



Technical Report

# Bosch Video Recording Solution with NetApp E-Series E5760 Storage Systems

## Solution Deployment

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May 2020 | TR-4827-DEPLOY

### **Abstract**

This document provides specific deployment guidance for using NetApp® E-Series E5700 storage systems as a recording target in the Bosch Video Management System.

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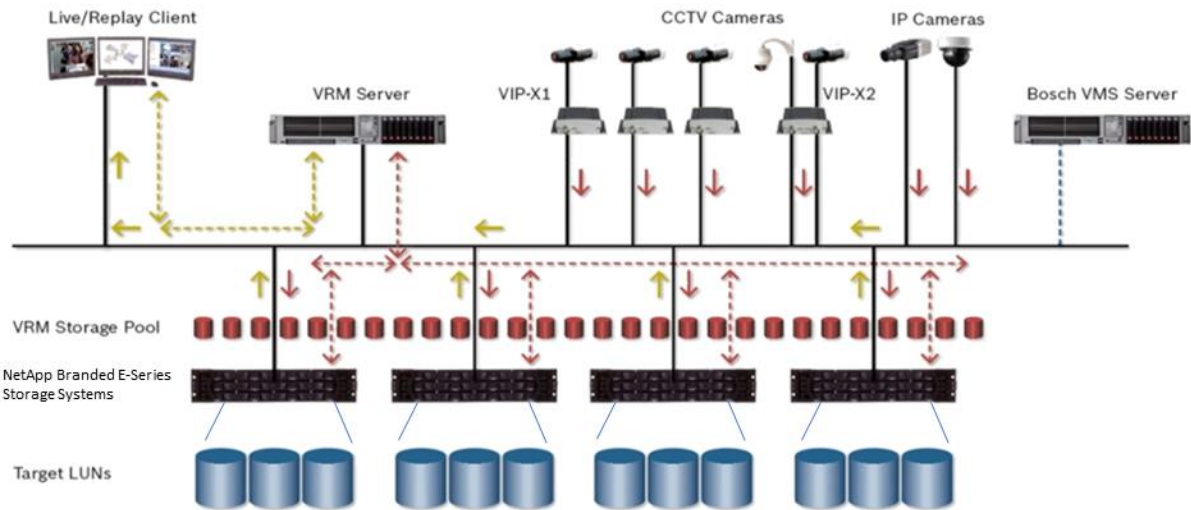
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# 1 Solution Overview

The Bosch Video Management System (VMS) is a unique video surveillance solution for managing large-scale surveillance environments across industries and even for smart cities. Unlike most video management systems, the Bosch solution enables Bosch video cameras to write directly to NetApp E-Series storage targets without the video streams passing through a recording server. As a result, the E-Series configuration for this type of architecture has special requirements that are unlike the standard HA configuration for other video management systems. The following sections provide detailed configuration information that you must follow to successfully deploy the E-Series E5700 in the Bosch VMS environment. Solution Technology

The Bosch Video Recording Manager (VRM) integrates E-Series storage, the Bosch VMS software, and a Bosch camera network into a tightly integrated package. The BVMS solution consists of the VRM server, the Bosch configuration client, and the VRM monitor. The Bosch video client or the Bosch VMS operator client can also be used as playback clients. Figure 1 provides a high-level view of the integrated solution.

Figure 1) Bosch VMS architecture with NetApp E-Series storage targets.



The use case for the E5760 E-Series storage system in the Bosch VMS architecture is based on scale and performance as opposed to the integrated storage management capability offered with the Bosch DSA E-Series solution.

## 2 Scaling Bosch Recording Capacity with E-Series E5760 Systems

The Bosch VMS is an enterprise-grade video management system that can scale to thousands of cameras and many petabytes of storage capacity. For large-scale environments, the NetApp branded E-Series E5760 storage system scales up to 480 NL-SAS drives and can provide over 5PiB of usable capacity per storage system. This ability to scale greatly simplifies the storage environment for large-scale Bosch VMS environments by reducing the number of storage systems needed to meet the capacity and performance requirements.

### 2.1 Technology Requirements

The Bosch VMS supports storage systems that have specific software settings enabling the VRM to recognize the system and integrate the storage provisioning into the VRM interface. The Bosch branded DSA E-Series E2800 can be configured and sold with this Bosch-specific software setting, but NetApp-

branded E5760 storage systems do not have these software settings. As a result, to use a NetApp-branded E5760, you must select the “Other” category of SAN storage in the Bosch VRM interface.

This lack of integrated provisioning does not mean the E5760 is not supported in this configuration. These caveats only affect the set-up process; load-balancing and iSCSI disk failover can still be performed on the storage array using the Bosch VRM and automatically using the built-in E-Series ALUA feature.

## Hardware Requirements

The E5700 storage system is equipped with asymmetric dual active controllers, each with two built-in host interface ports that must be set to use the iSCSI protocol. The BVMS environment supports up to four 10Gb iSCSI connections per storage system. No other host protocols are supported. Optionally, you could use four ports from optional iSCSI host interface cards instead of using the on-board ports, but using both the on-board host ports and the optional host interface card (HIC) installed in each controller is not tested and supported in this configuration.

**Note:** Both controllers in an E-Series storage system must have matching hardware, including optional HICs.

Table 1 lists the hardware components that are required to implement this use case.

Table 1) E5700 hardware requirements.

Hardware	Quantity
E-Series E5700 controllers configured for the iSCSI host protocol	Two per controller drive shelf
Shelf hardware equipped with dual power supplies and dual fan units	Up to seven expansion shelves can be connected to each E5700 controller shelf
12Gb IOM SAS expander modules (requires two per shelf when adding drive expansion shelves)	Two per drive expansion shelf
Disk drives	Up to 480 7200 RMP NL-SAS drives are support per storage system

## Software Requirements

Table 2 lists the software components that are required to run the storage system.

Table 2) E5700 software requirements.

Software	Version
E5700 SANtricity® OS storage software	11.50.3 or later
SANtricity Web Services Proxy with Unified Manager (optional but useful when there are multiple E-Series to manage)	4.1 or later

## Bosch VMS / VRM Requirements

Table 3 provides guidelines for Bosch VMS environments that you should consider when planning your E-Series deployment. Considerations such as RAID or DDP, how many volumes to provision, and what capacity to use are important considerations for an initial deployment, but they are also important to any growth plan. For example, if you do not plan to grow the storage capacity over time, it is acceptable to use 2000GiB LUNs up to the maximum of 254. Conversely, if you plan to grow the storage capacity in the future to accommodate more cameras or newer higher resolution cameras, then you should not initially

provision 254 LUNs. This might mean you should select the option in the Bosch Configuration Client to use LUNs larger than 2000GiB.

You should plan to use all the E-Series usable capacity to present to the Bosch camera network. For environments where growth is likely, DDP is highly recommended over traditional RAID 5 or RAID 6. Capacity expansion with DDP is quick and easy, just a few clicks in the SANtricity System manager GUI to add one or more drives to a pool and a couple more clicks to expand a given volume.

**Note:** With RAID 5 or RAID 6, expansion can take days to complete depending on the level of incoming write workload.

Table 3) Bosch VRM limits.

