

ARCHITECTURE FOR EMC STORAGE AND MILESTONE XPROTECT CORPORATE

EMC VNX and EMC Isilon

EMC Solutions

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Table of contents

Reference architecture overview	4
Document purpose	4
Solution purpose	4
The business challenge.....	4
The technology solution.....	5
Executive summary	6
Solution overview	6
Key results	6
Architectural overview of Milestone XProtect Corporate.....	7
Overview.....	7
XProtect Corporate servers and services.....	7
Milestone XProtect Corporate architecture	8
EMC storage considerations for Milestone XProtect Corporate	9
Overview.....	9
Video flow.....	9
Live DB.....	10
Archive DB	10
Storage considerations and recommendations	11
Conclusion.....	13
Summary	13
Findings.....	13
References.....	14
EMC documentation.....	14
Other documentation.....	14

Reference architecture overview

Document purpose This document describes the reference architecture of an EMC video storage infrastructure 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[®] and EMC Isilon.

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 for small and remote offices.
- EMC Isilon storage, via SMB2¹, 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[®]. 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, we² 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 account normal application processes, planned storage maintenance, and unplanned storage array component failures.

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.

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 [Error! Reference source not found.](#)

Executive summary

Solution overview This solution uses EMC® VNX® and EMC Isilon® storage platforms with Milestone XProtect Corporate 2013 R2 release video management software (VMS).

This Technical Notes document provides guidelines and recommendations for storage platform positioning and system sizing. The document focuses particularly on these storage design considerations:

- Storage bandwidth

- Maximum number of recording servers per storage array or cluster

This document is a companion paper to the: *EMC Storage for Milestone XProtect Corporate—EMC VNX and EMC Isilon Reference Architecture*, which describes the solution architecture and discusses the available storage protocols for each storage tier in multitier XProtect environments.

Key results

This Technical Notes document addresses these key results from the solution testing:

- Maximum Milestone XProtect 2013 recording server bandwidth with the Live database (Live DB) on VNX storage

- Maximum Milestone XProtect 2013 R2 recording server bandwidth with the Live database (Live DB) and Archive database(Archive DB) implemented on the same EMC VNX5800™ storage array

- Maximum bandwidth per Isilon X400 and Isilon NL400 node for the Archive database (Archive DB)

- Isilon X400 and Isilon NL400 configuration options, including SmartConnect™ and SmartQuotas™

- XProtect recording server configuration recommendations

Architectural overview of Milestone XProtect Corporate

Overview

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 number of recording servers is unlimited.

XProtect Corporate servers and services

Table 1 lists XProtect Corporate servers, services, and their functions.

Table 1. XProtect Corporate servers and services

XProtect server/service	Functions
Smart Client	Full-featured remote client, which provides these daily functions: Simultaneous live view and playback of 100 cameras Intelligent Pan Tilt Zoom (PTZ) camera control Advanced search capabilities Export of evidence material
Remote Client	Provides live view and playback of up to 16 cameras and performs most daily operations.
Matrix	Enables up to four live video streams to be sent to an XProtect Smart Client computer.
Recording/failover server	Provides the following functions: Storage and retrieval of 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
Management server	The Management Application is the XProtect Corporate 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 the Live DB to the Archive DB Hosting and controlling access from XProtect clients Logging

Milestone XProtect Corporate architecture

Figure 1 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.

