



# DELL EMC UNITY IMPLEMENTATION AND ADMINISTRATION LAB GUIDE - 5.1

Version [1]

**PARTICIPANT GUIDE**



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## Exploring the Lab Environment

## Exploring the Lab Environment

### Objective: Connect to Your Lab Environment

In this lab, you perform the following tasks:

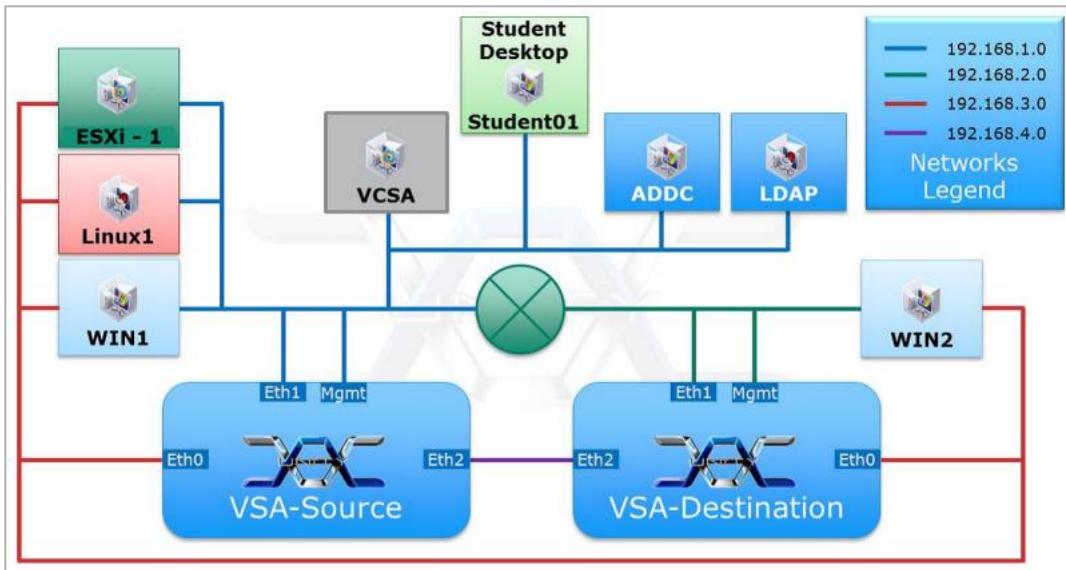
- View Lab Topology
- Log In to Your Lab Environment

### Lab Topology

Review dedicated Lab Environment.

1. In this class, you have a dedicated lab environment including:

- Student Desktop: Student01
- SMB Clients Windows iSCSI Hosts
- WIN1
- WIN2
- NFS Client: Linux1
- ESXi Server: ESXi-1
- Unity Storage Arrays:
  - UnityVSA-Source
  - UnityVSA-Destination
- Domain Controller/DNS/NTP: ADDC
- LDAP Server/NFS Users: LDAP
- vCenter Server Appliance: VCSA



## System Addressing and Credentials

<https://vcsa.hmarine.test:9443>

Server/Appliance Name	Use	Mgmt IP Address	Credentials	Data Network/iSCSI IP
WIN1	SMB client Windows iSCSI host	192.168.1.11	hmarine\administrator / emc2Admin! administrator / emc2Local!	192.168.3.106 (iSCSI) (Initiator)
WIN2	SMB client Windows iSCSI host	192.168.2.11	hmarine\administrator / emc2Admin! administrator / emc2Local!	192.168.3.107 (iSCSI) (Initiator)

## Exploring the Lab Environment

Linux1	NFS client Linux iSCSI host	192.168.1.111	root / emc2Local!	192.168.3.108 (iSCSI) (Initiator)
Student01	Student Desktop	192.168.1.12	Student01\student / student	
vSphere Web Client	Manage ESXi	192.168.1.49 <a href="https://vcsa.hmarine.test:9443">https://vcsa.hmarine.test:9443</a>	student@vsphere.local / Password123!	
AD/DC	Domain Controller DNS/NTP	192.168.1.50	hmarine\administrator / emc2Admin!	
LDAP	LDAP Server NFS Users	192.168.1.51	root / emc2Local!	
esxi-1.hmarine.test	ESXi Server	192.168.1.112	root/Password123!	192.168.3.104 (iSCSI)(Initiator)
UnityVSA-Source	Unity Storage Array Unisphere	192.168.1.113	admin / Password123! service / Password123! default: admin / Password123#	192.168.3.100 (Eth0) iSCSI TGT 192.168.1.115 (Eth1) NAS_SMB 192.168.1.116 (Eth1) NAS_NFS

UnityVSA-Destination	Unity Storage Array Unisphere	192.168.2.113	admin / Password123! service / Password123! default: admin / Password123#	192.168.3.101 (iSCSI Eth0) TGT 192.168.2.15 (Eth1) NAS_SMB 192.168.2.16 (Eth1) NAS_NFS
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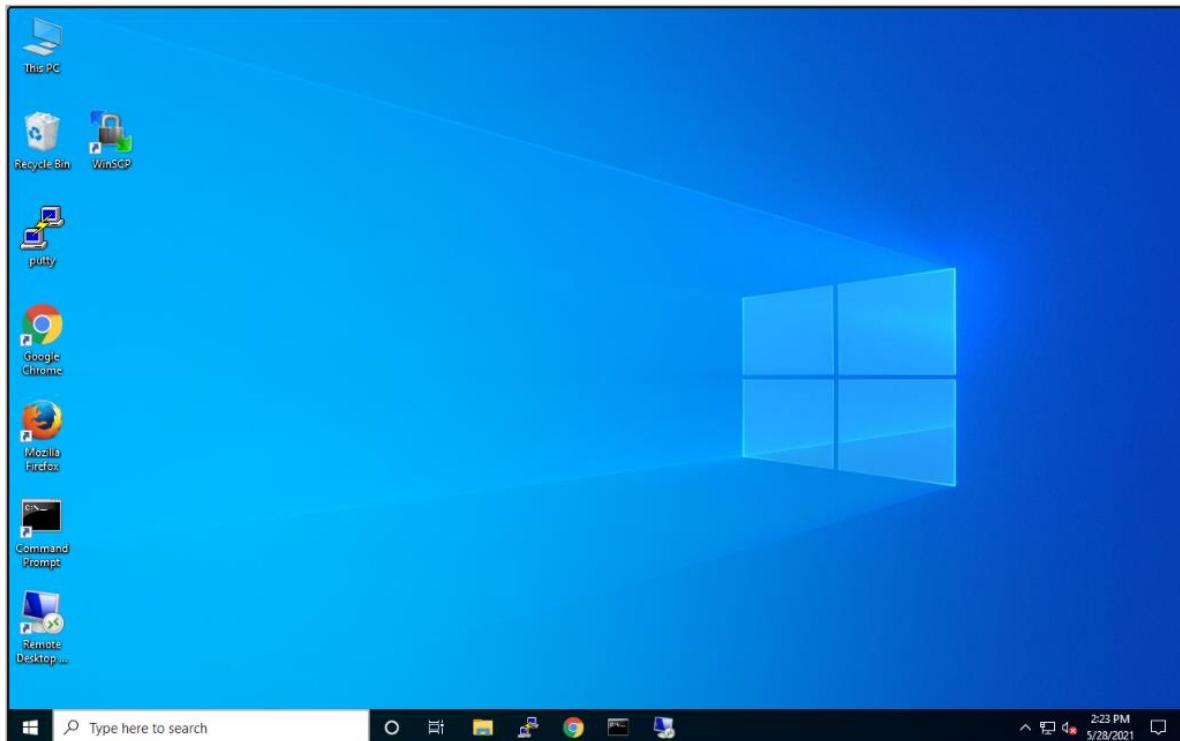
The preceding table details each system within the lab setup. It provides names, IP addressing, and access credentials.



**Note:** All of the specific addressing and access credentials are included directly within the lab exercise steps. It is presented here as a reference if needed and to provide an overview of the setup.

## Exploring the Lab Environment

### Student Desktop



When accessing the lab setup, the student is redirected to the Student Desktop Windows 10 system. The Task bar is preconfigured with application icons that are needed for the lab exercises.

Throughout the lab exercises, students move between the Student Desktop, Windows, and Linux Hosts. Students log in to the Windows and Linux hosts using different credentials depending on the Lab being performed.

## Lab Exercise: Unity Unisphere Tour

### Scenario:

In this lab, you take a tour of the Unisphere Dashboard, System View, and Settings pages to become familiar with the storage system and the GUI interface.

In this lab, you perform the following tasks:

- Log into Unisphere, customize the Dashboard, and explore Unisphere Navigation, Preferences, and Help options.
- Display the virtual components in the System View pages and confirm storage system health.
- View the system settings pages and confirm software versions, license information, system limits, and management settings.

## Lab Exercise: Unity Unisphere Tour

### Tour of Unisphere Dashboard, System View, and Settings

Introduction to task.

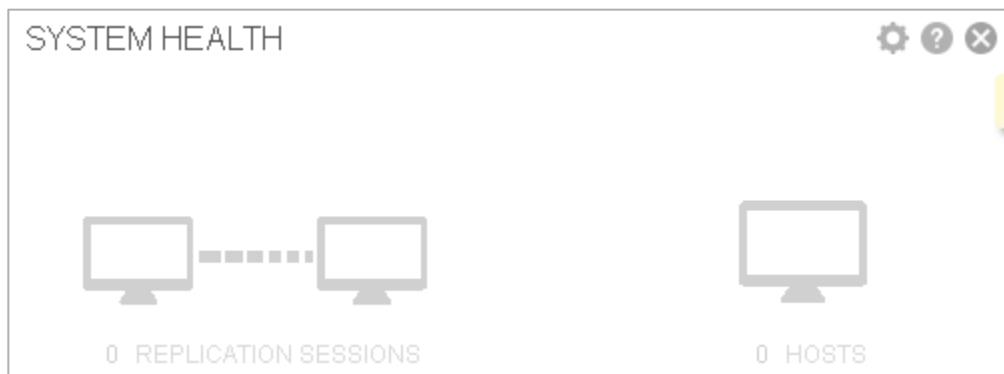
1. Launch the Google Chrome browser from the task bar on your Student Desktop.



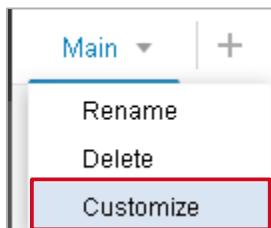
Enter the URL <https://192.168.1.113>, and log in to Unisphere with the **admin** user account and the password **Password123!**

2. The **Dashboard** displays several default **View Blocks**.

Click the **System Health View Block**. Three icons are displayed in the upper right side of the window. Hover over each icon to view the details.



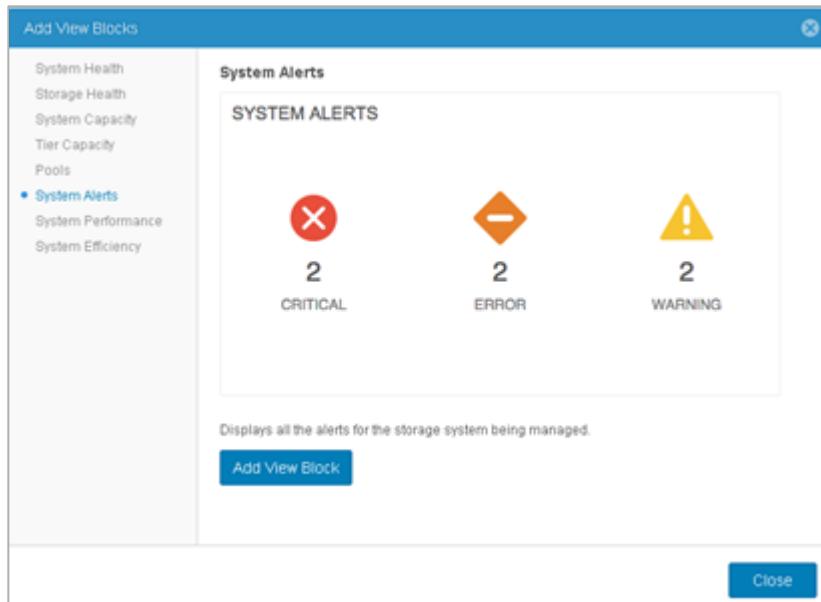
3. To customize the Dashboard, click the **Main** link text or use the drop-down arrow in the upper left of the window and select **Customize**.



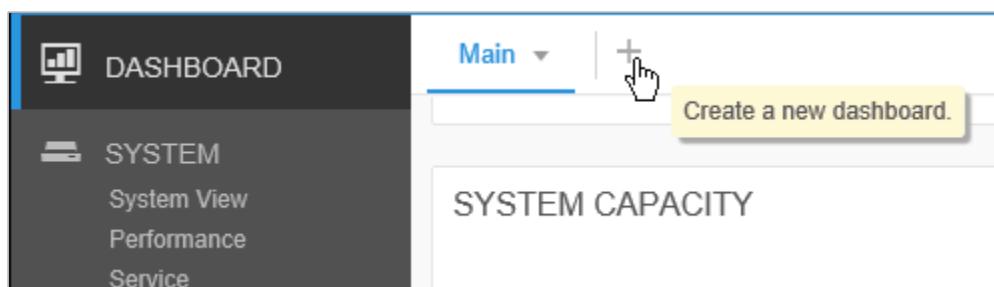
4. In the **Add View Blocks** window, select **System Alerts**, click **Add View Block**, and then click **Close** to return to the Dashboard.

Is your new widget displayed? \_\_\_\_\_

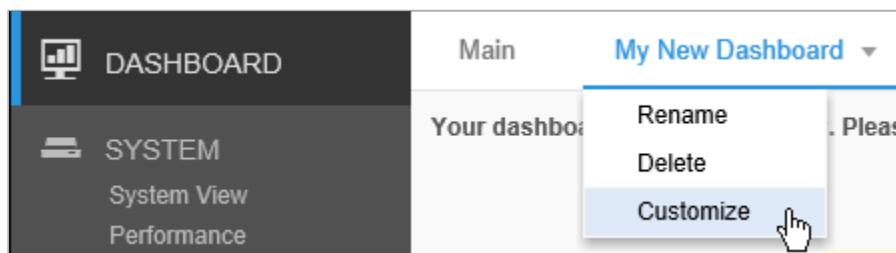
## Lab Exercise: Unity Unisphere Tour



- Now click the + icon to create a new dashboard.



- Enter **My New Dashboard** in the **Dashboard Name** field and click **OK**.
- From the **My New Dashboard** dropdown list, select **Customize** to add widgets to the new dashboard.



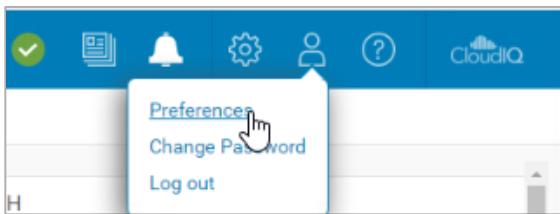
Select **System Capacity**, and click the **Add View Block** button.

Add another widget by selecting **System Alerts**, and click the **Add View Block** button.

## Lab Exercise: Unity Unisphere Tour

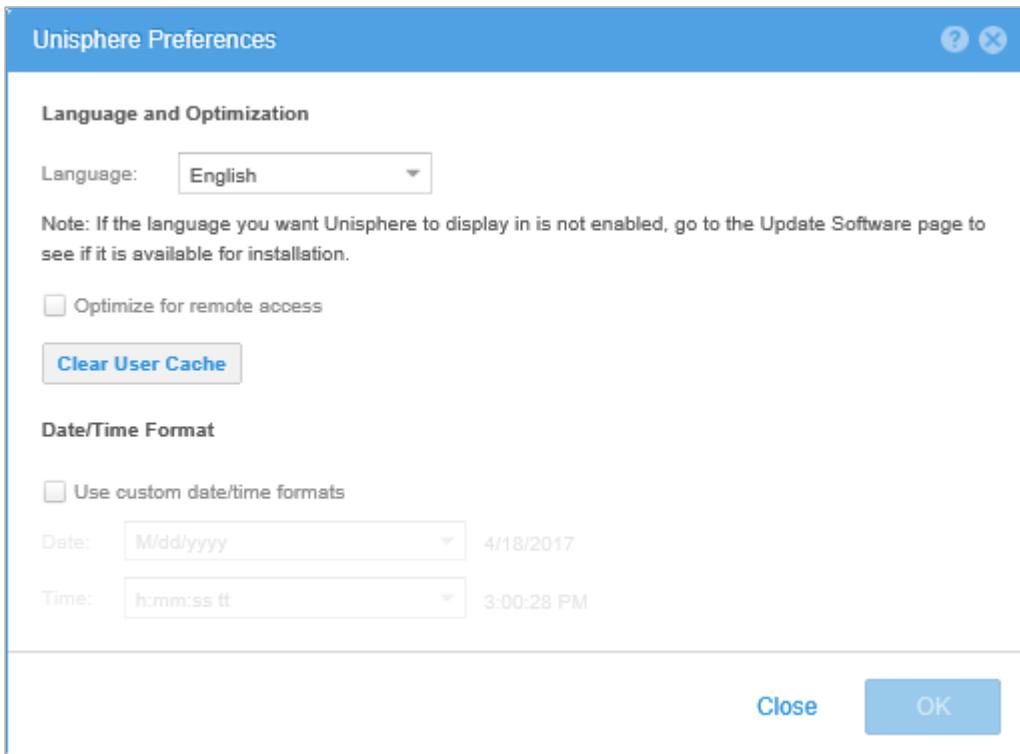
Click **Close**. The Dashboard displays the added widgets.

8. Let's look at Unisphere preferences. Click the **person** icon in the upper right corner and select **Preferences**. You can also change the password and log out here.



9. In the window that opens, hover over the **Optimize for remote access** link. What is the purpose of this option?

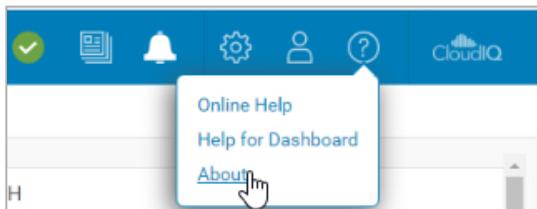
Click the **Clear User Cache** button next. Click **Yes** to confirm. What is the result of the clear user cache function?



10. Let's look at the help options. Click the **Help** icon in the upper right of the window to view the sub menu. Click the **About** link in the sub menu. Which version of Unisphere is running?

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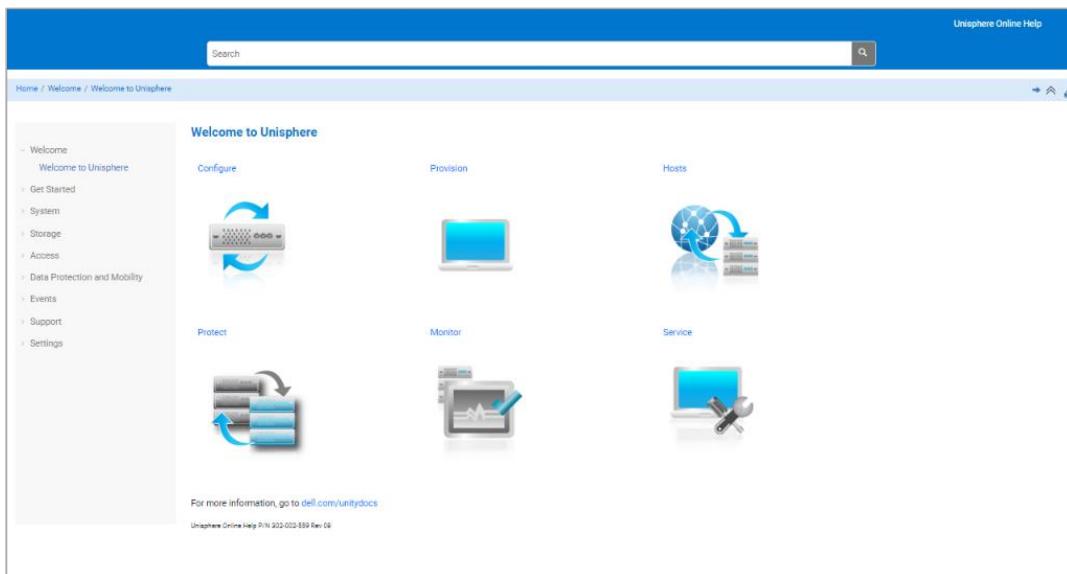
**Close** the window.



The other two sub menu items include a link to the online help main menu page and a direct link to the dashboard help page.

11. Click the **Online Help** link to view the main menu.

You can go to the online help using the content tree on the left or using the categories on the right. Try the **For more information** link near the bottom of the main menu.

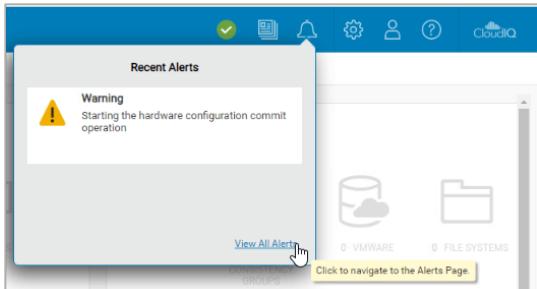


12. Close the browser tabs to Online Help and Product Documentation and return to the open Unisphere Dashboard tab.

Click the **Alerts** icon to view any recent alerts. If you select the **View All Alerts** link, it brings you to the **Alerts** page. You can also reach the Alerts page using the link in the navigation pane on the left.  
Are there any alerts displayed?

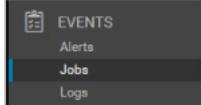
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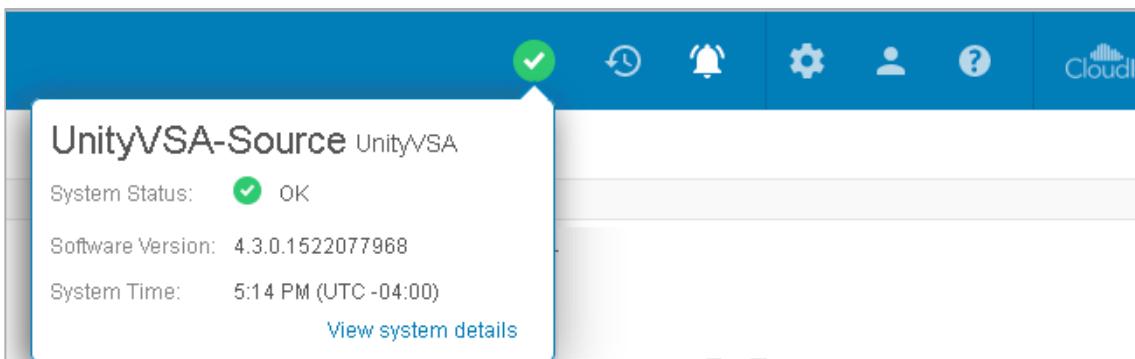
## Lab Exercise: Unity Unisphere Tour



13. Next to the Alerts icon, click the **Jobs** icon to view any active jobs. In this case, there are no active jobs shown.



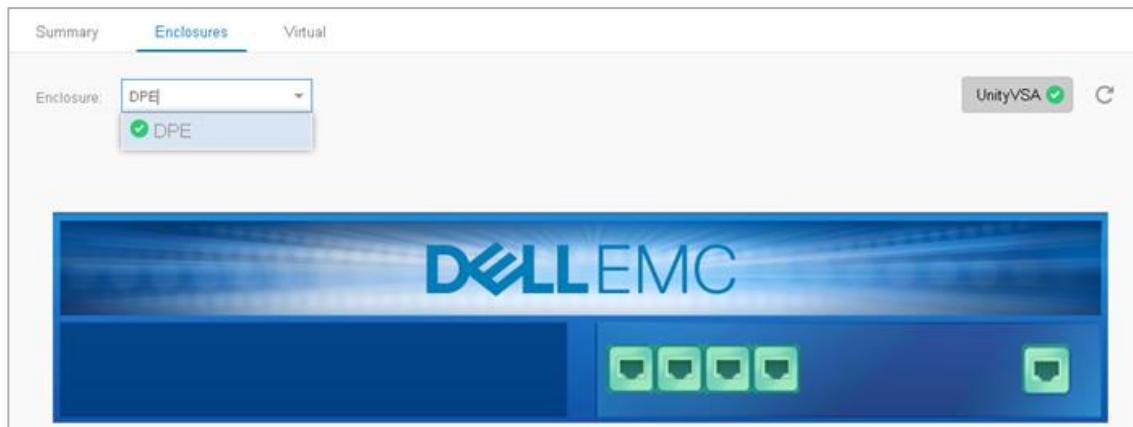
- Click the **Jobs** link in the navigation pane on the left to view the Jobs page.
- 
- A screenshot of the Dell EMC Unisphere left navigation pane. It includes links for EVENTS, Alerts, Jobs (which is highlighted with a blue arrow), and Logs.
14. To the left of the Jobs icon, click the **View system status** icon. Select the **View system details** link for more details.



15. This brings us to the **System View Summary** page.  
We can also navigate here using the **System View** link in the left navigation pane.  
Here is where we can see the general system status, the system name, serial number, license activation key, system UUID, software version, and system time.  
Are there any hardware issues detected on your system that need attention?

Does the software version match what was reported in the About Unisphere page? \_\_\_\_\_

Select the **Enclosures** tab. Click each port and view the details on the bottom page.



16. Select the **Virtual** tab. There should be nine Virtual Disks assigned to your UnityVSA storage system.
17. Now let's look at some system settings. Click the **Settings** icon in the upper right corner of Unisphere.



- a. The **Software and Licenses** Information window is displayed. The menu on the left roughly matches the flow of the Initial Configuration Wizard and that you can launch the Initial Configuration Wizard near the bottom of window.

## Lab Exercise: Unity Unisphere Tour

The screenshot shows the 'Software and Licenses' section of the Dell EMC Unity Unisphere Settings window. On the left, there's a sidebar with icons for Software and Licenses, Users and Groups, Management, Storage Configuration, Support Configuration, Access, and Alerts. The 'Software and Licenses' section is expanded, showing 'License Information' and links for Software Upgrades, Language Packs, UDoctor Packs, and System Limits. The main panel is titled 'License Management' and contains a table with columns: License, Version, Issued Date, and Expire Date. The table lists several licenses, all marked as 'Permanent'. Below the table, there's a 'License Description' section with the System UID (39538CAE-7F5E-3A63-76E4-76F757BCB222), License Activation Key (ELMEUV0421F6ZW), and buttons for 'Install License' and 'Get License Online'.

18. Click the **Software Upgrades** link to check the software version.  
What is the release date of the UnityOS?
- 

19. Click the **Perform Health Checks** button.

The screenshot shows the 'Software and Licenses' section of the Dell EMC Unity Unisphere Settings window. The sidebar is identical to the previous screenshot. The main panel shows 'System Information' with fields for Name (Unity-Source), Model (UnityVSA Community Edition), and Serial Number (VIRT211NQQFBH). Below that is the 'Installed System Software' table, which shows UnityOS with Version 5.1.0.0.5.394 and Release Date 5/26/2021. At the bottom is the 'Upgrade Software' section, which includes buttons for 'Perform Health Checks' (which is highlighted with a red box), 'Start Upgrade', and 'Download New Software'.

- a. The **Pre Upgrade Health Checks** window is displayed (not shown here). Click the **Perform Health Checks** button to perform the health check.

Did the health check successfully complete?

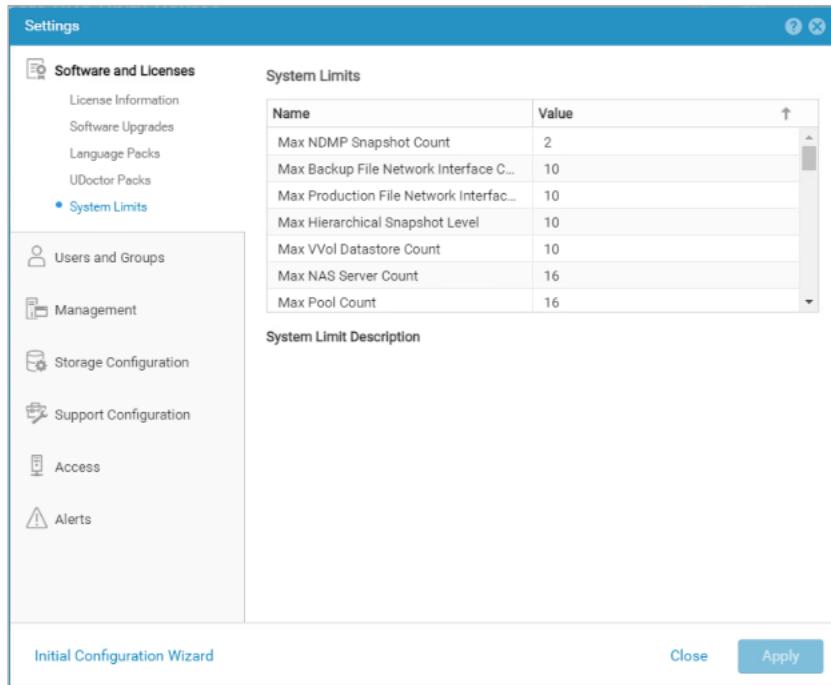
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Any issues reported?

---

**Close the Pre Upgrade Health Check** window to continue.

20. Now let's look at the system limits. Click the **System Limits** link in the **Settings** window. Use the slide bar to view all the limits.

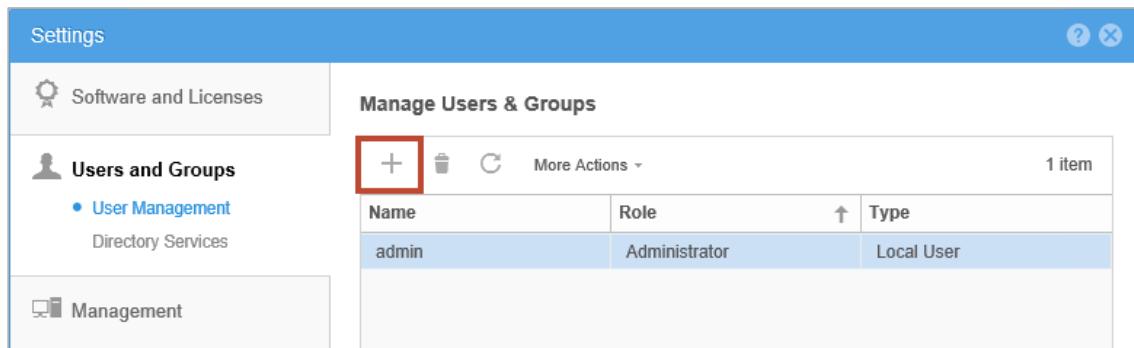


21. Use the menu on the left to explore the rest of the Settings.  
This completes part 1 of the lab exercise.

## Adding a New User Account with a Role Associated to It

- From the **Settings** window, go to the **Users and Groups > User Management** section.

From the **Manage Users & Groups** page, launch the **Create User or Group** wizard by clicking on the **Add** link (+).



The screenshot shows the Unity Unisphere Settings window. On the left, there's a sidebar with 'Software and Licenses', 'Users and Groups' (selected, showing 'User Management' and 'Directory Services'), and 'Management'. The main area is titled 'Manage Users & Groups' and shows a table with one item: 'admin' (Role: Administrator, Type: Local User). At the top of this area, there's a toolbar with icons for add, delete, edit, and more actions, and a status message '1 item'. The 'Add' button (+) is highlighted with a red box.

- From the **Create User or Group** wizard, notice that **Local User** is the only option available because LDAP service was not configured for the Unity system.

If LDAP was configured in the Directory Services tab of the System Settings window, both existing LDAP User and Group could be configured to access Unisphere.

Click **Next** to continue the wizard.

- In the **Specify User Information** section enter the following:

Username: **student**

Password: **P@ssw0rd**

Confirm Password: **P@ssw0rd**

Click **Next** to continue.

- On the **Select a Role** section, select the **Operator** role for the new user.

Click **Next** to continue.

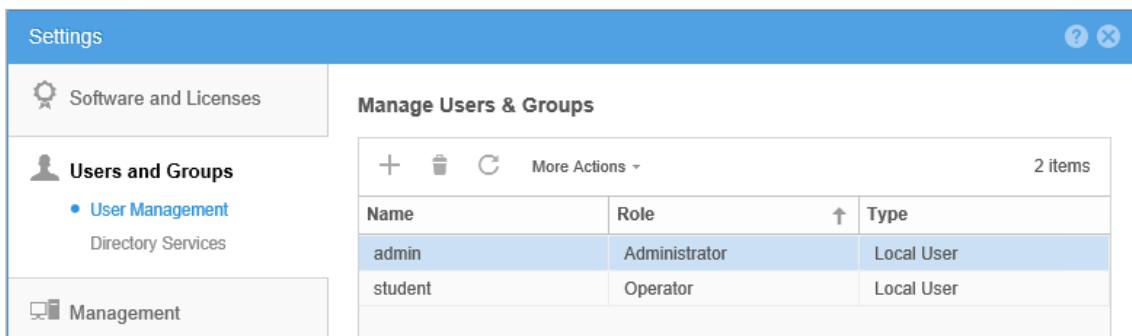
5. Review your settings on the **Summary** section and click **Finish**.
6. The **Results** section shows the status of the operation.

A green check mark specifies that the operation was completed successfully.

Wait until the job has completed, and then click **Close**.

7. The new User is displayed in the **Manage Users & Groups** page.

Notice that among the information that is displayed in this page are the user name, role, and the type of user (Local or LDAP).



The screenshot shows the 'Manage Users & Groups' section of the Settings window. On the left, there's a sidebar with 'Software and Licenses', 'Users and Groups' (which is selected and shows 'User Management' and 'Directory Services'), and 'Management'. The main area has a table with two items:

Name	Role	Type
admin	Administrator	Local User
student	Operator	Local User

- a. Close the **Settings** window.
8. Test the new user and the permissions that are associated with the role:

First log off from the Unisphere session. (Remember that we are logged as **Admin**).



Confirm the **Log Out** operation. The browser redirects the page to the Login screen.

9. On the Login screen, enter the credentials of the new user:

User: **student**

## Lab Exercise: Unity Unisphere Tour

Password: **P@ssw0rd**

Click **LOG IN**.

10. Click the **Settings** icon in the upper right corner of Unisphere.

The **Settings** window opens.

11. The default **License Management** page is displayed under the **Software and Licenses > License Information** section.

Is this user allowed to install a new license?

---

12. Navigate through the other sections of the Settings window.

Can this user create New Users or Groups?

---

Which configuration from the **Management** section, is this user allowed to perform?

---

13. This concludes the demonstration of Role-based user management. **Close** the **Settings** window, and log out from the Unisphere session.

## Lab Exercise: Storage Provisioning

### Scenario:

In this lab, you assign the storage tier levels to virtual disks presented to the Dell EMC UnityVSA system. From that storage space, you create several heterogeneous and homogeneous pools. From the pools, you create LUNs, Consistency Groups, NAS servers, and file systems.

In this lab, you perform the following tasks:

- Assign storage tiers to the available virtual disks. Then create two multi-tier storage pools and three single-tier storage pools.
- Create two LUNs and a multi-LUN Consistency Group.
- Create two NAS Servers: one for SMB file access and one for NFS file access.
- Create two file systems: one for containing SMB file data and one for NFS file data.

### Creating Storage Pools

In this lab, you create two multi-tiered FAST VP pools for general storage use and three single tiered homogenous pools. In a Dell EMC UnityVSA environment, Virtual Disks are created for the use of the Dell EMC UnityVSA. You assign different level tiers to those Virtual Disks to be able to simulate a FAST VP environment. When using a physical Unity storage array, the back end disks are automatically assigned to the correct tiers based on their performance characteristics.