Category	Limits
Max LUNs per VRM	254
Max LUN Capacity	64 TiB (large volumes do not perform as well as smaller volumes in the BVMS application)
Recommended LUN Capacity	2000 GiB

## Planning Your Storage Configuration

Before deploying the storage system, it is important to plan ahead and ensure the proper infrastructure, site preparation, and implementation gear is ready for the installation date. These items include:

- Site power and footprint
- Management port 1Gb Ethernet network access – one per controller and two static IP addresses (including subnet mask and gateway address)
- NTP, DNS, and mail server information is available
- Firewall proxy information and port information is available when planning to use AutoSupport
- Four E-Series iSCSI ports (2 per controller) have been planned, connected, and static IP addresses in the same network as the Bosch VRM and cameras have been allocated for those ports
- OM4 fiber patch cables or Cat7 copper patch cables have been planned for host interface port connectivity
- System capacity planning is complete:
  - Decided to deploy RAID 5, RAID 6, or DDP (recommended for systems with > 24 drives)
  - If using RAID 5 or RAID 6, decide if hot spares will be used – hot spares are highly recommended with RAID 5 configurations
  - The volume group or DDP usable capacity has been divided into 2000 GiB volumes to determine the number of volumes to create, or larger volumes have been calculated in order to present all of the available E-Series storage capacity to the Bosch camera network

**Note:** Volume group usable capacity can simply be divided by the desired capacity to determine the number of volumes to create. For DDP, the calculation is not simple division. As a result, you should use the DDP calculator that is embedded in the [E-Series and EF-Series SE Technical Training](#) deck, in the Dynamic Disk Pool section.

## 2.2 Deployment Procedures

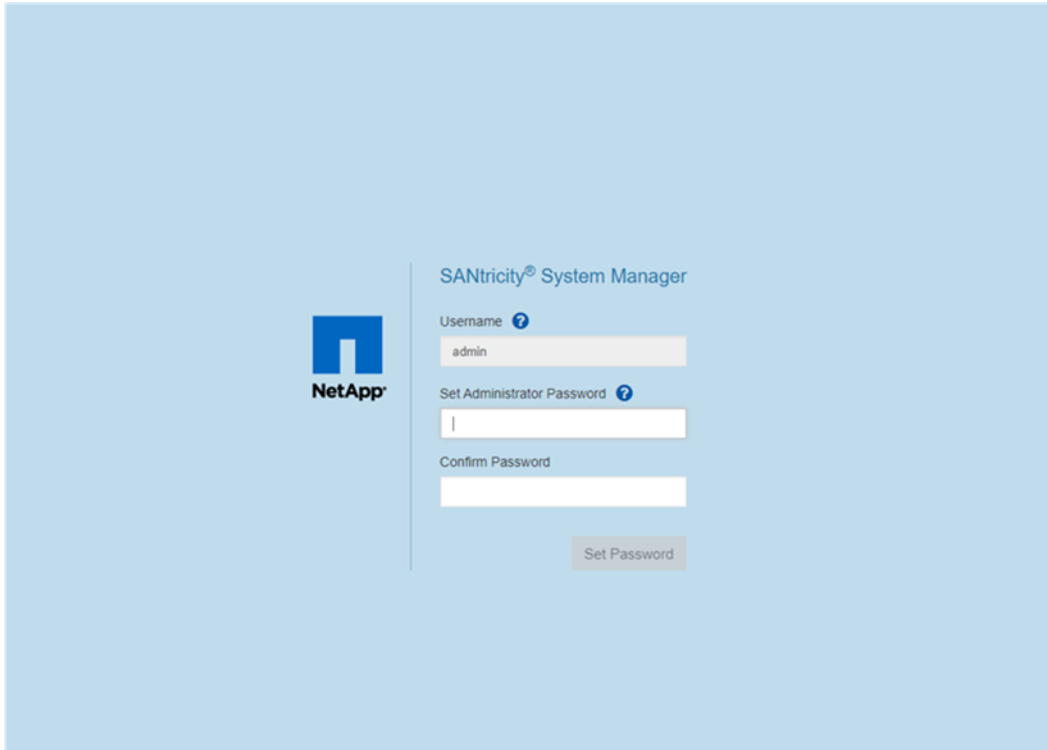
Deploying the E5700 in the Bosch VRM involves the following tasks:

- Install the E5760 storage system using the installation procedures provided on the NetApp Support site ( [https://library.netapp.com/ecm/ecm\\_download\\_file/ECMLP2842061](https://library.netapp.com/ecm/ecm_download_file/ECMLP2842061) ) including:
  - Install the shelf mounting hardware

- Install the shelves
  - Power-up the system, expansion shelves first if the system has more than one shelf
  - Using SANtricity System manager, set the E5760 system admin password
  - Using SANtricity System Manager, set the controller manage port IPs
  - Use the SANtricity System Manager GUI set-up wizard to enter the IP and/or FQDN and firewall proxy information to configure NetApp AutoSupport®, and system e-mail alerts
  - Use SANtricity System Manager to configure NTP and DNS servers
  - Use SANtricity System Manager to optionally set-up SSL certificated, LDAP, RBAC, and the audit log
  - Use SANtricity System Manager to configure the iSCSI host ports on the E-Series
  - Use SANtricity System Manager to provision the storage usable capacity, 2000 GiB is preferred, but larger volumes can be used if needed to access the total storage available
- Note:** If using larger volumes, the flag to use larger volumes must be set at the pool level of the BVRM Configuration Client.
- Use SANtricity System Manager API interface to map volumes to the factory-default host cluster
- Note:** After the first volume is mapped to the default host cluster using the API interface, you can then use SANtricity System Manager to map the rest of the volumes to the default host cluster. The navigation starts with the Storage tab then the Host tile and Assign LUNs.
- Use the SANtricity System Manager Restful API interface to set the storage system to recycle iSCSI sessions
  - Use the Bosch VRM Configuration Client to add the storage system to Bosch VRM
  - Use the Bosch VRM Configuration Client to add cameras to the E-Series recording targets

## Installing the Storage System

The steps to install the E-Series storage system in the 60 drive shelf are documented in the [DE460C E-Series quick install guide](#) available on the NetApp Support site. This step includes setting the system Admin account password and management IP address for each controller. This password will also be used by the Bosch VRM to discover the E5760.



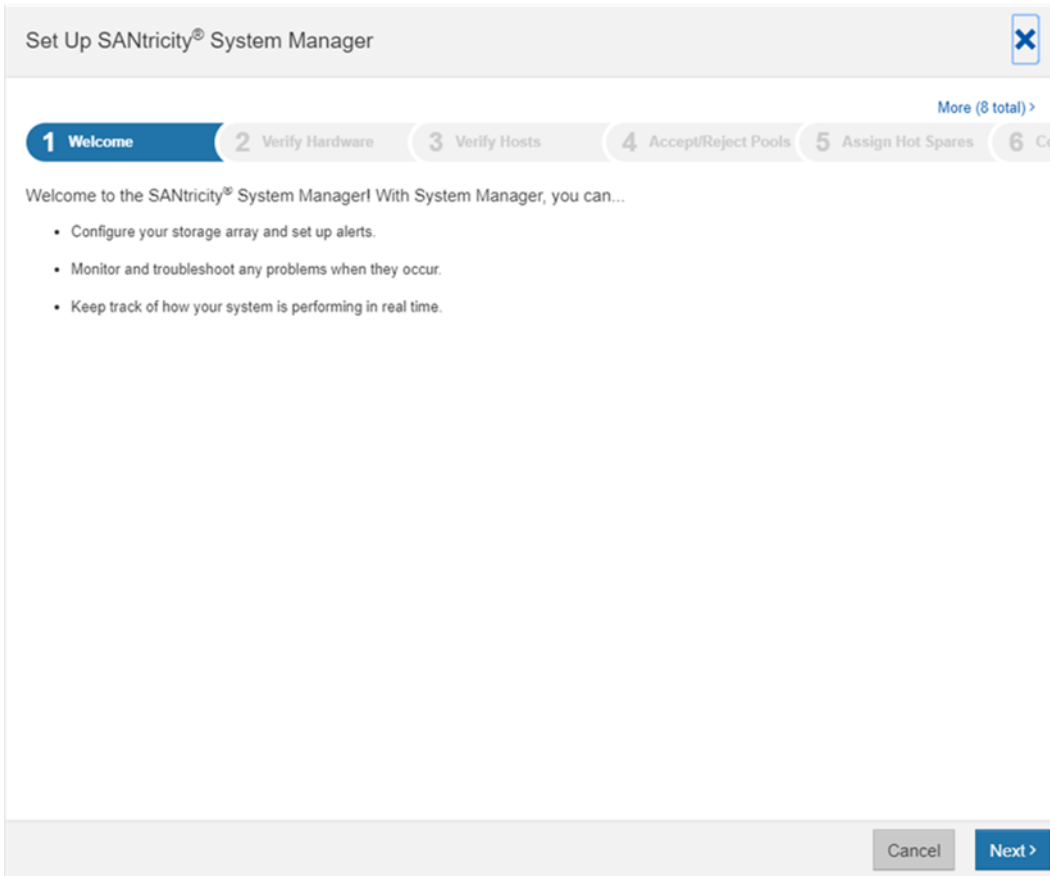
**Note:** You should review the requirements documented in the site planning guide for the DE460C shelf before you try to install the system. The DE460C requires dual 208-240 VAC power sources and the new datacenter 1280mm deep rack.