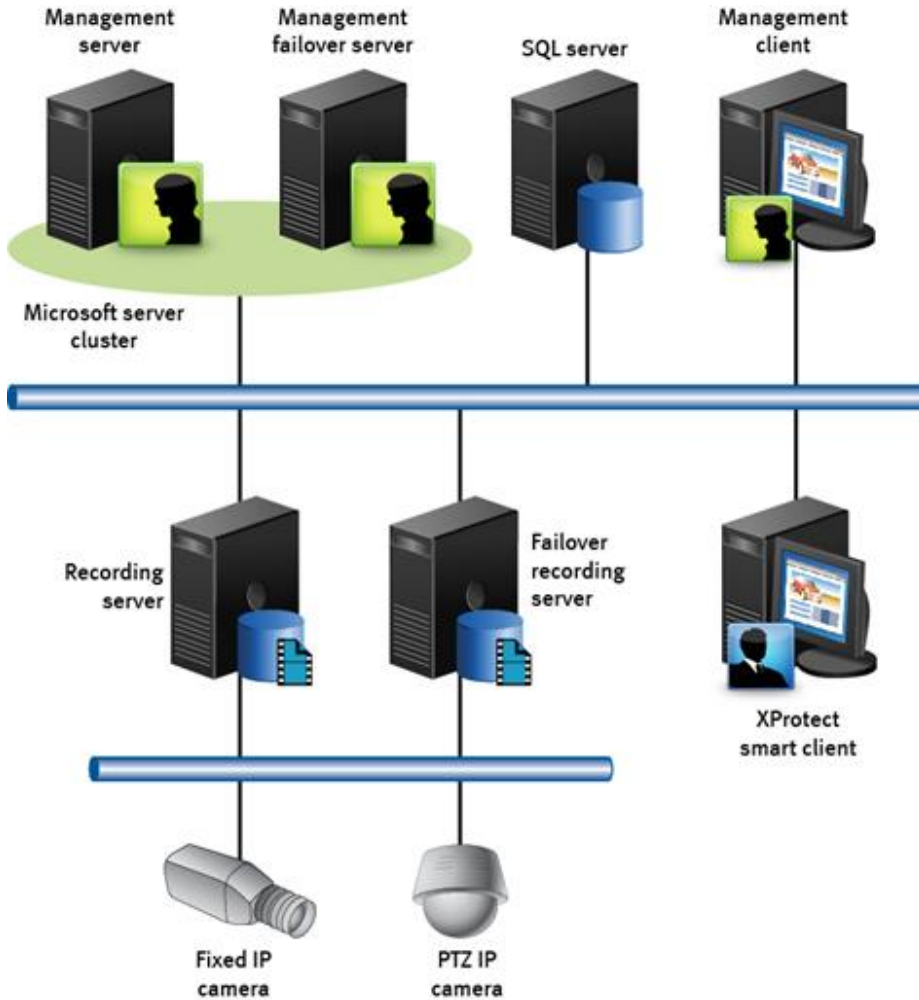


Figure 1. Milestone XProtect Corporate architecture

EMC storage considerations for Milestone XProtect Corporate

Overview

To successfully design and implement a Milestone XProtect Corporate system, you need to consider many aspects of the system, including networks, cameras, storage, and more. This section presents storage considerations and recommendations you should take into account when deploying a Milestone XProtect Corporate system on EMC storage platforms.

This reference architecture includes EMC VNX and VNX-VSS100 storage platforms. You can integrate EMC storage platforms and array sizes with Milestone XProtect to provide a physical security solution to meet the requirements of applications of any size.

EMC VNX supports unified storage solutions. Unified storage topologies include FC, iSCSI, and SMBx (CIFS). The VNX can be configured as block storage only (FC and iSCSI) or unified storage to include SMB protocols.

The VNX-VSS100 is a purpose built Video Surveillance Storage platform. This is an enterprise-class, block-only array supporting FC and iSCSI built on the proven VNX platform. As a low cost, high performance and highly available array it is ideally suited for remote locations or smaller centralized sites.

Video flow

There are many EMC storage platform options for each storage tier. The Live DB can be DAS, FC or iSCSI block storage. The single tier implementation is the simplest implementation and uses only the Live DB.

Figure 2 shows the LiveDB-only implementation using a VNX or VNX-VSS100 array. The Live DB can be DAS if the storage requirement is minimum. As the video storage requirements increase, the Live DB should be placed on a VNX or VNX-VSS100.

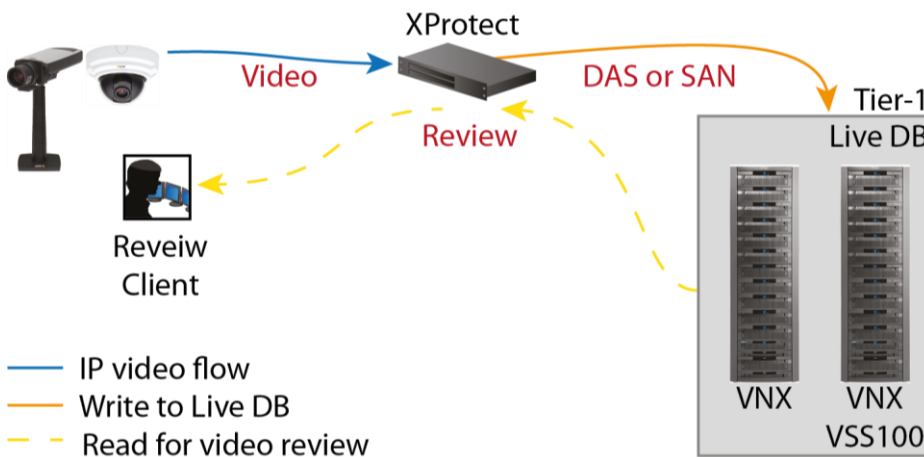


Figure 2. Video flow in a single tier XProtect environment

Figure 3 shows a two-tier implementation where the video traffic flow is using DAS or SAN, and NAS. The Live DB is on DAS or SAN, and the Archive DB is on Isilon NAS or VNX.

