Reference Architecture

EMC STORAGE FOR MILESTONE XPROTECT CORPORATE

EMC VNX and EMC Isilon

- Milestone multitier video surveillance storage architectures
- Design guidelines for Live Database and Archive Database video storage

EMC Solutions Group

September 2013

EMC² PROVEN SOLUTIONS

EMC²

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

The information in this publication is provided as is. EMC Corporation makes no representations or warranties of any kind with respect to the information in this publication, and specifically disclaims implied warranties of merchantability or fitness for a particular purpose.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license.

For the most up-to-date listing of EMC product names, see EMC Corporation Trademarks on EMC.com.

All trademarks used herein are the property of their respective owners.

Part Number H12078

Contents

Reference architecture overview

Document purpose

This document describes the reference architecture of an EMC video storage infrastructue solution for Milestone XProtect Corporate 2013. It defines the supported EMC storage platforms, their purpose in the solution design, and supported protocols. The document is intended to be used in conjunction with *Technical Notes: EMC Storage for Milestone XProtect Corporate—EMC VNX and EMC Isilon,* which provides information about system design, sizing, and configuration.

Solution purpose

The purpose of this reference architecture is to demonstrate the functionality, multitier architecture, and scalability offered by the following EMC storage platforms with Milestone XProtect Corporate 2013: EMC® VNX®, EMC Isilon®, and LenovoEMC® px series.

The EMC Physical Security Lab validated Milestone XProtect 2013 video surveillance management with the EMC storage platforms, including:

- Fibre Channel (FC) and iSCSI block-based storage for the XProtect Live database (Live DB) and Archive database (Archive DB), provided by the VNX series and by the LevonoEMC px series for small and remote offices.
- EMC Isilon storage, via SMB2[1], for the Archive DB when using direct-attached storage (DAS), FC, and iSCSI environments for the Live DB. EMC Isilon scale-out storage enables dynamic scalability and ease of use for Archive DB video storage.

The reference architecture validates the performance of the solution and provides guidelines for building similar solutions. The document is not a comprehensive guide to every aspect of this solution.

The business challenge

Video surveillance storage requirements can vary significantly, especially in highly distributed environments. The smallest installations can be satisfied by internal server storage or by lower capacity arrays like EMC VNXe® and products from LenovoEMC. Larger centralized installations can benefit from the use of virtualization for consolidation purposes. For large-scale multi-petabyte requirements, Isilon scale-out storage can offer high scalability and storage density for XProtect archiving.

For this solution, we[2] tested various storage scenarios, including FC, iSCSI, and SMB2, to determine the EMC storage platforms and associated network protocols best suited to each XProtect video database tier.

Because video surveillance is a constant write application, we performed additional validation and testing to determine best practices and provide configuration guidelines for partners and field sales teams. This validation and testing takes into

[1] The Server Message Block (SMB) Protocol Versions 2 and 3, referred to as SMB2 in this document, is an extension of the original SMB Version 1.0 Protocol, which defines extensions to the Common Internet File System (CIFS) Protocol.

[2] In this guide, "we" refers to the EMC Physical Security Lab team that validated the solution.

account normal application processes, planned storage maintenance, and unplanned storage array component failures.

This Reference Architecture document discusses:

- The available storage protocols and which are appropriate for each storage tier
- EMC storage array positioning, with XProtect configured as a multitier video storage solution based on Milestone best practices

The companion Technical Notes, *EMC Storage for Milestone XProtect Corporate—EMC VNX and EMC Isilon*, discusses the validation and testing in more detail, including system design, sizing, and configuration.

The technology solution

This solution demonstrates how to use EMC storage platforms to provide the storage resources for a multitier XProtect video surveillance implementation.

Note: Although not Milestone best practice, a single tier solution may be implemented.

Planning and designing the storage infrastructure is a critical step due to the XProtect requirement for both Live DB and Archive DB tiers for video surveillance data. Each network-attached (NAS) storage tier must be able to accommodate large amounts of large block sequential data, even during times when storage paths are crippled (for example, during disk rebuilds, network issues, and maintenance). Otherwise, loss of video will occur.

To provide predictable performance for each tier of the XProtect video storage infrastructure, the storage must be able to handle sustained, high-bandwidth video feeds from servers without dropping video frames or introducing high response times for users reviewing the video. Designing for this workload involves deploying Live DB storage (Tier-1 storage) on EMC FC or iSCSI arrays or, for smaller environments, LenovoEMC iSCSI or DAS (internal server storage). The Live DB read performance is also a design consideration for moving the video data from the Live DB to the Archive DB (Tier-2 storage), as discussed in Live DB and Archive DB.

