

Dell EMC Storage with Verint Nextiva

Surveillance

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Sizing Guide

Abstract

Use this guide to determine the requirements for a successful Verint Nextiva installation. The storage platforms include VMware ESXi hosts that are running Verint Nextiva.

Dell EMC Solutions



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CONTENTS

Chapter 1	Introduction	5
	Solution overview.....	6
	Scope.....	6
	Key objectives.....	7
Chapter 2	Solution components	9
	Dell EMC storage.....	10
	Storage protocols.....	10
	Verint Nextiva.....	10
	Releases tested.....	11
Chapter 3	Configured components	13
	Dell EMC Surveillance Lab test environment.....	14
	Isilon clustered storage system.....	14
	Isilon protection with OneFS.....	14
	Data protection.....	15
	Cluster size.....	15
	Dell EMC Unity and EMC VNX.....	15
	Dell EMC ECS Object Storage	16
	Dell EMC CIFS-ECS	16
	Dell EMC PowerEdge servers.....	17
Chapter 4	Sizing the solution	19
	Block storage (SAN, local).....	20
	Dell EMC Unity.....	20
	EMC VNX and EMC VNXe.....	20
	File storage (NAS).....	21
	Dell EMC Isilon node and cluster.....	22
	Dell EMC ECS	23
	Dell EMC PowerEdge server storage.....	23
Chapter 5	Testing and validation	25
	Test objectives.....	26
	Test parameters.....	26
	Tests conducted.....	26
	Video playback test	26
	Disk failure test.....	27
	Disk failure test with ECS.....	27
	NIC failure test.....	27
	NIC failure test with ECS.....	28
	NIC Failure test with NIC aggregation in Active/Passive	28
	Node poweroff test	29
	Node poweroff test with ECS	29
	Node reboot test with ECS.....	30
	Storage bandwidth and configuration test.....	30
Chapter 6	Conclusion	31

CONTENTS

Summary.....	32
ECS storage.....	32
Dell EMC Unity arrays.....	32
Dell EMC Isilon scale-out storage.....	32

CHAPTER 1

Introduction

This chapter provides information on the purpose and scope of this solution:

- [Solution overview](#).....6
- [Scope](#).....6
- [Key objectives](#).....7

Solution overview

The purpose of this guide is to help you understand the benefits of using a Dell EMC storage solution with Verint Nextiva. The solution includes both hardware and software elements for video surveillance.

Use this guide to determine the requirements for a successful Verint Nextiva installation. The storage platforms include VMware ESXi hosts that are running Verint Nextiva.

Scope

This guide is intended for use by internal Dell EMC sales and pre-sales personnel, and qualified Dell EMC and Verint partners.

The guidelines presented are for storage platform positioning and system sizing. The sizing recommendations are based on performance and storage protocol conclusions derived from Dell EMC testing.

The guidelines for sizing this video storage solution describe the use of the following storage platforms:

- Dell EMC Isilon[®]
- Dell EMC Unity[®]
- Dell EMC PowerEdge[®]
- Dell EMC ECS[®] Object Storage
- EMC VNX[®]
- EMC VNXe[®]

These guidelines include the following design considerations:

- Bandwidth recommendations for Verint Nextiva release 6.3 or later and one or more Dell EMC systems
- Dell EMC storage system configurations that are ideal for physical security solutions with Verint Nextiva
- Architectural overview of Verint Nextiva
- Dell EMC storage considerations for Verint Nextiva
- Result summaries for the tests carried out by Dell EMC engineers in a VMware ESXi virtualized infrastructure

Use this guide to determine the best configuration for the following:

- Number of Verint Recorders
- Mix of nodes and Verint Recorders based on the expected bandwidth in an Isilon implementation
- Mix of nodes and Verint Recorders based on the expected bandwidth in an ECS implementation
- Storage using Fibre Channel (FC) and Internet SCSI (iSCSI) on VNX systems
- Storage using Fibre Channel (FC) and Internet SCSI (iSCSI) on Unity systems
- Storage using Server Message Block (SMB) on Isilon systems
- Load factors related to the use of Dell EMC storage arrays in the customer's solution

Note

All performance data contained in this report was obtained in a rigorously controlled environment. Network topology and system environment variables can have significant impact on performance and stability. Follow the best practices as outlined in the *Dell EMC Storage with Verint Nextiva: Configuration Guide* regarding network and storage array configuration. Server and network hardware can also affect performance. Performance varies depending on the specific hardware and software, and might be different from what is outlined here. Performance results will be similar if your environment uses similar hardware and network topology.

