

REFERENCE ARCHITECTURE

# Milestone XProtect and Nutanix

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# 1. Executive Summary

IT leaders are turning to hyperconverged infrastructure (HCI) to knock down silos and deliver simplicity, speed, operational efficiency, and overall lower total cost of ownership. HCI is also central to meeting the future needs of data growth, a core concern for today's state-of-the-art video surveillance use cases.

Built on an open platform architecture and supporting features from advanced video analytics to facial recognition, Milestone XProtect video management software (VMS) lets you customize your IP-based surveillance system and integrate it with other business applications. Running Milestone XProtect on Nutanix offers several advantages:

- Reduced complexity with a platform made of modular building blocks rather than separate silos and tiers.
- Management for your entire HCI at scale, including compute, networking, storage provisioning, and resources, through Prism Central.
- Resilience, modularity, and flexibility: The Nutanix Cloud Platform has redundant power supplies, memory, and CPU and is also resilient in the case of individual hard disk failures. If a disk fails, data automatically rebuilds without any impact to running applications. With the modular Nutanix architecture, you can easily scale up and out. AOS storage empowers you to efficiently store, scale, secure, protect, search, and retrieve your information. Additionally, the Nutanix Cloud Platform lets you run workloads on premises with the x86 platform of your choice and in multicloud environments.
- Pay-as-you-grow model: Nutanix software is licensed on a subscription basis, allowing you to scale on demand.
- Enterprise-grade integrated data protection: As video assets gain prevalence and importance, protecting them becomes increasingly critical. Nutanix provides built-in high availability and fault tolerance, safety from single points of failure, tunable redundancy on disks, snapshots (point-in-time copies of data), smart data replication, and intelligent data tiering.

- Compliance: We provide customers with the tools they need to ensure compliance with security requirements and obtain meaningful insights about their data. With built-in security features such as encryption, ransomware detection, antivirus integration, and recovery from snapshots, the Nutanix solution meets some of the most stringent security standards, including FIPS, TAA, and others.

This document describes key Nutanix components and features and explores the advantages of deploying the Milestone XProtect VMS product portfolio on Nutanix.

*Table: Solution Details*

Product Name	Product Version	Nutanix AOS Version	Hypervisor	Nutanix Files Version
Milestone XProtect	Corporate 2019 R3+	5.11+	AHV, ESXi	3.5.1+

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## 2. Introduction

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### Audience

This reference architecture is part of the Nutanix Solutions Library. We wrote it for IT practitioners who deploy and manage infrastructure solutions with Milestone XProtect VMS. Readers of this document should already be familiar with Nutanix and Milestone software.

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### Purpose

In this document, we cover the following topics:

- Milestone and Nutanix HCI architecture
- Sizing considerations
- Deployment considerations
- Deployment examples

Unless otherwise stated, the solution described in this document is valid on all supported AOS releases.

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### Document Version History

Version Number	Published	Notes
1.0	April 2021	Original publication.
1.1	April 2022	Refreshed content.
1.2	April 2023	Refreshed content.

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## 3. Milestone Components and Architecture

Milestone XProtect VMS is a feature-rich solution with multiple components that assist with flexibility and scale, allowing the system to grow to thousands of cameras spanning multiple sites. The basic Milestone XProtect Corporate VMS design consists of the following components:

- Server components
  - › Management server
  - › Recording server
  - › Event server
  - › Log server
  - › Microsoft SQL Server
  - › Mobile server
- Client components
  - › Management client
  - › Smart client
  - › Mobile client
  - › Web client

Milestone administrators often consolidate some of these roles on a common server or virtual machine (VM) for simplified management. You may also choose to deploy certain components with high availability using either failover clustering or related failover servers.

