

Course Exercises Guide

# IBM FlashSystem V9000 Storage Implementation

Course code SSFS3G ERC 3.0



## May 2018 edition

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# Exercises description

The following notes explain how this guide is organized and introduce the equipment available to you, the IP addressing, and the naming scheme of the team resources. Read the following notes before starting the labs to become familiar with the lab environment.

The following is a list of the resources available to each team, as required to perform the lab exercises:

- IBM FlashSystem V9000 (two nodes)
- DS3500 LUNs storage through FlashSystem V9000
- Hyper-V running Windows 2008 Server R2
- Power VC running AIX
- Power VC running Linux
- Ubuntu Linux VM
- Windows 2012 R2 ADMIN server VM to access lab resources



## Requirements

The team name is used to qualify a set of team resources. In general, the team name is defined by four values that comprise the six-character name ID. The first character identifies the storage type (F=V9000, V=V7000, S=SVC, and so on). The next 3 characters represent the third octet of the subnet in which the resources are configured (A third octet of 9 would result in the 3 characters being 009). The next character represents environment ID in which a set of resources are assigned together within the subnet. The last character represents the team number assignment for the given set of resources. An example team name is **F108A1**. Resources that are in the same subnet share the same back-end storage device.

This course includes the following exercises:

- Exercise 0: Lab environment overview
- Exercise 1: System user authentication
- Exercise 2: Provisioning internal storage
- Exercise 3: Managing external storage resources
- Exercise 4: Windows host definition and volume allocations
- Exercise 5: AIX host definition and volume allocations
- Exercise 6: Linux host definition and volume allocations
- Exercise 7: Thin Provisioning and Volume Mirroring
- Exercise 8: Easy Tier Hybrid pool implementation
- Exercise 9: Easy Tier and STAT analysis

- Exercise 10: V9000 data pool migration
- Exercise 11: Migrate existing data with Import Wizard GUI
- Exercise 12: Migrate existing data with Migration Wizard
- Exercise 13: Migrate existing data with Import Wizard CLI
- Exercise 14: Real-time Compression and IBM Comprestimator
- Exercise 15: FlashCopy and consistency groups
- Exercise 16: FlashCopy Snapshot monitoring user roles and access
- Exercise 17: Snapshot to the Cloud

In the exercise instructions, you can check off the line before each step as you complete it to track your progress.

Validate each configuration action performed in the management GUI and CLI entries before executing the task. Once a task is submitted, it might be difficult to undo the configuration change. Some tasks will respond with a successful completion and some do not. Most of the names and commands ARE case sensitive. For the exercise, always use UPPERCASE when creating specifies names. This will make it easier to distinguish names from the objects.

Most exercises include required sections, which should always be completed. It might be necessary to complete these sections before you can start later exercises. If you have sufficient time and want an extra challenge, some exercises might also include optional sections that you can complete.



### Attention

The screen shots used in this guide might not be identical to your lab system. The screen shots are for reference point only and not as directions to be performed. Read the instructions carefully and follow the steps that are provided in each lab exercise.

---

# Exercise 0. Lab environment overview

## Estimated time

00:15

## Overview

This exercise describes the lab environment and how to connect to it.

## Objectives

- Use the lab data sheet to interpret the team assigned lab equipment.
- Carry out access of the lab environment.

# Exercise instructions



## Stop

The instructor may use this exercise as an instructor-led exercise to ensure that all students connect to the remote hardware. Check with the instructor before proceeding.



## Important

Notify your instructor immediately if you have any connection issues.

## Section 1: Identify lab hardware and resources

This section is an overview of the IBM FlashSystem V9000 lab hardware configuration.

The following is a list of the lab resources available for each team:

- A FlashSystem V9000 with two nodes
- A shared DS3500 for external storage subsystem LUNs.
  - Shared among all lab teams
- An AIX LPAR running on a Power Systems server
- An Linux LPAR running on a Power Systems server
- An Hyper-V running Windows 2008 Server R2
- A VM running Ubuntu Linux Cloud server
- A VM as the Admin server to access exercise resources running Windows 2012 Server.

The key resource to access the lab environment is the Admin server VM. From this resource the student will access all the other lab resources. All lab exercises and procedures for these labs are written based on the following shared applications:

- RDP: Remote Desktop Connection used to connect to servers
- Firefox web browser: Used to connect to various hardware components
- PuTTY: Used to open a command-line interface (CLI) session to various hardware components
- SDDDSM (Windows), SDDPSM (AIX) and Device Mapper Multipath (Linux): Used to support the multipath configuration in the SAN environment.

## Section 2: Team lab data sheet

This section identifies information about the team lab data sheet (which the instructor should provide) that includes information necessary to enter the data that is needed for the labs. The team lab data sheet identifies each team resource by the assigned team number and team letter set.

- \_\_\_ 1. Determine the team name and team set ID you are assigned.
- \_\_\_ 2. Using your team identifier, enter the information into the exercise data sheet below, or use the data sheet that is given to you by the instructor.



### Requirements

The team name is used to qualify a set of team resources. In general, the team name is defined by four values that comprise the six-character name ID. The first character identifies the storage type (F=V9000, V=V7000, S=SVC, and so on). The next 3 characters represent the third octet of the subnet in which the resources are configured (A third octet of 9 would result in the 3 characters being 009). The next character represents environment ID in which a set of resources are assigned together within the subnet. The last character represents the team number assignment for the given set of resources. An example team name is **F104A1**. Resources that are in the same subnet share the same back-end storage device.

The following table lists the resources that the student will access in the labs.

The Team Logon ID \_\_\_\_\_ Password \_\_\_\_\_.

Resources	Resource Name	TCP/IP Address	ID / Password
Team Name (Ex. F104A1)		N/A	N/A
Team Set ID (EX. FA1)		N/A	N/A
WIN server			
AIX server			
Linux server			
Team Environment ID (Ex. A)		N/A	N/A
V9K management GUI IP			
DS3500 (back-end storage)			
Cloud server			
DS3500 (back-end storage) (Ex. B104)			

## Section 3: Connect to the Admin server

This section describes the procedure to connect to the lab hardware through the IBM Remote Lab Platform (IRLP) access server.



### Information

Remote access to the lab environment is provided through virtual machine based desktops hosted in the Skytap on Softlayer cloud environment. The instructor will provide URL information and credentials for each student to access their assigned environment.

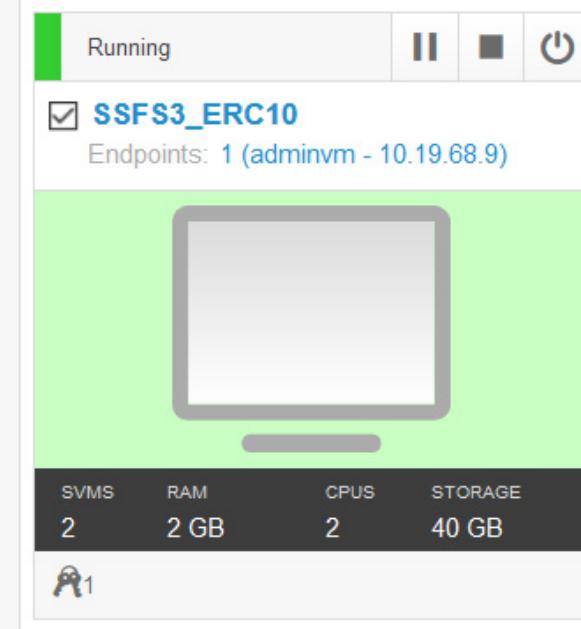
**The initial system that provides connection to the lab environment is the Admin server. From this system you will have direct access to all the other resources in the lab environment.**

If you are using lab equipment other than the IRLP hardware for executing lab exercises (non-IRLP) then use the connection procedures and information given by the instructor to access the hardware.

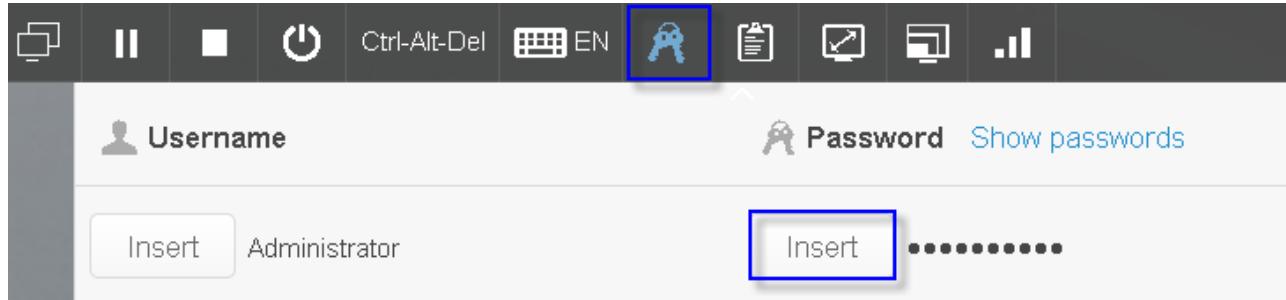
- \_\_\_ 3. Open a web browser on the student desktop system, and navigate to the URL provided by your instructor.
- \_\_\_ 4. Click **Play** to start the Admin server.



- \_\_\_ 5. Click the system console image to open the terminal view.



- \_\_\_ 6. At the login prompt, click the **Administrator** user. The password is field is displayed.
- \_\_\_ 7. In the bar at the top of the window, click the icon that represents a ring of keys. A pull down panel is displayed.
- \_\_\_ 8. Click **Insert** under the word Password. The password is inserted in the password prompt field.

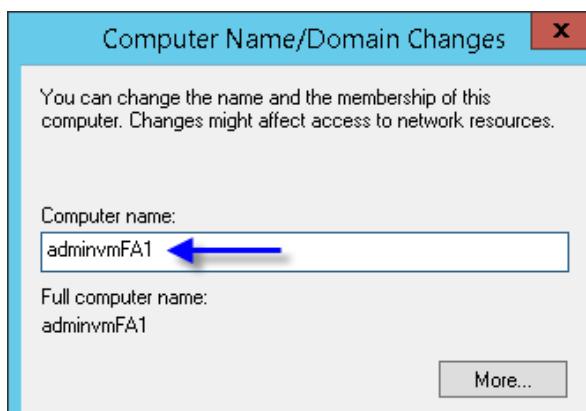


- \_\_\_ 9. Press **Enter** to log in to the Admin server.

## **Section 4: Change computer name on the admin server**

This procedure will navigate to the Server Manager to change the computer name of the admin server.

- \_\_\_ 10. From the Admin desktop, select the Windows Start menu, click the **Server Manager** tile or from the Windows system tray, click **Server Manager**.
- \_\_\_ 11. The Server Manager window is displayed. Select **Local Server**.
- \_\_\_ 12. Click on the computer name.
- \_\_\_ 13. From the System Properties, click **Change**.
- \_\_\_ 14. In the Computer name field append your *teamsetID* (example **admivmFA1**), and click **OK**.



- \_\_\_ 15. Close the System Properties window.
- \_\_\_ 16. Click on the **Start** icon. Click the **power** icon (top right corner) and select **Restart** to reboot the admin server.
- \_\_\_ 17. Log in again to the server using your admin credentials.

## Section 5: Access the WIN server with RDP

This section describes the procedure to setup connection to the WIN server.

- 18. From the Admin desktop, double-click on the **Remote Desktop Connection** icon to start the remote session.
- 19. The **Remote Desktop Connection** window is displayed. Enter the IP address for the WIN server (refer to the team lab data sheet).
- 20. Click the **Show Options**.

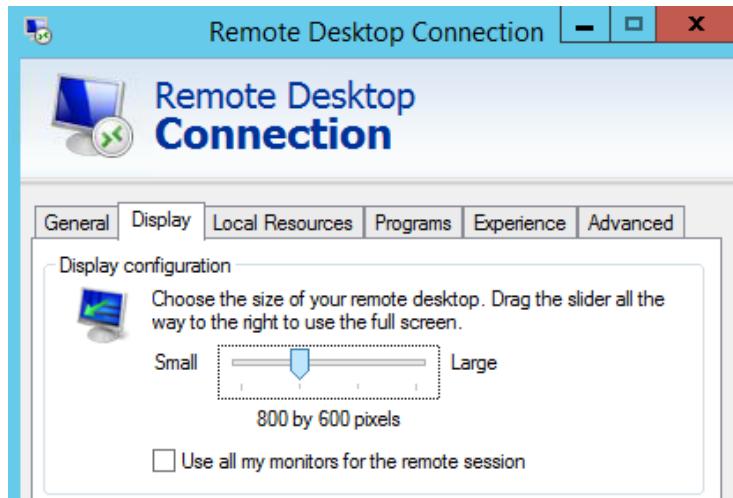


- 21. The Remote Desktop Connection **General** tab is displayed. Enter the user name (refer to the team lab data sheet).



- 22. Click the **Display** tab.

- \_\_\_ 23. The Remote Desktop Connection **Display** tab is displayed. Adjust the Display configuration by dragging the slider bar to the value of **800 by 600 pixels**. Do not click **Connect** yet.



- \_\_\_ 24. Return to the **General** tab display.
- \_\_\_ 25. Click **Save** and then click **Connect**.
- \_\_\_ 26. Log in using the credentials provided for your **WIN** server (refer to the team lab data sheet). Click **OK**.
- \_\_\_ 27. The system might be compelled to issue a security certificate warning on authentication. If so, click the **Yes** to continue.
- \_\_\_ 28. Once you have successfully logged into the **WIN** server, verify that the **WIN** server desktop is displayed in a smaller window.



### Important

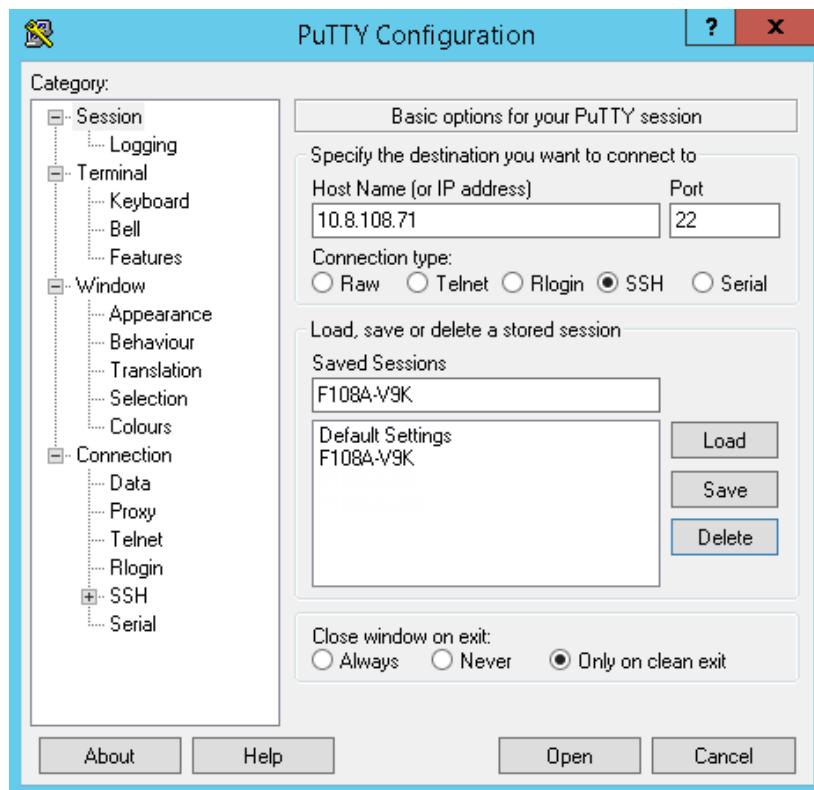
Notify your instructor immediately if you have any connection issues.

- 
- \_\_\_ 29. Select **Start > Log off** to close.

## Section 6: Access the FlashSystem V9000 with SSH

This section describes the procedure to setup an SSH client connection between the host server and the FlashSystem V9000 CLI.

- \_\_\_ 30. From the Admin server desktop, open a **PuTTY** session.
- \_\_\_ 31. From the PuTTY Configuration Session window, complete the following settings:
  - \_\_\_ a. Host Name (or IP address): Enter the IP address of your V9000 cluster management (refer to the team lab data sheet).
  - \_\_\_ b. Port: Accept the default of **22**.
  - \_\_\_ c. Connection type: Accept the default of **SSH**.
  - \_\_\_ d. Saved Sessions: Enter the ***teamname*-V9K** management name (refer to the team lab data sheet). Click **Save**.
- \_\_\_ 32. Click **Open** to start a session.



- \_\_\_ 33. If a PuTTY Security Alert is displayed. Click **Yes** to continue.
- \_\_\_ 34. Log in with the FlashSystem V9000 cluster management credentials and password (refer to the team lab data sheet).



### Information

The command prompt might contain the storage system product ID and/or the system name, followed by the logged in user name.

- \_\_\_ 35. Once you have successfully logged into your V9000 CLI session, type `exit` to log off.

## Section 7: Access the AIX server with SSH

This section describes the procedure to setup an SSH connection for the AIX server.

- \_\_\_ 36. From the Admin desktop, double-click on the **PuTTY** shortcut to launch the application.
- \_\_\_ 37. From the PuTTY Configuration Session window, create a standard SSH connection profile to connect to the AIX remote host as follows:
  - \_\_\_ a. Host Name (or IP address): Enter the IP address of your **teamname-AIX** server (refer to the team lab data sheet).
  - \_\_\_ b. Port: Accept the default of **22**.
  - \_\_\_ c. Connection type: Accept the default of **SSH**.
  - \_\_\_ d. Saved Sessions: Enter your **teamname-AIX** (refer to the team lab data sheet). Click **Save**.
  - \_\_\_ e. Click **Open** to start a session.
- \_\_\_ 38. If a PuTTY Security Alert is displayed. Click **Yes** to continue.
- \_\_\_ 39. Log in with the **AIX** host credentials (refer to the team lab data sheet).



### Information

The command prompt might contain the storage system product ID and/or the system name, followed by the logged in user name.

- 
- \_\_\_ 40. Once you have successfully logged into your AIX server, type `exit` to log off.

## Section 8: Access the Linux server with SSH

This section describes the procedure to setup an SSH connection for the Linux server.

- \_\_\_ 41. Return to the Admin desktop, double-click on the **PuTTY** shortcut to launch the application.
- \_\_\_ 42. From the PuTTY Configuration Session window, create a standard SSH connection profile to connect to the Linux remote host as follows:
  - \_\_\_ a. Host Name (or IP address): Enter the IP address of your **teamname-LNX** server (refer to the team lab data sheet).
  - \_\_\_ b. Port: Accept the default of **22**.
  - \_\_\_ c. Connection type: Accept the default of **SSH**.
  - \_\_\_ d. Saved Sessions: Enter your **teamname-LNX** (refer to the team lab data sheet). Click **Save**.

**Note**

At this point, you should have SSH host connections to the V9000, and both the AIX server and LINUX server.

- \_\_\_ 43. Click **Open** to start a session.
- \_\_\_ 44. If you are connecting to an SSH session for first time, you might see a PuTTY Security Alert. Click **Yes** to continue.
- \_\_\_ 45. Log in with the **Linux** host credentials (refer to the team lab data sheet).
- \_\_\_ 46. Once you have successful logged into your LNX server, type **exit** to log off.

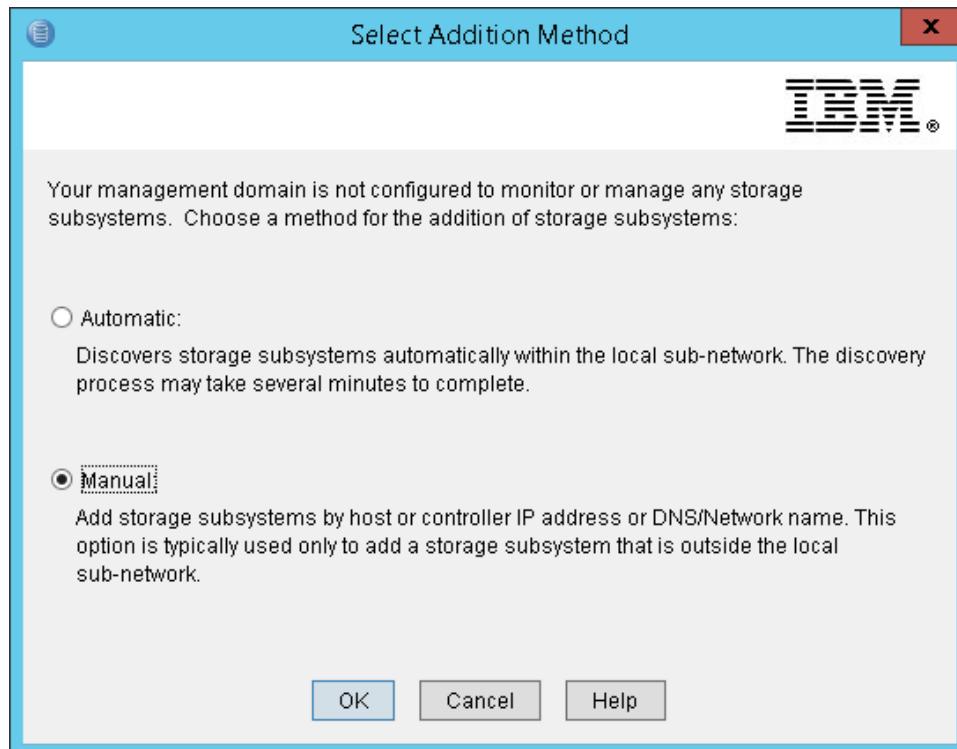
**Information**

The command prompt might contain the system product ID and/or the system name, followed by the logged in user name.

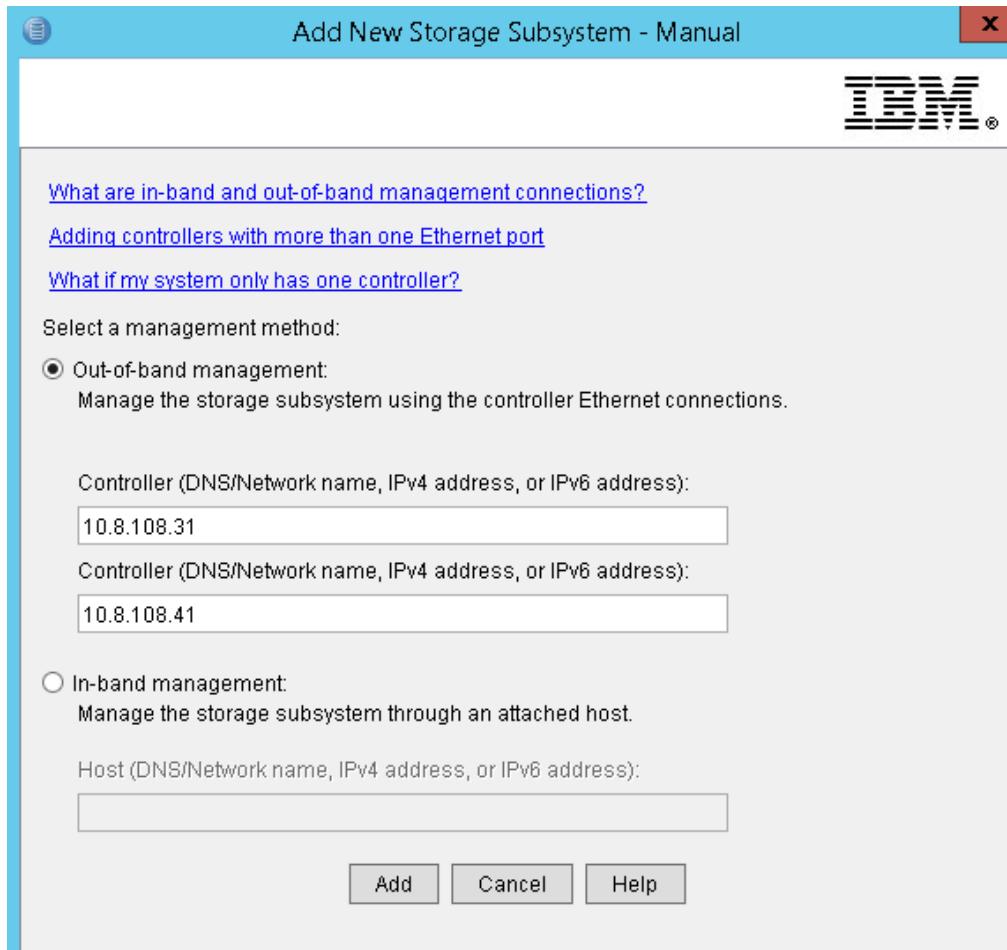
## **Section 9: Access the back-end storage device with DS Storage Manager**

This procedure manually discovers the IBM DS3524 storage subsystem for management.

- \_\_\_ 47. From the Admin server desktop, double-click the **DS Storage Manager Client** icon.
- \_\_\_ 48. The Select Addition Method window is displayed, select **Manual** to discovery the storage subsystem. Click **OK** to continue.

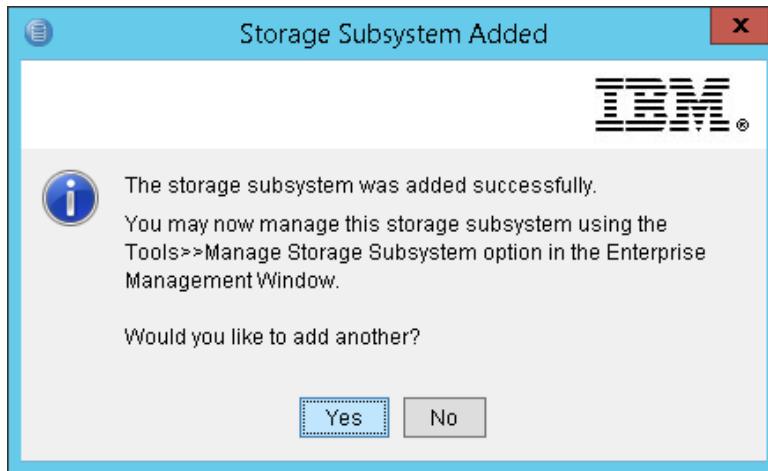


- \_\_\_ 49. From the Add New Storage Subsystem-Manual panel, select the **Out-of-band management**.
- \_\_\_ 50. Enter the controller IP addresses for the DS3500 storage subsystem (refer to your team lab data sheet).



- \_\_\_ 51. Click **Add** to begin manual discovery of the storage device. The storage device discovery might take a few minutes to complete.

- \_\_\_ 52. The Storage Subsystem Added widow is displayed. Verify that the manual discovery was completed successfully. Click **No** to close.



### Note

The **IBM System Storage DS Storage Manager 11.20 (Enterprise Management)** window displays the interface to manage the DS3500, including tasks such as displaying RAID arrays, logical drives, hosts and host mappings.

The **Enterprise Management** window can take up to a minute to refresh after an initial automatic discovery.

- \_\_\_ 53. From the **Enterprise Management** window, select the **Devices** tab.
- \_\_\_ 54. From the DS Storage Manager (Enterprise Management) **Devices** tab, observe the name of the storage subsystem.