Key objectives

The configurations documented in this guide are based on tests conducted in the Dell EMC Surveillance Lab and actual production implementations.

These are the key objectives of this solution:

- Determine the Recorder services maximum bandwidth to specific Dell EMC storage arrays and clusters.
- Measure the sizing needs for specific system requirements so that an implementation can be correctly sized and the appropriate Dell EMC products can be matched to a customer's requirements.
- Recommend VNX cache configuration.
- Determine the VNX, VNXe, and VSS LUN bandwidth within the storage pool.
- Determine the Unity LUN bandwidth within the storage pool.
- Recommend an Isilon SMB configuration.
- Calculate array or node maximum bandwidths.
- Recommend disk drive types.
- Confirm the previous test results with lab controlled failures, such as disabled storage processors, disk rebuilds, node removals, and network path failures.

CHAPTER 2

Solution components

This chapter provides information about storage options for video and audio data:

- [Dell EMC storage](#).....10
- [Storage protocols](#)..... 10
- [Verint Nextiva](#).....10

Dell EMC storage

Dell EMC storage arrays are ideal for storing video and audio data.

This guide describes the tests for the following storage arrays:

- Isilon clusters
- Unity arrays
- ECS Clusters
- PowerEdge servers
- VNX arrays
- VNXe arrays

For our testing, we used both single and dual storage processors for the full range of Unity storage arrays and single- and multi-node performance testing on the Isilon storage array.

Storage protocols

Dell EMC uses standard file protocols to enable users and applications to access data that is consolidated on a Dell EMC storage solution.

This guide provides information about these network protocols:

- FC
- iSCSI
- SMB (CIFS)
- FC, iSCSI

Verint Nextiva

A Verint Nextiva installation can consist of a single server or multiple servers in a hierarchical structure. You can configure Nextiva to manage a few cameras or thousands of cameras.

The following table describes three primary Nextiva services.

Table 1 Nextiva primary services

Service	Description
Recorder	Nextiva records video through the recorder service. The recorder provides dynamic discovery and status polling of units and processes and stores (archives) all video and multimedia streams to storage. Archiving is the term used for storing video.
Master	The main server application that is required by the service to provide a centralized catalog for the other Nextiva services and applications on the system. From the Directory, applications can review connections, establish connections, and receive centralized configuration information.

Table 1 Nextiva primary services (continued)

Service	Description
ESM	Enterprise Storage Manager providing a video offload to a second storage tier. Some features available for primary storage are not available for video that is moved to the second tier and uses ESM.

Releases tested

The following table lists the Verint Nextiva releases used for our tests.

Table 2 Verint Nextiva releases

Release	Subrelease
Verint Nextiva	7.5.1.7623
	6.4.2811
	6.4.1591
	6.3.2292

CHAPTER 3

Configured components

This chapter provides information about the components configured in this solution:

- [Dell EMC Surveillance Lab test environment](#)..... 14
- [Isilon clustered storage system](#)..... 14
- [Dell EMC Unity and EMC VNX](#)..... 15
- [Dell EMC ECS Object Storage](#) 16
- [Dell EMC CIFS-ECS](#) 16
- [Dell EMC PowerEdge servers](#)..... 17

Dell EMC Surveillance Lab test environment

The Dell EMC Surveillance Lab is constantly being upgraded to the most recent software releases.

In order to test this solution, the Dell EMC Surveillance Lab was configured as follows:

Virtualized environment:

- 12 vCPUs
- 16 GB memory
- Network adapter type: VMXNET3 (GbE and 10 GbE)
- Isolated VLAN for storage (if not FC)

Physical/Baremetal minimum environment:

- 8 Cores
- 32 GB memory

Network environment:

- Network adapter type: 10 GbE
- Camera user VLAN
- Storage VLAN

For all the tests, the virtual CPU (vCPU), memory, and network were configured according to Verint best practices. The VMware vSphere configuration was in accordance with the VMware Compatibility Guide (www.vmware.com/resources/compatibility/search.php). In addition, Dell EMC PowerPath™ is recommended for use with block storage (FC and iSCSI) implementations on VNX and VNXe arrays. Microsoft MPIO is recommended for use with Unity arrays.

