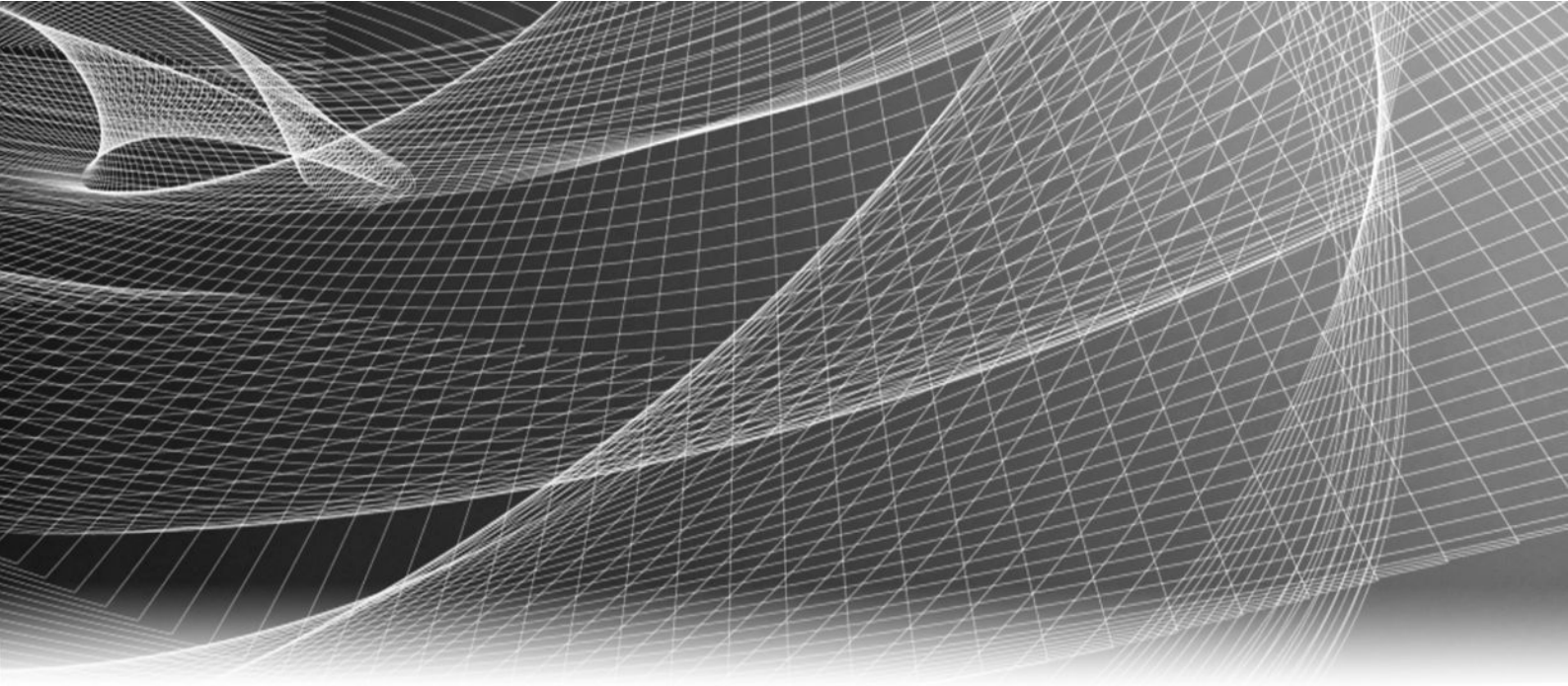


Physical Security
EMC Storage with ISS SecurOS

Version 1.0

Configuration Guide

H14191

EMC² VS-LAB TESTED

ISS INTELLIGENT SECURITY SYSTEMS

EMC²

Published June, 2015

For the most up-to-date regulatory document for your product line, go to EMC Online Support (https://support.emc.com).

EMC Corporation
Hopkinton, Massachusetts 01748-9103
1-508-435-1000 In North America 1-866-464-7381
www.EMC.com

CONTENTS

CHAPTER 1

Introduction

Solution overview

Video surveillance is a highly competitive market not only for Video Management Software (VMS) providers, but also for hardware and value-added companies such as EMC.

The purpose of this Configuration Guide is to help EMC field personnel understand how to configure EMC storage system offerings to simplify the implementation of ISS SecurOS. This document is not a replacement for the ISS implementation guide nor is the document a replacement for the EMC sizing guides.