1. From your Student Desktop system taskbar, launch **Chrome** and establish a Unisphere session to the UnityVSA-Source system at IP address **192.168.1.113**. The login credentials are **admin/Password123!**
2. Navigate to **System > System View > Virtual**. You will see nine Virtual Disks that are displayed with three different capacities.

Select the first **9.9 GB** Virtual Disk so it is highlighted, and then move the cursor to the **Details** icon in the tool bar and click it. As a note, double-clicking the Virtual Disk also works.

## Lab Exercise: Storage Provisioning

Virtual							
	Details	Size (GB)	WWN	Storage Pool	SCSI ID SP A	Storage Tier	
<input checked="" type="checkbox"/>	Virtual Disk 1	9.9	60:06:01:60:...	--	0:3	None	
<input type="checkbox"/>	Virtual Disk 2	9.9	60:06:01:60:...	--	0:4	None	
<input type="checkbox"/>	Virtual Disk 3	9.9	60:06:01:60:...	--	0:5	None	

The **Properties** window is displayed. From the **Storage Tier** dropdown list, select the **Extreme Performance Tier**. Click **Apply**, and then click **Close**. Repeat this step for the other two 9.9 GB Virtual Disks.

Double-click on the first **19.9 GB** Virtual Disk. The **Properties** window is displayed. From the **Storage Tier** dropdown list, select the **Performance Tier**. Click **Apply**, and then click **Close**. Repeat this step for the other two **19.9 GB** Virtual Disks.

Double-click on the first **49.9 GB** Virtual Disk. The **Properties** window is displayed. From the **Storage Tier** dropdown list, select the **Capacity Tier**. Click **Apply**, and then click **Close**. Repeat this step for the other two **49.9 GB** Virtual Disks.



**Note:** this is one of several places that tiers can be assigned to virtual disks.

3. Navigate to **Storage > Pools**. Click the **+** icon to create a new pool. The **Create Pool Wizard** opens. In the **Name** field input: **FAST VP-1**. Click **Next** to continue the wizard.

In the **Assign Tier to the Virtual Drive** window, click **Next** since you already performed this step.

In the **Select Storage Tiers** window, check the box for each of the three storage tiers, **Extreme Performance Tier**, **Performance Tier**, and **Capacity Tier** as this pool will be a multi-tiered FAST VP Pool. Click **Next** to continue the wizard.

In the **Select Virtual Drives** window, **remove** the check marks from all virtual disks except the first one listed in each of the three tiers. Click **Next** to continue the wizard.

Leave the **Create VMware Capability Profile for the Pool** check box **cleared**. Click **Next** to continue the wizard.

The **Summary** section displays the pool configuration to be created. Verify that a single disk is displayed in each of the tiers. Click **Finish** to begin the creation operation.

The **Results** window displays the creation status. **Close** the window when the operation completes.

The newly created **FAST VP-1** pool is now listed.

4. Click the + icon to create another pool. The **Create Pool Wizard** opens. In the **Name** field input: **FAST VP-2**. Click **Next** to continue the wizard.

In the **Assign Tier to the Virtual Drive** window, click **Next**.

In the **Select Storage Tiers** window, check the box for each of the three storage tiers, **Extreme Performance Tier**, **Performance Tier**, and **Capacity Tier** as this pool will be a multi-tiered FAST VP Pool. Click **Next** to continue the wizard.

In the **Select Virtual Drives** window, **remove** the check marks from all virtual disks except the first one listed in each of the three tiers. Click **Next** to continue the wizard.

Leave the **Create VMware Capability Profile for the Pool** check box **cleared**. Click **Next** to continue the wizard.

The **Summary** section displays the pool configuration to be created. Verify that there is a single disk in each of the tiers. Click **Finish** to begin the creation operation.

The **Results** window displays the creation status. **Close** the window when the

## Lab Exercise: Storage Provisioning

operation completes.

The newly created **FAST VP-2** pool is now listed.

5. Click the + icon to create another pool. The **Create Pool Wizard** opens. In the **Name** field input: **Extreme Performance Pool**. Click **Next** to continue the wizard.

In the **Assign Tier to the Virtual Drive** window, click **Next**.

In the **Select Storage Tiers** window, check the box for **Extreme Performance Tier** only, as this pool will be a single tier pool. Click **Next** to continue the wizard.

In the **Select Virtual Drives** window, only the one virtual disk will be displayed and checked. Click **Next** to continue the wizard.

Leave the **Create VMware Capability Profile for the Pool** check box **cleared**. Click **Next** to continue the wizard.

In the **Review Your Selections** window, verify that you have a single **9.9 GB** drive in the **Extreme Performance Pool**. Click **Finish**.

The **Results** window displays the creation status.

**Close** the window when the operation completes.

6. Click the + icon to create another pool. The **Create Pool Wizard** opens. In the **Name** field input: **Performance Pool**. Click **Next** to continue the wizard.

In the **Assign Tier to the Virtual Drive** window, click **Next**.

In the **Select Storage Tiers** window, check off the box for **Performance Tier**.

Click **Next** to continue the wizard.

In the **Select Virtual Drives** window, verify **Virtual Disk 6** is checked.

Click **Next** to continue the wizard.

Leave the **Create VMware Capability Profile for the Pool** check box **cleared**. Click **Next** to continue the wizard.

In the **Review Your Selections** window, verify that you have a single **19.9 GB** drive in the **Performance Pool**. Click **Finish**

The **Results** window displays the creation status.

**Close** the window when the operation completes.

7. Click the **+** icon to create another pool called **Capacity Pool**. Repeat the process to add the last **49.9 GB** drive (**Virtual Disk 9**) to the Capacity Pool.

In the **Review Your Selections** window, verify that you have a single **49.9 GB** drive in the Capacity Pool. Click **Finish**

The **Results** window displays the creation status. **Close** the window when the operation completes.

All five newly created pools should be listed.

Pools						
		Name	Free (TB)	Used (%)	Subscription (%)	Size (TB)
<input type="checkbox"/>	!	Capacity	< 0.1		0	< 0.1
<input type="checkbox"/>	!	Extreme Perform...	< 0.1		0	< 0.1
<input type="checkbox"/>	!	FAST VP-2	< 0.1		0	< 0.1
<input type="checkbox"/>	!	FAST-VP-1	< 0.1		0	< 0.1
<input type="checkbox"/>	!	Performance Pool	< 0.1		0	< 0.1

This completes part 1 of the lab exercise.

## Creating Block Storage LUNs and Consistency Groups

In this lab, you provision block storage LUNs and a Consistency Group with three LUNs.

1. In Unisphere, navigate to **Storage > Block > LUNs**. Click the + icon to create a new LUN.

The **Create LUNs** wizard opens.

In the **Configure LUN(s)** section, input the following configuration:

Number of LUNs: **1**

Name: **WIN1 LUN0**

Pool: **FAST VP-1**

Tiering Policy: **Start High, Then Auto-Tier**

Size: **5 GB**

Thin: **Checked**

Host I/O Limit: **No Limit**

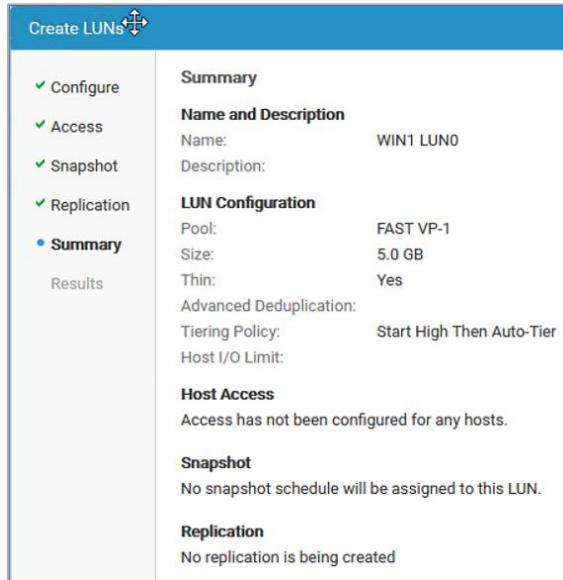
Click **Next** to continue the wizard.

In the **Configure Access** section you will not configure host access yet. Click **Next** to continue the wizard.

Also click **Next** in the **Snapshot** section and **Next** in the **Replication** section, you will not be configuring those features yet.

The **Summary** section will display the configuration of the LUN to be created as shown.

## Lab Exercise: Storage Provisioning



Click **Finish** to begin the creation operation.

The **Results** window will display the status of the operation. When it completes, **Close** the window. The newly created **WIN1 LUN0** will be displayed.

2. Click the + icon to create another LUN.

In the **Configure LUN(s)** section, input the following configuration:

Number of LUNs: **1**

Name: **Linux1 LUN0**

Pool: **FAST VP-1**

Tiering Policy: **Start High, Then Auto-Tier**

Size: **5 GB**

Thin: **Checked**

Host I/O Limit: **No Limit**

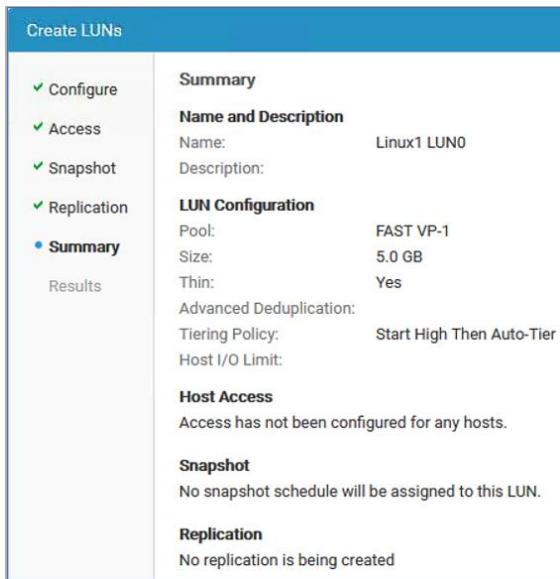
Click **Next** to continue the wizard.

In the **Configure Access** section you will not configure host access yet. Click **Next** to continue the wizard.

## Lab Exercise: Storage Provisioning

Also click **Next** in the **Snapshot** section and **Next** in the **Replication** section, you will not be configuring those features yet.

The **Summary** section will display the configuration of the LUN to be created as shown.



Click **Finish** to begin the creation operation.

The **Results** window will display the status of the operation. When it completes, **Close** the window. The newly created **Linux1 LUN0** will be displayed.

3. Select the **Consistency Groups** tab and click the + icon to create a Consistency Group. The **Create a Consistency Group** wizard opens.

In the **Name** field input: **FASTVP\_CG**. Click **Next** to continue the wizard.

In the **Populate Consistency Group** section click the + icon and select **Create new LUNs** from the dropdown list.

In the **Configure LUNs** window input the following configuration information:

Number of LUNs: **3**

Name: **CG\_LUN**

Pool: **FAST VP-1**

**Size: 5 GB**

**Thin: Checked**

**Tiering Policy: Start High, Then Auto-Tier**

**Host I/O Limit: No Limit**

Click **OK** to continue.

Click **Next** to the **Populate Consistency Group** window.

In the **Configure Access** section, click **Next** to continue the wizard.

Also click **Next** in the **Snapshot** section and **Next** in the **Replication** section, you will not be configuring those features yet.

The **Summary** section will display the configuration of the Consistency Group to be created as shown.

Name	Action	Pool	Size (GB)	Thin	Advanced D...	Tiering Policy	Description	I/O Limit
CG_LUN-1	Create	FAST VP-1	5.0	Yes	—	Start High ...	—	—
CG_LUN-2	Create	FAST VP-1	5.0	Yes	—	Start High ...	—	—
CG_LUN-3	Create	FAST VP-1	5.0	Yes	—	Start High ...	—	—

Click **Finish** to begin the creation operation.

4. The **Results** window displays the status of the operation. Please be patient, the operation will take a moment to complete. When it completes, **Close** the window.

The newly created consistency group will be displayed.

## Lab Exercise: Storage Provisioning

This completes part 2 of the lab exercise.

## Creating NAS Servers

1. You will now create a NAS server for accessing file storage via SMB.

In Unisphere, navigate to **Storage > File > NAS Servers**. Click the + icon to create a new NAS server. A wizard to create the NAS server opens to the **Configure NAS Server General Settings** section. Input the following configuration:

Server Name: **NAS\_SMB**

Pool: **FAST VP-2**

Storage Processor: **SP A** (Only SP available on a UnityVSA)

Click **Next** to continue the wizard.

2. In the **Configure NAS Server Address** section, input the following configuration:

Ethernet Port: **Ethernet Port 1**

IP Address: **192.168.1.115**

Subnet Mask/Prefix Length: **255.255.255.0**

Gateway: **192.168.1.1**

Click **Next** to continue the wizard.

3. In the **Configure Sharing Protocols** section check the **Windows Shares (SMB, CIFS)** protocol option. The window expands with the **Join to the Active Directory domain** option selected. Input the following configuration:

SMB Computer Name: **NAS\_SMB** (already populated)

SMB Server Description: **File server for Windows users**

Windows Domain: **hmarine.test**

Domain Privileged Username: **Administrator** (already populated)

Password: **emc2Admin!**

## Lab Exercise: Storage Provisioning

Leave the **Enable NFSv3** and **Enable NFSv4** options **unchecked**.

Click **Next** to continue the wizard.

4. In the **Configure NAS Server DNS** section the **Domain** and **Servers** fields are populated:

Domain: **hmarine.test**

Servers: **192.168.1.50**

Click **Next** to continue the wizard.

5. You will not be configuring Replication so click **Next** to continue the wizard.

The **Summary** section displays the configuration of the NAS Server to be created as shown here.

Create a NAS Server	
<ul style="list-style-type: none"><li>✓ General</li><li>✓ Interface</li><li>✓ Sharing Protocols</li><li>✓ DNS</li><li>✓ Replication</li><li>● Summary</li></ul>	<p><b>Review Your Selections</b></p> <p><b>NAS Server Configuration</b></p> <p>Name: <b>NAS_SMB</b></p> <p>Pool: <b>FAST-VP-2</b></p> <p>Storage Processor: <b>SP A</b></p> <p>Multiprotocol: <b>No</b></p> <p><b>NAS Server Interface Configuration</b></p> <p>Ethernet Port: <b>Ethernet Port 1</b></p> <p>IP Address: <b>192.168.1.115</b></p> <p>Subnet Mask / Prefix Length: <b>255.255.255.0</b></p> <p>Gateway: <b>192.168.1.1</b></p> <p>Support Linux/Unix Shares (NFS) - <b>None</b></p> <p>Support Windows Shares (SMB) - <b>Configured</b></p> <p>Join to the Active Directory domain: <b>Configured</b></p> <p>SMB Computer Name: <b>NAS_SMB</b></p> <p>Description: <b>File server for Windows users</b></p> <p>Windows Domain: <b>hmarine.test</b></p> <p>User Name: <b>Administrator</b></p> <p>NetBIOS Name: <b>NAS_SMB</b></p> <p>Organizational Unit: <b>ou=Computers,ou=EMC NAS servers</b></p>

Click the **Finish** button to initiate the creation operation.

The **Results** section displays the status of the creation operation.

**Close** the window when the operation completes successfully.

The **NAS\_SMB** NAS server is now listed on the page.

6. You will now create a second NAS server which will be used to access file

storage via NFS.

Click the **+** icon to create a new NAS server. The wizard to create the NAS server opens to the **Configure NAS Server General Settings** section. Input the following configuration:

Server Name: **NAS\_NFS**

Pool: **FAST VP-2**

Storage Processor: **SP A**

Click **Next** to continue the wizard.

7. In the **Configure NAS Server Address** section input the following configuration:

Ethernet Port: **Ethernet Port 1**

IP Address: **192.168.1.116**

Subnet Mask/Prefix Length: **255.255.255.0**

Gateway: **192.168.1.1**

Click **Next** to continue the wizard.

8. In the **Configure Sharing Protocols** section, check the **Enable NFSv3** protocol option.

Click **Next** to continue the wizard.

9. In the **Configure Unix Directory Service** section, check the **Enable a Unix Directory Service using NIS or LDAP**.

The window will open further configuration information.

From the dropdown list, select **LDAP**.

Click the radio button to **Configure LDAP servers IPs manually**.

Click the **Add** button. Input the following configuration:

## Lab Exercise: Storage Provisioning

IP Address: **192.168.1.51**

Click the **Add** button.

Input the following configuration:

Port: **389** (already populated)

Authentication: **Anonymous** (already populated)

LDAP Secure (Use SSL): **unchecked**

Base DN: **hmarine.test**

Profile DN: (leave blank)

Click **Next** to continue the wizard.

10. In the **Configure NAS Server DNS** section, **check** the **Enable DNS** option. This exposes further configuration information. Input the following configuration:

Domain: **hmarine.test**

IP Address: **192.168.1.50** (populated)

Click **Next** to continue the wizard.

11. You will not be configuring Replication so click **Next** to continue the wizard.

The **Summary** section displays the configuration of the NAS server to be created as shown.

## Lab Exercise: Storage Provisioning

Create a NAS Server

<ul style="list-style-type: none"><li><input checked="" type="checkbox"/> General</li><li><input checked="" type="checkbox"/> Interface</li><li><input checked="" type="checkbox"/> Sharing Protocols</li><li><input checked="" type="checkbox"/> Unix Directory Service</li><li><input checked="" type="checkbox"/> DNS</li><li><input checked="" type="checkbox"/> Replication</li><li><input checked="" type="checkbox"/> Summary</li></ul>	<p><b>Review Your Selections</b></p> <p><b>NAS Server Configuration</b></p> <table><tr><td>Name:</td><td>NAS_NFS</td></tr><tr><td>Pool:</td><td>FAST VP-2</td></tr><tr><td>Storage Processor:</td><td>SP A</td></tr><tr><td>Multiprotocol:</td><td>No</td></tr></table> <p><b>NAS Server Interface Configuration</b></p> <table><tr><td>Ethernet Port:</td><td>Ethernet Port 1</td></tr><tr><td>IP Address:</td><td>192.168.1.116</td></tr><tr><td>Subnet Mask / Prefix Length:</td><td>255.255.255.0</td></tr><tr><td>Gateway:</td><td>192.168.1.1</td></tr></table> <p><b>Support Linux/Unix Shares (NFS) - Configured</b></p> <table><tr><td>NFSv3 enabled:</td><td>Yes</td></tr><tr><td>NFSv4 enabled:</td><td>No</td></tr><tr><td>Enable Secure NFS (with Kerberos):</td><td>No</td></tr><tr><td>VVOLs enabled:</td><td>No</td></tr></table> <p><b>Support Windows Shares (SMB) - None</b></p> <p><b>Unix Directory Service - LDAP</b></p> <table><tr><td>Servers:</td><td>192.168.1.51</td></tr><tr><td>Port:</td><td>389</td></tr><tr><td>Base DN:</td><td>hmarine.test</td></tr><tr><td>Authentication:</td><td>Anonymous</td></tr><tr><td>LDAP Secure (Use SSL):</td><td>No</td></tr></table> <p><b>DNS Server Configuration</b></p> <table><tr><td>Enabled:</td><td>Yes</td></tr><tr><td>Domain:</td><td>hmarine.test</td></tr><tr><td>Address(es):</td><td>192.168.1.50</td></tr></table> <p><b>Replication</b> No replication is being created</p>	Name:	NAS_NFS	Pool:	FAST VP-2	Storage Processor:	SP A	Multiprotocol:	No	Ethernet Port:	Ethernet Port 1	IP Address:	192.168.1.116	Subnet Mask / Prefix Length:	255.255.255.0	Gateway:	192.168.1.1	NFSv3 enabled:	Yes	NFSv4 enabled:	No	Enable Secure NFS (with Kerberos):	No	VVOLs enabled:	No	Servers:	192.168.1.51	Port:	389	Base DN:	hmarine.test	Authentication:	Anonymous	LDAP Secure (Use SSL):	No	Enabled:	Yes	Domain:	hmarine.test	Address(es):	192.168.1.50
Name:	NAS_NFS																																								
Pool:	FAST VP-2																																								
Storage Processor:	SP A																																								
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LDAP Secure (Use SSL):	No																																								
Enabled:	Yes																																								
Domain:	hmarine.test																																								
Address(es):	192.168.1.50																																								

Click the **Finish** button to initiate the creation operation.

The **Results** section displays the status of the creation operation.

**Close** the window when the operation completes successfully.

The **NAS\_NFS** NAS server is now listed on the page.

## Creating File Systems

1. You will now configure a file system for SMB file storage.

In Unisphere, navigate to **Storage > File > File Systems**. Click the **+** icon to create a new file system.

A wizard opens for creating the file system. In the **Configure the Protocols** section, select the **Windows Shares (SMB)** radio button.

From the **NAS Server** dropdown list, the **NAS\_SMB** should be selected as it is the only NAS Server available configured for SMB.

Click **Next** to continue the wizard.

2. In the **Provide a Name and Description** section, input the following:

Name: **SMB\_fs**

Description: **File system for NAS\_SMB NAS Server**

Click **Next** to continue the wizard.

3. In the **Configure the File-level Retention** section, keep the **Off** radio button selected.

Click **Next** to continue the wizard.

4. In the **Configure the File System Storage Characteristics** section, input the following configuration:

Pool: **FAST VP-2**

Size: **5 GB**

Thin: **Checked** (default)

Tiering Policy: **Start High Then Auto-Tier**

Click **Next** to continue the wizard.

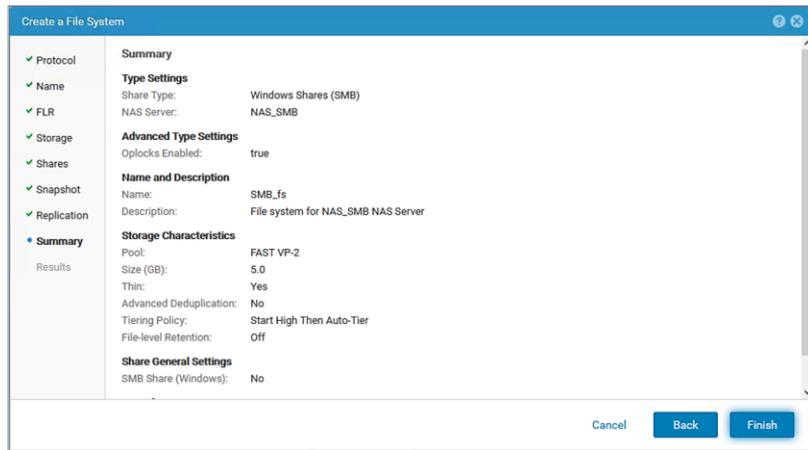
5. You will not configure a share for the file system at this time so in the

**Configure the Initial Share** section click **Next** to continue the wizard.

You will not configure Snapshots for the file system at this time so in the **Configure Snapshot Schedule** section click **Next** to continue the wizard.

You will not configure Replication for the file system at this time so in the **Provide a Replication Mode and RPO** section click **Next** to continue the wizard.

6. The **Summary** section displays the details of the file system creation as shown:



Click **Finish** to perform the creation operation.

The **Results** section will display the status of the file system creation.

**Close** the window when the operation completes successfully

The **SMB\_fs** file system is displayed in the list.

7. You will now configure a file system for NFS file storage.

From the **File Systems** page, click the + icon to create a new file system.

The wizard to create a file system opens. In the **Configure the Protocols** the **File System Supports** section, select the default of **Linux/Unix Shares (NFS)** radio button.

From the **NAS Server** dropdown list, the **NAS\_NFS** should be selected as it is

## Lab Exercise: Storage Provisioning

the only NAS Server available configured for NFS.

Click **Next** to continue the wizard.

8. In the **Provide a Name and Description** section, input the following:

- Name: **NFS\_fs**
- Description: **File system for NAS\_NFS NAS Server**

Click **Next** to continue the wizard.

9. In the **Configure the File-level Retention** section, keep the **Off** radio button selected.

Click **Next** to continue the wizard.

10. In the **Configure the File System Storage Characteristics** section, input the following configuration:

- Pool: **FAST VP-2**
- Size: **5 GB**
- Thin: **Checked** (default)
- Tiering Policy: **Start High Then Auto-Tier**

Click **Next** to continue the wizard.

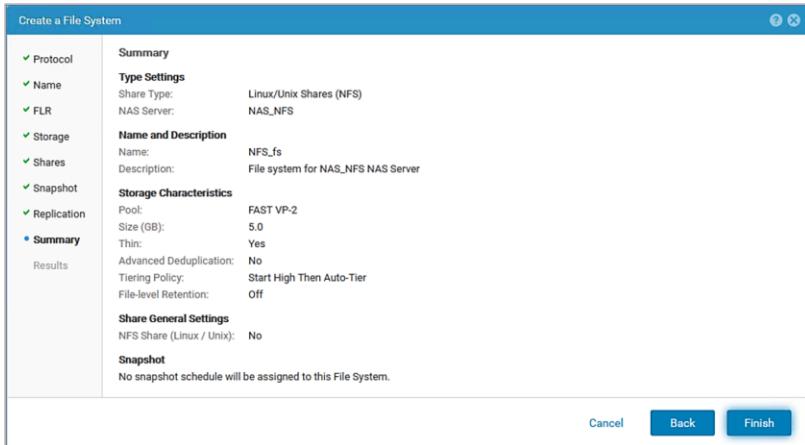
11. You will not configure a share for the file system at this time so in the **Configure the Initial Share** section click **Next** to continue the wizard.

You will not configure Snapshots for the file system at this time so in the **Configure Snapshot Schedule** section click **Next** to continue the wizard.

You will not configure Replication for the file system at this time so in the **Provide a Replication Mode and RPO** section click **Next** to continue the wizard.

12. The **Summary** section displays the details of the file system creation as shown.

## Lab Exercise: Storage Provisioning



Click **Finish** to perform the creation operation.

The **Results** section will display the status of the file system creation.

**Close** the window when the operation completes successfully.

The **NFS\_fs** file system is displayed in the list.

End of Lab Exercise

## Lab Exercise: Windows Host Access to Block Storage

### Scenario:

In this lab, you configure a Windows iSCSI host to access a LUN on the Dell EMC UnityVSA.

In this lab, you perform the following tasks:

- Configure an iSCSI interface on the Dell EMC UnityVSA data network port and discover the target array using the Microsoft iSCSI initiator software.
- Attach the host to the LUN.
- Format the drive
- Assign a drive letter to the LUN for host access.
- Write data to the LUN.

### Create an iSCSI Interface

Introduction to task.

1. In Unisphere, from the UnityVSA-Source system, go to **Storage > Block > iSCSI Interfaces**. Click the **+** icon to create an iSCSI interface. Input the following configuration:
  - Ethernet Port: **Ethernet Port 0**
  - Storage Processor: **SPA** (only SPA is available on the VSA)
  - IP Address: **192.168.3.100**
  - Subnet Mask/Prefix Length: **255.255.255.0**
  - Gateway: Leave blank
  - IQN Alias: Leave as is

Record the Port IQN value: \_\_\_\_\_

Click **OK** to create the interface.

## Lab Exercise: Windows Host Access to Block Storage

This completes part 1 of the lab exercise.

## Host Microsoft iSCSI Initiator - Target Discovery

In this lab, you use the Microsoft iSCSI Software Initiator to discover the Dell EMC UnityVSA target data network port, and establish a connection between the host and Dell EMC UnityVSA. The initiator software should already be installed on the system.

1. From the Student Desktop taskbar, click the **Remote Desktop Connection** (RDC) icon to launch the application.



Establish an RDC session to **WIN1** as the local administrator using the following settings:

Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**

Select **Use a different account**

From the **Enter your credentials** window, input the following:

Username: **\administrator**

Password: **emc2Local!**

Click **Ok**

Click **Yes** to any Certificate errors.

2. From the **WIN1** system taskbar, click the **iSCSI Initiator** icon to launch the application.



Select the **Discovery** tab. Click the **Discover Portal** button. In the **Discover Target Portal** window, in the **IP address or DNS name** field input: **192.168.3.100**

Click **OK** to close the **Discover Target Portal** window.

## Lab Exercise: Windows Host Access to Block Storage

Select the **Targets** tab. In the **Discovered targets** section, the UnityVSA-Source IQN is displayed with an **Inactive** status. Click the **Connect** button to connect the initiator to the target.

In the **Connect to Target** window, check the **Enable multi-path** checkbox. Click the **Advanced** button.

From the **Advanced Settings** window, in the **Local adaptor** dropdown list, select **Microsoft iSCSI Initiator**. In the **Initiator IP** dropdown list, select **192.168.3.106**. From the **Target portal IP** dropdown list, select **192.168.3.100 /3260**. Click **OK** to configure the settings.

Click **OK** in the **Connect To Target** window.

Click **OK** to close the **iSCSI Initiator Properties** window.

This completes part 2 of the lab exercise.

## Unisphere Initiator and Host Access

In this lab, you locate the initiator IQN and map it to a host for LUN access.

1. From your Student Desktop system, open the Unisphere session to UnityVSA-Source go to to **Access > Initiators**.
2. Verify the **WIN1** Initiator is displayed. You may need to refresh the Unisphere page.



**Note:** The initiator displays a green circle with a white check icon along with an orange dot, indicating that the initiator is not yet associated with a host.

In the next step, you will register this initiator to a host.

3. Navigate to **Access > Hosts**. Click the **+** icon and from the dropdown list select **Host**. The **Add a Host** wizard opens. Input the following configuration:

Name: **WIN1**

Description: **Windows WIN1 host**

Operating System: **Windows Server**

Network Address: **192.168.1.11**

Click **Next** to continue.

4. In the **Select Discovered Initiators or Manually Add Initiators** section, **check** the **WIN1** initiator IQN checkbox to register the initiator with the host.

Click **Next** to continue the wizard.

5. The **Summary > Review the host configuration** window displays the configuration of the host to be registered as shown.

## Lab Exercise: Windows Host Access to Block Storage

The screenshot shows the 'Add a Host' configuration window. On the left, there's a sidebar with sections: Name (checkmark), Initiators (checkmark), Summary (selected), and Results. The main area displays host details: Name: WIN1, Description: Windows WIN1 host, Operating System: Windows Server, Network Addresses: 192.168.1.11. Below this, it lists 'Initiators to be registered with this host' with one entry: iSCSI, Protocol, Initiator IQN / WWN: iqn.1991-05.com.microsoft.win1.hmarine.test.

Click the **Finish** button to add the host.

The **Results** screen displays the progress of the operation.

**Close** the window when the operation completes.

The WIN1 host is now listed and indicates it is a registered host by the white check in the green circle.

The screenshot shows the 'Hosts' list view. The table has columns: Name, Network..., Operati..., Type, Tenant, LUNs, Initiators, Initiator ... . There is one item listed: WIN1, 192.16..., Windo..., Manual, -, 0, 1, 1. A green checkmark is visible next to the WIN1 entry.

	Name	Network...	Operati...	Type	Tenant	LUNs	Initiators	Initiator ...
	WIN1	192.16...	Wind...	Manual	-	0	1	1

6. Navigate to **Storage > Block > LUNs** and double-click on **WIN1 LUN0** to open its properties page.

Select the **Host Access** tab.

Click the **+** icon to configure host access to the LUN.

The **Select Host Access** window opens.

**Check** the **WIN1** host checkbox.

Click **OK** to configure the host access to the LUN.

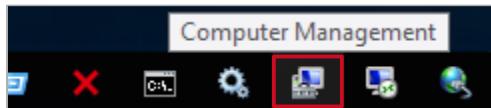
**Close** the properties page window.

This completes part 3 of the lab exercise.

## Present the LUN to a Windows Host

In this lab you use the Computer Management tools to discover, format, and present a LUN to a Windows host.

1. From the WIN1 RDC session, launch **Computer Management** from the desktop or taskbar.



2. Navigate to **Storage**.

Click **Disk Management**.

Locate the disk **5 GB**. This disk is associated with the LUN you created. Right-click the disk and bring it **Online**.

Once it displays **Not Initialized**, right-click and select **Initialize Disk**. Use the default setting, and click **OK**.

**Right-click** the unallocated space and select **New Simple Volume**. The **New Simple Volume Wizard** opens. Click **Next** to continue the wizard.

In the **Specify Volume Size** window, accept the default size, and click **Next** to continue the wizard.

In the **Assign Drive Letter or Path** window, accept the default settings and click **Next** to continue the wizard.

In the **Format Partition** window, accept the default settings for **File system** and **Allocation unit size**. In the **Volume label** field input **WIN1 LUN0** and check the **Perform a quick format** option.

Click **Next** to continue.

Click **Finish** to complete the operation.

3. **Right-click** the formatted drive and select **Open**.

**Right click** in the window and select **New > Text Document**.

Open the document, and write some data in it.

**Save** and **Exit** the file.

**Close** the window.

You have verified host access and successfully written data to the LUN.

Close the **Computer Management** window.

If you see the following window after closing Computer Management, select **Cancel** here:



**Logoff** the RDC session to WIN1.

End of Lab Exercise

## Lab Exercise: Linux Host Access to Block Storage

### Scenario:

This lab details the steps to configure an iSCSI interface on the Dell EMC UnityVSA data network port. After configuration, discovery of the target array is performed using the Linux native iSCSI initiator software (open-iscsi). Once the target is discovered, you will:

- Attach the host to the LUN.
- Format the drive
- Partition the drive
- Create a file system.
- Write data to the LUN.



**Important:** Completely read each step through as they contain more than a single command or action.

The Linux host uses the open-iscsi initiator software. The driver contains parameters which may need to be changed for Dell EMC Unity. The settings can be found in the **Unity Series Configuring Host to Access Fibre Channel (FC) or iSCSI Storage** guide available on [dell.com/support](http://dell.com/support).

The file is located here: `/etc/iscsi/iscsid.conf`.

### Linux Host iSCSI Initiator - Target Discovery

In this lab, you use the Linux native iSCSI Initiator to discover the Dell EMC UnityVSA target data network port, and establish a connection between the host and Dell EMC UnityVSA. The initiator software is already installed on the system as part of the Linux installation.

1. From your Student Desktop system desktop or taskbar, click the **PuTTY** icon to launch the application.



Establish an SSH session to the Linux1 system.

In the PuTTY screen **Host Name (or IP address)** field input: **Linux1** and click the **Open** button.

In the **PuTTY Security Alert** window, if presented, click the **Yes** button to connect to the system.

At the **Login as:** prompt input: **root**

At the **Password:** prompt input: **emc2Local!**

You are now logged in as **root** to the Linux1 host as indicated by the **#** cursor symbol.

2. In this step, you identify the initiator IQN for the Linux system.

Issue the command:

```
cat /etc/iscsi/initiatorname.iscsi
```

Record the initiator name: \_\_\_\_\_

3. Verify the host iSCSI initiator software configuration.

The Linux iSCSI initiator software configuration is defined in the **/etc/iscsi/iscsid.conf** file. Dell EMC recommends several settings be modified from their default values. The recommended configuration settings have been put in place on your Linux host.

View the configuration file, run the command:

```
cat /etc/iscsi/iscsid.conf | grep -i node | grep -v "#"
```

The command displays all node related settings. Verify that the following configuration lines are present in the file:

```
node.startup = automatic
node.session.timeout - 120
```

## Lab Exercise: Linux Host Access to Block Storage

```
node.conn[0].timeo.noop_out_interval = 10  
node.conn[0].timeo.noop_out_timeout = 15  
node.session.iscsi.InitialR2T - Yes  
node.session.iscsi.ImmediateData - No
```

4. Discover the iSCSI target.

Discover the Unity iSCSI target, run the command:

```
/sbin/iscsiadm -m discovery -t sendtargets -p  
192.168.3.100
```

The output displays the Unity target port IP address, port number, and IQN.