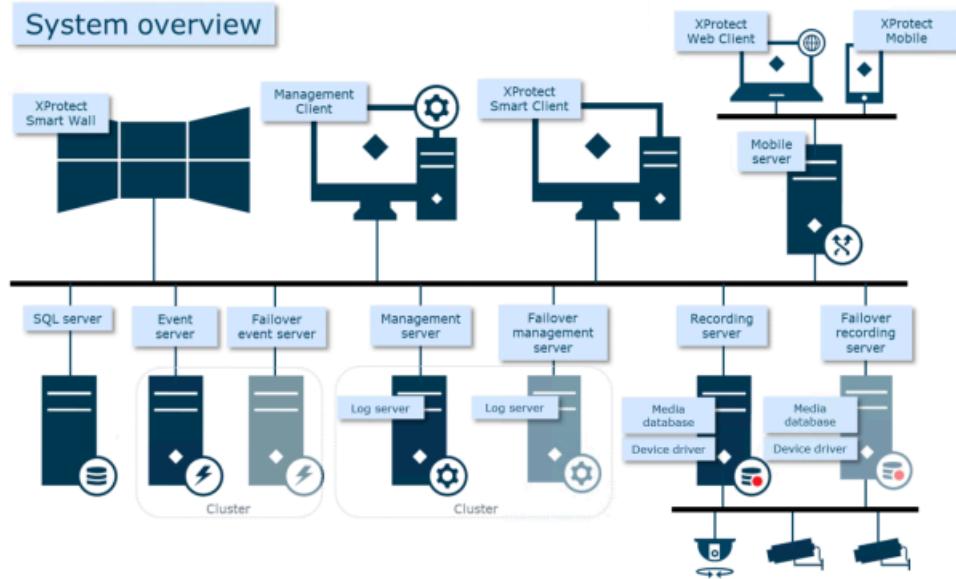


Figure 1: Milestone System Overview

## Server Component Details

### Management Server

The management server is the central element of XProtect VMS, responsible for handling system configuration across components (for example, which cameras the recording servers support). The management server also configures client functionality, like XProtect Smart Walls and user authentication. You can create a failover management server and form a Windows Server Failover Cluster (WSFC) to provide high availability if desired.

Store configuration data in a standard Microsoft SQL Server instance, which you install either on the management server or on a separate dedicated server.

### Microsoft SQL Server

The management, event, and log servers use Microsoft SQL Server to store VMS data and the logging associated with these services. Small environments can use a standalone SQL Server running on the management server. Larger environments (more than 300 cameras) should consider a dedicated SQL

Server. You can also configure SQL Server in high availability configurations using native Always On clustering.

## Recording Server

The recording server is responsible for the core XProtect VMS functionality of communicating with cameras and surveillance devices. It records, stores, and secures the retrieved media while also providing VMS clients access to the live and recorded media. You can configure a failover recording server for high availability in either cold-standby or hot-standby mode. A cold-standby recording server acts as a failover target for multiple recording servers. A hot-standby recording server is a dedicated failover partner to a specific recording server. The media database is a key component of the recording server.

## Media Database

Milestone's dedicated media database is optimized to store and stream real-time metadata, audio, and video retrieved from cameras. The media database supports various features such as encryption, digital signatures, and multistage storage based on retention time. The storage architecture lets you divide the media database into a live database and one or more archive databases. Splitting the storage into multiple tiers optimizes performance for the live database and cost for archive databases.

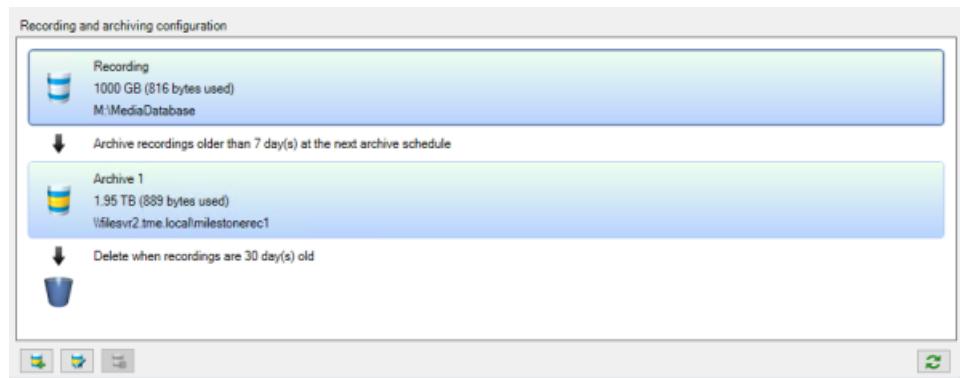


Figure 2: Recording and Archive Storage Configuration

## Event Server

The event server consolidates all events so specific features and integrated components can access them. These features and components include alarms,

maps, license plate detection and registration, and point-of-sale systems. You can configure a failover event server for high availability.

## Log Server

The log server captures log messages for all components. The management server and the log server use the same SQL Server instance. The log server typically runs on the same host as the management server, but you can place it on a different host if necessary.

There are three main types of logging:

1. System log: captures system information, warnings, and errors
2. Audit log: captures administrative, authentication, and user activity
3. Rule log: creates records based on specified events

## Mobile Server

The mobile server hosts the XProtect Web Client and acts as the gateway for both web client and XProtect Mobile users. The mobile server helps stream and transcode video as needed for smart phones and browsers that might not support all the codecs XProtect VMS uses.

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## Client Components

### Management Client

The management client is the XProtect administrative interface, where you centrally configure the system. You can run this client remotely.