The Dell EMC Surveillance Lab's host hardware met and exceeded the minimum system requirements for an ESXi/ESX installation. The Verint Recorder VM was running on an ESXi 6.5 host using Cisco UCS B230 Blade Servers and various Dell EMC servers, such as the Dell EMC FC630s, FC430s, and R730xd. For more information about VM configuration, see the General recommendations for storage and sizing section of the *Using EMC VNX storage with VMware VSphere* guide.

Isilon clustered storage system

Isilon NAS was designed and developed specifically for storing, managing, and accessing digital content and other unstructured data.

An Isilon clustered storage system is composed of three or more nodes. Each node is a self-contained, rack-mountable device that contains industry-standard hardware such as disk drives, CPUs, memory, and network interfaces. These nodes are integrated with the proprietary Isilon OneFS™ operating system, which is a distributed networked file system that unifies a cluster of nodes into a single shared resource.

Isilon protection with OneFS

New or upgraded clusters, starting with OneFS 7.2, provide a data protection level that meets Dell EMC Isilon guidelines for mean time to data loss (MTTDL) for large capacity nodes. Current releases of OneFS offer a new protection option, +3d:1n1d, which means the cluster can survive three simultaneous disk failures or one entire

node failure plus one disk. OneFS also provides an option that continually evaluates the cluster and sends an alert if the cluster falls below the suggested protection level.

Data protection

OneFS does not rely on hardware-based RAID for data protection. The Isilon system uses the Reed-Solomon algorithm for N+M protection with Forward Error Correction (FEC).

Protection is applied at the file level, enabling the cluster to recover data quickly and efficiently. Nodes, directories, and other metadata are protected at the same or a higher level as the data blocks they reference. Since all data, metadata, and FEC blocks are spread across multiple nodes, dedicated parity drives are not required. For more information about Isilon data protection, see *Dell EMC Isilon OneFS: A Technical Overview*.

Although cluster sizes as small as three nodes are possible, for surveillance applications we recommend a minimum of five nodes. Sizing calculations need to include a minimum free space calculation for proper cluster sizing. We recommend a cluster size that enables a node to be removed while retaining a minimum of 10 percent free space in the remaining capacity. This cluster size ensures that node removal and node failures have minimal or no impact on video ingestion.

The Isilon sizing tool provides an accurate calculation. You can find this tool at <https://isilon-sizing-tool.herokuapp.com>. Other sizing tools from video management software (VMS) and camera vendors may also be used for sizing the necessary bandwidth and storage capacity.

Cluster size

We recommend a minimum cluster size of five nodes, even if you are not writing to all of them. For example, if you are implementing a four-node Recorder solution, implement a five-node cluster. This also meets the recommended best practices for data protection.

To estimate the ideal number of nodes in a cluster, you need to consider cluster bandwidth and capacity.

Sizing by bandwidth

We recommend a cluster size with one or more additional nodes than calculated in bandwidth sizing. This ensures that failover of a node allows for redistribution of NAS connections and avoids any frame loss.

Sizing by aggregate capacity

We recommend a cluster size with enough usable capacity to handle 110 percent of the calculated space requirement, with a minimum added capacity of one full node plus 10 percent. The values are based on camera bit rate.

The Isilon sizing tool can use both the sizing by bandwidth and sizing by aggregate capacity methods when calculating ideal cluster size.

Dell EMC Unity and EMC VNX

Dell EMC Unity and EMC VNX storage arrays are ideal for recording and managing terabytes of video from distributed locations. This section describes best practices for

configuring a Unity or VNX storage system for this solution. The VNX family includes the VNX, VNXe, and VNX-VSS series arrays.

The Unity and VNX series arrays are designed for midtier to enterprise storage environments, are ideal for distributed environments, and can scale to handle large petabyte (PB) environments with block-only requirements at central locations.

Dell EMC ECS Object Storage

Dell EMC ECS is a complete software-defined cloud storage platform that supports the storage, manipulation, and analysis of video surveillance and unstructured data on a massive scale on commodity hardware. ECS is specifically designed to support the mobile, cloud, and Big Data workloads that are similar to large-scale workloads.

ECS provides UI, RESTful API, and CLI interfaces for provisioning, managing, and monitoring storage resources. Storage services provided by the unstructured storage engine (USE) ensure that video is available and protected against data corruption, hardware failures, and data center disasters. The USE enables global namespace management and replication across geographically dispersed data centers and enables the following storage services:

Object service

Enables you to store, access, and manipulate video and unstructured data. The object service is compatible with existing Amazon S3, EMC Dell EMC Centera™ content addressable storage (CAS), and EMC Atmos™ APIs.

