



# Video Surveillance EMC Storage with Honeywell Digital Video Manager

## Sizing Guide

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**Honeywell**

**EMC<sup>2</sup>**

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# CHAPTER 1

## Introduction

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

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

## Solution overview

Honeywell 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 EMC® Isilon® Scale-out NAS storage or EMC VNX® family block storage including the Video Surveillance Storage (VSS) array. These options provide the customer with exceptional performance and reliability creating a successful implementation.

Use this guide to determine the requirements for a successful Honeywell Digital Video Manager (DVM) installation. Testing was conducted to confirm functional compatibility, but does not provide specific bandwidth or configuration information at this time.

## Scope

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

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

This guide provides guidelines for sizing Honeywell DVM using EMC storage systems for video storage including:

- EMC Isilon®
- EMC VNX®

It includes the following design considerations:

- Architectural overview of Honeywell DVM
- EMC storage considerations for Honeywell DVM
- 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 Honeywell Recorders
- Mix of nodes and Recorders based on the expected bandwidth in an Isilon implementation
- Storage using Fibre Channel (FC) and Internet SCSI (iSCSI) on VNX
- Storage using Server Message Block (SMB 2.0) on Isilon
- Load factors that are related to designing EMC storage arrays into the customer's solution

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**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 Honeywell DVM: 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. If your environment uses similar hardware and network topology, performance results should be similar.

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## Key objectives

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

Following are the key objectives of this paper, which are based on the results of these tests:

- Measure sizing needs for a specific system requirement so that an implementation can be correctly sized and the right EMC products can be matched to the customer's requirements
- Determine EMC VNX bandwidth for each logical unit number (LUN)
- Determine disk pool and LUN configurations
- Recommend Isilon SMB configuration
- Determine Isilon bandwidth for each Recorder
- Calculate array or node maximum bandwidths
- Recommend disk drive types
- Determine the previous test results with a lab controlled failure, for example disk rebuilds, removing a node, network path failures, or disabling a storage processor.





# CHAPTER 2

## Configured components

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

- [EMC surveillance lab virtual test environment](#)..... 10
- [Isilon clustered storage system](#)..... 10
- [Data protection](#)..... 11
- [Cluster size](#)..... 11

## EMC surveillance lab virtual test environment

During all the tests, we assumed that the virtual CPU (vCPU), memory, and network are configured according to Honeywell 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 5.5 host
- Per virtualized Video Management Software (VMS) host:
  - 8 vCPUs
  - 32 GB memory
  - Network adaptor type: VMXNET3 (GbE and 10 GbE), E1000 or VMXNET2 (GbE only)
  - Isolated VLAN for storage if not FC

This recommended ESXi virtual machine configuration provides for full time review of 10 to 20 percent of the archived video files.

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### Note

For a 20-core ESXi host at 2.2 GHz or greater, the VMXNET3 network adaptor performs well with GbE NICs, but identifies it as a 10 GbE network. To avoid confusion, a VMXNET2 or E1000 may be used.

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Previous test environments with non-current EMC arrays and clusters such as CLARiiON were tested using ESX/ESXi 4.0 or greater. The ESX/ESXi host CPU, memory, and network configurations of previous test environments are not represented in the environment configuration list.

## VMware ESX/ESXi minimum requirements

Make sure the host hardware meets the minimum system requirements for an ESXi/ESX Installation.

The VMware vSphere minimum system requirements are as follows:

- EMC PowerPath<sup>®</sup> for block storage (FC and iSCSI)
- Four-core 1.99 GHz processors or greater

For a list of compatible hardware, refer to the *VMware Compatibility Guide* and *Honeywell Configuration Guide*.

## Isilon clustered storage system

Isilon scale-out network-attached storage (NAS) was designed and developed specifically to address the needs of 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 chips, and network interfaces. These nodes are integrated with the proprietary Isilon OneFS<sup>®</sup> operating system, which is a distributed networked file system that unifies a cluster of nodes into a single shared resource.

## Isilon protection with OneFS 7.2

On new installations, OneFS 7.2 provides a data protection level that meets EMC Isilon guidelines for mean time to data loss (MTTDL) for large capacity nodes. OneFS offers a new protection option, +3d:1n1d. OneFS 7.2 also provides an option where it continually evaluates the cluster and sends an alert if the cluster falls below the suggested protection level.

## Data protection

Isilon OneFS does not rely on hardware-based RAID for data protection. The Isilon system uses the Reed Solomon algorithm for N+M protection.

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 forward error correction (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*.

You can use cluster sizes as small as a three-node cluster, but we do not recommend it. 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 bandwidth and storage capacity that is needed.

## 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-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 can base the calculation on either bandwidth or capacity.

### Sizing by bandwidth

We recommend a cluster size with one or more additional nodes than is 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 (values 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:

- [EMC storage](#)..... 14
- [Storage protocols](#)..... 14
- [Honeywell DVM](#)..... 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
- VNX arrays

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

## Storage protocols

This guide provides information about these network protocols.

- FC
- iSCSI
- SMB (CIFS)

## Honeywell DVM

A typical Honeywell DVM system comprises a Database Server, one or more Camera Servers, clients, camera streamers and IP cameras. The system can optionally be integrated with an Enterprise Buildings Integrator (EBI) or Experion system.

The following table describes three primary DVM services.