### XProtect Smart Client

The XProtect Smart Client allows VMS operators to view live video or playback from specific time windows. You can use this client, which is intended to run remotely, in conjunction with the XProtect Smart Wall add-on tool.

### XProtect Mobile

XProtect Mobile provides purpose-built video playback for Apple and Android devices. You can also use XProtect Mobile to turn your device into a remote camera for the VMS system.

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## 4. Milestone XProtect VMS on Nutanix

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### Nutanix Infrastructure and Virtualization

The native Nutanix hypervisor, AHV, provides a simple and scalable virtualization solution through the software intelligence of the hyperconverged architecture. AHV is performance-tuned for Nutanix and takes advantage of intelligent storage services that provide full data resiliency and data services such as snapshots, clones, and VM provisioning operations. The Nutanix Cloud Platform and AHV are ideal for the server and client components of Milestone XProtect.

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### Nutanix Files

Nutanix Files is a software-defined storage solution that consolidates unstructured data storage silos into a single manageable platform. It can easily scale-up or scale-out compute and storage capacity without compromising performance. With integrated cybersecurity and ransomware protection, Nutanix Files proactively safeguards data to help you take control of it. Offering both SMB- and NFS-based protocol access to AOS storage, Nutanix Files provides an archiving tier for the recording servers in the environment.

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### Nutanix Prism

Nutanix Prism is a comprehensive interface and unified control plane that simplifies and streamlines management of virtualized datacenter environments. Manage everything from storage and compute to VMs and deploy clusters for storage and virtualization within minutes—with one-click cluster management, one-click VM setup, one-click storage management, and self-service provisioning. In the context of an XProtect VMS solution, you can control Nutanix infrastructure, virtualization, and Files from the same Prism interface, simplifying administration and eliminating siloed architectures.

## 5. Milestone and Nutanix Deployment Architecture Options

### Nutanix Infrastructure Only

A common configuration for Milestone with Nutanix is to deploy a single Nutanix AOS cluster with AHV for all server components and data.

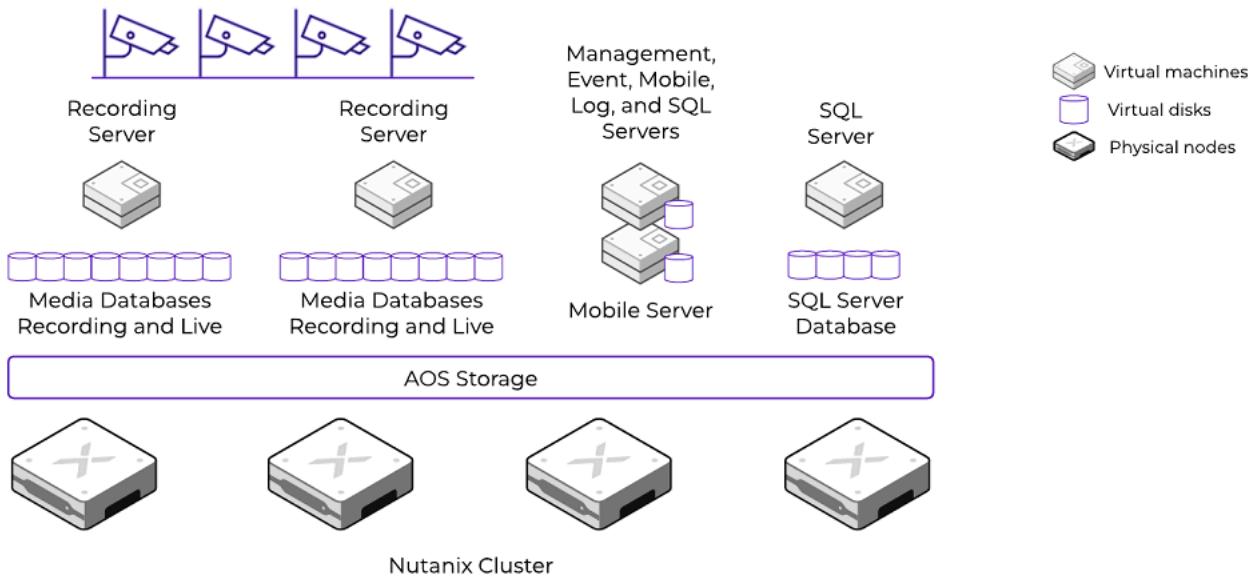


Figure 3: Milestone XProtect VMS and Nutanix HCI

Because a single Nutanix cluster shares one storage pool, you don't need a separate archive tier—all data resides on the same underlying media. Some of the design considerations and benefits for this architecture include the following points:

- Single media database tier: You can maintain short- and long-term retention with a single recording storage target per recording server. Having a single

recording target helps minimize storage I/O, as you avoid the reads and writes associated with an archiving policy.