Hadoop Distributed File System (HDFS)

Helps you use your ECS infrastructure as a Big Data repository against which you can run Hadoop analytic applications.

The provisioning service manages the provisioning of video surveillance storage resources and user access. Specifically, it handles user management, authorization, and authentication for all provisioning requests, resource management, and multitenancy.

You can scale up, scale out, and add users, applications, and services, as well as manage your local and distributed storage resources for your surveillance data through a single view.

Dell EMC CIFS-ECS

CIFS-ECS is a lightweight application that allows you to upload and download files to a Dell EMC ECS storage platform. It creates a Windows virtual drive to ECS cloud storage and transfers data from a Windows platform to an ECS using REST S3 API. CIFS-ECS is designed as an easy access to data in the cloud by allowing Windows applications to interface with an ECS storage server through standard file system APIs.

ECS combined with CIFS-ECS provides applications and users efficient access to content in the cloud from a Windows platform.

Dell EMC PowerEdge servers

Dell PowerEdge™ servers are ideal for recording and managing terabytes of video from distributed locations. This section describes best practices for configuring a PowerEdge server system for this solution.

PowerEdge single-unit rack servers are excellent servers when external NAS clusters or block arrays are planned for surveillance storage.

PowerEdge dual-unit rack servers are designed for local video storage where external surveillance storage will not be used.

Configured components

CHAPTER 4

Sizing the solution

This chapter provides information to enable you to quickly determine the correct storage array based on your customer's bandwidth requirements:

- [Block storage \(SAN, local\)](#) 20
- [File storage \(NAS\)](#) 21
- [Dell EMC ECS](#) 23
- [Dell EMC PowerEdge server storage](#) 23

Block storage (SAN, local)

We conducted validation tests to determine how Verint works with Dell EMC block and local storage arrays.

Dell EMC Unity

We conducted the functional tests to determine how Verint works with Unity™ storage arrays.

The test results shown in the following table are based on a conservative model to ensure that the constant-bandwidth video traffic is unaffected during a single storage processor (SP) maintenance cycle, disk rebuild, or similar performance-intensive events.

Table 3 EMC Unity storage array results

Storage protocol	Array	Array BW (MB/s)	RAID type	LUN bandwidth	SP utilization (percent)	Disks	Maximum (RAW)
iSCSI	Unity300	225	5 (4+1)	37.5	22	80	343 TB
			6 (6+2)	37.5	18		

Our results are based on 4 port 1 GbE adapters, which achieved a bandwidth of 300 MB/s. The 2 port test was conducted using only 2 ports of a 4 port GbE adapter.

EMC VNX and EMC VNXe

We conducted validation tests to determine how Verint works with VNX and VNXe storage arrays.

Our testing found the best bandwidth for a single camera server to be 43 MB/s. The tests included an overall read bandwidth of 10 percent.

The test results shown in the following table are based on a conservative model to ensure that the constant-bandwidth video traffic is unaffected during a single storage processor (SP) maintenance cycle, disk rebuild, or similar performance-intensive events.

Table 4 EMC VNX/VNXe storage array results

Array	Array Bandwidth (MB/s)	Disks	Maximum (RAW)
VNXe1600	256	35	400 TB
	256	200	
VSS1600	210	120	500 TB
	210	150	
VNX-VSS100	381	90	360 TB
VSS1600	256	35	400 TB
	256	200	

Table 4 EMC VNX/VNXe storage array results (continued)

Array	Array Bandwidth (MB/s)	Disks	Maximum (RAW)
VNX5200	360	55	500 TB
VNX5400	476	120	1 PB
	476	250	
VNX5600	500	120	2 PB
	800	240	
	800	500	
VNX5800	530	120	3 PB
	847	240	
	1068	360	
	1068	750	
VNX7600	547	120	4 PB
	876	240	
	1314	360	
	1752	480	
	1752	1000	
VNX8000	655	120	6 PB
	1047	240	
	1571	360	
	2094	480	
	2618	600	
	2618	1000	

This guide provides details on the total load that was tested in the Dell EMC Surveillance Lab. However, the independent software vendor (ISV) should provide the actual server specification. The test results in this guide set a server bandwidth specification that is based on our lab environment, which can be used in the event the ISV does not provide these specifications.

File storage (NAS)

The Dell EMC Surveillance Lab conducted validation tests to determine how Verint works with Dell EMC file storage clusters.