This test configuration includes the following components:

- EMC VNX5300™ and VNX7500™ storage arrays
- Isilon X400 five-node cluster
- Lenovo EMC px12 Network Storage Array[3]
- Eight Milestone XProtect Corporate 2013 virtualized recording servers
- 512 video cameras at 0.5 MB/s for each camera
- Multipathing and load balancing by EMC PowerPath®/VE
- VMware vSphere virtualization—ESXi 5.1 Update 1 hosts were used for implementing the Milestone XProtect Corporate 2013 servers

[3] Formerly known as Iomega® StorCenter™ px12.

Solution architecture

Architecture diagram

This solution validates the Milestone XProtect video surveillance infrastructure enabled by EMC storage. The architecture includes the optional VMware components, VNX, Isilon, and Lenovo EMC px series storage arrays, and the Milestone XProtect Corporate video management software (VMS). The solution validation involved building various storage scenarios, including FC, iSCSI, and SMB2 implementations.

Figure 1 depicts the overall physical architecture of the solution.

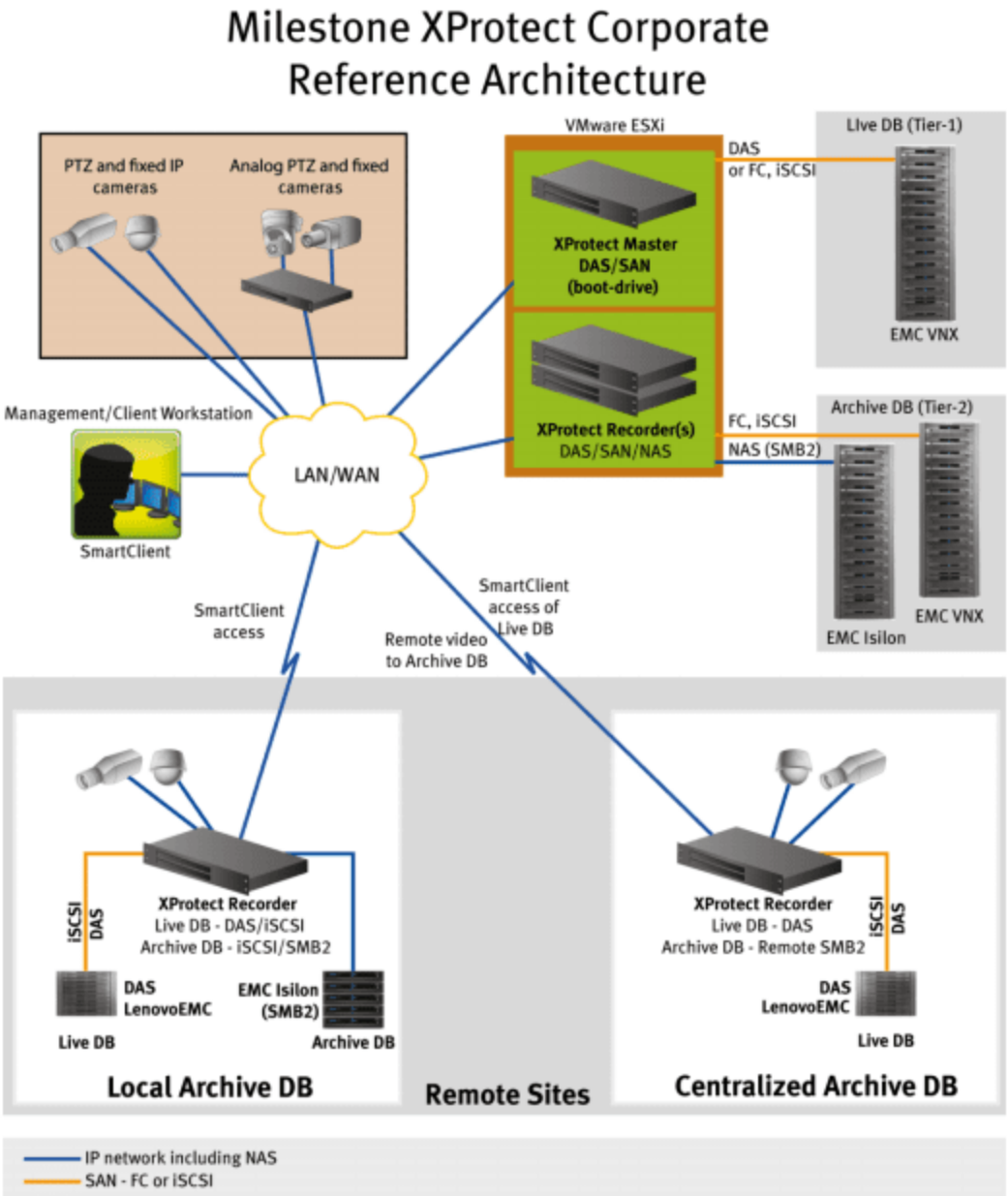

Figure 1. Solution architecture

Note: Test environment remote links are via local LAN.

Storage protocols

As illustrated in Figure 1, many storage protocols can be used in XProtect implementations. Table 1 lists the EMC storage platforms and associated network protocols determined by testing to be suitable for each XProtect video database storage tier.

Table 1. Storage and protocols for XProtect database tiers

Array/cluster	Database	Protocol	Verified
DAS	Live DB	DAS	Yes (by Milestone)
VNX series	Live DB	FC	Yes (functional test)
VNX series	Live DB	iSCSI	Yes (extrapolated[4])
Lenovo EMC px series	Live DB	iSCSI	Yes (functional test)
DAS	Archive DB	DAS	Yes (by Milestone)
Isilon clusters*	Archive DB	SMB2	Yes
VNX series	Archive DB	FC	Yes (extrapolated[4])
VNX series	Archive DB	iSCSI	Yes

* Isilon OneFS® 7.0 or greater must be used.

The EMC storage platforms listed in Table 1, with the exception of the Lenovo EMC px12, are suited for either centralized storage or distributed storage. The px12 can be a good candidate for the Live DB on small, distributed sites.

Hardware resources

Table 2 lists the hardware resources used to validate this solution.

Table 2. Solution hardware

Hardware	Quantity	Configuration	Notes