## Setting Up NTP, DNS, AutoSupport, and System Alerts

System alerts and AutoSupport settings are set up using the built-in SANtricity System Manager set-up wizard. From there, use SANtricity System manager to complete the basic storage system configuration.

**Note:** This is a standard configuration required for all E-Series installations and is usually done by some form of profession services. As a result, pre-planning for NTP, DNS, firewall settings, etc. is essential to ensure the installation can be completed in one visit.

1. The first time you log on to SANtricity System Manager, you are automatically directed to the setup wizard where you can configure your storage system, including hardware, hosts, applications, workloads, pools, and volumes. For the BVMS implementation, you should skip the steps to create a pool or set-aside hot spare drives as these steps will be done later in the procedure.

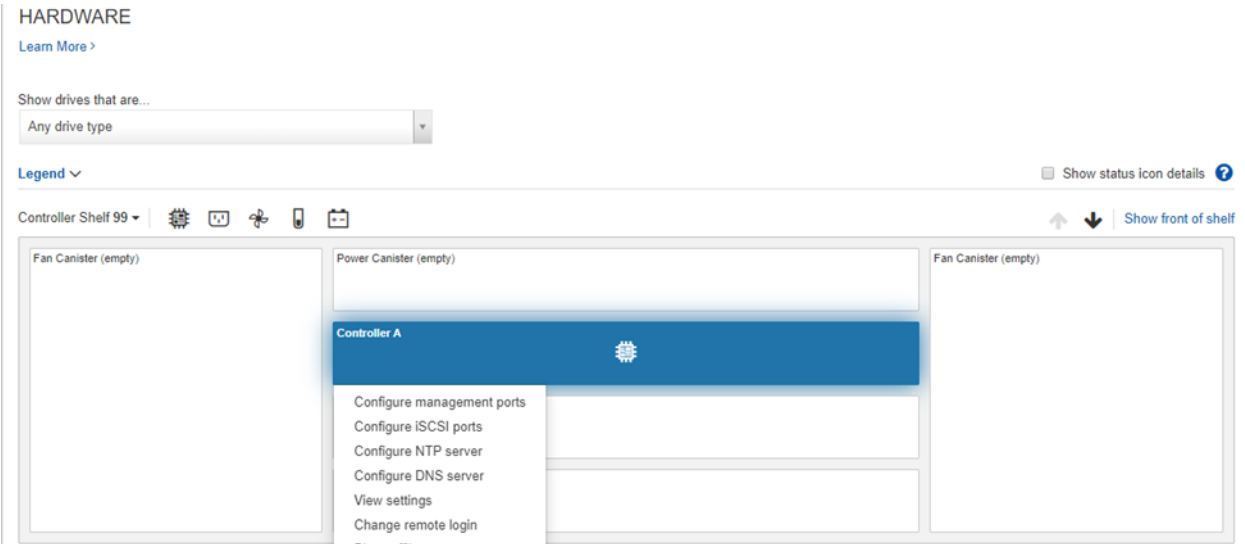


2. Use SANtricity System Manager and navigate to the Hardware tab. Select the link to show back of shelf.



3. Select controller A to expose the drop-down menu.





4. Select Configure NTP server to enter the IP or FQDN information for the NTP server.

**Configure Network Time Protocol (NTP) Server**

I want to enable NTP on Controller A ?

Automatically obtain NTP server addresses from DHCP server ?

Manually specify NTP server addresses

Primary NTP server ?

Backup NTP server (Optional) ?

Save Cancel

5. Repeat step 3 except this time select Configure DNS server.

### Configure Domain Name System (DNS) Server ✕

DNS server configuration for Controller A

Automatically obtain DNS server addresses from DHCP server ?

Manually specify DNS server addresses

Primary DNS server ?

Backup DNS server (Optional) ?

6. Repeat step 3 again and select Configure iSCSI ports.
7. Select the first port to use for camera recording - in this example, the controller onboard ports 0a and 0b will be used, but you should configure the ports specified in the build plan for each deployment.

### Configure iSCSI Ports ✕

1 Select Port
2 Configure Port
3 Configure Network Settings

I want to configure network settings for the following Controller **A** port...

Port 0a Link Status: Up ▾

[What else do I need to do to configure or diagnose iSCSI?](#)

8. Uncheck the unused IP version, IPv4 or IPv6, and only enter network information for one or the other. You can also set jumbo frames and disable/enable ICMP ping from this window. Select Next to proceed.

Configure iSCSI Ports
Show more port settings
✕

1 Select Port
2 Configure Port
3 Configure Network Settings

I want to configure network settings for the following Controller A port...

**Port 0a settings** [Show fewer port settings](#)

MAC address: 00:A0:98:AF:40:AA

Enable IPv4:

Enable IPv6:

**Port 0a TCP listening port** ?

3260

**Port 0a MTU size** ?

-
9000
+
bytes per frame

Note: TCP listening port and MTU size settings apply to both IPv4 and IPv6.

Enable ICMP PING responses (applies to all iSCSI ports on the storage array)

< Back
Cancel
Next >

**Note:** You can use ICMP ping to verify the network connection from the BVRM server to the E-Series E5760, but once confirmed, the best practice for security is to disable ICMP ping in your production environment.

9. Enter the iSCSI IP address, subnet mask, and if required the gateway address for the E5760 port to access the camera network. You can optionally use VLAN settings. Select Finish to complete the port settings.

**Note:** Selecting Finish will cause the iSCSI port to reset.

10. Repeat steps 6 - 9 for controller A port 0b.
11. Select controller B to expose the drop-down menu.
12. Select Configure NTP server to enter the IP or FQDN information for the NTP server.
13. Repeat step 11 and select Configure DNS server.
14. Repeat step 11 and select Configure iSCSI ports.
15. Repeat steps 7 - 9 for controller B port 0a.
16. Repeat steps 7 - 9 for controller B port 0b.

**Note:** When iSCSI security is required, the BVMS VRM uses a single CHAP password for all camera and storage target connections. Use SANtricity System Manager to set the CHAP password for the storage system. The navigation is in the Settings tab in the iSCSI settings section.

## Provision the Storage System

To provision the storage system, complete the following steps:

1. Use SANtricity System Manager to create a RAID 5 or RAID 6 volume group or a dynamic disk pool. When you have 24 or more drives or you intend to grow the system capacity over time, DDP is

recommended. The volume group(s) or pool(s) should be exclusive to the BVMS application. Do not create any volumes in this volume group or pool to be used for other applications.

**Note:** You must preplan the deployment of the storage system RAID or pool configuration to fully present the storage system usable capacity to the network of Bosch cameras.

2. Bosch recommends using 2000GiB volumes for video recording data. Use all the space in the volume group or disk pool to create as many 2000GiB volumes as possible. If you are left with free capacity less than 2000GiB, use the remaining space to create two volumes of equal size.

