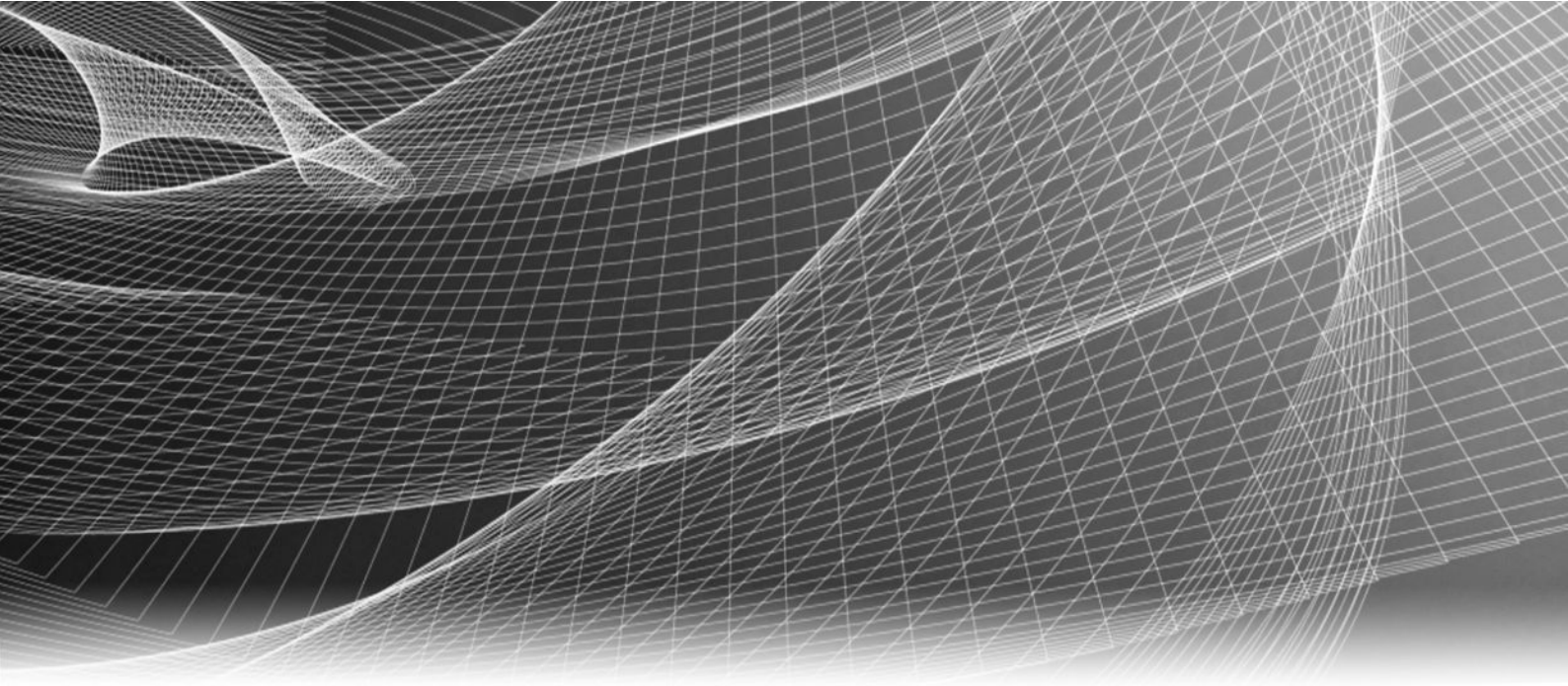

Video Surveillance
EMC Storage with Synectics Digital Recording System

Sizing Guide

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EMC² VS-LAB TESTED

SYNECTICS

EMC²

Published June 2016

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CHAPTER 1

Introduction

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

Solution overview

The purpose of this guide is to help you understand the benefits of using an EMC storage solution with Synectics Digital Recording System for video surveillance that includes both hardware and software elements.

Scope

This guide is intended for use by internal EMC sales and pre-sales personnel, and qualified EMC and Synectics 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 Synectics Digital Recording System using EMC storage systems for video storage describe the use of the following platforms:

- EMC Isilon®
- EMC VNX®

These guidelines include the following design consideration topics:

- Architectural overview of Synectics Digital Recording System and Synergy 3
- EMC storage considerations for Synectics Digital Recording System
- Result summaries for the tests carried out by EMC engineers on the Synectics PSN 3 servers

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

- Number of Synectics Recorders
- Mix of nodes and Synectics Recorders based on the expected bandwidth in an Isilon implementation
- Storage using Internet SCSI (iSCSI) on VNX
- 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 Synectics Digital Recording System: 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 paper are based on tests conducted in the EMC Physical Security lab and actual production implementations.