- The media database is configured as a striped volume across multiple virtual disks. AOS storage maintains data redundancy through the replication factor setting, commonly set to 2, which maintains two copies of the data dynamically across the cluster. If you enable erasure coding, the system creates parity bytes so that it can remove the redundant copies. AOS invokes erasure coding after data has been write-cold for seven days.
- Nutanix storage takes advantage of data locality for the primary writes and potential reads from the recording server. Data locality helps minimize network traffic and optimizes storage performance for the recording server.
- If the Nutanix cluster has hybrid storage (mixed NVMe, SSD, and HDD) nodes, AOS storage automatically places cold data on slower media. AOS storage uses the following prioritization for data placement, tiering, and balancing as data ages:
  - › Local high performance
  - › Remote high performance
  - › Local low performance
  - › Remote low performance
- Nutanix supports different node types in the same cluster, so you can size the physical servers to support your compute requirements, including use cases that require graphic processing units (GPUs). You can meet storage requirements either with local storage in the compute nodes or by adding storage-only nodes to ensure the proper storage pool size. As environments change and grow, you can add more nodes, dense in either compute or storage, at any time.
- Hypervisor high availability helps limit downtime, as the VMs running XProtect can restart on other nodes in the cluster during a hardware failure. As you can live-migrate VMs to other nodes in the cluster for any upgrade event, hypervisor high availability also minimizes planned maintenance downtime. Native high availability helps eliminate the need to configure

redundant XProtect components (for example, failover recording servers) in some environments.

- Integrated data protection that includes synchronous and asynchronous remote replication safeguards you against and provides recovery following site-level events.

## Nutanix Infrastructure and Nutanix Files

For environments with multiple clusters or long-term archiving requirements, Nutanix Files is ideally suited for the Milestone archive storage tier. A common use case is to create a dedicated Nutanix Files cluster, built and sized to handle the storage throughput and retention requirements of multiple recording servers.

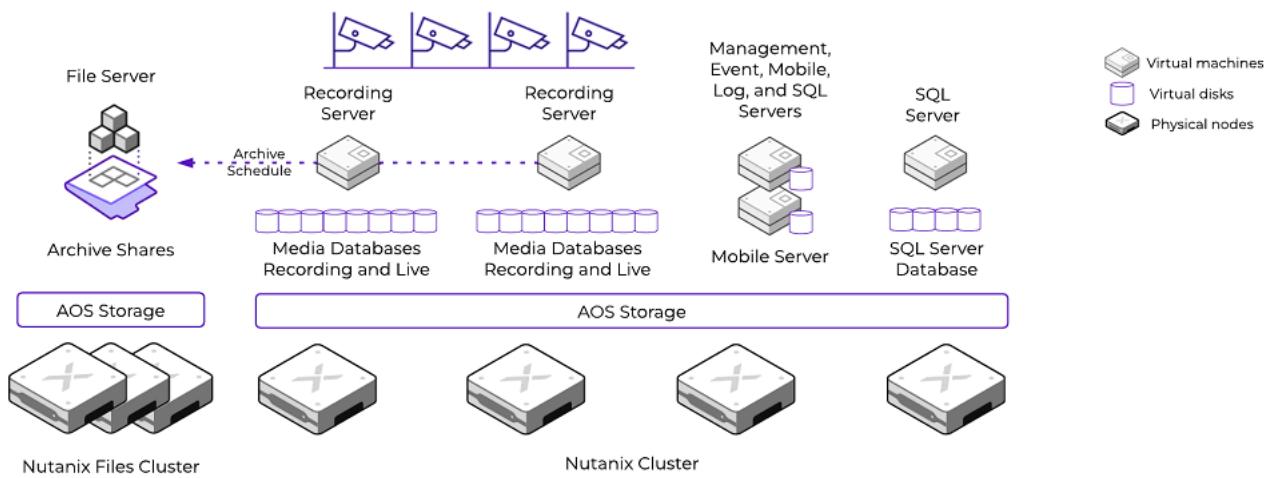


Figure 4: Milestone XProtect VMS with Nutanix HCI and Nutanix Files

Some of the design considerations and benefits involved in running Nutanix Files include the following points:

- Creating a separate cluster for the Nutanix Files archive tier allows you to choose node types appropriate for your storage requirements without changing your compute cluster, which might be built for short-term recording and XProtect VMS processing.