5. Start the iSCSI initiator software.

Manually start the iSCSI initiator software, run commands:

```
systemctl start iscsid  
systemctl start iscsi
```

Enable the iSCSI initiator software to start on system boot and shut down when the host is brought down, run the commands:

```
systemctl enable iscsid  
systemctl enable iscsi
```

6. Verify the iscsi initiator software status is active, run the command:

```
systemctl status iscsi
```

The output displays the iscsi service is loaded, active, and logged into the Unity target IQN.

7. Display the iSCSI session.

Verify the host iscsi initiator session to the Unity target, run the command:

```
iscsiadm -m session
```

## Lab Exercise: Linux Host Access to Block Storage

The output displays the Unity target portal IP address and port number and its IQN as seen below:

```
[root@linux1 ~]# iscsidadm -m session
top: [1] 192.168.3.100:3260,1 iqn.1992-04.com.emc:cx.virt2117nqqf8h.a0 (non-flash)
[root@linux1 ~]#
```

## Unisphere Initiator and Host Access

In this lab, you use Unisphere to verify that the Linux iSCSI initiator has been attached to the Dell EMC UnityVSA. You then add Linux host and present a LUN for host access.

1. Return to your Unisphere session to the UnityVSA-Source system. Refresh your login if the security session has expired. Navigate to **Access > Initiators**.

Verify the Linux iSCSI Initiator is displayed.



**Note:** The initiator displays a green circle with a white check icon along with a blue square indicating that the initiator is not yet associated with a host.

2. Navigate to **Access > Hosts**. Click the **+** icon and from the dropdown list select **Host**. The **Add a Host** wizard opens. Input the following configuration:

Name: **Linux1**

Description: **Linux1 host**

Operating System: **Linux**

Network Address: **192.168.1.111** (the IP address of eth0 on the Linux host)

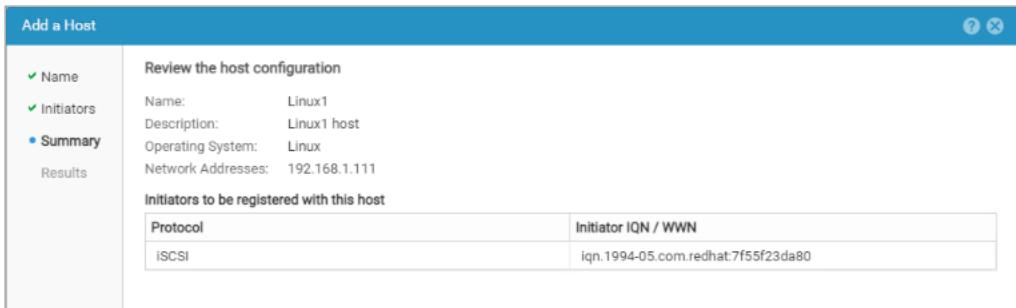
Click **Next** to continue the wizard.

3. In the **Select Discovered Initiators or Manually Add Initiators** section, **check** the Linux1 initiator IQN checkbox to register the host initiator.

Click **Next** to continue the wizard.

4. The **Summary** screen displays the configuration of the host to be registered as shown:

## Lab Exercise: Linux Host Access to Block Storage



Click the **Finish** button to continue.

The **Results** screen displays the progress of the operation.

**Close** the window when the operation completes.

The **Linux1** host is now listed as a registered host as indicated by the white check in the green circle:

Hosts										
	!	Name	↑	Netw...	Oper...	Type	Tenant	LUNs	Initia...	Initiat...
<input type="checkbox"/>	<span style="color: green;">✓</span>	Linux1		19...	Linux	Ma...	--	0	<span style="color: blue;">1</span>	<span style="color: blue;">1</span>
<input type="checkbox"/>	<span style="color: green;">✓</span>	WIN1		19...	Wi...	Ma...	--	<span style="color: blue;">1</span>	<span style="color: blue;">1</span>	<span style="color: blue;">1</span>

5. Navigate to **Storage > Block > LUNs** and double-click on **Linux1 LUN0** to open its properties page.

Select the **Host Access** tab.

Click the **+** icon to configure host access to the LUN.

The **Select Host Access** window opens.

**Check** the **Linux1** host checkbox.

Click **OK** to configure the host access to the LUN.

**Close** the properties page window.

This completes part 2 of the lab exercise.

## Lab Exercise: Linux Host Access to Block Storage

## Present the LUN to a Linux Host

In this lab you discover, format, and present a LUN to a Linux host.

- From your Student Desktop, open the existing SSH session to the Linux1 system.

Your Linux system is configured with PowerPath multipath software. At the command prompt, run the command:

```
powermt config
```

There is no output from the command.

View devices seen by PowerPath, run the command:

```
powermt display dev=all
```

The output of the command displays the Pseudo name PowerPath has assigned to the new LUN. Verify the Pseudo name in the output as shown:

```
[root@linux1 ~]# powermt display dev=all
Pseudo name=emcpowera
Unity ID=VIRT2117NQQF8H [Host 2]
Logical device ID=60060160D575882ADE54B6606DF62B64 [Linux1 LUN0]
state=alive; policy=REquest; queued-IOS=0; protocol=SCSI
Owner: default=SP A, current=Unknown    Array failover mode: 4
=====
----- Host ----- - Stor - -- I/O Path -- -- Stats --
###  HW Path          I/O Paths   Interf. Mode   State  Q-IOS Errors
=====
 3  192.168.3.108      sdb        SP A0   active  alive     0      0
```

The example above shows the pseudo name of emcpowera. The name may be different for you if the host had access to another LUN previously. For example, the pseudo name returned could be emcpowerb for the LUN. Record the pseudo name returned for you. You will use it in a following step.

- LUN discovery.

Verify the new LUN is discovered as a disk device, run the command:

```
fdisk -l
```

## Lab Exercise: Linux Host Access to Block Storage

The command displays the disk devices that the system can see. Locate the disk device having the PowerPath pseudo name recorded in the earlier step. The example below shows the disk device having the pseudo name emcpowera.

**Note:** To see the new LUN on the Linux host, the host SCSI bus must be rescanned. In some conditions, a reboot of the host may be needed.

```
Disk /dev/emcpowera: 5368 MB, 5368709120 bytes, 10485760 sectors  
Units = sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 8192 bytes / 4194304 bytes
```

3. Partition the new disk device.

Create a new primary partition on the pseudo named device, run the command:

```
fdisk -c -u /dev/emcpowera
```

The command launches a wizard to partition the disk. You create a primary partition on the disk using the default values for the disk device. Enter the **bolded** responses at each of the wizard prompts shown:

```
Welcome to fdisk (util-linux 2.23.2) .
```

```
Changes will remain in memory only, until you decide to write them.
```

```
Be careful before using the write command.
```

```
Device does not contain a recognized partition table  
Building a new DOS disklabel with disk identifier  
0x77a62c0d.
```

```
Command (m for help): n  
Partition type:  
    p primary (0 primary, 0 extended, 4 free)  
    e extended  
Select (default p) : Press Enter to use default value
```

## Lab Exercise: Linux Host Access to Block Storage

```
Using default response p
Partition number (1-4, default 1) : Press Enter to use default value
First sector (8192-10485759, default 8192) : Press Enter to use default value
Using default value 8192
Last sector, +sectors or +size{K,M,G} (8192-10485759,
default 10485759) : Press Enter to use default value
Using default value 10485759
Partition 1 of type Linux and of size 5 GiB is set

Command (m for help) : w
The partition table has been altered!

Calling ioctl () to re-read partition table.
Syncing disks
```

Here is example output from the command:

```
[root@linux1 ~]# fdisk -c -u /dev/emcpowera
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0x77a62c0d.

Command (m for help): n ← Type n for new partition
Partition type:
  p  primary (0 primary, 0 extended, 4 free)
  e  extended
Select (default p): ← Press Enter to accept the default partition type
Using default response p
Partition number (1-4, default 1): ← Press Enter to accept the default partition number
First sector (8192-10485759, default 8192): ← Press Enter to accept the default first sector value
Using default value 8192
Last sector, +sectors or +size{K,M,G} (8192-10485759, default 10485759): ← Press Enter to accept the default last sector value
Using default value 10485759
Partition 1 of type Linux and of size 5 GiB is set

Command (m for help): w ← Type w to write the new partition to disk
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

#### 4. View and format the new partition.

To view the new partition device name, run the command:

```
fdisk -l
```

## Lab Exercise: Linux Host Access to Block Storage

Verify the new device name. In the example below, the new partition is **/dev/emcpowera1**:

```
Disk /dev/emcpowera: 5368 MB, 5368709120 bytes, 10485760 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 8192 bytes / 4194304 bytes
Disk label type: dos
Disk identifier: 0x77a62c0d

   Device Boot      Start         End      Blocks   Id  System
/dev/emcpowera1          8192     10485759     5238784   83  Linux
```

Format and create a file system on the new device, run the command:

```
mkfs.ext4 /dev/emcpowera1
```

An example of the command and output is shown below.

```
[root@linux1 ~]# mkfs.ext4 /dev/emcpowera1
mke2fs 1.42.9 (28-Dec-2013)
Discarding device blocks: done
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=2 blocks, Stripe width=1024 blocks
327680 inodes, 1309696 blocks
65484 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=1342177280
40 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
      32768, 98304, 163840, 229376, 294912, 819200, 884736

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

### 5. Mount the new device on the host.

Create a mountpoint on the host, run the command:

```
mkdir /emcpowera_mp
```

Mount the disk device to the mountpoint, run the command:

```
mount /dev/emcpowera1 /emcpowera_mp
```

To verify the operation, run the command:

## Lab Exercise: Linux Host Access to Block Storage

**df -h**

An example of the steps is shown below.

```
[root@linux1 ~]# mkdir /emcpowera_mp  
[root@linux1 ~]# mount /dev/emcpoweral /emcpowera_mp  
[root@linux1 ~]# df -h  
Filesystem      Size  Used Avail Use% Mounted on  
devtmpfs        1.9G   0    1.9G  0% /dev  
tmpfs          1.9G   0    1.9G  0% /dev/shm  
tmpfs          1.9G  41M  1.9G  3% /run  
tmpfs          1.9G   0    1.9G  0% /sys/fs/cgroup  
/dev/mapper/centos-root  22G  2.2G  20G  11% /  
/dev/sdal       1014M 192M  823M  19% /boot  
tmpfs          379M   0   379M  0% /run/user/0  
/dev/emcpoweral  4.8G  20M  4.6G  1% /emcpowera_mp
```



**Note:** The disk device mount does not persist if the host is rebooted. As an option, to have the disk device mount persist on boot, edit the **/etc/fstab** file to include the line as shown below:

```
[root@linux1 ~]# cat /etc/fstab  
  
#  
# /etc/fstab  
# Created by anaconda on Fri Apr 23 08:35:20 2021  
#  
# Accessible filesystems, by reference, are maintained under '/dev/disk'  
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info  
#  
/dev/mapper/centos-root /          xfs      defaults        0 0  
UUID=2e975788-0d66-4697-8ba5-93a7dabe9dfd /boot           xfs      defaults        0 0  
/dev/mapper/centos-swap swap     swap      defaults        0 0  
/dev/emcpoweral /emcpowera_mp ext4    defaults,_netdev  0 2  
[root@linux1 ~]#
```

### 6. Write data to the LUN.

Create a file containing some text, run the command:

```
echo "This is a line of text written to the newfile  
created on the LUN" > /emcpowera_mp/newfile
```

Verify that the data was written to the LUN, run the command:

```
cat /emcpowera_mp/newfile
```

Close the ssh session, run the command:

## Lab Exercise: Linux Host Access to Block Storage

```
exit
```

This concludes the lab. You have configured a data network port on the Dell EMC UnityVSA, discovered the Target using the Linux native iSCSI Initiator, attached the Linux host to the Dell EMC UnityVSA LUN, formatted the device, and wrote data to it!

End of Lab Exercise

## Lab Exercise: SMB File Storage Access

### Scenario:

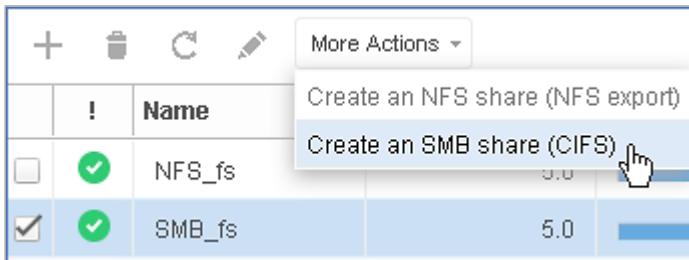
In this lab, you create SMB shares to a Unity file system and access its file storage from a Windows SMB client.

In this lab, you perform the following tasks:

- Configure SMB shares on a Unity file system. Create a hidden share to the top-level of the file system for administrator access.
- Create a lower-level subfolder share, configure permissions to a specified user community, and test file storage access.
- Create a lower-level subfolder share to a Unity file system using the Windows Computer Management utility and test file storage access.

## Create a Hidden Top-Level SMB Share of a File System

1. From your Student Desktop system, establish a Unisphere session to the UnityVSA-Source Unity system IP address **192.168.1.113** and login.
2. In Unisphere, go to **Storage > File**. Select the **SMB\_fs** file system, place a check in its checkbox, and clear any other file system. From the **More Actions** dropdown list, select **Create an SMB share (CIFS)**.



3. A wizard to create a share opens to the **Select a source for the new share** section. In the **File System** field, the **SMB\_fs** will be listed. The radio button option is selected for the **File System "SMB\_fs"**. The option to create the share on a Snapshot of the file system is grayed-out since there are no snapshots of the file system.



Click **Next** to continue with the wizard.

4. In the **Provide SMB share name and path** section input the following configuration:

Share Name: **Top\$**

Description: **Top-level hidden share for administrator access**

Local Path: **/**

Click **Next** to continue with the wizard.

Example configuration shown below:

Provide SMB share name and path:	
Share Name: *	Top\$
Description:	Top-level hidden share for administrator access.
NAS Server:	NAS_SMB
SMB Server:	nas_smb
File System:	SMB_fs
Local Path:	/SMB_fs /
Export Paths:	\nas_smb.hmarine.test\Top\$ \192.168.1.115\Top\$

5. The **Provide SMB share details** section of the wizard lets you configure various advanced SMB properties and offline availability options. In this lab, you keep the default values.

Click **Next** to continue with the wizard.

6. The **Summary** section of the wizard displays the configuration summary for the share as shown:

## Lab Exercise: SMB File Storage Access

Create an SMB Share

✓ File System	<b>Summary</b>
✓ General	<b>Source Configuration</b>
✓ Advanced	File system name: SMB_fs
<b>Summary</b>	<b>Share details</b>
Results	Share Name: Top\$ Description: Top-level hidden share for administrator access. Local Path: /
	<b>Other Settings</b>
	Continuous Availability: No Protocol Encryption: No Access-Based Enumeration: No Branch Cache Enabled: No Offline Availability: None UMASK: 022

Click **Finish** to initiate the share creation.

The **Results** page displays the status of the share.

**Close** the page.

Click the **SMB Shares** tab. Verify the **Top\$** share is listed.

	File Systems	SMB Shares	NFS Shares	NAS Servers	Tenants
	1 item				
	+				
		Share Name ↑	Type	NAS Server	File System
		<input type="checkbox"/>	Top\$	Filesystem	NAS_SMB
					SMB_fs
					/SMB_fs/

7. Establish an RDC session to the WIN1 system as the Domain administrator.

From the taskbar, launch the Remote Desktop Connection



In the Computer(s): **WIN1**.

Click the **Connect** button.

From the **Windows Security** window, select **More choices**.

Select **Use a different account**.

In the **Enter your credentials** window, input the following:

Username: **hmarine\administrator**

Password: **emc2Admin!**

Click **Ok**.

8. From the **WIN1** Desktop or taskbar, click the **Run** icon.

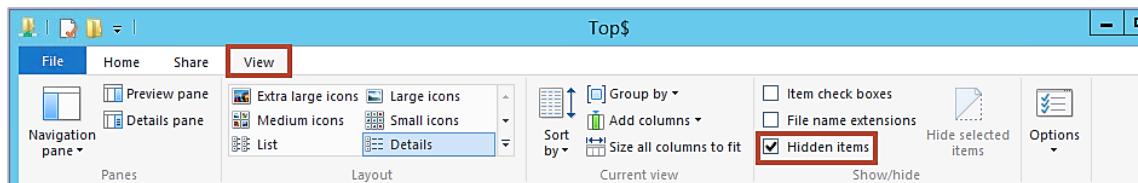


9. Now open the file system share by accessing its share name from the NAS server that is associated with the file system.

In the **Open** field input: **\NAS\_SMB\Top\$** (this is not case-sensitive).

Click the **OK** button.

10. The share to the file system opens. In the Explorer window, select the **View** tab. Ensure that the **Hidden items** is **checked** as shown below:



You will see the **.etc** and **lost+found** folders that are present at the top-level of all Unity file systems. These folders are used internally by the file system and should not be disturbed or modified. As an administrator, you can control the on-disk permissions to this top-level shared area of the file system.

Right-click within the share window, and select **Properties**.

The **Top\$ (\NAS\_SMB)** properties windows opens. Select the **Security** tab.

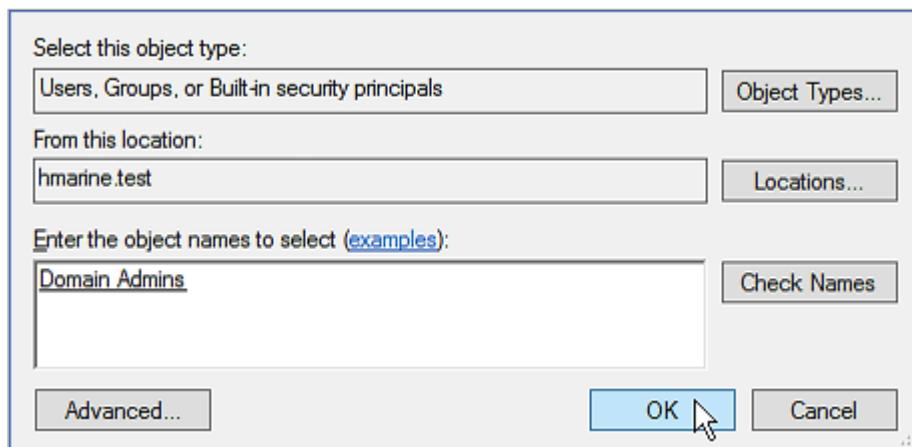
## Lab Exercise: SMB File Storage Access

Click the **Edit** button to modify the on-disk permissions.

11. A permissions window to the share opens. The **Everyone** group is listed and has **Full control** permissions by default. As the domain administrator you can add discrete administrative permissions.

Click the **Add** button.

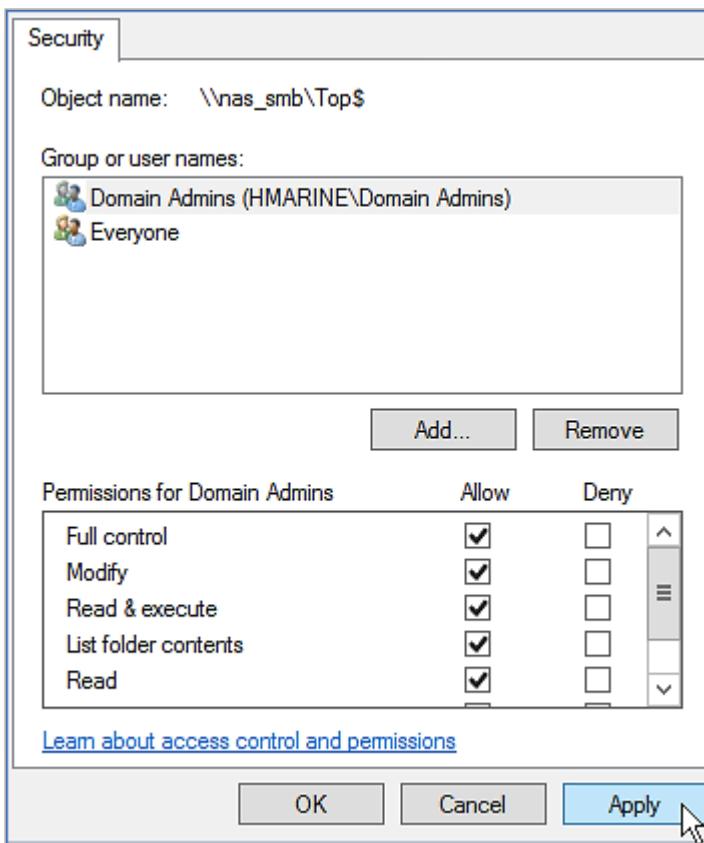
12. A window for adding users and groups opens. In the **Enter the object names to select** field type: **Domain Admins** and click the **Check Names** button. The group appears underlined when it is located within the domain.



Click **OK** to add the group to the permissions.

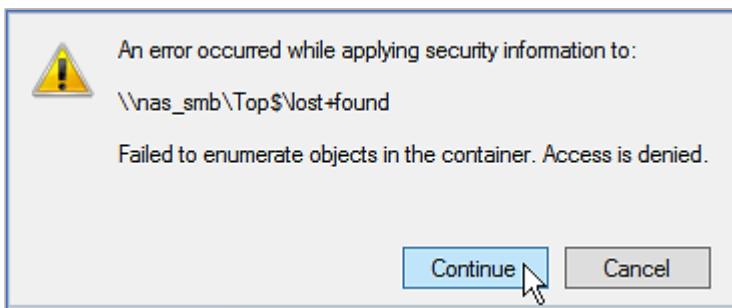
13. The **Domain Admins** group is now listed on the permissions. Select the **Domain Admins** group. In the **Allow** column of checkboxes, check the **Full control** box. Full Control automatically enters more permissions checkboxes. Click the **Apply** button to add the new permission setting for the **Domain Admins** group.

## Lab Exercise: SMB File Storage Access

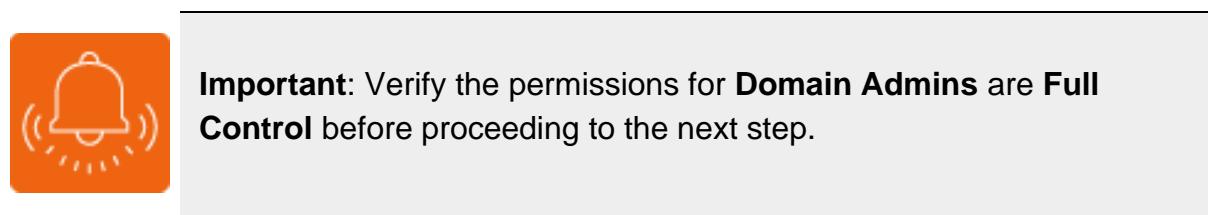
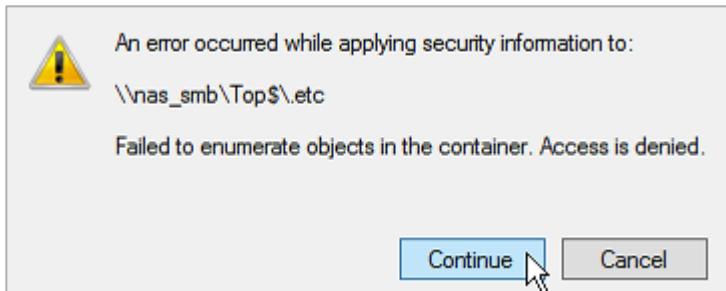


A security window is presented relating to setting permissions remotely and its effect on inherited permissions. Click **Yes** to continue.

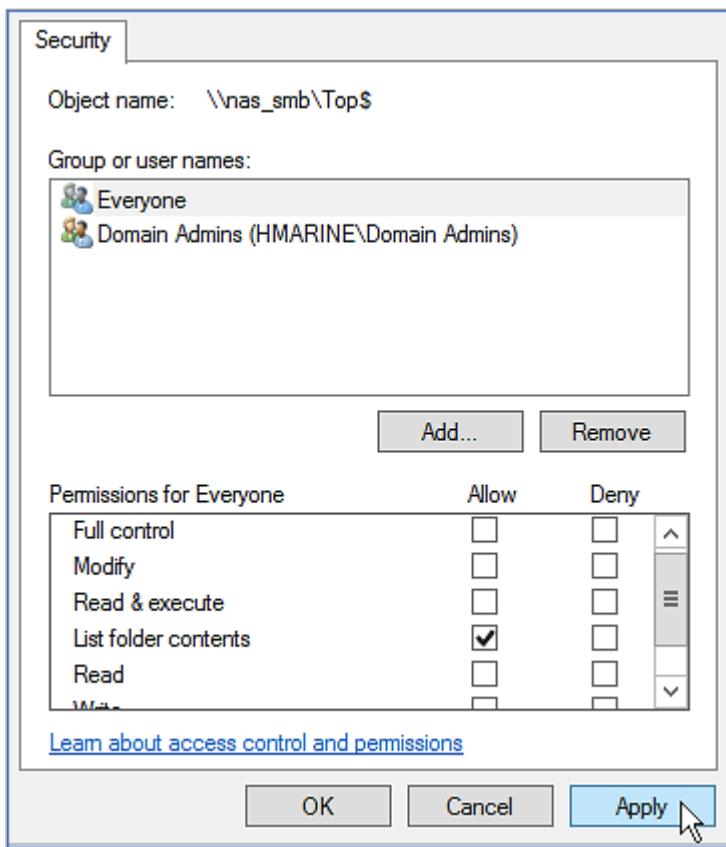
Two additional windows appear relating to errors adjusting permissions on the lost+found and .etc folders. Click the **Continue** button in each window to complete the permissions operation.



## Lab Exercise: SMB File Storage Access



14. To limit access to the top level of the file system, modify the permissions for the **Everyone** group. In the permissions window, select the **Everyone** group. In the **Allow** column of checkboxes, **clear** all permissions except for **List folder contents**. Leave that permission checked.



## Lab Exercise: SMB File Storage Access

Click the **Apply** button.

The two more windows relating to errors adjusting permissions on the lost+found and .etc folders appear again. Click the **Continue** button in each window to complete the permissions operation.

Click **OK** to close the permissions window.

Click **OK** to close the properties window.

Leave the share open. You will be accessing it in the next part of this lab exercise.

This completes part 1 of the lab exercise.

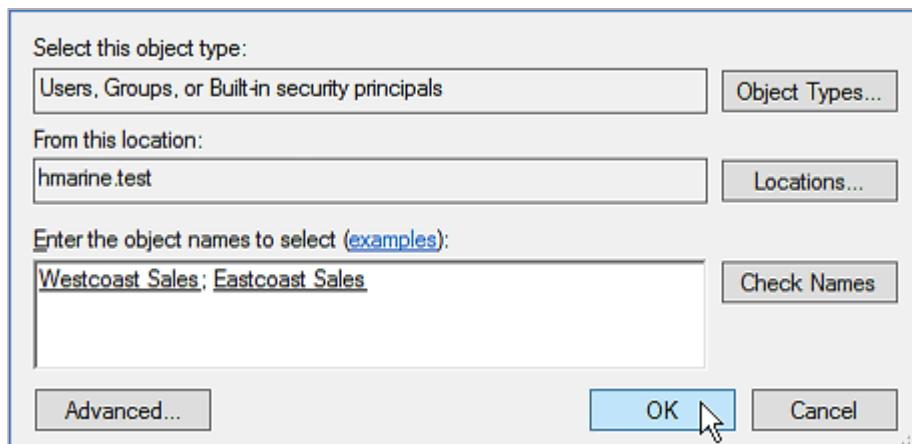
## Create a Lower-Level SMB Share of a File System

1. As an administrator, you are going to create a lower-level share on the file system. This keeps the .etc and lost+found folders at the top-level of the file system from being exposed to the user community. From the open **Top\$** share, right-click within the share and select **New > Folder**. Name the folder **Sales\_Data**.
2. Adjust permissions on the folder for specific domain user and group access. Right-click the **Sales\_Data** folder, and select **Properties**. Select the **Security** tab.

You will see the permissions that were set on the **Top\$** share are inherited by the folder. Click the **Edit** button to add permissions to the folder.

A permissions window for the folder opens. Click the **Add** button.

3. A window to add users and groups to the folder opens. In the **Enter the object names to select** field, type: **Westcoast Sales; Eastcoast Sales** and click the **Check Names** button. The groups appear underlined when they are located within the domain.



Click the **OK** button to add the groups.

4. The groups are now listed in the permissions window for the folder.

Select the **Eastcoast Sales** group. In the **Allow** column of checkboxes, check the **Full control** permission, and click the **Apply** button to assign the permission for the group.

Repeat the same permissions assignment for the **Westcoast Sales** group.

Click **OK** to close the folder permissions and properties windows.

Close the **Top\$** share window.

Disconnect the RDC session to the **WIN1** system by clicking the **Logoff Session** icon on the WIN1 taskbar.



5. From the Student Desktop system, return to your Unisphere session. Login again if your session has timed out. Navigate to **Storage > File > SMB Shares**. Click the + icon to create an SMB share.
6. The wizard to create an SMB Share opens. Click the grid in the **File System** field. A **Select a File System for share creation** window opens. Select the **SMB\_fs** for the file system and click **Select**.

Click **Next** to continue the wizard.

7. Name the share **Hmarine\_Sales**.

Type **Sales\_Data** into the **Local Path** field as shown:

## Lab Exercise: SMB File Storage Access

Create an SMB Share

✓ File System	Provide SMB share name and path:	
● General	Share Name: *	Hmarine_Sales
Advanced	Description:	
Summary		
Results	NAS Server:	NAS_SMB
	SMB Server:	nas_smb
	File System:	SMB_fs
	Local Path:	/SMB_fs /Sales_Data
	Export Paths:	\nas_smb.hmarine.test\Hmarine_Sales \192.168.1.115\Hmarine_Sales



**Important:** This is case sensitive!

Click **Next** to continue the wizard.

8. Keep the default options for the **Advanced** wizard section and click **Next** to continue.
9. Review the **Summary** section for the share creation as shown:

## Lab Exercise: SMB File Storage Access

Create an SMB Share

✓ File System	<b>Summary</b>
✓ General	<b>Source Configuration</b>
✓ Advanced	File system name: SMB_fs
<b>Summary</b>	<b>Share details</b>
	Share Name: Hmarine_Sales
Results	Description:
	Local Path: /Sales_Data
	<b>Other Settings</b>
	Continuous Availability: No
	Protocol Encryption: No
	Access-Based Enumeration: No
	Branch Cache Enabled: No
	Offline Availability: None
	UMASK: 022

Click **Finish** to initiate the share creation operation.

- When the operation completes, close the **Results** section.

The two SMB shares are listed as shown.

<input type="checkbox"/>	Share Name	Type	NAS Server	File System	Local Path
<input type="checkbox"/>	Hmarine_Sales	Filesystem	NAS_SMB	SMB_fs	/SMB_fs/Sales_Data
<input type="checkbox"/>	Top\$	Filesystem	NAS_SMB	SMB_fs	/SMB_fs/

- From the Student Desktop system taskbar, launch the **RDC** application.

You will log in to the **WIN1** system as a user who is a member of the Westcoast Sales group.

In the Computer(s): **WIN1**

Click the **Connect** button.

In the **Windows Security** window, select **More choices**

## Lab Exercise: SMB File Storage Access

Select **Use a different account**

In the **Enter your credentials** window, input the following:

Username: **hmarine\swall**

Password: **emc2Admin!**

Click **OK**

12. From the **WIN1** Desktop, double-click the **Run** icon.

In the **Open** field, input **\NAS\_SMB\Hmarine\_Sales** and click **OK**. The share opens.

Right click in the share window and select **New > Text Document**. Name the file **Swall**. Open the file, and write a line of text indicating the current time as seen on the WIN1 system clock.

Save and close the file.

Did the operation to create, write to and save this file complete?

---

13. Close the share window.

Log off from the **WIN1** RDC session, double-click the **Logoff** session icon on the **WIN1** Desktop.

14. From the Student Desktop system, launch the **RDC** application again.
15. You will log in to the **WIN1** system as a user who is a member of the Propulsion Engineers group.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the Windows Security window, select **More choices**.

Select **Use a different account.**

From the **Enter your credentials** window, input the following:

Username: **hmarine\lepratt**

Password: **emc2Admin!**

Click **OK**.

16. From the **WIN1** Desktop, double-click the **Run** icon.

In the **Open** field, input **\NAS\_SMB\Hmarine\_Sales** and click **OK**. The share opens.

Double-click the **Swall** file to open it.

Does the file open? \_\_\_\_\_

Close the Notepad window.

Right-click in the share, and select **New > Text Document**.

Can you create a new file? \_\_\_\_\_

The user who is a member of the Propulsion Engineers group does not have permissions on the shared directory to perform the operations.

**Cancel** the message.

Close the share window.

Log off from the **WIN1** RDC session.

This completes part 2 of the lab exercise.

## Create an SMB Share Using Computer Management

1. Establish an RDC session to the **WIN1** system as the Desktop or domain administrator.

From the Student Desktop system, launch the **RDC** application.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**.

Select **Use a different account**.

From the **Enter your credentials** window, input the following:

Username: **hmarine\administrator**

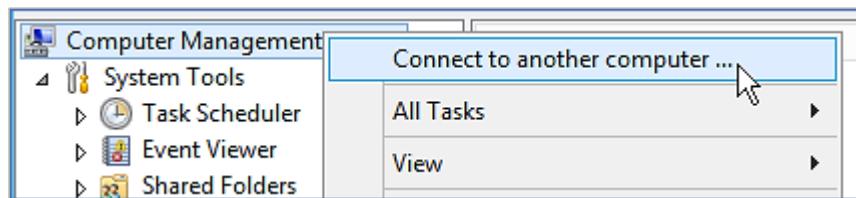
Password: **emc2Admin!**

Click **OK**.

2. From the **WIN1** system taskbar, click the **Computer Management** icon to launch the application.



3. From the left-side tree, right-click the **Computer Management (Local)** text and select the **Connect to another computer** option.



4. With the radio button option selected for **Another computer**, in the field input: **NAS\_SMB** and click **OK**.

5. Expand the **System Tools** tree object. Be patient, this can take a moment to complete.

Expand the **Shared folders** tree object.

6. Right-click the **Shares** object, and select the **New Share** option. This opens a wizard to create a new shared folder. Click **Next** to continue the wizard.
7. The wizard configures a path for the shared folder. Click the **Browse** button.

In the **Browse for Folder** window, the structure for the NAS server is displayed. Single click the **SMB\_fs** file system and it populates the **Folder** field.

Click the **Make New Folder** button. Name the folder **Engineering\_Data** and click the **OK** button.

The Folder Path field should now be populated with  
**C:\SMB\_fs\Engineering\_Data**.

Click **Next** to continue.

8. The next wizard window names the share. Accept the default values here.
  9. Click **Next** to continue.
9. The next wizard window sets permissions on the folder. Select the radio button option for **Customize permissions** and click the **Custom** button.

The window displays tabs for **Share Permissions** and **Security**. The Share Permissions relates to permissions for seeing the shared item over the network. The Security tab relates to on-disk permissions for the folder. You are modifying both sets of permissions. Select the **Share Permissions** tab. For the **Everyone** group, in the **Allow** column of checkboxes, **check** the **Full Control** permission. This setting enables the share to be seen by all users.

Next you customize the on-disk permissions for a specific group. Select the **Security** tab.

Click the **Edit** button.

## Lab Exercise: SMB File Storage Access

10. This opens a window for setting permissions on the Engineering\_Data folder.

Click the **Add** button.

A window to add users and groups to the folder opens. In the Enter the object names to select field input: **Propulsion Engineers** and click the **Check Names** button. The group appears underlined when it is located within the domain.

Click **OK** to continue.

With the **Propulsion Engineers** group selected, in the **Allow** column of permissions checkboxes **check** the **Full control** permission.

Click **OK** to complete the permissions assignment to the folder.