**Note:** The VRM maximum is 254 LUNs, so you may have to use larger LUNs when larger storage capacities are required.

## Map Volumes to the Factory-Default Host Cluster

The cameras and VRM server are not connected to the E5760 as SANtricity hosts. Instead the cameras are connected using the SANtricity default host cluster. To map volumes to the factory-default host cluster, complete the following steps:

1. Open Web Services from the SANtricity System Manager GUI Help drop-down menu, and make sure that the top right drop-down menu is showing V2.
2. Expand the Volumes Operation.
3. Click `GET /storage-systems/{system-id}/mappable-objects`
4. On the right of the window, click Try It Out.
5. Under Parameters, system-id should already be set as 1. Click the blue Execute command.
6. Under Responses, the details next to Code 200 should list out several data points about the storage array. Look for the 40-digit ID value for your first volume. Copy this value for use in the next step.

```
},
"thinProvisioned": false,
"wwn": "600A098000AF59CA000017425DB25A51",
"preferredControllerId": "070000000000000000000000",
"totalSizeInBytes": "2147483648000",
"onlineVolumeCopy": false,
"name": "LUN_VRM0",
"id": "02000000600A098000AF59CA000017425DB25A51"
},
{
"offline": false,
```



7. Click `POST /storage-systems/{system-id}/volume-mappings` and then Try It Out.
8. Paste the ID in the quotation marks next to "mappableObjectId" and use "000" for the targetId. It should look like the following example:

```
{
  "mappableObjectId": "02000000600A098000AF59CA000017425DB25A51",
  "targetId": "0000000000000000000000000000000000000000000000000000000000000000",
  "lun": 0
}
```

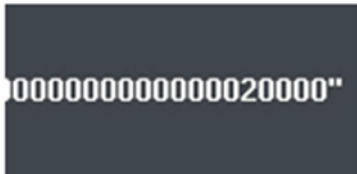
9. Click the blue Execute command. LUN 0 should now be mapped to a default cluster. Continue mapping the rest of your volumes to this host cluster.
10. You can now use SANtricity System Manager to map the remaining LUNs to the default SANtricity host cluster, or you can continue using the Web Services method to map the remaining LUNs to the default host cluster.



```
"regionData": "02",  
"hostIndex": 0  
}
```

9. Go back to SANtricity System Manager and open the Hardware page.
  - a. On the top right corner of the drive diagram, click Show Back of Shelf.
  - b. Click controller A and select Reset.
  - c. When the operation completes, click controller B and select Reset.
10. Verify the change by executing the following text from the web services interface under G>  
`\/storage-systems/{systemid}/symbol/getHostSpecificNVSRAM':

```
{  
  "regionId": "hostTypeDependentData",  
  "hostIndex": 0  
}
```



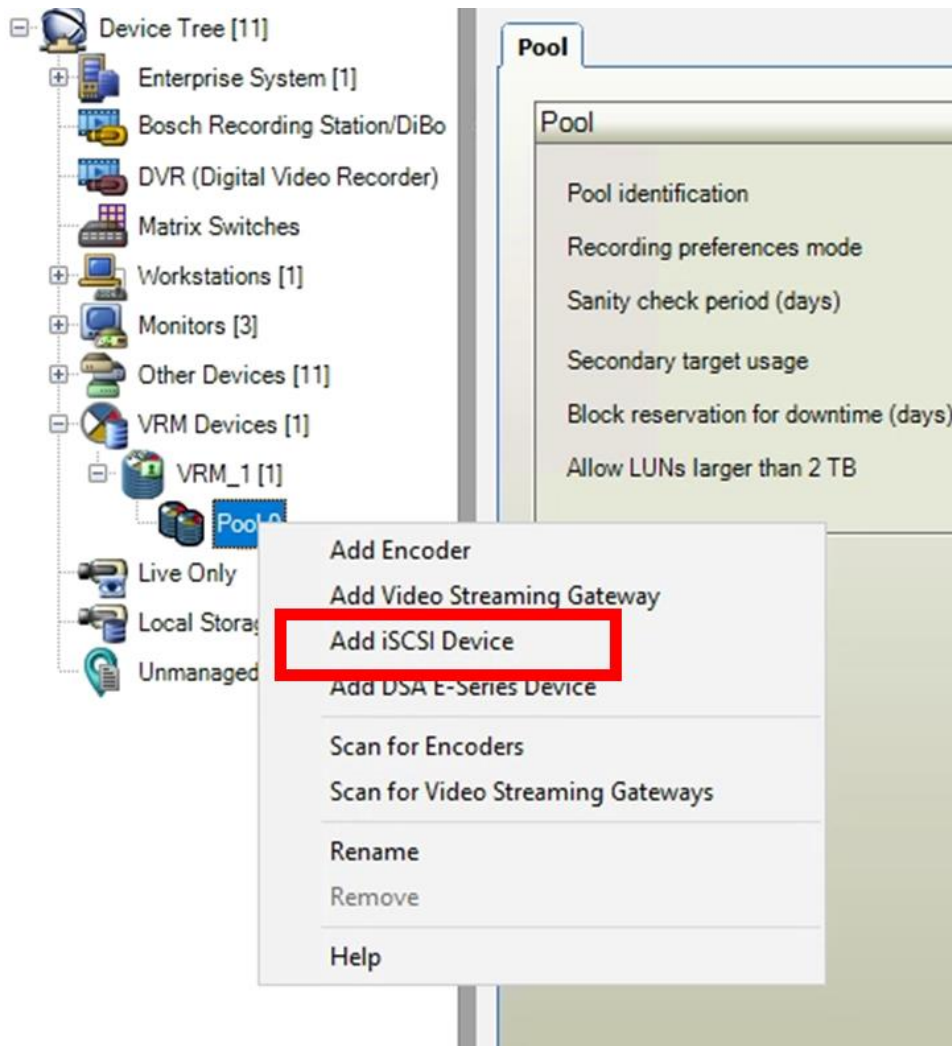
### Add the Storage System to Bosch Video Recording Manager

1. On your Bosch VRM server, ping the storage system iSCSI IP addresses for the four ports planned for your deployment – you must have IP connectivity to all four ports.
2. In the VRM configuration client, go to the Devices tab and expand the device tree.
3. Right-click VRM Devices and select Scan for VRM Devices.
4. Check the Primary VRM with the network address that matches the address of the host, and then select Next and Finish.



5. A pool should be automatically created under the VRM device you just added. If not, right-click the VRM device and select Add Pool.
6. Right-click the pool and select Add iSCSI Device.





7. For Network Address, use the iSCSI IP address that you assigned to the first port on controller A. Select Other for iSCSI device type and use the storage system admin account and password.