### Important

The lab environment supports the DS3524. The storage device has been pre-configured and is shared with other teams.

- \_\_\_ 55. Verify that the storage subsystem device shows a status of **Optimal**.
- \_\_\_ 56. If the storage subsystem does not list the correct name, perform the following steps to rename the subsystem:
- Right click on the unnamed storage device in the tree list. In the pop-up menu, click **Rename**.
  - Enter the ***teamname*-DS3K** storage subsystem name (refer to your team lab data sheet). Click **OK**.
- \_\_\_ 57. Verify the subsystem has been renamed.
- \_\_\_ 58. Close the DS Storage Manager.

## Section 10: Access the cloud server

This section describes the procedure to connect to the Cloud server.

- 59. From the Admin server desktop, open a browser window.
- 60. Enter the URL of the Cloud server (refer to your team lab data sheet).
- 61. Log in using your team admin credentials.
- 62. Once you have successfully logged into the Cloud server, select your **team ID** and **Sign Out** from the OpenStack Swift GUI.



**DANGER**

**DO NOT change the system password or upgrade the system firmware.**

---

**End of exercise**

# Exercise 1. System user authentication

## Estimated time

00:45

## Overview

This exercise explores the FlashSystem V9000 system initial configuration and hardware resource using the root superuser credentials. The student will also create and modify administrator users' credentials to enable SSH management access to the FlashSystem V9000 clustered system using both the graphical user interface (GUI) and command-line interface (CLI).

## Objectives

- Use the FlashSystem V9000 management GUI to identify system information.
- Create an administrator user ID to manage the FlashSystem V9000 system.
- Use PuTTYGen to generate an SSH key pair for authentication access.
- Modify local user credentials to add SSH authentication access.
- Create user accounts with various security roles on the FlashSystem V9000.
- Verify FlashSystem V9000 system information using CLI SSH authentication access.

# Exercise instructions

## Section 1: Review system initial configuration

This section logs into the FlashSystem V9000 system to review the system configuration details and to identify the location of the hardware components.

- 1. From the Admin server desktop, open a browser window.
- 2. Enter the URL <https://xx.xx.xx.xx> of the FlashSystem V9000 management IP address (refer to the team lab data sheet).
- 3. Log on with the superuser credentials (refer to the team lab data sheet).



### Troubleshooting

The Suggest Tasks window might appear to remind you to create your volumes and hosts. These tasks will not be done at this time. Click **Cancel**.

- 4. Observe that the FlashSystem V9000 system graphical user interface (GUI) Dashboard is displayed.



### Note

The Dashboard is the default home page that provides a high-level view of information about the system, its performance, capacity, and system health.

The Dashboard serves as a quick view to assess the overall condition of the system and view notifications of any critical issues that require immediate action.

The screenshot shows the IBM FlashSystem V9000 Dashboard. At the top, there's a navigation bar with tabs for 'Dashboard' (highlighted), 'Performance', 'Event notifications', and 'Location/Help Menu'. The 'Event notifications' tab has a blue arrow pointing to it. Below the navigation bar, there's a 'Suggested Tasks' box with a blue arrow pointing to it. On the left, a vertical 'Side Menu' is visible with several icons: Home, Storage, Capacity, System Health, Hardware Components, Logical Components, and Connectivity Components. A blue arrow points upwards from the bottom of the Side Menu towards the 'Navigation' tab. The main dashboard area displays performance metrics like Latency (0 ms), Bandwidth (0 MBps), IOPS (0 IOPS), and CPU Utilization (2 %). It also shows a graph of CPU Utilization over time. The 'System Health' section at the bottom right includes version information (Version: 8.11.0) and cluster ID (Cluster ID: 000002032AE0AF80).

- 
- \_\_\_ 5. Observe the navigation path. This serves as quick view of your GUI location. The navigation path is not an active link.
  - \_\_\_ 6. Observe the three icons to the right on the navigation path.
- 



## Information

System indicators:

- The **bell icon** (leftmost) indicator provides notifications of health alerts or critical errors that has occurred and might need immediate attention. All events are presented by priority.
  - The **notepad icon** (center) indicator provides reminder of suggested tasks to be configured. It also provides a selectable view of all **Running Task** details/status on tasks being initiated by the user or system.
  - The **?** icon (rightmost) indicator provides a panel of information pertaining to the selected GUI menu. For example, if the Pool menu is selected, all details about pool option and its resources can be view using this option. It also provide Help content that redirects to the IBM Knowledge Center for additional learning and IBM Support.
- 

- \_\_\_ 7. Observe the GUI side menu option. In addition to the Dashboard, the GUI side menu provides common access to the features for management, configuration, and more.
  - \_\_\_ 8. From the GUI side menu, select **Monitoring**. Observe the additional menu options available under this function.
  - \_\_\_ 9. Select **System**. Observe the Dynamic System view of the IBM FlashSystem V9000 9846 model.
- 



## Important

The view shown represents a complete system configuration that includes the IBM FlashSystem V9000 AC2 control enclosures and IBM FlashSystem V9000 AC2 storage enclosure.

As of the IBM FlashSystem V9000 control code release 8.1, the GUI no longer manages the AE3 storage enclosures. While the lab uses AE2 storage enclosures, the AE3 storage enclosures are managed independently from the control enclosure providing greater configuration flexibility.

FlashSystem V9000 containing the Model AE2 storage enclosure will continue with consolidated management.

---



## Hint

Hovering the mouse cursor over each component highlights its details. Right-clicking on a component displays pop-up menu with a description, and identifies important parameters and functions of the selected element.

---

- \_\_\_ 10. Hover the mouse pointer over each node in the V9000 system. Observe the pop up information for each node.



## Troubleshooting

If the nodes have not been renamed, perform following steps:

- \_\_\_ a. Right-click on **node 1**. A pop up menu is displayed.
- \_\_\_ b. Select **Rename** from the pop up menu.
- \_\_\_ c. Click the default **node1** name. Rename node to **NODE1** using all capital letters. Click **Rename**.
- \_\_\_ d. Review the generated **svctask chnode -node** command. Click **Close**.
- \_\_\_ e. Repeat steps to rename **node2** to **NODE2**.
  
- \_\_\_ 11. Right-click on **NODE1**. Select **Properties**. Review the information displayed in the pop up information window and then click **Close**.
- \_\_\_ 12. Review the properties for the other node in the system. Right-click on **NODE2**. A pop-up menu is displayed.
- \_\_\_ 13. Click **View > Fibre Channel Ports**. Observe the active ports and the associated WWPN assignments. Click **Close**.
- \_\_\_ 14. Hover the mouse pointer over each V9000 AC2 storage enclosure battery module.



## Questions

What is the percentage of each battery module?

NODE1 Battery 1 \_\_\_\_\_ Battery 2 \_\_\_\_\_

NODE2 Battery 1 \_\_\_\_\_ Battery 2 \_\_\_\_\_

- 
- \_\_\_ 15. Locate the arrow which is at the bottom right corner of the FlashSystem V9000 system.
  - \_\_\_ 16. Click the **arrow** to rotate the system to view the rear components. Observe that the system rotates by 180° from front and rear.
- 



## Note

Your system might display a red indicator that indicates issues in system configuration. No need to worry as this might be because of inactive port configurations and should have no affect to the you the success of the lab exercise.

- 
- \_\_\_ 17. Hover the mouse pointer over the rear components to view the node canisters, installed Fibre Channel (FC) host interface cards, active Ethernet and iSCSI ports and connectors.



## Questions

What type of adapter is installed in both the AC2 control enclosure and AE2 storage enclosure?

---

Which Fibre Channel ports are active? \_\_\_\_\_

---

- \_\_\_ 18. Click the arrow to rotate the system until the front view is visible again.
  - \_\_\_ 19. Right-click on **AE2 storage enclosure**. A pop-up menu is displayed.
  - \_\_\_ 20. Click **Properties**. Review the information displayed in the pop up information window. Click **Close**.
  - \_\_\_ 21. Hover the mouse pointer over all center **flash card slots** to view the technology information about the flash modules.
- 



## Questions

What is the capacity TiB size of the flash modules installed? \_\_\_\_\_

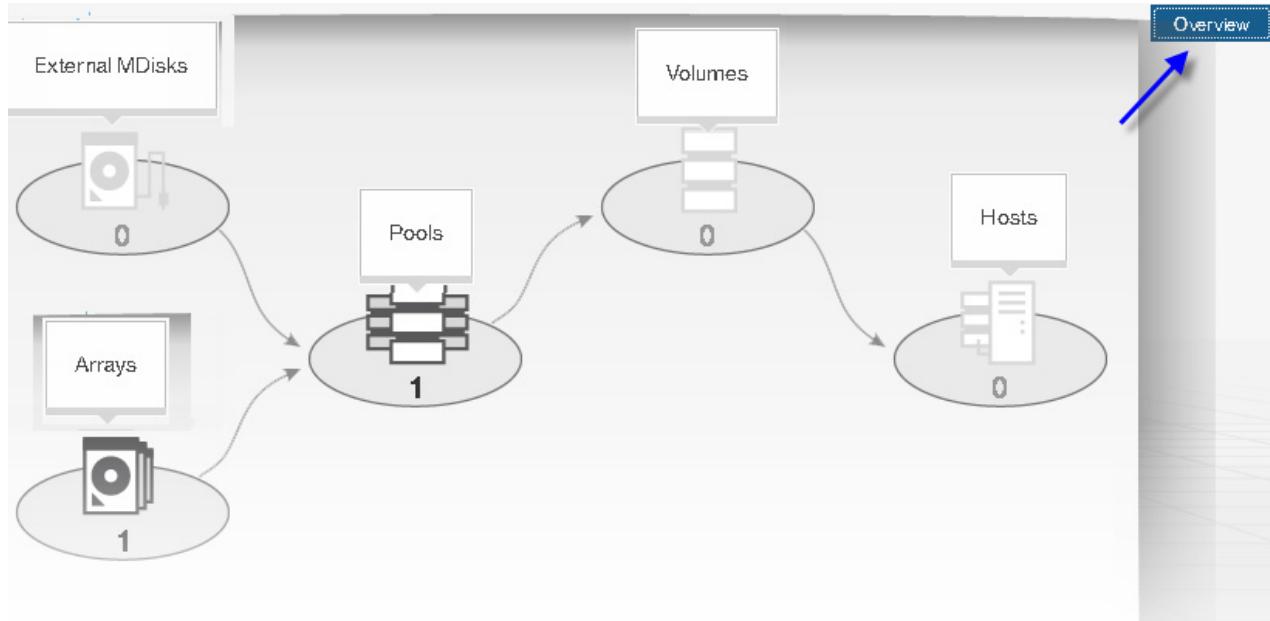
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## Section 2: *Review task functions and their icons*

This procedure reviews the function icons and various ways to navigate to the function panels.

- \_\_\_ 22. From the GUI side menu, select each menu icon to display a pop up menu for the related function.
- \_\_\_ 23. Return to the **System** menu. Click the **Overview** link in the upper right corner of the browser.

- \_\_\_ 24. A configuration overview panel is displayed. Observe that the system has defined one internal RAID array and one mdiskgrp. Hover the mouse pointer over the entries with non-zero values.



### Note

The **Overview** panel tracks the number of system resource that is allocated. Each menu icon is an active link that if selected, redirects to the menu window.

- \_\_\_ 25. Click anywhere to close the Overview panel.  
 \_\_\_ 26. Observe the mini-Dashboard that is located beneath the FlashSystem V9000 system view.



### Note

This performance indicator provides a quick glance of the total, read latency, write latency, bandwidth, and IOPS performance for the system utilization. These system-wide indicators are accessible from any GUI display panel.

27. Select the **Action** menu (top left) of the System menu. Observe the tasks that can be performed.



### Note

From the Action menu or by clicking anywhere on the System menu, you have the ability to rename the system or site location, modify the system topology, or power off system.

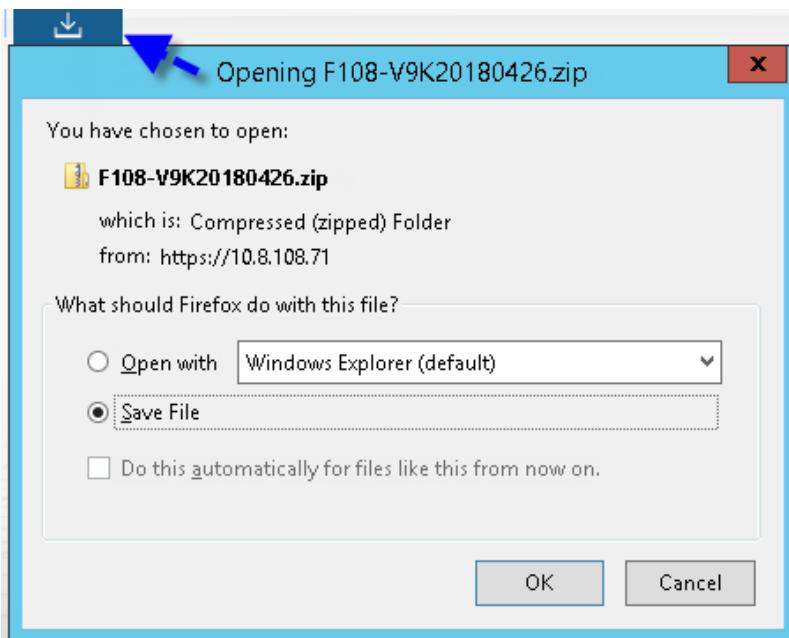
**DANGER**

**Do not** make any changes to the system environment. Doing so could prevent access to the shared environment of resources.

### Section 3: View system VPD information

This procedure shows how to gather vital product data for the components in the system.

- \_\_\_ 28. Click the **Export to CSV** icon that is to the right of the Actions area found in the upper left corner of the panel. A pop up window is displayed.
- \_\_\_ 29. Select the **Save File** option and click **OK**. This will download system properties in as a `.csv` file to the browser's download area.



- \_\_\_ 30. Navigate to the download area of the browser (click the blue arrow in the upper right corner) and double-click on the zip file.
- \_\_\_ 31. Observe the multiple `.csv` files that are included in the one zip file.

**Note**

The `.csv` files captures a support snap shot and cluster state/configuration data from the system.

- \_\_\_ 32. Click the **X** to close.

### Section 4: Identify user groups

- \_\_\_ 33. Navigate to the **Access > Users** view.



### Hint

The column width in any display area can be resized by dragging the edge of its heading box left or right. A column heading can be dragged and dropped to reorder the display of the columns.

- 
- \_\_\_ 34. The Users panel is displayed. Observe the list of default User Groups on the left.
- 



### Information

User groups are used for local and remote user authentication as well as role-based administration. The six default user groups representing six different user roles are defined:

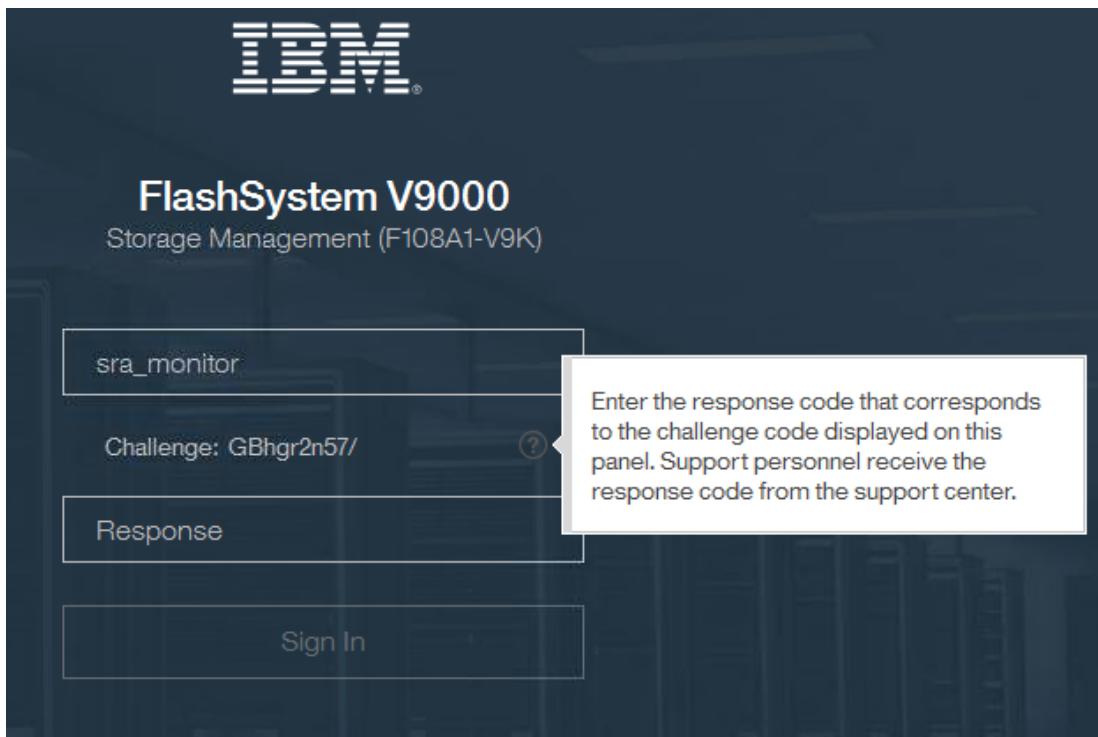
- The **SecurityAdmin** role has access to all GUI and CLI functions. It also has the authority to manage users, user groups, and user authentication.
- The **Administrator** role has access to all GUI and CLI functions except those related to users, user groups, and authentication.
- The **CopyOperator** role has the authority to manage existing FlashCopy mappings and Metro/Global Mirror relationships using the GUI and CLI. The role has the ability to start, modify, stop mappings and relationships and switch copy direction. In addition, it has all the functions that are associated with the monitor role.
- The **Service** role is limited to service and support activities that are typically used by IBM support. It also has all the functions that are associated with the monitor role.
- The **Monitor** role can access panels and commands, back up configuration data, initiate change to its own password and SSH key, and issue the following commands: **finderr**, **dumperrlog**, **dumpinterallog**, and **chcurrentuser**. This role cannot perform actions that change the state of the system or the resources that the system manages.
- The **RestrictedAdmin Users** can perform the same tasks and run most of the same commands as administrator-role users. However, users with the Restricted Administrator role are not authorized to run the **rmvdisk**, **rmvdiskhostmap**, **rmhost**, or **rmmmdiskgrp** commands and cannot remove volumes, host mappings, hosts, or pools. When secure remote assist is enabled on the system, support personnel can be assigned this role to help resolve errors and fix problems.

- 
- \_\_\_ 35. From the All User panel, observe the list of user IDs that are defined.  
\_\_\_ 36. Observe the assigned sra\_x users and its user group roles.



### Information

If Remote Support Assistance is enabled, the system will also display sra\_x users. The sra\_IDs were generated during the system setup wizard to support Remote Support access. These ID are restricted and only used by IBM Support personnel. When logging with an sra\_ID, the support personnel must respond to the challenge code presented with a response code that is received from the IBM Support Center.



- 
- \_\_\_ 37. Observe that the system automatically assigns a superuser ID as a Security Administrator.



### Information

The Security Administrator can manage all the FlashSystem V9000 features and functions. This is the most user powerful role. All functions are permitted, including user management functions.



### DANGER

**Do not** change or modify the `superuser` password or any other user IDs assigned as this is an environment shared with other students.

- 
- \_\_\_ 38. Minimize the **V9000** management GUI browser.

## Section 5: Establish an SSH Client Connection

The procedure establishes an SSH client connection between the host server and the FlashSystem V9000 CLI.

- \_\_\_ 39. From the Admin server desktop, open a PuTTy SSH session to the FlashSystem V9000 management CLI.
  - \_\_\_ 40. Log in with your **superuser** credentials (refer to the team lab data sheet).
- 
- 



### Information

The command prompt might contain the storage system product ID and/or the system name, followed by the logged in user name.

---

---



### Note

The CLI 'ls' command provides a more concise detail than what is often presented in the management GUI.

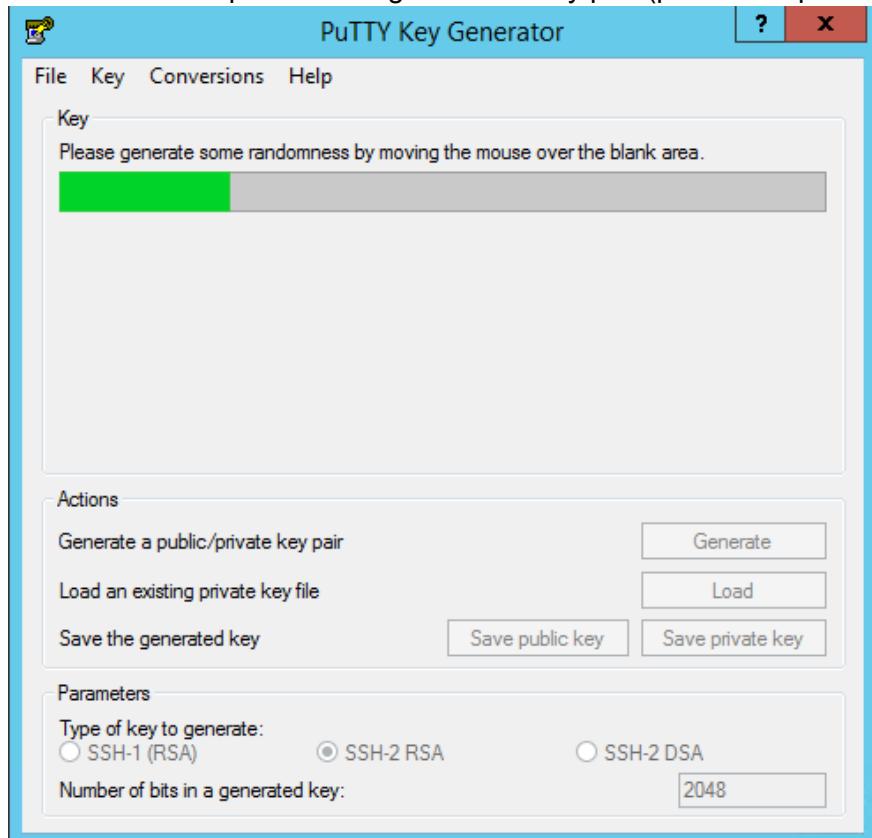
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- \_\_\_ 41. Issue the `lscurrentuser` command to display the name and role of the logged-in user.
- \_\_\_ 42. Issue the `lsusergrp` command to view the list all of the user groups that have been created on the system.
- \_\_\_ 43. Type `exit` to close the V9000 CLI session.

## Section 6: Generate SSH keys for local user CLI access

In this procedure, you will generate an SSH key pair and associate the key pair with a user name.

- \_\_\_ 44. From the admin server desktop, double-click the **PuTTYgen** icon.
- \_\_\_ 45. From the PuTTYgen Generator window, performing the following steps:
  - \_\_\_ a. Type of key to generate: Accept the default (**SSH-2 RSA**).
  - \_\_\_ b. Click **Generate**. This process will generate a key pair (public and private).

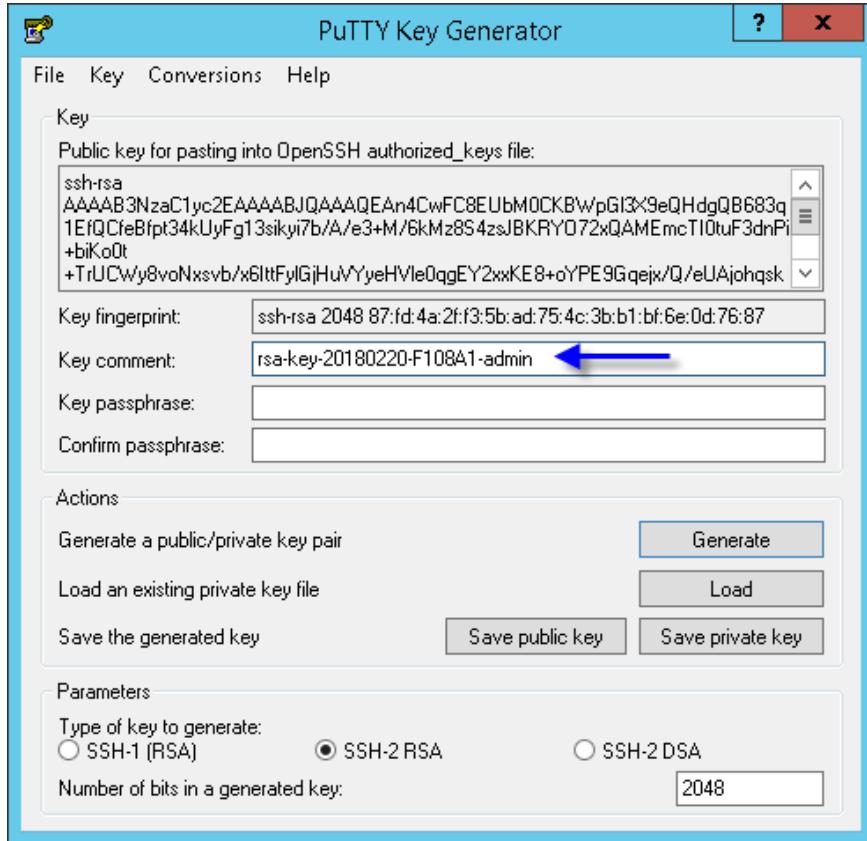


### Hint

Move the mouse cursor around in the blank (gray) area below the Key generator progress bar (to generate some randomness) until the progress bar is full. The more the cursor is moved, the faster the key pair will be generated.

- \_\_\_ 46. Once the public/private key pair has been generated, the PuTTY Key Generator window lists key attributes of the key pair.

- \_\_\_ 47. Click the **Key comment** field. Append your **-teamname-admin** user name.



- \_\_\_ 48. Click **Save public key**. Navigate to the **C:\Software\MyKeys** folder to save the public key as **teamname-admin.pub**.
- \_\_\_ 49. Click **Save private key**. Save the private key in the **C:\Software\MyKeys** folder as **teamname-admin.ppk**.
- \_\_\_ 50. Click **Yes** to confirm that you wish to save the private key without a Key Passphrase.