EMC VNX5300	1	Disk array enclosures (DAEs) configured with: • 3 TB 7.2k near-line SAS disks	VNX storage used for the Live DB (Tier-1) and the Archive DB (Tier-2)
EMC VNX7500	1	DAEs configured with: • 3 TB 7.2k near-line SAS disks	VNX storage used for the Live DB (Tier-1)
EMC Isilon X400	5	Each Isilon node configured with: • 1 TB 7.2k near-line SAS disks	Isilon storage used for the Archive DB (Tier-2)
Lenovo EMC px12	12	• 1 TB 7.2k enterprise class drives • 1 12-disk pool	LenovoEMC storage used for the Live DB (Tier-1)
Blade server	8	Four 8-core Intel Xeon 7500: • 128 GB RAM • 8 GigE network adaptors	Blade servers running ESXi 5.1 Update 1
Server	2	Various ESXi servers used for traffic generation	Video traffic generators

[4] Extrapolated due to IP network bandwidth limitations in the test environment.

Hardware	Quantity	Configuration	Notes
Ethernet switch	1	10 GbE and GigE	Infrastructure Ethernet switch
Storage area network (SAN) switch	2	4 x 4 Gb/s switches	For dual FC fabric
Windows 7	1	1 vCPU, 1.5 GB RAM, 20 GB virtual machine disk (VMDK), 1 network interface card (NIC)	Laptop used for video review using a 3D graphic card

Software resources

Table 3 lists the software resources used in this solution.

Table 3. Solution software

Software	Configuration	Notes
Milestone XProtect	Corporate 2013	Pre-GA
EMC VNX Operating Environment for Block	Release 32	Operating environment for EMC VNX5300 and EMC VNX7500
EMC Isilon OneFS	Version 7.0.5	Operating system for EMC Isilon X400
LenovoEMC LifeLine™	Version 4.0.2.8251	Operating system for Lenovo EMC px12
VMware vSphere ESXi	5.1 Update 1	Hypervisor for server virtualization
EMC PowerPath/VE	5.7	Multipathing and load balancing for block access
Microsoft Windows Server 2008	R2 64-bit	Operating system for the server environment
EMC Unisphere®	1.2	Management tool for the EMC VNX family
VMware Tools	8	Enhancement tool for the virtual machine

VMware vSphere minimum requirements

The minimum system requirements for VMware vSphere are as follows:

- VMware ESX/ESXi 5.0 or later
- Four-core 2 GHz processors
- Intel 31xx, 33xx, 52xx, 74xx, or AMD 13xx, 23xx, 84xx series of processors (or later) for VMware Fault Tolerance (FT)—we did not test VMware FT for this solution
- 4 GB of memory for each vSphere guest
- 4 vCPU defined to the vSphere guests
- EMC PowerPath/VE recommended

Visit the VMware Compatibility Guide web page for a list of compatible hardware.