The ISS SecurOS software is designed to control video surveillance systems that are deployed within local or global networks. Simply scaling software and hardware platforms lets you create video surveillance systems of any complexity. From local systems that are intended to control small- and mid-scale objects, to complex systems that enable you to control physical and organizational structures and facilities.

All performance data that is contained in this guide was obtained in a rigorously controlled environment. Performance varies depending on the specific hardware and software and might be different from what is outlined here.

Scope

This guide is intended for internal EMC personnel and qualified EMC and ISS partners. It provides configuration instructions for installing the SecurOS video management software using EMC storage platforms including:

- EMC Isilon®
- EMC VNX®

This guide augments the standard SecurOS implementation guide and assumes that the EMC partners who intend to deploy this solution are:

- Familiar with product implementation
- ISS certified or well versed with installing ISS SecurOS services
- Familiar with VMware and Microsoft Windows Server, including how to install and configure them

Note

All performance data that is contained in this guide was obtained in a rigorously controlled environment. Performance varies depending on the specific hardware and software and may be different from what is outlined here.

Assumptions

This solution assumes that internal EMC personnel and qualified EMC partners are using this guide in conjunction with an established architecture based on the EMC Sizing Guide.

This guide assumes that the EMC partners who intend to deploy this solution are:

- Associated with product implementation
- ISS certified to install ISS SecurOS services
- Familiar with installing and configuring VMware hypervisors and Microsoft Windows operating systems

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

CHAPTER 2

Configuring the solution

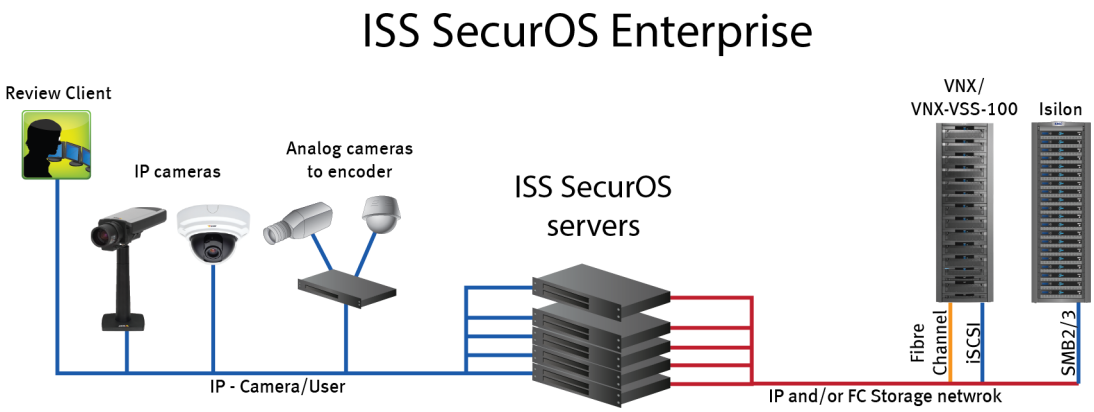
Design concepts

There are many design options for an ISS SecurOS implementation. ISS offers many documents and materials related to the design and implementation of ISS SecurOS Enterprise. These design details are beyond the scope of this paper.

Tests were conducted using physical servers running MIcrosoft Windows Server 2012 R2. In the EMC lab environment, Isilon SMB2 share and VNX RAID 5 storage were used for testing.

The following figure illustrates the EMC components that were tested.

Figure 1 ISS SecurOS architecture



EMC VNX

This section describes best practices for configuring a VNX for this solution.

Disk drives

Although any supported drive will work, video surveillance systems typically rely on the density of the array.

EMC recommends NL-SAS drives of the highest available density in this solution. In general, we used one-terabyte (TB) or multiple-TB NL-SAS drives when performing our tests.

Note

Because of the high percentage of sequential large block writes, EMC does not recommend using flash drives for video storage within a surveillance application.

Storage pool configuration (recommended)

The tests we conducted show how storage pools that are defined with the maximum allowable number of disks per pool perform as well as, or better than, traditional RAID groups. Therefore, EMC recommends that you use storage pools rather than RAID groups. Storage pools also reduce the required array management tasks.

Building a storage pool is a straightforward process. You can configure either RAID 5 or RAID 6 pools depending on the VNX storage system restrictions and the risk factor that

the customer is willing to accept. When configuring storage pools, use large storage pools with large LUN sizes, and configure the LUNs as thick rather than thin.