Enter controller iSCSI port IP

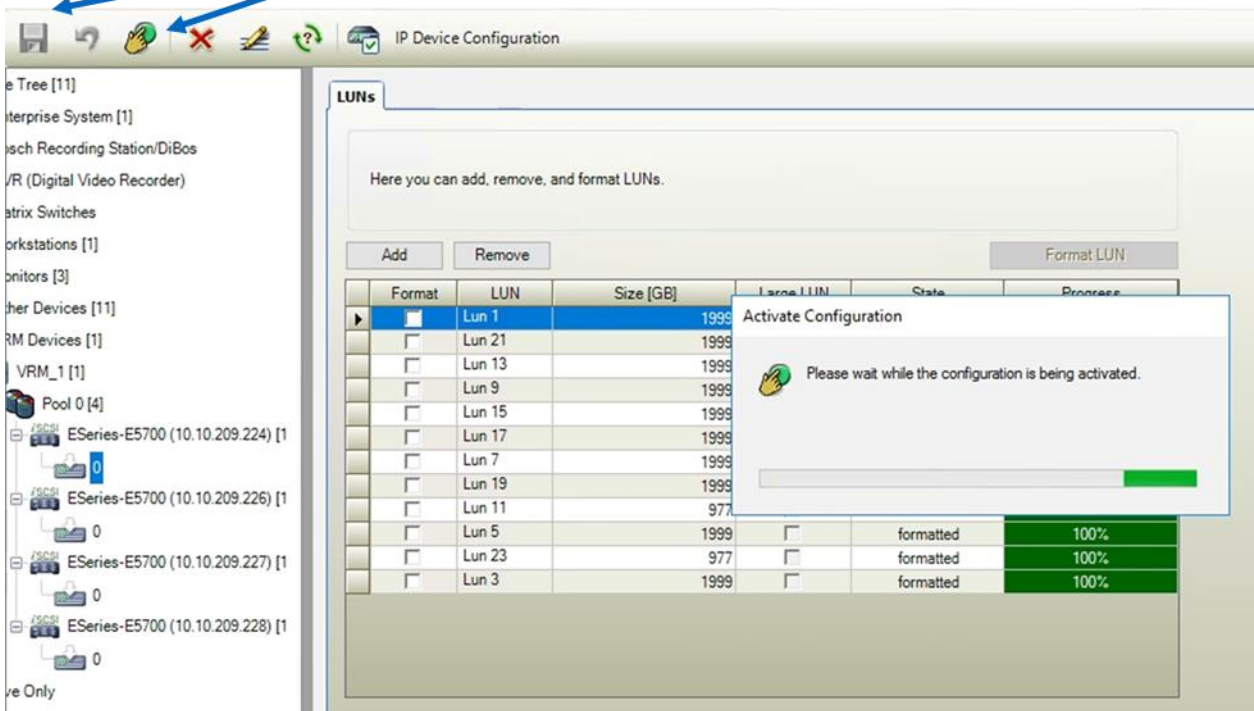
8. Repeat step 6 for both iSCSI ports on each controller.
9. In the tree view, select the iSCSI target list under each iSCSI device to view a list of iSCSI LUNs from the E5700.

Format	LUN	Size [GB]	Large LUN	State	Progress
<input checked="" type="checkbox"/>	Lun 1	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 21	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 13	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 9	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 15	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 17	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 7	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 19	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 11	977	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 5	1999	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 23	977	<input type="checkbox"/>	formatted	100%
<input type="checkbox"/>	Lun 3	1999	<input type="checkbox"/>	formatted	100%

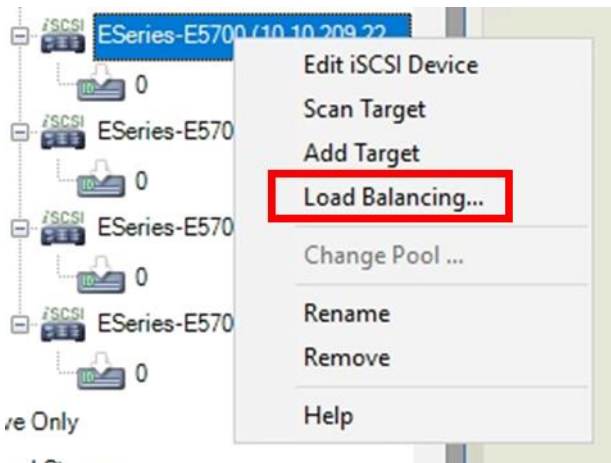
**Note:** Ports on the same controller should see all the LUNs owned by that controller.

10. Select Save and Activate in the tool bar of the Bosch VRM Configuration Client.

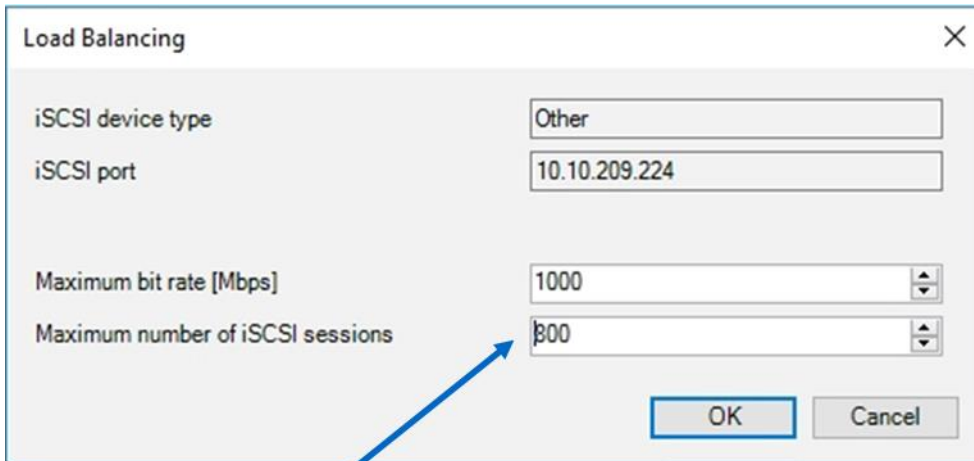
Save and activate



11. In the tree view, right-click each controller iSCSI port and select Load Balancing.

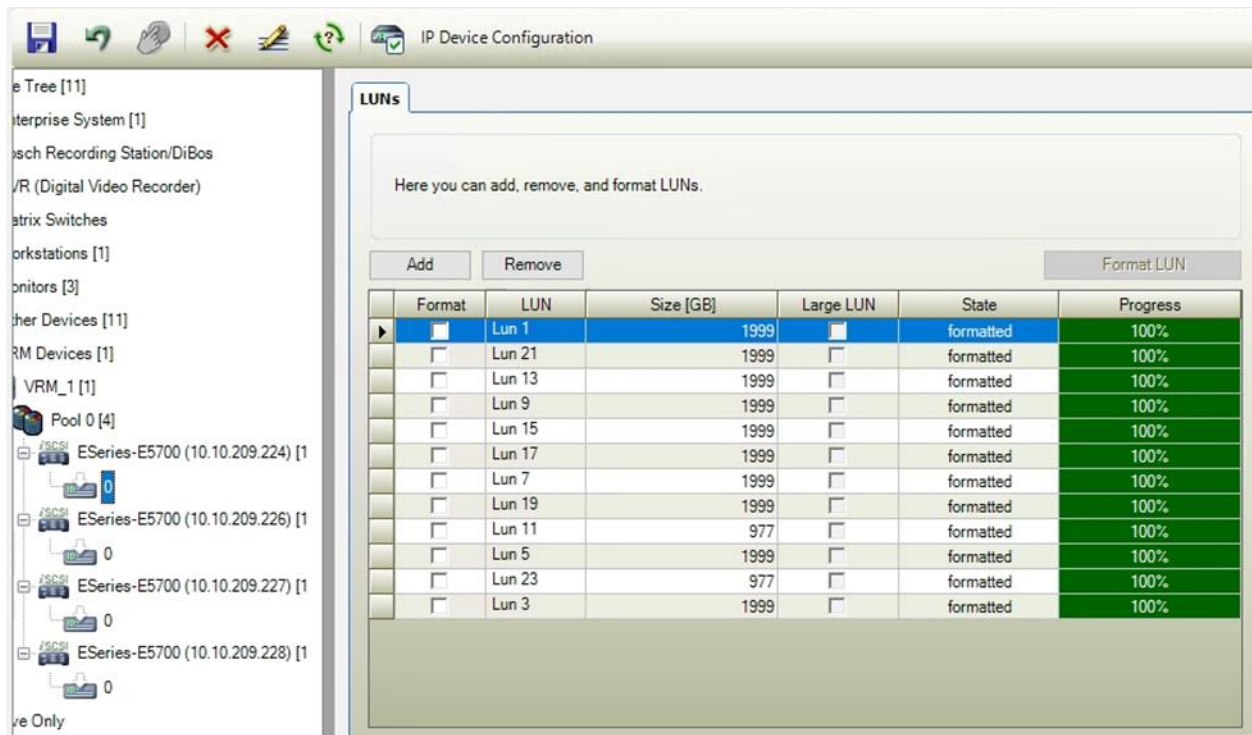


12. Increase the maximum number of iSCSI sessions to account for the number of cameras. The maximum amount allowed is 800.