### Information

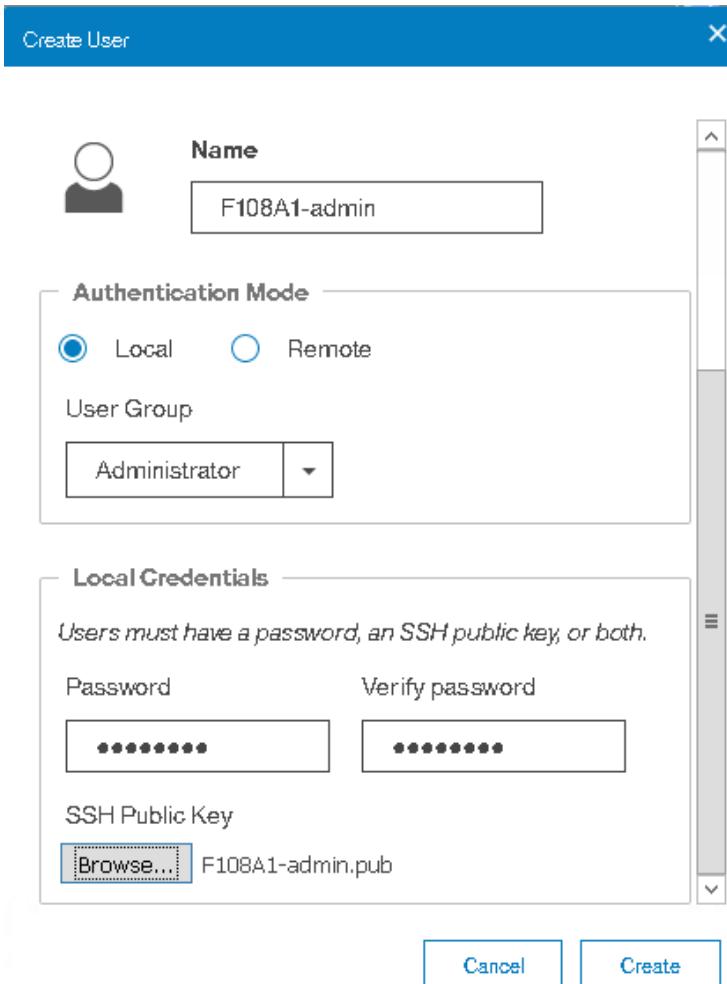
The Key Passphrase is used to encrypt the file that contains the RSA Key. In order to use the key for public-key encryption, users will need to enter the passphrase to decrypt its file. Using a passphrase helps increase security when using SSH keys.

- \_\_\_ 51. Navigate to the admin server **C:\Software\MyKeys** folder. Verify that the **teamname-admin** private/ public key pairs are listed.
- \_\_\_ 52. Close both the **MyKeys** folder and the **PuTTYgen** window.

## Section 7: Create a user with administrator role

This procedure creates local administrative user IDs with authorization to manage the FlashSystem V9000 using both the management GUI and CLI SSH authentication.

- \_\_\_ 53. Return to the V9000 management GUI, and select **Access > Users**.
- \_\_\_ 54. From the User pane, click **Create User** (above the Name field).
- \_\_\_ 55. Create a user using the following parameters:
  - \_\_\_ a. Assign a name of **teamname-admin** for this user.
  - \_\_\_ b. Accept **Local** as the default Authentication Mode.
  - \_\_\_ c. Select **Administrator** in the **User Groups** pull-down list.
  - \_\_\_ d. Enter the password value of **password** and retype password to verify.
  - \_\_\_ e. Under the SSH Public Key field, click **Browse**. Navigate to the **C:\Software\MyKeys** folder.
  - \_\_\_ f. Click on the **teamname-admin.pub** key. Click **Open**.



- \_\_\_ g. Verify that the **teamname-admin.pub** file is now listed in the **SSH Public Key** field. Click **Create**.

- 
- 56. Review the generated **svctask mkuser** command. Observe that the key file is passed to the system and a password is set up for the **teamname-admin** user that is being created. Note that the **-usergrp 1** value denotes the Administrator user group.



### Important

In order to view the generated commands, the user must be able to click on the **View more details** link in the task window before it disappears (This may take some persistence and a good aim!).

Once the task details are shown, then every subsequent task execution will have the task window stay displayed until the user clicks the **Close** button.

- 
- 57. Click **Close**. Verify that the **teamname-admin** user ID has been created with SSH authentication.



### CAUTION

Because there are multiple teams using the same V9000, we recommend that you use the Filter field to search for your team resources, including user name, pool, volume, host, and so on.



### Information

As best practice, when using scripts it is more secure to use the SSH keys rather than passwords.

- 
- 58. From the **User Groups** filter list, click **Administrator**.
  - 59. Observe that your admin user ID is assigned to the Administrator user group which authorizes administrative privileges to manage the FlashSystem V9000 clustered system.
  - 60. Right-click on your **teamname-admin** entry.
  - 61. Examine the pop-up list of options. Observe that this user has the authority to remove its password and SSH key. Note that the Properties option provides the ability to modify their own password and SSH key.



### Information

Administrator-role users can run the system commands that the security-administrator-role users can run from the CLI except for commands that deal with users, user groups, and authentication.

Because the admin user is in the Administrator user group, it does not have the authority to delete itself, manage other users, or create new users. When logged in as the teamname-admin user, these options will be displayed in gray indicating they are not available.

## Section 8: Create users with copy operator role and monitor role

This procedure creates two additional users with the copy operator and monitor roles for use in later labs.

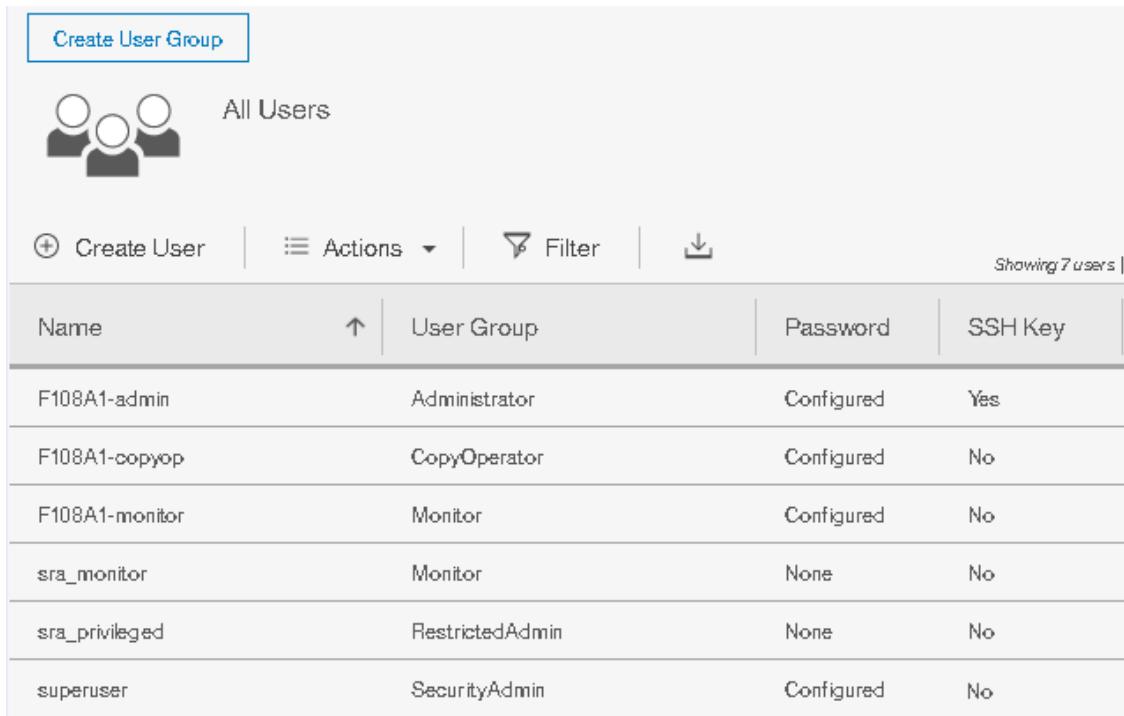
- \_\_\_ 62. Click **Create User** to create a new user. The create user window is displayed.
  - \_\_\_ a. Assign a user Name of **`teamname-copyop`**.
  - \_\_\_ b. Select the Authentication Mode as **Local**.
  - \_\_\_ c. Select **CopyOperator** in the **User Group** drop-down list.
  - \_\_\_ d. Set the Password to **password**.
  - \_\_\_ e. *Do not* set up the **SSH Public Key**.
  - \_\_\_ f. Click **Create** to create.
  - \_\_\_ g. Review the generated **`svctask mkuser`** command. Click **Close**.
  
- \_\_\_ 63. Click **Create User** to create another user. Perform the following:
  - \_\_\_ a. Assign a user Name of **`teamname-monitor`**.
  - \_\_\_ b. Select the Authentication Mode as **Local**.
  - \_\_\_ c. Select **Monitor** in the **User Group** drop-down list.
  - \_\_\_ d. Set the Password to **password**.
  - \_\_\_ e. *Do not* set up the **SSH Public Key**.
  - \_\_\_ f. Click **Create** to create.
  - \_\_\_ g. Review the generated **`svctask mkuser`** command. Click **Close**.



### Information

Each user has a password to enable access to the V9000 management GUI and CLI. If required, SSH keys need to be set up for CLI authentication access.

- 64. Verify that the newly created CopyOperator and Monitor users are displayed. At this point you should have created three team IDs.



Name	User Group	Password	SSH Key
F108A1-admin	Administrator	Configured	Yes
F108A1-copyop	CopyOperator	Configured	No
F108A1-monitor	Monitor	Configured	No
sra_monitor	Monitor	None	No
sra_privileged	RestrictedAdmin	None	No
superuser	SecurityAdmin	Configured	No



### Important

For the remaining labs, you will use only your team IDs that you have defined. **You will no longer be required to used the *superuser* ID.**

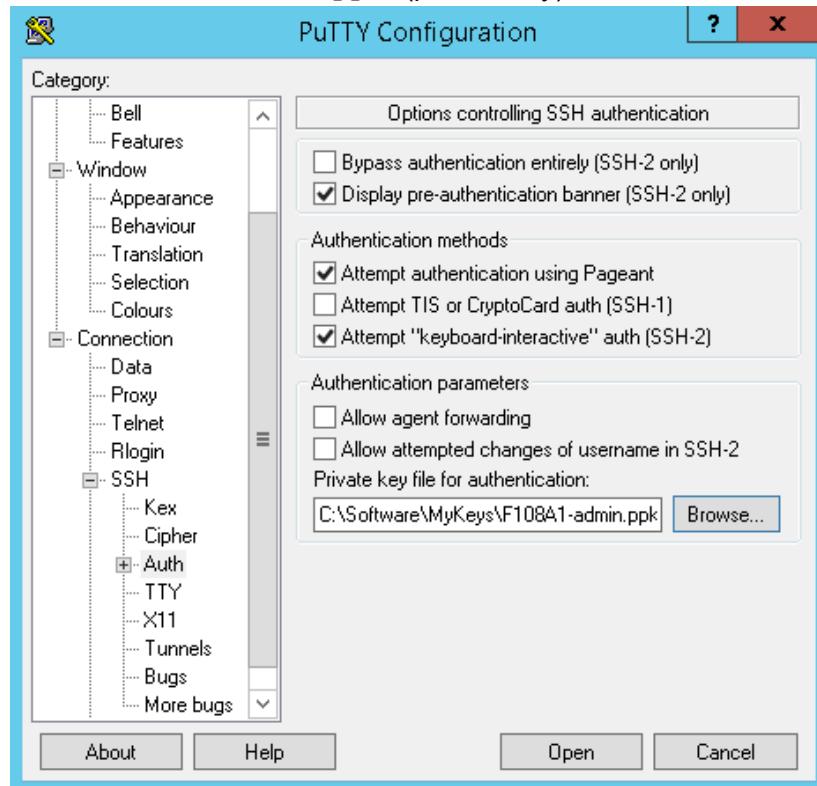
- 65. Click the superuser (Security Administrator) pulldown (top right), and select **Log Out** to close the V9000 management GUI.

## Section 9: Validate administrator user CLI authentication

This procedure validates the user CLI authentication to the FlashSystem V9000 system.

- 66. From the Admin server, open a **PuTTY** session.
- 67. Select your **teamname-V9K** saved session. Click **Load**.
- 68. From the Category pane, select **Connection > SSH > Auth** to view the options controlling the SSH Authentication.
- 69. Click **Browse** associated with the Private key file for authentication field. Navigate to the **C:\Software\MyKeys** folder.
- 70. Select the **teamname-admin** file (that you generated earlier).

- \_\_\_ 71. Verify that the `teamname-admin.ppk` (private key) is listed in the window.



### Reminder

This is the private key that matches the public key that you had stored in the system. If you want to log in with a password instead of a key, this field needs to be cleared.

If you are managing the FlashSystem V9000 system as a superuser, you must upload the **superuser.ppk** key.

- \_\_\_ 72. From the Category pane, select **Session**.  
 \_\_\_ 73. Click **Save** to save the private key with the V9000 saved session.  
 \_\_\_ 74. Click **Open** to start the SSH session with the V9000 CLI.



### Troubleshooting

The SSH keys are stored in the Windows Registry. If the SSH access was configured earlier, an older key might still be in the registry. Click **Yes** to reset the key.

- \_\_\_ 75. Log in with your admin user ID (refer to the team lab data sheet).  
 \_\_\_ 76. Observe that the SSH performs authentication of its private key with the public key that was previously installed to the system.

**1+1=2 Example**

```
login as: F108A1-admin
Authenticating with public key "rsa-key-20160816-F108A1-admin"
```

**Section 10: Use selected FlashSystem V9000 CLI commands**

This procedure uses CLI commands issued by the administrator.

- \_\_\_ 77. Enter the `lscurrentuser` command to display the name of the current user.
- \_\_\_ 78. Enter the `lsuser` command to display a list of the assigned users of the system.
- \_\_\_ 79. Verify that you as the administrator is the only user with SSH authentication.

**Information**

The CLI provides command-line completion to ease command entry. Enter enough characters until the command name is unambiguous then press the Tab key. The remainder of the command name is filled in automatically. Also the up arrow of the keyboard retrieves previously entered commands.

- \_\_\_ 80. Enter the `lssystem` command to display system information and settings. Use the scroll bar to review the full output of this command.

**Questions**

What is the system current code level? \_\_\_\_\_

- \_\_\_ 81. Press the up arrow of the keyboard to retrieve the `lssystem` command and append `ip` to the command to list the FlashSystem V9000 system's management IP addresses.
- \_\_\_ 82. Enter the `lsiogrp` command to display information about I/O groups and assigned nodes.

**Note**

An I/O group consists of 2 nodes. When a write operation is performed to a volume, the node that processes the I/O duplicates the data onto the partner node that is in the I/O group. After the data is protected on the partner node, the write operation to the host application is completed. The data is physically written to disk later.

The recovery I/O group is a temporary holder place for volumes when all nodes in the I/O group that normally owns them have suffered multiple failure.

- 83. Enter the `lsnode` command to obtain a list of the nodes in the system. Observe that each node has an object ID as well as a name and the configuration node of the clustered system.
- 



### Questions

What is the hardware attribute, referring to the model number, for NODE1? \_\_\_\_\_

What is the hardware attribute, referring to the model number, for NODE1? \_\_\_\_\_

---



### Note

The `-delim` or `delimiter` parameter condenses the on-screen content by separating the data fields with a comma (or other special characters, such as a colon or slash) instead of white space to minimize text wrapping.

---

- 84. Enter the `lsnodehw NODE1 (node1)` command to display hardware detailed information about a specific node, including the installed host adapters. Use the scroll bar to review the full output of this command.
- 



### Note

Use the `help` (or `man`) command to display help information for system commands or the `-h` parameter behind the `svcinfo` and `svctask`. If you specify a command name using `command_name`, the complete help file text for the command is displayed. If you do not specify a command name, a comprehensive list of all commands is displayed (with one brief descriptive line).

---

- 85. Type `exit` to close the **V9000** CLI session.
- 

## End of exercise

---

# Exercise 2. Provisioning internal storage

## Estimated time

00:15

## Overview

This exercise will explore the IBM FlashSystem V9000 internal storage environment. Students will create a child pool that will be used to create virtualized storage resources.

## Objectives

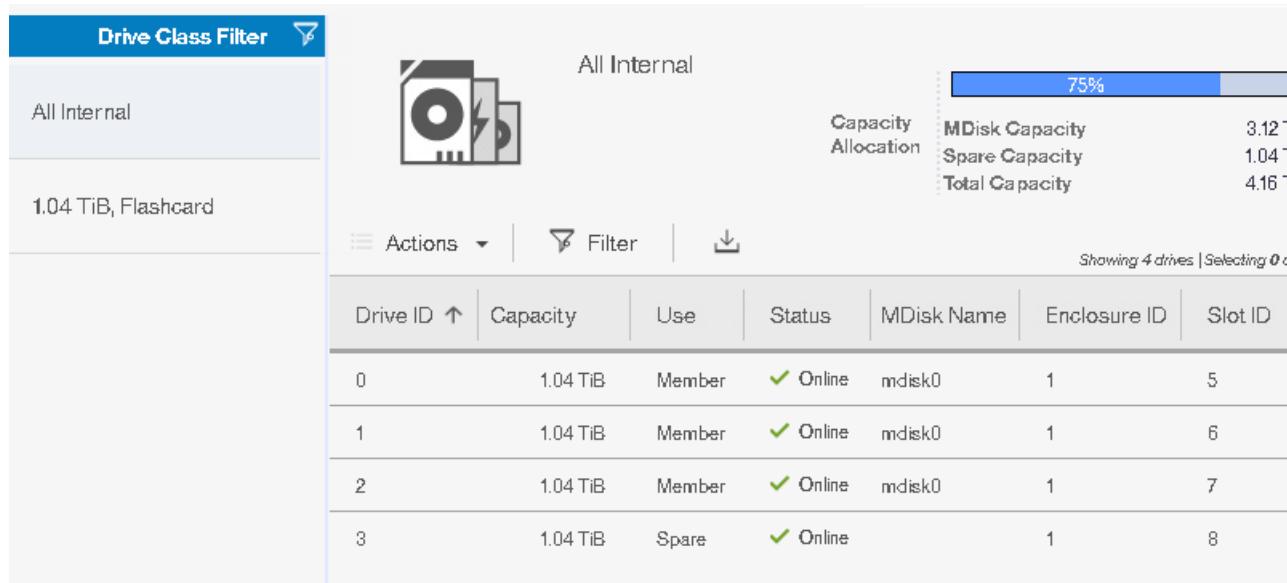
- Categorize internal storage resources that can be managed by the FlashSystem V9000.
- Create a child storage pool to be used as virtualize system capacity.

# Exercise instructions

## Section 1: Evaluate internal storage resource

This procedure reviews the internal drive resources and its attributes.

- \_\_\_ 1. From the Admin server desktop, open a browser window.
- \_\_\_ 2. Enter the IP address of your V9000 cluster management.
- \_\_\_ 3. Log in using your admin credentials (refer to the team lab data sheet.)
- \_\_\_ 4. From the FlashSystem V9000 management GUI, select **Pools > Internal Storage**.
- \_\_\_ 5. The Internal Storage panel **All Internal** view is displayed by default. From the Drive Class Filter, select the **1.04 TiB Flashcard** option.
- \_\_\_ 6. Observe the list of drives that were automatically detected by the system and configured as RAID-protected storage, as indicated via the Member and Spare values in the Use field, and the MDisk Name referring to the RAID array.



### Note

If the storage enclosure contains other drive technology, they would be listed individually by technology type and size.

- \_\_\_ 7. Observe the Internal Storage columns displayed:
  - \_\_\_ a. The system automatically assigns a **Drive ID** to each drive based on the order in which the drives are detected.
  - \_\_\_ b. The Use column identifies the status of each drive. Once a drive becomes part of an array, its **Use** attribute changes from **Candidate** to **Member** indicating it is part of an arrays. The system will also assign one drive in the array to act as a **Spare**.

- \_\_\_ c. The **Slot ID** identifies the physical location of the drives that are installed in the enclosure.
  - \_\_\_ d. Observe the **MDisk Name** column. During the System Setup RAID initialization, a single MDisk was created on a basis of one internal expansion enclosure (AE2) attached to the FlashSystem V9000 system.
- 



### Note

Arrays in FlashSystem V9000 are built from all flash modules in the AE2 enclosures and all available drives are used to create one RAID-5 array. This is not the case for AE3.

- 
- \_\_\_ e. The **Enclosure ID** is used to properly identify the enclosure in the order it is attached to the system.
  - \_\_\_ 8. Observe the internal storage capacity allocation indicator in the upper right corner of the GUI browser.
- 



### Information

The **Total Capacity** shows the overall capacity of the internal storage that is installed in this IBM FlashSystem V9000 storage system.

The **MDisk Capacity** shows the internal storage capacity that is assigned to the MDisks, which means capacity used to create the RAID array including parity information.

The **Spare Capacity** shows total capacity of all drives that were designated as spare drives.

The **percentage bar** indicates the percentage of the total capacity that is allocated to the MDisk capacity, with the grayed area showing the capacity of the spare disks.



### Questions

What is the total capacity allocated to the MDisk? \_\_\_\_\_

Hover over the percentage bar. What percentage of capacity is allocated to the Spare? \_\_\_\_\_

- 
- \_\_\_ 9. Right-click on any drive and select **Properties**.
  - \_\_\_ 10. Select the **Show Details** option to show additional details in the General, Technical and Logical sections.
- 



### Questions

What is the block size specified for the drive? \_\_\_\_\_

- \_\_\_ 11. Click **Close**.

## Section 2: Examine the storage pool

This procedure examines the internal managed disk group (**mdiskgrp**) pool attributes.

- \_\_\_ 12. Navigate to **Pools > MDisks by Pools**.
  - \_\_\_ 13. Observe **mdiskgrp0** that has been assigned by the system.
- 



### Information

MDisk groups (also known as storage pools) provide the storage capacity to configure and manage storage resources for both internal storage and external storage, and to migrate existing storage to the system.

---

- \_\_\_ 14. Click the (>) symbol associated with the **mdiskgrp0** to examine the mdisk contained in this pool.
  - \_\_\_ 15. Right-click in the column headings area and add an **ID** and **Encryption** column to the display.
- 



### Information

In the FlashSystem V9000 system, each object within an object category has an **object name** and an **object ID**. Object IDs are often used in commands that are generated by the GUI, and when using the CLI one usually has the choice to specify the object ID or its name.

---

- \_\_\_ 16. Scroll to the right. Observe that Encryption indicates '**Yes**'. This indicates that the pool has encryption enabled.
- 



### Note

Once the drives are encryption enabled, internal storage pools are automatically encrypted at creation.

---

- 17. Observe there is a variation in the total capacity allocated to the **mdiskgrp0**. Compare this to the Internal Storage MDisks capacity previously recorded.

Name	ID	State	Capacity
> Unassigned MDisks (24)			
mdiskgrp0	0	✓ Online	0 bytes / 2.08 TiB (0%)
mdisk0	0	✓ Online	2.08 TiB



### Questions

What is the difference in the capacity between the mdiskgrp0 and the MDisk Capacity? \_\_\_\_\_

---



### Information

In a RAID 5 configuration, one IBM MicroLatency module is reserved as an active spare, and capacity equivalent to one module is used to implement a distributed parity algorithm. Therefore, the system has a potential physical storage capacity of 2.08 TiB of usable capacity.

---

- 18. Right-click on the **mdiskgrp0**. Observe the list of options available.
  - 19. Select **Properties** from the menu list, and click the [View more details](#) link to expand the view.
  - 20. Observe the Easy tier status of the mdiskgrp0.
- 



### Note

If a pool contains a single type of MDisk, Easy Tier goes into **balancing** mode. When the pool contains multiple types of MDisks, Easy Tier is in active mode.

---



### Questions

What is the default extent size assigned to the mdiskgrp? \_\_\_\_\_

---



## Information

The extent size affects the maximum addressable capacity of the FlashSystem V9000 system. The maximum addressable size is 4 PB; which is more than sufficient for our exercise environment.

The extent size is not a real performance factor, but rather it is a management factor. You can allow changes to the default extent size using the **Settings > GUI Preferences**, and then select the **General** option. Click the checkbox (If not checked) to enable **Advanced pool settings**.

General	
Clear customization:	<input type="button" value="Clear"/>
Default logout time (minutes, or 0 to disable):	120
Knowledge Center:	<a href="https://ibm.biz/fs_V9000_kc">https://ibm.biz/fs_V9000_kc</a>
Refresh GUI cache:	<input type="button" value="Refresh"/>
Advanced pool settings:	<input checked="" type="checkbox"/> Enable

- \_\_\_ 21. Click **Close** to close the Properties view.
- \_\_\_ 22. Minimize the V9000 management GUI.

## Section 3: Create a child pool

This procedure uses CLI operations to create a child pool from the internal managed disk group (**mdiskgrp**) pool.

- \_\_\_ 23. From the Admin server, open a PuTTY SSH session to your V9000 management.
- \_\_\_ 24. Log in using your team **admin** ID.



## Note

The CLI '**ls**' command provides a more concise detail than what is often presented in the management GUI.

- \_\_\_ 25. Enter the **lsquorum** command to list the quorum disks. This output represents the FlashSystem V9000 storage controller.
- \_\_\_ 26. Observe the quorum index, status, and ID assigned for each quorum disk.



## Information

A quorum disk is an MDisk or a managed drive that contains a reserved area that is used exclusively for system management. A clustered system automatically assigns quorum disk candidates.

Quorums are identified by their assigned quorum index values - 0, 1, and 2. The system uses the three quorum disks to record a backup of system configuration data to be used in the event of a disaster. One of the quorum disks maintains the active status of *yes* and the other two disks status is *no* indicating they are in stand-by mode to provide redundancy if the active quorum disk fails before a system is partitioned.

**Best practice:** To avoid the possibility of losing all the quorum disk candidates with a single failure, the System Administrator must assign quorum disk candidates on multiple storage systems.



## Questions

Which of the following quorum index is the active quorum index 0? \_\_\_\_\_

- \_\_\_ 27. Enter the `lsmdiskgrp 0` command to examine the pool details. Scroll down to view the complete details.



## Questions

What is the capacity for the mdiskgrp0? \_\_\_\_\_ TB

- \_\_\_ 28. Observe that the mdiskgrp is the same as the `parent_mdisk_grp`.



## Information

In general, a pool or storage pool is an allocated amount of capacity that jointly contains all of the data for a specified set of volumes. The system supports two types of pools: parent pools and child pools.

- Parent pools receive their capacity from MDisks.
- Child pools are created from existing capacity that is allocated to a parent pool.

- \_\_\_ 29. Enter the `lsfreeextents mdisk0` command to view the number of free extents available on a managed disk.



## Questions

What is the number of extents available for the mdisk0? \_\_\_\_\_

---



---



## Note

Since child pools receive their capacity from parent pools, their size cannot exceed the size of the parent pool.

All MDisks in a pool are split into extents of the same size. Volumes are created from the extents that are available in the pool. You can add another MDisk to a pool at any time to increase the number of extents that are available. The system automatically balances volume extents between the MDisks to provide the best performance to the volumes.