Key components

Introduction

This section briefly describes the key components used in this solution, including:

- EMC VNX storage platform
- EMC Isilon storage platform
- LenovoEMC storage platform
- Milestone XProtect Corporate VMS
  - XProtect management server
  - XProtect recording/failover server
  - XProtect Smart Client

In addition, EMC PowerPath/VP provides multipathing and load balancing for block access and VMware vSphere provides the optional virtualization platform.

EMC VNX storage platform

The EMC VNX family is optimized for virtual applications delivering industry-leading innovation and enterprise capabilities for file, block, and object storage in a scalable, easy-to-use solution. This storage platform combines powerful and flexible hardware with advanced efficiency, management, and protection software to meet the demanding needs of today's enterprises. The VNX family is powered by Intel Xeon processors for intelligent storage that automatically and efficiently scales in performance, while ensuring data integrity and security.

The VNX series is designed to meet the high-performance, high-scalability requirements of midsize and large enterprises. The VNXe series is designed for the IT manager in smaller environments.

The VNX series supports the following features:

- Next-generation unified storage, optimized for virtualized applications
- Capacity optimization features including compression, deduplication, thin provisioning, and application-centric copies
- High availability, designed to deliver five 9s (99.999 percent) availability
- Automated tiering with FAST VP™ (Fully Automated Storage Tiering for Virtual Pools) and FAST™ Cache that can be optimized for the highest system performance and lowest storage cost simultaneously
- Multiprotocol support for file, block, and object with object access through EMC Atmos® Virtual Edition (Atmos VE)
- Simplified management with EMC Unisphere for a single management interface for all NAS, SAN, and replication needs
- Up to three times improvement in performance with the latest Intel Xeon multicore processor technology, optimized for Flash

This solution uses a VNX array for both the Live DB and Archive DB tiers.

EMC Isilon storage platform

EMC Isilon Video Surveillance solutions, along with leading video management software such as XProtect, provide video surveillance, security, and data storage. EMC Isilon scale-out NAS can manage surveillance data from a range of sources for scalable, efficient storage solutions that address large amounts of video data.

Isilon Video Surveillance solutions are simple to install, manage, and scale to virtually any size, regardless of how your surveillance needs change in the future.

Isilon scale-out NAS provides unparalleled scalability for your video surveillance data storage needs. With the ability to scale to over 15 PB (petabytes) of capacity per cluster in a single file system, it can accommodate large-scale increases in the video quality per camera, or bringing more cameras online, by dynamically expanding video surveillance storage.

This solution uses Isilon scale-out NAS for the Archive DB tier.

LenovoEMC storage platform

The Lenovo EMC px12 network storage array is a powerful network storage solution offering the highest level of performance and advanced data protection for small- to medium-sized businesses and the distributed enterprise. Powered by LenovoEMC storage technology, the px12 is ideal for production data stores, server virtualization, backup-to-disk target, and video surveillance.

This solution supports using the px12 for Live DB implementations for small, distributed sites.

Milestone XProtect Corporate VMS

XProtect Corporate is powerful IP video management software designed for large-scale, high-security deployments. Its single management interface enables efficient management of the system, all connected cameras, and security devices, regardless of the system size or if it is distributed across multiple sites.

This solution uses these XProtect components:

- XProtect management server
- XProtect recording/failover server
- XProtect Smart Client

XProtect management server

The Management Application is XProtect Corporate's user interface to the management server and provides the following functions:

- Managing recording servers, users, and devices
- System configuration wizards, automated device discovery, smart bulk configuration, event/alarm configuration, and management of user access privileges
- Multi-stage storage schemes, which enable video migrations from primary storage (Live DB) to secondary storage (Archive DB) or from secondary storage to secondary storage

- Hosting and controlling access from XProtect clients
- Logging

XProtect recording/failover server

The recording/failover server provides the following functions:

- Storing and retrieving video and audio from MJPEG, MPEG4, MxPEG, and H264 devices
- Standby for a single or a group of recording servers, when configured as a failover server
- Edge Storage capability, which enables cameras to write to an Edge Storage device if the recording server is unreachable
- Processing events, alerts, and actions

XProtect Smart Client

XProtect Smart Client is a full-featured remote client, which provides these daily functions:

- Simultaneous live view and playback of 100 cameras
- Intelligent Pan Tilt Zoom (PTZ) camera contol
- Advanced search capabilities
- Export of evidence material

Milestone XProtect Corporate tiered infrastructure

Introduction

This section briefly describes the Milestone XProtect Live DB and Archive DB as well as implementation options with EMC storage.