EMC recommends the following RAID configurations for VNX arrays:

- RAID 5 or RAID 10 with SAS drives
- RAID 6 with NL-SAS drives (recommended)

Procedure

1. In Unisphere, select **Storage** › **Storage Pools** for block.
2. Click **Create** in the **Pools** section under **Pools**.
3. Set the following options for the storage pool:
   - Storage pool name
   - RAID type
   - Number of SAS drives
   - Number of NL SAS drives
4. Select one of the following methods for selecting disks to include in the storage pool:
   - **Automatic**: Provides a list of available disks.
   - **Manual**: Enables you to select specific disks to include in the storage pool from a list of available disks. Be sure to clear the automatic disk recommendation list before selecting new disks from the list.
5. Select **Perform a Background verify on the new storage** and set the priority to medium.
6. Click **Apply**, and then click **YES** to create the storage pool.

LUN configuration

A VNX pool LUN is similar to a classic LUN in many ways. Pool LUNs comprise a collection of slices and have the option to be thin or thick. A slice is a unit of capacity that is allocated from the private RAID groups to the pool LUN when it needs additional storage.

Thin LUNs typically have lower performance than thick LUNs because of the indirect addressing. The mapping overhead for a thick LUN is less than for a thin LUN.
Thick LUNs have more predictable performance than thin LUNs because they assign slice allocation at creation. However, thick LUNs do not provide the flexibility of oversubscribing like a thin LUN does, so use them for applications where performance is more important than space savings.

Thick and thin LUNs can share the same pool, allowing them to have the same ease-of-use and benefits of pool-based provisioning.

To create LUNs for the storage pools:

Procedure

1. Right-click a storage pool and click **Create LUN**.
2. Type the user capacity for the LUN.
3. Type the starting **LUN ID**, and then select the number of LUNs to create.

   If the selected LUN ID is 50, and 3 is the selected number of LUNs to create, the LUNs names would be 50, 51, and 52.
4. Select **Automatically assign LUN IDs as LUN names**.
5. Click **Apply**.

Fibre Channel configuration

To transfer traffic from the host servers to shared storage, the serial-attached network (SAN) uses the Fibre Channel (FC) protocol that packages SCSI commands into FC frames.

Note

iSCSI is very popular for video security implementations because this often provides a lower-cost option when compared to FC.

To restrict server access to storage arrays not allocated to that server, the SAN uses zoning. Typically, zones are created for each group of servers that access a shared group of storage devices and LUNs. A zone defines which host bus adapters (HBAs) can connect to specific service providers (SPs). Devices outside a zone are not visible to the devices inside the zone.

Zoning is similar to LUN masking, which is commonly used for permission management. LUN masking is a process that makes a LUN available to some hosts and unavailable to other hosts.

Zoning provides access control in the SAN topology. Zoning defines which HBAs can connect to specific targets. When you use zoning to configure a SAN, the devices outside a zone are not visible to the devices inside the zone.

Zoning has the following effects:

- Reduces the number of targets and LUNs presented to a host
- Controls and isolates paths in a fabric
- Prevents non-ESX/ESXi systems from accessing a particular storage system and from possible VMFS data loss
- Optionally, separates different environments, such as a test and production environments.

With VMware ESX/ESXi hosts, use single-initiator zoning or single-initiator-single-target zoning. The latter is the preferred zoning practice because it is more restrictive and prevents problems and misconfigurations that can occur on the SAN.

Microsoft iSCSI initiators (recommended)

For both physical servers and VMware ESXi servers, EMC recommends using the Microsoft iSCSI initiators:

- iSCSI software initiators for 64-bit initiators
- Microsoft Windows Server 2008 R2 or later supports the iSCSI initiators natively in the OS. Our tests were conducted using Windows Server 2012 R2.

Note

At the date of this publication, we had not tested the Cisco UCS unified adapter iSCSI capabilities.
Microsoft software initiators before Microsoft Windows Server 2008 are not supported.

Recommended cache configuration

EMC recommends that you configure the cache as 90 percent write and 10 percent read if the storage array does not automatically adapt to the write characteristics of video surveillance (for example, EMC VNX5500 or EMC VNX-VSS100).

This is not applicable to newer VNX systems, such as EMC VNX5200 or EMC VNX5400, because the system manages the cache. If the array is shared with other applications, then you can use a lower write cache value, but be careful to avoid excessive forced flushes.