- 30. Enter the following `mkdiskgrp` command syntax string to create a team child pool with the capacity size of 250 GB:

```
mkmdiskgrp -name teamID-CHILD -unit gb -size 250 -parentmdiskgrp mdiskgrp0
```



## Example

```
IBM_FlashSystem:F108A-V9K:superuser> mkmdiskgrp -name F1A1-CHILD -unit gb  
-size 250 -parentmdiskgrp mdiskgrp0  
MDisk Group, id [1], successfully created  
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```



## Reminder

This is a shared environment. Refer to your team data sheet to ensure you are using the proper credentials required.

- 31. Enter the `lsmdiskgrp -delim , -filtervalue name=teamsetID*` command to list your storage pools (or MDisk groups).
- 32. Observe the attributes of your team child pool.



## Note

Child pools are created with fully allocated physical capacity by default, and are similar to parent pools with similar properties, and can be used for volume copy operation.



## Questions

What is your team child pool [ID]? \_\_\_\_\_

What is the extent size assigned to your child pool? \_\_\_\_\_

- 
- \_\_\_ 33. Recall the `lsmdiskgrp` command. Append the command with your team **child pool name** or **ID** to view the complete details.
- 



## Questions

What is the encryption status of your team child pool? \_\_\_\_\_

- 
- \_\_\_ 34. Navigate to the V9000 management GUI, and select **Pools > Pools**.
- \_\_\_ 35. Click the (>) symbol to the left of `mdiskgrp0` pool to examine its details.
- \_\_\_ 36. If necessary, right-click in the column headings area and add an **ID** column to the display.
- \_\_\_ 37. Navigate to the **Dashboard** view.
- \_\_\_ 38. Observe that the overall system capacity remains unchanged since no capacity has been allocated.
- \_\_\_ 39. Type `exit` to close the **V9000** CLI session.
- \_\_\_ 40. Log out of the **V9000** management GUI.

## End of exercise

---

# Exercise 3. Managing external storage resources

## Estimated time

00:30

## Overview

This exercise explores the ability to manage external storage subsystems on the Fibre Channel SAN. Students will use the DS Storage Manager to verify the LUNs that are presented to the FlashSystem V9000 clustered system. Students will create storage pools using the external storage LUNs presented to the FlashSystem V9000 system for management.

## Objectives

- Classify external storage resources attached to the IBM FlashSystem V9000 SAN Fabric.
- Correlate the LUNs that are mapped to the IBM FlashSystem V9000 host type.
- Use the management GUI and CLI to rename the external storage subsystem resources.
- Create virtual system capacity from LUNs presented as MDisks.

## Exercise instructions

### Section 1: Verify DS3K resources presented to the FlashSystem V9000

This procedure uses the DS Storage Manager application to explore the external storage subsystem configuration and hardware resources.

- 1. From the Admin server desktop, double-click the **DS Storage Manager Client** icon.
- 2. From the DS Storage Manager (Enterprise Management) **Devices** tab, double-click the Storage Subsystem **DS3K** device entry to open the subsystem management window.
- 3. The Enter Password window is displayed. Enter the Administrator password for the *DS3K* storage subsystem (refer to your team data sheet). Click **OK** to continue.
- 4. Observe that the (default) **Summary** tab provides an intuitive summary of information about the storage managed by the *DS3K* storage subsystem.
- 5. From the **Summary** tab, click **View Storage Subsystem Profile** link in the **Monitor** box.
- 6. The Storage Subsystem Profile window is displayed. Click the **Hardware > Controllers** tab.
- 7. Observe that this model is configured with dual controllers.
- 8. In the Find field box, type **Product ID** and click the binoculars icon to search for the string Product ID.



#### Questions

What is the Product ID name of the DS3K storage subsystem? \_\_\_\_\_

- 
- 9. In the Find field box, type **world-wide node** click the binoculars icon. Observe the speed of the Fibre Channel (FC) Host Interface Card (HIC) installed.



## Information

The unique World Wide Node Name (WWNN) is used to identify the storage subsystem in a Storage Area Network (SAN). Each port on a IBM Storage Device also has a unique and persistent (16 hexadecimal digits) World Wide Port Name (WWPN) that is actually 8 bytes. Three of these bytes are used for the vendor ID. The WWPN represents each FC port presented to a SAN. IBM Storage uses a methodology whereby each WWPN is a child of the WWNN. Therefore, if you know the WWPN of a port, it can easily identify the vendor and match it to the WWNN of the storage subsystem that owns that port.

Examples of a Vendor IEEE WWPN name format:

- 1 = **IEEE 803.2** standard format (example **10:00:00:00:c9:2f:65:d6**) - Emulex owns the 0000c9 company ID.
- 2 = **IEEE 803.2** extended format (example: **21:00:00:e0:8b:90:90:04**) - QLogic owns the 00e08b company ID.
- 5 = **IEEE Registered Name** format (example **50: 05: 07:63:00:c7:01:99**) - IBM owns the 005076 company ID.



## Questions

What are the last **3** bytes of the WWNN identifier for the DS3K storage subsystem? \_\_\_\_\_

\_\_\_ 10. Click the **Storage > Arrays** tab.



## Questions

How many arrays have been defined on the DS3K storage subsystem? \_\_\_\_\_

\_\_\_ 11. Click **Close** to close the profile window.



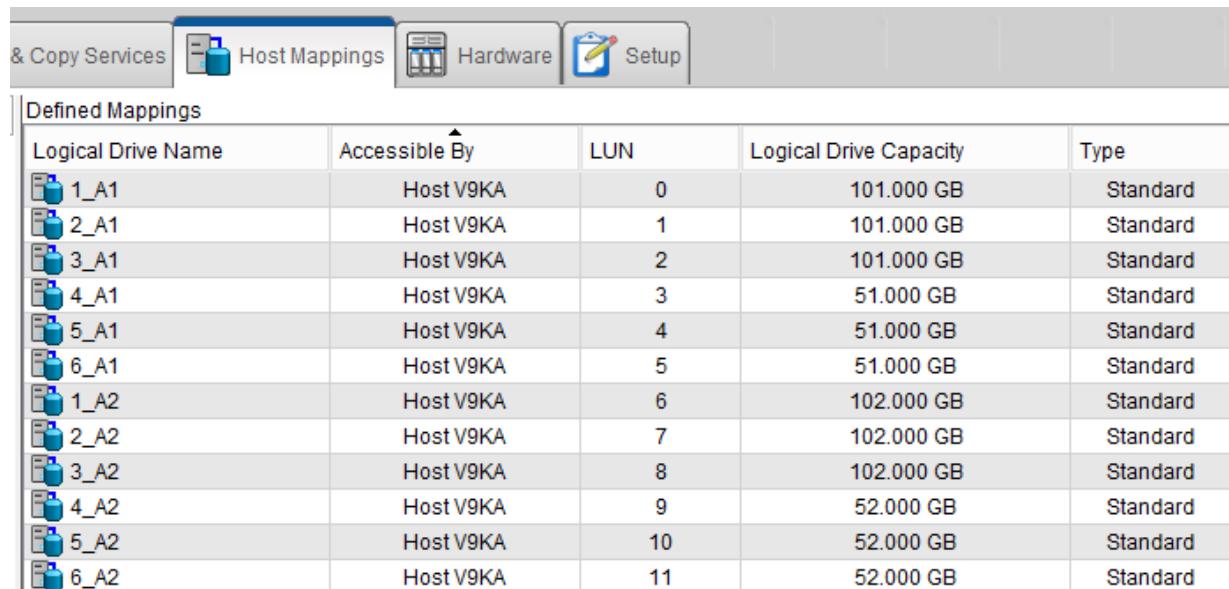
## Note

The FlashSystem V9000 is defined as a SCSI initiator (host) to the external storage subsystem. The IBM TS SAN VCE host type allows the FlashSystem V9000 to properly manage SCSI LUN ownership between controllers used and the paths specified by the host.

## Section 2: Verify LUNs presented to the FlashSystem V9000

This procedure uses the DS Storage Manager application to verify the host and LUNs that are available to the FlashSystem V9000.

- \_\_\_ 12. From the DS Storage Manager (Subsystem Management) view, click **Host Mappings** tab.
- \_\_\_ 13. The Host Mappings window is displayed. Under the Default Group, observe that the V9000 clustered system is defined to the DS3K as a host group with the name of **HostV9Kx** (x represent your team environment ID).
- \_\_\_ 14. Right-click on your team **HostV9Kx** in the object tree window. Select **Properties**.
- \_\_\_ 15. Observe that the IBM FlashSystem V9000 host type is set to **IBM TS SAN VCE**. Click **Close**.
- \_\_\_ 16. From the **HostV9Kx** entry, view the list of Logical volumes or drives that are assigned to the team host group.
- \_\_\_ 17. Examine the contents of the Defined Mappings window. Observe the logical drive name, LUN number, and drive capacity of each LUN (scroll down to view the complete list)



The screenshot shows the DS Storage Manager interface with the 'Host Mappings' tab selected. Below the tabs is a table titled 'Defined Mappings' with the following data:

Logical Drive Name	Accessible By	LUN	Logical Drive Capacity	Type
1_A1	Host V9KA	0	101.000 GB	Standard
2_A1	Host V9KA	1	101.000 GB	Standard
3_A1	Host V9KA	2	101.000 GB	Standard
4_A1	Host V9KA	3	51.000 GB	Standard
5_A1	Host V9KA	4	51.000 GB	Standard
6_A1	Host V9KA	5	51.000 GB	Standard
1_A2	Host V9KA	6	102.000 GB	Standard
2_A2	Host V9KA	7	102.000 GB	Standard
3_A2	Host V9KA	8	102.000 GB	Standard
4_A2	Host V9KA	9	52.000 GB	Standard
5_A2	Host V9KA	10	52.000 GB	Standard
6_A2	Host V9KA	11	52.000 GB	Standard



### Reminder

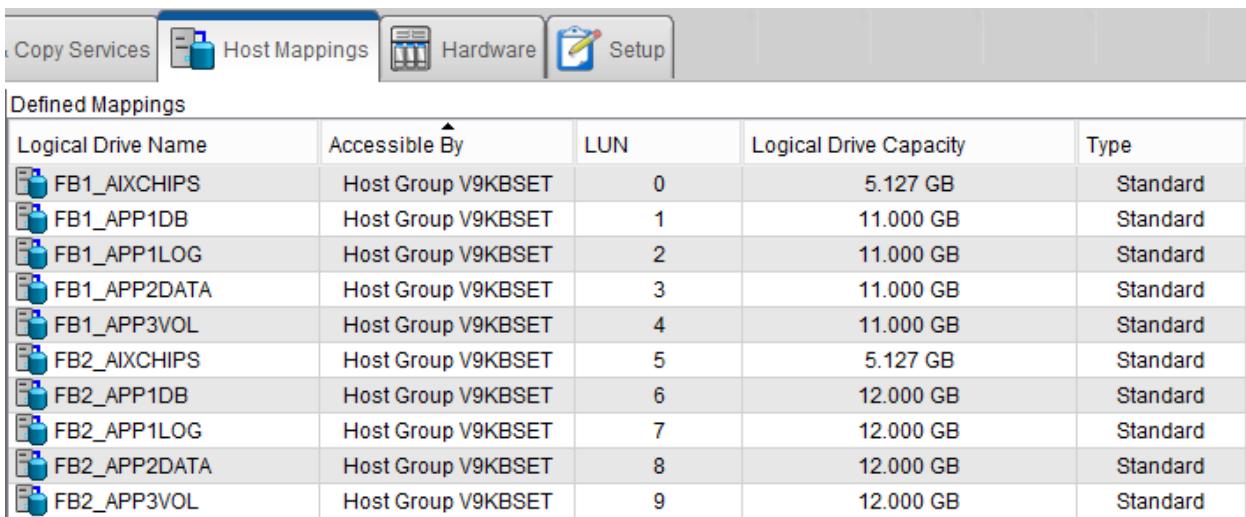
The capacity of the logical drive specifies to which team should use the drive. For example, capacities of 101 and 51 GB (as identified by the last digit of 1) are for **team 1**, while logical drives with capacities of 52 or 102 GB are for **team 2**. This applies to MDisks mapped to the V9000.



### Questions

How many LUNs or logical drives are in the **HOSTV9Kx** group for your team use? \_\_\_\_\_

- \_\_\_ 18. Click the Host Group **V9KxSET** in the object tree window (**x** represent your team environment ID) to view the APP logical drives for the lab environment.



Logical Drive Name	Accessible By	LUN	Logical Drive Capacity	Type
FB1_AIXCHIPS	Host Group V9KBSET	0	5.127 GB	Standard
FB1_APP1DB	Host Group V9KBSET	1	11.000 GB	Standard
FB1_APP1LOG	Host Group V9KBSET	2	11.000 GB	Standard
FB1_APP2DATA	Host Group V9KBSET	3	11.000 GB	Standard
FB1_APP3VOL	Host Group V9KBSET	4	11.000 GB	Standard
FB2_AIXCHIPS	Host Group V9KBSET	5	5.127 GB	Standard
FB2_APP1DB	Host Group V9KBSET	6	12.000 GB	Standard
FB2_APP1LOG	Host Group V9KBSET	7	12.000 GB	Standard
FB2_APP2DATA	Host Group V9KBSET	8	12.000 GB	Standard
FB2_APP3VOL	Host Group V9KBSET	9	12.000 GB	Standard



### Questions

Record the logical drives that are assigned with your teamsetID. The logical drives can be identified by your **teamset\_ID** (Example: FB1 = Team 1)

- (1) \_\_\_\_\_ (2) \_\_\_\_\_ (3) \_\_\_\_\_  
 (4) \_\_\_\_\_ (5) \_\_\_\_\_ (6) \_\_\_\_\_

- \_\_\_ 19. Close the **DS Storage Manager** windows.

## Section 3: Modify external storage resources

This procedure verifies the external storage provisioning using V9000 GUI and identifies steps to rename external storage controller.

- \_\_\_ 20. From the Admin server desktop, open a browser window.  
 \_\_\_ 21. Enter the URL of the V9000 management IP address.  
 \_\_\_ 22. Log on with your admin credentials provided in the team lab data sheet.  
 \_\_\_ 23. Navigate to **Pools > External Storage**.



### Note

The system presents all external storage subsystems that are part of the system SAN Fabric and are discovered with a default name of **controller#**. The number assigned to the controller is based on the order it was discovered. Only one controller has been discovered.

If the controller has a different name, then that means someone has already renamed it using the **teamname**. If so, skip to the next step



## Troubleshooting

If the controller has a default (controller0) name, right-click the **controller** name and select **Rename**.

- From the Rename Storage System pane, enter the name of the team DS3500 storage subsystem name (refer to the team lab data sheet), and click **Rename**.
- Review the `svctask chcontroller -name` command which is used to change the name of the storage subsystem. Click **Close**.



## Hint

The GUI automatically refreshes its display about every 15 seconds. If you experience a delay after renaming the external resources, you can refresh the browser view by using the URL entry field reload page icon, or log out and back into the GUI.

- 24. Use the scroll bar to locate the WWNN column. Examine the last **3** bytes of the WWNN value displayed.
- 25. Verify that the last 3 bytes match the value previously recorded from the DS3K storage subsystem.
- 26. Click the (>) symbol to expand the controller view.
- 27. Review the list of discovered MDisks that are assigned to the storage subsystem.



## CAUTION

Because there are multiple teams using the same V9000, we recommend that you use the Filter field to search for your team resources, including user name, pool, volume, host, and so on.



## Troubleshooting

A new storage controller (external storage subsystem) is listed automatically when the SAN zoning configuration is done, but typically without detected disk drives.

- If the mdisks are not listed, select **Actions > Discover Storage** or right-click on the **DS3K** entry and select **Discover Storage**.
- Examine the `svctask detectmdisk` command. Click **Close**.

- 28. Observe the access mode of **unmanaged** as well as the capacity and LUN number for each MDisk.

**Note**

Each MDisk represents a LUN that has been assigned to the V9K host from the DS3K. All newly discovered MDisks are always placed in ***unmanaged*** mode.

**Hint**

To tailor the column displayed, you can right-click any column heading to add or remove from the display table using the associated check box.

The column width in any display area can be resized by dragging the edge of its heading box left or right. A column heading can be dragged and dropped to reorder the display order of the columns.

\_\_\_ 29. Right-click anywhere in the column heading area to add a **ID** column to the display.

**Questions**

What is the DS3K controller ID? \_\_\_\_\_

\_\_\_ 30. Click the **ID** column heading to sort the ID numerically.

Name	ID	State	Capacity	Mode	Storage System	LUN
B108-DS3K	2	✓ Online	IBM 1746 FASTT			Site: Unassigned
mdisk1	1	✓ Online	101.00 GiB	Unmanaged	F108_DS35K	0000000000000000
mdisk2	2	✓ Online	101.00 GiB	Unmanaged	F108_DS35K	0000000000000001
mdisk3	3	✓ Online	101.00 GiB	Unmanaged	F108_DS35K	0000000000000002
mdisk4	4	✓ Online	51.00 GiB	Unmanaged	F108_DS35K	0000000000000003
mdisk5	5	✓ Online	51.00 GiB	Unmanaged	F108_DS35K	0000000000000004
mdisk6	6	✓ Online	51.00 GiB	Unmanaged	F108_DS35K	0000000000000005
mdisk7	7	✓ Online	102.00 GiB	Unmanaged	F108_DS35K	0000000000000006
mdisk8	8	✓ Online	102.00 GiB	Unmanaged	F108_DS35K	0000000000000007

## Section 4: Modify external resource MDisk names using the GUI

This procedure identifies steps to multi-select resources to be renamed using the same action from the management GUI.

- \_\_\_ 31. From the Capacity column, observe the mdisks (LUNs) that have been assigned to your **teamsetID**.



### Note

Last digit of the capacity indicates your **teamsetID** to be used for the MDisk (FA1 = 101 GB (team 1), FA2=102 (team 2), and so on).

- \_\_\_ 32. Multi-select the three **mdisks** with a capacity size of 100+ GiB.
- \_\_\_ 33. Verify that you have selected your team's mdisks.
- \_\_\_ 34. Right-click and select the **Rename**.
- \_\_\_ 35. From the Rename MDisks pane, perform the following:
  - \_\_\_ a. Enter the **teamsetID-mdisk** as the mdisks names.
  - \_\_\_ b. Change the starting index number to **1**.



### Hint

If you selected mdisks 1 - 3, the starting index is **1** = renaming mdisk1, mdisk2, mdisk3; where as if you selected mdisk 4 - 6, the starting index is **4** = renaming mdisk4, mdisk5, mdisk6

- \_\_\_ c. Click **Rename** to continue.

**Rename 3 MDisks**

Enter the new name prefix:

Enter starting index:

MDisk names:

- FA1-mdisk1
- FA1-mdisk2
- FA1-mdisk3

**Cancel** **Rename**

- \_\_\_ 36. Observe that a separate **svctask chmdisk** command is generated to rename each MDisk. Click **Close**.
- \_\_\_ 37. Multi-select the three **mdisks** with a capacity size of 50+ GiB.

- \_\_\_ 38. Verify that you have selected your team's mdisks.
- \_\_\_ 39. Right-click and select the **Rename**.
- \_\_\_ 40. From the Rename MDisks pane, perform the following:
  - \_\_\_ a. Enter the `teamsetID-mdisk` as the mdisks names.
  - \_\_\_ b. Change the starting index number to **4**.
  - \_\_\_ c. Click **Rename**.
- \_\_\_ 41. Observe that a separate `svctask chmdisk` command is generated to rename each MDisk. Click **Close**.
- \_\_\_ 42. Verify that the selected mdisks representing your `teamsetID` have been renamed to `teamsetID-mdisk1` through `teamsetID-mdisk6`.
- \_\_\_ 43. To view details of the mdisk, right-click on one of your renamed entries. From the pop-up menu, select **Properties**.
- \_\_\_ 44. From the Properties window, click [View more details](#) link to expand the view.
- \_\_\_ 45. Scroll down to review the information associated with the selected mdisk.



### Note

The storage subsystem name, LUN number, and UID of the MDisk can be displayed as a column here. This information is useful to correlate the MDisk to a specific LUN from a given storage device.

- \_\_\_ 46. Observe that the Path count of **2** is the number of paths that are currently being used to handle I/O to this MDisk.



### Information

Each managed disk will have an online path count, which is the number of nodes that have access to that managed disk. This represents a summary of the I/O path status between the cluster nodes and the particular storage device. For ALUA backend disk subsystems such as the DS3500, this is typically half of the available paths, since I/Os are directed to the primary controller in the disk subsystem for the MDisk. The maximum path count is the maximum number of paths that have been detected by the cluster at any point in the past. Therefore, if the current path count is not equal to the maximum path count then the particular managed disk may be degraded and paths may be offline.

- \_\_\_ 47. Click **Close**.
- \_\_\_ 48. Right-click on any column heading and click the check box next to **UID** to add it to the display.

## Section 5: Create storage pools from external resources

This procedure defines storage pools by using the external LUNs presented to the FlashSystem V9000 as MDisks.

- \_\_\_ 49. Navigate to **Pools > MDisks by Pools**.
  - \_\_\_ 50. Click the (>) symbol to the **Unassigned MDisks** entry to expand the view. This indicates the number of unassigned mdisks (LUNs) that can be add to a storage pool.
- 



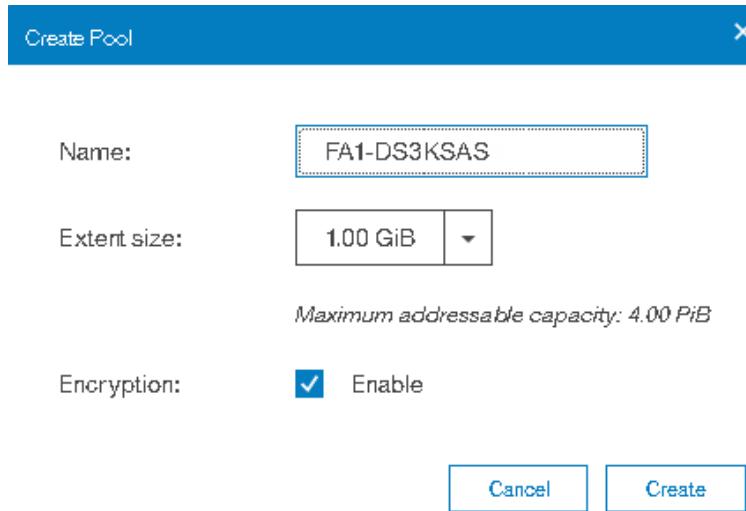
### Information

Although there are no restrictions as to which MDisks can be added to a storage pool, there are a few important concepts to understand:

- Before storage can be provisioned, the MDisk must be placed into a storage pool. The storage pool stripes VDisks across these MDisks. SCSI LUNs used from dissimilar systems or dissimilar performance attributes might have different performance characteristics. It is not desirable to have MDisks with different performance or availability characteristics in a single tier pool and can cause disk hot spots and I/O latency performance issues. Multi-tiered pools using Easy Tier are an exception by design.
  - The storage pool might use space from multiple MDisks in the pool. If any managed MDisk or any array goes OFFLINE, the storage pool also goes offline including any VDisks in the pool. If a storage subsystem is taken down, any storage pool containing MDisks from that storage subsystem also goes offline.
- 

- \_\_\_ 51. If required, right-click in the column headings area and add an **ID** column to the display (Adjust columns for viewing).
- \_\_\_ 52. Click the (v) symbol to minimize the **Unassigned MDisks** view.
- \_\_\_ 53. Click **Create Pool** (top left of the menu) to create a new storage pool.
- \_\_\_ 54. From the Create Pool panel, enter the name of **teamsetID-DS3KSAS** (Refer to the team data sheet).
- \_\_\_ 55. Observe that the default extent size is 1.00 GB.

- \_\_\_ 56. Check the Encryption box to enable encryption (option might be enabled by default).



### Note

If you have preexisting storage pools, it's recommended to create a storage pool with the same extent size equal to the existing storage pools.

FlashSystem V9000 supports encryption for externally virtualized storage, even if the supported virtualized array does not have encryption capabilities.

- \_\_\_ 57. Click **Create**.

- \_\_\_ 58. Examine the `svctask mkmdiskgrp` command that creates a storage pool.

### Information

The `-easytier` setting of `auto` indicates that the Easy Tier function will be **On** and either doing automated single tier storage pool balancing, or doing automated tiering for multi-tiered pools (typically with flash and HDD tiers) with the proper licensing. The `-encrypt` indicates the pool is created with encryption enabled. The `-guid` value corresponds to the particular GUI icon selected for the pool. The pool is defined with a (default) extent size of 1024 MB. The `-warning` value of 80% indicates that a warning message is to be generated when 80% of the pool capacity has been allocated.

- \_\_\_ 59. Click **Close**.

- \_\_\_ 60. A suggested task pop-up might appear as a reminder to **Add storage to the pool**. Click **Got it** to disable the reminder.

- \_\_\_ 61. Click **Create Pool** to create another team storage pool.

- \_\_\_ 62. Enter the pool name of `teamsetID-DS3KSATA`. Accept all defaults and click **Create**.

- \_\_\_ 63. Examine the `svctask mkmdiskgrp` command that creates a storage pool. Click **Close**.

- \_\_\_ 64. Verify that both your **teamsetID-DS3KSAS** and **teamsetID-DS3KSATA** pools are listed in the MDisks by Pools display.
- \_\_\_ 65. Observe the current state of your team pools.

## Section 6: Assign mdisks to the external storage pools

- \_\_\_ 66. Click the (>) symbol to expand the **Unassigned MDisks** view.
- \_\_\_ 67. Right-click in the column headings area and add an **ID** and **Encryption** column to the display.
- \_\_\_ 68. Click the **ID** column heading to sort the ID numerically.
- \_\_\_ 69. Multi-select the first two **teamsetID-mdisks** with a capacity size of 100+ GiB.



### Reminder

Refer to the last digit of the capacity that represents your **teamsetID**-MDisks; i.e FA1-mdisk#=101 GB, FA2-mdisk#=102, etc.

- \_\_\_ 70. Right-click on the selected mdisks and select **Assign**.
- \_\_\_ 71. From the Assign # MDisks to Pool panel, complete the following:
  - \_\_\_ a. Select your **teamsetID-DS3KSAS** pool.
  - \_\_\_ b. Select **Enterprise Disk** as the Tier technology for the pool.
  - \_\_\_ c. Do not check the Encryption box to enable external storage encryption.

Assign 2 MDisks to Pool
X

Pool:	<input style="width: 100%; border: 1px solid #ccc; padding: 2px;" type="text" value="FA1-DS3KSAS"/>
Tier:	<input style="width: 100%; border: 1px solid #0070C0; padding: 2px;" type="text" value="Enterprise Disk"/>
Encryption:	<input type="checkbox"/> Externally encrypted

?
Cancel
Assign



### Note

The Externally encrypted check box should only be used if the MDisks being assigned are declared as self-encrypted. In other words, they are known to belong to a storage controller that already deploys encryption.

- \_\_\_ 72. Click **Assign**.

- \_\_\_ 73. Examine the `svctask chmdisk -tier tier_enterprise # (mdisk# selected)` command syntax that is generated for each mdisk to enable encryption and change the tier type to Enterprise. The `svctask addmdisk` command is used to assign the mdisks with its object ID to the selected storage pool. Click **Close**.
- \_\_\_ 74. Navigate back to the **Unassigned MDisks** view.
- \_\_\_ 75. Multi-select the first two `teamsetID-mdisks` with a capacity size of 50+ GiB.
- \_\_\_ 76. Verify that you have selected your team's mdisks.
- \_\_\_ 77. Right-click on the selected mdisks and select **Assign**.
- \_\_\_ 78. From the Assign # MDisks to pool panel, complete the following:
  - \_\_\_ a. select your `teamsetID-DS3KSATA` pool.
  - \_\_\_ b. Select **Nearline Disk** as the Tier technology for the pool.
- \_\_\_ 79. Do not check the Encryption box to enable external storage encryption. Click **Assign**.
- \_\_\_ 80. Examine `svctask chmdisk -tier tier_nearline # (mdisk# selected)` command syntax that is generated. Click **Close**.
- \_\_\_ 81. Click the (>) symbol associated with the **DS3KSAS** and **DS3KSATA** pools.
- \_\_\_ 82. Observe the encryption status of the **storage** pools once the mdisks have been added.



### Note

The internal storage attribute of **Encryption 'Yes'** indicates that the pool is encrypted, which means that any child pools and VDisks created are automatically encrypted.

The external storage pool Encryption setting of Encrypted, means the pool is encrypted by the V9000 and any child pools or VDisks created from the pool storage will be encrypted. Selecting the "**Externally Encrypted**" box when adding MDisks to the pool indicate that the backend storage encrypts the storage; thus there's no need for the V9000 to encrypt the data.

- 
- \_\_\_ 83. Right-click on each pool and select **Properties**.
  - \_\_\_ 84. From the Properties window, click [View more details](#) link to view the mdisk Encryption status. Click **Close**.
- 



### Questions

What is the current storage capacity of each external storage pool?

What is the last four non-hexadecimal digits of the mdisks (LUNs) UID that have been assigned to each pool?

DS3KSAS pool capacity \_\_\_\_\_ mdisk# UID \_\_\_\_\_ mdisk# UID \_\_\_\_\_

DS3KSATA pool capacity \_\_\_\_\_ mdisk# UID \_\_\_\_\_ mdisk# UID \_\_\_\_\_

**Optional**

You have the option to assign external storage capacity to the FlashSystem V9000 storage pool using the External storage icon shown below in the Pools > MDisks by Pools window. This method does not provide the ability to filter or sort the mdisks. You will have to scroll through the list of mdisks to make your selections.

F108A-DS3K  
1.52 TiB

20 MDisks

Assign

Pool: Click to select

MDisks: Select MDisks

Tier: Nearline Disk

Encryption:  Externally encrypted

pool capacity: Not selected

Cancel Assign

**Reminder**

The GUI automatically refreshes its display about every 15 seconds.

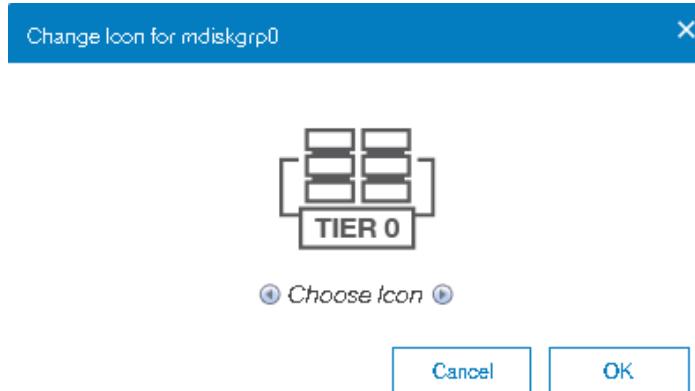
- \_\_\_ 85. Navigate to **Pools > Volumes by Pool**.
- \_\_\_ 86. Right-click in the column headings area and add the Encryption column to the display.
- \_\_\_ 87. Select the **mdiskgrp0** pool in the pool filter.

**Reminder**

You are working in a shared environment, if a Tier 0 icon already exist, then that means someone may have changed it previously.

- \_\_\_ 88. If not, hover the mouse pointer over the default pool icon. A pencil icon appears. Click the pool icon.

- \_\_\_ 89. Use the Change Icon left/right arrows to select the **Tier 0** icon. Click **OK**.



- \_\_\_ 90. Examine the `svctask chmdiskgrp` command used to used to change the icon Tier 0. Click **Close**.
- \_\_\_ 91. Observe that changes made to the mdiskgrp0 icon have also updated your CHILD pool icon.
- \_\_\_ 92. Select your **SAS** pool. Change the default icon to **Tier 1** icon. Click **OK**.
- \_\_\_ 93. Examine the `svctask chmdiskgrp` command used to change the icon Tier 1. Click **Close**.
- \_\_\_ 94. Select the **SATA** pool. Change the graphic to **Tier 2**. Click **OK**.
- \_\_\_ 95. Examine the `svctask chmdiskgrp` command used to change the icon Tier 0. Click **Close**.
- \_\_\_ 96. Navigate back to the **Pools > External Storage** view.
- \_\_\_ 97. If necessary, click the (>) symbol associated with the DS3K controller to expand view.
- \_\_\_ 98. Observe that the mdisks have now been assigned to their respective pools, and are now in Managed mode.



### Troubleshooting

If the pool is not displayed, add the pool column by right clicking on the column heading and selecting the Pool box.



### Information

Once the MDisk has been assigned to a storage pool means that their capacity and allocation are now being *managed* by the FlashSystem V9000 system.

- \_\_\_ 99. Minimize the **V9000** management GUI.

## Section 7: Examine external storage using the CLI

- \_\_\_ 100.From the Admin server desktop, open a CLI session to your V9000 management.
  - \_\_\_ 101.Log in using your **admin** credentials.
  - \_\_\_ 102.Enter the `lsmdiskgrp -delim , -filtervalue name=teamsetID*` command to list your storage pools (or MDisk groups). Observe the object ID of each pool.
  - \_\_\_ 103.Observe that the external pools are defined as parent pools which means that they support child pool creation.
- 



### Questions

What is your SAS pool object ID? \_\_\_\_\_

What is your SATA pool object ID? \_\_\_\_\_

- 
- \_\_\_ 104.Enter `lscontroller` to list controllers and their IDs.
  - \_\_\_ 105.Enter `lscontroller [ID]` to view specific details about the DS3500 controller.
  - \_\_\_ 106.Observe the WWPNs and the number of path counts assigned for access.
- 



### Note

The `path_count` attribute here for each port on the backend controller is different than the `path_count` attribute for an MDisk though they are related. For each controller port, the `path_count` is the sum of preferred paths using this port for all the MDisks, between the V9000 and the backend controller. The `port_count` for each MDisk is the number of preferred paths for the MDisk between the V9000 and the backend controller.

---



### Information

IBM Storage uses a methodology whereby each WWPN is a child of the WWNN. This means that if you know the WWPN of a port then you can easily match it to the WWNN of the storage device that owns that port. The WWPNs associated with a WWNN will have the same last six hex digits.

WWNN is based on: 20:0Z:00:80:E5:**xx:xx:xx** where **xxxxxx** is unique for each machine

WWPN is based on: 20:YZ:00:80:E5:**xx:xx:xx** where **xxxxxx** is unique for each machine

- 
- \_\_\_ 107.To list information about the mdisks presented from the DS3K storage subsystem, you will need to filter on the name of the storage system. Enter the following command:

