. Milestone recommends setting up an NTP server in your configuration to ensure all server clocks are synchronized.

SUMMARY

To complete a video surveillance solution, a scalable, simple-to-manage, secure, and affordable storage solution is a must. The HPE MSA 2060 storage array is an excellent storage platform for use with Milestone XProtect Corporate. It delivers the performance, availability, and scalability demanded by Milestone XProtect Corporate.

For dynamic workloads, the HPE MSA 2060 storage array provides the flexibility to scale both performance and capacity to meet video surveillance workloads. Start small and scale as needed with any combination of solid-state drives (SSDs), high-performance enterprise SAS HDDs, or low-cost midline SAS HDDs.

Higher resolution cameras are being used to capture more data. These high-resolution videos require greater performance and larger storage capacity. More information is also being captured by increasing the number cameras by using low-cost IP cameras. As more cameras are added, more storage capacity is needed. With a flexible, modular architecture that facilitates future growth, the HPE MSA storage portfolio supports both LFF and SFF expansion enclosures to expand your storage capacity as needed. Up to nine expansion enclosures can be added to the HPE MSA 2060/2062 array.

The HPE MSA 2060 10GbE iSCSI LFF storage array has successfully completed the verification process for use with Milestone XProtect Corporate.

RESOURCES, CONTACTS, OR ADDITIONAL LINKS

HPE MSA Storage (to further explore the features and benefits of HPE MSA Storage)
hpe.com/us/en/storage/msa-shared-storage.html

HPE MSA 2060 Storage for Milestone XProtect solution brief
hpe.com/psnow/doc/a00120945enw

HPE MSA Gen6 Virtual Storage Technical Reference Guide
hpe.com/psnow/doc/a00103247enw

Sizing solutions for the HPE MSA Gen6 Storage family
ninjaonline.ext.hpe.com/

HPE ProLiant DL servers
hpe.com/us/en/servers/proliant-dl-servers.html

Hewlett Packard Enterprise PointNext Services
hpe.com/us/en/services/pointnext.html

Hewlett Packard Enterprise at Milestone MarketPlace
milestonesys.com/marketplace/hewlett-packard-enterprise/

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