Tested firmware

The following table lists the firmware builds used for our tests.

Table 1 Firmware builds

Model	Firmware
VNX5100	VNX OE 5.31.000.5.006
VNX5300	VNX OE 5.31.000.5.006
VNX-VSS100	VNX OE 5.32.000.5.215
VNX5400	VNX OE 5.33.000.5.015
VNX5500	VNX OE 5.31.000.5.720

EMC Isilon (NAS)

In the Isilon N+M data protection model, N represents the number of nodes, and M represents the number of simultaneous node, drive, or a combination of node and drive failures that the cluster can withstand without incurring data loss. N must be larger than M.

EMC Isilon OneFS supports N+1, N+2, N+3, and N+4 data protection schemes, and up to 8x mirroring. OneFS also supports several hybrid protection schemes. These include N +2:1 and N+3:1, which protect against two drive failures or one node failure, and three drive failures or one node failure, respectively.

The following best practices are based on a five-node minimum cluster size. You can use cluster sizes as small as a three-node cluster, but EMC does not recommend this.

- Our five-node cluster lab tests were based on the Isilon recommended +2:1 protection level for this node count range. Larger node-count clusters have more disks, which causes an increase in the possibility of multiple disk failures. For larger clusters, consult your EMC Isilon team for appropriate protection schemes: N+2:1, N +2, N+3, or N+4.
- Include a minimum free space calculation for proper cluster sizing. EMC recommends a cluster size that enables a node to be removed, while retaining a minimum of 10 percent free space in the remaining capacity. This free space ensures that node removal and node failures have minimal or no impact on video ingestion.

An Isilon sizing tool provides a more accurate calculation. You can find this tool at https://isilon-lawndart.herokuapp.com/pools/search. Other sizing tools are available for sizing bandwidth and storage capacity needed.

Impact policy and priority configuration

The impact policy defines the number of parallel tasks or workers that can run at one time within OneFS. Leave the impact policy as is unless Isilon directs a change to one or more policies.

In releases before OneFS 7.0, the best I/O performance is obtained by configuring all background jobs with the impact policy set to **Low**. You can set the impact policy by selecting **Operations** › **Jobs and Impact Policies**.

OneFS 7.0 or greater (recommended)
EMC recommends using OneFS 7.0 or later to maximize bandwidth and minimize video review response times. You can use the default impact policy with Isilon X200, Isilon X400, Isilon NL400, and greater. For less powerful nodes, such as the Isilon X200 and earlier running OneFS 7.0 or greater, modify all jobs to use an impact policy of **Low**.

Priority configuration
Even if the impact policy is modified, for example by modifying all the jobs to Low, the priority of the jobs remains at their default settings.

Volume limits

Implementations greater than eight TB are common when video is stored on high-end storage such as Isilon scale-out NAS storage and VNX block storage. Isilon can handle these large volumes because of the clustered file system that is used by OneFS.

ISS has not defined the limit on the SMB2 share or VNX block storage drive storage. The limitation is based on how much storage an operating system supports.

Large file system, small view (SmartQuotas)

Although it is possible to assign the full Isilon cluster file system to a single Video Server, the EMC best practice is to use SmartQuotas to segment the single Isilon file system so that each Video Server has a logical subset view of storage.

There are three directory level quota systems:

Advisory limit
Enables you to define a usage limit and configure notifications without subjecting users to strict enforcement.

Soft limit
Enables you to define a usage limit, configure notifications, and specify a grace period before subjecting users to strict enforcement.

Hard limit (recommended)
Enables you to define a usage limit for strict enforcement and configure notifications. For directory quotas you can configure the way the storage users view space availability as reported through the operating system.

Use the **Hard limit** quota system to set the video storage as a defined value.

Configuring SmartQuotas (recommended)

The SmartQuotas feature enables you to limit the storage that is used for each ISS Video Server and presents a view of available storage that is based on the assigned quota to

the Video Server. SmartQuotas enables each Video Server to calculate its available disk space and react appropriately.

Without SmartQuotas, the SecurOS Enterprise administrator must anticipate the total write rate to the cluster and adjust the **Min Free Space** on each Video Server accordingly. A miscalculation can result in lost video. SmartQuotas resolves the issues that are caused by manual calculations.

Configure SmartQuotas when more than one Video Server is writing to the Isilon cluster or when other users share the cluster. Enable SmartQuotas and define a quota for each share or directory.