```
lsmdisk -delim , -filtervalue controller_name=DS3Kname | grep
[teamnsetID]
```

(Where **DS3Kname** is the current name for the controller)

**1+1=2 Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>lsmdisk -delim , -filtervalue controller_name=B108-DS3K | grep FA1
```

- \_\_\_ 108.Observe the list of mdisk entries that contains the updated names in the format of **teamsetID-mdiskX**.
- \_\_\_ 109.To obtain detailed information about a given specific MDisk or object, enter the command (use the scroll bar to view the complete output):  
**lsmdisk teamsetID-mdiskX** (where X is the object ID)

**Questions**

What is the preferred\_WWPN for the mdisk? \_\_\_\_\_

- \_\_\_ 110.Enter the **lsfreeextents teamsetID-mdisk1** command to view the number of free extents available on a managed disk.
- \_\_\_ 111.What is the number of free extents for the mdisk? \_\_\_\_\_
- \_\_\_ 112.Type **exit** to close the V9000 CLI session.
- \_\_\_ 113.Navigate to your V9000 management GUI.
- \_\_\_ 114.Select **Monitoring > System**.
- \_\_\_ 115.Click the **Overview** (top right corner of the System panel). Observe the current active resources.
- \_\_\_ 116.Navigate to the **Dashboard** view.
- \_\_\_ 117.Observe the overall physical capacity values for system.
- \_\_\_ 118.Log out of the **V9000** management GUI.

**End of exercise**

# Exercise 4. Windows host definition and volume allocations

## Estimated time

00:30

## Overview

This exercise uses the IBM FlashSystem V9000 GUI to define a Windows host and volumes, and to check the availability of the new disks on the host. In addition, establishes FlashSystem V9000 volume access from previously assigned host. The Windows host is used to view, access, and write to the prospective mapped V9000 volumes. Subsystem Device Driver Device Specific Module (SDDDSM) is used to correlate and display the volumes and their paths on the host.

## Objectives

- Evaluate the hosts' world wide port number (WWPN) using host interface.
- Create Fibre Channel Protocol (FCP) host object using both the management GUI.
- Create and map volumes to host object using the management GUI.
- Carry out procedures to access V9000 mapped volumes on the host system in a multipath environment.

# Exercise instructions

---

## Section 1: Identify WWPN on the Windows server

Before a Windows host can be defined on the V9000, the WWPN of the host must be identified. This procedure uses the Windows command prompt to display the WWPNs of the host HBAs.

- \_\_\_ 1. From the Admin server desktop, double-click on the **Remote Desktop Connection** icon to start a remote desktop session.
  - \_\_\_ 2. Observe the IP address of your **WIN** server. Click **Connect**.
  - \_\_\_ 3. Log in with your **teamnameID-WIN** server credentials (refer to the team lab data sheet).
  - \_\_\_ 4. The system might be compelled to issue a security certificate warning on authentication. If so, click **Yes** to continue.
  - \_\_\_ 5. From the WIN server desktop, open an **SDDDSM** command line interface.
  - \_\_\_ 6. Enter the **datapath query wwpn** command to display the WWPNs for the HBA.
- 

**1+1=2**

### Example

```
C:\Program Files\IBM\SDDDSM>datapath query wwpn
      Adapter Name      PortWWN
      Scsi Port5:      C003FF0000060811
      Scsi Port6:      C003FF0000060813
C:\Program Files\IBM\SDDDSM>
```

---



### Questions

Locate the two 16-character hexadecimal WWPN strings for the WIN Server.

What are the last 3 bytes of the WWPN for WIN HBA (Port 1) instance 0? \_\_\_\_\_

What are the last 3 bytes of the WWPN for WIN HBA (Port 2) instance 1? \_\_\_\_\_

- \_\_\_ 7. Type **exit** to close the command prompt window.

## Section 2: Create a Windows host object in V9000

This procedure defines a Windows host system on the IBM FlashSystem V9000 system.

- \_\_\_ 8. From the Admin server desktop, open a browser window.
  - \_\_\_ 9. Enter the URL of the team V9000 management IP address.
  - \_\_\_ 10. Log in with your admin credentials (refer to the team lab data sheet).
  - \_\_\_ 11. From the V9000 management GUI, navigate to **Hosts > Hosts**.
- 



### Information

A host object represents a host that can own storage. SAN-attached hosts usually are connected with two or more Fibre Channel adapter ports for redundancy. This implies that they have multiple paths to access storage. Through SAN zoning, fabric and process logins, the FlashSystem V9000 system learns the appropriate WWPNs to access a host. To accommodate the multiple paths, a host object is created to represent the host using the IBM FlashSystem V9000 GUI.

- 
- \_\_\_ 12. Click the **Add Host** option (top left of the window).
  - \_\_\_ 13. From the Add Hosts pop-up window, define a Windows-attached FCP host using the following information:
    - \_\_\_ a. Enter **teamname-WIN** as the WIN host name (refer to the team lab data sheet).
    - \_\_\_ b. Accept the default to create a **Fibre Channel** host connection type.
    - \_\_\_ c. From the **Host port (WWPN)** pull down list, select the first WWPN value associated with the WIN WWPN you recorded.
    - \_\_\_ d. Click the **(+)** symbol to select the second host WWPN port.
    - \_\_\_ e. From the Optional Fields, accept the following defaults:
      - Host types: **Generic**. The most commonly used host type.
      - I/O groups: **All**. Assigns host access to all I/O groups.
    - \_\_\_ f. Observe that the Host cluster field is grayed out.
- 



### Note

A host cluster must be predefined for this option to be enabled. A host cluster is a group of separate physical hosts that share a set of volumes. The system uses internal protocols to manage access.

A new host can be added to an existing host cluster.

- \_\_ g. Verify your selections, and then click **Add**.

Add Host

Required Fields

Name: F108A4-WIN

Host connections:  Fibre Channel  iSCSI

Host port (WWPN): C003FF0000060811 | - + -

C003FF0000060813 C | - + -

Optional Fields

Host type: Generic

I/O groups: All

Host cluster: No Host Cluster Selected

Cancel Add

- \_\_ 14. Observe the **svctask mkhost -fcwwpn** command generated to define the logical host object and its object ID.



### Information

The **-fcwwpn** specifies that two WWPNs with a 16-character hexadecimal string added to the host object. The **-iogroup** specifies that the host can access the volumes from all I/O groups. The **-name** and **-type** indicates the host type is assigned as a generic host. Observe the object ID assigned to this host.

- \_\_ 15. Click **Close**. Verify that your **WIN** host object has been created.



### CAUTION

Because there are multiple teams using the same V9000, we recommend that you use the Filter field to search for your team resources, including user name, pool, volume, host, and so on.

- \_\_\_ 16. Right-click any column and click the **ID** check box to add an ID column to the display.

ID	Name	Status	Host Type	# of Ports	Host Mappings	Host Cl
0	F108A1-WIN	✓ Online	Generic	2	No	

### Questions

What is the host object [ID] of your **teamsetID-WIN** host? \_\_\_\_\_

- \_\_\_ 17. Right-click on your **WIN** host object and select **Properties**.
- \_\_\_ 18. From the Host Details properties pane, click the **Show Details** option
- \_\_\_ 19. Observe that by default the WIN host has access to all I/O groups. Click **Edit**.
- \_\_\_ 20. Observe the ability to restrict host access to volumes in a particular I/O group. This option also allows you to make modifications to the host name and host type.



### Note

Currently no volumes have been allocated to the host.

- \_\_\_ 21. Click the **Port Definition** tab.
- \_\_\_ 22. Observe that the system has detected the WIN host's two WWPNs that are now logged in to each FlashSystem V9000 node through the Fibre Channel network.



### Note

The host ports are inactive if the nodes have not received any Small Computer System Interface (SCSI) commands or any I/O activity transpired from the WWPN.

- \_\_\_ 23. Click the **X** to close the Host Details window (or Click **Overview > Cancel > Close**).

## Section 3: Create volumes and map to WIN host

This procedure creates two more volumes. Only one of new volumes will be assigned to the AIX host.

- \_\_\_ 24. From the V9000 management GUI.
- \_\_\_ 25. Navigate to the **Volumes by Host** view and select your **WIN** host from the Host Filter list.
- \_\_\_ 26. Click the **Create Volumes** option.
- \_\_\_ 27. Create a basic volume and assign it to a storage pool using the following parameter:
  - \_\_\_ a. Pool: **teamsetID-CHILD**
  - \_\_\_ b. Quantity: **2**.
  - \_\_\_ c. Capacity: **6 GiB**
  - \_\_\_ d. Volume name: **teamsetID-WIN** (Refer to the team lab data sheet)
  - \_\_\_ e. Change the first box number to a **1** (to the right of the name field). Click anywhere in this pane to cause the second suffix to update the value to **2**.
  - \_\_\_ f. Capacity savings: **None**.
  - \_\_\_ g. I/O group: Accept default **Automatic**.
  - \_\_\_ h. Verify that the volume Summary information is correct. Click **Create and Map**.
- \_\_\_ 28. Review the **svctask mkvdisk** commands generated for each volume created. Click **Continue**.
- \_\_\_ 29. The Create Mapping window is displayed:
  - \_\_\_ a. Select your **WIN** host. Click **Next**.
  - \_\_\_ b. Observe the highlighted **WIN** volumes. Click **Map Volumes**.
- \_\_\_ 30. Examine the **svctask mkvdiskhostmap** command generated to map each volume to the **WIN** host. Note that the host ID and volume IDs are referenced in the output. Click **Close**.
- \_\_\_ 31. Observe that the two created **WIN** volumes have now been mapped to the **WIN** host.



### Note

Volumes are online and available for use, even though they are being formatted with zeros in the background.

---



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### Questions

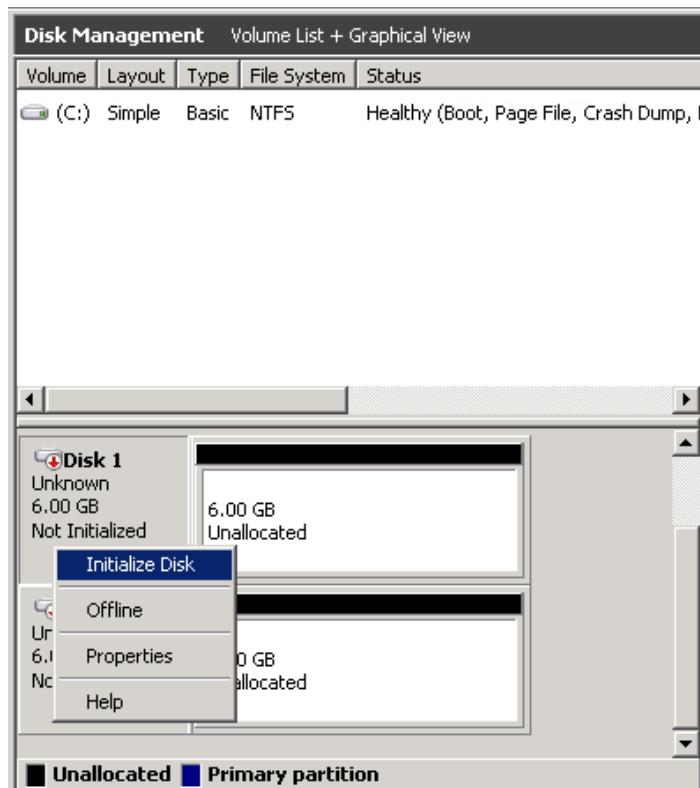
What is the latest 3-digits of each VDisk UID? **teamset-WIN1** \_\_\_\_\_ **teamset-WIN2** \_\_\_\_\_

---

## Section 4: Discover V9000 volumes on the WIN server host

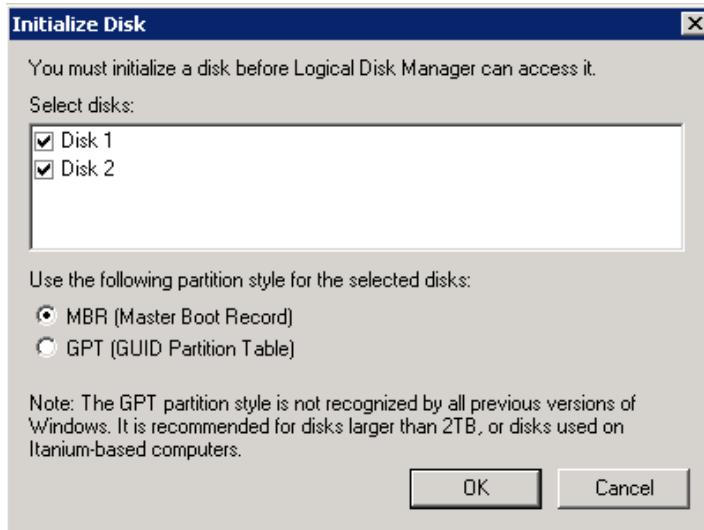
This procedure uses Disk Management to create partitions on the Windows host server.

- \_\_\_ 32. From the WIN server remote desktop, navigate to **Server Manager**.
- \_\_\_ 33. From the Server Manager pane, click the plus sign (+) associated with the **Storage** entry.
- \_\_\_ 34. Click **Disk Management**.
- \_\_\_ 35. Verify that the Windows SYSTEM C: drive is the only disk listed.
- \_\_\_ 36. If no disks are detected, right-click on **Disk Management** and select **Rescan Disks**.
- \_\_\_ 37. Right-click the left portion of any one of the Unknown Disk of the drive designation. Select **Initialize Disk**.

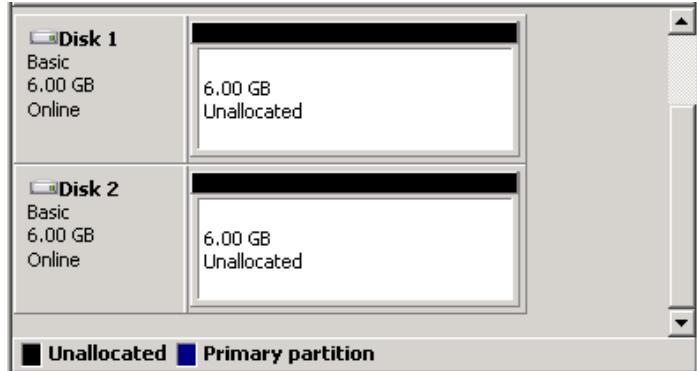


- \_\_\_ 38. From the Initialize Disk window, observe the two newly detected and selected disks.

- \_\_\_ 39. Accept the default **MBR** option. Click **OK** to initialize both disks.



- \_\_\_ 40. Observe that the two new Windows Basic 6 GB disks have been initialized. The disk space shows as **Unallocated** because it hasn't been formatted by Windows yet.



- \_\_\_ 41. Minimize the Server Manager window.

## Section 5: Correlate Windows host disks to V9000 volumes

This procedure identifies the Windows volume for each new disk entry and compares it to the volumes in the V9000.

- \_\_\_ 42. From the WIN server remote desktop, open an **SDDDSM** command line interface.



**Optional**

The SDDDSM interface can also be opened on the WIN server by clicking **Start > All Programs > Subsystem Device Driver DSM > Subsystem Device Driver DSM**.

- \_\_\_ 43. Enter the SDDDSM **datapath query device** command to view the disks, their paths and preferred paths.



## Information

FlashSystem V9000 virtualizes SAN-attached storage and externalizes volumes to host servers as IBM 2145 SCSI disks. SDDDSM entries identify these as disks with a **Type** value of 2145.

- \_\_\_ 44. Observe the number of paths that are listed for each device.



## Questions

What is the **DEVICE NAME** and the last 3-digits of the **SERIAL** number for each disk as shown in the SDDDSM output?

Device Name	Last 3 bytes of serial number

Record the **SELECT** count for each disk path#...

Device	Path	Select count
Disk1	Path0	
	Path1	
	Path2	
	Path3	

Device	Path	Select count
Disk2	Path0	
	Path1	
	Path2	
	Path3	



## Note

The asterisk identifies the paths to the alternate or non-preferred node of the volume. SDD automatically drives I/O to paths to the preferred node.

The path outputs are based on how the host was cabled to the SAN, the zoning, and the controller in the DS3500 handling I/Os for the disk.

- \_\_\_ 45. Minimize the SDDDSM interface.

- \_\_\_ 46. From the Admin server desktop, open a browser window.
- \_\_\_ 47. Enter the URL of your V9000 management IP address.
- \_\_\_ 48. Log in using your **admin** credentials (refer to the team lab data sheet).
- \_\_\_ 49. Navigate to **Volumes > Volumes by Host**.
- \_\_\_ 50. Select your **teamname-WIN** host in the Host filter. Locate the **UID** column.
- \_\_\_ 51. Correlate the **WIN Volume name** and **UID** column with the SDDDSM **Disk name** and **SERIAL** number from the information recorder earlier.



### Attention

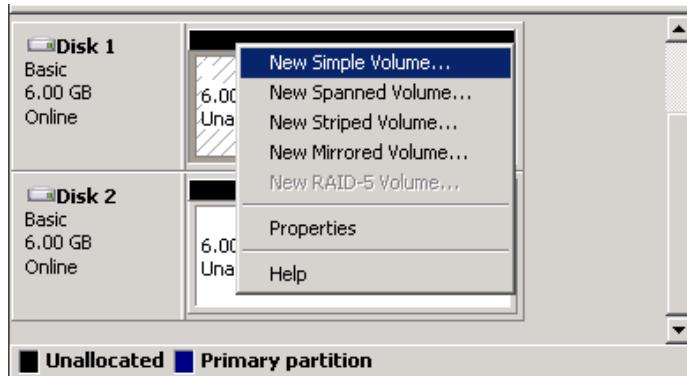
Due to SAN device discovery and the I/O group ownership of the V9000 volumes, the Windows disk entries might not be in the same sequence as the V9000 volume UIDs.

- \_\_\_ 52. Minimize the V9000 management GUI.

## **Section 6: Create simple volume on the WIN server host**

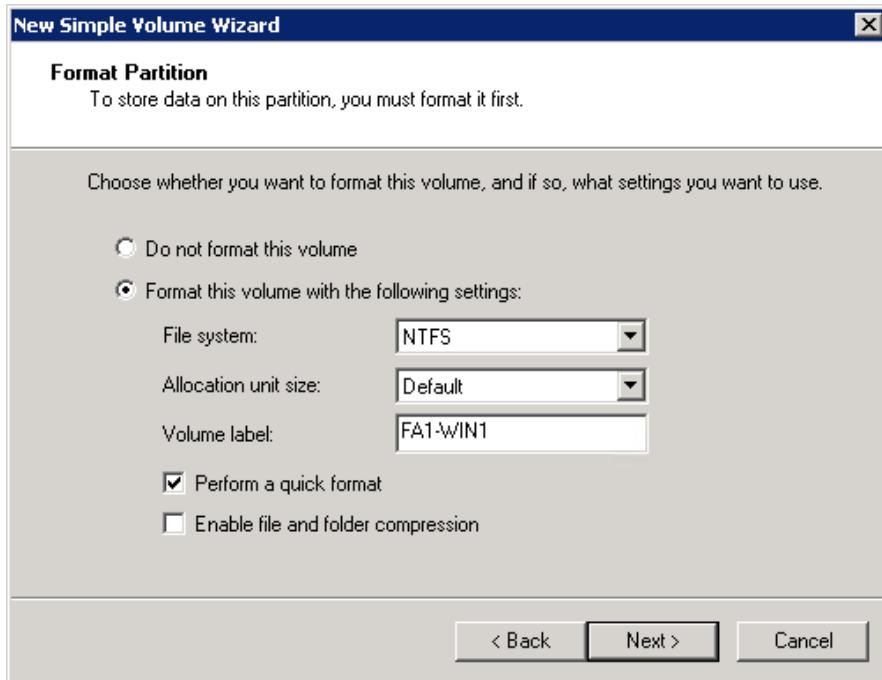
This procedure runs the Simple Volume wizard on the WIN server for both V9000 volumes that are mapped to the WIN server.

- \_\_\_ 53. From the WIN server, navigate to the **Server Manager > Disk Management** pane.
- \_\_\_ 54. Right-click on the right pane of first disk's 6 GB **Unallocated partition**.
- \_\_\_ 55. Select the **New Simple Volume** option.