Click **OK** to close the Customize Permissions window.

Click **Finish** in the wizard screen.

A status of the sharing operation is displayed. Click **Finish** to close the window.

11. Close the **Computer Management** application.

Log off from the WIN1 RDC session.

12. From your Student Desktop access, the open session to Unisphere. If the session has timed out, log in again. Navigate to **Storage > File > SMB Shares** and refresh the page.

Is the new Engineering\_Data share listed? \_\_\_\_\_

13. Test access to the share.

From the Student Desktop system, open an RDC session to WIN1 as the epratt domain user.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**.

Select **Use a different account**.

From the **Enter your credentials** window, input the following:

Username: **hmarine\epratt**

Password: **emc2Admin!**

Click **OK**.

14. Double-click the **Run** icon on the WIN1 desktop and in the **Open** field input: **\NAS\_SMB\Engineering\_Data** and click **OK**. A window to the share opens.
15. Right-click in the share window, and select **New > Text Document**. Name the file **epratt**. Open the file and add text to the file indicating the user who wrote the file and the current time that is displayed on the WIN1 system. Save and close the file.
16. Right-click on the file, and select **Properties**. Select the **Security** tab, and click the **Advanced** button. Who is the file **Owner?** \_\_\_\_\_

Close the **Security** and **Properties** windows.

Close the share window and logoff the RDC session to WIN1.

You have completed the SMB File Storage Access lab.

End of Lab Exercise

## Lab Exercise: NFS File Storage Access

### Scenario:

In this lab, you create NFS shares to a Unity file system and access its file storage from a Linux NFS client.

In this lab, you perform the following tasks:

- Configure NFS shares on a Unity file system.
- Create a top-level share of the file system for administrator access.
- Create a lower-level subfolder share, configure permissions to a specified user community, and test file storage access.

## Create a Top-Level Administrative NFS Share of a File System

1. Establish a Unisphere session to UnityVSA-Source at **IP 192.168.1.113**.
2. Navigate to **Storage > File > NFS Shares**. Select the **+** icon to create an NFS share.
3. The wizard to create a new NFS share opens to the **Select a source for the new share** section. Click the grid in the **File System** field and a window opens to select a Unity file system for creating the share. Double-click the **NFS\_fs** to select it for the share. The radio button option is selected for the File System **NFS\_fs**. The option to create the share on a Snapshot of the file system is grayed-out since there are no snapshots of the file system.

Click the **Next** button to continue the wizard.

4. In the **Provide NFS share name and path** section input the following configuration:

Share Name: **root**

Description: **Top-level share for administrator access**

Local Path: **/**

Leave all other share options and values at their default settings.

Example configuration shown below:

The screenshot shows the configuration dialog for creating an NFS share. The 'Provide NFS share name and path' section contains the following fields:

- Share Name: \* **root**
- Description: **Top-level share for administrator access**
- NAS Server: **NAS\_NFS**
- File System: **NFS\_fs**
- Local Path: **/NFS\_fs /**
- Export Paths: **192.168.1.116:/root**
- Allow SUID
- Anonymous UID: **4294967294**
- Anonymous GID: **4294967294**

Click **Next** to continue with the wizard.

5. The wizard now presents the access configuration of the share. You configure specific access for a single client having root privileges on the file system.

## Lab Exercise: NFS File Storage Access

In the **Default Access** field, keep the default: **No Access** setting.

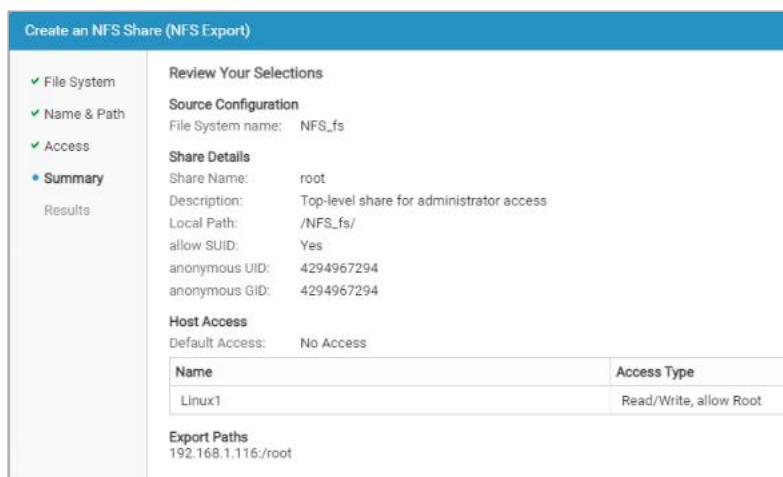
Click the **+** icon to create customized access for a specific client.

In the **Access Type** field, select the **ReadWrite, allow Root** setting.

In the section listing hosts, select the **Linux1** host by **checking** its checkbox and click **OK**.

Click **Next** to continue with the wizard.

6. The wizard presents a summary of the share configuration to create as shown here:



Click **Finish** to initiate the share creation operation.

7. The wizard presents a **Results** window for the creation operation. Verify that the operation completed successfully and click **Close** to exit the wizard.
8. From the Student Desktop system taskbar, click the **PuTTY** icon to launch the application.



9. Establish an SSH session to the Linux1 system.

In the PuTTY screen **Host Name (or IP address)** field input: **Linux1** and click

the **Open** button.

In the PuTTY security message, if presented, click the **Yes** button to connect to the system.

At the login as: prompt input: **root**

At the password: prompt input: **emc2Local!**

You are now logged in as root to the Linux1 client as indicated by the **#** cursor symbol.

10. Create an empty directory at the root of the client to use as a mount point for mounting to the NFS share.

Run the command:

```
mkdir /nfs
```

11. Mount the newly created NFS share to the mountpoint.

Run the command:

```
mount 192.168.1.116:/root /nfs
```

Verify that the client is mounted to the remote file system, run the command:

```
df -h
```

Its output should show the file system `192.168.1.116:/root` mounted on `/nfs`.

12. View the remote file system.

Go to the mountpoint directory, run the command:

```
cd /nfs
```

View the content of the file system, run the command:

## Lab Exercise: NFS File Storage Access

```
ls -la
```

You will see the `.etc` and `lost+found` folders that are present at the root of the Unity file system. These folders are used internally by the file system and should not be modified.

13. As the administrator, you have root user access to the file system through this share.

You can now create subfolders on the file system to use for more shares for the user community. Create a subfolder on the file system, run the command:

```
mkdir engineering_data
```

View the folder metadata, run the command:

```
ls -la
```

Review the output, and record the following information for the folder:

Permissions (mode bits): \_\_\_\_\_

The owner: \_\_\_\_\_

The group: \_\_\_\_\_

This completes part 1 of the lab exercise.

## Create a Lower-Level NFS Share of a File System

1. Now use the newly created engineering\_data folder to create a lower-level NFS share of the file system for a specific NFS user group. To do this, change the folder mode bits, owner, and group.

Change the folder permissions bits, run the command:

```
chmod 775 engineering_data
```

Change the folder owner, run the command:

```
chown epallis engineering_data
```

Change the folder group, run the command:

```
chgrp engprop engineering_data
```

2. Verify the engineering\_data metadata settings.

Run the command:

```
ls -l
```

The permissions bits should be: drwxrwxr-x

The owner should be: epallis

The group should be: engprop

3. Unmount the NFS share.

Stop accessing the share by changing directory out of the mount point, run the command:

```
cd /
```

Unmount the client, run the command:

```
umount /nfs
```

## Lab Exercise: NFS File Storage Access

Verify that the client is unmounted, run the command:

```
df -h
```

The output should **not** reference the 192.168.1.116:/root file system.

Disconnect the SSH session, run the command:

```
exit
```

The SSH session closes.

4. Return to your Unisphere session. Refresh your login if the security session has expired. Navigate to **Storage > File > NFS Shares**.

Click the **+** icon to create an NFS share.

5. The wizard to create a new NFS share is displayed. Click the grid in the **File System** field to select a file system. From the list, highlight the **NFS\_fs** and click the **Select** button.

The **File System** field should contain: **NFS\_fs**

Click **Next** to continue with the wizard.

6. The share name and its path will now be configured.

In the **Share Name** field input: **engineering**

Modify the **Local Path** field so it contains **/engineering\_data**.

Leave all other share options and values at their default settings.

Click **Next** to continue the wizard.

7. The wizard now presents the access configuration of the share. Configure Read/Write access for a subnet.

From the **Configure Access** window, in the **Default Access** field keep the

## Lab Exercise: NFS File Storage Access

default **No Access** setting.

Click the **+** icon to create access for a subnet.

In the **Access Type** field, select **Read/Write** from the dropdown list.

In the section listing hosts, click **More Actions** and from the dropdown list, select **Add Subnet**.

The **Add Subnet** window opens.

In the **Name** field, input: **Engineering network**

In the **IP Address** field, input: **192.168.1.0**

In the **Subnet Mask/Prefix Length** field, input: **255.255.255.0**

Click the **Add** button to add the new subnet.

The newly added **Engineering network** is now listed in the hosts section. Select it by **checking** its checkbox, and click the **OK** button.

Click the **Next** button to continue the wizard.

8. The wizard presents a summary screen for the NFS share configuration it will create as shown here:

Create an NFS Share (NFS Export)

<input checked="" type="checkbox"/> File System	Review Your Selections				
<input checked="" type="checkbox"/> Name & Path	Source Configuration				
<input checked="" type="checkbox"/> Access	File System name: NFS_fs				
<input checked="" type="checkbox"/> Summary	<b>Share Details</b>				
	Share Name: engineering				
	Description:				
	Local Path: /NFS_fs/engineering_data				
	allow SUID: Yes				
	anonymous UID: 4294967294				
	anonymous GID: 4294967294				
	<b>Host Access</b>				
	Default Access: No Access				
	<table border="1"><thead><tr><th>Name</th><th>Access Type</th></tr></thead><tbody><tr><td>Engineering network</td><td>Read/Write</td></tr></tbody></table>	Name	Access Type	Engineering network	Read/Write
Name	Access Type				
Engineering network	Read/Write				
	<b>Export Paths</b>				
	192.168.1.116:/engineering				

## Lab Exercise: NFS File Storage Access

Click the **Finish** button to initiate the share creation operation.

9. The wizard presents a results window for the creation operation. Verify that the operation completed successfully and click **Close** to exit the wizard.
10. From the Student Desktop system taskbar, click the **PuTTY** icon to launch the application.
11. Establish an SSH session to the Linux1 system.

In the PuTTY screen **Host Name (or IP address)** field input: **Linux1** and click the **Open** button.

At the login as: prompt input: **root**

At the password: prompt input: **emc2Local!**

You are now logged in as root to the Linux1 client as indicated by the **#** cursor symbol.

12. Access the engineering NFS share.

Mount the share to the client mount point, run the command:

```
mount 192.168.1.116:/engineering /nfs
```

Verify that the client is mounted to the remote file system, run the command:

```
df -h
```

Its output should show the file system **192.168.1.116:/engineering** mounted on **/nfs**.

13. Now test NFS share access using the epallis user who is a member of the engprop NFS users group.

Switch user to epallis, run the command:

```
su epallis
```

## Lab Exercise: NFS File Storage Access

Access the NFS share, run the command:

```
cd /nfs
```

Create a file, and insert some text, run the command:

```
echo "this is text written to the file as epallis" >  
epallis
```

Verify that the text is present in the file, run the command:

```
more epallis
```

Look at the file permissions bits, owner, and group, run the command:

```
ls -l
```

14. Now test access to the share as another user who is not a member of the engprop NFS user group.

Switch user to swoo, run the command:

```
su swoo
```

At the password prompt input: **emc2Admin!**

View the content of the **epallis** file, run the command:

```
more epallis
```

Create a file with some text added to it, run the command:

```
echo "this is some text written to the file as swoo" >  
swoo
```

What was the result of the command?

---

Why could the user read from the share but not write to it?

## Lab Exercise: NFS File Storage Access

---

---

15. Logoff the swoo user, run the command:

```
exit
```

Logoff the epallis user, run the command:

```
exit
```

Stop accessing the share, run the command:

```
cd /
```

Unmount the share, run the command:

```
umount /nfs
```

Disconnect the SSH session, run the command:

```
exit
```

This completes the lab exercise.

## Lab Exercise: VMware Datastore Access

### Scenario:

In this lab, you create VMware datastores on a Unity system, and make them available to a VMware ESXi host through VMware aware integration.

In this lab, you perform the following tasks:

- Add vCenter server to Unisphere.
- Create VMware vStorage VMFS and NFS datastores in Unisphere.
- View the automatically created datastores in vCenter for the Unity VMFS and NFS datastores.

## Add vCenter Hosts

Dell EMC Unity Unisphere VMware aware integration enables storage administrators to discover a VMware environment directly from Unisphere and the relationships between its resources. It also enables the creation and management of VMware datastores from the Unisphere interface which minimizes the management overhead of configuring the provisioned storage in vCenter. Furthermore, the datastores that are created in Unisphere are automatically pulled into vCenter, again reducing the amount of management by administrators.

1. Before creating VMware storage resources, you must add VMware hosts to the storage environment so you can configure host access later.

Navigate to **Access > VMware > vCenters**. Click **+** to open the Add vCenter wizard.

2. To discover your ESXi host, in the **Discover ESXi hosts in the vCenter** section, enter the following settings:

Network Name or Address: **vcsa.hmarine.test**

User Name: **student@vsphere.local**

Password: **Password123!**

Click **Find**.

3. A list opens that includes any ESXi hosts managed by this vCenter server. Locate and **check** ESXi host **esxi-1.hmarine.test**.

Click **Next** to continue.

4. In the **Configure VASA Provider** section, click **Next**.
5. The **Summary** displays the ESXi host to be added to VMware hosts as shown here:

## Lab Exercise: VMware Datastore Access

The screenshot shows the 'Add vCenter' dialog box with the 'Summary' tab selected. On the left sidebar, there are three items: 'Find ESXi Hosts' (checked), 'VASA Provider' (checked), and 'Summary' (selected). The main area displays the 'Summary' section with the following details:

- vCenter: vcsa.hmarine.test
- Register VASA Provider: No

The message below states: "The following ESXi Hosts, managed by a vCenter Server, will be added to VMware Hosts." A table titled "ESXi Hosts" lists one host:

Name	ESXi Host IP Address	Software Version	Notes
esxi-1.hma...	192.168.1.112, 192.168.3...	VMware ESXi 7.0.2	Can be imported

6. Click **Finish** to add the ESXi host.

After the job completes successfully, click **Close**.



**Note:** The job will continue to run in the background if you close the page before it completes.

7. Confirm you can see vcsa.hmarine.test and its Software Version.

Click the **ESXi Hosts** tab to see added hosts.

8. Confirm **esxi-1.hmarine.test** is listed here along with details such as vCenter name and Initiators.

Click the **Virtual Machines** tab. There will not be any VMs listed currently.

Click the **Virtual Drives** tab. There will not be any Virtual Drives that are listed currently.

This completes part 1 of the lab exercise.

## Provision and Access VMware vStorage VMFS Datastore

In this section, you provision a VMFS datastore using Unisphere. You will notice due to Unity's integration with vSphere, the datastore is automatically added as a datastore in vSphere.

1. In Unisphere, go to to **Access > Initiators**.

You will see the initiator for the ESXi host **esxi-1.hmarine.test**.



**Note:** the initiator has an orange dot on the health status icon indicating there are no logged in initiator paths.

2. In Unisphere, go to to **Storage > VMware > Datastores**.

Click the **+** icon to create a datastore.

A wizard to create a new datastore opens to the **VMware Datastore Type** section.

Select the **Block** radio button option.

In the **VMware VMFS version** list, select **VMFS6**.

Click **Next** to continue the wizard.

3. In the **Enter a name for the datastore** section input the following:

Name: **VMFS\_Datastore**

Description: **VMFS datastore for esxi-1 host**

Click **Next** to continue the wizard.

4. In the **Configure the storage for this datastore** section, input the following configuration:

- Pool: **FAST VP-1**

- Tiering Policy: **Start High Then Auto-Tier**
- Size: **10 GB**
- Thin: **Checked**
- Host I/O Limit: **No Limit**

Click **Next** to continue the wizard.

5. In the **Configure Access** section, click the **+** icon to define host access to the datastore.

A list box is exposed to select and add hosts.

- Check the **esxi-1.hmarine.test** checkbox.
- Click **OK**.

Click **Next** to continue the wizard.

In the **Configure Snapshot Schedule** section, you will not be configuring snapshots for the datastore. Click **Next** to continue.

In the **Provide a Replication Mode and RPO** section, you will not be configuring replication for the datastore. Click **Next** to continue.

6. A **Summary** section for the datastore to be created is displayed as shown:

Create VMware Datastore	
<input checked="" type="checkbox"/> Type	Summary
<input checked="" type="checkbox"/> Name	Type Datastore Type: VMFS6
<input checked="" type="checkbox"/> Storage	Name and Description Name: VMFS_Datastore Description: VMFS datastore for esxi-1 host
<input checked="" type="checkbox"/> Access	Storage Pool: FAST VP-1 Size: 10.0 GB Thin: Yes Advanced Deduplication: No Tiering Policy: Start High Then Auto-Tier Host I/O Limit:
<input checked="" type="checkbox"/> Snapshot	Host Access Host(s): Complete List of Host Names and Associated Host LUN IDs
<input checked="" type="checkbox"/> Replication	Snapshot No snapshot schedule will be assigned to this VMware VMFS.
<input checked="" type="checkbox"/> Summary	Replication
Results	

## Lab Exercise: VMware Datastore Access

Click **Finish** to create the datastore.

A **Results** screen shows the progress and status of the created datastore.

**Close** the window when the operation completes.

The newly created datastore is now listed.

Datastores								
Capability Profiles      Protocol Endpoints      Datastore Shares      Virtual Volumes								
+ <span style="color: #0070C0;">!</span> More Actions								
	Name	↑	Size (GB)	Allocated (%)	Used (%)	Type	NAS Server	Pool
<input type="checkbox"/>	VMFS_Datastore	<span style="color: #0070C0;">!</span>	10.0	<div style="width: 100%;"> </div>	-	VMware VMFS	-	FAST VP-1

7. Open a new browser tab to access vCenter.

In the address field, enter: **https://vcsa.hmarine.test**

Click the **LAUNCH VSphere CLIENT (HTML5)** button.

In the **Open vmware-cip-launcher?** window, **check** the option to always allow vCenter to open associated links.

Click the **Open vmware-cip-launcher** button.

Login using the following credentials:

User name: **student@vsphere.local**

Password: **Password123!**

Click **LOGIN**.

8. The VMware vSphere UI opens. At the top, click the **Menu** drop-down list and select **Home**, and then click the **Hosts and Clusters** object as shown:

## Lab Exercise: VMware Datastore Access

The screenshot shows the vSphere Client interface. The left sidebar has a red box around the 'Menu' dropdown. The main area displays resource usage: CPU (32.33 GHz free), Memory (32.18 GB free), and Storage (1.27 TB free). Below this, there are two sections: 'VMs' (3 total, 3 Powered On, 0 Powered Off, 0 Suspended) and 'Hosts' (2 total, 2 Connected, 0 Disconnected, 0 Maintenance).

9. Verify the host has access to the datastore from Unity.

If not already expanded, expand the tree **vcsa.hmrine.test > Datacenter** and select the **esxi-1.hmarine.test** host. Select the **Datastores** tab from the page as shown:

The screenshot shows the host details page for 'esxi-1.hmarine.test'. The left sidebar shows the host's network configuration. The top navigation bar has a red box around the 'Datastores' tab. The Datastores table lists three datastores: 'Datastore', 'Datastore 1', and 'VMFS\_Datastore'. A red arrow points to the 'VMFS\_Datastore' row.

Name	Status	Type	Datastore Clus...	Capacity	Free
Datastore	Normal	VMFS 6		149.75 GB	148.34 GB
Datastore 1	Normal	VMFS 6		999.75 GB	993.31 GB
VMFS_Datastore	Normal	VMFS 6		9.75 GB	8.34 GB

You will see the **VMFS\_Datastore** listed with several details including the format type. The storage resource is now ready for use within VMware.

As you can see, VMware integration with Unity provides ease of storage provisioning and access. The ESXi host initiator is automatically registered in Unity. Once created, the storage object is mounted and formatted as a virtual machine file system, and is ready for use within VMware.

## Lab Exercise: VMware Datastore Access

Leave the **vSphere UI** browser tab open, you will use it again in the next part of the lab exercise.

This completes part 2 of the lab exercise.

## Provision and Access VMware NFS Datastores

In this lab, you create and configure access to an NFS Datastore from Unisphere. The datastore will be automatically added as a datastore in vSphere.

1. Open a Unisphere session to the UnityVSA-Source.

Navigate to **Storage > File > NAS Servers**. You should find the two NAS Servers that were created during the Storage Provisioning Lab.

Double-click **NAS\_NFS** and verify the following settings under the **General** tab:

Name: **NAS\_NFS**

Supported Protocols: **NFSv3**

Pool: **FAST VP-2**

Current SP: **SP A**

IP Address: **192.168.1.116**

Port: **SP A Ethernet Port 1**

Click **Close**.

2. Navigate to **Storage > VMware > Datastores**.

Click the **+** icon to create a datastore.

A wizard to create a new datastore opens to the **VMware Datastore Type** section. Select the **File** radio button option if not already selected.

Click **Next** to continue the wizard.

3. In the **Enter a name for the datastore** section input the following:

Name: **NFS\_Datastore**

Description: **NFS datastore for esxi-1 server**

Click **Next** to continue the wizard.

## Lab Exercise: VMware Datastore Access

- In the **Configure the storage for this datastore** section, input the following configuration:

Pool: **FAST VP-2**

Tiering Policy: **Start High Then Auto-Tier**

Size: **10 GB**

Thin: **Checked**

Host IO Size: **SQL Server**

Click **Next** to continue the wizard.



**Note:** Host IO Size allows users to specify the block size used to communicate to hosts or choose predefined application profiles.

- In the **Configure Access** section, input the following access configuration:

Default Access: **No Access**

Click the **+** icon to customize access to the datastore for a specific host. A list box is exposed to configure an access type and select or add hosts:

Access Type: **Read/Write, allow Root**

**Check** the **esxi-1.hmarine.test** checkbox.

Click **OK**.

Click **Next** to continue the wizard.

In the **Configure Snapshot Schedule** section, you will not be configuring snapshots for the datastore. Click **Next** to continue.

In the **Provide a Replication Mode and RPO** section, you will not be configuring replication for the datastore. Click **Next** to continue.

- A **Summary** section for the datastore to be created is displayed as shown:

## Lab Exercise: VMware Datastore Access

Create VMware Datastore

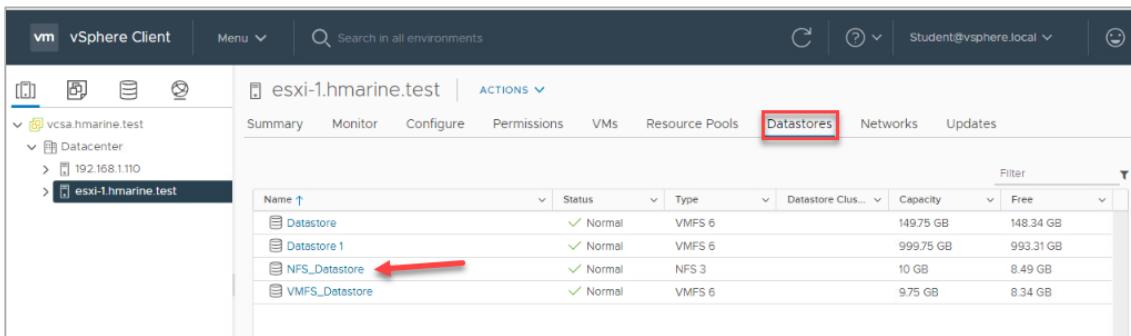
Type	Summary				
Name	Type Datastore Type: NFS NAS Server: NAS_NFS				
Storage					
Access					
Snapshot					
Replication					
<b>Summary</b>	<b>Name and Description</b> Name: NFS_Datastore Description: NFS datastore for esxi-1 server <b>Storage</b> Pool: FAST VP-2 Size (GB): 10.0 Host IO Size: SQL Server Thin: Yes Advanced Deduplication: No Tiering Policy: Start High Then Auto-Tier <b>Host Access</b> Default Access: No Access Minimum Security: sys - Client-side authentication (AUTH_SYS) <table border="1"><thead><tr><th>Name</th><th>Access Type</th></tr></thead><tbody><tr><td>esxi-1.hmarine.test</td><td>Read/Write, allow Root</td></tr></tbody></table> <b>Snapshot</b> No snapshot schedule will be assigned to this VMware NFS. <b>Replication</b> No replication is being created	Name	Access Type	esxi-1.hmarine.test	Read/Write, allow Root
Name	Access Type				
esxi-1.hmarine.test	Read/Write, allow Root				
Results					

Click **Finish** to create the datastore.

A **Results** screen shows the progress and status of the created datastore.

**Close** the window wizard when the operation completes.

7. Return to the open **vSphere UI** browser tab. The navigation in the left pane should be set to **Hosts and Clusters** with the **esxi-1.hmarine.test** host selected. The **Datastores** tab is selected as shown.



The screenshot shows the vSphere Client interface with the navigation bar set to "Hosts and Clusters" and the host "esxi-1.hmarine.test" selected. The "Datastores" tab is active. In the data grid, there are four entries:

Name	Status	Type	Capacity	Free
Datastore	Normal	VMFS 6	149.75 GB	148.34 GB
Datastore 1	Normal	VMFS 6	999.75 GB	993.31 GB
NFS_Datastore	Normal	NFS 3	10 GB	8.49 GB
VMFS_Datastore	Normal	VMFS 6	9.75 GB	8.34 GB

Click the **Refresh** icon at the top of the page if the new **NFS\_Datastore** is not shown.

Confirm the **NFS\_Datastore** that you created is now available to the host for VMware use.

## Lab Exercise: VMware Datastore Access

From the information listed about the new datastore, record the value that is shown for its **Type**: \_\_\_\_\_

This further demonstrates the integration Dell EMC Unity provides for VMware. The NFS datastore has automatically mounted the Unity storage resource, and it is ready for use within VMware.

End of Lab Exercise

## Lab Exercise: Host I/O Limits Setup

### Scenario:

This lab demonstrates how to set Host I/O Limits (Quality of Service) to provisioned block storage resources using the Unisphere user interface. You can create Host I/O Limits policies for block storage resources with host access that limit maximum throughput in IO/s and/or maximum bandwidth in KBPS or MBPS.

In this lab, you perform the following tasks:

- Verify the Host I/O Limit is licensed and enabled in a Dell EMC Unity system.  
Note the license is displayed as Quality of Service (QoS).
- Create different Host I/O Limit policies, and associate them with block storage resources.

## Lab Exercise: Host I/O Limits Setup

### Verify the Status of the Host I/O Limit Feature

In this lab, you check if the Host I/O Limits (QoS) feature is licensed on the system and verify its status.

1. From your Student Desktop system, open a Unisphere session to the UnityVSA-Source system at IP address **192.168.1.113**

Login using the credentials: **admin/Password123!**

2. Verify if the Host I/O Limits feature is licensed and enabled.

From the Unisphere UI, open the system **Settings** window by single clicking the Settings gear icon.



3. From the **License Management** page of the **Software and Licenses > License Information** section, look for the **Quality of Service (QoS)** license.

!	License	Version	Issued Date	Expire Date
✓	Internet Small Computer System...	1	4/3/2018	Permanent
✓	Local Copies	1	4/3/2018	Permanent
✓	Network File System (NFS)	1	4/3/2018	Permanent
✓	Quality of Service (QoS)	1	4/3/2018	Permanent
✓	Replication	1	4/3/2018	Permanent
✓	Thin Provisioning	1	4/3/2018	Permanent
✓	Unisphere	1	4/3/2018	Permanent
✓	Unisphere Central	1	4/3/2018	Permanent

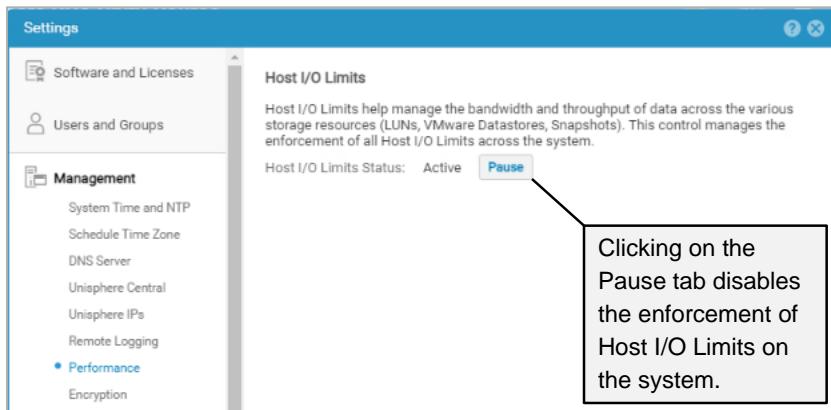
Verify that the feature has a green check mark in front of it meaning that the license is installed and the feature is operational.

4. In the **Settings** window, go to **Management > Performance**. The status of the Host I/O Limits is **Active**.

There is also a control button which switches between **Pause** and **Resume**. This control manages the enforcement of all Host I/O limits applied to the

## Lab Exercise: Host I/O Limits Setup

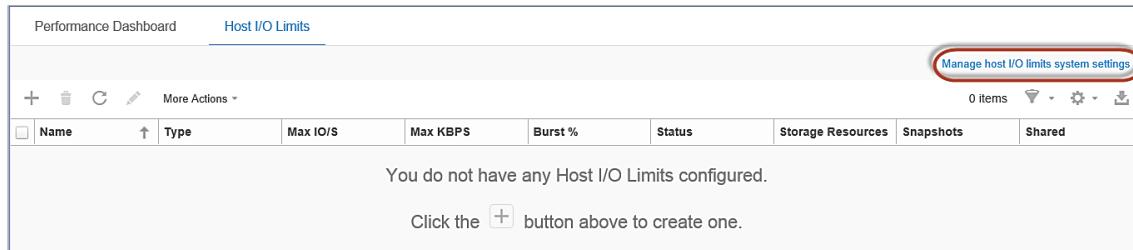
various block storage resources (LUNs, VMware datastores, and snapshots) across the system.



**Close** the Settings window.

### 5. Navigate to **System > Performance > Host I/O Limits**.

From the page, host I/O limit policies can be created and any existing policies are displayed. It also has a link to the Host I/O settings page which was viewed in the previous step.



### 6. From Unisphere, go to **Storage > Block > LUNs**.

Double-click on **WIN1 LUN0** to open its **Properties** page.

### 7. On the **Properties** page, select the **Host I/O Limit** tab.

Note that there is no Host I/O Limit that is associated with the LUN.

Is there any peak of Bandwidth and Throughput utilization in the graphic?

Change the frequency range to **Real Time**. Wait at least 1 minute for the graphic to refresh and populate with information.

## Lab Exercise: Host I/O Limits Setup

Both I/O measures should default to zero since there is no write activity from the Host to this LUN at the moment.

8. From the Student Desktop system taskbar, open an RDC **session** to **WIN1**.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the Windows Security window, select **More choices**.

Select **Use a different account**.

From the Enter your credentials window, input the following:

Username: **\administrator**

Password: **emc2Local!**

Click **OK**.

9. From the **WIN1** system taskbar open **File Explorer**.

Expand the **Local Disk (C: )** tree and open the **Big\_Files** folder.

There are some large files that are located in this folder which will be used to generate some write I/O to the **WIN1 LUN0**.

10. Highlight, right-click and copy the four **1 GB** files.

Paste the files into the **E:** drive which is from the WIN1 LUN0 LUN. Wait for the copy operation to complete.

11. Return to the Unisphere session.

Observe in the graphic the Bandwidth KB/s and Throughput IO/s used by the host to perform the copy operation.

**Close the WIN1 LUN0 Properties** window.

12. Return to the **RDC** session to **WIN1**.

Delete all of the **1 GB** files that were copied to the **E:** drive folder.

**Close** the RDC session to **WIN1**.

This completes part 1 of the lab exercise.

## Create a Host I/O Limits Policy for a LUN

In this part of the lab, you create a Host I/O Limits policy and associate it to **WIN1 LUN0**.

1. Create a HostI/O policy.

From the open Unisphere session, navigate to **System > Performance > Host I/O Limits**.

2. On the **Host I/O LImits** page, you can define Host I/O Limit policies. Limiting I/O bandwidth and throughput provides more predictable performance in system workloads between hosts, their applications, and storage resources.

Click the + icon to create a limit.

The **Create Host I/O Limit** wizard opens.

3. You can limit I/O traffic to block storage resources (LUNs, Consistency Groups) by setting a threshold here (throughput and/or bandwidth).

In the **Provide a Name and Limits** section enter the configuration information for a new Host I/O Limit policy:

Name: **Silver\_Policy**

Description: **Good (Class – Service)**

Shared: **Unchecked**

Limit Type: **Absolute Limit** (radio button selected)

Maximum IO/S: **800**

Maximum Bandwidth: **9000 KBPS**

Click **Next** to continue the wizard.

4. In the **Select Storage Resources to Associate with the I/O Limit** section, select **WIN1 LUN0**.

Click **Next** to continue the wizard.

- Skip the Snapshots section.

Click **Next** to continue.

- In the **Summary** section the policy to be created is displayed as shown here:

Name	Type	Consistency Group Name	Size (GB)
WIN1 LUN0	LUN	--	5.0

You do not have any items configured.

Click **Finish** to create the policy.

- The **Results** page shows the status of the operation.

A green check mark specifies that the operation was completed successfully.

Wait until the job completes, and then click **Close**.

- The new policy is displayed in the Host I/O Limits page.
- Follow previous steps to create additional policies with the information below.

Click the + icon to create a second policy with the settings below:

Name: **Gold\_Policy**

Description: **Better (Class – Service)**

Shared: **unchecked**

Limit Type: **Absolute Limit** (radio button selected)

## Lab Exercise: Host I/O Limits Setup

Maximum IO/S: **1000**

Maximum Bandwidth: **11000 KBPS**

Storage Resource: **Linux1 LUN0**

Create a third policy with the settings below:

Name: **Platinum\_Policy**

Description: **Best (Class – Service)**

Shared: **Checked**

Limit Type: **Absolute Limit** (radio button selected)

Maximum IO/S: **2000**

Maximum Bandwidth: **20480 KBPS**

Storage Resource: **CG\_LUN-1, CG\_LUN-2, CG\_LUN-3**

10. From Unisphere, go to to the **Storage > Block > LUNs**.

Double-click **WIN1 LUN0** to open its properties page.

11. Select the **Host I/O Limit** tab.

Note that there is a Host I/O Limit Silver Policy that is associated with the LUN.

Observe that both bandwidth and throughput graphics show a line for the limits.

Change the frequency range to **Real Time**. Wait at least 1 minute for the graphic to refresh and populate with information.

Both I/O measures should default to zero since there is no write activity from the Host to this LUN at the moment. The limit lines are still displayed in the graphic.

**Close the WIN1 LUN0 Properties window.**

12. This completes the lab exercise. You have successfully created a Host I/O Limits absolute policy and associated it with block storage resource.

## Lab Exercise: File System Extension and Shrink Operations

### Scenario:

The UFS64 architecture enables users to extend thick and thin file systems. Performing UFS64 file system extend operations is transparent to the client meaning the array can still service I/O to a client during extend operations.

This lab demonstrates how to manually extend and shrink the capacity of a UFS64 file system using the Unisphere UI.

Verify that the new advertised size and space is allocated from the pool.

In this lab, you perform the following tasks:

- Manually extend the capacity of the file system.
- Check the new file system capacity and the allocated space.
- Manually shrink the capacity of a file system.
- Verify that the file system capacity has been reduced.