**Table 1** DVM primary services

Service	Description
Camera Server	The Camera Server is responsible for: <ul style="list-style-type: none"> <li>• Connecting to video sources</li> <li>• Transmitting video from the cameras to the clients</li> <li>• Storing recorded video</li> <li>• Notifying the Database Server of the system state</li> </ul>
Database Server	The Database Server is responsible for: <ul style="list-style-type: none"> <li>• Storing the configuration and runtime information of the Honeywell DVM system</li> <li>• Distributing state information to the clients</li> <li>• Accepting requests from Honeywell DVM clients to view video</li> </ul>
DVM Console Client	DVM console client is used for live monitoring and play back of recorded video.

# CHAPTER 4

## Sizing the solution

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

- [EMC VNX](#) ..... 16
- [EMC Isilon node and cluster \(SMB2\)](#)..... 17

## EMC VNX

We conducted the functional tests to determine how Honeywell works with VNX storage arrays.

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

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 pool (SP) maintenance cycle, disk rebuild, or similar performance-intensive events.

**Table 2** EMC VNX/VNXe storage array results

Storage protocol	Array	Array bandwidth (MB/s)	Disks	Maximum (RAW)
iSCSI	VNXe1600**	226	35	400 TB
		226	200	
	VNXe3200*	150	120	500 TB
		150	150	
	VNX-VSS100*	325	90	360 TB
	VNX5200	345	75	500 TB
	VNX5400*	397	120	1 PB
		397	250	
	VNX5600*	456	120	2 PB
		552	240	
		552	500	
	VNX5800*	548	120	3 PB
		876	240	
		1314	360	
		1314	750	
	VNX7600*	657	120	4 PB
		1051	240	
		1577	360	
		2102	480	
		2102	1000	
VNX8000*	788	120	6 PB	
	1261	240		
	1892	360		
	2096	480		



**Table 2** EMC VNX/VNXe storage array results (continued)

Storage protocol	Array	Array bandwidth (MB/s)	Disks	Maximum (RAW)
		3154	600	
		3154	1000	

\* Extrapolated based on VNX5200 iSCSI results.

\*\* Extrapolated based on the VNX5200 and other VMS tests. In our tests the newer technology in the VNXe1600 out-performed the VNXe3200.

Each recorder can write up to 43 MB/s.

## 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 FlexProtect running) to ensure a worst-case scenario for all sizing parameters. The Node failure had a video loss of 30 seconds on the recorders connected to the failed node. Smart connect feature transfers the connection to available nodes. The test included an overall read bandwidth of 20%.

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

**Table 3** 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		
X410	7.2.x	1	78	78	4 TB	20.7 PB
		2	110	55	4 TB	
		3	132	44	4 TB	
		4	136	34	4 TB	
NL410	7.2.x	1	78	78	6 TB	30.2 PB
		2	106	53	6 TB	
		3	120	40	6 TB	
HD400	7.2.x	1	78	78	6 TB	50.9 PB
		2	106	53	6 TB	
		3	120	40	6 TB	

### Note

All disk drives are SATA 7200 RPM unless otherwise noted.



# CHAPTER 5

## Testing and validation

This chapter describes the testing used to validate this solution.

- [Test objectives](#)..... 20
- [Test parameters](#)..... 20
- [Storage bandwidth and configuration test](#)..... 20

## 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 arrays and clusters using SMB, FC, and iSCSI.
- Determine the configuration parameters for Isilon and VNX storage options.
- Determine optimal video storage performance requirements for use with Isilon scale-out storage clusters and VNX storage arrays.
- Determine the maximum bandwidth with multiple Recorders.
- Determine the previous test results with a lab controlled failure, for example disk rebuilds, removing a node, network path failures, or disabling a storage processor.

## Test parameters

All test parameters and scenarios reflect standard production behavior for Honeywell DVM 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 Honeywell Recorder.

## 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.

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

### Procedure

1. Configured video storage for an EMC storage system.
2. Configured Honeywell Recorders for the storage protocol to be tested (FC, iSCSI, SMB2).
3. Set up camera simulators (traffic generators) to produce a traffic load to each Camera server at the desired bandwidth.
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
  - The 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, we incremented the bandwidth.
  - If issues were detected, we decremented the bandwidth.

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

### Results

The test results associated with the previous procedure, for each tested EMC storage array or cluster, are presented in *EMC Storage with Honeywell DVM: Configuration Guide*. The test results provide information about the maximum expected bandwidth per array or node, the disk configuration, as well as recommendations for various configuration parameters derived from extensive testing.

Testing and validation

# CHAPTER 6

## Conclusion

This chapter summarizes the testing for this solution:

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## Summary

EMC performed comprehensive testing with Honeywell DVM against EMC VNX and EMC Isilon clusters. Depending on the implementation needs, you can use EMC storage for Honeywell DVM. The Honeywell DVM architecture and product suite allows extreme scaling from a few cameras to tens of thousands of cameras using EMC storage.

### **VNX**

The use of storage pools to create LUNs within the EMC VNX 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.

### **EMC VNX-VSS100 arrays**

The VNX Video Surveillance Storage (VSS) is a storage solution that is purpose-built to meet the unique demands of the video surveillance environment. We found that this high availability, low-cost array performs comparably to other arrays in the VNX family.

### **EMC VNXe arrays**

An iSCSI-connected VNXe array, implemented with storage pools, provides a cost-effective implementation while maintaining the expected performance. Many mid-sized deployments can use VNXe.

Low-bandwidth implementations can use a NAS-connected VNXe, but ideally NAS implementations should be based on EMC Isilon scale-out storage.

### **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 Recorder view of the storage is based on the assigned quota and not the entire file system. We recommend using SmartQuotas with Honeywell DVM as a best practice.