- Consolidating archiving from multiple sources improves efficiency and eliminates waste from siloed environments. You can scale and implement a pay-on-demand approach by adding nodes to the Nutanix Files cluster as needed.
- Nutanix Files eases administration for long-term retention requirements by automatically creating thin-provisioned shares that comply with Nutanix best practices. Nutanix Files eliminates the need to provision and manage virtual disks, file systems, and recording server mount points for your archived data.
- You can use File Analytics to help detect anomalies and prevent ransomware attempts with native file blocking, which includes preventing file create and file rename operations associated with known ransomware signatures.

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## 6. Sizing Questions and Considerations

To size a solution, gather the following criteria:

- Number of cameras
  - › Cameras per recording server generally range from 30 to 300 devices.
- Resolution or image size
- Frames per second (FPS)
- Image retention in days
- Size of recording or live tier (hours or days)
- Size of archive tier (days, weeks, or months)
- Recording hours in a day
- Percentage of time with motion (100 percent if recording regardless of motion)
- GPU usage for smart client, mobile client, or recording server
- Camera manufacturer and model

Note: Don't include compression savings when you size storage for either the recording tier or the archive tier of the media database. Only include erasure coding benefits for data older than the seven-day write-cold window.

Consider sizing each recording server's local storage to fit within one node's usable available capacity. This guideline helps ensure data locality for the recording server, which provides predictable performance for the recording and archive (if hosted locally and not on Nutanix Files) storage tiers. Also consider sizing the live or recording storage to reside in the Nutanix SSD tier.

## Sizing Resources

### Basic Storage Calculator

The [Seagate storage calculator](#) provides an estimate of the required storage sizing for the VMS. The user should provide most of the information for the calculator based on their environment.

### Milestone Server and Storage Calculator

Milestone also has an [XProtect server calculator](#) (credentials required) intended for Milestone employees and partners. The server calculator generates a detailed list of the server compute and storage requirements for the full XProtect solution. We recommend working with Milestone or a qualified partner to ensure proper sizing with help from this calculator.

Cameras									
Camera Name	Manufacturer / Model	Qty	Resolution / Codec / Complexity	Continuous FPS	Event FPS	Hours	Motion / Event %	Retention (Days)	Bitrate (Kbps)
Camera	Akuvox R27	300	HD1080 (1920x1080) h.264 Medium	0	8	24	50	30	2223.93

Recording Server Specification									
Qty	Server Configuration				Bandwidth and Throughput				
3 x	Server(s) with the following configuration				Camera Bandwidth to Rec. Server:	217.18	Mbps		
	Intel Xeon E5-2620 v4				Client Bandwidth from Rec. Server:	21.71	Mbps		
	12 GB RAM				Rec. Server Bandwidth:	238.89	Mbps		
	2 Gigabit NICs				Rec. Server Disk Throughput Live DB:	47.51	MB/sec		
	Windows Server 2016 x64 Standard/Datacenter				Rec. Server Disk Throughput Arch. DB:	20.36	MB/sec		
OS and Application Volume - Disk Configuration:					Rec. Server Disk Throughput Total:	67.87	MB/sec		
2 x	300 GB minimum RAID 1				Estimated IOPS:	361.98			
					Rec. Server Video Storage:	34358.73	GB		
Live Database Disk Configuration:									
4 x	Connectivity	Internal or Direct Attached							
	10K RPM	300GB	RAID 1 / RAID10						
Archive Database Disk Configuration:									
5 x	Connectivity	Internal or Direct Attached							
	7.2K RPM	10TB	RAID 5						

Management Server Specification									
CPU	2x Intel Xeon Silver 4208								
RAM	20GB RAM								
NIC	Gigabit Network Connection								
OS	Windows Server 2016 x64 Standard/Datacenter								
SQL Version	Microsoft SQL Server 2016 Standard								
Maintenance Notes	SQL Server should be set to a regular backup schedule and transaction logs truncated as a part of the scheduled								

Figure 5: Milestone XProtect Server Calculator Example

## Nutanix Sizer

Enter the compute, storage capacity, and storage throughput numbers from the Milestone calculators into [Nutanix Sizer](#) (credentials required) to determine the hardware and Nutanix cluster configuration your environment needs.

The following image shows a Nutanix Sizer summary for a single cluster that supports a 300 HD camera solution and requires about 100 TB of storage with a 30-day retention policy and 3 days of data in the recording or live tier. This configuration can provide all the compute resources required by the Milestone XProtect server calculator.

