



Technical Report

Video Surveillance Storage and Verint Nextiva

NetApp Video Surveillance Storage Solution

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1 Executive Summary

1.1 Overview

This solution incorporates NetApp® video surveillance storage using the E-Series storage array to support video archival for the Verint Nextiva video management software (VMS) system.

1.2 Verint Nextiva VMS

Verint® Systems Inc. (NASDAQ: VRNT) is a leading provider of Actionable Intelligence® solutions and services for enterprise and security intelligence. Verint is headquartered in Melville, New York, with offices worldwide.

Verint Nextiva video management software promotes a more proactive, effective approach to security and emergency management. This software solution helps organizations of virtually any size and scope address a wide array of strategic video security challenges.

1.3 NetApp Video Surveillance Storage

The NetApp Video Surveillance Storage solution using the E5400 high-performance storage system meets an organization's demanding performance and capacity requirements without sacrificing simplicity and efficiency.

The E5400 is based on a field-proven architecture designed to provide the highest reliability and 99.999% availability. Its redundant components, automated path failover, and online administration provide 24/7/365 availability for video management applications.

1.4 Key Findings

The validation program successfully demonstrated that the performance characteristics of the E5460 provide sufficient throughput for megapixel network video camera deployments with video ingest rates observed at several times higher than would be typical of a production deployment.

2 Introduction

2.1 Overview

This technical report is the result of the collaborative efforts of Verint and NetApp in the E-Series Video Management System Validation Program. The recording server component of Verint Nextiva is tested with an E5460 dual-controller 60-drive storage array. The engineering staff of Verint successfully installed and configured the storage using SANtricity® ES management software and completed a series of functional and performance tests using simulated megapixel network video cameras at high frame rates.

2.2 Audience

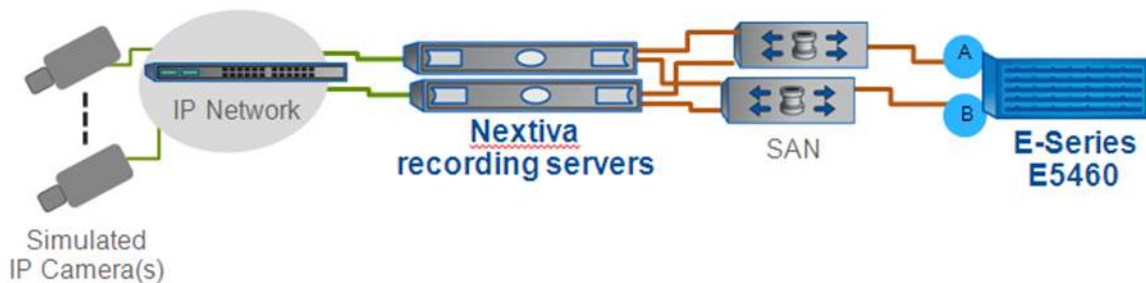
This document is a reference for both NetApp and Verint employees and partners implementing Verint Nextiva combined with the E5460 storage array.

2.3 Solution Overview

The solution topology is an open platform–based Nextiva video management software deployment model. Implementations of hundreds or thousands of networked video cameras are common in this deployment model. The validation program topology verifies the basic building block: IP cameras streaming video to a recording server, which in turn writes video archives to a volume (LUN) on a storage array.

This topology is shown in Figure 1) Solution overview topology.

Figure 1) Solution overview topology.



The goal of testing is to validate that the performance of a volume (LUN) on the E-Series storage array meets or exceeds the throughput required for megapixel network video cameras streaming to the Nextiva recording server.

3 Configuration

3.1 Verint Nextiva

Nextiva video management software is configured for continuous recording of all megapixel video cameras. Nextiva VMS is an open platform system and can be deployed on any compatible physical hardware as well as in virtual environments.

3.2 Nextiva Directory Structure

Nextiva uses a Windows® directory structure in which initially video files from each camera are stored in a temporary directory on the E-Series volume (LUN). The recorder creates individual folders for each

camera input using the camera identifier as the folder name. Subordinate to the camera folder, additional folders are created daily and named for the year, month, and day. Each individual video file contains approximately three minutes of video archive and is moved from the temporary directory to the appropriate folder for the configured retention period.

This structure is illustrated as follows.

Working directory	H:\verint\cctvware
Temporary directory	H:\verint\cctvware\temp
Camera ID folder	H:\verint\cctvware\cam0123
Date folder	H:\verint\cctvware\cam0123\20120728\

3.3 Recording Server

The recording server in this topology is a Dell Inc. PowerEdge R710 x64-based PC. There is a single Intel® 64 Family 6 Model 44 Stepping 2 Genuine Intel ~2394 Mhz processor with 6GB of memory.

The system has four embedded Broadcom NetXtreme II 5709c Gigabit Ethernet NICs. A TCPIP Offload Engine is supported and operational. One of the four Gigabit Ethernet ports is connected to the IP network. The Fibre Channel host bus adapter is a QLogic model, QLE2462 Firmware 5.06.04.