## Extend a Thin UFS64 File System

Introduction to task.

1. From your Student Desktop system, open a Unisphere session to the UnityVSA-Source using IP address **192.168.1.113**.

Login using the credentials: **admin/Password123!**

2. Navigate to **Storage > File**.

Double-click the **SMB\_fs** file system to open its properties.

3. From the **SMB\_fs Properties** window, check the following:

What is the allocated capacity? \_\_\_\_\_ (hover over blue bar).

What is the used space? \_\_\_\_\_

What is the Total Pool Space Used? \_\_\_\_\_

Observe that this is a thin UFS64 file system.

Click the **Close** button to close the Properties window.

4. Navigate to **Storage > Pools**.

What is the Subscription (%) of pool **FAST VP-2**? \_\_\_\_\_

Double-click the **FAST VP-2** pool to open its properties.

5. From the **FAST VP-2 Properties** window, go to the **Usage** tab.

The **Capacity** option is selected, and the **Current Pool Capacity** is displayed.

Record the following:

Pool Capacity: \_\_\_\_\_

Free space: \_\_\_\_\_

## Lab Exercise: File System Extension and Shrink Operations

Used space: \_\_\_\_\_

- From the **Usage** tab, select the **Storage Resources** option.

The NAS servers and file systems that were created in the storage pool are displayed.

Select the **SMB\_fs** and note the value that is listed for it in the **Total Pool Space Used (GB)** column. \_\_\_\_\_

Double-click the **SMB\_fs** file system to open its properties page.

- From the **SMB\_fs Properties** window, change the size field to **10 GB**.

Click the **Apply** button to commit the change.

For thick file systems, the extend operation increases the actual space that is allocated to the resource from the pool.



**Note:** Manually extending a thin file resource increases the visible (virtual) size of the resource without increasing the actual size allocated to the resource from the pool.

- From the **SMB\_fs Properties** window check the following:

How much was the file system space increased? \_\_\_\_\_

What is the Allocated capacity? \_\_\_\_\_

What is the Used Space? \_\_\_\_\_

What is the Total Pool Space Used? \_\_\_\_\_

**Close the **SMB\_fs Properties** window.**

- From the **FASTVP-2 Properties** page **Usage** tab, select **Storage Resources**.

Click the **Refresh** icon and note the value for the **SMB\_fs Total Pool Space Used (GB)**.

## Lab Exercise: File System Extension and Shrink Operations

Was there a change in size after the extension of the file system?

---

10. From the **Usage** tab, select the **Capacity** option. Record the following:

Pool Capacity: \_\_\_\_\_

Free space: \_\_\_\_\_

Used space: \_\_\_\_\_

Have you noticed any changes besides the advertised file system size?

---

**Close** the window.

This completes part 1 of the lab exercise

## Shrink a Thin UFS64 File System

In this lab section, you manually shrink the capacity of a thin file system.

1. Navigate to **Storage > Pools**.

Double-click the **FAST VP-2** pool, and open its properties.

2. From the **FAST VP-2 Properties** window, go to the **Usage** tab.

The default **Capacity** option is selected, and the **Current Pool Capacity** is displayed.

A bar graph showing space-related information for the pool is displayed.

Mouse over the graph to display its used and free space information.

Record the following:

Pool Capacity: \_\_\_\_\_

Free space: \_\_\_\_\_

Used space: \_\_\_\_\_

3. Select the **Storage Resources** option.

The NAS servers and file systems in the storage pool are displayed, along with the space they are using from the pool and space that is consumed by their snapshots.

Review the values that are displayed in the **Total Pool Space Used (GB)** column. Add all these values together and verify that the sum correlates to the Used Space you recorded previously.

Select the **SMB\_fs** file system and record its **Total Pool Space Used (GB)** value: \_\_\_\_\_

Click the **Edit** icon (pencil) or double-click the selection to open its properties.

4. The **SMB\_fs Properties** window displays various space-related information. Record the following:

## Lab Exercise: File System Extension and Shrink Operations

Allocated capacity (hover over blue bar): \_\_\_\_\_

Used space: \_\_\_\_\_

Total Pool Space Used: \_\_\_\_\_

5. From the **SMB\_fs Properties** window, change the **Size** field to **5 GB**.

Click the **Apply** button to commit the change.

6. A warning message displays alerting the user that the file system will be reduced in size. An estimate of how much space will be returned to the pool is displayed.

How much space will be returned to the storage pool? \_\_\_\_\_

Click **Yes** to continue with the operation.

7. From the **SMB\_fs Properties** window record, the following:

Allocated capacity: \_\_\_\_\_

Total Pool Space Used: \_\_\_\_\_

Did the Total Pool Space Used value change from the value that was recorded in step 4? \_\_\_\_\_

**Close the SMB\_fs Properties** window.

8. From the **FAST VP-2 Properties** page, select the **Usage** tab and then select **Storage Resources**.

Review the **Total Pool Space Used (GB)**.

What is the Total Pool Space that is used by the **SMB\_fs** file system?

\_\_\_\_\_

**Close the FAST VP-2 Properties** window.

End of Lab Exercise

## Lab Exercise: FAST VP Settings

### Scenario:

This lab demonstrates how to configure and use the FAST VP support on Dell EMC Unity systems using the Unisphere.

This lab also demonstrates how FAST VP data relocation can be scheduled or manually started, and how it behaves with the selection of tiering policies for the storage resources.

In this lab, you perform the following tasks:

- Check if the FAST VP feature is licensed in the system and verify its status (Active/Paused).
- Perform a simple write operation to WIN1 LUN0. This LUN is associated with the Start High Then Auto Tier policy.
- Verify how FAST VP relocates data depending on the storage tier policy that is assigned to the storage resource.

## Verify Status of the FAST VP Feature

In this lab, you check if the FAST VP feature is licensed on the system. and verify its status.

- From your Student Desktop system, open a Unisphere session to the lab UnityVSA-Source Unity system (IP address **192.168.1.113**).

Login using the credentials: **admin/Password123!**

- To check if **FAST VP** can be set in the Unity system, you must verify if the feature is licensed and enabled.

Open the **System Settings** window (**Gear** icon).

- From the **License Management** window, look for the **FAST VP** license.

<b>License Management</b>					
!	License	Version	Issued Date	Expire Date	
✓	EMC Storage Analytics (ESA)	1	4/3/2018	Permanent	
✓	FAST VP	1	4/3/2018	Permanent	
✓	File System Events Publishing	1.0	4/3/2018	Permanent	

- FAST VP settings are managed at the System Settings level and at the storage resource levels.

From the **Settings** window, go to to **Storage Configuration > FAST VP**. Check if the feature is active on the Unity system.

The data relocation can be paused and resumed by clicking the **Pause** button.

Are Data Relocations scheduled? \_\_\_\_\_

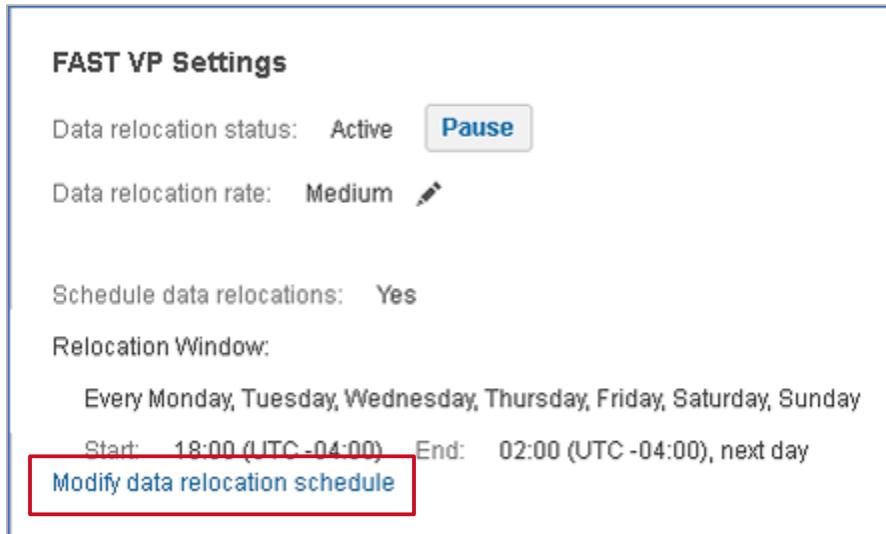
What is the Data relocation rate? \_\_\_\_\_

Is there any data scheduled to relocate? \_\_\_\_\_

- From the **FAST VP Settings** window, it is also possible to modify the schedule for the Data Relocation between the storage tiers on the system.

## Lab Exercise: FAST VP Settings

Click the **Modify data relocation schedule** text.



6. The **Modify data relocation schedule** window is displayed.

The **Schedule data relocations** can be enabled or disabled using the check box.

The **Relocation Window** schedule can be modified according to the user's needs.

Change the **Relocation Window** parameters to:

Start Time: **7:00PM**

End Time: **3:00AM**

Click **OK** to configure the new schedule. The window closes.

Prior to the change, if data was scheduled for relocation, then the FAST VP Settings page calculates the amount of data to relocate and updates the information on the window.

**Close** the Settings window.

7. Navigate to **Storage > Pools**

Double-click the **FAST VP-1** pool to open its properties.

8. In the **FAST VP-1 Properties** window, select the **FAST VP** tab.

The **FAST VP** tab shows the following information for the heterogeneous pool:

Whether the pool participates in scheduled data relocations

Estimated time that is needed for scheduled data relocations

Start and end time for the most recent data relocation

Number and type of disks in each tier

Amount of data in the pool scheduled to move to higher and lower tiers

Amount of data in the pool scheduled to be rebalanced within a tier

Your window may display data to be relocated between tiers.

The data relocation can be manually started from this page and that the **Manage FAST VP system settings** window can also be launched from here by clicking the blue text.

**Close** the properties window.

This completes part 1 of the lab exercise.

## Observing FAST VP Data Relocation

This part of the lab demonstrates how to check the data relocation operation from a LUN and from a storage pool.

1. This part of the lab demonstrates how to check the data relocation operation from a LUN and from a storage pool. In this section, you perform a simple write operation to **WIN1 LUN0** and observe how FAST VP relocates data according to the storage tier policy assigned to the storage resource.
2. Open an RDC session to **WIN1** and login as **Administrator**.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**.

Select **Use a different account**.

From the **Enter your credentials** window, input the following:

Username: **\administrator**

Password: **emc2Local!**

Click **OK**.

3. From the **WIN1** Desktop or taskbar, click the **File Explorer** icon.

Expand the **Local Disk (C: )** tree and open the **Big\_Files** folder.

There are some sizeable files that are located in this folder which will be used to generate some write I/O to the **WIN1 LUN0** disk.

4. Select the four **1 GB** files, and then right-click and select **Copy**.
  5. Select the **WIN1 LUN0 (E: )** disk from the File Explorer navigation pane.
- Paste** the files into the drive. Wait for the copy operation to complete.
6. Return to the Unisphere session.

Note: If the Unisphere session has expired, login again.

7. Navigate to **Storage > Block > LUNs**.

Double-click **WIN1 LUN0**.

You may notice that the LUN usage values do not increase to match what was written to the LUN. This is caused by the sparse files that are used in the copy operation and client-side caching.

8. In the **WIN1 LUN0 Properties** page, select the **FAST VP** tab.

What is the **Tiering Policy** that is associated with the LUN?

---

What is the **Data Distribution** percentage between the three tiers?

Extreme Performance Tier: \_\_\_\_\_ %

Performance Tier: \_\_\_\_\_ %

Capacity Tier: \_\_\_\_\_ %

You may notice that the data on the LUN is distributed across multiple tiers and does not reside in only the highest tier. The distribution of data depends on the tier having space available from the pool. If there is no space on the highest tier, space is allocated from the next highest tier having space available for the data. The available space for the tiers within the pool is not predictable for this lab exercise; it varies based on past activities you may have performed. You are recording the distribution above so that when you change the tiering policy, you can see its effect on the data distribution.

Change the **Tiering Policy** to **Lowest Available Tier** and click **Apply**.

**Close** the properties window.

9. Navigate to **Storage > Pools**.

## Lab Exercise: FAST VP Settings

Double-click the **FAST VP-1** storage pool.

10. In the **FAST VP-1 Properties** window, select the **FAST VP** tab.

Click **Start Relocation**.

11. In the **Start Data Relocation** window, enter the following settings if not already selected:

Data Relocation Rate: **High**

Observe that the **Start time** is defined as **Now**.

Click **OK** to start the data relocation.

The **Move Down (GB)** column is immediately populated with the total amount of data that is to be allocated to the lowest available tier possible because of the tiering policy chosen for **WIN1 LUN0**.

**Close** the properties window.

12. Navigate to **Storage > Block**.

Double-click **WIN1 LUN0**.

13. In the **WIN1 LUN0 Properties** window, select the **FAST VP** tab.

How was the data distributed between the three tiers?

Note: you may need to wait several minutes for the data distribution values to change. Closing and opening the LUN Properties page refreshes the data.

Extreme Performance Tier: \_\_\_\_\_ %

Performance Tier: \_\_\_\_\_ %

Capacity Tier: \_\_\_\_\_ %

Change the Tiering Policy to **Start High then Auto Tier**. Click **Apply**.

**Close** the properties window.

14. Navigate to **Storage > Pools**. Double-click the **FAST VP-1** storage pool.
15. In the **FAST VP-1 Properties** window, select the **FAST VP** tab.

Click **Stop Relocation** to interrupt the current data relocation. Then click **Start Relocation**.

16. In the **Start Data Relocation** window, enter the following settings if not already selected:

Data Relocation Rate: **High**

Observe that the Start time is defined as **Now**.

Click **OK** to start the data relocation.

The **Move Up (GB)** column is immediately populated with the total amount of data being allocated to a higher tier because of the tiering policy chosen for **WIN1 LUN0**.

**Close** the properties window.

17. From your Student Desktop, open the existing RDC session to **WIN1**. In the open File Explorer window, delete all the files that were copied to the WIN1 LUN0 and leave the existing **New Text Document** file.

Close the window.

Log off the RDC session to **WIN1**.

You have successfully observed the data relocation based on choice of Tiering Policy that is associated with a storage resource.

End of Lab Exercise.

## Lab Exercise: File System Quotas

### Scenario:

This lab demonstrates how to configure limits for specific users and directories on a file system.

User Quotas and Tree Quotas are supported on Dell EMC Unity systems both independently and in combination. It is also possible to limit the amount of storage that a user consumes by storing data on a quota tree.

In this lab, you perform the following tasks:

- Create a User Quota on a file system. Select a Windows Domain user and specify the soft and hard limits to configure the User Quota. Test the User Quota configuration from a Windows client connection to the shared file system.
- Configure a Quota Tree on a file system. Select the directory in the file system and specify the soft and hard limits to configure the Quota Tree. Test the Quota Tree configuration from a Windows client connection to the shared file system.
- Create a User Quota on the created Quota Tree. Select the Windows Domain user and specify the soft and hard limits to configure the User Quota. Test the quota configuration from a Windows client connection to the shared file system.

### Create User Quota

In this lab, you create a User Quota on a file system.

1. From your Student Desktop system, open a Unisphere session to the lab UnityVSA-Source Unity system (IP address **192.168.1.113**).

Login using the credentials: **admin/Password123!**

2. Navigate to **Storage > File > File Systems**.

Double-click **SMB\_fs** to open its properties page.

3. From the **SMB\_fs Properties** window, select the **Quota** tab.

The tab is divided in two sections: **File System** and **Quota Tree**. The default section is **File System** showing the **User Quota Report** page that displays the

file system storage space that is consumed per user.

4. Launch the **Create User Quota** wizard by clicking the + icon.
5. From the **Create User Quota** wizard window, click the + icon to open the **Configure User** window.
6. From the **Configure User** window, enter the following settings:

Host Type: **Windows Name**

Domain: **hmarine.test**

Name: **Swest**

Click **Add User** to commit the changes.

7. In the **Provide the User's Information** window, Verify the following:

Type: **Window Name**

User: **hmarine.test\Swest**

Click **Next** to continue the wizard.

8. On the **Limits** page, specify the **Soft Limit** and a **Hard Limit** for the User Quota.

A soft limit, when surpassed, begins the grace period countdown. The user can continue to write to the file system until the grace period expires. The grace period is modifiable and defaults to 7 days.

The hard limit stops any write activity when it is reached, regardless of any grace period.

Use the following settings:

Soft Limit: **1 GB**

Hard Limit: **3 GB**

Click **Next** to continue the wizard.

## Lab Exercise: File System Quotas

9. The quota settings are displayed on the **Review Your Selections** section as shown here:

The screenshot shows a 'Create User Quota' interface. On the left, a sidebar lists 'User Name' (checked), 'Limits' (checked), and 'Summary' (selected). Below this is a 'Results' section. The main area is titled 'Review Your Selections'. It shows a path 'Path: /' and a table for 'Users'. The table has two columns: 'Type' and 'User'. A single row is present with 'Windows Name' as 'hmarine.test\Swest'. Below the table, there's a 'Limits' section with 'Soft Limit: 1.0 GB' and 'Hard Limit: 3.0 GB'.

Click **Finish** to create the user quota.

10. The **Results** page shows the status of the operation.

A green check mark specifies that the operation was completed successfully.

Wait until the job completes, and then click **Close**.

11. The new **User Quota** is displayed in the **User Quota Report** page.

This completes part 1 of the lab exercise.

## Testing User Quota

In this section, you test the User Quota that you configured in the previous part of this lab exercise.

1. Launch an RDC session to **WIN1**.

Log in to the WIN1 system as **swest**.

In the Computer(s), enter **WIN1**

Click the **Connect** button.

In the **Windows Security** window, select **More choices**.

Select **Use a different account**.

In the **Enter your credentials** window, input the following:

Username: **hmarine\swest**

Password: **emc2Admin!**

Click **OK**.

2. From the **WIN1** Desktop or system taskbar, open **File Explorer**.

Expand the **Local Disk (C: )** tree and open the **Big\_Files** folder.

3. Copy the **1GBFile-1** and the **500MBFile-1** files to the clipboard.
4. From the **WIN1** Desktop, double-click the **Run** icon.

In the **Open** field, input **\NAS\_SMB\Hmarine\_Sales** and click **OK**.

The share opens.

5. Paste the file into the share. Wait for the copy operation to complete.
6. Return to the Unisphere session.

From the **SMB\_fs Properties** page, select **Quota**.

## Lab Exercise: File System Quotas

Click the **Refresh** icon to update the information displayed on the User Quota Report.

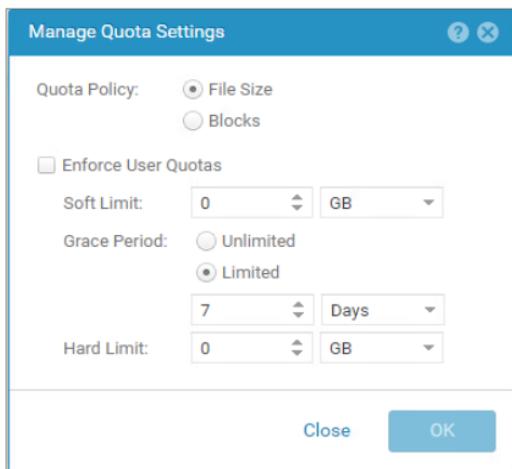
Is there any change to storage consumption for the **Scott West** user? \_\_\_\_\_

How about the Soft Limit Usage (%)? \_\_\_\_\_

Has the User Quota been affected? \_\_\_\_\_

**Note:** You should not see any update to the user quotas when you click refresh.

7. From the **User Quota Report** tab of the **SMB\_fs Properties** window, click the **Manage Quota Settings** link.
8. In the **Manage Quota Settings** dialog box, you realize that User Quotas were never enforced.



Check the checkbox for **Enforce User Quotas** and click **OK**.

9. From the **Quotas** tab of the **SMB\_fs Properties** window, click the **Refresh** icon to poll updated information about your User Quotas.
10. Verify that the User Quota for **Scott West** has changed its state, and its Soft Limit Usage has been fully consumed:

## Lab Exercise: File System Quotas

The screenshot shows the 'SMB\_fs Properties' dialog box with the 'Quota' tab selected. On the left, there's a 'File System' tree view with 'Quota Tree' expanded. The main area displays a 'User Quota Report' table with the following data:

User ID	Unix Name	Windows Name	Usage (GB)	Soft Li...	Soft Limit Usage (%)	Hard Limit...
214748...	--	--	0.0	0.0	0.0	0.0
214748...	--	--	< 0.1	0.0	0.0	0.0
214748...	--	--	< 0.1	0.0	0.0	0.0
Exceeded Soft ...	214748...	HMARINE\SWest	1.4	1.0	3.0	3.0

You can verify that there are entries in **User Quota Report** for the other users (administrator, Swall, and Epratt) who have accessed the file system. Notice that there are no limits that are defined for them.

Also notice that users are listed by User ID and by Windows or Unix names.

Double-click the entry that has exceeded its soft limit.

The **Edit Selected User Quota Limits** window opens. It displays the User ID and the Windows Names for the user.

Verify the user who exceeded their Soft limit is **HMARINE\SWest**.

**Close** the window.

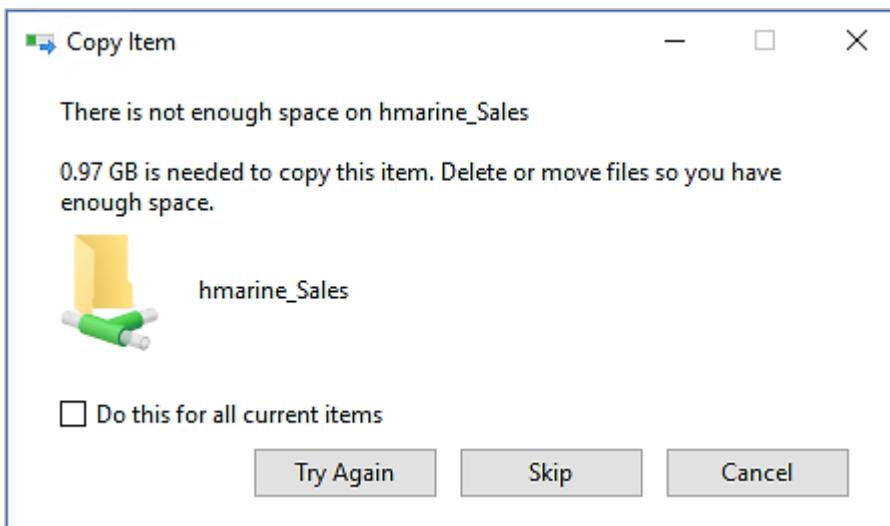
11. Next, you are going to test the Hard Limit defined in the user quota policy for Scott West.

Return to the **RDC** session to **WIN1**.

12. From the **Local Disk (C: )\ Big\_Files** folder, copy **1GBFile-2** and **1GBFile-3** to the clipboard.
13. Paste the files in the **\NAS\_SMB\Hmarine\_Sales** share.
14. The copy process proceeds, but eventually is interrupted by an error message. Review the error message.

The error message is due to the User Quota's Hard Limit restricting the consumable space for the user **swest**. Click **Skip** to end the copy operation.

## Lab Exercise: File System Quotas



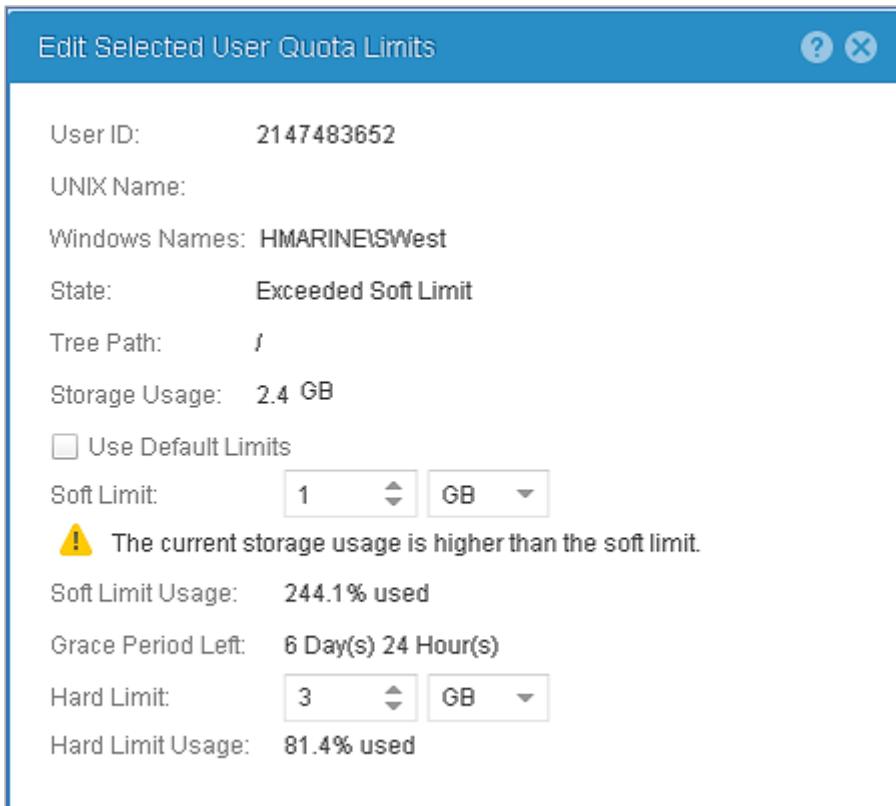
Verify that only one of the files was copied to the directory.

15. From the Student Desktop, return to the Unisphere session.

Click the **Refresh** icon to update the information displayed on the **User Quota Report**.

Notice that the **Usage (GB)** of the **Swest** account has increased above 2.0 GB. One of the files could not be copied because it would have exceeded the **3 GB** hard limit.

16. Double-click the quota to edit the limits for **swest**.



Observe that the **Soft Limit** has been exceeded and the **Grace Period** (7 days) has been activated.

Modify the **Hard Limit** to **5 GB**, and click **OK**.

17. In the **User Quota Report** page, observe that the **Hard Limit** has been increased to **5.0 GB**.
18. Return to the **RDC** session to the **WIN1** system.
19. From the **Local Disk (C: )\Big\_Files** folder, copy **750MBFile-1** to the clipboard.
20. Paste the file in the **\NAS\_SMB\Hmarine\_Sales** share.

The copy process should succeed. Verify that the copied files are present on the share.

21. **Delete** the copied files from the **\NAS\_SMB\Hmarine\_Sales** share.

**Close** the File Explorer windows and logoff the RDC session.

## Lab Exercise: File System Quotas

This completes part 2 of the lab exercise.

## Configure a Quota Tree

In this section of the lab, you create a Quota Tree on a file system.

1. Return to the open Unisphere session.
2. From the **Quota** tab of the **SMB\_fs Properties** window, select **Quota Tree** on the left of the window.
3. Launch the **Create Quota Tree** wizard by clicking the **+** icon.
4. In the **Create Quota Tree** wizard, enter the configuration information for the new quota tree.

Path: **/Engineering\_Data** (This is case-sensitive!)



**Note:** The path is relative to the root of the file system SMB\_fs and must start with a forward slash.

Click **Next** to continue the wizard.

5. In the **Limits** page, enter the following configuration:

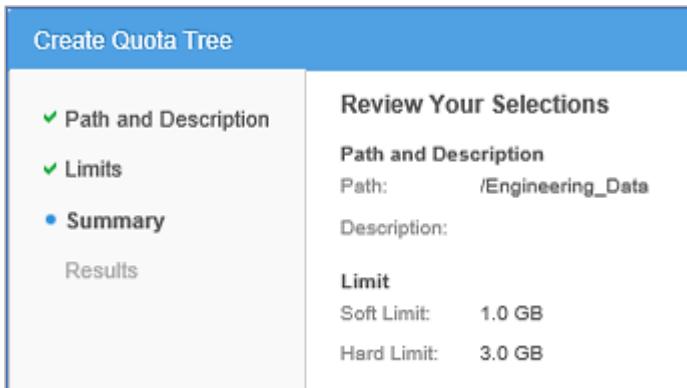
Soft Limit: **1 GB**

Hard Limit: **3 GB**

Click **Next** to continue the wizard.

6. The quota settings are displayed on the **Review Your Selections** section as shown here:

## Lab Exercise: File System Quotas



Click **Finish** to create the quota.

7. The **Results** page shows the status of the operation.

A green check mark indicates that the operation was completed successfully.

Wait until the job has completed, and then click **Close**.

8. The new configuration is displayed in the **Quota Tree** page.

You have successfully configured a File System Quota Tree.

SMB_fs Properties						
General	Snapshots	FAST VP	Replication	Quota	Advanced	
File System	<a href="#">+</a>	<a href="#">-</a>	<a href="#">↻</a>	<a href="#">Edit</a>	1 item	<a href="#">Filter</a> <a href="#">Sort</a> <a href="#">Settings</a>
• Quota Tree	<input type="checkbox"/> State	Path	<a href="#">↑</a>	Usage (GB)	Soft Limit Usage (%)	Enforce User Quotas
	<input type="checkbox"/> OK	/Engineering_Data		< 0.1		No

This completes part 3 of the lab exercise.

## Testing the Quota Tree

In this section, you test the Quota Tree that you configured in the previous part of this Lab exercise.

1. Open an RDC session to **WIN1**.
2. Log in to the **WIN1** system as user **eplace**:

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**.

Select **Use a different account**.

In the **Enter your credentials** window, input the following:

Username: **hmarine\eplace**

Password: **emc2Admin!**

Click **OK**.

3. From the WIN1 Desktop or system taskbar, open **File Explorer**.

Expand the **Local Disk (C: )** tree and open the **Big\_Files** folder.

4. Copy **1GBFile-1** and **1GBFile-2** to the clipboard.
5. From the **WIN1** system desktop, double-click the **Run** icon.

In the **Open** field, input **\NAS\_SMB\Engineering\_Data** and click **OK**.

The share opens.

6. Paste the files into the share. Wait for the copy operation to complete.
7. From the Student Desktop, return to the open Unisphere session.

From the **Quota** tab of the **SMB\_fs Properties** window, click the **Refresh** icon

## Lab Exercise: File System Quotas

to update the information displayed.

Are there any changes to storage usage for the **/Engineering\_Data** path?

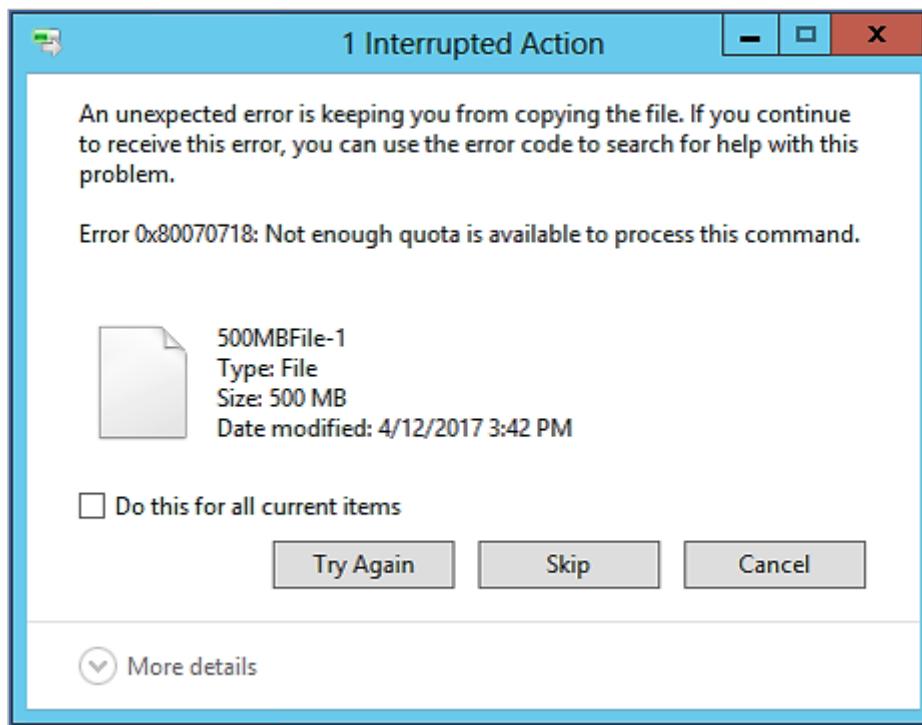
---

How about the **Soft Limit Usage (%)**? \_\_\_\_\_

The usage for the /Engineering\_Data path should have increased to ~2.0 GB.

8. Return to the **RDC** session to the **WIN1** system.
9. From the **Local Disk (C: )\Big\_Files** folder, copy the **500MBFile-1**, and the **750MBFile-1** files.
10. Paste the file in the **\NNAS\_SMB\Engineering\_Data** share.

One of the files gets copied to the share, but the copy of the second file is interrupted with the message displayed here:

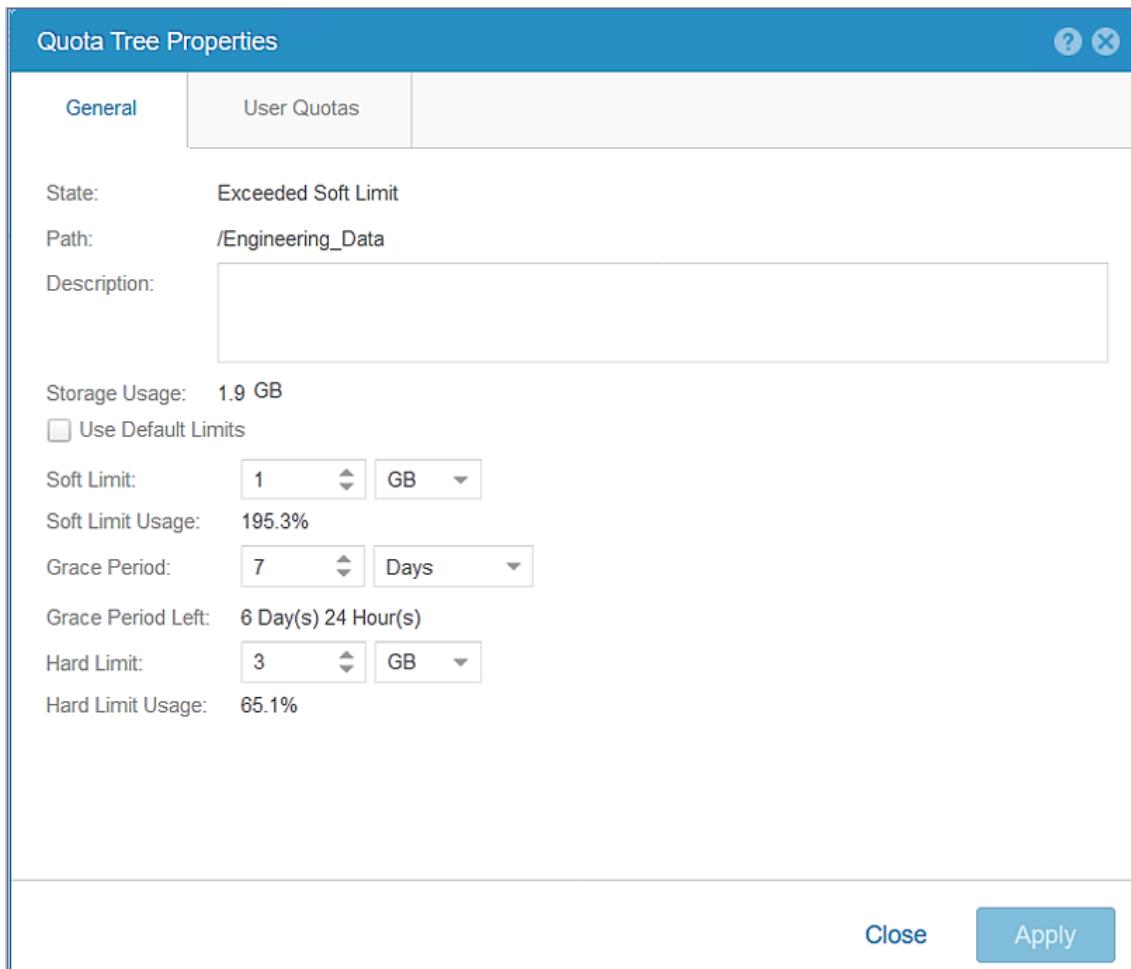


The only way to enable this copy operation to complete is to increase the Hard Limit of the Quota Tree for the /Engineering\_Data directory.