The SmartQuotas setup requires the following configuration settings:

- Configure a hard share limit threshold to the Video Server video files.
- Define OneFS to show and report the available space as the size of the hard threshold.
- Set the usage calculation method to show the user data only.

Procedure

1. From the OneFS GUI, select **File System Management** › **SmartQuotas**.
2. For each listed share, select **View details**.
3. Under **Usage Limits**, select **Edit usage limits**.
4. Define the SmartQuotas limit and set the threshold:
   a. Select **Specify Usage Limits**.
   b. Select **Set a hard limit**.
   c. Type the hard limit value.
   d. Select the size qualifier, typically TB.
   e. Select the size of the hard threshold.
5. Click **Save**.
6. Repeat the process for the remaining shares.

Unique share naming

When working with a single file system, each Video Server uses the time and date as part of its directory and file-naming conventions.

To avoid corruption that is caused by overwriting or grooming (deleting) files prematurely, you must create a unique share for each Video Server. The share uses the form \\ *‹Share IP Address or FQDN›**‹Share_name›*.

On the ISS Video Server, the share must be mounted as `Network Drive` for the ISS SecurOS Enterprise software to identify the share which can be configured as `Read only` or `Read/Write`.

Configuring SmartConnect (optional)

SmartConnect uses the existing DNS Server and provides a layer of intelligence within the OneFS software application.

The resident Domain Name Service (DNS) Server forwards the lookup request for the delegated zone to the delegated zone's server of authority, which is the SmartConnect Service IP (SIP) address on the cluster. If the node providing the SmartConnect service becomes unavailable, the SIP address automatically moves to a different node in the pool.

Connections are balanced across the cluster, which ensures optimal resource utilization and performance. If a node goes down, SmartConnect automatically removes the node's IP address from the available list of nodes, thus ensuring that a connection is not tried with the unavailable node. When the node returns to service, its IP address is added to the list of available nodes.

The delegated server authority is always the node with the lowest ID, unless it has either voluntarily or involuntarily surrendered its authority status. This node should always be available, but if the status of the node changes and becomes unavailable, it voluntarily surrenders its role as server of authority.

You must add a delegation Name Server (NS) entry to the resident DNS Server for the SmartConnect name, which points to the SIP address as the Name Server. In your DNS Manager, create a **New Delegation** using your SmartConnect zone name. In the Microsoft DNS wizard, a New Delegation record is added in the forward lookup zone for the parent domain.

SmartConnect balances connection loads to the Isilon cluster and handles connection failover. With SmartConnect, all SecurOS Enterprise Video Servers use a single fully qualified domain name (FQDN) or universal naming convention (UNC) path for video storage access. Using this network name provides load balancing when the connection to the cluster is made and simplifies installations.

SmartConnect Basic can use a round-robin-type connection allocation, which is based on DNS load balancing.

SmartConnect Advanced can include multiple pools for each subnet, Dynamic IP address (for NFS), and the following load balancing options (connection and rebalance policy):

Round-robin (recommended)
: Sequentially directs a connection to the next Isilon IP address in the cycle. Based on field reports, this option works well with 20 servers or more.

Connection count
: Provides uniform distribution of the SecurOS Enterprise servers to specified nodes in the Isilon cluster. Use a unique IP address pool for video recording and Video Server read/write access.

Network throughput
: Based on NIC utilization. Use of throughput requires that each Video Server is activated, configured, and recording video after it connects to Isilon.

CPU usage
: Uses the node CPU utilization to determine which Isilon IP address to assign to the next connection request.

Ensure that no other service uses the Video Server IP address pool. Define additional pools for management (such as Isilon InsightIQ or administrative access), evidence repository, post process, or other use.

Procedure

1. Select **Networking Configuration**.
2. Under **Subnet** › **Settings**, define the SmartConnect service IP (SSIP) address. The SSIP address is the IP address that the DNS uses for the Isilon Authoritative name service.
3. Under **Pool settings**:
   a. Define the SmartConnect zone name, which is the name to which clients connect.
   b. Define the SmartConnect service subnet (the subnet that has the SSIP configured on the DNS Server).
   c. Define the connection balancing policy to Connection Count or Network Throughput (see Figure 2).

d. Set the IP allocation strategy to **Static**.