Microsoft® Windows Server® 2008 R2 Standard is running natively on the physical hardware. For more details on the configuration, the output from the Windows command `systeminfo` is shown in the appendix to this document. The CPU busy and memory utilization observed is approximately 50% and 47%, respectively.

3.4 Video Ingress

Video streams to the recording server are simulated megapixel IP cameras using SXGA resolution (1280x1024 pixels or 1.3 megapixels) at 30 frames per second. The single recording server is processing 45 video feeds with an average data rate per camera of 12 Mbps. The total network traffic reported by the Windows Performance Monitor is 541 Mbps at the ingress interface. This is a relatively high data rate for a single video recording server.

3.5 E-Series Configuration

The E-Series storage array is a dual-controller E5460 with a total of 12GB cache running firmware version 07.80.55.00. The storage array and recording server are connected over an 8 Gbps Fibre Channel SAN switch fabric. Two host interfaces on each controller are attached to the switch fabric.

Global Parameters

The Start/Stop cache flushing values are configured at 80%/80%, respectively. The cache block size is 32K. Media scan is disabled.

Volume (RAID) Group

The volume group configured (RAID5_10Disks) is a RAID 5 (9+1) configuration. The total capacity of the volume group is 24.556TB.

Volume

The volume (Raid5_10Disks_vol2) mapped to the recording server (rec) is a 1024GB LUN. The segment size is 128K with read and write cache enabled. Data Assurance is disabled. Write cache without batteries and write cache with mirroring are both disabled. Write cache is flushed after 10 seconds. Dynamic cache read prefetch is enabled. Pre-read redundancy check is disabled. The modification priority is set to "lowest."

Disks

The disks in this deployment are Seagate 3TB NL-SAS drives.

4 Performance

The performance data shown in Table 1) SANtricity volume performance, is captured from the SANtricity ES Performance Monitor as well as Windows Performance Monitor network statistics. The disk throughput data rate is converted to megabits per second to correlate with the ingress network data rate.

Table 1) SANtricity volume performance.

Volume	Total I/O	Read %	Cache Hit %	Maximum KB/Second	Maximum Mbps	Maximum I/O/Second	Ave. KB/I/O	Ingress Network Mbps
Raid5_10Disks_vol2	33,027	0.3	20.2	74,440.1	581	320.1	232	541

Note that the Ingress Network Mbps column includes both IP and Ethernet headers and that the ingress video is encapsulated in 1,500-byte Ethernet packets. The disk I/O is representative of video archive data as well as I/O related to managing the file and directory structure of the temporary and permanent video archives. However, the ingress and egress video data rates are within approximately 10% of each other.

Windows Performance Monitor data on the recording server is examined to validate the performance data reported by SANtricity from the storage array. The data rate per camera is calculated by dividing the number of cameras into the ingress network data rate. The disk write throughput is shown in both bytes per second and megabits per second.

Table 2) Perfmon physical disk performance.

Instance (Physical Disk)	Disk Write Bytes/Sec and Mbps	Ave. Write KB/I/O	Number of Cameras	Ingress Network Mbps	Rate Mbps per Camera	Volume Size (GB)	Est. Retention Period Hours
11 H: Raid5_10Disks_vol2	68,102,145 519	546	45	541	12	1,024	4.5

Of interest in Table 2) Perfmon physical disk performance, is the rate that video is being written to the volume in relation to the volume capacity. The volume is 1024GB (1TB) and the 45 cameras are generating approximately 12 Mbps each. At that rate, the volume will reach its capacity after approximately 4.5 hours of continuous recording.

Using a typical 30-day retention period, it would require approximately 160TB of storage to archive video from the 45 cameras at the observed data rate. Most implementations would allocate this required capacity over several volumes assigned to more than one server.

5 Supplemental Configurations and Performance

Several additional configurations were tested in addition to the Nextiva recorder running natively on the physical machine. Also tested was Nextiva running in a VMware® virtual machine configured with four CPUs and 4GB of memory.

The storage configuration is a 1TB volume using a total of eight disks in a RAID 5 (7+1), RAID 6 (6+2), and RAID 10 (4+4) configuration. Each configuration was tested using Verint network video cameras. The results of this testing are shown in Table 3) Supplemental performance .

Table 3) Supplemental performance data.

RAID Level	Number of Camera Inputs	Disk Throughput MB/s	Disk Throughput Mb/s	Rate Mbps/ Camera	Ingress Network Utilization	CPU Busy
RAID 5	221	80	640	2.89	68%	27%
RAID 10	221	80	640	2.89	68%	27%
RAID 6	251	88	704	2.80	72%	45%

In all iterations the recording server did not show any signs of excessive buffering and the E-Series performance exceeded the recommended requirements.

6 Conclusion

In this test, the performance characteristics of the E-Series for a single RAID 5 (9+1) volume group was demonstrated to be substantially higher than what would be typical when configured with capacity to retain 30 days of archived video.

Additionally, the performance characteristics of Verint Nextiva and the E-Series storage array are in line with the capability of the ingress network interface to deliver workload to the server.