Leave the error message open.

11. Open Unisphere session.

From the **Quota** tab of the **SMB\_fs Properties** window, Select **Quota Tree**. Double-click the quota for the **Engineering\_Data** path.



12. From the **Quota Tree Properties** window, notice that the **Soft Limit** has been exceeded and the **Grace Period** (7 days) is activated.

Modify the **Hard Limit** to **5 GB** and click **Apply**. Then click **Close**.

13. Return to the **RDC** session to the **WIN1** system.

14. In the error message left open in a previous step, click **Try Again** to continue with the copy operation.

The operation should be successful this time. You should now see two 1 GB

## Lab Exercise: File System Quotas

files, one 750 MB file and a 500MB file in the share.

You have successfully configured and tested a Quota Tree.

15. **Delete** the copied files from the **\NAS\_SMB\Engineering\_Data** share.

Close the File Explorer windows and logoff the **RDC** session.

This completes part 4 of the lab exercise.

## Create User Quota on a Quota Tree

In this section of the lab, you create a User Quota on a previously created Quota Tree.

1. Return to your open Unisphere session.

The session should display the **SMB\_fs Properties** page.

2. From the **SMB\_fs Properties** page, select **Quota > Quota Tree**. Double-click the quota tree **/Engineering\_Data**.
3. From the **Quota Tree Properties** window, select the **User Quotas** tab.
4. Click the **+** icon to open the **Create User Quota** wizard.

In the **Create User Quota** wizard, click the **+** icon to add a user.

5. In the **Configure User** section, enter the following configuration:

Host Type: **Windows Name**

Domain: **hmarine.test**

Name: **epratt**

Click **Add User**.

6. The user **hmarine.test\lepratt** is now listed on the table.

Click **Next** to continue the wizard.

7. On the **Configure Storage Limits** page, enter the following configuration information:

Soft Limit: **1 GB**

Hard Limit: **3 GB**

Click **Next** to continue the wizard.

8. The quota settings are displayed on the **Review Your Selections** section as shown here.

## Lab Exercise: File System Quotas

**Create User Quota**

<ul style="list-style-type: none"><li><input checked="" type="checkbox"/> User Name</li><li><input checked="" type="checkbox"/> Limits</li><li><input checked="" type="radio"/> Summary</li><li><input type="radio"/> Results</li></ul>	<p><b>Review Your Selections</b></p> <p>Path: /Engineering_Data</p> <p><b>Users</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Type</th><th>User</th></tr></thead><tbody><tr><td>Windows Name</td><td>hmarine\epratt</td></tr></tbody></table> <p><b>Limits</b></p> <p>Soft Limit: 1.0 GB</p> <p>Hard Limit: 3.0 GB</p>	Type	User	Windows Name	hmarine\epratt
Type	User				
Windows Name	hmarine\epratt				

Click **Finish** to create the quota.

9. The **Results** page shows the status of the operation.

A green check mark specifies that the operation was completed successfully.

Wait until the job completes, and then click **Close**.

10. The new configuration is displayed in the **Quota Tree Properties** page.

Double-click the quota to verify that the **Windows Name**, **Tree Path**, **Soft Limit**, and **Hard limit** values are correct. Click **Close**.

At the top of the **Quota Tree Properties** this page, **check** the **Enforce User Quotas** checkbox.

Click **Apply** to commit the changes.

**Close** the window.

11. You have successfully configured a user quota on a Quota Tree.

This completes part 5 of the lab exercise.

## Testing User Quota on a Quota Tree Configuration

In this section you test the User Quota that was configured on the Quota Tree created previously in this lab exercise.

1. Open an **RDC** session to **WIN1**.
2. Log in to the **WIN1** system as user **epratt**:

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**.

Select **Use a different account**.

In the **Enter your credentials** window, input the following:

Username: **hmarine\epratt**

Password: **emc2Admin!**

Click **Ok**.

3. From the **WIN1** Desktop or system taskbar, open **File Explorer**.

Expand the **Local Disk (C: )** tree and open the **Big\_Files** folder.

4. Copy **1GBFile-1** and **1GBFile-2** to the clipboard.
5. From the **WIN1** system desktop, double-click the **Run** icon.

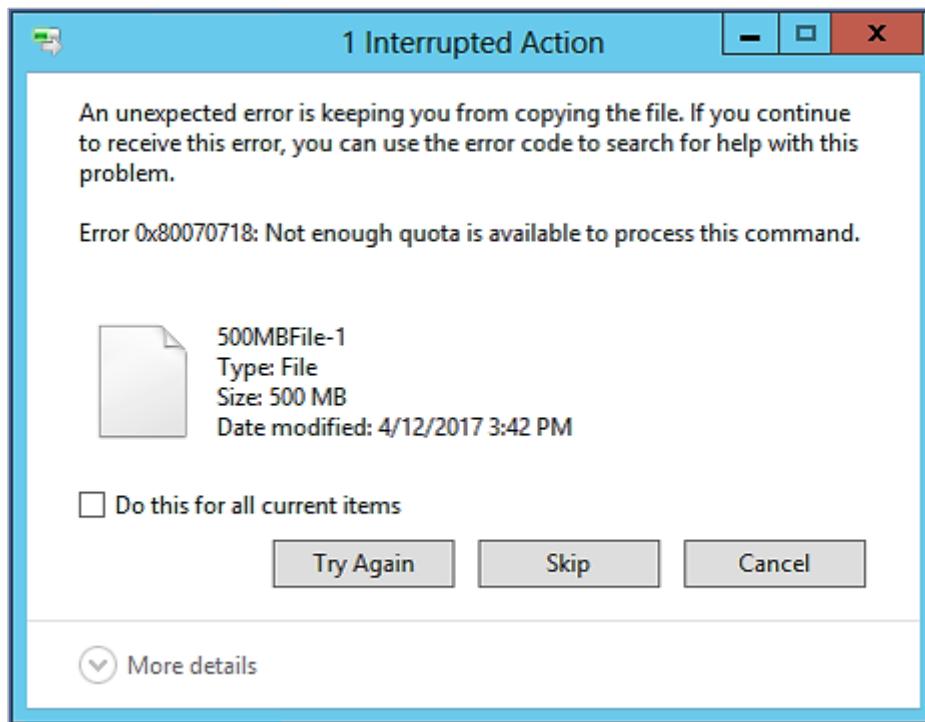
In the **Open** field, input **\NAS\_SMB\Engineering\_Data** and click **OK**.

The share opens.

6. Paste the files into the share. Wait for the copy operation to complete.
7. Now try copying the **500MBFile-1** and **750MBFile1** files from **Big\_Files** to **Engineering\_Data**.

## Lab Exercise: File System Quotas

One of the files is copied to the share but the copy of the second file is interrupted with the message displayed here:



Leave the error message open.

8. Return to the open Unisphere session.

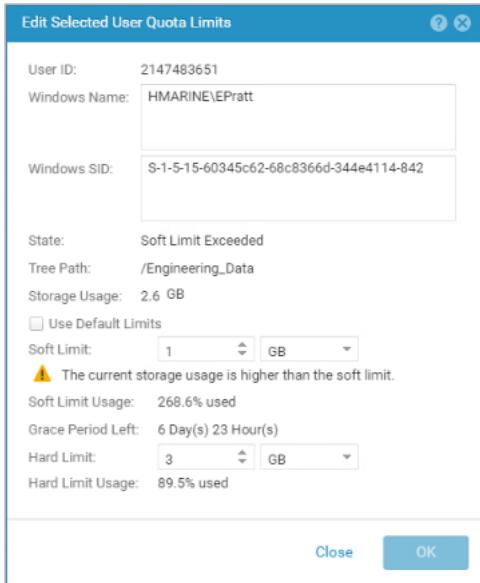
From the **User Quotas** tab in the **Quota Tree Properties** page, click the **Refresh** icon to update the information displayed.

Observe that the usage of the **Epratt** account has increased due to the copy operations. The hard limit was exceeded when trying to copy one of the last two files. Notice that one file did get copied to the share.

9. Verify the **User Quota** configuration for **Eldon Pratt**.

Double-click the user quota.

## Lab Exercise: File System Quotas



Notice that the Soft Limit has been exceeded and the Grace Period (7 days) has been activated.

Modify the **Hard Limit** to **5 GB**, and click **OK**.

10. Return to the **RDC** session to the **WIN1** system.
11. In the error message left open in a previous step, click **Try Again** to continue with the copy operation.

The operation should be successful this time. You should now see two 1GB files, one 750MB file and a 500MB file in the share.

The operation completes and all the files that are copied are on the share.

12. You have successfully configured and tested a User Quota on a Quota Tree.

Delete the copied files from the **\\\NAS\_SMB\Engineering\_Data** share.

Close the File Explorer windows and logoff the **RDC** session.

Return to the open Unisphere session.

In the **Quota Tree Properties** page, click **Close**.

In the **SMB\_fs Properties** page, click **Close**.

## Lab Exercise: File System Quotas

End of Lab Exercise

## Lab Exercise: Local LUN Move

### Scenario:

In this lab, you move a LUN from one storage pool to another.

In this lab, you perform the following tasks:

- Move an existing LUN to a different storage pool.
- Access data from the LUN before, during and after the move operation.
- Move the LUN back to its original storage pool.

## Lab Exercise: Local LUN Move

### Move a LUN

1. Establish a Unisphere session to the UnityVSA-Source system IP address: **192.168.1.113**. The login credentials are: **admin/Password123!**
2. Navigate to **Storage > Block > LUNs**. Select the **Linux1 LUN0**.

Verify the Pool that is associated to this LUN.

This LUN is provided from the FAST VP-1 storage pool. You will move the LUN to a different storage pool on the system. Before moving the LUN, you will access its data from the Linux1 host to see how the move operation is transparent to the host.

3. Launch a **PuTTY** session from the taskbar, and establish an SSH session to the **Linux1** system.



In the PuTTY screen **Host Name (or IP address)** field input: **Linux1** and click the **Open** button.

Click the **Open** button.

At the **login as:** prompt input: **root**

At the **password:** prompt input: **emc2Local!**

You are now logged in as root to the **Linux1** client as indicated by the **#** cursor symbol.

4. Verify that the host has the LUN mounted by running the **df -h** command.

Verify that the output shows the **/dev/emcpowera1** is mounted on **/emcpowera\_mp**.

If not already mounted, mount the file by running **mount /dev/emcpowera1 /emcpowera\_mp** command.

Access the LUN by running the **cd /emcpowera\_mp** command.

Run the `ls` command to see the LUN content.

Verify in the output a file named `newfile` and a folder named `lost+found`.

5. Next, create and run a script that displays the current date and lists the content of the LUN every two seconds.

This script will run during the LUN move operations to demonstrate how the move is transparent to the host data access on the LUN.

Enter the following: `while true; do date; ls -l; sleep 2; echo; done`

The script will continue displaying a varying time value on each loop to indicate it is still running.

6. Return to your open Unisphere session. With the **Linux1\_LUN0** selected, select **Move** from the **More Actions** list.

The **Move LUN** configuration window opens. Input the following configuration:

Session Priority: **Normal**

Pool: **FAST VP-2**

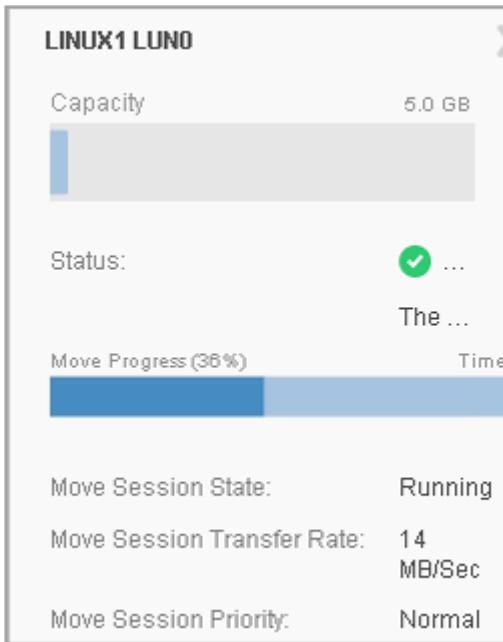
Thin: **Checked**

Data Reduction: **Not available for selection**

Click **OK** to perform the move operation.

The right side of the page displays the move session progress. It should show **Running** state.

## Lab Exercise: Local LUN Move



7. Return to your **PuTTY** session and verify that the script is still running. The second value in the date output will increment with each loop.

This verifies that the move operation does not affect host data access.

8. Return to the Unisphere session.

**Refresh** the page. The move session should now show **Completed**.

9. Initiate another **Move** operation to return the LUN to the **FAST VP-1** pool. From **More Actions**, select **Move**.

Set the following move configuration:

Session Priority: **High**

Pool: **FAST VP-1**

Thin: **Checked**

Data Reduction: **Not available for selection**

Click **OK** to perform the move operation.

Verify that the move status is **Running**.

10. Return to your **PuTTY** session and verify that the script is still running with the second value changing with each loop.

Stop the script by pressing the **<Ctrl> <c>** keyboard keys simultaneously.  
The script will stop and return the prompt.

Type **exit** to close the PuTTY session.

11. In the Unisphere session, refresh the screen and verify that the move operation is complete and the *Linux1 LUN0* is back on the *FAST VP-1* pool.

This completes the lab exercise.

## Lab Exercise: LUN Snapshots

### Scenario:

This lab demonstrates how to create snapshots of a LUN, create a snapshot schedule, apply a schedule time zone, access the snapshot from another host to see its point-in-time data state, and perform a restore operation.

In this lab, you perform the following tasks:

- Create a manual snapshot of an existing LUN.
- Create a snapshot schedule.
- Configure a host for snapshot access.
- Attach the host to the snapshot, and access its point-in-time data state.
- Perform write operations to the snapshot.
- Perform a snapshot restore operation to a LUN.

## Create Snapshot of a LUN

1. Launch an RDC session to **WIN1** and log in as local \administrator:

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**

Select **Use a different account**

From the **Enter your credentials** window, input the following:

Username: \administrator

Password: **emc2Local!**

Click **OK**.

2. From the WIN1 Desktop or taskbar launch **File Explorer**.

Select **WIN1 LUN0** drive, and open the text document that is created that you in the earlier exercise.

Add a line of text to the document: **This line was written to the LUN from WIN1 prior to the initial snapshot.**

Save and close the file.

3. From your Student Desktop system, establish a Unisphere session to the UnityVSA-Source system IP address: **192.168.1.113**. The login credentials are: **admin/Password123!**

Navigate to **Storage > Block > LUNs**, and double-click **WIN1 LUN0** to open its properties page.

4. Select the **Snapshots** tab and click the **+** icon to create a snapshot of the LUN.

The **Create Snapshot** window opens. In the **Name** field, replace the default system provided name with: **Initial\_snap**

## Lab Exercise: LUN Snapshots

In the **Description** field, type the current time as displayed from the Student Desktop taskbar.

Leave all other options at their default settings. The **Local Retention Policy** option has the **Pool Automatic Deletion Policy** selected to enable the snapshot to be retained until the pool the LUN was created from reaches a predefined capacity threshold, and then deletes the snapshot to return space back to the pool. The **Retain Until** option can be configured to retain the snapshot to a specified calendar date and time for up to a year. The **No Automatic Deletion** option prevents the snapshot from being deleted.

Click **OK** to create the snapshot.

The new snapshot is now listed in the **Snapshots** tab.

You have manually created a snapshot of an existing LUN.

5. With the LUN Snapshots tab still open, select the **Snapshot Schedule** option.

Click the **Snapshot schedule** dropdown to display a list of available schedules.

The list displays three system defined schedules. Select the **Default Protection** schedule, and review its creation and retention times. Select and review the other two systems defined schedules one at a time.

6. The system defined schedules cannot be modified or deleted. User-defined schedules can be created and customized to fit a wide range of snapshot needs.

Click the **New Schedule** button and the **Create Schedule** window opens. The window provides a snapshot frequency granularity that is hourly/daily/weekly based and also provides a retention policy configuration. You are going to configure a snapshot schedule that creates a snapshot every Monday morning at 7:00 AM and is retained for 7 days.

In the **Name** field input: **Monday AM Snap**

### **Snapshot Frequency: Unchecked**

The **Daily/Weekly** option should be **checked** along with each day of the week. **Uncheck Tue, Wed, Thu, Fri, Sat, Sun, and leave Mon checked.**

In the **Snapshot time** dropdown list, select **7:00 AM**

The **Retention Policy** section should have the **Retain for** radio button selected and set to **7 Days**.

Click the **Create** button to create the schedule.

7. The newly created schedule is now listed in the **Snapshot schedule** field.

Click the **Apply** button to schedule snapshots for the LUN.

A **Modify Schedule** window is displayed. Review the message and click **Yes** to continue.

Snapshots of the LUN will now be created and retained automatically by the system.

**Close** the **Snapshots** tab window.

8. Change the schedule time zone.

Navigate to **PROTECTION & MOBILITY > Snapshot schedule**.

Double-click the **Monday AM Snap** to open its properties page.

Click the **Change schedule time zone** link.

The system **Settings** page opens to the **Configure Schedule Time Zone** portion of **Management**.

By default the **Schedule Time Zone** is set to **UTC Legacy**.

Expand the **Schedule Time Zone** list and select **(UTC-05:00 Eastern Time US & Canada)**.

## Lab Exercise: LUN Snapshots

Click **Apply**.

A **Changing time zone** message is displayed. Read the message. Click **Yes** to accept the change.

**Close the Settings** window.

**Close the Monday AM Snap Properties** window.

9. Identify the schedule time zone change impact on existing schedules.

The Unisphere session should display the **Snapshot Schedule** page with the **Monday AM Snap** schedule selected.

Click the **Refresh** icon to refresh the **Snapshot Schedule** page.

On the right side slide-out panel, notice the **Description** for the schedule and the change in creation time due to the schedule time zone change. Changing the time zone schedule impacts schedule timing of existing schedules.

Double click the **Monday AM Snap** schedule to open its properties page.

Change the **Snapshot Time** back to **7:00 AM**.

Click **Apply**.

**Close the Monday AM Snap Properties** window.

One by one, select each of the system defined schedules to see the impact of the schedule time zone change. Also note that, unlike the user defined **Monday AM Snap**, the system defined schedules cannot be modified.

10. Open the existing RDC session to the **WIN1** host.

From the open **File Explorer** window, open the text document on the **WIN1 LUN0** drive.

Add the following line of text: **This line was written to the LUN from WIN1**

**after the initial snapshot was taken.**

**Save and Exit** the file.

This completes part 1 of the lab exercise.

## Lab Exercise: LUN Snapshots

## Access a LUN Snapshot

1. Access the LUN snapshot from another Windows host.

From your Student Desktop system taskbar, launch the RDC application and establish an **RDC** session to the **WIN2** host as the local administrator.

In the **Computer(s)**: Click the **Connect** button.

From the **Windows Security** window, select **More choices**.

Select **Use a different account**.

From the **Enter your credentials** window, input the following:

Username: \administrator

Password: **emc2Local!**

**Click OK.**

2. The **WIN2** host must be registered to the UnityVSA-Source system. A first step is to connect its iSCSI initiator to the array.

From the WIN2 system taskbar, click the **iSCSI Initiator** icon to launch the application.



Select the **Discovery** tab. Click the **Discover Portal** button. In the **Discover Target Portal** window, in its **IP address or DNS name** field input:

192.168.3.100

Click **OK** to close the **Discover Target Portal** window.

Select the **Targets** tab. In the **Discovered targets** section, the UnityVSA-Source IQN is displayed with an **Inactive** status. Click the **Connect** button to connect the initiator to the target.

In the **Connect to Target** window, **check** the **Enable multi-path** checkbox. Click the **Advanced** button.

From the **Advanced Settings** window, in the **Local adapter** dropdown list, select **Microsoft iSCSI Initiator**.

In the **Initiator IP** dropdown list, select **192.168.3.107**.

From the **Target portal IP** dropdown list, select **192.168.3.100 /3260**.

Click **OK** to configure the settings.

Click **OK** in the **Connect To Target** window.

Click **OK** to close the **iSCSI Initiator Properties** window.

3. From the Student Desktop system Unisphere session, go to **Access > Hosts** and click the **+** icon and select **Host** from the list to add a new Host. The wizard to add a new host opens. Input the following configuration:

Name: **WIN2**

Operating System: **Windows Server**

Network Address: **192.168.2.11**

Click the **Next** button to continue the wizard.

In the **Select Discovered Initiators or Manually Add Initiators** section, the WIN2 host initiator IQN is displayed.

**Check** the initiator checkbox and click **Next** to continue the wizard.

In the **Review the host configuration** section, a summary of the host configuration is displayed as shown here:

## Lab Exercise: LUN Snapshots

Add a Host

<input checked="" type="checkbox"/> Name	Review the host configuration
<input checked="" type="checkbox"/> Initiators	Name: WIN2
<input type="radio"/> Summary	Description:
Results	Operating System: Windows Server
	Network Addresses: 192.168.2.11
	Tenant:
Initiators to be registered with this host	
Protocol	Initiator IQN/WWN
iSCSI	iqn.1991-05.com.microsoft:win2.hmarine.test

Click **Finish** to add the host.

The **Results** window displays the status of the operation to add the host. When it has completed successfully **Close** the window.

The **WIN2** host should now be listed in the **Hosts** window with **1** displayed in the **Initiators** column.

4. Next, attach the snapshot (initial\_snap) to the WIN2 host.

In Unisphere, go to **Storage > Block > LUNs** and select the **WIN1 LUN0** and click the **Edit** icon to open its properties page.

Select the **Snapshots** tab, and **check** the checkbox for the **Initial\_snap** if not already selected.

From the **More Actions** dropdown list, select the **Attach to host** action.

Click the **+** icon to configure access. In the **Access Type** dropdown list, select **Read/Write**.

**Check** the checkbox for **WIN2**, and click **OK**.

When attaching a host to a snapshot with **Read/Write** access type, by default an option is checked to automatically create a copy of the existing snapshot to preserve its data state. Keep the option to create the copy checked, but in the **Name** field, remove the system provided name and enter: **Initial\_snap\_copy** and then click **OK** to create the copy and attach the host.

A snapshot copy is made, and the host is attached to the **Initial\_snap** snapshot with read/write access.

5. Open the existing RDC session to the **WIN2** host. From the Desktop or taskbar, click the **Server Manager** icon to launch the application.



- ## **6. Navigate to File and Storage Services > Volumes > Disks.**

From the upper right corner **Tasks** dropdown, select **Rescan Storage**.

Click **Yes** to the **Rescan Storage** message.

A **5.00 GB** disk is listed, Right-click it and select **Bring Online**. A **Bring Disk Online** window is displayed. Click **Yes** to bring the disk online.

In the **Volumes** section, the new disk is assigned a drive letter.

7. From the WIN2 taskbar, launch **File Explorer** and select **WIN1 LUN0** drive.

Open the text document. Is the line of text present in the file that you entered from the **WIN1** host before the initial snapshot?

Is the line of text present in the file that you entered from the WIN1 host after the initial snapshot was created? \_\_\_\_\_

**Explain the results.**

8. Add the following line of text to the file: **This line was written to the LUN snapshot from WIN2.**

**Save** and **Exit** the file.

Open the **New Text Document** again, was the line written to the file?

## Lab Exercise: LUN Snapshots

Close the file.

9. Next, remove the snapshot disk from the host.

In **Server Manager** under **Disks**, right-click the **5.00 GB** disk and select **Take Offline**.

In the **Take Disk Offline** window, click **Yes** to offline the disk.

The disk status is shown as **Offline**.

Close **Server Manager**. In **File Explorer** the **WIN1 LUN0** drive is no longer present.

Close **File Explorer** and logoff from the **WIN2** RDC session.

10. Open the existing Unisphere session.

From the **WIN1 LUN0 Properties** page **Snapshots** tab, the **Initial\_snap** should still be **checked**. If not, check it.

From the **More Actions** dropdown, select **Detach from host** from the list.

Click **Yes** in the **Detach confirmation** window. **No** should now be displayed in the **Attached** column for the **Initial\_snap**.

Close the **WIN1 LUN0 Properties** window.

This completes part 2 of the lab exercise.

## Restore a LUN from a Snapshot

1. Open the existing RDC session to the WIN1 host.

In its open **File Explorer** window with the **WIN1 LUN0** drive selected, open the text document. Is the line of text that was written to the snapshot from the WIN2 host present in the file?

---

Why? \_\_\_\_\_

---

Add the following line of text to the file: **This line was written to the LUN from WIN1 after the initial snapshot was taken and before the Restore operation.**

Save and close the file

2. Launch **Server Manager** from the **WIN1** taskbar.

Navigate to **File and Storage Services > Volumes > Disks**.

Right-click the **5.00 GB** disk and select **Take Offline** from the list. In the **Take Disk Offline** window, click **Yes** to offline the disk.

The disk now shows **Offline** status.

In **File Explorer**, verify that the **WIN1 LUN0** drive is no longer present.

3. From your Student Desktop system, open the existing Unisphere session.

From the **WIN1 LUN0 Properties** page **Snapshots** tab, the **Initial\_snap** should still be **checked**. If not, **check** it.

From the **More Actions** dropdown, select **Restore** from the list.

The system automatically creates a backup snapshot of the LUN to preserve its state before initiating a restore operation. The **Restore** window provides a field for the snapshot name and provides a message recommending to quiesce IO from the host.

## Lab Exercise: LUN Snapshots

Click **OK** to perform the snapshot restore operation.

The LUN has now been restored to the data state that the **Initial\_snap** snapshot captured.

4. Open the existing RDC session to **WIN1**.

Launch the **Server Manager** application and navigate to **File and Storage Services > Volumes > Disks**. Right-click the **5.00 GB** disk and select **Bring Online** from the list.

In the **Bring Disk Online** window, click **Yes** to bring the disk online.

In the **Volumes** section, the disk now is assigned a drive letter.

In the open **File Explorer** window with the **WIN1 LUN0** drive selected, open the text document.

Is the line of text written to the LUN by **WIN1** prior to the initial snapshot present in the file?

---

Is the line of text written to the LUN by **WIN1** after the initial snapshot and prior to the restore present in the file? \_\_\_\_\_

Is the line of text written to the snapshot from **WIN2** present in the file?

Explain the data seen in the file.

---

---

5. Close the file, and close **File Explorer**.

Close **Server Manager**.

Log off the **WIN1** RDC session.

This completes the LUN Snapshot lab exercise. You have created a LUN snapshot and a snapshot schedule, and set a schedule time zone. You

## Lab Exercise: LUN Snapshots

accessed a LUN snapshot to see its captured data state and wrote to the snapshot. You also performed a Snapshot restore operation to restore a LUN to the data state captured in the snapshot.

End of Lab Exercise

## Lab Exercise: File System Snapshots

### Scenario:

This lab demonstrates how to schedule snapshots, create snapshots manually, configure access to snapshots, and access snapshots.

In this lab, you perform the following tasks:

- Enable a snapshot schedule during file system creation.
- Create a manual snapshot of existing file systems.
- Configure access to a read/write snapshot and perform write operations to it.
- Access read-only snapshots from an SMB Windows client and from an NFS Linux client.

## Enable Snapshot Schedule During File System Creation

Introduction to task.

1. Establish a Unisphere session to the UnityVSA-Source system IP address: **192.168.1.113**. The login credentials are: **admin/Password123!**
2. In Unisphere, go to **Storage > File > File Systems**. Click the **+** icon to create a file system.

The **Create a File System** wizard opens. In the **Protocol** section, select the **Windows Shares (SMB)** radio button. In the **NAS Server** list, the **NAS\_SMB (Replication: No, Multiprotocol:No)** is listed for the NAS Server.

Click **Next** to continue the wizard.

In the **Name** field input: **DP\_fs**

In the **Description** field input: **Data Protection file system**

Click **Next** to continue the wizard.

On **Configure the File-level Retention**, leave the **Off** radio button selected and click **Next**.

In the **Pool** field, select **FAST VP-2**. Configure the **Size** to be **5 GB**. Leave all other settings at default. Click **Next** to continue the wizard.

In the **Shares > Configure the Initial Share** section, **check** the **SMB Share (Windows)** checkbox. Name the share: **DP\_FS\_share**. Click **Next** to continue the wizard.

In the **SMB Share's Other Settings > Configure the SMB Share's Other Settings** section, keep the defaults. Click **Next** to continue the wizard.

In the **Snapshot > Configure Snapshot Schedule** section, **check** the **Enable Automatic Snapshot Creation** checkbox.

From the **Snapshot schedule** dropdown, select the **Protection with longer retention** schedule from the list. Click **Next** to continue the wizard.

You will not configure **Replication**. Click **Next** to continue the wizard.

## Lab Exercise: File System Snapshots

The **Summary** section displays the details of the file system creation. Click **Finish** to perform the creation operation.

The **Results** section displays the status of the file system creation. **Close** the window when the operation completes successfully.

The new **DP\_fs** file system is displayed in the list.

3. **Check** the **DP\_fs** file system checkbox and click the **Edit** icon to open its properties page.

Select the **Snapshots** tab, and go to the **Snapshot Schedule** page. It displays the schedule that is enabled that was during the file system creation. The schedule will automatically create snapshots every morning and retain them for 7 days.

Navigate to the **Snapshots** page. There are no snapshots of the file system yet, because the scheduled time for the automatic creation has not yet occurred. The system creates snapshots of the file system that are read-only and named based on the date and time the snapshot was created.

Leave the page open in Unisphere.

4. Access the DP\_fs file system share, and create data on it before creating any snapshots.

Launch the **RDC** application, and establish an RDC session to **WIN1** as the Domain administrator.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**

Select **Use a different account**

From the **Enter your credentials** window, input the following:

Username: **hmarine\administrator**

Password: **emc2Admin!**

Click **OK**.

5. From the **WIN1** system taskbar, click the **Run** icon. In the **Open** field input: **\NAS\_SMB\DP\_FS\_share** and click the **OK** button. The share window opens.

Right-click in the share window, and select **New > Text Document**. Open the file and input the following text: **This line was written to the file system prior to any snapshot creation.**

Save and close the file.

This completes part 1 of the lab exercise.

## Create Read/Write and Read-Only File System Snapshots

- From the existing Unisphere session, from the **Snapshots** tab, click the + icon to create a snapshot.

In the **Name** field input: **First\_snap\_ro**.

In the **Description** field input: **This is the first snapshot of the file system. It is a read-only snap.**

Leave the **Retention Policy** set to **Pool Automatic Deletion Policy**.

Leave the **Access Type** set to **Read-only (hidden .CKPT access)**.

Click the **OK** button to create the snapshot.

The new snapshot is now listed.

- Open the existing RDC session to **WIN1**. In the share window, open the **New text document** and add the following line to the file: **This line was added after the first read-only snapshot was created.**

Save and close the file.

- Return to your open Unisphere session. In the **Snapshots** tab, click the + icon to create a snapshot.

In the **Name** field input: **Second\_snap\_rw**. In the **Description** field input: **This is the second snapshot of the file system. It is a read/write snap.**

Leave the **Retention Policy** set to **Pool Automatic Deletion Policy**.

Select the radio button to set the **Access Type** to **Read/Write (shares)**.

Click the **OK** button to create the snapshot.

The page now lists the two manually created snapshots: one read-only snap and one read/write snap.

## Lab Exercise: File System Snapshots

DP_fs Properties							
General	Snapshots	FAST VP	Replication	Quota	Advanced		
<b>Snapshots</b>		+			More Actions	2 items	
Snapshot Schedule		<input checked="" type="checkbox"/>	Name	State		Taken	Auto-Delete
		<input checked="" type="checkbox"/>	first_snap_ro	Ready		3/21/2018, 9...	Yes
		<input checked="" type="checkbox"/>	second_sn...	Ready		3/21/2018, 9...	Yes
							Taken By
							admin
							Shared
							No
							Hidden.ckpt...
							Share

**Close** the properties window.

4. Open the existing RDC session to **WIN1**. In the share window, open the **New text document** and add the following line to the file: **This line was added after the second read/write snapshot was created.**

Save and close the file.

5. Place some data on the **NFS\_fs** file system before creating a snapshot of it.

From your Student Desktop system taskbar, click the **PuTTY** icon to launch the application and establish an SSH session to the **Linux1** system.

In the PuTTY screen **Host Name (or IP address)** field input: **Linux1** and click the **Open** button.

At the **login as:** prompt input: **root**

At the **password:** prompt input: **emc2Local!**

Mount the engineering NFS share by issuing the command:

```
mount 192.168.1.116:/engineering /nfs
```

Verify that the client is mounted to the remote file system.

Issue the command: **df -h**

Its output should show the **filesystem 192.168.1.116:/engineering** mounted on **/nfs**.

Switch user to epallis by issuing the command: **su epallis**

Access the NFS share by issuing the command: **cd /nfs**

## Lab Exercise: File System Snapshots

Add a line of text to the epallis file by issuing the command: `echo "this is text written to the file prior to the read-only snapshot of the file system." >> epallis`

The line of text will be appended to the end of the epallis file. Verify that the text is present by issuing the command: `more epallis`

6. Create a read-only snapshot of the NFS\_fs file system.

Return to your open Unisphere session. Navigate to **Storage > File > File Systems** and select the **NFS-fs** file system by placing a **check** in its checkbox and clearing any other checkboxes.

Click the **Edit** icon to open the properties page and select the **Snapshots** tab. Click the **+** icon to create a new snapshot.

In the **Name** field input: **NFS\_cvfs**. In the **Description** field input: **This is a read-only snapshot to be accessed via NFS using the .ckpt data path.**

Leave the **Retention Policy** set to **Pool Automatic Deletion Policy**.

Leave the **Access Type** set to **Read-only (hidden .CKPT access)**

Click the **OK** button to create the snapshot.

The page now lists the new read-only snapshot.

**Close the Snapshots** window.

7. Return to the open SSH session to **Linux1**.

Add a line of text to the epallis file by issuing the command: `echo "this is text written to the file after the creation of the read-only snapshot of the file system." >> epallis`

Verify that the text was appended to the end of the epallis file by issuing the command: `more epallis`

This completes part 2 of the lab exercise.

## Access Read/Write and Read-Only File System Snapshots

1. Accessing read/write snapshots requires creating a specific share to the snapshot. In this step, you create an SMB share to the read/write snapshot of the **DP\_fs** file system.

From the existing Unisphere session on your Student desktop, go to **Storage > File > SMB Shares** and click the **+** icon to create a new SMB share.

The **Create a SMB Share** wizard opens.

From the **Select a source for the new share** window, click the grid in the **File System** field.

The **Select a File System for share creation** window opens.

Click the **DP\_fs** file system and click on **Select**.

From the **Select a source for the new share** window, select the **Snapshot for File System “DP\_fs”** radio button.

From the dropdown list, select the **Second\_snap\_rw** snapshot.

Click **Next** to continue the wizard.

In the **Share Name** field input: **DP\_fs\_RW\_snap\_share**

Leave the **Local Path** setting as is to create a top-level share. Click **Next** to continue the wizard.

In the **Advanced > Provide SMB share details** section, leave the default settings in place, and click **Next** to continue the wizard.

