White Paper

EMC STORAGE IN PHYSICAL SECURITY SOLUTIONS WITH AXIS NAS-ATTACHED CAMERAS

Iomega StorCenter px Storage, VNXe Storage, and Axis NAS-attached camera

- Axis configuration guidelines with EMC storage arrays
- Implementation notes for Axis cameras

EMC Solutions

Abstract

This White Paper describes guidelines for storage configuration, bandwidth assessments, and the disk recovery and rebuild of EMC storage arrays based on the results of EMC tests using the Axis camera and Axis camera station. The values presented are intended to assist by providing the optimum configuration on a per storage array basis.

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Executive summary

Business Case

Storage is a major component of a physical security installation. To understand how to design and deploy Axis cameras, we evaluated video retention times, frame rates, resolution, target bit rates, and other video quality parameters to determine:

- The required aggregate megabytes per second (MB/s) to be written to the storage array
- The required amount of total storage

Solution overview

As the aggregate storage bandwidth is defined along with the total storage requirement, you can use this solution to determine which storage array best meets customers' requirements.

EMC provides a large range of storage arrays for storing physical security video and audio files. By using Iomega® NAS storage arrays, you can meet the needs of a customer's Axis network-attached storage (NAS) video storage needs. This solution provides guidelines for the EMC® VNXe® series and Iomega StorCenter™ px Family products specifically.

Key results

These technical notes provide information on the following test results:

- Maximum bandwidth for each array
- Rebuild times for the replacement of a failed disk
- Disk drive types and RAID types

Introduction

Purpose

This document provides guidelines for storage configuration, bandwidth assessments, and the disk recovery and rebuild of EMC storage arrays based on the results of EMC tests using the Axis camera and Axis camera station.

The values presented are intended to assist by providing the optimum configuration on a per storage array basis.

Scope

The scope of this document is to:

- Present optimum storage configuration guidelines for the Axis camera when it is attached to Iomega StorCenter px series arrays and VNXe storage arrays.
- Summarize test results carried out by the EMC solution team.

Audience

The intended audience is field sales and EMC partners that are OEMs or resell EMC products in the digital video surveillance industry.

Terminology

Common resolutions

Table 1 shows the video pixel density standard used in digital video security.

Table 1. Common intermediate format (CIF) resolution

CIF format	Resolution (pixel)	
	PAL	NTSC
QCIF (Quarter CIF)	176 x 144	176 x 120
2CIF (CIF x 2)	704 x 288	704 x 240
CIF	352 x 288	352 x 240
4CIF (CIF x 4)	704 x 576	704 x 480
480i/p	704 x 480	704 x 480
720i/p	1280 x 720	1280 x 720
1080i/p[1]	1920 x 1080	1920 x 1080

There are two color TV standards: Phase Alternating Line (PAL) and National Television Standards Committee (NTSC). CIF definitions were originally created in Europe where the PAL color TV standard is used. The CIF definition was later expanded to include the NTSC definition.

Block-level storage system

A block-level storage system writes and reads blocks of data using logical block addresses (LBAs), which are translated into disk sector addresses on the drives. SAN

[1] The format of the Axis cameras tested used 1080i

storage environments use block-level storage to provide a higher level of performance compared to file-level storage.

File-level storage system

File-level storage systems add a level of abstraction above the block-level access. In this case, the host's data is sent as file system extents, which must be mapped to logical disk blocks before they are stored on the hard drives. Network-attached storage (NAS) refers to file-level storage.

Axis bandwidth calculator

Axis provides a design tool that can help determine network bandwidth and storage. By specifying video-stream characteristics, such as resolution and framerate, you can obtain an estimate on the approximate bandwidth and storage that the video stream takes. You can find the Axis design tool from the Axis website:

http://www.axis.com/products/video/design_tool/

Technology overview

EMC storage arrays

This document provides configuration information about the following storage arrays:

- Iomega StorCenter px4
- Iomega StorCenter px6
- Iomega StorCenter px12
- EMC VNXe3100
- EMC VNXe3300

Axis camera

Axis system requirements are as follows:

- The minimum Axis camera firmware supported for the NAS function is version 5.40.9.
- You can use all firmware later than version 5.40.9 that incorporates the NAS function.

Optimum EMC VNXe and Iomega storage array configurations

Storage array performance

Table 2 shows the optimum storage configuration for each storage array.

Table 2. Array performance

Storage array (CIFS NAS)	Total array bandwidth (MB/s)[2]	Camera per share folder	Streams tested[3]	RAID	Disk per storage pool	Disk size	Disk RPM	Type of disk
Iomega px4-300d	12	1	3	5	4	1 TB	5,900	SATA II
Iomega px4-300r	12	1	3	5	4	3 TB	5,900	SATA II
Iomega px6-300d	12	1	3	5	6	1 TB	5,900	SATA II
Iomega px12-350r	21[4]	1	3	6	6	3 TB	5,900	SATA II
EMC VNXe3100	18[5]	1	3	6	30	2 TB	7,200	SAS
EMC VNXe3300	24[6]	1	3	6	30	2 TB	7,200	NL-SAS

[2] **Total array bandwidth**: The maximum bandwidth a customer should configure for each array. This value represents the sustained bandwidth that can be achieved with a failed storage resource, such as a failed storage processor or a disk.

[3] **Streams tested**: The number of cameras used for this test. This does not imply the maximum value.

[4] The number was extrapolated because of a lack of resources (Axis cameras) for a full test.

[5] The number was extrapolated because of a lack of resources (Axis cameras) for a full test.