Increase camera count

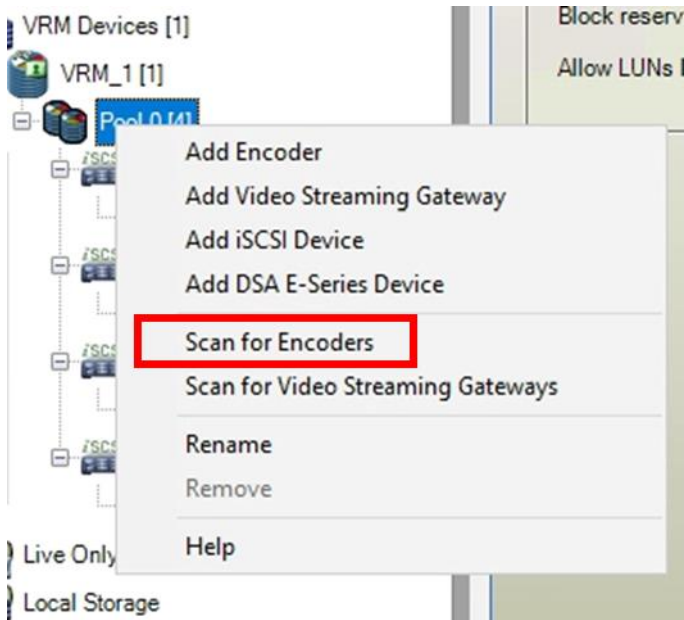
- Click the child labeled 0 under each controller again. You should see a list of LUNs owned by each controller. Under Format, check the box next to each unformatted LUN and then click Format LUN.



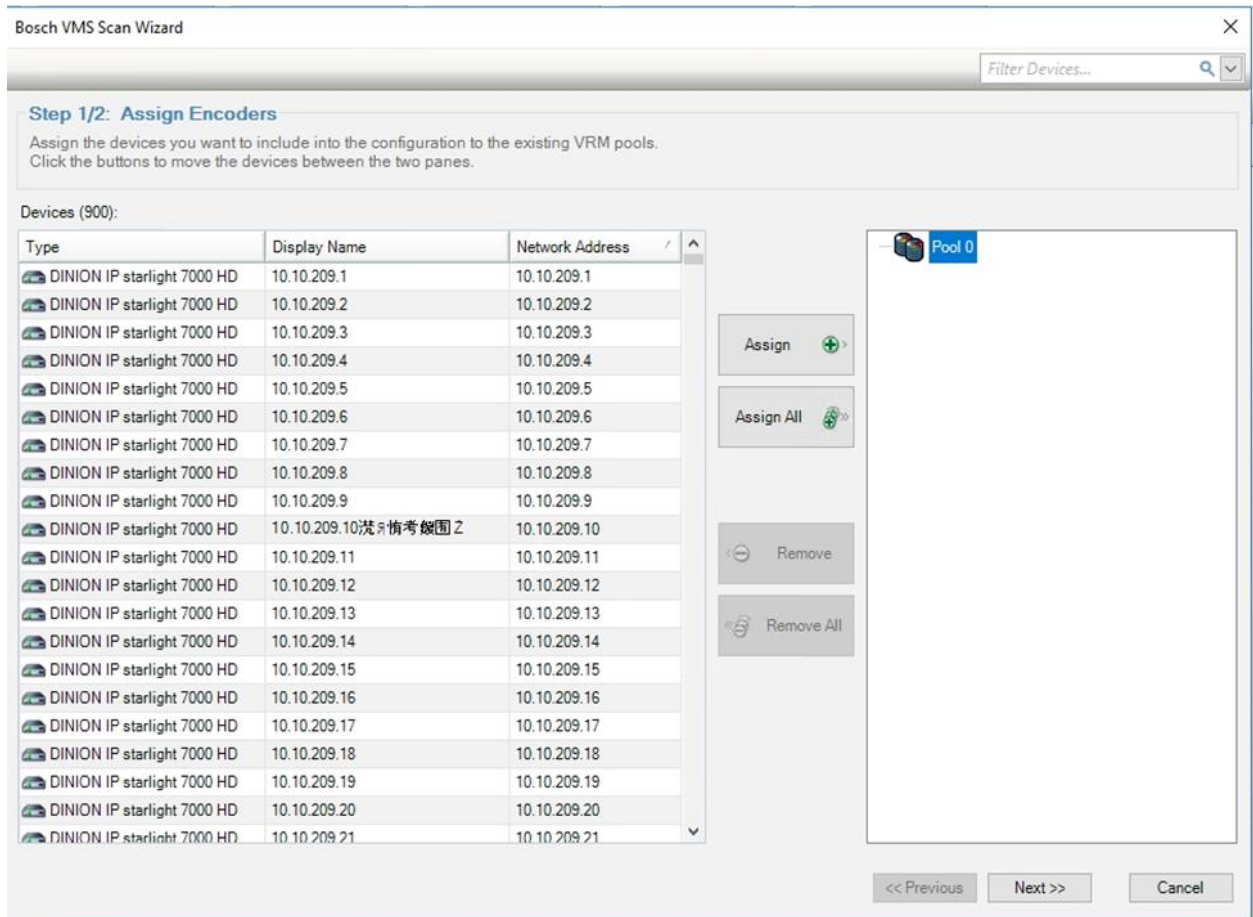
- Repeat steps 9-13 for all four storage targets.
- Select Save and Activate in the tool bar of the Bosch VRM Configuration Client.

## Adding Cameras to Bosch Video Recording Manager

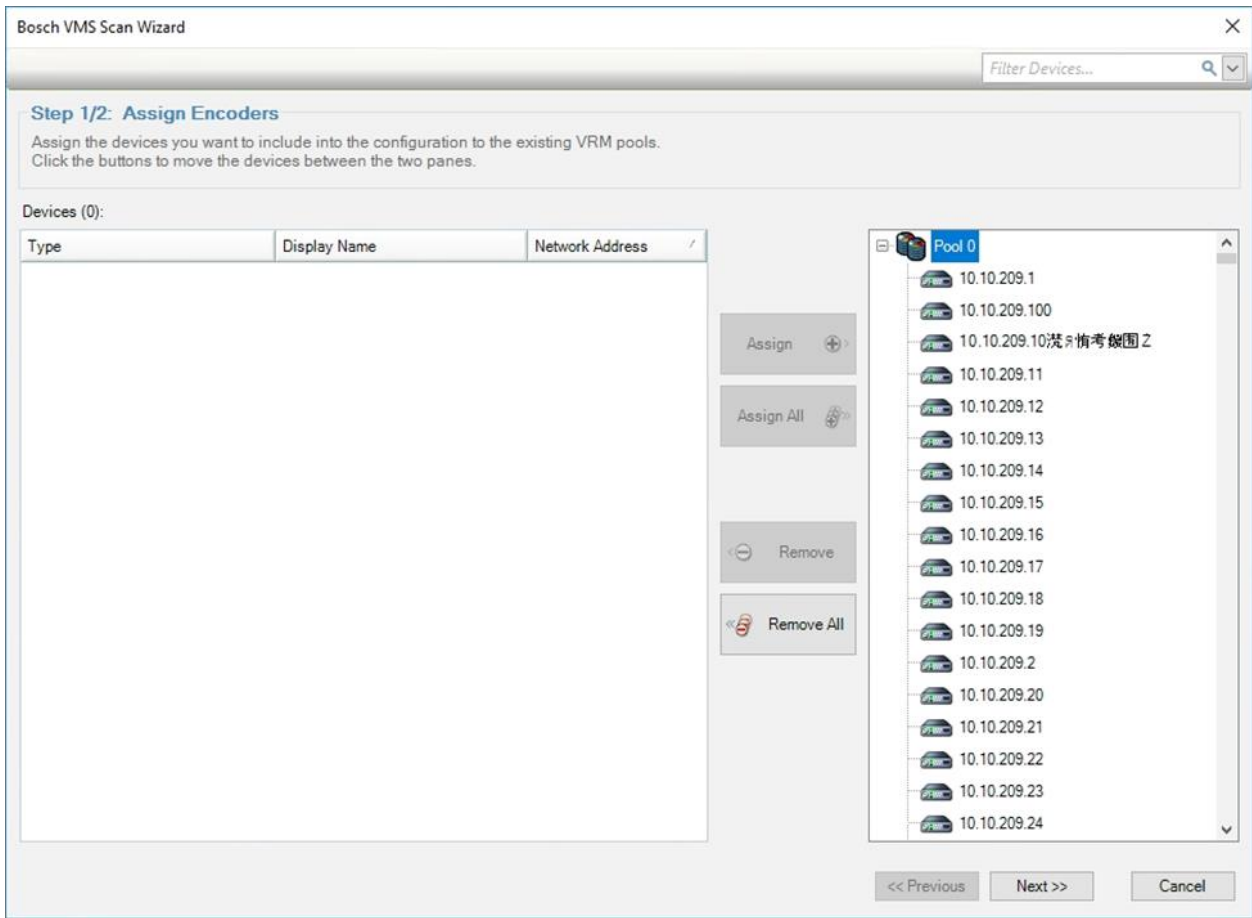
- Follow the [Bosch documentation](#) for your cameras to configure their IP addresses and establish an iSCSI connection to the storage array.
- Go to the VRM Configuration Client and right-click the Pool. Select Scan for Encoders.



