



Video Surveillance EMC Storage with IndigoVision Control Center

Sizing Guide

H14832

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Published May, 2016

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CHAPTER 1

Introduction

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

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Solution overview

IndigoVision provides video management software (VMS) for video surveillance that is scalable, provides sensor integration, and is standards based for open integration. The VMS incorporates smart technology to automatically detect, analyze, and classify behaviors of people and vehicles. This solution is ideally coupled with Isilon Scale-out NAS storage. These options provide the customer with exceptional performance and reliability creating a successful implementation.

Use this guide to determine the requirements for a successful IndigoVision Control Center installation. Testing was conducted to confirm functional compatibility, but does not provide specific bandwidth or configuration information at this time.

Scope

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

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

The guidelines for sizing IndigoVision Control Center using EMC storage systems for video storage describe the use of the following platforms:

- EMC Isilon®

These guidelines include the following design consideration topics:

- Architectural overview of IndigoVision Control Center
- EMC storage considerations for IndigoVision Control Center
- Result summaries for the tests carried out by EMC engineers in a VMware ESXi virtualized infrastructure

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

- Number of IndigoVision NVR-AS servers
- Mix of nodes and NVR-AS servers based on the expected bandwidth in an Isilon implementation
- Storage using Server Message Block (SMB) on Isilon
- Load factors that are related to including 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 *EMC Storage with IndigoVision Control Center: 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 should be similar if your environment uses similar hardware and network topology.

Key objectives

The configurations documented in this paper are based on tests that were conducted in the EMC Physical Security lab, during production implementations, or a combination of the two.

These are the key objectives of this paper:

- Measure sizing needs for specific system requirements so that an implementation can be correctly sized and the right EMC products can be matched to a customer's requirements
- Recommend Isilon SMB configuration
- Calculate node maximum bandwidths
- Recommend disk drive types
- Confirm the previous test results with lab controlled failures, such as disk rebuilds, node removals, or network path failures.

CHAPTER 2

Configured components

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

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- [Isilon clustered storage system](#)..... 10
- [Data protection](#)..... 10
- [Cluster size](#)..... 11

EMC surveillance lab virtual test environment

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.

During all the tests, we assumed that the virtual CPU (vCPU), memory, and network are configured according to IndigoVision best practices.

Our test environment was configured as follows:

- VMware ESXi 6.0
- 20-core ESXi host at 2.2 GHz or greater
- 128 GB memory per ESXi 6.0 host
- Per virtualized IndigoVision Control Center host:
 - 8 vCPUs
 - 8 GB memory
 - Network adaptor type: VMXNET3 (GbE and 10 GbE), E1000 or VMXNET2 (GbE only)
 - Isolated VLAN for storage if not FC

During all the tests, the virtual CPU (vCPU), memory, and network were configured according to IndigoVision best practices. The VMware vSphere configuration was in accordance with the VMware Compatibility Guide (www.vmware.com/resources/compatibility/search.php). In addition, EMC PowerPath[®] was used for block storage (FC and iSCSI) and is recommended for block storage implementations.

Isilon clustered storage system

Isilon network-attached storage (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, 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 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. 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 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 data protection, see *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 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 NVR-AS 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.

Isilon sizing tool

The Isilon sizing tool can use both the sizing by bandwidth and sizing by aggregate capacity methods when calculating ideal cluster size. You can find this tool at <https://isilon-sizing-tool.herokuapp.com>.

Configured components

CHAPTER 3

Solution components

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

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- [IndigoVision Control Center](#)..... 14

EMC storage

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

This guide describes the tests for the following arrays:

- Isilon clusters

For our testing, we used single- and multi-node performance testing on the Isilon storage array.

Storage protocols

This guide provides information about these network protocols.

- SMB (CIFS)

IndigoVision Control Center

A typical IndigoVision Control Center system comprises a Control Center Server, Control Center Client, one or more NVR-AS servers, and IP cameras.