[6] The number was extrapolated because of a lack of resources (Axis cameras) for a full test.

Disk configuration

Table 3 shows the disk configuration requirements for each storage array.

Table 3. Disk configuration

Storage array	Disk configuration
Iomega px4-300d/px4-300r	Specify the appropriate share size using the Iomega GUI interface
Iomega px6-300d	Specify the appropriate share size using the Iomega GUI interface
Iomega px12-350r	Specify the appropriate share size using the Iomega GUI interface
VNXe3100	One share folder per share
VNXe3300	One share folder per share

Axis camera configuration

Overview

This section describes the implementation details required for a correct implementation of Axis cameras with VNXe and Iomega px storage arrays.

Axis camera configuration

Before configuring the Axis camera, check if the camera model supports firmware of version 5.40.9 or later from the Axis website and upgrade all connected cameras.

Perform the following steps to configure the Axis camera:

1. Install the Axis camera from the network and assign a valid IP address.
2. Create a RAID group on the Iomega or VNXe storage array.
3. Create the required common Internet file system (CIFS) shares on the storage array (one CIFS share for each camera).
4. Mount the CIFS share on the installed camera. You can do this directly from the camera interface or the Axis application such as the Axis camera station.

Test results

Overview

This section shows the test observations and requirements for the VNXe and Iomega px storage arrays when they are connected with the Axis camera.

Test observations

Test observations for Iomega px4-300d and px4-300r

The test observations and requirements for the Iomega px4-300d and px4-300r storage arrays are as follows:

- Minimum firmware requirement: 3.1.14.995
- The array was a four-disk unit
- We created a single RAID 5 (3+1) storage pool with two LUNs for testing purposes
- The StorCenter px4 array used 8-hour duty cycle disks (consumer grade)
- We collected data during a forced single disk fault recovery (disk rebuild)
- Memory configuration was fixed (no changes)
- Fault recovery time (hours): 10
- We used one CIFS share for each camera

Test observations for Iomega px6-300d

The test observations and requirements for the Iomega px6-300d storage array are as follows:

- Minimum firmware requirement: 3.2.2.4456
- The array was a six-disk unit
- We created a single RAID 6 (4+2) storage pool with two LUNs for testing purposes
- The StorCenter px6 array used 8-hour duty cycle disks (consumer grade)
- We collected data during a forced single disk fault recovery (disk rebuild)
- Memory configuration was fixed (no changes)
- Fault recovery time (hours): 16
- We used one CIFS share for each camera

Test observations for Iomega px12-350r

The test observations and requirements for the Iomega px12-350r storage array are as follows:

- Minimum firmware requirement: 3.1.14.995
- The array was a 12-disk unit
- We created two RAID 6 (4+2) storage pools for testing purposes, two LUNs for each storage pool
- By default, the StorCenter px12 array used 8-hour duty cycle disks (consumer grade); enterprise-class disks are available
- We collected data during a forced single disk fault recovery (disk rebuild)
- Memory configuration was fixed (no changes)
- Fault recovery time (hours): 36
- We used one CIFS share for each camera

Test observations for VNXe3100

The test observations and requirements for the VNXe3100 storage array are as follows:

- Minimum VNXe operating environment requirement: 2.0.3.13400
- We created a single RAID 5 (4+1) storage pool (30 disks) for testing purposes:
  - One CIFS share was used for each camera
  - When creating the storage pool, we selected the pool type **Generic Storage-General Purpose**
- We collected data in the worst-case scenario:
  - During a forced single disk fault recovery (disk rebuild)
  - Using a single storage processor (SP)
- Memory configuration was fixed (no changes)
- Maximum bandwidth:
  - Single SP utilization was 50 percent
  - Maximum bandwidth should be load balanced over both SPs
- Fault recovery time (hours): 22

Test observations for VNXe3300

The test observations and requirements for the VNXe3300 storage array are as follows:

- Minimum VNXe operating environment requirement: 2.0.3.13400
- We created a single-disk or double-disk storage pool:
  - When creating a storage pool, we selected the pool type **Generic Storage–General Purpose**
  - One share was used for each camera
- We collected data in the worst case scenario:
  - During a forced single disk fault recovery (disk rebuild)
  - Using a single SP
- Memory configuration was fixed (no changes)
- Maximum bandwidth:
  - Single SP utilization was 50 percent
  - Maximum bandwidth should be load balanced over both SPs (55 percent utilization for each SP)
- Fault recovery time (hours): 22

Conclusion

Summary

The Axis camera is compatible with and performs well on EMC VNXe and Iomega StoreCenter px series storage arrays.

Findings

The key findings of the test are as follows:

- Axis camera firmware version 5.40.9 or later is supported for the NAS function.
- The Axis camera can record at its peak high-definition bandwidth with Iomega px4-300d, Iomega px4-300r, and Iomega px6-300d storage arrays. We extrapolated from the test that, with Iomega px12-350r, VNXe3100, and VNXe3300 storage arrays, the Axis camera can also record at its peak high-definition maximum bandwidth.
- It is easy to configure Axis cameras for the NAS storage. You can do this by either connecting to the camera directly or using Axis camera station.
- VNXe storage pools make provisioning easy and are ideally suited for Axis NAS cameras.

References

Product documentation

For additional information about EMC products, see the product documents listed below.

- *Iomega StorCenter px Series Quick Install Guide*
- *Iomega StorCenter px Series Users Manual*
- *EMC VNXe3300 Installation Guide*
- *EMC VNXe3100 Installation Guide*

Other documentation

For additional information about Axis firmware, see the following article on the Axis website.

- *Axis Firmware*