- \_\_\_ 56. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
  - \_\_\_ a. Accept the default capacity value. Click **Next**.
  - \_\_\_ b. Accept the default drive letter. Click **Next**.

- \_\_\_ c. In the Volume label field enter `teamsetID-WIN1`. Click **Next**.



- \_\_\_ 57. Verify the selected settings. Click **Finish**.
- \_\_\_ 58. Observe that the WIN server Disk Management window shows that the new disk has been created, assigned a drive letter, and given the label.
- \_\_\_ 59. Right-click the other disk's **Unallocated partition**. Select the **New Simple Volume** option.
- \_\_\_ 60. Repeat these procedures to create a volume label for the `teamsetID-WIN2` disk.
- \_\_\_ 61. Verify that Disk Management displays two Windows Basic disks labeled `teamsetID-WIN1` and `teamsetID-WIN2`.
- \_\_\_ 62. From the WIN server desktop, navigate to the SDDDSM window.
- \_\_\_ 63. Recall the SDDDSM `datapath query device` command to view the preferred paths selected by the SSD.
- \_\_\_ 64. Observe that half of the paths have an asterisk next to them.



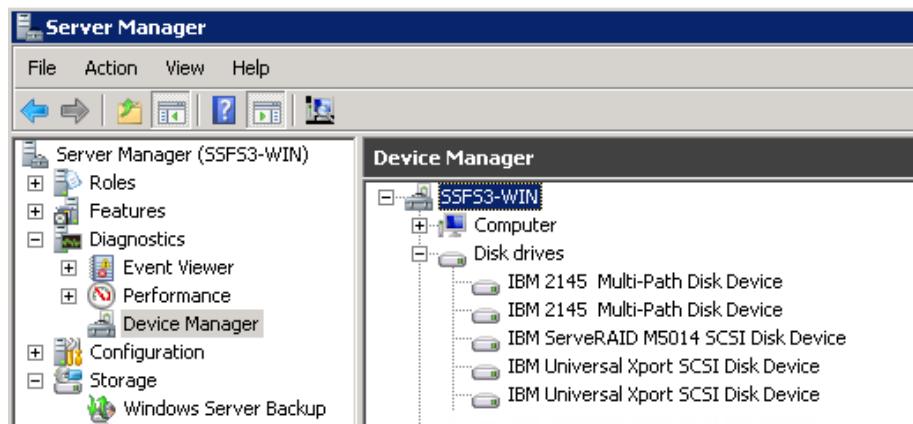
## Questions

Record the **SELECT** count for each disk path#.

Device	Path	Select count
Disk1	Path0	
	Path1	
	Path2	
	Path3	

Device	Path	Select count
Disk2	Path0	
	Path1	
	Path2	
	Path3	

- \_\_\_ 65. Navigate to the **Server Manager** window of your WIN server.
- \_\_\_ 66. In the Server Manager navigation tree, navigate to the **Diagnostics > Device Manager** pane.
- \_\_\_ 67. From the Device Manager pane, click the (+) symbol to expand the **Disk drives** view.
- \_\_\_ 68. Examine the two instances of IBM 2145 Multi-Path Disk Devices created by SDDDSM. Each instance correlates to the disk entries in Disk Management.



**Note**

As FlashSystem V9000 volumes are mounted to a host they're represented by the SDDDSM/MPIO as IBM 2145 Multi-Path Disk Device instances to the upper layers of Windows. The SCSI Disk Device represents the paths zoned to connect the host to the FlashSystem V9000 system.

## Section 7: Monitor V9000 write performance

This procedure views performance results on the V9000 after generating some write activity from the WIN server to the mapped V9000 volumes.

- \_\_\_ 69. From the Admin server, navigate to the V9000 management GUI and select **Monitor > Performance**.
- \_\_\_ 70. Observe the real-time statistics to monitor CPU utilization, volume, interface, and MDisk bandwidth.

**Note**

Leave this window open to quickly maneuver between devices to view system changes.

- \_\_\_ 71. Return to your WIN host server, navigate to the **Disk Management** pane.
- \_\_\_ 72. Right-click the **WIN1** volume, click **Explore**.
- \_\_\_ 73. Navigate to the **C:\Software\ClassFolders** location.
- \_\_\_ 74. Copy the **FolderPic-4GB** folder to your **teamsetID-WIN1** disk drive.

**Attention**

This file is over 4 GB and might take a few minutes for the copy to complete.

- \_\_\_ 75. Copy the **FolderDB-4GB** folder to your **teamsetID-WIN2** disk drive.
- \_\_\_ 76. *Immediately* return to the V9000 management GUI **Monitor > Performance** view.

- \_\_\_ 77. Observe the performance metrics the ongoing system operations.



## i Information

The Performance view represents 5-minutes worth of rolling data reported at 5-second intervals. It displays Bandwidth, IOPS, and Latency values for the read and write operations. The CPU shows the percent of CPU used for standard processes, and for compression. If there is no other continuous activity, the numbers and graphic lines drop to zero.

- \_\_\_ 78. Navigate back to the **WIN** host RDP server. Close all other open windows.  
 \_\_\_ 79. Click **Start > Logoff** to exit from the WIN server.

## Section 8: View hosts connectivity connections

- \_\_\_ 80. From the Admin server, navigate to the V9000 management GUI, and select **Settings > Network**.
  - \_\_\_ 81. Select **Fibre Channel Connectivity** from the *Network Filter* list.
  - \_\_\_ 82. From the **View connectivity** drop-down lists, select **Hosts** and select your WIN host.
  - \_\_\_ 83. Click **Show Results**.
  - \_\_\_ 84. Examine the contents of the **Remote WWPN** column. These values should look familiar since they are the WWPNs of the WIN host.
  - \_\_\_ 85. Examine the contents of the **Local WWPN** column. These values are the V9000 ports zoned with the WIN host WWPNs.
- 



### Note

The four rows indicates four disk paths from the V9000 to the Windows host. This view validates the zoning between the host HBA ports and the V9000 Fibre Channel ports.

---

- \_\_\_ 86. Log out of the V9000 management GUI.

## End of exercise

---

# Exercise 5. AIX host definition and volume allocations

## Estimated time

00:30

## Overview

This exercise uses the IBM FlashSystem V9000 GUI and CLI to define an AIX host and volumes, and to check the availability of the new disks on the host. In addition, establishes FlashSystem V9000 volume access from previously assigned host. The AIX host is used to view, access, and write to the prospective mapped V9000 volumes. Subsystem Device Driver Path Control Module (SDDPCM) is used to correlate and display the volumes on the host.

## Objectives

- Evaluate the hosts' world wide port number (WWPN) using host interface.
- Create Fibre Channel Protocol (FCP) host objects using both the management GUI and CLI.
- Create and map volumes to host object using the management GUI.
- Carry out procedures to access V9000 mapped volumes on the host system in a multipath environment.

# Exercise instructions

---

## Section 1: Identify WWPN on the AIX server

This procedure uses SSH to access the AIX server and display the WWPNs of the HBA.

---



### Note

Before an AIX host can be defined on the V9000, the WWPN of the host must be identified.

---

- \_\_\_ 1. From the Admin server desktop, open a PuTTy SSH session to your AIX server.
- \_\_\_ 2. Log in using your **teamname**-AIX server credentials (refer to the team lab data sheet).
- \_\_\_ 3. The PuTTY session might be compelled to issue a security certificate warning on authentication. If so, click **Yes** to continue.
- \_\_\_ 4. Enter the **cfgmgr** command to force the AIX ports to log back into the FC switch.

(Wait for the return prompt sign (#) to appear)

---



### Important

The **cfgmgr** command configures devices and optionally installs device software into the system. You must wait until the command prompt returns before the task is completed.

---

- \_\_\_ 5. Enter the **lsdev -Cc adapter | grep fcs** command to display the HBA adapter name.
- 



```
# lsdev -Cc adapter | grep fcs
fcs0  Available 73-T1 Virtual Fibre Channel Client Adapter
fcs1  Available 74-T1 Virtual Fibre Channel Client Adapter
#
```

---

- \_\_\_ 6. Enter the **lscfg -vl fcs\* | grep Network** command to view the details for each HBA adapter (where # is the fcs number, and l is letter L).

---

**1+1=2 Example**

```
# lscfg -vl fcs* | grep Network
Network Address.....C003FF0002060811
Network Address.....C003FF0002060813
```

---

**Optional**

An alternate way to display WWPN on an AIX server is to use an SDDPCM command, as long as it is installed on the server.

```
# pcpnpath query wwpn
Adapter Name      PortWWN
fscsi0            C0507604AFA20080
fscsi1            C0507604AFA20082
#
```

---

**Questions**

What are the last 4 digits of the WWPN for AIX fcs0? \_\_\_\_\_

What are the last 4 digits of the WWPN for AIX fcs1? \_\_\_\_\_

\_\_\_ 7. Minimize your AIX SSH session view.

**Section 2: Create an AIX host object**

This procedure configures an AIX host system in the V9000 using the management GUI.

- \_\_\_ 8. From the Admin server desktop, open a browser window.
- \_\_\_ 9. Enter the URL of your team V9000 management IP address.
- \_\_\_ 10. Log in with your admin credentials (refer to the team lab data sheet).
- \_\_\_ 11. Navigate to **Hosts > Hosts** view.
- \_\_\_ 12. Click the **Add Host** option.
- \_\_\_ 13. From the Add Hosts - Required Fields pop-up window, define a AIX FCP host using the following information:
  - \_\_\_ a. Host name: **teamname-AIX** (refer to the team lab data sheet)
  - \_\_\_ b. Host connection type: **Fibre Channel**.
  - \_\_\_ c. Add the **WWPNs** associated with the AIX WWPNs you recorded.
  - \_\_\_ d. Click the **(+)** symbol to select the second host WWPN port.



## Troubleshooting

If necessary, click **Rescan** to refresh the menu to get the WWPN to appear. If the WWPNs are still not displayed, re-enter the **cfgmgr** command from AIX CLI session.

- \_\_\_ e. From the Optional Fields, accept all defaults.
- \_\_\_ f. Verify your selections, and then click **Add**.
- \_\_\_ 14. Review the command **svctask mkhost -fcwwpn** generated to define the logical host object and the object ID. Click **Close**.
- \_\_\_ 15. Verify the **AIX** host object has been created.



## CAUTION

Because there are multiple teams using the same V9000, we recommend that you use the Filter field to search for your team resources, including user name, pool, volume, host, and so on.



## Questions

What is the host object [ID] of your **teamsetID-AIX** host? \_\_\_\_\_

## Section 3: Create volumes and map to AIX host

This procedure creates two more volumes. Only one of new volumes will be assigned to the AIX host.

- \_\_\_ 16. From the Admin server desktop, navigate to the V9000 management GUI.
- \_\_\_ 17. Navigate to the **Volumes by Host** view and select your **teamname-AIX** host from the Host Filter list.
- \_\_\_ 18. Click the **Create Volumes** option.
- \_\_\_ 19. Create a basic volume and assign it to a storage pool using the following parameter:
  - \_\_\_ a. Pool: **teamsetID-DS3KSAS**
  - \_\_\_ b. Quantity: **2**.
  - \_\_\_ c. Capacity: **6 GiB**
  - \_\_\_ d. Volume name: **teamsetID-AIX** (Refer to the team lab data sheet)
  - \_\_\_ e. Change the first box number to a **1** (to the right of the name field). Click anywhere in this pane to cause the second suffix to be updated.
  - \_\_\_ f. Capacity savings: **None**.
  - \_\_\_ g. I/O group: Accept default **Automatic**.

- \_\_\_ h. Verify that the volume Summary information is correct. Click **Create and Map**.
- \_\_\_ 20. Review the `svctask mkvdisk` commands generated for each volume created. Click **Continue**.
- \_\_\_ 21. The Create Mapping window is displayed:
  - \_\_\_ a. Select your `teamname-AIX` host. Click **Next**.
  - \_\_\_ b. Observe the highlighted `teamsetID-AIX` volumes. Click **Map Volumes**.
- \_\_\_ 22. Examine the `svctask mkvdiskhostmap` command generated to map each volume to the AIX host. Note that the host and volumes are referenced in the output. Click **Close**.
- \_\_\_ 23. Observe that the two created AIX volumes have now been mapped to the AIX host.



### Reminder

Volumes are online and available for use while they are still being formatted in the background.

- \_\_\_ 24. Navigate to the **Hosts > Hosts** view.



### Note

After mapping both volumes to the AIX host you realized that only one volume should have been mapped directly to the host.

- \_\_\_ 25. Right-click on your `teamname-AIX` host and select **Modify Volume Mappings**.
- \_\_\_ 26. Select your `teamsetID-AIX2` volume from the list of volumes that are privately to your `teamname-AIX` host. Click **Remove Volume Mappings**.

Volumes mapped privately to F108A1-AIX:

Filter				Showing 2 volumes
Name	Capacity	Pool	UID	
FA1-AIX1	6.00 GiB	FA1-DS35KSAS	600507680CAB82BE0000	
FA1-AIX2	6.00 GiB	FA1-DS35KSAS	600507680CAB82BE0000	

- \_\_\_ 27. Click **Remove Volumes** to confirm that your **AIX2** volume is to be removed.
- \_\_\_ 28. Examine the `svctask rmvdiskhostmap` command generated to unmap the volume from the AIX host. Click **Close**.
- \_\_\_ 29. Navigate to **Hosts > Volumes by Hosts** view.
- \_\_\_ 30. From the Host Filter panel, select your `teamname-AIX` host. Confirm the only volume allocated to this host is `teamsetID-AIX1`.

- \_\_\_ 31. Navigate to the **Volumes > Volumes** view.
  - \_\_\_ 32. Right-click on your **`teamsetID-AIX2`** volume. Click the **Rename** option in the pop-up list.
  - \_\_\_ 33. From the Rename Volume pane, change the volume name to **`teamsetID-WINA`**. Click **Rename**.
  - \_\_\_ 34. Review the **`chvdisk`** command generated to change the volume name. Click **Close**.
  - \_\_\_ 35. Verify that the volume has been renamed to **`teamsetID-WINA`**.
  - \_\_\_ 36. Minimize the V9000 management GUI.
- 



### Questions

What is the latest 3-digits of each vdisk UID?

**`teamsetID-AIX1`** \_\_\_\_\_

**`teamsetID-WINA`** \_\_\_\_\_

---

## Section 4: Discover V9000 volume on AIX host

This procedure identifies the AIX hdisk volume and compares it to the volume in the V9000.

- \_\_\_ 37. From the Admin server desktop, navigate to your **AIX** server session.
  - \_\_\_ 38. Enter the **`lsdev -Cc disk`** command to list the available disk configuration. If the **hdisk0** is the only disk listed, enter the **`cfgmgr`** command to configure devices and optionally installs device software into the system.
  - \_\_\_ 39. Re-enter the **`lsdev -Cc disk`** command to list the available disk configuration.
- 

1+1=2

### Example

```
#lsdev -Cc disk
hdisk0 Available          Virtual SCSI Disk Drive
hdisk1 Available 73-T1-01 MPIO FC 2145
#
```

---



### Note

The LUNs are represented as **`hdisk0`**, **`hdisk1`**, and so on. The **`hdisk0`** is the root volume group (**`rootvg`**). The **`hdisk0`** gets created during the install along with the other physical or virtual disks. An **`hdisk#`** with the 'Available' state means that the disk can be accessed for use.

---



## Questions

What is the `hdisk` number of the MPIO FC 2145 device? \_\_\_\_\_

---



## Information

The Subsystem Device Driver (SDD) is a software solution to support the multipath configuration environments for supported storage devices. It resides in a host system with the native disk device driver and provides enhanced data availability, dynamic input/output (I/O) load-balancing across multiple paths, and automatic path failover protection.

The SDDPCM identifies preferred paths for each host disk based on how the host is zoned.

---

- \_\_\_ 40. Enter the `pcmpath query adapter` command and press **Enter**. The output displays the installed Fibre Channel HBA adapters.
  - \_\_\_ 41. Observe that each adapter has 2 paths and none are active. This provides a total of 4 accessible paths for the hdisk.
- 



## Example

```
# pcmpath query adapter
```

```
Total Dual Active and Active/Asymmetric Adapters : 2
```

Adpt#	Name	State	Mode	Select	Errors	Paths	Active
0	fscsi0	NORMAL	ACTIVE	0	0	2	0
1	fscsil	NORMAL	ACTIVE	0	0	2	0
#							

- \_\_\_ 42. Enter the `pcmpath query device` command to view the paths, and preferred paths, for the hdisk.
- 



## Note

This output lists information about the hdisk, the path selection algorithm, the serial number, size and paths.

---

- \_\_\_ 43. Observe that only one hdisk has been discovered by the SDD.
- \_\_\_ 44. Observe that SDDPCM identifies multiple paths for the hdisk. Currently all paths have a state of CLOSE because the host has not opened the hdisk for use.

**Note**

The paths identified in this output are based on how the host was zoned.

- 45. Enter the `lscfg -l hdiskX -v` command. Validate that the Serial Number of the AIX hdisk1 matches with the V9000 **UID** value of your AIX1 volume.

(Where **X** is the 2145 AIX hdisk#)

**Example**

```
# lscfg -l hdisk1 -v
hdisk1          U8233.E8B.101843R-V62-C383-T1-W500507680C1457C0-L0  MPIO FC
2145

        Manufacturer.....IBM
        Machine Type and Model....2145
        ROS Level and ID.....0000
        Device Specific. (Z0).....0000063268181002
        Device Specific. (Z1).....020320ae
        Serial Number.....600507680C8282C108000000000000002
#
```

## **Section 5: Create a mount point using V9000 volume on AIX**

This procedure creates partitions on the AIX host server.

- 46. From the AIX server session, enter the `mkvg -y teamsetID-VG hdiskX` command to create a volume group using the MPIO FC 2145 hdisk (refer to the team lab data sheet).

(Where **X** is the 2145 AIX hdisk#)

**Example**

```
# mkvg -y FA1-VG hdisk1
0516-1254 mkvg: Changing the PVID in the ODM.
F108A1VG
#
```

- 47. Enter the `lspv` command to list the physical volume.
- 48. Enter the `lsvg teamsetID-VG` command to list the volume group details.
- 49. Re-enter the `pathquery device` command to verify the state of the paths within the hdisk.



## Questions

Record the **SELECT** count for each disk path#.

Device	Path	Select count
Disk1	Path0	
	Path1	
	Path2	
	Path3	



## Information

The volume group has created a logical volume, file system, and mount point that still needs to be defined. Also the state of the paths of the hdisk is now OPEN.

To determine which paths are those to the preferred node, SDDPCM has to send a small number of I/Os to each path. Once identified, each path to the non-preferred node is flagged with an asterisk.

- \_\_\_ 50. Enter the following command syntax to create a file system for the **teamsetID-VG** (this is one long command syntax).

```
crfs -v jfs2 -g teamsetID-VG -a size=256M -m /teamsetID-VGMP -p rw -a
logname=INLINE
```



## Example

```
# crfs -v jfs2 -g FA1-VG -a size=256M -m /FA1-VGMP -p rw -a logname=INLINE
File system created successfully.
259884 kilobytes total disk space.
```

```
New File System size is 524288
#
```

- \_\_\_ 51. After the file system is created, enter the **lsvg -l teamsetID-VG** command.
- \_\_\_ 52. Observe that the volume group now has a log logical volume (lv00), and a mount point of **teamset-VGMP**, but the logical volume state (LV STATE) is **closed** because the file system isn't mounted and thus open for I/O.

## 1+1=2 Example

```
# lsvg -l FA1-VG
F108A1VG:
LV NAME          TYPE     LPs    PPs    PVs   LV STATE      MOUNT POINT
lv00            jfs       32     32     1    closed/syncd /FA1-VGMP
#
```

- 53. Re-enter the `parpath query device` command to verify the state of the paths within the hdisk. Observe that the SDDPCM displays an increase in the select counts for half of the paths of this hdisk.

## Questions

Record the **SELECT** count for each disk path.#.

Device	Path	Select count
Disk1	Path0	
	Path1	
	Path2	
	Path3	

- 54. Enter the `lsfs` command to verify the file system `/dev/1v00` mount point.

```
# lsfs
Name        Nodename  Mount Pt          VFS  Size    Options  Auto
Accounting
/dev/hd4    --        /           jfs2  1048576 --      yes  no
/dev/hd1    --        /home       jfs2  524288  --      yes  no
/dev/hd2    --        /usr        jfs2  2621440 --      yes  no
/dev/hd9var  --        /var        jfs2  524288  --      yes  no
/dev/hd3    --        /tmp        jfs2  524288  --      yes  no
/dev/hd11admin  --      /admin      jfs2  524288  --      yes  no
/proc       --        /proc       procfs --      --      yes  no
/dev/hd10opt  --      /opt        jfs2  524288  --      yes  no
/dev/livedump  --      /var/adm/ras/livedump jfs2  524288  --      yes  no
/dev/fslv00  --      /FA1-VGMP   jfs2  524288  rw      no   no
#
```

- 55. Enter the `mount /teamsetID-VGMP` command to mount the file system.  
— 56. Enter the `df -m` command to display the file systems and its capacity in MBs.


**Example**

```
# mount /FAL-VGMP
# df -m
Filesystem      MB blocks      Free %Used   Iused %Iused Mounted on
/dev/hd4        7504.00    7328.22     3%    11590    1% /
/dev/hd2        2160.00    261.02    88%    37790    38% /usr
/dev/hd9var     176.00     33.82    81%     1196    13% /var
/dev/hd3        608.00     606.39     1%      38     1% /tmp
/dev/hd1        16.00      15.64     3%       7     1% /home
/dev/hd11admin  128.00    127.63     1%      5     1% /admin
/proc           -          -         -        -      - /proc
/dev/hd10opt    2144.00   1576.74    27%    12469    4% /opt
/dev/livedump   256.00    255.64     1%      4     1% /var/adm/ras/livedump
/dev/fslv00     256.00    253.64     1%      4     1% /FAL-VGMP
#
#
```

- 
- \_\_\_ 57. With the file system mounted, enter the `lsvg -l teamsetID-VG` command to list the volume group.
  - \_\_\_ 58. Observe that after the `mount` command has been processed, the LV STATE is open.
  - \_\_\_ 59. Re-enter the `pmpath query device` command to review the hdisk path status and the selected counts again.


**Questions**

Record the **SELECT** count for each disk path#.

Device	Path	Select count
Disk1	Path0	
	Path1	
	Path2	
	Path3	

- 
- \_\_\_ 60. Enter the `pmpath query version` command to verify the version level of SDDPCM.

**1+1=2 Example**


---

```
# pcopath query version
SDDPCM VERSION 2.7.1.0 (devices.sddpcm.72.rte)
#
```

---

- \_\_\_ 61. Enter the `cd /teamsetID-VGMP` command to change into the new directory.
  - \_\_\_ 62. Using the echo command, create a `.txt` file named `file1.txt` with some text.
- 

**1+1=2 Example**


---

```
# cd /FA1-VGMP
# echo 'This is being written to the V9000 FA1-AIX1 volume.' > file1.txt
#
```

---

- \_\_\_ 63. Enter the `ls` command to view the txt file name.
  - \_\_\_ 64. Enter the `cat file1.txt` command to verify read access.
  - \_\_\_ 65. Enter the `pcopath query device` command to check traffic and status. Compare the select path count information from the previous output.
  - \_\_\_ 66. Enter the `lspath -l hdisk# -HF"name parent connection status path_status"` command syntax to display the path connection data and status of the hdisk.
- (where x is your hdisk #)
- 

**1+1=2 Example**


---

```
# lspath -l hdisk1 -HF"name parent connection status path_status"
name      parent connection          status   path_status
hdisk1    fscsi0 500507680c1457c0,0 Enabled Available
hdisk1    fscsi0 500507680c145799,0 Enabled Available
hdisk1    fscsi1 500507680c245799,0 Enabled Available
hdisk1    fscsi1 500507680c2457c0,0 Enabled Available
#
```

---



### Information

The path connection data for each hdisk identifies a target WWPN that presented the LUN instance (the FlashSystem V9000) to AIX. This AIX server is zoned for multiple paths and the WWPNs (connections) are those of the nodes of the caching I/O group of the volume.

- 
- \_\_\_ 67. Enter the `exit` command to log out from AIX.

## Section 6: View hosts connectivity connections

- \_\_\_ 68. From the Admin server desktop, navigate to the V9000 management GUI.
  - \_\_\_ 69. Navigate to **Settings > Network** view.
  - \_\_\_ 70. Select **Fibre Channel Connectivity** from the *Network Filter* list.
  - \_\_\_ 71. From the **View connectivity** drop-down lists, select **Hosts** and select your AIX host.
  - \_\_\_ 72. Click **Show Results**.
  - \_\_\_ 73. Examine the contents of the **Remote WWPN** column. These values should look familiar since they are the WWPNs of the WIN host.
  - \_\_\_ 74. Examine the contents of the **Local WWPN** column. These values are the V9000 ports zoned with the WIN host WWPNs.
- 



### Information

This view validates the zoning between the host HBA ports and the V9000 Fibre Channel ports.

- 
- \_\_\_ 75. Log out of the V9000 management GUI.

## End of exercise

---

# Exercise 6. Linux host definition and volume allocations

## Estimated time

00:30

## Overview

This exercise uses the IBM FlashSystem V9000 CLI to define a Linux host object, volumes for it, map the volumes to the host, and configure the volumes on Linux. The Linux host is used to view, access, and write to the prospective mapped V9000 volumes. Device Mapper Multipath is used to correlate and display the volumes on the host.

## Objectives

- Evaluate the hosts' world wide port number (WWPN) using host interface.
- Create Fibre Channel Protocol (FCP) host objects using the management CLI.
- Create and map volumes to host object using the management CLI.
- Carry out procedures to access V9000 mapped volumes on the host system in a multipath environment.

# Exercise instructions

## Section 1: Create a Linux host object using CLI

This procedure accesses and displays the WWPNs of the Linux server HBAs to define a host object.

- \_\_\_ 1. From the Admin server desktop, open an SSH session to your LNX server.
- \_\_\_ 2. Log in using your LNX server credentials (refer to the team lab data sheet).
- \_\_\_ 3. The PuTTY session might be compelled to issue a security certificate warning on authentication. If so, click **Yes** to continue.



### Note

Before a Linux host can be defined on the V9000, the WWPN of the host must be identified.

- \_\_\_ 4. Enter the `cat /sys/class/fc_host/host*/port_name` command to display the HBA adapter name.