Milestone XProtect Corporate architecture

Milestone XProtect Corporate uses a distributed architecture with a management server as the core server. The management server can be centrally located or distributed to multiple sites and connected using the Milestone Federated Architecture. The total number of recording servers is unlimited.

This reference architecture focuses on implementing a single management server, with recording servers being either local or remotely distributed. The single management server implementation is the unit construct for a Milestone federated implementation.

Figure 2 shows a simple Milestone XProtect Corporate architecture. You can achieve scaling by expanding the number of servers in each site in addition to combining many sites into a federated architecture.

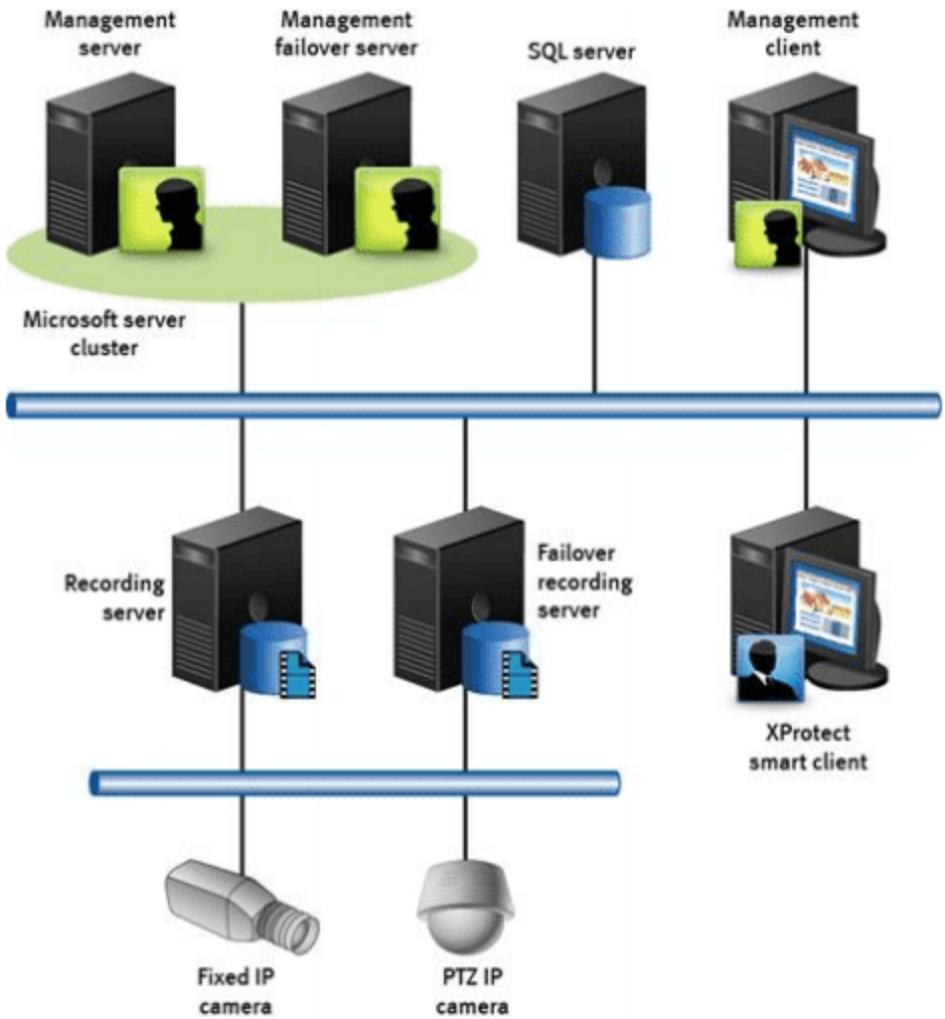

Figure 2. Milestone XProtect Corporate architecture

Live DB and Archive DB

Live DB and Archive DB storage tiers

Milestone XProtect Corporate is designed for a tiered storage implementation. The Live DB is the first tier of storage and is intended to retain video recordings for periods of from 1 hour to 24 hours, depending on the implementation requirements. The Archive DB is the second tier of storage, intended for long-term storage. Surveillance video generally has retention times ranging from a few weeks to many months. You can easily size and configure the Archive DB to meet the installation's video retention needs as well as its retrieval performance needs.