To maximize performance for surveillance workloads, the Dell EMC Surveillance Lab recommends the following best practices:

- Use two SSD system drives per node in clusters where it is supported, such as the NL-Series
- Cluster utilization not to exceed 70 percent capacity

Dell EMC Isilon node and cluster

The test results are based on a model in which the constant-bandwidth surveillance video traffic remained unaffected during a single node maintenance cycle, disk rebuild, SP failure, or non-disruptive upgrade.

We used 1 GbE interfaces with no more than two SMB connections per interface. A 10 GbE interface can accommodate up to four Recorder connections at the maximum Verint-supported values.

We performed all tests with a per-camera bandwidth of 4 Mb/s and 8 Mb/s, so a single Recorder that handles 40 MB/s can support 40 to 80 such cameras.

We performed all tests with node or drive failures in place in the cluster (for example, with Isilon FlexProtect™ running) to ensure a worst-case scenario for all sizing parameters.

To maximize caching performance for surveillance workloads, the Dell EMC Surveillance Lab recommends using two SSD system drives per node in clusters where it is supported, such as the NL-series.

The following table provides bandwidth-sizing guidelines based on our test results.

Table 5 Dell EMC Isilon node and cluster (SMB) test results

Array	OneFS version	Recorders per node	Bandwidth (MB/s)		Drive size	Maximum cluster RAW
			Per node	Per host		
A2000	8.1.0.2 ^a	1	32.5	32.5	10 TB	28 PB
		2	65	32.5	10 TB	
HD400	8.0.0.2	1	37.5	37.5	6 TB	50.9 PB
		2	75	37.5	6 TB	
	7.2.1	1	40	40	6 TB	
		5	200	40	6 TB	
NL410	7.2.1	1	40	40	4 TB	30.2 PB
		5	200	40	4 TB	
NL400	7.0.x	1	37.5	37.5	1 TB	30.2 PB
		2	40	20	1 TB	
		4	40	10	1 TB	

a. See Dell EMC Storage with Verint Nextiva Configuration Guide for additional information regarding OneFS 8.1 installations.

Note

All disk drives are NL-SAS 7200 RPM unless otherwise noted.

Dell EMC Isilon node and cluster (SMB3)

The test results are based on a model in which the constant-bandwidth surveillance video traffic remained unaffected during a single NIC failure on the host or Isilon.

Dell EMC ECS

The test results are based on a model in which the constant-bandwidth surveillance video traffic remained unaffected during select storage failure scenarios, such as disk rebuild, node failures, and failing network paths.

We performed all tests with disk drive failures, node failures, storage process failures, or NIC failures to ensure a worst-case scenario for all sizing parameters.

Dell EMC recommends:

- Using SSD or 15k rpm SAS drives for the CIFS-ECS cache disks.
- Calculating drive space requirements for local disk and ECS buckets based on the retention times used.

The following table provides bandwidth-sizing guidelines based on our test results.

Table 6 Dell EMC ECS Object Storage test results

Cluster	ECS Version	Recorders per node	Bandwidth (MB/s)		ECS Node Drives	
			Recorder	Node	Size	Type
ECS	3.1.0.3	1	40	40	8 TB	NL-SAS
	3.1.0.3	2	40	80	8 TB	NL-SAS

Dell EMC PowerEdge server storage

The test results are based on a model in which the constant-bandwidth surveillance video traffic remained unaffected during select storage failure scenarios, such as disk rebuild, failing processors, and failing network paths.

We performed all tests with disk drive failures, node failures, storage process failures or NIC failures to ensure a worst-case scenario for all sizing parameters.

We used 10 GbE interfaces with Master Recorder configured on physical R730 and R630 servers with the connection set at the maximum bandwidth supported. A combination of 4 Mb/s and 8Mb/s cameras were used with motion detection enabled.

We performed all tests with disk drive rebuild and replacement, to ensure a worst-case scenario for all sizing parameters.

With local storage, we recommend using RAID 6 to accommodate the disk rebuild duration. For example, in the Dell EMC Surveillance Lab, a disk rebuild in a 16 x 10 TB disk system takes at least 1.5 weeks to complete when 40 TB of data and 125 MB/s of write are in place.

The following table provides bandwidth-sizing guidelines based on our test results.