The NetApp Video Surveillance Solution and Verint Nextiva offer the physical security integrator a reliable, scalable, and high-throughput repository for organizations with complex deployments and high-availability requirements.

Appendix

SystemInfo

```
Host Name: R710RECORDER
OS Name: Microsoft Windows Server 2008 R2 Standard
OS Version: 6.1.7601 Service Pack 1 Build 7601
OS Manufacturer: Microsoft Corporation
OS Configuration: Member Server
OS Build Type: Multiprocessor Free
Registered Owner: Windows User
Registered Organization:
Product ID: 00477-001-0000421-84047
Original Install Date: 5/7/2010, 2:54:22 PM
System Boot Time: 7/27/2012, 3:05:12 PM
System Manufacturer: Dell Inc.
System Model: PowerEdge R710
System Type: x64-based PC
Processor(s): 1 Processor(s) Installed.
               [01]: Intel64 Family 6 Model 44 Stepping 2
GenuineIntel ~2394 Mhz
BIOS Version: Dell Inc. 2.1.15, 9/2/2010
Windows Directory: C:\Windows
System Directory: C:\Windows\system32
Boot Device: \Device\HarddiskVolumel
System Locale: en-us;English (United States)
Input Locale: en-us;English (United States)
Time Zone: (UTC-05:00) Eastern Time (US & Canada)
Total Physical Memory: 6,134 MB
Available Physical Memory: 4,690 MB
Virtual Memory: Max Size: 12,266 MB
Virtual Memory: Available: 10,439 MB
Virtual Memory: In Use: 1,827 MB
Page File Location(s): C:\pagefile.sys
Domain: NextivaLab.com
Logon Server: \\NEXTIVA-DOMAIN
Hotfix(s): 82 Hotfix(s) Installed.

[ snip]

Network Card(s): 4 NIC(s) Installed.
                 [01]: Broadcom BCM5709C NetXtreme II GigE (NDIS
VBD Client)
                   Connection Name: Local Area Connection 5
                   Status: Media disconnected
                 [02]: Broadcom BCM5709C NetXtreme II GigE (NDIS
VBD Client)
                   Connection Name: Local Area Connection 6
                   Status: Media disconnected
                 [03]: Broadcom BCM5709C NetXtreme II GigE (NDIS
VBD Client)
                   Connection Name: Local Area Connection 7
                   Status: Media disconnected
                 [04]: Broadcom BCM5709C NetXtreme II GigE (NDIS
VBD Client)
```



```

Connection Name: Local Area Connection 8
DHCP Enabled:    No
IP address(es)
[01]: 169.254.244.27
[02]: 172.16.68.180
[03]: fe80::85d1:1b6c:a90a:dfd9

```

Volume Group Configuration

```

Name:                                RAID5_10Disks

Status:                               Optimal

Capacity:                             24.556 TB
RAID level:                            5

Media type:                            Hard Disk Drive
Interface type:                         Serial Attached SCSI (SAS)
Tray loss protection:                   No
Drawer Loss Protection:                 No

Security Capable:                       Yes, Full Disk Encryption (FDE)
Secure:                                 No

Data Assurance (DA) capable:            Yes
DA enabled volumes present:             No

Current owner:                          Controller in slot B

Associated volumes and free capacity

Volume                                Capacity                                DA Enabled
raid5_10disks_vol1                    500.000 GB                             No
Raid5_10Disks_vol2                    1,024.000 GB                             No
Free Capacity:                          23.068 TB

Associated drives - present (in piece order)

Tray    Drawer    Slot
99      1          10
99      2          9
99      2          10
99      2          11
99      2          12
99      3          5
99      3          6
99      3          7
99      3          8
99      3          9

```

Volume Configuration

```
Volume name:                               Raid5_10Disks_vol2

Volume status:                             Optimal

Capacity:                                  1,024.000 GB
Volume world-wide identifier:
60:08:0e:50:00:1f:82:38:00:00:0f:36:50:0d:13:7b
Subsystem ID (SSID):                       19
Associated volume group:                   RAID5_10Disks
RAID level:                                 5

LUN:                                        0
Accessible By:                             Host rec

Media type:                                Hard Disk Drive
Interface type:                            Serial Attached SCSI (SAS)
Tray loss protection:                     No
Drawer Loss Protection:                   No

Secure:                                    No

Data Assurance (DA) enabled:              No

Preferred owner:                           Controller in slot B
Current owner:                             Controller in slot B

Segment size:                              128 KB
Capacity reserved for future segment size changes: Yes
Maximum future segment size:              2,048 KB
Modification priority:                    Lowest

Read cache:                               Enabled
Write cache:                              Enabled
  Write cache without batteries:          Disabled
  Write cache with mirroring:             Disabled
Flush write cache after (in seconds):     10.00
Dynamic cache read prefetch:              Enabled

Enable background media scan:              Disabled
Media scan with redundancy check:         Disabled

Pre-Read redundancy check:                Disabled
```

Disks

The disks in this deployment are Seagate ST33000651SS 7200-RPM, 6-Gbps NL-SAS drives. The drive firmware version is MS01.

Refer to the [Interoperability Matrix Tool](#) (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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