The **Summary** screen displays the share configuration to be created. Click **Finish** to begin the creation operation.

The **Results** screen displays the share creation process. **Close** the window when the share is successfully created.

The newly created **DP\_fs\_RW\_snap\_share** is now listed.

2. Open the existing RDC session to **WIN1**. It should have an open window to the **DP\_FS\_share**.

## Lab Exercise: File System Snapshots

From the Student Desktop or system taskbar, click the **Run** icon to open another window to the read/write snapshot share.

In the **Open** field input: **\lNAS\_SMB\DP\_fs\_RW\_snap\_share** and click the **OK** button.

The share window opens.

There should now be two open share windows: one to the file system share **DP\_FS\_share** and one to the RW snapshot share **DP\_fs\_RW\_snap\_share**.

From each window, open the existing **New Text Document** and compare them.

What are the differences between the content of the two files?

---

Why? \_\_\_\_\_

3. Close the file opened from the **DP\_FS\_share**.

Add the following line of text to the **New Text Document** opened from the **DP\_fs\_RW\_snap\_share**: **Text added to the RW snapshot**.

Save and close the file.

Open the file from the **DP\_fs\_share**. Is the newly added line to the **DP\_fs\_RW\_snap\_share** present in this file? \_\_\_\_\_

Why? \_\_\_\_\_

Close the file.

Close the share window to the RW Snapshot share **DP\_fs\_RW\_snap\_share**.

4. You will now access the read-only snapshot of the **DP\_fs** using the snapshot **CVFS** mechanism.

From your open **DP\_FS\_share** window, right-click in the white space and select **Properties**.

The **dp\_fs\_share (\lNAS\_SMB) Properties** window opens.

Select the **Previous Versions** tab.

The **Folder versions** section lists read-only snapshots of the file system with a date and time timestamp when the snapshot was taken. You should see the read-only snapshot that you created manually. If time had elapsed for the snapshot schedule to have automatically created snapshots, they would be listed here.

Select the snapshot you manually created, and click the **Open** button.

A new window opens with the snapshot path listed in its navigation field.

Open the existing **New Text Document**.

What data state is captured by the file on the snapshot?

---

Close the text document.

Right-click the **New Text Document** file to display the list of operations that can be done to the file. Is the **Delete** option present?

---

Why? \_\_\_\_\_

Close the **Previous Versions** window. (Leave the **dp\_fs\_share (\nas\_smb) Properties** open).

5. From the **Network >NAS\_SMB > DP\_FS\_share** window, right-click the **New Text Document** to display the list of operations. Is the **Delete** option present?
- 

**Delete** the file. Did it get deleted? \_\_\_\_\_

Why? \_\_\_\_\_

6. You can now recover the original file from the read-only snapshot. In the open **DP\_FS\_share (NAS\_SMB) Properties** window, highlight the **dp\_fs\_share** folder and select **Restore**.

Select **Restore** to the **Previous Versions** messages, and click **OK**.

## Lab Exercise: File System Snapshots

Did the file get copied to the file system?

---

Close the open windows to the file system share and the read-only snapshot.

Log off the **WIN1** RDC session.

7. Access the read-only snapshot of the file system from the **Linux1** NFS client.

Access the existing SSH session to list the content of the NFS share by issuing the command: `ls -la /nfs`

Verify that you see the **epallis** file.

Issue the following command to see the file content: `more /nfs/epallis`

This is the file that resides on the file system. To view and access the read-only snapshot of the file system, you must explicitly use the hidden `.ckpt` data path. You will then see a snapshot folder having a date/time name format for when the snapshot was created. To see the read-only snapshot, issue the following command: `ls -la /nfs/.ckpt`

Record the snapshot folder name. \_\_\_\_\_

To access the snapshot, change directory into the snapshot folder name using the following command: `cd /nfs/.ckpt/<snapshot folder name>`

List the content of the snapshot by issuing the following command: `ls -la`

You should see the **epallis** file.

Look at the file content using the following command: `more epallis`

Is the content of the **epallis** file on the snapshot different than the content of the file on the file system?

---

Why? \_\_\_\_\_

8. Stop accessing the NFS export by issuing the following command: `cd /`

Log off the **epallis** user by issuing the following command: `exit`

## Lab Exercise: File System Snapshots

Unmount the file system by issuing the following command: `umount /nfs`

Disconnect the SSH session by issuing the following command: `exit`

This completes the lab exercise. You have applied a snapshot schedule to a file system during its creation. You have created manual Read/Write and read-only snapshots of file systems and have accessed them.

End of Lab Exercise

## Lab Exercise: Thin Clones

### Scenario:

The lab demonstrates how to configure a Thin Clone resource on Dell EMC Unity storage system.

This lab also demonstrates how to refresh a Base LUN.

In this lab, you perform the following tasks:

- Create a Thin Clone from a base LUN.
- Verify Thin Clone snapshot and clone configuration.
- Restore a Base LUN to its original contents from a Thin Clone.

## Create a Thin Clone

In this lab, you create Thin Clones from snapshots of a Base LUN, write data to the LUN, and then perform a refresh of the Base LUN from the Thin Clone snapshot.



**Note:** The lab requires you to go back between Unisphere and the RDC session to WIN1. Also pay attention to the LUNs as they are presented to the Windows host. Clones inherit the name of the Base LUN and the disk numbers increase as the LUNs are made available to the host. In the lab you will see three 15 GB disks created, one for the original Base LUN, and one each for the Thin Clones created.

1. Establish a Unisphere session to the UnityVSA-Source system IP address: **192.168.1.113**. The login credentials are: **admin/Password123!**
2. Navigate to **Storage > Block > LUNs**.

Create a LUN with the following properties:

Number of LUNs: **1**

Name: **Base LUN**

Description: **Base LUN for the Thin Clone family**

Pool: **Capacity**

Tiering Policy: **Start High Then Auto-Tier**

Size: **15 GB**

Thin: **Checked**

Host I/O Limit: **No Limit**

Click **Next**.

3. From the **Configure Access** window, click the **+** icon and **check** the **WIN1** host from the list of available hosts.

Click **OK**.

## Lab Exercise: Thin Clones

**WIN1** should be displayed with a green icon.

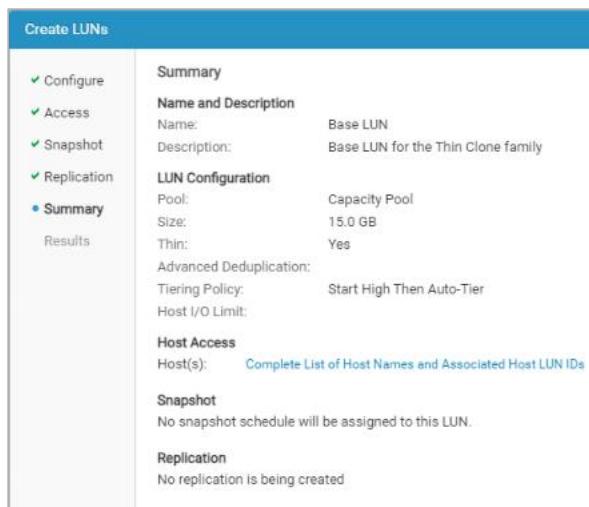
Click **Next**.

4. Click **Next** to the **Snapshot** and **Replication** windows.

5. Review the **Summary** page.

Click **Finish** and verify that the LUN was created successfully.

**Close** the window.



6. Open an RDC session to **WIN1** and login as a local administrator.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**

Select **Use a different account**

From the **Enter your credentials** window, input the following:

Username: \administrator

Password: emc2Local!

Click **OK**.

7. From the **WIN1** system taskbar, click the **Computer Management** icon.

Click **Storage > Disk Management**.

If the new 15 GB disk is not listed, perform a **Rescan Disks**.

Record here the disk number of the new 15 GB disk: \_\_\_\_\_

Bring the new **15 GB** disk Online.

**Initialize** the disk using the defaults values.

Create a **New Simple Volume**.

Accept all the defaults except for **Volume label**.

Name the volume **Base LUN**.

Perform a **quick format**.

Once formatted, open the **Base LUN**.

8. Expand the **Local Disk (C:)** tree and open the **Big\_Files** folder.

Select the first four 1 GB files, and copy the files to the **Base LUN**.

Leave the **Computer Management** window open.

**Note:** You may see a window open by Microsoft asking if you want to format the disk, select **Cancel**.

9. From Unisphere, go to **Storage > Block > LUNs**.

Check the **Base LUN** box, and click the **Edit** icon.

10. From the **Base LUN Properties** window, select the **Snapshots tab**.

Select the **+** icon to create a Snapshot called **Snap1\_Base\_LUN4GB**

Set the **Local Retention Policy** to **No Automatic Deletion**.

Click **OK**.

## Lab Exercise: Thin Clones

The snapshot is created. Note the time at which the snapshot was taken. Also note the **Auto-Delete** and **Attached** columns. To create a Thin Clone, these columns should display a status of **No**.

**Close** the window.

11. With the **Base LUN checked**, from the **More Actions** dropdown, select **Clone**.

The **Populate Thin Clone** window is displayed. You have an option of using an existing snapshot of the Base LUN or creating a new version of the **Base LUN**.

Take the default to create a Clone using the existing snapshot of the Base LUN. (**Snap1\_Base\_LUN4GB**)

**Check** the box for **Snap1\_Base\_LUN4GB**, and click **Next**.

12. From the **Configure Thin Clone** window, input the following:

Name: **TC1\_Snap1\_Base\_LUN4GB**

Click **Next**.

The **Configure Access** window is displayed.

Click the + icon, add host **WIN1**, and close the window.

Click **Next** to the next three windows.

Click **Finish** on the **Summary** page to create the clone.

From the **Results** page, verify that the Thin Clone was created.

**Close** the window.

The Clone should be displayed in the **LUNs** page.

Select **TC1\_Snap1\_Base\_LUN4GB**.

View the clone properties from the right-hand window.

What is the Thin Clone Base LUN? \_\_\_\_\_

What is the Clone Source LUN? \_\_\_\_\_

13. From **WIN1**, open **Computer Management** if not already open.

Perform a **Rescan Disks** of the storage from **Disk Management**. Note the disk numbers for the disks.

Record here the number of the new 15 GB disk: \_\_\_\_\_

Take the current Base LUN Offline.

Bring the new 15 GB disk **Online**, and open the disk.

How many files are on the disk? \_\_\_\_\_

Copy the last two remaining files (**500MB** and **750MB**) from **Big\_Files** folder to the open LUN.

Close the LUN.

**TC1\_Snap1\_Base\_LUN4GB** now contains **six** files.

14. Take the current Base LUN **Offline**.

Perform **Rescan Disks**, then bring the first **15 GB** LUN **Online** and open the LUN.

Did the two new files get written to the **Base LUN**? \_\_\_\_\_

**Close** the LUN.

15. In Unisphere, create a snapshot of **TC1\_Snap1\_Base\_LUN4GB**.

From the LUNs window, select **TC1\_Base\_LUN4GB** and click **Edit**.

Select the **Snapshots** tab. Use the **+** icon to create a snapshot.

Name: **Snap2\_TC1\_Base\_LUN6GB**

Set the **Retention Policy** to **No Automatic Deletion**.

Apply the changes.

Verify that the snapshot appears under **Snapshots** and close the window.

## Lab Exercise: Thin Clones

**Close** the window.

16. Next, create a Thin Clone of **Snap2\_TC1\_Base\_LUN6GB**.

If not already selected, select **TC1\_Snap1\_Base\_LUN4GB** and from the **More Actions** dropdown select **Clone**.

From the **Populate Thin Clone** page, verify the radio button for **Clone using an existing snapshot of LUN TC1\_Snap1\_Base\_LUN4GB** is selected.

**Check** the box for **Snap2\_TC1\_Base\_LUN6GB**, and click **Next**.

17. From the **Configure Thin Clone** window, Provide a Name:

Name: **TC2\_Snap2\_Base\_LUN6GB**

Click **Next**.

Configure Host Access for **WIN1**.

Click **Next** to the next three windows.

View the **Summary** page and click **Finish**.

Verify that the Thin Clone was created and close the window.

The Clone should be displayed in the LUNs page.

Highlight **TC2\_Snap2\_Base\_LUN6GB**.

View the Clone from the right-hand window.

What is the Thin Clone Base LUN? \_\_\_\_\_

What is the Source LUN? \_\_\_\_\_

18. From the **WIN1**, open **Computer Management** if not already open.

Perform a **Rescan Disks** of the storage from **Disk Management**. Note the disk numbers for the disks. A fourth disk is displayed.

Record here the Disk number for the newest 15 GB disk: \_\_\_\_\_

Take the current Base LUN **Offline**. (the first 15 GB disk).

Bring the most recent **15 GB** disk Online and open the LUN.

How many files are on the disk? \_\_\_\_\_

Delete all but the first **1 GB** file.

Close the LUN window.

**TC2\_Snap2\_Base\_LUN6GB** now contains **one** file.

19. Offline the current Base LUN (the most recent 15 GB disk).

Perform **Rescan Disks** and **Online** the original 15 GB disk (Base LUN) and open it.

How many files are on the disk? \_\_\_\_\_

This verifies that changes that are made to the Clone do not affect the Base LUN.

Close the **Base LUN** window.

20. You have taken two snapshots and created two Thin Clones from those snapshots.

This completes part 1 of the lab exercise.

## Refresh a Base LUN from a Thin Clone Snapshot

In this lab section, you refresh the contents of the Base LUN from a Thin Clone snapshot and verify the contents of the Base LUN.

1. In Unisphere, go to **Storage > Block > LUNs**.

Check the box for **Base LUN** and select **Refresh** from the **More Actions** dropdown (clear any other LUNs).

Read the **Host Access Message**. Click **Yes**.

2. The **Refresh Base LUN** window is displayed.

By default, a new snapshot is created using the current timestamp.

Leave the default name.

The window displays all the available snapshots that you can select to refresh the Base LUN. Read the line at the bottom about eligible snapshots.

From the **Select a snapshot to refresh from** window, **check** the **Snap2\_TC1\_Base\_LUN6GB** snapshot and click **OK**.

3. From **WIN1**, perform **Rescan Disks**.

**Offline** the original Base LUN, and then **Online** the **Base LUN**.

Open the LUN. It should display the six files since you refreshed the LUN with the contents of **TC2\_Snap2\_Base\_LUN6GB**.

Close the LUN.

4. In Unisphere: From the LUNs page, select the **Base LUN**, Select **Refresh** from the **More Actions** dropdown.

Click **Yes** to the message.

Leave the **Snapshot name** at the default.

You should see all available snapshots.

Select **Snap1\_Base\_LUN4GB**, and click **OK**.

5. From **WIN1**, perform **Rescan Disks**.

**Offline** the original Base LUN, then **Online** the Base LUN.

Open the LUN. The LUN should display the original 4 GB files since you refreshed the **Base LUN** with the contents of **Snap1\_Base\_LUN4GB**.

Close the window.

You have refreshed the Base LUN from two different images.

6. The next few steps have you clean up the resources that were created for the exercise.

In Unisphere: Remove Host access to the LUNs.

To remove Host Access to the LUNs, go to the **Storage > Block > LUNs page**.

Select the **Base LUN**, and click the **Edit** icon.

Select the **Host Access** tab.

Check the box for **WIN1**, Click the **Trash can** icon (Remove Access).

Select **Remove** to the **Confirm Remove** message.

**Close** the window.

7. Remove Host Access for the other Thin Clones:

- **TC1\_Snap1\_Base\_LUN4GB**
- **TC2\_Snap2\_Base\_LUN6GB**

8. Delete all the created storage resources.

Select **TC1\_Snap1\_Base\_LUN4GB** and click the **Trash can** icon.

Repeat for the other Thin Clone.

Repeat for the **Base LUN**.

From the WIN1 RDP session, close **Computer Management**.

## Lab Exercise: Thin Clones

Close the RDP session to **WIN1**.

9. You have successfully created Thin Clones within a single the Base LUN family and restored the Base LUN from a snapshot of a Thin Clone.

This concludes the Thin Clone lab exercise.

## Lab Exercise: Asynchronous Remote Replication

### Scenario:

This lab demonstrates how to create Asynchronous remote replication sessions for LUNs, NAS servers, and their associated file systems. LUN and file system Snapshots are also replicated. Perform replication Failover, Failback, Failover with sync, and Resume operations.

In this lab, you perform the following tasks:

- Configure Replication communications between two Unity systems by creating Replication Interfaces and Replication Connections.
- Create a remote replication session for a LUN.
- Create remote replication sessions for a NAS Server and its associated file systems.
- Replicate LUN and file system snapshots
- Perform Failover, Failback, Failover with Sync, and Resume operations on the sessions testing data access with each operation.

### More References:

- EMC Unity: Replication Technologies A Detailed Review white paper

## Create Replication Communications

In this part of the lab, you configure replication between the UnityVSA-Source and UnityVSA-Destination storage systems.

1. From your Student Desktop system taskbar, launch a browser and establish a Unisphere session to the UnityVSA-Source system at IP address **192.168.1.113**.

Open another browser tab from the + icon, and establish a Unisphere session to the UnityVSA-Destination system at IP address **192.168.2.113**.

The login credentials for both systems are **admin/Password123!**

2. The first replication communications channels are the Interfaces that are used for replication on both systems. The Interfaces establish an IP connection between the systems to carry the replicated data.

In the Unisphere session to the UnityVSA-Source system, go to **Protection & Mobility > Interfaces**. Click the + icon to create an Interface for replication.

In the **Ethernet Port** dropdown list, select **Ethernet Port 2**.

In the **SPA IP Address** field, input: **192.168.5.100**.

In the **Subnet/Prefix Length** field input: **255.255.255.0**

Leave the **Gateway** field **blank**.

Click **OK** to create the Interface.



**Note:** The Interfaces on both systems are on the same network, so a Gateway will not be required. If the interfaces on each system are on different networks, the Gateway configuration would be needed.

3. In the Unisphere session to the UnityVSA-Destination system, go to **Protection & Mobility > Interfaces**. Click the + icon to create an Interface for replication.

In the **Ethernet Port** dropdown list, select **Ethernet Port 2**.

## Lab Exercise: Asynchronous Remote Replication

In the **SPA IP Address** field, input: **192.168.5.200**.

In the **Subnet/Prefix Length** field input: **255.255.255.0**.

Leave the Gateway field **blank**. Click **OK** to create the Interface.

4. The next part of configuring the replication communications is to configure the Replication Connections. These connections establish the channel that is used for managing the replication between the systems.

In the Unisphere session to the UnityVSA-Source system, go to **Protection & Mobility > Replication** and select the **Connections** tab. Click the **+** icon to create the connection. In the **Remote System Management IP Address** field input: **192.168.2.113**.

The **User Name** and **Password** fields are populated with credentials which are: **admin/Password123!**

In the **Local System Password** field input: **Password123!**

Because Dell EMC UnityVSA only supports Asynchronous replication, the **Mode** dropdown list is grayed out with **Asynchronous** selected. Note: On a physical Unity system, the **Mode** dropdown list would also show Synchronous and Both. Click **Next** to continue.

In the **Bandwidth Schedules** page, click **+** to create a bandwidth schedule.

In the **Maximum Bandwidth** field, enter **51200**. This limits the bandwidth to 50 megabits per second.

In the **Days of the Week** section, check the boxes for **Mon, Tue, Wed, Thu, Fri**.

From the **Hours of the day** section, select **7:00 AM** from the **Start Hour** list. Select **7:00 PM** from the **End Hour** list. Click **OK** to create the schedule.

Click **Next** to continue. Review the **Summary** page. Click **Finish** to create the Replication Connection. The operation advances to the **Results** page and takes a moment to complete several tasks to create the connection. **Close** the **Results** page when complete. The new Connection between the two systems is listed when the operation completes.

## Lab Exercise: Asynchronous Remote Replication



Sessions		Connections					
				Verify and Update			
	!	Remote Syste...	↑	System Type	Mode	Management IP A...	
		Unity-Destination	UnityVSA	Asynchronous R...	192.168.2.113	192.168.5.100	-
						SPA Interfaces	SPB Interfaces
						SPA Interfaces	SPB Interfaces
						192.168.5.200	-

5. Now access the UnityVSA-Destination system and go to **Protection & Mobility > Replication**. Select the **Connections** tab to view the new Connection. Highlight the connection and click **Verify and Update** to verify the new connection from the UnityVSA-Destination perspective. Click **Yes** to proceed with the verification operation. The verification operation takes a moment to complete, please be patient. The Replication communications are now complete.

This completes part 1 of the lab exercise.

## Create a Remote Replication of a LUN

1. From the UnityVSA-Source session, go to **Storage > Block > LUNs**.

Select **WIN1 LUN0** by placing a **check** in its checkbox.

Click the **Edit** icon to open the LUN properties page.

Select the **Replication** tab and click the **Configure Replication** button.

2. A wizard to **Create a Session** opens.

From the **Provide a Replication Mode and RPO** window, select **Asynchronous** from the **Replication Mode** dropdown.

Decrease the **RPO** time to **10** minutes.

In the **Replicate To** dropdown list, select **UnityVSA-Destination**.

Leave the two snapshot replication options at their default **unchecked** settings.

**Check the Reuse destination resource** option. Notice that the **Automatically search user snap as common base** option now is available to select, **check** the option. These are options to help avoid full synchronization during replication fallback or reverse operations.

**Check the Overwrite Destination** option.

Click **Next** to continue the wizard.

3. The next wizard section configures the destination storage resources for creating the replicated LUN. The **Name** field defines the name the LUN has on the destination system. Keep the populated name of: **WIN1 LUN0**.

The **Pool** field defines the destination system storage pool the LUN is created from. Keep the populated pool of **FAST VP-1**.

**Thin: Checked**

The destination **Tiering Policy** can also be configured. Keep the default policy of **Start High Then Auto-Tier**.

## Lab Exercise: Asynchronous Remote Replication

Click **Next** to continue the wizard.

4. The wizard displays a **Summary** for the configuration of the replication session as shown here:

Summary	
<b>Settings configurations</b>	
Replication Mode:	Asynchronous (RPO: 10 minutes)
Destination System:	Unity-Destination (192.168.2.113)
Replicate all existing snapshots:	No
Replicate scheduled snapshots:	No
Reuse destination resource:	Yes
Automatically search user snap as common base:	Yes
Overwrite Destination:	Yes
<b>Destination configurations</b>	
Name:	WIN1 LUN0
Pool:	FAST VP-1
Size (GB):	5.0
Thin:	Yes
Tiering Policy:	Start High Then Auto-Tier

Click **Finish** to start the session creation.

The **Results** section displays the status of the creation operation. Verify the **Overall status** displays **100% Completed**.

**Close** the window.

The replication properties are displayed for **WIN1 LUN0**.

The properties include: Session Name, Mode, Local Role, Time of Last Sync, and Replicate Scheduled Snapshots.

The pencil indicates which of those parameters can be edited.

The replicated object on the two systems identifies which system allows IO to the LUN, and what Replication operations can be done to the session.

Which replication operation buttons are active?

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---

Which replication operation buttons are grayed out? \_

---

---

**Close** the **WIN1 LUN0 Properties** window.

5. On the UnityVSA-Source system, go to **Protection & Mobility > Replication > Sessions**. The new replication session is displayed.

**Check** the box for the **WIN1 LUN0** Resource. Click the **More Actions** dropdown list. Compare its active and grayed out replication operations to the ones recorded in the previous step. Are they the same or different?

---

6. Click the **Edit** icon to open the session details page.

Click the **View/Edit** icon for the **Session Name** from the right of the session name. If necessary, expand the window to view the **Edit** icon.

Change the name to **WIN1\_LUN0\_rep**, and click the **OK** button.

**Close** the session details page.

7. On the UnityVSA-Destination system, go to **Protection & Mobility > Replication > Sessions**.

The replication session is displayed. Use the window slider to see the session **Name** field on the far right. Use the refresh icon until the new session name is displayed, this takes a minute to update.

What is its name? \_\_\_\_\_

8. **Check** the session.

Click the **More Actions** dropdown list. Compare its active and grayed out replication operations to the ones recorded previously from the UnityVSA-Source system.

Are the active operations different on the destination system? \_\_\_\_\_

Why? \_\_\_\_\_

9. Navigate to **Storage > Block > LUNs**. The **WIN1 LUN0** is displayed. It was created on the destination system by the replication process.
10. Double-click **WIN1 LUN0** to open the properties page.

Select the **Host Access** tab and notice that no host has been granted access to the LUN. Host access must be configured to the LUN so its replicated data

## Lab Exercise: Asynchronous Remote Replication

will be accessible to a host should the source site become unavailable and the replication session failed over.

11. Establish an RDC session to the **WIN2** host as the local administrator.

In the **Computer(s)** field input: **WIN2**

In the **User** field input: **\administrator**

In the **Password** field input: **emc2Local!**

Click the **Connect** button.

12. From the **WIN2** system taskbar, click the **iSCSI Initiator** icon to launch the application.

Select the **Discovery** tab. Click the **Discover Portal** button. In the **Discover Target Portal** window, in its **IP address or DNS name** field input:  
**192.168.3.101**

Click **OK** to close the **Discover Target Portal** window.

Select the **Targets** tab. In the **Discovered targets** section, the UnityVSA-Destination IQN is displayed with an **Inactive** status. Select it and click the **Connect** button to connect the initiator to the target.

In the **Connect to Target** window, **check** the **Enable multi-path** option. Click the **Advanced** button.

From the **Advanced Settings** window, in the **Local adaptor** dropdown list, select **Microsoft iSCSI Initiator**. In the **Initiator IP** dropdown list, select **192.168.3.107**. From the **Target portal IP** dropdown list, select **192.168.3.101 /3260**. Click **OK** to configure the settings.

Click **OK** in the **Connect To Target** window.

Click **OK** to close the **iSCSI Initiator Properties** window.

Keep the RDC session to **WIN2** open.

13. Return to the UnityVSA-Destination Unisphere session.

From the LUN properties page **Host Access** tab, click the **+** icon to add host access to the LUN.

The **Select Host Access** window opens. From the **More Actions** dropdown list, select **Add Host**.

14. The **Add a Host** wizard opens. Input the following host configuration:

Name: **WIN2**

Operating System: **Windows Server**

Network Address: **192.168.2.11**

Click **Next** to continue the wizard.

The WIN2 IQN is displayed in the **Automatically-Discovered Initiators** window. **Check** the initiator IQN checkbox and click **Next** to continue the wizard.

A **Summary** window displays the information for the host being added. Click **Finish** to initiate the Add Host operation.

The **Results** window displays the progress of the operation.

**Close** the window when the operation completes.

15. In the **Select Host Access** window, **check** the **WIN2** checkbox to select the host and click **OK**.

The **WIN2** host is now configured to access the replicated **WIN1 LUN0**.

**Close** the window.

This completes part 2 of the lab exercise.

## Create Remote Replication for a NAS Server and File Systems

1. In the UnityVSA-Source Unisphere session, go to **Storage > File > NAS Servers**.

Select: **NAS\_SMB**.

Click the **Edit** icon to open the **NAS Server** properties page.

Select the **Replication** tab and click the **Configure Replication** button.

2. A wizard to **Create a Session** opens.

From the **Provide a Replication Mode and RPO** window, select **Asynchronous** from the **Replication Mode** dropdown.

Decrease the RPO time to **10** minutes.

In the **Replicate To** dropdown list, select **UnityVSA-Destination**.

Verify the **Support Asynchronous Snap Replication** option is **checked**. Enabling this option exposes two other options relating to existing and scheduled snapshots. These snapshot options are only available to enable during the replication creation. They are important to consider if subsequent snapshots would need to be replicated. **Check the Replicate all existing snapshots** because later in this lab exercise a snapshot of a file system will be created and replicated. Leave the **Cascade replicated snapshots** and **Replicate scheduled snapshots** options **unchecked**.

**Check the Reuse destination resource** option. Notice that the **Automatically search user snap as common base** option now is available to select, **check** the option. These are options to help avoid full synchronization during replication fallback or reverse operations.

Click **Next** to continue the wizard.

3. The next wizard section configures the destination storage resources for creating the replicated NAS Server and any of its associated file systems. The **Name** field defines the name the NAS Server has on the destination system. Keep the populated name of: **NAS\_SMB**.

## Lab Exercise: Asynchronous Remote Replication

The **Pool** field defines the destination system storage pool the storage resource is created from. Keep the populated pool of **FAST VP-2**

**Storage Processor** field of **SP A** since it is the only SP on a UnityVSA.

**Destination System** field should be: **UnityVSA-Destination**.

The **Associated File Systems/VMware NFS Datastore** section displays two file systems that are associated with the NAS Server: **SMB\_fs** and **DP\_fs**.

Also displayed is the destination pool for the file systems. Keep the populated pool of **FAST VP-2**.

Click **Next** to continue the wizard.

A **Summary** is displayed for the replication configuration to create as shown here:

Summary					
<b>Replication Session</b>					
Replication Mode:	Asynchronous (RPO: 10 minutes)				
Destination System:	Unity-Destination (192.168.2.113)				
Replicate all existing snapshots:	Yes				
Replicate scheduled snapshots:	No				
Reuse destination resource:	Yes				
Automatically search user snap as common base:	Yes				
<b>Destination NAS Server</b>					
Name:	NAS_SMB				
Pool:	FAST-VP-2				
Storage Processor:	SP A				
<b>Destination Associated File System Configuration</b>					
Source FS/V... ↑	Destination FS/...	Destination Stor...	Thin	Data Reduction	Advanced Dedu...
DP_fs	DP_fs	FAST-VP-2	Yes	--	--
SMB_fs	SMB_fs	FAST-VP-2	Yes	--	--

Click **Finish** to initiate the creation operation.

The **Results** window displays the status of the replication creation operation. It takes some time to complete so be patient. **Close** the window when the operation completes.

The NAS Server replication session details are displayed in the **Replication** tab of the **NAS\_SMB Properties** page.

**Close** the properties page.

- From the **Storage > File > File Systems** tab, select the **SMB\_fs** file system and click the **Edit** icon to open its properties page.

## Lab Exercise: Asynchronous Remote Replication

Select the **Replication** tab. The session details are shown for the **SMB\_fs** file system. The system automatically replicates the existing file systems that are associated with a NAS Server when the NAS Server is replicated.

Double-click the session to open its details window.

Click the **Edit** icon next to the **Session Name**.

In the **Session Name** field, replace the existing name with: **SMB\_fs\_rep** and click **OK**.

**Close** the session details window.

**Close** the **SMB\_fs Properties** page.

5. Navigate to **Protection & Mobility > Replication > Sessions**.
6. Locate the replication session for the **DP\_fs** file system and select it. Then click the **Edit** icon to open its details page.

Replace its session name with: **DP\_fs\_rep** and click **OK**.

**Close** the session details window.

7. Locate the session for the **NAS\_SMB** NAS Server and select it. Click the **Edit** icon to open its session details page.

Click the **Edit** icon for the **Session Name**. Replace its session name with: **NAS\_SMB\_rep** and click **OK**.

**Close** the session details window.

8. In the Unisphere session for the UnityVSA-Destination system, go to **Storage > File > NAS Servers**. Double-click **NAS\_SMB** to open the properties page.

Select the **Network** tab.

In the **Network Interfaces** section, the interface for the **NAS\_SMB** server is shown. This interface configuration was replicated along with the NAS Server from the UnityVSA-Source. However, the UnityVSA-Destination system is connected to a different network. So the interface configuration of the replicated NAS Server must be changed.

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Select the interface, and click the **Edit** icon.

**Check the Override address option.**

You can now enter a new interface configuration for the NAS Server.

Leave the **Ethernet Port** selection set to **Ethernet Port 1**.

In the **IP Address** field input: **192.168.2.115**

Leave the **Subnet Mask/Prefix Length** field set to: **255.255.255.0**

In the **Gateway** field input: **192.168.2.1**

Click the **OK** button.

In the **Edit NAS Server Interface** confirmation window, click **Yes** to apply the change.

The interface is now modified for the network that is connected to the UnityVSA-Destination system. If the NAS Server replication session is failed over, it will be available on the correct network and be able to provide data services to users.

**Close the NAS\_SMB Properties window.**

This completes part 3 of the lab exercise.

## Remote Replication Operations for a LUN

In this part of the lab, you perform replication operations on the replicated LUN and access its data after the operations.

1. Launch an RDC session to the **WIN1** host as the local administrator.

In the **Computer(s)** field input: **WIN1**

In the **User** field input: **\administrator**

In the **Password** field input: **emc2Local!**

Click the **Connect** button.

2. The **WIN1** system has access to the **WIN1 LUN0** from the previous lab exercises.

From the **WIN1** system taskbar, open **File Explorer** and select the **WIN1 LUN0 (E:)**.

Open the **New Text Document**. Add the following line of text to the file: **This line was added from WIN1 before the Failover with sync was performed.**

Save and close the file.

3. Before performing the replication operation **Failover with sync**, quiesce host IO to **WIN1 LUN0** on the **UnityVSA-Source** system. This is done by using Server Manager to offline the disk.

From the **WIN1** taskbar launch **Server Manager**.

In Server Manager, go to **File and Storage Services > Disks**.

Right-click the **5.00 GB** disk and select **Take Offline**. Click the **Yes** button to offline the disk.

4. Access the Unisphere session to the UnityVSA-Source storage system, and go to **Protection & Mobility > Replication > Sessions**.

Select the **WIN1\_LUN0\_rep** session. From the **More Actions** dropdown list, select the **Failover with sync** operation.

A **Failover Session After Sync** window displays information about the operation. Review the message and click **Yes** to perform the operation.

The **WIN1\_LUN0** session **State** will now be **Failed Over with Sync**.

The operation makes **WIN1 LUN0** read/write on the UnityVSA-Destination system.

The operation removes host access to **WIN1 LUN0** on the UnityVSA-Source system.

5. Access the existing RDC session to **WIN1**. In the open Server Manager window, right-click the **5.00 GB** disk and select **Bring Online**. Click the **Yes** button to bring the disk online.

What is the result of the online operation? \_\_\_\_\_

Why? \_\_\_\_\_

**Close the Server Manager > Disks** window.

6. Access the open the RDC session to the **WIN2** system.

From the **WIN2** system taskbar launch **Server Manager**.

In Server Manager, go to **File and Storage Services > Disks**. In the upper right corner from the **Tasks** dropdown, select **Rescan Storage** and click **Yes** in the **Rescan Storage** confirmation window.

Right-click the **5.00 GB** disk and select **Bring Online**.

Click **Yes** to bring the disk online.

7. From **WIN2**, launch **File Explorer**, access the **WIN1 LUN0 (E:)** drive and open the **New Text document**.

Is the line of text added before the Failover with sync present in the file? \_\_\_\_\_

Add the following line of text to the file: **This line was added from WIN2 when failed over to UnityVSA-Destination**.

Save and close the file.

## Lab Exercise: Asynchronous Remote Replication

8. Next, perform the **Resume** operation on the replication session. The resume operation keeps the read/write access to the LUN from the UnityVSA-Destination system and restarts the replication from the UnityVSA-Destination system to the UnityVSA-Source system.

In the Unisphere session to the UnityVSA-Destination, go to **Protection & Mobility > Replication > Sessions**.

Select the **WIN1\_LUN0\_rep** session and from the **More Actions** dropdown list select **Resume**. The **Resume Session** window provides information about the operation. Review the information and click the **Yes** button to resume the replication session.

When completed, the session is displayed with a normal state. (Auto Sync Configured)

9. Now perform a Sync operation. This operation manually synchronizes the data state of the LUN on the UnityVSA-Source to the data state that is currently on the UnityVSA-Destination system.

With **WIN1 LUN0\_rep** session selected, from the **More Actions** dropdown list, select the **Sync** operation.

Click **Yes** in the **Sync Session** window to perform the synchronization operation.