Table 7 Dell PowerEdge server test results

Server	Nextiva Version	Drive size (TB)	RAID	Write BW (MB/s)	CPU %	IOPS	Rebuild duration	Storage
R730xd	6.4.3.2811	8 x 4	6 (6+2)	80	20	536	33 hours	Local

Table 7 Dell PowerEdge server test results (continued)

Server	Nextiva Version	Drive size (TB)	RAID	Write BW (MB/s)	CPU %	IOPS	Rebuild duration	Storage
		16 x 4	6 (13+2) 1 HS	125	41	898	35 hours	
		16 x 10	6 (13+2) 1 HS	125	—	—	1.5 weeks	
R630	6.4.3.2811	5 x 1	5 (4+1)	75	—	—	4 hours	Local

Note

All disk drives are NL-SAS 7200 RPM unless otherwise noted.

CHAPTER 5

Testing and validation

This chapter describes the testing used to validate this solution.

- [Test objectives](#).....26
- [Test parameters](#).....26
- [Tests conducted](#)..... 26
- [Storage bandwidth and configuration test](#)..... 30

Test objectives

Many factors must be considered when designing your solution.

The Dell EMC Surveillance Lab tests focus on storage-related factors with the following objectives:

- Determine the bandwidth for various Dell EMC storage arrays using FC and iSCSI.
- Determine the bandwidth for various Dell EMC storage clusters using SMB.
- Determine the best configuration parameters for Unity storage options.
- Determine the best configuration parameters for Isilon storage options.
- Determine best video storage performance requirements for use with Isilon scale-out storage clusters and VNX storage arrays.
- Determine the maximum bandwidth with multiple Recorders.
- Determine all factors with a lab-controlled failure, such as disabling a storage processor, rebuilding disks, removing a node, or network path failures.

Test parameters

All test parameters and scenarios reflect standard production behavior for Verint Nextiva under storage-intensive conditions, including typical storage functions and failures. We followed best practices for recovery and break-fix issues for normal situations that might arise in a standard production environment.

We used the following parameters to perform the tests:

- Tests were conducted by loading each recorder at the maximum recommended bandwidth of 40 MB/s Various per 4 CIF or H.264 (1080P) camera bandwidths were used.

Note

40 MB/s (320 Mb/s) is the minimum recommended bandwidth.

- All test measurements were based on active failure scenarios. Failure scenarios include drive failures and recovery, forced Isilon node failures, and storage processor failures. These scenarios generally caused background jobs to run, such as Isilon's FlexProtect. Testing with these realistic scenarios helps ensure a successful implementation that is able to withstand various types of failures.
- The IP network (Layer 2) is a flat, high-availability network with plenty of capacity, which enabled us to focus on the products we were testing.
- All tests assumed uniform distribution of bandwidth from the Verint Recorder.

Tests conducted

We ran tests with the SmartConnect™ configuration in place and the SMB shares were mounted using the SmartConnect zone name.

Video playback test

As video is being written to the storage, video is simultaneously recalled or reviewed at a rate equal to 20 percent of the write rate. Tests are run with the SmartConnect™

configuration in place and the SMB shares are mounted using the SmartConnect zone name.

The review did not affect the write rate, video quality, or result in dropped video.

Disk failure test

A single disk failure is the most common failure affecting storage systems today. When a disk fails, that disk is removed and replaced. The replacement disk is then reconstructed.

The Unity block storage arrays were protected using RAID with hot spare disks. For the test, disk failure scenarios were induced and the data rebuild to the hot spare disks was observed with effect to write bandwidth.

The Isilon cluster was protected using a +2 protection scheme that allows for two simultaneous disk failures. For the test, two disks are failed and then recovered. The SmartFail process started and the CPU utilization of the node increased with no observed effect to the write streams.

Disk failure test with ECS

A single disk failure is the most common failure affecting storage systems today. When a disk fails, that disk is removed and replaced. The replacement disk is then reconstructed.

ECS employs a hybrid model of triple mirroring data, metadata, and indexing. Erasure coding is also used for enhanced data protection and reduction of storage overhead. For data integrity, ECS uses checksums.

When the system labels a drive as FAILED, the data protection logic rebuilds the data on that drive on other drives in the system. The FAILED drive no longer participates in the system in any way. ECS requires a minimum of four nodes to be able to conduct the default erasure coding and six nodes for the cold archive option.

The disk rebuild operation did not affect the write rate, video quality, or result in dropped video.

The Unity block storage arrays were protected using RAID with hot spare disks. For the test, disk failure scenarios were induced and the data rebuild to the hot spare disks was observed with effect to write bandwidth.

The Isilon cluster was protected using a +2 protection scheme that allows for two simultaneous disk failures. For the test, two disks are failed and then recovered. The SmartFail process started and the CPU utilization of the node increased with no observed effect to the write streams.