4. Verify this configuration on the SmartConnect dashboard.

SMB specific configuration

During testing in the EMC lab, we encountered a network connectivity failure issue between the Isilon and Video Server that lead to a `File Open` issue. The TCP socket connections that were previously made between the Video Server and the Isilon node were not closed. As a result, the ISS Video Server failed to write to the Isilon share as the files were being opened, and were then not available for further modifications. When SmartConnect was setup and in place, the expected behavior, if the failure is on the Isilon end, was that the connection would move to the next available node.

We worked with the ISS and Isilon support teams to discover that the TCP socket connections were causing the ISS recovery issue from a network connectivity failure. In the EMC lab, we tested the workaround to keep the socket connection open for a minimum of one minute only, and then closed the socket if the previously connected IP address was not available. This workaround was implemented by adding two timeouts, *keepidle* and *keepintvl*, on the Isilon cluster. The Isilon Development and Support team recommend that we set *keepidle* to 61 seconds, with one minute being the minimum we can assign to this parameter, and *keepintvl* to 5 seconds. Using this configuration, the ISS Video Servers start writing to the share with a data loss interval of 1-2 minutes.

To make a `sysctl` configuration change persistent, add to or change the desired parameter in the `sysctl.conf` file.

Procedure

1. Open an SSH connection on a node in the cluster and log on using the `root` account.
2. Run the following command to back up the `/etc/mcp/override/sysctl.conf` file:

```
touch /etc/mcp/override/sysctl.conf && cp /etc/mcp/override/
sysctl.conf /etc/mcp/override/sysctl.conf.bku1
```

3. Run the following command, where *‹sysctl_name›* is the parameter you want to add or change and *‹value›* is the value assigned to the parameter.

```
isi_sysctl_cluster <sysctl_name>=<value>
```

   The following output is displayed:

```
Value set successfully
```

   For example:

```
isi_sysctl_cluster net.inet.tcp.keepidle=61000
isi_sysctl_cluster net.inet.tcp.keepintvl=5000
```

4. Run the following command to verify that the change was successfully added to the `/etc/mcp/override/sysctl.conf` file:

```
cat /etc/mcp/override/sysctl.conf
```

   Output similar to the following is displayed:

   ‹sysctl_name›=‹value› #added by script

For example:

```
cat /etc/mcp/override/sysctl.conf
efs.bam.layout.disk_pool_global_force_spill=1 #added by script
net.inet.tcp.keepidle=61000 #added by script
net.inet.tcp.keepintvl=5000 #added by script
```

5. If you need to revert the `sysctl.conf` file to the backup version created previously:
   a. Open an SSH connection on any node in the cluster and log on using the `root` account.
   b. Run the following command to copy and then rename the original backup of the `sysctl.conf` file:

```
cp /etc/mcp/override/sysctl.conf.bku1 /etc/mcp/override/
sysctl.conf
```

Refer to the KB Library topic: 000089232 for further information about configuring these parameters.

Frame loss reduction

In our testing we discovered there might be some video loss when adding or removing a node from the cluster. Isilon OneFS is a scale-out, single namespace, clustered file system. To maintain coherency, OneFS implements a distributed lock manager that marshals locks across all nodes in the cluster. When a node is added or removed from the cluster, all operations must be temporarily suspended until all existing locks are rebalanced across the resulting node set. The system must then re-calculate the cluster write plan. The time required for this group change to occur depends on the size of the cluster, individual node performance, and cluster workload.

We optimized the parameters on the cluster to reduce the frame loss duration as much as possible.

Procedure

1. Set the paramters in the `syctl` configuration file using the following commands:

```
declare -i COUNT MDS
BASE=10000
COUNT=$((1.01 * $BASE))
MDS=$(($BASE * 0.75))
isi_sysctl_cluster kern.maxvnodes=$BASE
isi_sysctl_cluster kern.minvnodes=$BASE
isi_sysctl_cluster efs.lin.lock.initiator.lazy_queue_goal=$COUNT
isi_sysctl_cluster efs.ref.initiator.lazy_queue_goal=$COUNT
isi_sysctl_cluster efs.mds.block_lock.initiator.lazy_queue_goal=
$MDS
isi_sysctl_cluster efs.bam.datalock.initiator.lazy_queue_goal=$MDS
```