10. At this point, the data states of the LUN on the UnityVSA-Destination and the UnityVSA-Source are the same. The LUN on the UnityVSA-Destination system is in the read/write state, while the LUN on the UnityVSA-Source is still unavailable for access.

To test this, open the existing RDC session to **WIN1**. Open **Server Manager** and try to bring the LUN online again.

What were the results? \_\_\_\_\_

**Close** the resulting Server Manager message.

11. In the next few steps, you return the replication as it was before the Failover with sync operation. But before doing that, the **WIN2** host IO should be quiesced. You do this by using **Server Manager** to offline the disk.

## Lab Exercise: Asynchronous Remote Replication

Open the existing RDC session to **WIN2**. From its open Server Manager window, right-click the **5.00 GB** disk and select **Take Offline**. Click **Yes** to offline the disk.

12. Perform a **Replication Failover** operation to return the LUN to read/write status on the UnityVSA-Source system.

In the Unisphere session to the UnityVSA-Source, go to **Protection & Mobility > Replication > Sessions**. Select the **WIN1\_LUN0\_rep** session. If the session state still shows **Failed over with Sync**, refresh the page.

From the **More Actions** dropdown list, select the **Failover** operation.

Review the information about the operation in the **Failover Session** window. Click the **Yes** button to perform the failover operation.

The replication session is now shown in the **Failed Over** state.

13. Open the existing RDC session to the **WIN1** system. In the open Server Manager **window**, if the disk is not already online, right-click the **5.00 GB** disk and select **Bring Online**. Click the **Yes** button to online the disk.

Note: The disk may need to be placed offline and then online to be visible.

From the **WIN1** Desktop or system taskbar, open **File Explorer** and select the **WIN1 LUN0 (E:)** drive. Open the **New Text Document**.

Is the line that was written by the WIN2 host during failover present? \_\_\_\_\_

Close the document.

Close the File Explorer window.

14. After the **Failover** operation, the Replication session is paused and must be restarted by performing a **Resume** operation.

In the Unisphere session to the UnityVSA-Source, go to **Protection & Mobility > Replication > Sessions**.

With the **WIN1\_LUN0\_rep** session selected, from the **More Actions** dropdown list, select the **Resume** operation.

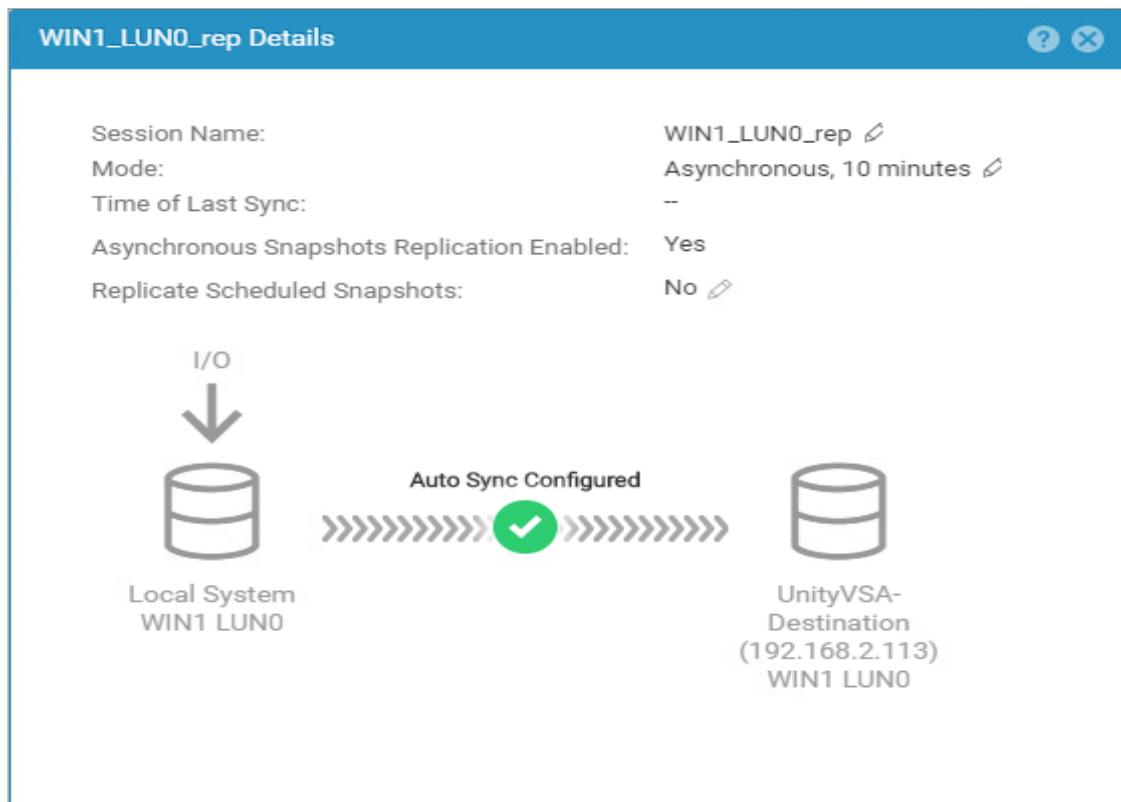
Click the **Yes** button to resume the replication session.

## Lab Exercise: Asynchronous Remote Replication

The session is now shown in the normal state (**Auto Sync Configured**).

Double-click the **WIN1\_LUN0\_rep** session to open its **Details** window..

The source of the replication is again on the Local System (UnityVSA-Source), and the replication destination is the UnityVSA-Destination system.



**Close** the replication session **Details** window.

Log off the RDC sessions to **WIN1** and **WIN2**.

This completes part 4 of the lab exercise.

## Remote Replication Operations for a NAS Server and File Systems

In this part of the lab, you perform replication operations on the replicated NAS Server and its file systems, and then access the data after the operations.

1. Launch an **RDC** session to the **WIN1** host as the Domain administrator.

- In the Computer(s): **WIN1**
- Click the **Connect** button.
- From the **Windows Security** window, select **More choices**
- Select **Use a different account**
- From the **Enter your credentials** window, input the following:
- Username: **hmarine\administrator**
- Password: **emc2Admin!**

Click **Ok**

2. Before performing replication operations, add some data to the **Top\$** share on the **SMB\_fs** file system served by the **NAS\_SMB** NAS Server.

From the **WIN1** taskbar, click the **Run** icon and in the **Open** field input:  
**\NAS\_SMB\Top\$**

A window to the share opens. Right-click in the share, and select **New > Text Document**. Open the file, and add the following line to the file: **This line was added prior to the manual sync operation.**

Save and close the file.

Close the share window.

3. From the Unisphere session to the UnityVSA-Source system, go to **Storage > File > File systems**. Select the **SMB\_fs** file system and click the **Edit** icon to open the properties page. Select the **Replication** tab.

Double-click the the **SMB\_fs\_rep** session to open its **Details** window.

Record the time displayed for **Time of Last Sync:** \_\_\_\_\_

## Lab Exercise: Asynchronous Remote Replication

**Close the Details** window.

From the **More Actions** dropdown list, select **Sync** to perform a manual Sync of the replication session. Click **Yes** to perform the sync operation.

Double-click the the **SMB\_fs\_rep** session to open its **Details** window again.

Did the **Time of Last Sync** change? \_\_\_\_\_

**Close the Details** window.

**Close the SMB\_fs Properties** window.

4. Return to the RDC session for **WIN1**. From the **WIN1** Desktop or system taskbar, click the **Run** icon and in the **Open** field input: **\NAS\_SMB\Top\$**

A window to the share opens. Open the **New Text Document**, and add the following line to the file: **This line was added prior to the failover operation.**

Save and close the file.

Close the share window.

5. Perform a failover operation for the NAS Server and its associated file systems. The NAS Server is failed over first, and then the file systems.

From the Unisphere session on the UnityVSA-Destination system, go to **Protection & Mobility > Replication > Sessions**.

Select the **NAS\_SMB\_rep** session. From the **More Actions** dropdown list, select the **Failover** operation.

Review the information that is displayed in the **Failover NAS Server and File System Sessions** window.

Verify that **SMB\_fs** and **DP\_fs** sessions are listed for **Failover**.

Click **Failover** to perform the failover operation.

Review the **State** of the three sessions: **NAS\_SMB\_rep**, **SMB\_fs\_rep**, and **DP\_fs\_rep**.

The sessions should be listed as **Failed Over** state with a yellow triangle.

## Lab Exercise: Asynchronous Remote Replication

6. Access the data from the UnityVSA-Destination system.

Return to the **WIN1** RDC session.

From the **WIN1** Desktop or system taskbar, click the **Command Prompt** icon.

Enter the following command: `ipconfig /flushdns`

The command flushes the client DNS Resolver cache. This is used because the **WIN1** client had previously accessed the **NAS\_SMB** NAS Server on the UnityVSA-Source system where it has an IP address of 192.168.1.115. Therefore, that name to IP address resolution was held in the client's DNS cache. The **NAS\_SMB** NAS Server on the UnityVSA-Destination system is configured for the IP address of 192.168.2.115. The client DNS cache must be flushed in order for it to be able to access the **NAS\_SMB** NAS Server at its new IP address.

7. Access the **Top\$** share from the **NAS\_SMB** NAS Server.

From the **WIN1** system taskbar, click the **Run** icon.

In the **Open** field input: `\NAS_SMB\Top$`

A window to the share opens. Open the **New Text Document**.

Is the line of text added before the manual sync operation present?

---

Is the line of text added before the failover operation present? \_\_\_\_\_

Why? \_\_\_\_\_

8. Add the following line to the file: **This line was added during failover to the UnityVSA-Destination system.**

Save and close the file.

Close the share window.

9. Perform a **Fallback** operation on the three replication sessions.

From the Unisphere session to the UnityVSA-Destination system, go to **Protection & Mobility > Replication > Sessions** and refresh the page.

## Lab Exercise: Asynchronous Remote Replication

Select the **SMB\_fs\_rep** session and from the **More Actions** dropdown list select the **Fallback** operation. Click the **Fallback** button to failback the session.

Did the operation succeed? \_\_\_\_\_

Why? \_\_\_\_\_

Close all the resultant message windows.

10. Select the **NAS\_SMB\_rep** session and from the **More Actions** dropdown list, select the **Fallback** operation.

From the **Fallback NAS Server and File System Sessions** window, verify that the associated file systems are listed for **Fallback**.

Click **Fallback**.

The operation takes a moment to complete. When completed, the replication sessions displays a normal state of **Auto Sync Configured**.

Double-click the **NAS\_SMB\_rep** session, and view the details.

The session replicated resource is receiving I/O on the UnityVSA-Source system with **Auto Sync Configured** to the UnityVSA-Destination system.

**Close the Details** window.

11. Return to the RDC session to the **WIN1** system. In the Command window, flush the DNS client cache by running the following command: `ipconfig /flushdns`

From the taskbar, click the **Run** icon and in the Open field input: `\NAS_SMB\Top$` to access the Top\$ share.

A window to the share opens. Open the **New Text Document**.

Is the line of text added during failover present in the file? \_\_\_\_\_

Why? \_\_\_\_\_

Close the file.

12. Open a Unisphere session to the UnityVSA-Source system.

Navigate to **Storage > File > NAS Servers**. Select the **NAS\_SMB** NAS Server and click the **Edit** icon to open its properties page.

Select the **Network** tab. Review the information in the **Network Interfaces** section.

What is shown in the **Preferred** column? \_\_\_\_\_

**Close the NAS\_SMB Properties** window.

13. Access the open Unisphere session to the UnityVSA-Destination system and go to **Storage > File > NAS Servers**. Select the **NAS\_SMB** NAS Server and click the **Edit** icon to open its properties page.

Select the **Network** tab review the information in the **Network Interfaces** section.

What is shown in the **Preferred** column? \_\_\_\_\_

**Close the NAS\_SMB Properties** window.

14. Ping the two different IP addresses of the **NAS\_SMB** NAS Server.

Access the RDC session to the **WIN1** system. In the command window issue, the following command: **ping 192.168.1.115**

What is the result? \_\_\_\_\_

In the command window issue,, the following command: **ping 192.168.2.115**

What is the result? \_\_\_\_\_

The NAS Server network interface that displays **Preferred = Yes** is the NAS Server that is the source of the replication session and therefore has its interface up and available for access. The NAS Server network interface that displays **Preferred = No** is the NAS Server that is the destination of the replication session and should not be reachable for access. Therefore, its interface is down and not accessible.

Close the command window.

## Lab Exercise: Asynchronous Remote Replication

This completes part 5 of the lab exercise.

## Replicating a LUN Snapshot

In this part of the lab, you take a snapshot of an existing LUN, and then replicate the LUN along with the snapshot. Then you restore the LUN to the original state using the replicated snapshot.

1. Launch an RDC session to the **WIN1** host as the local administrator.

In the Computer(s): **WIN1**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**

Select **Use a different account**

From the **Enter your credentials** window, input the following:

Username: \administrator

Password: **emc2Local!**

Click **OK**.

2. Update data on the **WIN1 LUN0** LUN.

From the **WIN1** Desktop or system taskbar, open **File Explorer** and select the **WIN1 LUN0(E:)** drive.

Open the **New Text Document**.

**Delete** all the text in the document.

Add the following lines of text to the file:

**This is the original data on the LUN of which we will take a snapshot.**

**After restoring the LUN from a snapshot, this is what you should see.**

Save and close the file.

3. Create a snapshot of **WIN1 LUN0**.

## Lab Exercise: Asynchronous Remote Replication

From the Unisphere session on the UnityVSA-Source system, go to **Storage > Block > LUNs**.

Select **WIN1 LUN0** by placing a **check** in its checkbox.

Click the **Edit** icon to open the LUN properties page.

Select the **Snapshots** tab.

Click the **+** icon to create a snapshot.

Name the snapshot: **Snap1\_WIN1\_LUN0**

Local Retention Policy: **No Automatic Deletion**

Replicate Snapshot (async): **checked**

Remote Retention Policy: **No Automatic Deletion**

Click **OK**.

**Close** the **WIN1 LUN0 Properties** window.

4. Quiesce IO before performing the Failover with sync operation using Server Manager to offline the disk.

From the **WIN1** taskbar launch **Server Manager**.

In Server Manager, go to **File and Storage Services > Disks**.

Right-click the **5.00 GB** disk and select **Take Offline**.

Click the **Yes** button to offline the disk.

5. Perform a **Failover with sync** operation on the **WIN1\_LUN0\_rep** session

In the UnityVSA-Source Unisphere session, navigate to **Protection & Mobility > Replication > Sessions**.

Select the **WIN1\_LUN0\_rep** session. From the **More Actions** dropdown list, select the **Failover with sync** operation.

Review the message in the **Failover Session After Sync** confirmation window and click **Yes** to confirm the operation.

## Lab Exercise: Asynchronous Remote Replication

The operation takes a moment to complete. When complete, the **WIN1\_LUN0\_rep** session **State** will now be **Failed Over with Sync**.

The operation makes **WIN1 LUN0** read/write on the UnityVSA-Destination system. The operation removes host access to **WIN1 LUN0** on the UnityVSA-Source system.

6. Open the RDC session to the **WIN2** system. Log in as local administrator.

In the Computer(s): **WIN2**

Click the **Connect** button.

From the **Windows Security** window, select **More choices**

Select **Use a different account**

From the **Enter your credentials** window, input the following:

Username: \administrator

Password: emc2Local!

Click **OK**.

From the **WIN2** Desktop or system taskbar launch **Server Manager**.

In **Server Manager**, go to **File and Storage Services > Disks**. In the upper right corner from the **Tasks** dropdown, select **Rescan Storage**. Click **Yes** to rescan.

Right-click the **5.00 GB** disk and select **Bring Online**. Click **Yes** to bring the disk online.

7. From the **WIN2** Desktop or taskbar, open **File Explorer** and select the WIN1 LUN0 disk. Open the **New Text Document**.

Are the lines of text indicating the original data on the LUN added before the Failover with sync present in the file? \_\_\_\_\_

Enter some text: **This line was written during a Failover operation to the UnityVSA-Destination**.

## Lab Exercise: Asynchronous Remote Replication

Save and close the file.

8. Restore **WIN1 LUN0** LUN from the replicated snapshot.

In Unisphere from the UnityVSA-Destination system, go to **Storage > Block > LUNs**.

Highlight **WIN1\_LUN0**, and select **Edit**.

Select the **Snapshots** tab.

Select the **Snap1\_WIN1\_LUN0** snapshot. From the **More Actions** dropdown list, select **Restore**.

From the **Restore** window, read the message and click **OK**. This creates a backup restore point and restores the LUN to the data state captured by the snapshot.

Click **OK**, and close the window.

9. Next, perform the **Resume** operation on the replication session. The resume operation keeps the read/write access to the LUN from the UnityVSA-Destination system and will restart the replication with the direction being from the UnityVSA-Destination system to the UnityVSA-Source system.

In the Unisphere session to the UnityVSA-Destination, go to **Protection & Mobility > Replication > Sessions**.

Select the **WIN1\_LUN0** session and from the **More Actions** dropdown list select **Resume**. The **Resume Session** window provides information about the operation. Review the information and click the **Yes** button to resume the replication session.

The session is now displayed with a normal state (**Auto sync Configured**).

10. Perform a Sync operation to manually synchronize the data state of the LUN on the UnityVSA-Source to the data state that is on the UnityVSA-Destination system.

With **WIN1 LUN0\_rep** selected, from the **More Actions** dropdown list, select the **Sync** operation.

Click **Yes** in the **Sync Session** window to perform the synchronization operation.

11. In the next few steps, you return the replication as it was before the Failover with sync operation. But before doing that, the **WIN2** host IO should be quiesced. Do this using Server Manager to offline the disk.

From your Student Desktop system, open the existing RDC session to **WIN2**. From its open **Server Manager** window, right-click the **5.00 GB** disk and select **Take Offline**.

Click **Yes** to offline the disk.

12. Next, perform a Replication Failover operation to return the LUN to read/write status on the UnityVSA-Source system.

In the Unisphere session to the UnityVSA-Source, go to **Protection & Mobility > Replication > Sessions**.

Select the **WIN1\_LUN0\_rep** session. If the session state still shows **Failed over with Sync**, refresh the page.

From the **More Actions** dropdown list, select the **Failover** operation.

Review the information about the operation in the **Failover Session** window. Click the **Yes** button to perform the failover operation.

The replication session should now show in the **Failed Over** state.

13. Open the existing RDC session to the **WIN1** system. In the open **Server Manager** window, right-click the **5.00 GB** disk and select **Bring Online**. Click the **Yes** button to online the disk.

From the **WIN1** Desktop or system taskbar, open **File Explorer** and select the **WIN1 LUN0** disk. Open the **New Text Document**.

Has the LUN been restored with the original data? \_\_\_\_\_

Close the document.

14. After the **Failover** operation, the replication session is paused and must be restarted by performing a **Resume** operation.

## Lab Exercise: Asynchronous Remote Replication

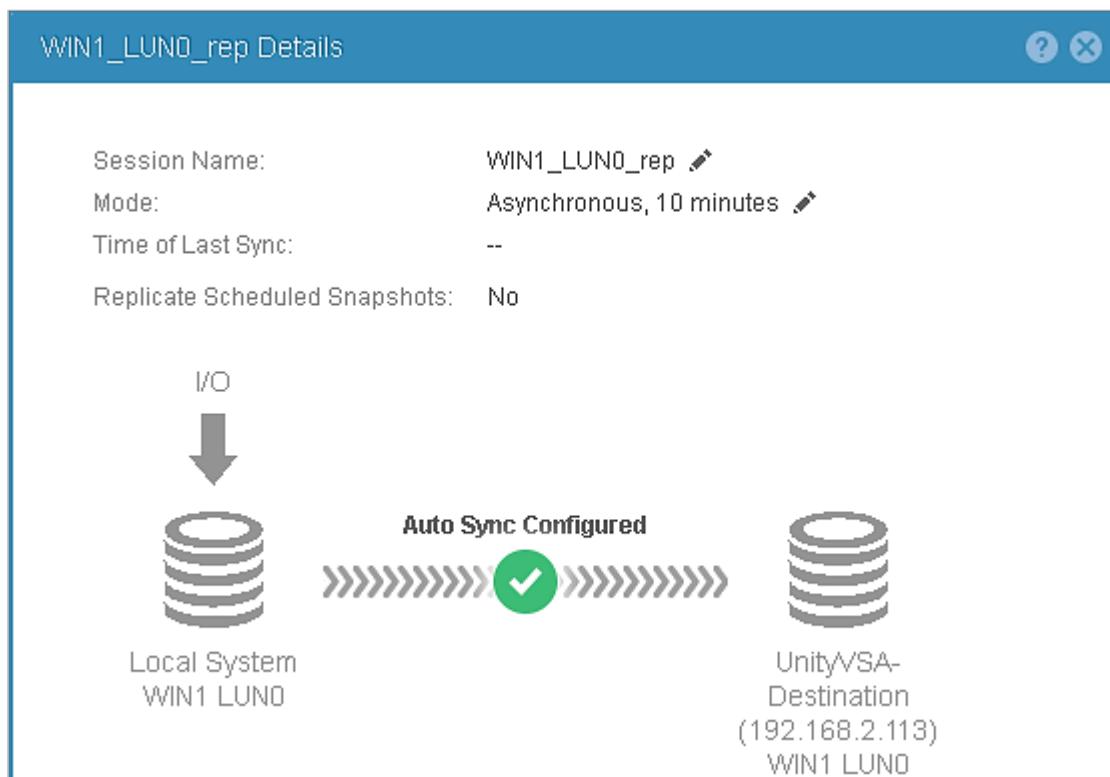
From the Unisphere session to the UnityVSA-Source, go to **Protection & Mobility > Replication > Sessions**.

With the **WIN1\_LUN0\_rep** session selected, from the **More Actions** dropdown list, select the **Resume** operation.

Click **Yes** to resume the replication session.

Double-click the **WIN1\_LUN0\_rep** session to open its Details window.

The session is now shown in the normal state. The source of the replication is again on the UnityVSA-Source system, and the replication destination is to the UnityVSA-Destination system.



**Close the Details** window.

You have replicated a block resource along with its snapshots.

The snapshot was used to restore the original state of the source LUN.

Log off the RDC sessions to **WIN1** and **WIN2**.

This completes part 6 of the lab exercise.

## Lab Exercise: Asynchronous Remote Replication

## Replicating a File System Snapshot

In this part of the lab, you perform replication operations on the replicated NAS Server, its file systems, and snapshots. Data will then be restored from a replicated snapshot of the source file system.

1. Launch the RDC session to **WIN1** and log in as the Domain administrator.

- In the Computer(s): **WIN1**
- Click the **Connect** button.
- From the **Windows Security** window, select **More choices**
- Select **Use a different account**
- From the **Enter your credentials** window, input the following:
  - Username: **hmarine\administrator**
  - Password: **emc2Admin!**

Click **OK**.

2. Before performing replication operations, add some data to the **DP\_fs** file system served by the **NAS\_SMB** NAS Server.

From the **WIN1** taskbar, click the **Run** icon and in the **Open** field enter:  
**\NAS\_SMB\DP\_fs\_share**.

A window to the share opens. Open the **New > Text Document** file and remove all of the existing text. Add the following lines of text to the file:

**This is the original data on the production file system.**

**This text should be seen after restoring the file system from a replicated snapshot.**

Save and close the file.

Close the share window.

3. Take a snapshot of the Production data.

In Unisphere on the UnityVSA-Source system, go to **Storage > File > File Systems**.

Double click the **DP\_fs**.

The **DP\_fs Properties** window opens.

Select the **Snapshots** tab.

4. Create a file system snapshot for replication.

Click the **+** icon to create a snapshot.

Name: **Snap1\_DP\_fs**

Local Retention Policy: **Pool Automatic Deletion Policy**

Access Type: **Read-only (hidden .CKPT access)**

Replicate Snapshot (async): **Check**

Remote Retention Policy: **No Automatic Deletion**

Click **OK**.

The new snapshot is displayed in the **DP\_fs Properties** window.

5. Return to the **RDC** session to the **WIN1** system. From the **WIN1** Desktop or system taskbar, click the **Run** icon.

In the **Open** field, enter: **\\\NAS\_SMB\DP\_fs\_share**. Open the **New Text Document**.

Delete the two lines you created earlier, and add the following:

**This line was created before the sync operation.**

Save and close the file.

Close the share window

6. In the Unisphere session to the UnityVSA-Source system, go to **Storage > File > File systems**. Select the **DP\_fs** file system and click the **Edit** icon to open the properties page. Select the **Replication** tab.

## Lab Exercise: Asynchronous Remote Replication

Double-click the **DP\_fs\_rep** session to view its details. Record the time displayed for **Time of Last Sync:** \_\_\_\_\_

Close the **DP\_fs\_rep Details** window.

Select the **DP\_fs\_rep** session. Under **More Actions**, select **Sync**. Click **Yes** to perform the sync operation. The operation takes a moment to complete.

After the sync operation completes, double-click the **DP\_fs\_rep** session to view its details again. Did the **Time of Last Sync** change? \_\_\_\_\_

**Close the DP\_fs\_rep Details** window. **Close the DP\_fs Properties** window.

7. Now perform a failover operation for the NAS Server and its associated file systems.

In the Unisphere session to the UnityVSA-Destination system, go to **Protection & Mobility > Replication > Sessions**.

Select the **NAS\_SMB\_rep** session. From the **More Actions** dropdown list, select the **Failover** operation.

Review the information that is displayed in the **Failover NAS Server and File System Sessions** window. Verify that **SMB\_fs** and **DP\_fs** sessions are listed for Failover.

Click **Failover** to perform the failover operation.

Review the State of the three sessions: **NAS\_SMB\_rep**, **SMB\_fs\_rep**, and **DP\_fs\_rep**.

The sessions are listed as **Failed Over** state.

8. Now access the data from the UnityVSA-Destination system.

Return to the **RDC** session to the **WIN1** system. From the **WIN1** Desktop or system taskbar, click the **Command Prompt** icon.

Enter the following command: `ipconfig /flushdns`

The command flushes the client DNS Resolver cache. This is used because the **WIN1** client had previously accessed the **NAS\_SMB** NAS Server on the UnityVSA-Source system where it has an IP address of 192.168.1.115.

## Lab Exercise: Asynchronous Remote Replication

Therefore, the name to IP address resolution was held in the client's DNS cache. The NAS\_SMB NAS Server on the UnityVSA-Destination system is configured for the IP address of 192.168.2.115. The client DNS cache must be flushed so it can access the NAS\_SMB NAS Server at its new IP address.

Double-click the **Run** icon.

In the **Open** field, enter: **\NAS\_SMB\dp\_fs\_share** and click **OK**.

A window to the share opens. Open the **New Text Document**.

Is the line of text you added after the manual sync operation present?  
\_\_\_\_\_

Are the two lines of text added before the sync operation present?  
\_\_\_\_\_

Why? \_\_\_\_\_

9. Add the following line to the file: **This line was added during failover to the UnityVSA-Destination system.**

Save and close the file.

Close the share window.

10. Restore the **DP\_fs** file system from the **Snap1-DP\_fs** snapshot.

In Unisphere on the UnityVSA-Destination system, go to **Storage > File > File systems**.

Check the box for **DP\_fs**. Select the **Edit** icon.

From the **DP\_fs Properties** page, select **Snapshots**.

**Check** the box for **Snap1\_DP\_fs**. (Uncheck any other snapshots)

Select **Restore** from the **More Actions** dropdown.

Name: **Snap1\_DP\_fs\_BU**

Click **OK**. **Close** the window.

11. Now perform a fallback operation on the three replication sessions.

## Lab Exercise: Asynchronous Remote Replication

From the Unisphere session to the UnityVSA-Destination system.

Navigate to **Protection & Mobility > Replication > Sessions** and refresh the page.

Select the **NAS\_SMB\_rep** session and from the **More Actions** dropdown list, select the **Failback** operation.

From the **Failback NAS Server and File System Sessions** window, verify that the associated file systems are listed for failback.

Select **Failback**.

Once completed, the replication sessions should display a State of **Auto Sync Configured** (the session replicated Resource is a **Source** on the UnityVSA-Source system and a **Destination** on the UnityVSA-Destination system).

12. Check the data state of the file system.

Return to the **RDC** session to the **WIN1** system. In the **Command** window, flush the DNS client cache by running the following command: `ipconfig /flushdns`

From the Desktop or taskbar, click the **Run** icon and in the Open field enter: `\NAS_SMB\DP_fs_share` to access the share.

A window to the share opens. Open the **New Text Document**.

Are the two lines of text added before the sync and failover operations present in the file? \_\_\_\_\_

Why? \_\_\_\_\_

13. Log off the **WIN1** session.

This completes part 7 of the lab exercise.

## Creating a NAS Proxy Server

In this part of the lab, you create a Proxy NAS Server on the UnityVSA-Destination system and access a file system snapshot replica. You will recover a file from the file system snapshot replica to the production file system.

### 1. Create a NAS Server on the UnityVSA-Destination system.

Access the Unisphere session on the UnityVSA-Destination system.

Navigate to **Storage > File > NAS Servers**.

Click the + icon to create a NAS Server.

The **Create a NAS Server** wizard opens.

### 2. Configure NAS Server General Settings

Enter the following:

Server Name: **NAS\_SMB\_Proxy**

Pool: **FAST VP-2**

Storage processor: **SPA**

Click **Next**.

### 3. Configure NAS Server Address

Enter the following:

Ethernet Port **Ethernet Port 1**

IP Address: **192.168.2.118**

Subnet Mask / Prefix Length: **255.255.255.0**

Gateway: **192.168.2.1**

Click **Next**.

### 4. Configure Sharing Protocols

Enter the following:

## Lab Exercise: Asynchronous Remote Replication

Windows Shares (SMB, CIFS): **Checked**

From the Join to the Active Directory Domain:

SMB Computer Name: **NAS\_SMB\_Proxy** (already populated)

Windows Domain: **hmarine.test**

Domain Privileged Username: **Administrator** (already populated)

Password: **emc2Admin!**

Enable NFSv3: **Checked**

Click **Next**.

### 5. Configure Unix Directory Service

Click **Next**.

### 6. Configure NAS Server DNS

Verify that DNS is enabled for **Domain hmarine.test** and is using the **192.168.1.50 Servers**.

Click **Next**.

### 7. Provide a Replication Mode and RPO

Click **Next**.

### 8. The **Review Your Selections** window is displayed.

Verify that the settings are correct.

## Lab Exercise: Asynchronous Remote Replication

Review Your Selections	
<b>NAS Server Configuration</b>	
Name:	NAS_SMB_Proxy
Pool:	FAST VP-2
Storage Processor:	SP A
Multiprotocol:	No
<b>NAS Server Interface Configuration</b>	
Ethernet Port:	Ethernet Port 1
IP Address:	192.168.2.118
Subnet Mask / Prefix Length:	255.255.255.0
Gateway:	192.168.2.1
<b>Support Linux/Unix Shares (NFS) - Configured</b>	
NFSv3 enabled:	Yes
NFSv4 enabled:	No
Enable Secure NFS (with Kerberos):	No
VVOLs enabled:	No
<b>Support Windows Shares (SMB) - Configured</b>	
Join to the Active Directory domain:	Configured
SMB Computer Name:	NAS_SMB_Proxy
Windows Domain:	hmarine.test
User Name:	Administrator
NetBIOS Name:	NAS_SMB_PROXY
Organizational Unit:	ou=Computers,ou=EMC NAS servers
<b>Unix Directory Service - None</b>	
<b>DNS Server Configuration</b>	
Enabled:	Yes
Domain:	hmarine.test
Addresses:	192.168.1.50
<b>Replication</b>	
No replication is being created	

Click **Finish**.

Once completed, read the **Results** and **Close** the window.

### 9. Enable SSH on UnityVSA-Destination

Navigate to **System > Service > Service Tasks**.

Enable SSH access by selecting **Enable SSH** and clicking the blue **Execute** button.

Enter the **service** password of **Password123!**.

## Lab Exercise: Asynchronous Remote Replication

The screenshot shows a 'Storage System' interface. At the top, it says 'Status: OK' with a green checkmark and the message 'The system is operating normally.' Below that, 'SSH Protocol' is listed as 'Disabled'. On the left, there's a vertical list of options: 'Collect Service Information' (selected), 'Save Configuration', 'Restart Management Software', 'Reinitialize', 'Change Service Password', 'Shut Down Storage System', and 'Enable SSH' (highlighted with a red border). On the right, there's a detailed description of each option and a large blue 'Execute' button.

Option	Description
Collect Service Information	Collect information about your system and save it to a file.
Save Configuration	Contact your service provider to determine if it is necessary to save configuration files to a provider.
Restart Management Software	
Reinitialize	
Change Service Password	
Shut Down Storage System	
Enable SSH	

**Execute**

- Establish an SSH session to the UnityVSA-Destination system.

From your student Desktop, open a **PUTTY** session to the UnityVSA-Destination system IP address **192.168.2.113**.

Click **Yes** if you see a certificate warning.

Username: **service**

Password: **Password123!**

- Configure the new NAS Server as a Proxy server.

Enter the following command:

```
spa> svc_nas NAS_SMB_Proxy -proxy -add NAS_SMB  
ip=192.168.2.118
```

The command creates **NAS\_SMB\_Proxy** server for the **NAS\_SMB** server with an IP address of **192.168.2.118**.

Verify that the command was successful. It should state **Command Succeeded**.

- Launch the RDC session to **WIN1** and log in as the Domain administrator.

- In the Computer(s): **WIN1**

- Click the **Connect** button.
- From the **Windows Security** window, select **More choices**
- Select **Use a different account**
- From the **Windows Security** window, input the following:
- Username: **hmarine\administrator**
- Password: **emc2Admin!**

Click **OK**.

13. Simulate user caused data loss in a file on the production **DP\_fs** file system served by the **NAS\_SMB** NAS Server.

From the **WIN1** taskbar, click the **Run** icon and in the **Open** field enter:  
**\NAS\_SMB\DP\_fs\_share**. Click **OK**.

A window to the share opens. Open the **New > Text Document** file and verify the following lines of text are present:

**This is the original data on the production file system.**

**This text should be seen after restoring the file system from a replicated snapshot.**

Delete the two lines of text from the file.

Add the following line of text to the file:

**This production data is incorrect.**

Save and close the file.

Leave the the share window open.

14. Access the snapshot replica **Snap1\_DP\_fs** on the UnityVSA-Destination system using the **NAS\_SMB\_Proxy** NAS Server. .

From the **WIN1** taskbar, click the **Run** icon and in the **Open** field enter:  
**\NAS\_SMB\_Proxy**.

## Lab Exercise: Asynchronous Remote Replication

A Share window opens to the **NAS\_SMB** share folder.

Double click the **NAS\_SMB** share folder to open it. Various files and folders will be shown for file systems, snapshots and internals associated with the replicated **NAS\_SMB** NAS Server.

Open the **Snap1\_DP\_fs** folder.

Locate and open the **New Text Document**.

Verify it contains the following lines of text:

**This is the original data on the production file system.**

**This text should be seen after restoring the file system from a replicated snapshot.**

This is the data needed to be recovered to the production file system. Close the file.

15. Copy the file from the **Snap1\_DS\_fs** snapshot to the **DP\_fs** production file system.

Copy the **New Text Document** from the share window accessing the **Snap1\_DP\_fs** snapshot and paste it into the share window open to the **DP\_fs\_share**.

Open the **New Text Document** just pasted into the **DP\_fs\_share** and verify it contains the following lines of text:

**This is the original data on the production file system.**

**This text should be seen after restoring the file system from a replicated snapshot.**

Close the file.

16. You have restored a file from a snapshot replica using a NAS proxy server to the production file system.

Close all windows.

End of Lab Exercise.

# Dell EMC Unity Implementation and Administration Lab Guide



**END OF LAB GUIDE**