The following table describes the primary Control Center services.

Table 1 Control Center primary services

Service	Description
IndigoVision Windows Network Video Recorder / Alarm Server (NVR-AS)	The NVR-AS combines video recording and playback with advanced alarm management capabilities.
IndigoVision Control Center	The Control Center front-end application is the user interface for IndigoVision's Control Center system. It is used for configuring and managing IndigoVision installations, viewing live video, managing recorded video and handling alarms.
IndigoVision Control Center Client	IndigoVision Control Center console client is used for live monitoring and play back recorded video.
IndigoVision Camera Gateway	Connects non IndigoVision cameras from all major manufacturers using native protocols.

CHAPTER 4

Sizing the solution

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

- [EMC Isilon node and cluster \(SMB2\)](#)..... 16

EMC Isilon node and cluster (SMB2)

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 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. The test included an overall read bandwidth of 20%.

Note

Node smartfail is tested in EMC lab with Flexprotect job set as **Medium** impact policy. The node smartfail was fast but the CPU usage on the nodes running the recorders had CPU utilization up to 92 percent. The IndigoVision NVR-AS recording tests ran fine during the node smartfail. However, setting Flexprotect job to **Low** impact policy will bring down the CPU utilization, but may result in longer-running node smartfail process.

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

Table 2 EMC Isilon node and cluster (SMB) test results

Array	OneFS version	Archivers per node	Bandwidth (MB/s)		Drive Size	Maximum Cluster Raw
			Per node	Per host		
NL410	7.2.x	1	50	50	2 TB	30.2 PB
		2	100	50	2 TB	
		3	100	50	2 TB	
HD400	7.2.x	1	50	50	2 TB	50.9 PB
		2	100	50	2 TB	
		3	100	50	2 TB	

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.

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- [Test parameters](#)..... 18
- [Storage bandwidth and configuration test](#)..... 18

Test objectives

Many factors should be taken into account when designing your solution.

The EMC lab tests focus on storage-related factors with the following objectives:

- Determine the bandwidth for various EMC storage clusters using SMB.
- Determine the configuration parameters for Isilon storage options.
- Determine optimal video storage performance requirements for use with Isilon scale-out storage clusters.
- Determine the maximum bandwidth with multiple NVR-AS servers.
- Determine the previous test results with a lab-controlled failure, such as rebuilding disks, removing a node, or network path failures.

Test parameters

All test parameters and scenarios reflect standard production behavior for IndigoVision Control Center 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:

- 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 IndigoVision NVR-AS.

Storage bandwidth and configuration test

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

During these tests, IndigoVision Control Center was configured as described by IndigoVision's best practices and operated within the recommended bandwidth, camera count, and other IndigoVision maximum requirements.

Procedure

1. Configured video storage for an EMC storage system.
2. Set up camera simulators (traffic generators) to produce a traffic load to each IndigoVision NVR-AS at the recommended bandwidth.
3. Evaluated the network and video storage to ensure an error-free environment at the induced bandwidth.
4. Introduced storage device errors including:
 - 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

5. Captured the storage system and host statistics.

6. Based on the test results:

- If no issues were detected, we incremented the bandwidth.
- If issues were detected, we decremented the bandwidth.

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

Testing and validation

CHAPTER 6

Conclusion

This chapter summarizes the testing for this solution:

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Summary

We performed comprehensive testing with IndigoVision Control Center on a large number of EMC Isilon clusters.

Depending on a customer's requirements, you can use EMC Isilon family storage systems. The IndigoVision architecture and product suite enables scaling from a few cameras up to tens of thousands of cameras.

EMC Isilon scale-out storage

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 NVR-AS view of the storage is based on the assigned quota and not the entire file system. In our tests, we found this feature to be necessary to guarantee a successful disk rebuild and for various node removal tests. We recommend using SmartQuotas with IndigoVision Control Center as a best practice.

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