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
- Determine VNX and VSS logical unit number (LUN) bandwidth within the storage pool
- Recommend 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, or network path failures.

CHAPTER 2

Configured components

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

EMC surveillance lab test environment

All tests were conducted using Synectics Digital Recording System using PSN 3 servers with Synergy 3.

Synectics Digital Recording System

We made configurational changes on the Synectics Digital Recording system to achieve maximum performance results with EMC storage devices.

- We installed the latest network adapter drivers for the Intel® Ethernet Server Adapter I350 drivers present on the Synectics recorder.
- The Synectics team installed a fix to resolve the grooming issue on the Synectics servers.
- The Synectics team implemented a configuration change that significantly reduced the high IOPS write from the Synectics Servers to the EMC storage systems. This change resolved the high utilization on the Isilon platform and the VNX system.

Contact the Synectics team to incorporate these changes on the Synectics Digital Recording Systems.

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, 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.

failure

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 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.

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 .

CHAPTER 3

Solution components

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

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- and multi-node performance testing on the Isilon storage array.

Storage protocols

EMC uses standard file protocols to allow users and applications to access data consolidated on an EMC storage solution.

This guide provides information about these network protocols:

- iSCSI
- SMB (CIFS)

Synectics Digital Recording System

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

The following table describes the primary Synectics applications.

Table 1 Synectics primary services

Service	Description
Synectics Digital Recording System PSN3	Combines intelligent recording management software with a secure and robust hardware platform for professional video recording, storage and review. Video retention is configurable from hours to years on redundant enterprise servers. Recording can be centralized or distributed, and function in a fully IP or hybrid, analogue or IP CCTV environment.
Synectics Synergy 3	A comprehensive command and control platform that provides alarm management and workflows, smart video analytics, and multi-site and mobile surveillance solutions. Custom workflows automate and track operator reactions to defined alarm conditions. Synergy 3 provides "smart" monitoring to identify camera tampering, gross scene change, object classification, and tripwires in real time or after the fact.

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

We conducted the functional tests to determine how Synectics works with a VNX storage array on single Storage Processor.

Our testing found the best bandwidth for a single camera server to be 45 MB/s. The test included functional review/playback on the Synergy 3 server.

Note

The Synectics Digital Recording System we tested in the EMC Video Surveillance Lab was running a Windows Embedded Standard SP1 operating system, which is not compatible with the EMC PowerPath for Windows software. Therefore, the tests related to NIC failure or SP failure were not performed. Tests were run on the Single Storage Processor of the VNX system.

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 disk rebuild, or similar performance-intensive events.

Table 2 EMC VNX/VNXe storage array results

Array	Array Bandwidth (MB/s)	Disks	Maximum (RAW)
VNXe1600	220	35	400 TB
	220	200	
VNX-VSS100	260	90	360 TB
VSS1600	220	35	400 TB
	220	200	
VNX5200	280	55	500 TB

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 Gigabit Ethernet (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 Synectics-supported values.

We performed all tests with a per-camera bandwidth of 8 Mb/s and 16 Mb/s, so a single Recorder that handles 38 MB/s can support 20 to 40 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.

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	Recorders per node	Bandwidth (MB/s)		Drive size	Maximum cluster RAW
			Per node	Per host		
NL410	7.2.1	1	38	38	2 TB	30.2 PB
		4	152	38	2 TB	
HD400	7.2.1	1	38	38	2 TB	50.9 PB
		5	152	38	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.

Test objectives

Many factors should be considered 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 and iSCSI.
- Determine the bandwidth for various EMC storage clusters using SMB.
- Determine the configuration parameters for Isilon and VNX storage options.
- Determine best video storage performance requirements for use with Isilon scale-out storage clustersVNX storage arrays.
- Determine the maximum bandwidth with multiple Recorders.
- Determine the previous test results 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 Synectics Digital Recording System 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 Synectics Recorder.

Storage bandwidth and configuration test

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

These tests assumed that Synectics Digital Recording System was configured as described by Synectics's best practices and operated within the recommended bandwidth, camera count, and other Synectics 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 Synectics 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, we incremented the bandwidth.
   - If issues were detected, we decreased the bandwidth.

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

CHAPTER 6

Conclusion

This chapter summarizes the testing for this solution:

Summary

We performed comprehensive testing with Synectics Digital Recording System on a large number of EMC VNX and VNXe arrays and EMC Isilon clusters.

You can use EMC VNX, EMC VNXe, EMC VSS, or EMC Isilon storage systems with Synectics Digital Recording System for this solution. The Synectics architecture and product suite enables scaling from a few cameras up to tens of thousands of cameras with this solution.

EMC 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. iSCSI can be implemented with Synectics Digital Recording System.

EMC VSS

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

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.

EMC Isilon scale-out storage

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. EMC recommends using SmartQuotas with Synectics Digital Recording System as a best practice.