NIC failure test

The Unity block storage arrays were configured with multiple paths to the recorders using Microsoft MPIO. Multiple NICs were configured with the recorders and controllers for redundancy. The Unity hard NIC failure test removes one nic cable from the array. Recorders that were configured with multipathing reconnected to the volume across another available path. To reduce the reconnection time and eliminate video loss, adjust the TCP retransmission timers. For more information, see the [Dell EMC Block Storage with Video Management Systems Configuration Best Practices Guide](#).

The Isilon hard NIC failure test removes one NIC cable from the active node that was involved in active recording. After the NIC failure, writing to the same node failed. When the network fails, the server must recognize the failure, then it must establish a

new connection. Also, when the network fails TCP socket connections are left open and remain open on the cluster until Isilon's OneFS forces them closed, which allows the server to continue writing.

We can force the open TCP sockets to close for a duration of less than 2 minutes by reducing the `TCP keep idle` and `TCP keep interval` timeout to the optimum values recommended by Isilon Engineering.

To reduce the video loss duration due to the `TCP Socket Open` condition, set the persistent values in the `sysctl.config` file as follows to reduce the impact duration time significantly:

```
isi_sysctl_cluster
net.inet.tcp.keepidle=61000
isi_sysctl_cluster
net.inet.tcp.keepintvl=5000
```

Refer to the KB Article [89232](#), *Configuring sysctls and making sysctl changes persist through node and cluster reboots and upgrades* for further information about how to configure these parameters.

Note

NIC failure impact can be overcome by using NIC aggregation in Active/Passive Failure aggregation mode, which is explained in the next test case. Connectivity to the nodes that are not affected by the network outage continues to be available throughout the test scenario and no impact was observed.

NIC failure test with ECS

The ECS hard NIC failure test removes one NIC cable from the active node that was involved in active recording to simulate the NIC failure scenario.

The Dell EMC Surveillance Lab uses two 10 GbE, 24-port or 52-port Arista switches that are used to transfer data to and from customer applications as well as internal node-to-node communications. These switches are connected to the ECS nodes in the same rack and employ the Multi-Chassis Link Aggregation (MLAG) feature, which logically links the switches enabling active-active paths between the nodes and customer applications. This configuration results in higher bandwidth while preserving resiliency and redundancy in the data path. Any networking device supporting static LAG or IEEE 802.3ad LACP can connect to this MLAG switch pair. Because the switches are configured as MLAG, these two switches appear and act as one large switch.

The NIC failure tests did not affect the write rate, video quality, or result in dropped video.

NIC Failure test with NIC aggregation in Active/Passive

The hard NIC failure test with Active/Passive aggregation was run by removing the active NIC port cable. After the network failure, writing to the same node continued and the NIC that was passive was immediately changed to the active NIC. The NIC failure caused no apparent loss.

TCP transmission timers can be adjusted to reduce the reconnection times during Nic failures on recorders that use Microsoft MPIO. For more information, see the [Dell EMC Block Storage with Video Management Systems Configuration Best Practices Guide](#).

Note

NIC aggregation in Active/Passive mode remedies only a network disconnection/NIC failure that happens on the Isilon node or the corresponding switch port where it is connected.

Node poweroff test

An unexpected single node hard failure was simulated, which causes the servers that were writing to that node to reconnect to a new node.

During the tests, the servers on the failed node reconnected to a new node, but did not start writing again for an aggregate (reconnect and start writing) duration of up to 52 seconds while waiting for writing to the SMB share to be re-started.

Also, the removal or addition of a node causes an interrupt to the cluster. Therefore, video servers writing to the other nodes might experience a short interruption. The duration of the interruption can be reduced by modifying the OneFS environment variables.

The following changes are required to modify the remove or add node interruption:

```
declare -i COUNT MDS
BASE=10000
COUNT=$((1.01 * $BASE))
MDS=$(( $BASE * 0.75))
isi_sysctl_cluster kern.maxvnodes=$BASE
isi_sysctl_cluster kern.minvnodes=$BASE
isi_sysctl_cluster efs.lin.lock.initiator.lazy_queue_goal=$COUNT
isi_sysctl_cluster efs.ref.initiator.lazy_queue_goal=$COUNT
isi_sysctl_cluster efs.mds.block_lock.initiator.lazy_queue_goal=$MDS
isi_sysctl_cluster efs.bam.data_lock.initiator.lazy_queue_goal=$MDS
```

Note

During an abrupt failure of a node, the recorders writing to that node reconnect to SmartConnect and can buffer the video during reconnection. Data that was already written to the disk cannot be recovered which can range from about 4 to 5 seconds.