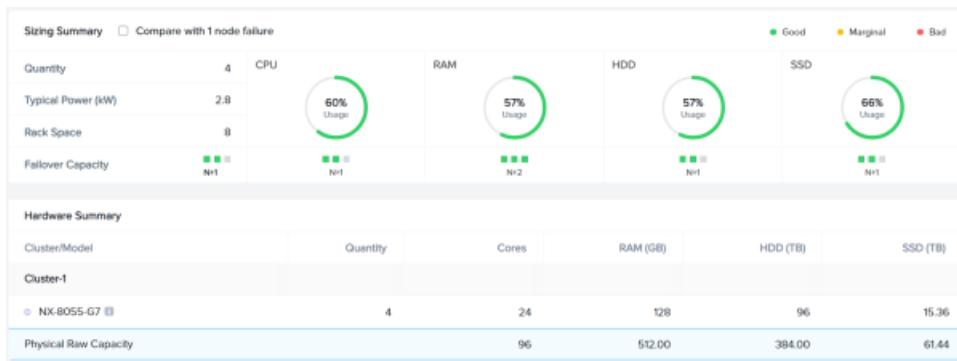


Figure 6: Nutanix Sizer

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## 7. Nutanix Deployment Recommendations

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### Nutanix Infrastructure and Virtualization

For the recording server:

- Use virtual disks presented directly to your recording server VMs for the live or recording storage tier.
- Use virtual disks that are 10 TB each or smaller.
- Use at least 4 and at most 16 virtual disks for the recording storage. To configure these virtual disks, use simple stripe in Storage Spaces.
- When individual recording server storage requirements are larger than the usable capacity in a node, consider using volume groups with load balancing enabled.
  - In ESXi environments you can use [Nutanix Volumes](#) or volume groups connected to clients through iSCSI for equivalent load balancing.
- Format the volume with a 64 KB allocation unit (AU) size.

Note: Windows 2019 supports larger AU sizes, which affects maximum supported NTFS volume size.

For the Microsoft SQL Server, when you set up a dedicated SQL Server in larger environments, apply [Nutanix Microsoft SQL Server best practices](#).

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### Nutanix Files

- Only use Nutanix Files for the archive database tier.

- Consider staggering the archive schedule of multiple recording servers to occur at different times. Staggered schedules help reduce the storage workload compared to archiving all recording servers at the same time.

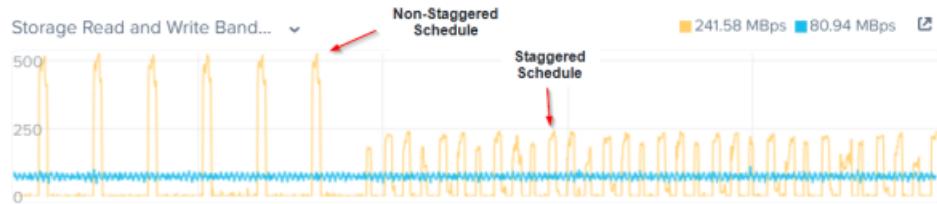


Figure 7: Archiving Bandwidth of 300 Cameras

- Use Nutanix Files standard shares (one per recording server target) as the archive tier.
  - You can leave compression enabled on the share but doing so isn't likely to provide a significant benefit.
- Configure your FSVMs with a minimum of 8 vCPU and 24 GB of memory.
- Set the share workload type to Sequential.
  - The maximum block size for sequential workloads is 1 MB.
- Configure a domain-based service account to connect to Nutanix Files from the recording server. The following section discusses this recommendation in more detail.

## Configuring a Service Account

For recording server archives stored on Nutanix Files, we recommend that you configure a service account. A service account ensures that only the recording server can access the files, rather than any user with access to the network. You must move the recording server service from the local system account to run under the Windows Domain service account you create. You must also set the service account to have the rights required to access the file share holding the archive media database.

For a domain account:

- Create a domain account to connect the XProtect Recording Server and Nutanix Files.

2. Set this account as a local administrator on the recording server.
3. Give this account full control of the Nutanix Files share used as the archive target.
4. Choose the Custom installation type when you install the recording server so that you can specify the service account.
5. If you didn't specify the service account during installation, go to the recording server properties and enter the username and password for this account in the Log On tab, then restart the service.