2. Verify the changes are logged in `sysctl.conf` file:

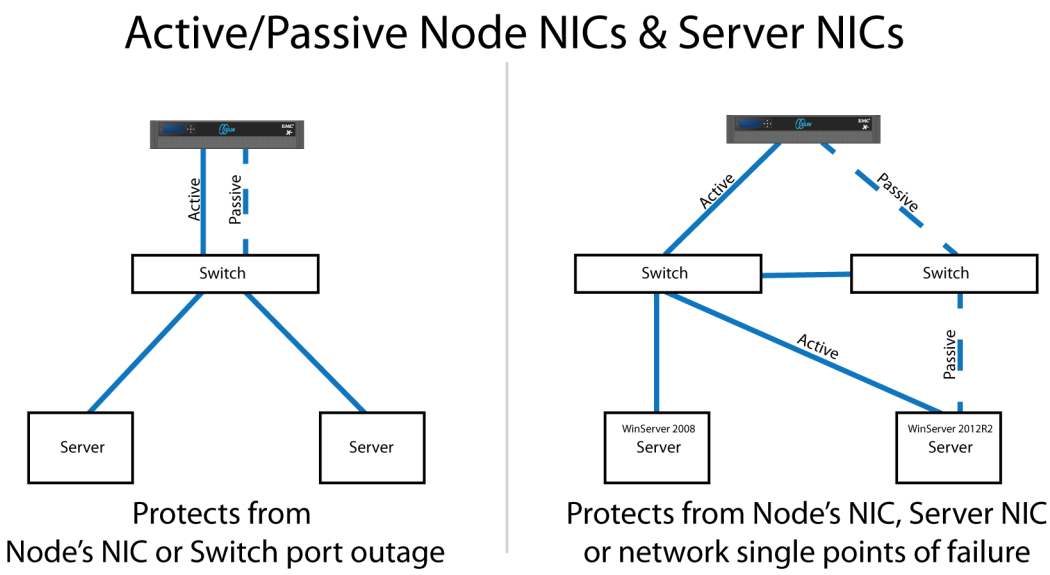
```
cat /etc/mcp/override/sysctl.conf
net.inet.tcp.keepidle=61000 #added by script
net.inet.tcp.keepintvl=5000 #added by script
kern.maxvnodes=10000 #added by script
kern.minvnodes=10000 #added by script
efs.lin.lock.initiator.lazy_queue_goal=10100 #added by script
efs.ref.initiator.lazy_queue_goal=10100 #added by script
```

```
efs.mds.block_lock.initiator.lazy_queue_goal=7500 #added by script
efs.bam.datalock.initiator.lazy_queue_goal=7500 #added by script
```

Active/Passive link aggregation

The active/passive configuration involves aggregating the NIC ports on the Isilon nodes for high availability. If one of the ports on the node or switch port fails, the ISS Video Server can continue writing to the Isilon share using the other port connection without effecting the recording. The SMB share continues to be accessible to the server using the passive connection port.

Figure 2 Isilon Active/Passive Configuration



I/O optimization configuration

As of OneFS 7.0.x, no changes are necessary to the I/O profiles for the directories that are used for ISS.

Note

This setting does not require a SmartPool license.

Configuring authentication and access control

Authentication and access control tests were conducted to determine the best method for share access.

The following three tests were conducted:

Full Active Directory (recommended)
Where the SecurOS Enterprise server and the Isilon cluster are part of the same Windows domain.

Partial Active Directory
Where the SecurOS Enterprise servers are part of the Windows domain, but the Isilon cluster is administered locally.

Fully locally administered control
Where the SecurOS Enterprise servers and the Isilon cluster are administered locally.

See the **ISS SecurOS Installation Guide** specific to the SecurOS Enterprise release you are configuring.

Alternatives to the previous methods might exist, but the EMC Physical Security Lab team does not plan to derive or support other methods.

Procedure

1. Select **Cluster Management** › **Access Management**.
2. Select **Access zone** and ensure that the **System access zone** has the provider status **Active Directory**, **Local**, and **File** marked with a green dot.
3. Under **Active Directory**, select **Join a domain** and add the Windows domain and appropriate users.
4. When the Isilon cluster and ISS are not part of the same domain, set the shares to **Run as Root**. This setting is not ideal from a security perspective.

CHAPTER 3

Conclusion

Summary

We performed comprehensive testing with ISS SecurOS against many EMC VNX arrays and EMC Isilon clusters.

The ISS SecurOS architecture and product suite allows extreme scaling, from a few cameras to up to tens of thousands of cameras, by using EMC storage.

EMC VNX arrays

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 Isilon scale-out storage

EMC Isilon scale-out storage is ideal for mid-tier 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 Video Server 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 ISS SecurOS as a best practice.