Live DB to Archive DB data movement

As shown in Figure 3, IP video moves from the source camera through the XProtect recording server onto the Live DB (Tier-1) storage. The Live DB storage can be either DAS or block storage attached over a SAN via FC or iSCSI.

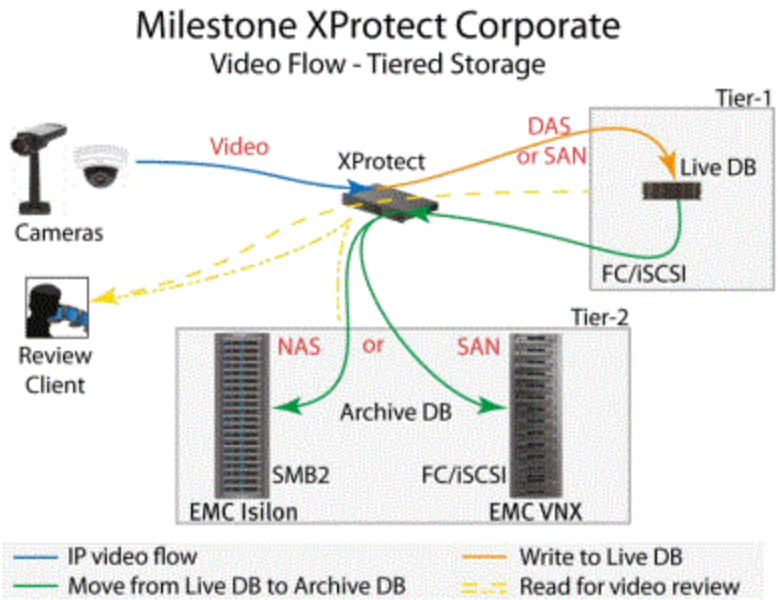

Figure 3. Milestone XProtect Corporate video flow and tiered storage

During each archive period, video is moved from the Live DB to the Archive DB long-term video repository over a NAS IP network, an IP-based iSCSI network, or an FC SAN.

Live DB storage

Depending on the number of XProtect recording servers, physical versus virtualized hosts, pre-existing infrastructure, or other operational considerations, the Live DB storage can be DAS in a RAID configuration, an FC-attached VNX array, or an iSCSI-attached VNX array. For small, distributed sites, the px12 can be a suitable option.

Archive DB storage

In pre-XProtect Corporate 2013 releases, the Archive DB is restricted to DAS or SAN (FC or iSCSI) storage. With XProtect Corporate 2013 (and later versions), enhancements to the XProtect archive process enable efficient use of EMC Isilon scale-out storage clusters. As shown in Figure 3, the Archive DB storage can now be Isilon NAS or VNX using FC or iSCSI.

Conclusion

This Milestone XProtect storage solution creates a tiered storage infrastructure with Tier-1 storage (Live DB) and Tier-2 storage (Archive DB). The solution was easily tailored to EMC Isilon scale-out NAS storage as well as EMC VNX storage.

This reference architecture demonstrates the EMC storage platforms and corresponding protocols best suited for each XProtect video database tier:

- The Live DB can be either DAS or EMC VNX or LenovoEMC block storage arrays.
- Due to performance enhancements in the Milestone XProtect's archive process, starting with XProtect Corporate 2013, the Archive DB can now be block- or file-based. Therefore, the Archive DB can be either SMB2-attached Isilon scale-out NAS or traditional block storage provided by a VNX storage array.

References

EMC documentation

For additional information, see the documents listed below:

- *Technical Notes: EMC Storage for Milestone XProtect Corporate—EMC VNX and EMC Isilon*
- *White Paper: Introduction to the EMC VNX Series—A Detailed Review*

Other documentation

For additional information on related topics, see the documents listed below:

- *XProtect Corporate Administrator's Getting Started Guide*
- *XProtect Corporate Administrator's Manual*
- *XProtect Smart Client User's Manual*