3. All cameras should show up. Select Assign.

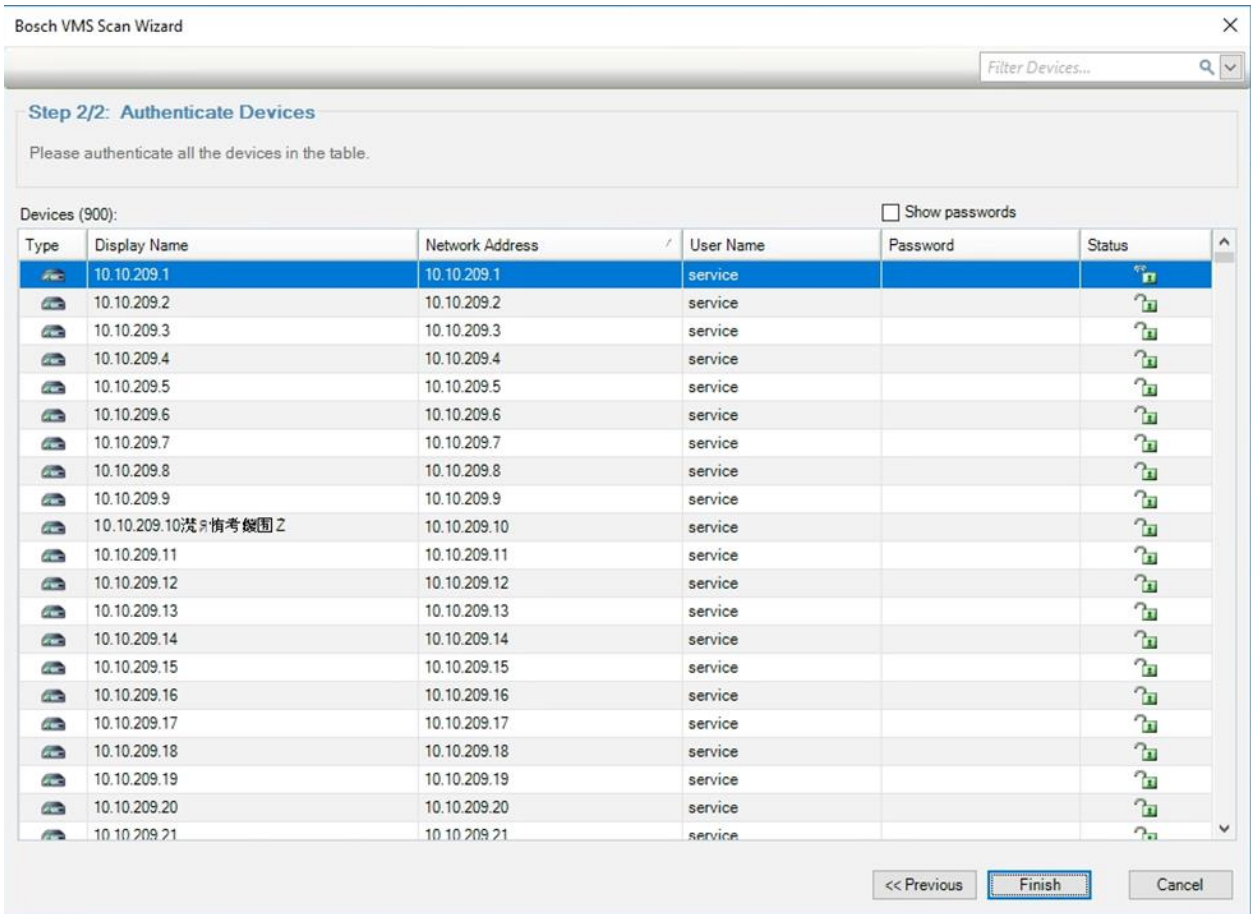


4. Assign the cameras to the pool and select Next.

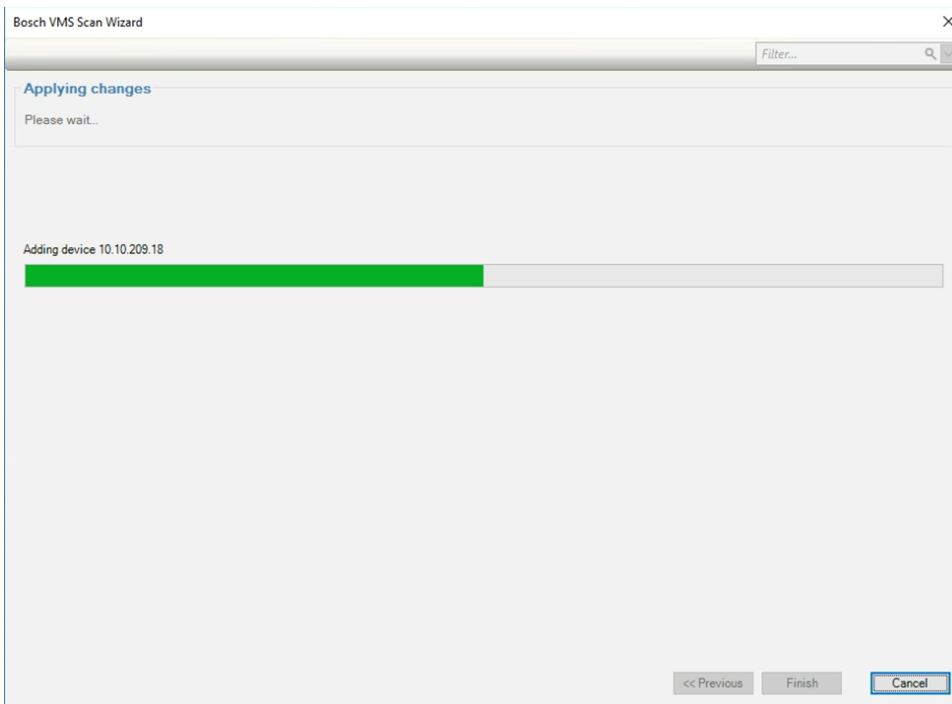


5. Select Finish to authenticate the devices to the storage targets.

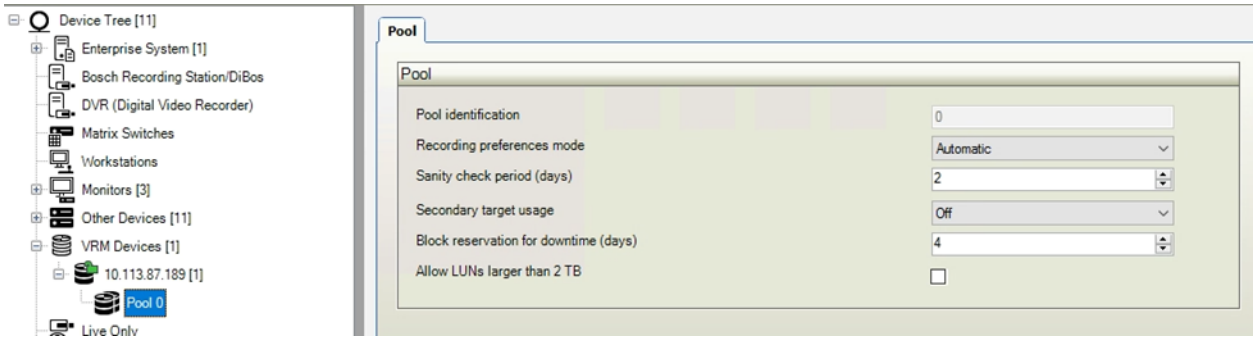




6. The devices are added to the device pool.

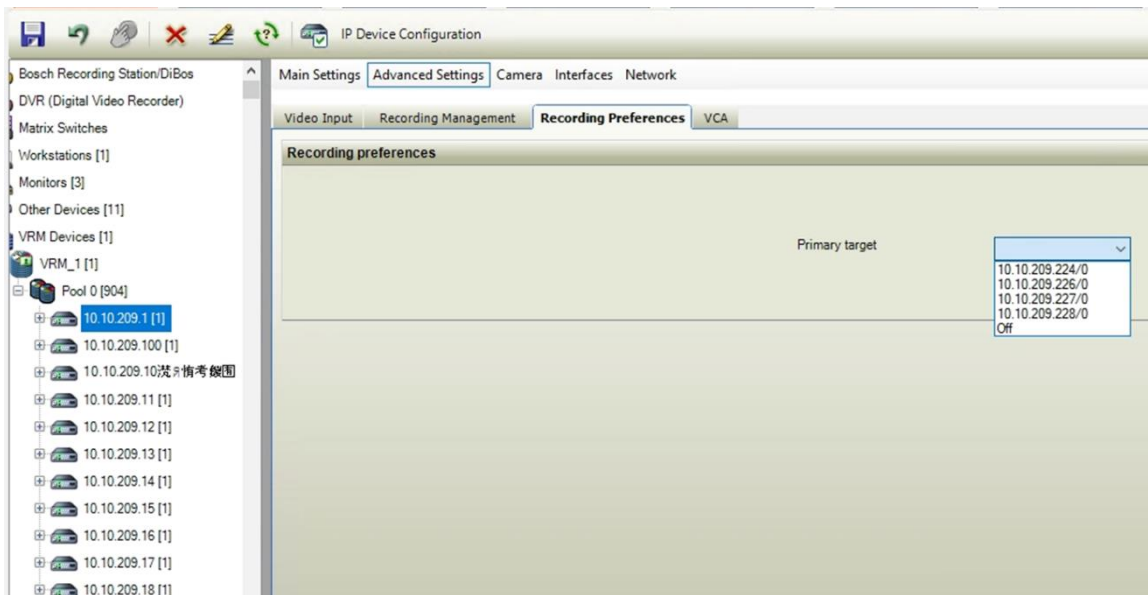


7. Save the configuration (top left) and click Activate Working Copy of Configuration.
8. There are two recording preferences modes used by the BVRM to assign cameras to storage targets, automatic and failover. From the pool level of the tree, select the mode you wish to use.



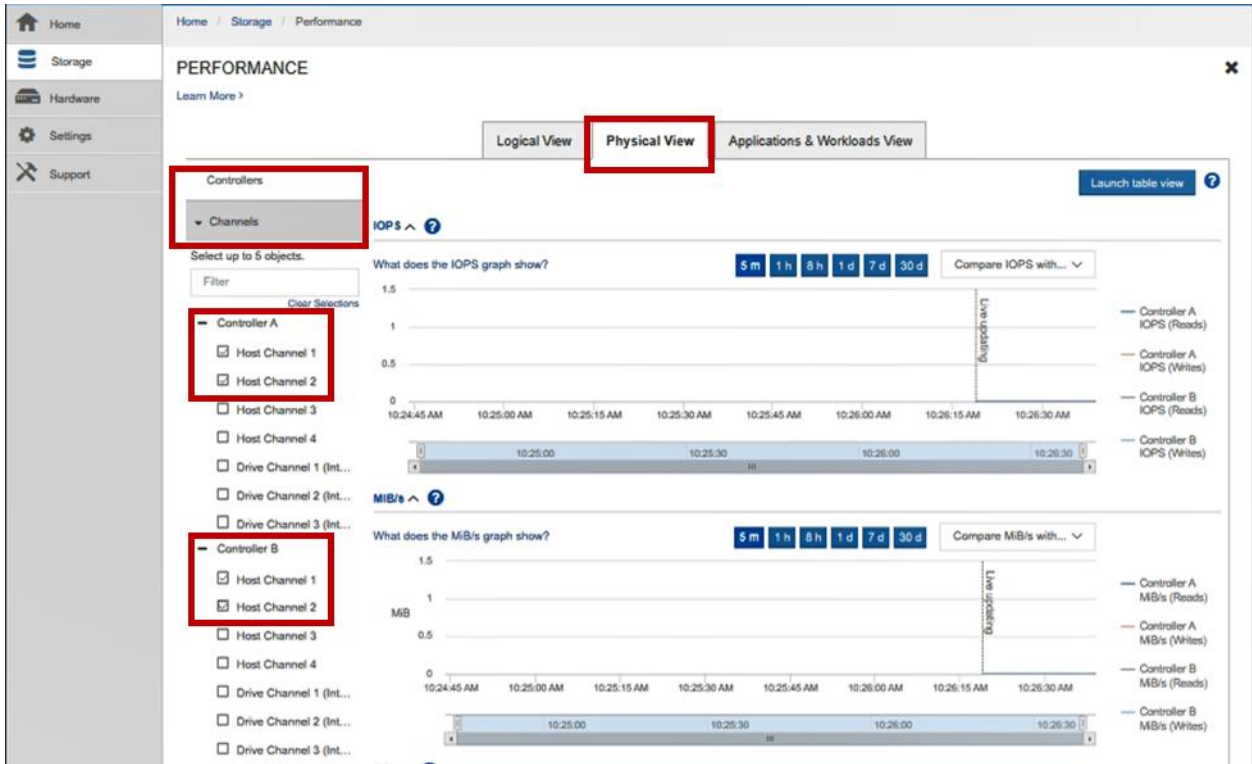
**Note:** Using Automatic triggers the VRM to logically assign the cameras to the available storage target ports. If you choose Failover mode, you must continue with step 9 to manually assign the cameras to the available storage target ports.

9. Assign a primary target for each camera. You can highlight multiple cameras at once if assigning to the same target. Try to evenly distribute cameras across all ports.



10. Once the cameras are recording, use the SANtricity System Manager performance feature to confirm the recording IO is distributed across the four physical iSCSI ports that were configured in this procedure.





### 3 Conclusion

The E5700 storage system has been validated with the Bosch VMS for configuration compatibility, multipath support, and load balancing characteristics. It is a high capacity, high performance storage system that easily integrates into the Bosch VRM to support large-scale solution deployments.

### Where to Find Additional Information

To learn more about the information that is described in this document, review the following documents and/or websites:

- Bosch camera specifications and set-up instructions  
<https://www.boschsecurity.com/us/en/>
- NetApp Product Documentation  
<https://docs.netapp.com>

### Version History

Version	Date	Document Version History
Version 1.0	May 2020	Initial release of the document.

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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