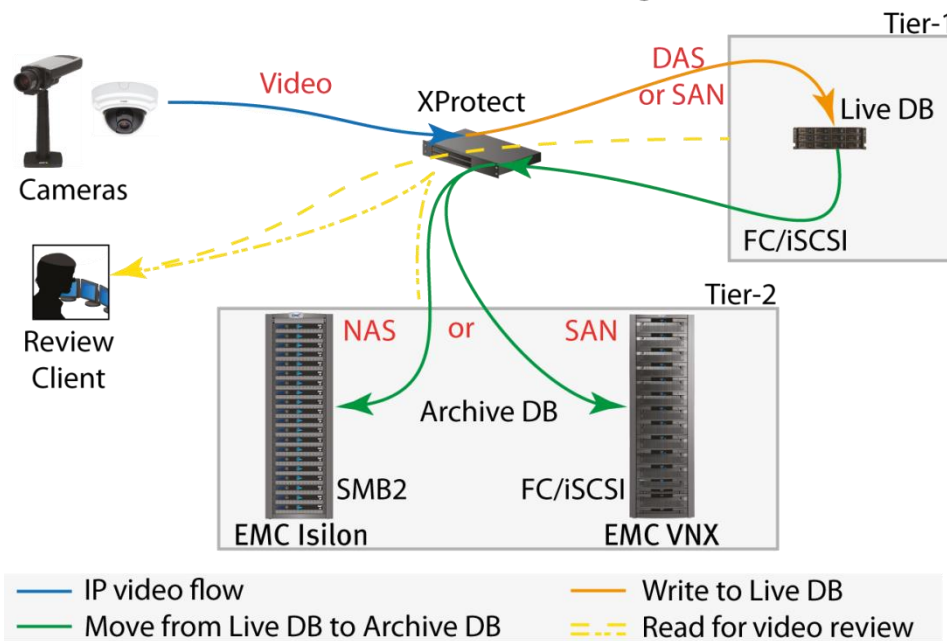


Figure 3. Video flow in a tiered XProtect environment

Video is initiated at the camera and XProtect initially places that video in the Live DB. Milestone recommends a retention period of 2 hours to 24 hours for video in the Live DB, as outlined in [Retention periods](#).

XProtect moves video files at rest from the Live DB storage tier to the Archive DB storage tier at regular intervals. The Archive DB stores each video file until that file's full retention time has expired.

For Archive DB the EMC Isilon Scale-Out storage provides enterprise class network attached storage (NAS) for centralized or decentralized enterprise requirements. An Isilon cluster is modularly scalable from terabytes to petabytes of storage.

Live DB

In a multitier implementation, the XProtect Live DB read rate is greater than 50 percent read and less than 50 percent write. The Live DB works best with the server's internal DAS or using external FC or iSCSI storage arrays, such as the VNX series.

Internal DAS storage is ideal for small implementations with a few servers. As an installation grows, the need to optimize storage for reliability, scalability, manageability, and rack space increases. In larger environments, and in virtualized server environments, VNX arrays in a SAN (FC or iSCSI) configuration are more practical for the Live DB.

Archive DB

The Archive DB is the long-term storage for XProtect and typically constitutes the majority of the storage capacity requirement. Moving video from the Live DB to the Archive DB involves many activities, including optimizing index files for the larger video repository, and moving the files.

For Archive DB, XProtect Corporate 2013 and later supports DAS, SAN, and NAS storage. In releases prior to XProtect Corporate 2013, the Archive DB is restricted to

DAS or SAN (FC or iSCSI) storage. Changes incorporated into XProtect Corporate 2013 expand the Archive DB storage protocol options to include NAS

Storage considerations and recommendations

Live DB and Archive DB

The Live DB can be a VNX or VNX-VSS100 storage array in a SAN configuration. The Archive DB can be an Isilon scale-out cluster in a NAS configuration or a VNX or VNX-VSS100 storage array in a SAN configuration.