### Example

```
# cat /sys/class/fc_host/host*/port_name
0xc003FF0001060811
0xc003FF0001060813
#
```



### Questions

Record the complete WWPN for LNX fcs0? \_\_\_\_\_

Record the complete WWPN for LNX fcs1? \_\_\_\_\_

- \_\_\_ 5. From the Admin server desktop, open an SSH session to your V9000 management CLI.
- \_\_\_ 6. Log in using your team **admin** credentials (refer to the team lab data sheet).
- \_\_\_ 7. Enter the following command syntax to define a Linux host object as follows:

```
mkhost -name <teamname-LNX> -force -fcwwpn <WWPN1>:<WWPN2>
```

**1+1=2 Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>mkhost -name F108A1-LNX -force
-fcwwpn c0507604afa2008:c0507604afa2008a
Host, id [2], successfully created
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

- 
- \_\_\_ 8. Enter the **lshost** command to verify the LNX host has been created.
- 

**Questions**

What is the host object ID for each host? **teamsetID-LNX [ID]** \_\_\_\_\_

---

- \_\_\_ 9. Recall the **lshost** command and append it the command with the LNX server [ID].
- 

**1+1=2 Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>lshost 2
```

- 
- \_\_\_ 10. Observe that the LNX host has been created with the same generic default settings.

**Section 2: Create and map volumes to a Linux server using CLI**

This procedure creates virtual disks (vdisks) and maps vdisks directly to the Linux host using the CLI command and syntax.

- \_\_\_ 11. From the V9000 CLI, enter the **lsmdiskgrp -delim , -filtervalue name=teamsetID\*** command syntax to view a list of your pools defined on the V9000.
- 

**Questions**

What is the **mdiskgrp [ID]** for your SATA pool? \_\_\_\_\_

---

- \_\_\_ 12. Enter **mkvdisk -?** to view the syntax for creating volumes or vdisks.

**Note**

The minimum inputs required for the Volumes are as follows:

- **-mdiskgrp:** mdisk group ID
- **-size**
- **-capacity unit:** (in CLI, the default is MB)
- **-name:** (in CLI this is optional; however, it is good practice to include this because the system automatically names it by with the format *vdisk <instance>*)

- 
- 13. Enter the following `mkvdisk` command syntax to create a 6 GB vdisk for the Linux server and assign the vdisk to the `teamsetID-DS3KSATA` pool:

```
mkvdisk -mdiskgrp <mdiskgrpID> -size <capacity> -unit <GB> -name
<teamsetID-LNX1>
```

**Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>mkvdisk -mdiskgrp 3 -size 6 -unit gb
-name FA1-LNX1
Virtual Disk, id [4], successfully created
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

- 
- 14. Recall the `mkvdisk` command syntax to create a second vdisk. Change the vdisk name to `<teamsetID-LNX2>`.
- 15. Enter `lsvdisk -delim , -filtervalue name=teamsetID-L*` to verify the newly created volumes.
- 16. Enter `lsvdisk teamsetID-LNX1` to view more details of a defined volume.

**Reminder**

Each volume UID can also be traced back to the storage system WWPN (...5076802...).

- 
- 17. Enter `mkvdiskhostmap -?` to view the command syntax for mapping.
- 18. Enter the following `mkvdiskhostmap` command syntax to map a vdisk to a host:

```
mkvdiskhostmap -host <teamnameID-LNX> <teamsetID-LNX1>
```

**1+1=2 Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>mkvdiskhostmap -host F108A1-LNX  
FA1-LNX1
```

Virtual Disk to Host map, id [0], successfully created  
IBM\_FlashSystem:F108A-V9K:F108A1-admin>

Optionally, the **-force** syntax is used in cases where the volume already has existing mappings to other host objects. Since this is a new volume therefore the **-force** parameter is not required.

- \_\_\_ 19. Recall the **mkvdiskhostmap** command syntax and change the volume name to **teamsetID-LNX2**.
- \_\_\_ 20. Enter **lshostvdiskmap teamname-LNX** to verify the vdisk mappings are defined on the Linux host.

**Questions**

What is the latest 3-digits of each vdisk UID?

**teamset-LNX1** \_\_\_\_\_

**teamset-LNX2** \_\_\_\_\_

- \_\_\_ 21. Type **exit** to close the V9000 CLI session.
- \_\_\_ 22. From the Admin server desktop, open a browser window.
- \_\_\_ 23. Enter the URL of your team V9000 management IP address.
- \_\_\_ 24. Log in with your admin credentials (refer to the team lab data sheet).
- \_\_\_ 25. From the V9000 management GUI, navigate to **Volumes > Volumes by Host**.
- \_\_\_ 26. From the Host Filter panel, select the **LNX** host.
- \_\_\_ 27. Observe that the volumes being formatted to the LNX host are assigned capacity from the **SATA** pool.
- \_\_\_ 28. Navigate to **Hosts > Mappings**.

**CAUTION**

Because there are multiple teams using the same V9000, you use the Filter field to search for your team resources, including user name, pool, volume, host, and so on.

- \_\_\_ 29. Examine the **SCSI ID** column.

Host Name	SCSI ID	Volume Name	UID	I/O Group ID	l...
F108A1-AIX	0	FA1-AIX1	600507680CAB82BE00000000000000000002	0	ic...
F108A1-LNX	0	FA1-LNX1	600507680CAB82BE00000000000000000004	0	ic...
F108A1-LNX	1	FA1-LNX2	600507680CAB82BE00000000000000000005	0	ic...
F108A1-WIN	1	FA1-WIN2	600507680CAB82BE00000000000000000001	0	ic...
F108A1-WIN	0	FA1-WIN1	600507680CAB82BE00000000000000000000	0	ic...

## Questions

Why are your three volume with SCSI IDs having a value of 0? \_\_\_\_\_

## Information

The number of devices on a SCSI bus depends on the data path for the bus. A cluster supports wide SCSI buses, which have a 16-bit data path and support a maximum of 16 devices. Therefore, there are sixteen possible SCSI identification numbers that can be assigned to the devices on a bus.

- \_\_\_ 30. Right-click in the table headings area to add the **Volume ID** column to the display.
- \_\_\_ 31. Navigate to the **Dashboard** view.
- \_\_\_ 32. Observe the change in the Physical Capacity and Volume Capacity.
- \_\_\_ 33. Navigate to **Monitoring > System**.
- \_\_\_ 34. Select the **Overview** link to view an updated system configuration.
- \_\_\_ 35. Click the **Pools** icon to be re-directed to the Pools > Pools view.
- \_\_\_ 36. Click the (>) symbol to expand the **mdiskgrp0** pool view.
- \_\_\_ 37. Hover the mouse pointer over each pool's capacity bar to view the allocated capacity.
- \_\_\_ 38. Navigate to **Pools > Volumes by Pool**.

## Information

Associated with each pool is a summary of the number of volumes in that storage pool, the used and available capacity of the pool, and a visual capacity bar depicting capacity consumption.

- \_\_\_ 39. Click each of your storage pool groups in the **Pool Filter** list to examine its resources.

## Section 3: Discover V9000 volumes on Linux host

Linux native Multipath I/O (MPIO) supports IBM FlashSystem V9000. This procedure will work with the MPIO and its configuration to map a Linux host to the IBM FlashSystem V9000.

- \_\_ 40. From the Admin server desktop, navigate to your Linux server.
- \_\_ 41. Enter the `fdisk -l` command to display the partitions and device paths including the LVM devices.

1+1=2

### Example

```
[root@ssfs3g-1102251-stud108-131 ~]# fdisk -l

Disk /dev/sda: 16.1 GB, 16106127360 bytes, 31457280 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x050d0400

      Device Boot      Start        End      Blocks   Id  System
/dev/sda1  *        2048     10239       4096   41  PPC PReP Boot
/dev/sda2            10240    1034239      512000   83  Linux
/dev/sda3            1034240   31457279     15211520   8e  Linux LVM
Disk /dev/sda: 16.1 GB, 16106127360 bytes, 31457280 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x050d0400

      Device Boot      Start        End      Blocks   Id  System
/dev/sda1  *        2048     10239       4096   41  PPC PReP Boot
/dev/sda2            10240    1034239      512000   83  Linux
/dev/sda3            1034240   31457279     15211520   8e  Linux LVM

Disk /dev/mapper/mpathb: 16.1 GB, 16106127360 bytes, 31457280 sectors
.....
.....
Disk /dev/mapper/rhel_lnx01-root: 13.9 GB, 13920894976 bytes, 27189248
sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/mapper/rhel_lnx01-swap: 1610 MB, 1610612736 bytes, 3145728 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
```

**Note**

The **fdisk -l |grep Disk** command will only list the lines with the test string of Disk.

```
[root@ssfs3g-1102251-stud108-131 ~]# fdisk -l |grep Disk
Disk /dev/sda: 16.1 GB, 16106127360 bytes, 31457280 sectors
Disk label type: dos
Disk identifier: 0x51210400
Disk /dev/sdb: 16.1 GB, 16106127360 bytes, 31457280 sectors
Disk label type: dos
Disk identifier: 0x51210400
Disk /dev/mapper/mpathb: 16.1 GB, 16106127360 bytes, 31457280 sectors
Disk label type: dos
Disk identifier: 0x51210400
Disk /dev/mapper/rhel-root: 13.4 GB, 13413384192 bytes, 26198016 sectors
Disk /dev/mapper/rhel-swap: 1610 MB, 1610612736 bytes, 3145728 sectors
[root@ssfs3g-1102251-stud108-131 ~]#
```

- 
- 42. Enter the **multipath -ll** to display the current disks configuration under Multipath. At this point, the newly provisioned disks are yet to be scanned.
- 

**Example**

```
[root@ssfs3g-1102251-stud108-131 ~]# multipath -ll
May 02 15:01:17 | /etc/multipath.conf line 44, duplicate keyword: wwid
mpathb (SIBM_3303_NVDISKd362db91cf71e3830645cddc6cfab801) dm-0 IBM ,3303
NVDISK
size=15G features='1 queue_if_no_path' hwhandler='0' wp=rw
|-- policy='service-time 0' prio=1 status=active
|- 0:0:1:0 sda 8:0 active ready running
`-- policy='service-time 0' prio=1 status=enabled
`- 1:0:2:0 sdb 8:16 active ready running
[root@ssfs3g-1102251-stud108-131 ~]#
```

- 
- 43. Enter the following command syntax to create a backup of the **multipath.conf** file.

```
cp /etc/multipath.conf /etc/multipath.conf.backup
```

**1+1=2 Example**

```
root@ssfs3g-1102251-stud108-131 ~]# cp /etc/multipath.conf
/etc/multipath.conf.backup
```

root@ssfs3g-1102251-stud108-131 ~]# (returns command prompt)

- 
- \_\_\_ 44. Enter the **vi /etc/multipath.conf** command syntax.

**Note**

This syntax allows you to exclude (blacklist) the local hard drives and other resources that should not be included in the multipath configuration. The highlighted parameters are reviewed to ensure the right Multipathing configurations for the IBM FlashSystem V9000 are in place for the `/etc/multipath.conf` configuration file.

- 
- \_\_\_ 45. Using the arrow keys, cursor down to the `blacklist_exceptions` stanza and to the WWID “36005076.....”entry.

- \_\_\_ 46. Using the vi insert (i) and delete (x) commands, modify the WWID entry as follows:

```
wwid "36005076"
```

**Information**

The number WWID “**3’6005076\***” in the blacklist exemption section, which says all devices whose WWID begins with 6005076 need to be exempted from blacklist. The digits from seven places onwards can be anything.

Numeric “3” here is an SCSI identifier prefix added by Linux. The WWID for the storage can be identified from the volume UUIDs. Look for the initial UUID area which is common.

- 
- \_\_\_ 47. Using the arrow keys, cursor down to the right closing bracket } right after the `blacklist_exceptions wwid "36005076*` stanza.

```
}
blacklist_exceptions {
    wwid "36005076*"
}
← Place cursor here
multipaths {
    multipath {
```

- 
- \_\_\_ 48. Type **dd** to delete the highlighted bracket “}”, and select the Tab key on your keyboard.

- 49. Add a device entry as follows using the **vi** insert (**i**) command. Use the Return key and Tab key after each entry.

```
device {  
    vendor "IBM"  
    product "2145"  
}
```

**Note**

Ensure that your entry contains an opening and closing brackets { }.

- 50. Using the arrow keys, cursor down to left most column (1) of the **multipaths** stanza.  
— 51. Comment out the stanza by inserting a hash-tag mark (#) in column 1 on all its associated entry lines using the **vi** insert (**i**) command.

```
#multipaths {  
#    multipath {  
#        uid 0  
#        gid 0  
#        wwid "36005076801808795600000000000b2ef"  
#        mode 0600  
#    }  
#}
```

- 52. To save changes, press the ESC key :**wq**.  
— 53. Enter the **cat /etc/multipath.conf** command to verify changes.

**1+1=2 Example**

```
root@ssfs3g-1102251-stud108-131 ~]# vi /etc/multipath.conf
# multipath.conf written by anaconda
.....
.....
.....
}
blacklist_exceptions {

    wwid "36005076*"

    device {
        vendor "IBM"
        product "2145"
    }
}
#multipaths {
#    multipath {
#        uid 0
#        gid 0
#        wwid "360050768018087956000000000000b2e6"
#        mode 0600
#    }
#}
```

- 
- \_\_\_ 54. Enter the `systemctl restart multipathd` command to restart the multipath service.

**1+1=2 Example**

```
root@ssfs3g-1102251-stud108-131 ~]# systemctl restart multipathd
# (returns command prompt)
```

- 
- \_\_\_ 55. Enter the `ls /sys/class/fc_host` command to manually scan the directory to list the `fc_host` entries in your Linux environment.
- \_\_\_ 56. Enter the following `fc_host` command syntax for each host entry to access the volumes mapped to the Linux host.

- \_\_\_ a. `echo "1" > /sys/class/fc_host/host2/issue_lip`
- \_\_\_ b. `echo "- - -" > /sys/class/scsi_host/host2/scan`
- \_\_\_ c. `echo "1" > /sys/class/fc_host/host3/issue_lip`
- \_\_\_ d. `echo "- - -" > /sys/class/scsi_host/host3/scan`

**Note**

The `issue_lip` syntax performs a Loop Initialization Protocol (LIP) and then scans the interconnect and causes the SCSI layer to be updated to reflect the devices currently on the bus. This procedure is necessary to configure a new SCSI target on a Fibre Channel interconnect.

The `host#/scan` syntax adds a storage device or path. In this case, however, the channel number, SCSI target ID, and LUN values are replaced by wildcards. This procedure will add LUNs, but not remove them.

- 
- \_\_\_ 57. Enter the `fdisk -l |grep mpath*` command to filter and identify new devices under `/dev/mapper` directory.
- 

**Example**

The device mapper is a Linux kernel framework for mapping block devices onto higher-level virtual block devices.

```
[root@ssfs3g-1102251-stud108-131 ~]# fdisk -l |grep mpath*
Disk /dev/mapper/mpathb: 16.1 GB, 16106127360 bytes, 31457280 sectors
/dev/mapper/mpathb1      *        2048       10239       4096   41  PPC PReP Boot
/dev/mapper/mpathb2            10240     2107391     1048576   83  Linux
/dev/mapper/mpathb3        2107392     31457279     14674944   8e  Linux LVM
Disk /dev/mapper/mpathc: 6442 MB, 6442450944 bytes, 12582912 sectors
Disk /dev/mapper/mpathd: 6442 MB, 6442450944 bytes, 12582912 sectors
[root@ssfs3g-1102251-stud108-131 ~]#
```

- 
- \_\_\_ 58. Enter the `multipath -ll` command to list the multipath devices, including which `sdx` devices are used.

## 1+1=2 Example

```
[root@ssfs3g-1102251-stud108-131 ~]# multipath -ll
mpathd (3600507680cb982be0000000000000001e) dm-7 IBM ,2145
size=6.0G features='1 queue_if_no_path' hwhandler='0' wp=rw
|--- policy='service-time 0' prio=50 status=active
| |- 2:0:0:1 sdd 8:48 active ready running
| `- 3:0:0:1 sdh 8:112 active ready running
`--- policy='service-time 0' prio=10 status=enabled
  |- 2:0:1:1 sdf 8:80 active ready running
  `- 3:0:1:1 sdj 8:144 active ready running
mpathc (3600507680cb982be0000000000000001d) dm-6 IBM ,2145
size=6.0G features='1 queue_if_no_path' hwhandler='0' wp=rw
|--- policy='service-time 0' prio=50 status=active
| |- 2:0:1:0 sde 8:64 active ready running
| `- 3:0:1:0 sdi 8:128 active ready running
`--- policy='service-time 0' prio=10 status=enabled
  |- 2:0:0:0 sdc 8:32 active ready running
  `- 3:0:0:0 sdg 8:96 active ready running
mpathb (SIBM_3303_NVDISKd362db91cf71e3830645cddc6cfab801) dm-0 IBM ,3303
NVDISK
size=15G features='0' hwhandler='0' wp=rw
|--- policy='service-time 0' prio=1 status=active
| `- 0:0:1:0 sda 8:0 active ready running
`--- policy='service-time 0' prio=1 status=enabled
  `- 1:0:2:0 sdb 8:16 active ready running
[root@ssfs3g-1102251-stud108-131 ~]#
```



### Note

If the path is up and ready for I/O, the status of the path is `ready` or `active`. If the path is down, the status is `faulty` or `failed`. The path status is updated periodically by the `multipathd` daemon based on the polling interval defined in the `/etc/multipath.conf` file.

## Section 4: Set up Linux host access infrastructure

- \_\_\_ 59. Enter the following `pvcreate /dev/mapper/<disk#>` commands to initialize both disks for use and to define a file system with the new devices from the FlashSystem using Linux LVM.
    - \_\_\_ a. `pvcreate /dev/mapper/<disk1>` (where disk# is the mpath\*)
    - \_\_\_ b. `pvcreate /dev/mapper/<disk2>` (where disk# is the mpath\*)
- 

1+1=2

### Example

```
[root@ssfs3g-1102251-stud108-131 ~]# pvcreate /dev/mapper/mpathc
Physical volume "/dev/mapper/mpathc" successfully created.
[root@ssfs3g-1102251-stud108-131 ~]# pvcreate /dev/mapper/mpathd
Physical volume "/dev/mapper/mpathd" successfully created.
[root@ssfs3g-1102251-stud108-131 ~]#
```

---



### Information

When you create or list a volume group or a logical volume with the Logical Volume Manager (LVM) that uses multipathed storage, you might receive a duplicate PV warning where the duplicate devices are both single paths to the same device.

These duplicate messages are only warnings and do not mean the LVM operation has failed. Rather, they are alerting the user that only one of the devices is used as a physical volume and the others are being ignored.

- \_\_\_ 60. Enter the `pvs` command to display the physical volumes in configurable form.
- 

```
[root@ssfs3g-1102251-stud108-131 ~]# pvs
PV                  VG   Fmt Attr PSize  PFree
/dev/mapper/mpathb3  rhel lvm2 a--  13.99g    0
/dev/mapper/mpathc       lvm2 ---   6.00g  6.00g
/dev/mapper/mpathd       lvm2 ---   6.00g  6.00g
[root@ssfs3g-1102251-stud108-131 ~]#
```

---



### Hint

The `pvdisplay` command can display the details for each physical volumes.

- \_\_ 61. Enter the following `vgcreate` command syntax to create a volume group using first disk from storage.

```
vgcreate teamsetID-VG /dev/mapper/<disk1> (where disk# is the mpath*)  
[root@ssfs3g-1102251-stud108-131 ~]# vgcreate FA1-VG /dev/mapper/mpathc  
    Volume group "FA1-VG" successfully created  
[root@ssfs3g-1102251-stud108-131 ~]#
```

- \_\_ 62. Enter the following `vgdisplay teamsetID-VG` command syntax to examine the details of the new volume group.

## 1+1=2 Example

```
[root@ssfs3g-1102251-stud108-131 ~]# vgdisplay FA1-VG
--- Volume group ---
VG Name          FA1-VG
System ID
Format          lvm2
Metadata Areas   1
Metadata Sequence No  1
VG Access        read/write
VG Status         resizable
.
.
.
VG Size          6.00 GiB
PE Size          4.00 MiB
Total PE         1535
Alloc PE / Size 0 / 0 GiB
Free PE / Size   1535 / 6.00 GiB
VG UUID          FsyUu1-NVgM-vQJr-7cdS-xLWd-yXqQ-ZYqNjp
[root@ssfs3g-1102251-stud108-131 ~]#
```

- \_\_\_ 63. Enter the following command syntax to extend the volume group with the second disk from storage.

```
vgextend teamsetID-VG /dev/mapper/<disk2> (where disk# is the mpath*)
```

### 1+1=2 Example

```
[root@ssfs3g-1102251-stud108-131 ~]# vgextend FA1-VG /dev/mapper/mpathd
Volume group "FA1-VG" successfully extended
[root@ssfs3g-1102251-stud108-131 ~]#
```

- \_\_\_ 64. Recall the **vgdisplay teamsetID-VG** command to examine the details of the volume group after being extended.
- \_\_\_ 65. Create a **teamsetID-VG\_VOL1** logical volume from the disk group utilizing the **10 GiB** size of the volume group by entering the following syntax. The logical volume will be striped across two disks in the volume group **teamsetID-VG**.

```
lvcreate -L 10G -n teamsetID-VG_VOL1 --stripes 2 teamsetID-VG
```

### 1+1=2 Example

```
[root@ssfs3g-1102251-stud108-133 ~]# lvcreate -L 10G -n FA1-VG_VOL1 --stripes 2 FA1-VG
Using default stripesize 64.00 KiB.
Logical volume "FA1-VG_VOL1" created.
[root@ssfs3g-1102251-stud108-133 ~]#
```

- \_\_\_ 66. Enter the following **lvdisplay** command syntax to examine the details of the **teamsetID-VG\_VOL1**.

```
lvdisplay /dev/teamsetID-VG/teamsetID-VG_VOL1
```

**1+1=2 Example**

```
[root@ssfs3g-1102251-stud108-131 ~]# lvdisplay FA1-VG
.....
.....
--- Logical volume ---
LV Path          /dev/FA1-VG/FA1-VG_VOL1
LV Name          FA1-VG_VOL1
VG Name          FA1-VG
LV UUID          ni5NGL-jlYA-woBX-Hpc2-hmR3-fQWS-QwLxip
LV Write Access  read/write
LV Creation host, time ssfs3g-1102251-stud108-133, 2018-05-02 15:38:07
-0400
LV Status        available
# open           0
LV Size          10.00 GiB
Current LE       2560
Segments         1
Allocation       inherit
Read ahead sectors auto
- currently set to 8192
Block device     253:8
[root@ssfs3g-1102251-stud108-131 ~]#
```

- 
67. Enter the `mkfs` command to create file system on the new logical volume.

```
mkfs.ext4 /dev/teamsetID-VG/teamsetID-VG_VOL1
```

**1+1=2 Example**

```
[root@ssfs3g-1102251-stud108-131 ~]# mkfs.ext4 /dev/FA1-VG/FA1-VG_VOL1
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=16 blocks, Stripe width=32 blocks
655360 inodes, 2621440 blocks
131072 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2151677952
80 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, 1605632

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

- 
- \_\_\_ 68. Enter the `mkdir teamsetID-VGMP` command to create a directory mount point for the logical volume.
  - \_\_\_ 69. Enter the `mount /teamsetID-VGMP` command to mount the file system.

`mount /dev/teamsetID-VG/teamsetID-VG_VOL1 teamsetID-VGMP`

---

**1+1=2 Example**

```
[root@ssfs3g-1102251-stud108-131 ~]# mkdir FA1-VGMP
[root@ssfs3g-1102251-stud108-131 ~]# mount /dev/FA1-VG/FA1-VG_VOL1 FA1-VGMP
[root@ssfs3g-1102251-stud108-131 ~]#
```

---

- \_\_\_ 70. Enter the `df -m` command to display the file systems and its capacity in MBs.

**1+1=2 Example**

```
[root@ssfs3g-1102251-stud108-131 ~]# df -m
Filesystem           1M-blocks   Used Available Use% Mounted on
/dev/mapper/rhel-root      12782   1589    11194  13% /
devtmpfs                  438     0     438  0% /dev
tmpfs                      485     0     485  0% /dev/shm
tmpfs                      485    12     474  3% /run
tmpfs                      485     0     485  0%
/sys/fs/cgroup
/dev/mapper/mpathb2        1014    168     847  17% /boot
tmpfs                      97     0      97  0% /run/user/0
/dev/mapper/FA1--VG-FA1--VG_VOL1  9952    37    9388  1% /root/FA1-VGMP
[root@ssfs3g-1102251-stud108-131 ~]#
```

- \_\_\_ 71. Enter the `cd teamseID-VGMP` command to change directory.
- \_\_\_ 72. Enter the following `echo` syntax to create a txt file and to write data to the mount point.

**1+1=2 Example**