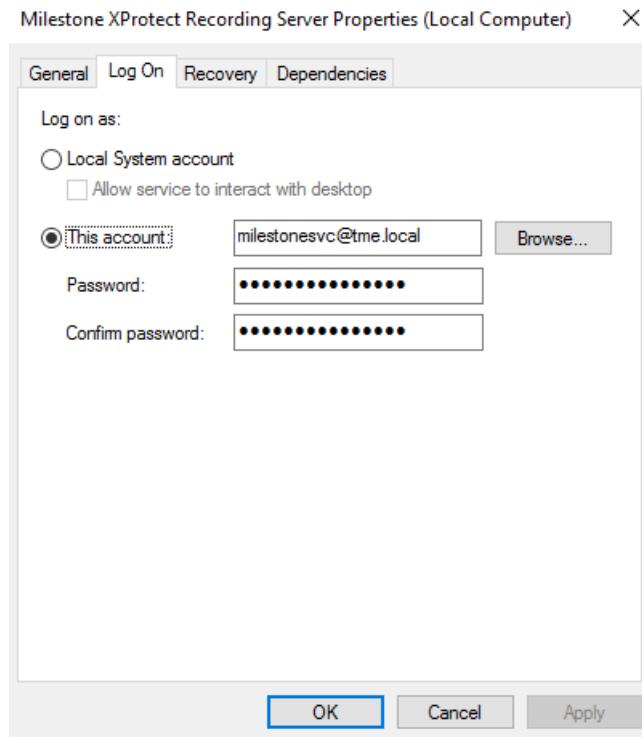


Figure 8: Recording Server Service Account

6. For XProtect 2019 R2 and later versions, you must also register the recording server again if you change the sign-in service account after installation. Navigate to the Windows taskbar and right-click the recording server. Select

either Register or Server Configurator from the menu to register the server. The interface for registering the recording server varies by XProtect version.

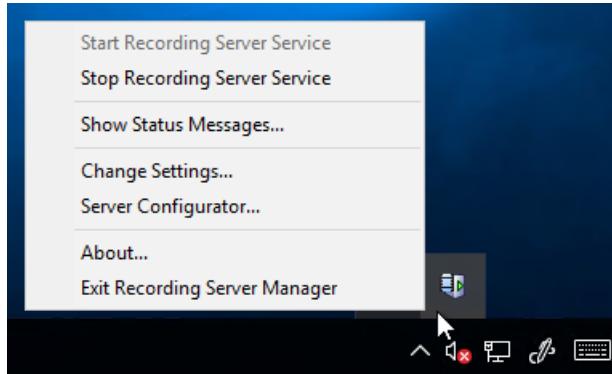


Figure 9: Recording Server Taskbar

## 8. Nutanix Ready Validation

We have validated Milestone XProtect with Nutanix AOS, AHV, and Nutanix Files using a single system design as described in the [Milestone XProtect VMS System Architecture Guide](#). We used Nutanix infrastructure and AHV to host the virtualized management server (and consolidated services) and the recording server. We used Nutanix Files for the archive storage.

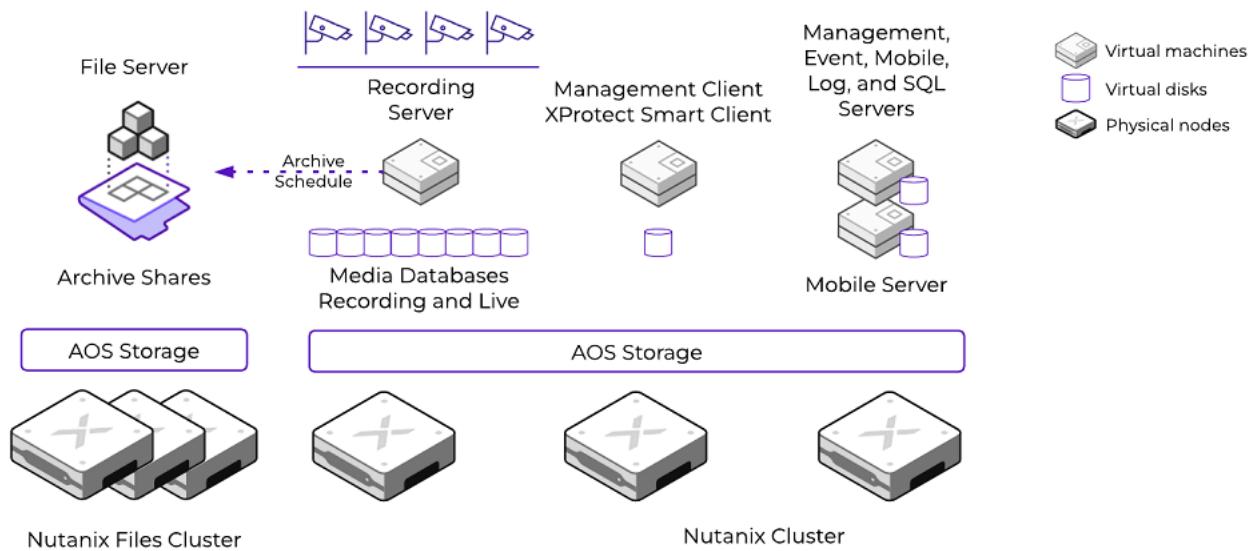


Figure 10: Nutanix Ready Validation

We used the Milestone workload [StableFPS](#) driver to create a video stream workload against the validated environment.