- With the VNX, the Archive DB is not required. If tiered storage is required, both the Live DB and Archive DB can use either FC or iSCSI protocols. For iSCSI, you can use GbE or 10 GB NICs.
- When using smaller VNX arrays with iSCSI, we recommend that the Live DB and Archive DB reside on different arrays.
- When using FC, Live DB and an FC Archive DB can co-exist on the same VNX array.
- Arrays such as the VNX5800 can be used with iSCSI for both the Live DB and Archive DB.
- VNX storage can be used for:
 - Live DB only
 - Live DB as the first tier in a tiered implementation
 - Archive DB as the second tier in a tiered implementation
- For Isilon scale-out storage, NAS (SMB2 protocol) can be used with Isilon OneFS 7.0 or later. The OneFS protection scheme should be +2:1 (or greater) for installations up to 10 nodes, N+2 for up to 20 nodes, and N+3 for more than 20 nodes. We tested +2:1 on our five-node clusters.
- You can use GigE or 10 GB network interface cards (NICs). Test results for this solution are based on both GigE and 10 GB interfaces on the Isilon cluster. XProtect by default moves video from the Live DB to the Archive DB using a single thread. With NAS (SMB2 protocol), the Archive DB thread count can be increased to enable parallel video file moves within the archive process.
- EMC recommends that you avoid using Isilon storage for the LiveDB storage tier.
- Although it is possible to use the NFS datastores for the Milestone boot drive in a VMware environment, this configuration with Milestone XProtect has not been tested in the EMC Lab.

Isilon SmartConnect

You can configure Isilon SmartConnect to provide load balancing of recording servers across nodes in an Isilon cluster. With SMB2, the load balancing occurs at connection initiation with the Isilon cluster.

Isilon SmartQuotas

When using the Isilon cluster, EMC recommends that you use SmartQuotas to protect the storage from a runaway application or misconfigured recording server. When

configuring SmartQuotas, you must use a Hard Quota. SmartQuotas also presents to each Milestone XProtect Corporate server the utilization information based on its assigned quota and not the entire file system.

SmartQuotas allows administrators to limit the storage used for each recording server and presents to the server a view of available storage based on the assigned quota. SmartQuotas allows each recording server to calculate its available disk space and react correctly. Without SmartQuotas, the Security Center administrator must anticipate the total write rate to the cluster and adjust **Min Free Space** on each recording server accordingly. A miscalculation could result in lost video. SmartQuotas resolves the issues caused by manual calculations.

Retention periods

In a multitier implementation, Milestone recommends that the Live DB retention period is limited to no more than 24 hours, with a higher frequency preferred. Milestone recommends a minimum retention period of two hours for the Live DB, although one hour is the minimum supported.

The Archive DB retention period depends on business requirements and can range from a few weeks to many months. The archived video index files are not verified upon recording server restart, so server restart is not a consideration for the Archive DB.

Conclusion

Summary

We performed comprehensive testing with Milestone XProtect Corporate 2013 beta to benchmark the application performance in a Milestone tiered storage environment. Milestone engineering confirmed that the test results achieved are consistent with the GA version released in May 2013.

Testing focused on the Archive DB enhancements of XProtect Corporate 2013 that allow the use of Isilon clusters running OneFS 7.0 or later. The archive process, when writing to an Isilon cluster, easily handled all video accumulated between archive process executions. In addition, various forced Isilon failures did not affect the Live DB to Archive DB process.

When using an Isilon cluster for the Archive DB, only two modifications to the XProtect Corporate configuration are necessary: increase the number of archive process threads; and increase the write block size to the Archive DB.

We also tested an FC- and iSCSI-attached VNX for the both the Live DB and Archive DB. The results for this configuration represent the maximum tested, not the array maximum.

For both FC- and iSCSI-attached storage, formatting with 8,192 KB blocks for Live DB and 64 KB blocks for Archive DB is required.

Findings

Testing and validation of this solution produced these key findings:

- FC- or iSCSI-attached VNX can be used in place of internal server storage for both Live DB and Archive DB video storage.
- NAS-attached Isilon clusters can be used with XProtect 2013 as Archive DB video storage.
- One NFS2 share per XProtect recording server is required.
- Bandwidth to the Isilon clusters and VNX arrays for the Archive DB was not affected during numerous forced failures on the cluster.

References

EMC documentation

For additional information, see the following EMC documents:

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

Other documentation

For additional information on related topics, see the following Milestone documents:

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