⚠ WARNING

If running a mixed workload, these changes can adversely affect the other workloads that might be present on the cluster.

Node poweroff test with ECS

ECS employs a hybrid model triple mirroring data, metadata, and indexing. Erasure coding is also used for enhanced data protection and reduction of storage overhead.

Erasure coding provides enhanced data protection from a disk or node failure that is storage efficient as compared to conventional protection schemes. The ECS storage engine implements the Reed Solomon 12+4 erasure-coding scheme, in which a chunk is broken into 12 data fragments and 4 coding fragments for parity. These 16 fragments are then dispersed across nodes at the local site. The data and coding fragments for each chunk are equally distributed across nodes in the cluster. For example, with 8 nodes, each node stores 2 of the 16 fragments. The storage engine can then reconstruct a chunk from any 12 fragments of the original 16.

One of the ECS nodes was manually shutdown. The CIFS-ECS tool load balanced the traffic across all the available nodes and the recorders bypassed the failed node. The node failure did not affect the write rate, video quality, or result in dropped video.

⚠ WARNING

If running a mixed workload, these changes can adversely affect the other workloads that might be present on the cluster.

Node reboot test with ECS

One of the ECS nodes was manually restarted to simulate a node reboot. The CIFS-ECS tool load balanced the traffic across all the available nodes and the recorders bypassed the failed node. The node reboot did not affect the write rate, video quality, or result in dropped video.

Storage bandwidth and configuration test

The storage bandwidth test evaluated video storage and applications with a number of different Dell EMC storage systems. Additional tests evaluated ESXi host hardware in relationship to vCPU settings and the resulting bandwidths.

These tests assumed that Verint Nextiva was configured as described by Verint's best practices and operated within the recommended bandwidth, camera count, and other Verint maximum requirements.

Procedure

1. Configured video storage for a Dell EMC storage system.
2. Set up camera simulators (traffic generators) to produce a traffic load to each Verint Recorder at the recommended bandwidth.
3. Verified that motion detection was in the **On** state for all cameras.
4. Evaluated the network and video storage to ensure an error-free environment at the induced bandwidth.
5. Introduced storage device errors including:
 - Disk failures and rebuilds on VNX and VNXe arrays
 - Use of only one VNX or VNXe storage processor
 - Disk failures and rebuilds on Isilon nodes
 - Initiation of Isilon node failures and recoveries
 - Initiation of Isilon node removals (downsizing a cluster)
 - Initiation of Isilon node additions (scaling up)
 - NIC failures with active/active and active/passive configurations
6. Captured the storage system and host statistics.
7. Based on the test results:
 - If no issues were detected, incremented the bandwidth.
 - If issues were detected, decreased the bandwidth.

This procedure was repeated until the maximum error-free bandwidth was determined.

CHAPTER 6

Conclusion

This chapter summarizes the testing for this solution:

- [Summary](#).....32

Summary

We performed comprehensive testing with Verint Nextiva on a large number of Dell EMC Unity, Dell EMC Isilon clusters, and Dell EMC ECS.

Depending on a customer's requirements, you can use Dell EMC ECS, Dell EMC Unity, or Dell EMC Isilon storage systems with Verint Nextiva for this solution. The Verint architecture and product suite enables scaling from a few cameras up to tens of thousands of cameras with this solution.

ECS storage

Dell EMC ECS is a software-defined, cloud-scale, object storage platform that combines the cost advantages of commodity infrastructure with the reliability, availability and serviceability of traditional arrays. With ECS, any organization can deliver scalable and simple public cloud services with the reliability and control of a private-cloud infrastructure.

Dell EMC Unity arrays

The use of storage pools to create LUNs within the Dell EMC Unity arrays greatly simplifies the configuration and increases the performance when compared to traditional block-level storage. Either iSCSI or FC can be implemented. FC performs better than iSCSI.

Dell EMC Isilon scale-out storage

Dell EMC Isilon scale-out storage is ideal for midtier and enterprise customers. An Isilon cluster is based on independent nodes working seamlessly together to present a single file system to all users.

Licensed SmartQuotas options can be configured so that each Recorder view of the storage is based on the assigned quota and not the entire file system. We recommend using SmartQuotas with Verint Nextiva as a best practice.