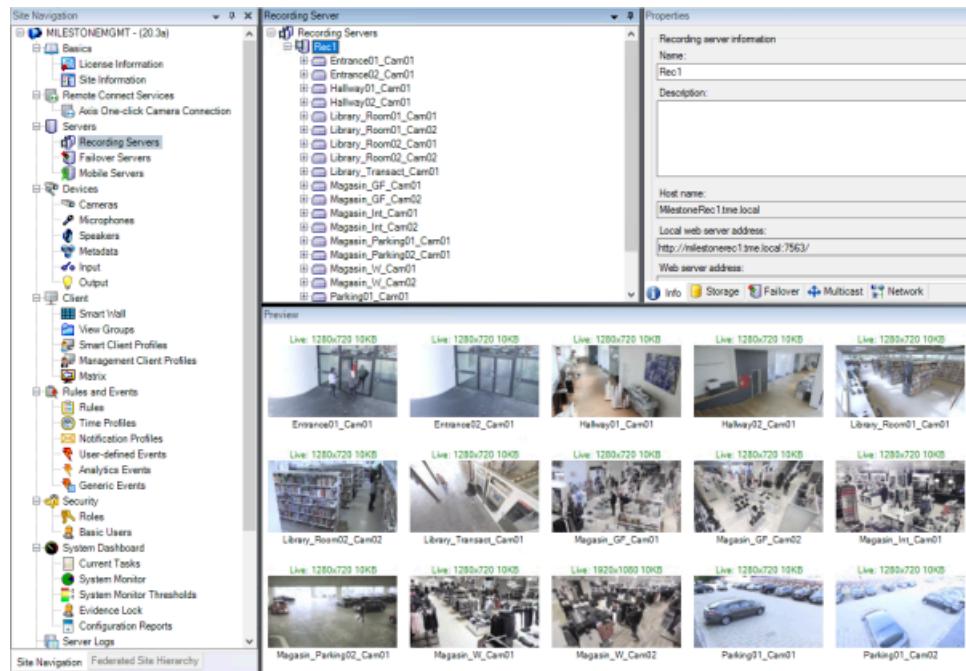


Figure 11: Milestone Management with StableFPS

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## 9. Conclusion

Milestone Systems is a global industry leader in open platform IP video management software. Milestone technology is easy to use, reliable, and proven in thousands of customer installations to provide flexible choices in network hardware and integration with other systems. With Nutanix infrastructure and Nutanix Files, Milestone XProtect is a validated solution for video surveillance.

The Nutanix Cloud Platform provides a simple building-block approach that enables on-demand scaling ideal for VMS systems like Milestone XProtect. Heterogeneous cluster capabilities enable you to mix node types to match your compute and storage requirements on deployment and as needs change over time. Nutanix self-healing infrastructure with integrated data redundancy support high availability and disaster recovery capabilities. Virtualized recording servers can come back online quickly after failure events, limiting downtime for accessing videos and archives stored on and through those servers. Upgrades across the infrastructure incur zero downtime thanks to live migration and upgrade automation built into the Nutanix platform.

Nutanix Files Storage is a simple and secure software-defined scale-out file storage solution. It enables organizations to store, manage, and scale unstructured data by consolidating storage silos onto a single platform, while keeping it secure with integrated cybersecurity and ransomware protection.

## 10. Appendix

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### References

1. [Milestone XProtect VMS System Architecture Guide](#)
2. [XProtect Storage Architecture and Recommendations](#)
3. [Nutanix Files tech note](#)
4. [Nutanix Microsoft SQL Server best practice guide](#)
5. [Enabling Load Balancing of vDisks in a Volume Group](#)
6. [Workload Optimization](#)
7. [Milestone Server and Storage Calculator](#) (requires credentials)
8. [Nutanix Sizer](#) (requires credentials)
9. [StableFPS Driver](#)

## About Nutanix

Nutanix is a global leader in cloud software and a pioneer in hyperconverged infrastructure solutions, making clouds invisible and freeing customers to focus on their business outcomes. Organizations around the world use Nutanix software to leverage a single platform to manage any app at any location for their hybrid multicloud environments. Learn more at [www.nutanix.com](http://www.nutanix.com) or follow us on Twitter [@nutanix](https://twitter.com/nutanix).

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