```
[root@ssfs3g-1102251-stud108-131 ~]# cd FA1-VGMP
[root@ssfs3g-1102251-stud108-131 F108A1-VGMP]# echo "Writing to storage
disks configured with LVM." > file1.txt
[root@ssfs3g-1102251-stud108-131 F108A1-VGMP]#
```

- \_\_\_ 73. Enter the `ls` command to view the `.txt` file name.
- \_\_\_ 74. Enter the `cat file1.txt` command to verify read access.
- \_\_\_ 75. Enter the command `exit` to log out from Linux.

**Section 5: View hosts connectivity connections**

- \_\_\_ 76. From the Admin server, navigate to the V9000 management GUI.
- \_\_\_ 77. Select **Settings > Network**.
- \_\_\_ 78. Select **Fibre Channel Connectivity** from the *Network Filter* list.
- \_\_\_ 79. From the **View connectivity** drop-down lists, select **Hosts** and select your Linux host.
- \_\_\_ 80. Click **Show Results**.

- \_\_\_ 81. Examine the contents of the **Remote WWPN** column. These values should look familiar since they are the WWPNs of the WIN host.
  - \_\_\_ 82. Examine the contents of the **Local WWPN** column. These values are the V9000 ports zoned with the WIN host WWPNs.
- 



### Information

This view validates the zoning between the host HBA ports and the V9000 Fibre Channel ports.

---

- \_\_\_ 83. Log out of the V9000 management GUI.

## End of exercise

---

# Exercise 7. Thin Provisioning and Volume Mirroring

## Estimated time

00:45

## Overview

This exercise creates a thin-provisioned volume and analyzes the capacities. Volume mirroring functions of the FlashSystem V9000 are applied on a current full capacity volume while also converting the volume to a thin-provisioned volume.

## Objectives

- Create thin-provisioned volumes on V9000.
- Create a mirrored copy of a volume on V9000.
- Carry out the conversion of a fully allocated volume to thin-provisioned on V9000.

# Exercise instructions

## Section 1: Create a thin-provisioned volume

This procedure creates a thin-provisioned volume and maps the volume to WIN host.

- \_\_\_ 1. From the Admin server desktop, open a browser window.
  - \_\_\_ 2. Enter the URL of your V9000 management IP address.
  - \_\_\_ 3. Log in with your admin credentials (refer to the team lab data sheet).
  - \_\_\_ 4. Navigate to **Volumes > Volumes by Pool**.
  - \_\_\_ 5. Select your **CHILD** pool from the Pool Filter list. Examine the pool Volume Allocation bar.
- 



### Questions

Record the following information for the storage pool.

Pool Name	Number of Volumes	Allocated to Volumes	Total Real / Virtual Capacity
CHILD pool			

---

- \_\_\_ 6. From the Volumes by Pool pane, click **Create Volumes**.
  - \_\_\_ 7. The Create Volumes panel is displayed. From the Create Volumes panel select the **Basic** preset and complete the following:
    - \_\_\_ a. Select the **teamname-CHIILD** pool for the volumes.
    - \_\_\_ b. Create one **50 GiB** volume.
    - \_\_\_ c. Name the volume **teamsetID-THIN** (refer to the team lab data sheet).
    - \_\_\_ d. Set the **Capacity savings** to **Thin-Provisioned**.
    - \_\_\_ e. Accept the I/O group default: **Automatic**
  - \_\_\_ 8. Examine the summary configuration details. Observe that with a virtual size of 50 GiB, only 1 GiB of real capacity would be allocated from the pool capacity.
- 



### Note

The thin-provisioned default settings include:

- The capacity savings is set with **Thin-Provisioned**.
- The 1 GiB real capacity from the previous pane is 2% of the volume's virtual capacity.
- As write activities occur, the volume's physical capacity expands automatically while maintaining a 2% (of virtual size) buffer.
- Should the physical or real capacities reach 80% of its virtual size, warning messages will be generated.

- Space within each extent is consumed in 256 K grains or increments driven by write activity.
- 

- 9. Click **Create and Map**.
  - 10. Review the generated `svctask mkvdisk` command used to create this thin-provisioned volume. The `-autoexpand` parameter allows the volume capacity to automatically increase as a result of write activity. A value of 256 for the `-grainsize` indicates that used capacity is allocated in 256 K chunks. The `-rsize` parameter is set to be 2% of the `-size` value. Click **Continue**.
  - 11. The Create Mapping window is displayed:
    - a. Select your **WIN** server host. Click **Next**.
    - b. Verify that the THIN volume is highlighted, click **Map Volumes** to confirm.
  - 12. Review the generated `svctask mkvdiskhostmap` commands. Click **Close**.
  - 13. From the **Volumes by Pool** view, examine the THIN volume entry. Observe the icon assigned to the volume in the Capacity column.
- 



### Note

The Thin-Provisioned Volume icon serves as an eye catcher to indicate the capacity value is virtual and not real.

---

- 14. Observe that the pool's capacity is still at 250 GiB of free space.
  - 15. Right-click in the column headings area and add the **Real Capacity** and **Used Capacity** columns to the display.
- 



### Information

A thin-provisioned volume is created with two capacities; total (virtual) and real. The total or virtual capacity is the capacity seen by host servers as well as Spectrum Virtualize services such as FlashCopy and Metro/Global Mirroring. The real capacity defines the amount of capacity actually allocated from a storage pool.

The used capacity represents the initial allocation of the metadata directory needed to manage the thin-provisioned volume. The directory is used to keep track of grain-sized storage space assignments within the extents of the volume.

---



### Questions

What is your THIN volume UID (record the last 3-digits)? \_\_\_\_\_

---

- 16. Right-click on your THIN volume entry. In the pop up menu, select **Volume Copy Actions > Properties**.

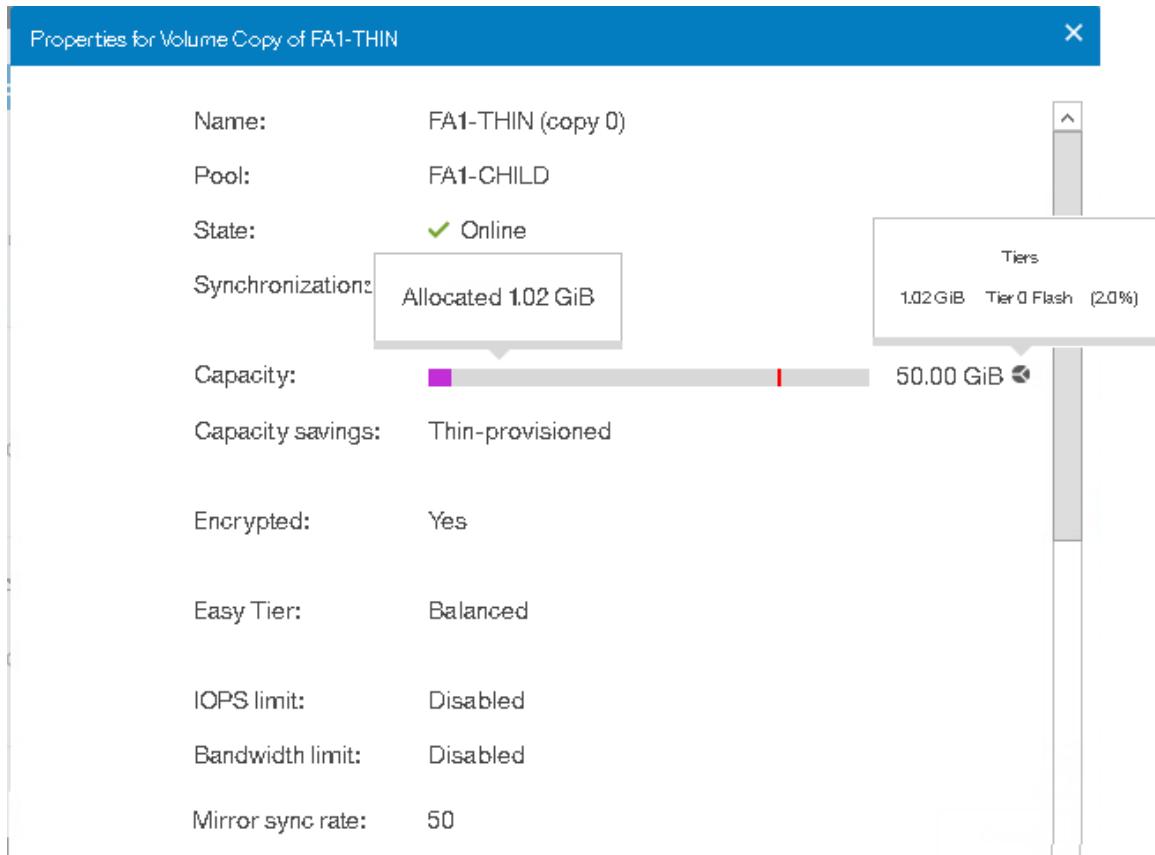
- \_\_\_ 17. From the Properties for Volume Copy, click the **View more details** link to view the volume details.
- \_\_\_ 18. Observe the THIN volume name reference (Copy 0).



## Information

A thin provisioning volume provides the ability to define logical volume sizes that are much larger than the physical capacity installed on the system. Physical capacity needs only to accommodate written data, while parts of the volume that have never been written to do not consume physical space. A thin provisioning volume can be converted to a fully allocated volume - if required.

- \_\_\_ 19. Observe the THIN volume details. Hover the mouse pointer over the capacity bar and icon to view allocated capacity and storage pool tier level.



## Questions

What is the default sync rate of the THIN volume? \_\_\_\_\_

- \_\_\_ 20. Click **Close**.
- \_\_\_ 21. Right-click your THIN volume again and click **View Member MDisks**.
- \_\_\_ 22. Examine the mdisk and the total number of extents used by this THIN volume.

**Note**

Although the volume capacity was allocated from the CHILD pool, the CHILD pool does not own any extents.

**Questions**

What is the difference between the volume's allocated capacity and its available capacity? Recall that the extent size of each pool is 1024 MiB which is one extent size beyond the 1 GiB capacity that is available.

**Answer:** Calculate the allocated capacity by multiplying the number of extents times the extent size (which is 1024 MiB).\_\_\_\_\_

**Information**

The capacity as specified by the `rsize` value is used as a contingency buffer when the volume is defined with the `autoexpand` option. As data is written, the software automatically acquires extents to maintain this buffer sized head room. Thus far, the metadata for the volume has been written, causing the volume's real capacity consumption to expand by one extent beyond its contingency buffer of 2% of the total virtual allocation.

- \_\_\_ 23. Click **Close**.
- \_\_\_ 24. Navigate to the **Dashboard** view.
- \_\_\_ 25. From the **Capacity > Capacity Savings** panel, observe the Thin-Provisioning capacity savings. The total capacity savings is accumulated for all thin-provisioned volumes on the system.

**Information**

The capacity savings represents the total of allocated VDisk sizes minus that amount of actual space to hold data written to thin and compressed volumes.

**Note**

The [View MDisks](#), [View Compressed Volumes](#), and [View Thin-Provisioned Volumes](#) links below each column re-directs to its descriptive location.

- \_\_\_ 26. Minimize the V9000 management GUI session.

## Section 2: Access the thin-provisioned volume from the WIN server

- \_\_\_ 27. From the Admin server desktop, start an RDP session to your **WIN** server.
  - \_\_\_ 28. Login using the server credentials (refer to the team lab data sheet).
  - \_\_\_ 29. From the **WIN** server, click the **Server Manager** icon.
  - \_\_\_ 30. Navigate to **Storage > Disk Management**.
- 



### Troubleshooting

If the new disk has not yet been automatically discovered by Windows, select from the Actions pane (on the far right), select **Disk Management > Rescan Disks**.

- \_\_\_ 31. If the Initialize Disk window is not displayed, right-click the **Disk# Basic** area, and select **Initialize**.
  - \_\_\_ 32. From the Initialize Disk pop-up window, accept the **MBR** default and click **OK** to continue.
  - \_\_\_ 33. Right-click the unallocated area of the new disk. In the menu list, click **New Simple Volume**.
  - \_\_\_ 34. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
    - \_\_\_ a. Accept the default capacity value. Click **Next**.
    - \_\_\_ b. Accept the default drive letter. Click **Next**.
    - \_\_\_ c. Relabel the volume as **teamsetID-THIN**. Click **Next**.
    - \_\_\_ d. Click **Finish** to complete the disk allocation.
  - \_\_\_ 35. Right-click the **THIN** disk entry and select **Properties**.
  - \_\_\_ 36. Observe that the volume has been defined by Windows as a fully allocated 50 GB disk.
  - \_\_\_ 37. Click **Cancel** to close the window.
- 



### Important

The next few steps will be time-sensitive. It is recommend that you read ahead before you execute the steps.

- \_\_\_ 38. Navigate to the Admin server desktop. open an SSH session to your V9000.
- \_\_\_ 39. Log in with your **admin** ID.

- 
- 40. Enter the `lssevdiskcopy -delim ,` command to display a summary of the thin-provisioned volumes of the system.



### Information

For each thin-provisioned volume, the `lssevdiskcopy` command output provides (using the **THIN** volume values as example):

- The total capacity of the volume: 50 GB
- The current used capacity: 68.00 MB
- The amount of real capacity allocated: 1.08 GB
- The amount of free capacity available within the real capacity allocated: 1.01 GB
- The overallocation value 4637. This value is calculated by dividing the volume's total capacity by its real capacity and then multiplying it by 50. As this value approaches 50, it means that the real capacity of the volume is growing closer to its virtual capacity. The overallocation value is not available from the GUI.

As write activity occurs on a thin-provisioned volume the various capacity indicators can be monitored using the `lssevdiskcopy` command.

- 
- 41. Return to the **WIN** server RDP session.
- 42. Navigate to the Disk Management view on Server Manager.
- 43. Right click on the **THIN** volume formatted area and select **Explore**.
- 44. Copy the `C:\Software\ClassFolders\FolderDB-300MB` to the THIN volume.
- 45. Quickly navigate back to the V9000 CLI management session.
- 46. While the copy is in progress, *immediately* use the up arrow to recall the `lssevdiskcopy -delim ,` command to display a summary of the thin-provisioned volumes of the system.
- 47. Wait a few seconds and then reenter the `lssevdiskcopy -delim ,` command a few more times.
- 48. Examine the difference between the **real capacity** and **used capacity** values in each output entry.



### Information

The iterative output of the `lssevdiskcopy` command enables one to monitor the increase in the volume's real storage capacity consumption as data is written to the volume.

As data is written to the **THIN** volume, capacity is automatically allocated to expand. The V9000 will continue to maintain about a 2 GB contingency buffer (2% of 50 GB) each time the used capacity increases.

- 
- 49. Observe the overallocation value in the **THIN** volume output entries.

**Note**

In our example, initially this value was 3809 for the THIN volume. As more real capacity is consumed; the overallocation value begins to decrease accordingly (from 4637 to 3636 in this example stream of output - issued 6x). As this value approaches 50, it is an indication that the real capacity of the volume is growing closer to its virtual capacity.

- \_\_\_ 50. Navigate back to the **WIN** server RDP session.
- \_\_\_ 51. In the Explore view of the THIN volume, rename the **FolderDB-300MB** folder to **FolderDB1-300MB**.
- \_\_\_ 52. Copy the **C:\Software\ClassFolders\FolderDB-300MB** to the THIN volume again.
- \_\_\_ 53. In the File view, right-click the THIN volume and select **Properties**.
- \_\_\_ 54. Observe the change in the volume's used space and free space as tracked by Windows. Click **Cancel**.
- \_\_\_ 55. Close any remaining open windows.
- \_\_\_ 56. Click **Start > Log off** to log out from the WIN server.

### **Section 3: Review thin-provisioned volume capacities**

- \_\_\_ 57. Navigate to the SSH session with the V9000 CLI.
- \_\_\_ 58. Enter the **lsvdisk teamsetID-THIN** command to view the details of the THIN volume. This output is a bit lengthy but easier to read than the **lssevdiskcopy** output.
- \_\_\_ 59. Scroll to examine the **copy\_id 0** details. Examine the capacity values associated with used, real, and free as well as the current overallocation value.

**Note**

This CLI output is the basis for the GUI volume properties view. You might have to wait a couple of minutes for the volume's data to be destaged from the node cache.

Note that the volume has automatically expanded and the 1 GB (or more precisely, 2% of 50 GB) contingency buffer is being maintained. These capacity values are quite a bit smaller than the operating system perception of the volume's capacity.

- \_\_\_ 60. Minimize the view to the V9000 SSH session.
- \_\_\_ 61. Navigate to the V9000 management GUI, and select **Volumes > Volumes by Pool**.
- \_\_\_ 62. Examine your THIN volume **Real Capacity** and **Used Capacity** after data have been written to the volume.

## Section 4: Create a thin-provisioned volume copy (Volume Mirroring)

This procedure converts a fully allocated AIX volume to a thin provisioned by mirroring to a thin volume in a CHILD pool, and deleting the original copy. This technique allows allocated but unused space (defined as grain sized strings of zeros) to be returned to the storage pool as free capacity.

- \_\_\_ 63. From the **Volumes > Volumes by Pool** view, select your **`teamsetID-SAS`** pool to examine the storage pool details.



### Questions

Record the following information for the storage pool.

Pool Name	Number of Volumes	Real_capacity	Virtual-capacity	Unused_capacity
SAS pool				

- 
- \_\_\_ 64. Right-click on your **`teamsetID-AIX1`** volume, and select **Modify Capacity Savings**.
  - \_\_\_ 65. From the Modify Capacity Savings window, observe the methods in which you can modify volume savings. **Do not click the Modify**.



### Note

This method would allow you to easily create a Thin-Provisioned copy of the volume or a compression volume in the same pool as the original, make the new copy as the primary, and then delete the original all in the one process

Instead, you will issue a CLI command syntax to create the Thin-Provisioned copy of the volume, without automatically setting the new copy to primary and deleting the original.

- 
- \_\_\_ 66. Click **Cancel**.



### Questions

What is the ID for the **`teamsetID-AIX1`** volume? \_\_\_\_\_

- 
- \_\_\_ 67. Navigate to the V9000 CLI.
  - \_\_\_ 68. Enter the **`lsmdiskgrp -delim , filtervalue name=teamsetID*`** command syntax to display a concise list of your storage pools the V9000 system.



## Questions

What is the ID for the parent pool (mdiskgrp0)? \_\_\_\_\_

What is the ID of your CHILD pool? \_\_\_\_\_

- \_\_\_ 69. Enter the following command syntax to create a thin-provisioned copy of the **AIX1** volume on the CHILD pool.

```
addvdiskcopy -autoexpand -grainsize 256 -mdiskgrp [child pool ID or name] -rsize 2% -warning 80% [teamsetID-aix1ID]
```

**1+1=2**

## Example

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>addvdiskcopy -autoexpand -grainsize 256 -mdiskgrp FA1-CHILD -rsize 2% -warning 80% FA1-AIX1
Vdisk [2] copy [1] successfully created
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```



## Information

The **addvdiskcopy** command is used to create a mirror copy. The options of **-autoexpand**, **-grainsize**, and **-rsize** are for creating a Thin-Provisioned volume.

- \_\_\_ 70. Return to the V9000 management GUI **Volumes > Volumes by Pool**.  
 \_\_\_ 71. Observe that the AIX1 volume entry in your **teamsetID-SAS** pool shows two copies.

Name	ID	Synchronized	State	UID
FA1-AIX1	2		✓ Online	600507680CAB82BE0000000000000007
Copy 0*	2	Yes	✓ Online	600507680CAB82BE0000000000000007
Copy 1	2	No	✓ Online	600507680CAB82BE0000000000000007
FA1-WINA	3		✓ Online	600507680CAB82BE0000000000000008

**Note**

Copy 0 is the original fully allocated primary copy (designated with the asterisk). It is used for reads and writes. Copy 1 has the **Thin Provisioning** icon with its capacity value. Copy 1 is used only for writes so that the two copies stay synchronized.

- 
- \_\_\_ 72. Navigate to the **Monitoring > Background Tasks**. Observe that your AIX1 volume is being synchronized with copy 0.
- 

**Note**

The Background tasks is another alternative to display all long running task that are currently in progress on the system. After the task completes, the task is automatically deleted from the display.

- 
- \_\_\_ 73. Navigate to **Volumes > Volumes by Pool**. Select your **teamsetID-CHILD** pool.
  - \_\_\_ 74. Verify that your **teamsetID-AIX1** volume also contains two volume copies.
  - \_\_\_ 75. Observe that the volume copies count in this pool has been incremented only by 1.
  - \_\_\_ 76. Toggle between your SAS pool and CHILD pool. Observe that both volume copies have been created with the exact same UID.
  - \_\_\_ 77. Navigate to your **teamsetID-CHILD** pool.
  - \_\_\_ 78. Right-click on your **teamsetID-AIX1** volume entry. Select **Properties** to examine volume details.
  - \_\_\_ 79. Click the **View more details** link to view the volume details.
  - \_\_\_ 80. Observe the pool name, pool assigned, virtualization type, and the mirror synch rate in the properties detail. Click **Close**.

**Note**

The default synchronization rate setting is 50 is about 2 Mbps. The synchronization rate must be set such that the volume copies will resynchronize quickly after loss of synchronization.

Syncrate value	Data copied per second
1-10	128 KB
11-20	256 KB
21-30	512 KB
31-40	1 MB
41-50	2 MB
51-60	4 MB
61-70	8 MB
71-80	16 MB
81-90	32 MB
91-100	64 MB

The default synchronization rate is typically too low for SSD volume mirrors. Instead, set the synchronization rate to 80 or above.

- \_\_\_ 81. Navigate to the V9000 CLI session.
- \_\_\_ 82. To speed up the copy process, enter the `chvdisk -syncrate 100 aix1ID` command syntax to modify the mirror synch rate for the AIX1 volume to **100**.
- \_\_\_ 83. Enter the `lsvdisk [AIX1ID]` command to view syncrate change.
- \_\_\_ 84. Type `exit` to close session V9000 CLI session.
- \_\_\_ 85. Navigate to the V9000 management GUI, and select **Volumes > Volumes**.
- \_\_\_ 86. Click the Name Column to sort the volume list. Locate your `teamsetID-AIX1` volume entry.
- \_\_\_ 87. Observe the two volume copies entries under your `teamsetID-AIX1` volume. The fully allocated volume copy remains in the original `teamsetID-SAS` pool and the thin-provisioned volume copy resides in your `teamsetID-CHILD` pool.
- \_\_\_ 88. Right-click on your `teamsetID-AIX1` volume. Select **View Member MDisks** tab.

- 89. Observe the number of extents allocated to created the volume copies. Modify columns to view the extents allocated for each copy.

Member MDisks

---

Both Copies						
Actions		Filter				
Name	Status	Capacity	# of Ext..	Pool	Storage System	LUN
FA1-mdisk2	✓ Online	101.00 GiB	3	FA1-DS35KSAS	F108A-DS35K	0000
FA1-mdisk1	✓ Online	101.00 GiB	3	FA1-DS35KSAS	F108A-DS35K	0000

---



### Note

By default, the extents are distributed across the MDisks for both copies.

---



### Questions

How many allocated extents are in your `teamsetID-SAS` pool? \_\_\_\_\_

---

How many allocated extents are in the mdiskgrp0 pool? \_\_\_\_\_

---



### Reminder

Child pools that receive their capacity from parent pools cannot have extents that are migrated to them.

---

- 90. Click **Close**.

## Section 5: Delete the source volume that was copied

This procedure will delete the Copy 0 version of the volume.

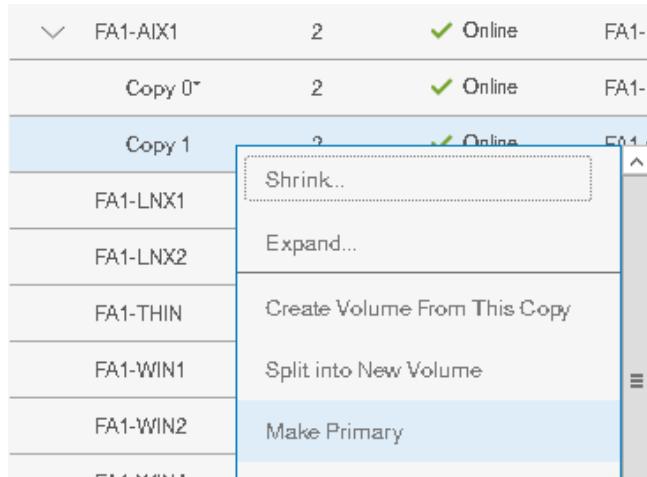
- \_\_\_ 91. Verify that your `teamsetID-AIX1` synchronization task is complete before proceeding.
- \_\_\_ 92. From the **Volumes > Volumes** view, right-click the **Copy 1** entry of your `teamsetID-AIX1` volume



### Reminder

This is the thin-provisioned volume copy that is assigned to the CHILD pool.

- \_\_\_ 93. Select **Make Primary** from the pop-up menu.



- \_\_\_ 94. Review the generated `svctask chvdisk` commands. Click **Close**.
- \_\_\_ 95. Right-click the **Copy 0** entry of your `teamsetID-AIX1` volume



### Reminder

This is the fully allocated volume copy assigned to the SAS pool.

- \_\_\_ 96. Select **Delete** from the pop-up menu.
- \_\_\_ 97. The Warning dialog appears. Click **Yes** to confirm you wish to remove Copy0 from the AIX1 volume.
- \_\_\_ 98. Review the generated `svctask rmvdiskcopy` command. Click **Close**.
- \_\_\_ 99. Navigate to **Volumes > Volumes by Pool**.
- \_\_\_ 100. Select your `teamsetID-CHILD` pool from the Pool filter list. Confirm that a single copy for the AIX1 volume exists in this pool.
- \_\_\_ 101. Select your `teamsetID-SAS` pool in the Pool Filter list.

- 
- 
- \_\_\_ 102.Verify that the AIX1 volume no longer exist in this pool. The pool's capacity bar has been updated with a decrease in the allocated capacity.
- 



### Information

The Volume Mirroring function of the FlashSystem V9000 provides a powerful tool to reclaim allocated but unused capacity from existing volumes, regardless of storage tier. It transparently and painlessly removes allocated excess capacity from existing volumes to increase capacity utilization efficiency across the enterprise.

---

- \_\_\_ 103.Log out of the V9000 management GUI.

## End of exercise

---

# Exercise 8. EasyTier Hybrid pool implementation

## Estimated time

00:45

## Overview

This exercise explores the features that are associated with Easy Tier and Flash drives. The student will create a Hybrid pool to implement Easy Tier Technology.

In addition, the student will review Easy Tier configurations, create volumes within the IBM FlashSystem V9000 GUI, generate I/Os for Easy Tier evaluation, and view the performance monitor to show current utilization. The IOmeter tool is used to generate storage activity.

## Objectives

- Create V9000 volumes to be used in the Easy Tier evaluation.
- Modify Easy Tier settings on an existing MDisk.
- Create a three-tier Hybrid pool by adding various disk technology to the flash storage pool.
- Use IOmeter tool to generate I/O activity for analyzing.

# Exercise instructions

## Section 1: Create new volumes in the hybrid pool

This procedure creates volumes that will be used by IBM Easy Tier in a Hybrid pool.

- \_\_\_ 1. From the Admin server desktop, open a CLI session to your V9000 management.
- \_\_\_ 2. Log in with your admin credentials (refer to the team lab data sheet).
- \_\_\_ 3. Enter the `lsmdiskgrp -delim , filtervalue name=teamsetID*` command to view a list of your pools.



### Questions

What is the mdiskgrp [ID] for your CHILD pool? \_\_\_\_\_

- \_\_\_ 4. Enter the following `mkvdisk` command syntax to create a **25 GB** volume named `teamsetID-ETier1` and assign it to your `teamsetID-CHILD` pool.

```
mkvdisk -mdiskgrp [child pool ID or name] -name teamsetID-ETier1 -size 25
-unit gb
```



### Example

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>mkvdisk -mdiskgrp 1 -name FA1-ETier1
-size 25 -unit gb
Virtual Disk, id [7], successfully created
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

- \_\_\_ 5. Recall the following `mkvdisk` command syntax. Modify the command to create second **25 GB** volume named `teamsetID-ETier2` and assign it to your `teamsetID-CHILD` pool.

```
mkvdisk -mdiskgrp [childID] -name teamsetID-ETier2 -size 25 -unit gb
```

- \_\_\_ 6. Enter the following `mkvdisk` command syntax to create a third 25 GB volume thin-provisioned volume named `teamsetID-ETier3` and assign it to your `teamsetID-ETier1CHILD` pool.

```
mkvdisk -autoexpand -grainsize 256 -mdiskgrp [childID] -name
teamsetID-ETier3 -rsize 2% -size 25 -unit gb -warning 80%
```



### Questions

What is the volume [ID] for the ETier1? \_\_\_\_\_

What is the volume [ID] for the ETier2? \_\_\_\_\_

What is the volume [ID] for the ETier3 (THIN)? \_\_\_\_\_

---

- \_\_\_ 7. Minimize the V9000 management CLI.
  - \_\_\_ 8. From the Admin server desktop, open a browser window.
  - \_\_\_ 9. Enter the URL of your V9000 management IP address.
  - \_\_\_ 10. Log in with your admin ID (Refer to the team lab data sheet).
  - \_\_\_ 11. Navigate to the **Volumes > Volumes by Pool**.
  - \_\_\_ 12. Select your **CHILD** pool. Observe the CHILD pool Easy Tier settings (top of panel).
- 



### Teamwork

Your are working in a shared resource environment. All CHILD pools created on the system receive its capacity from mdiskgrp0 (parent pool). Therefore some settings or parameters might have already been completed or implemented by another team member.

Do not make any modifications outside of what has been instructed, as this might disable the environment for others.

---

If no team member has assigned non-flash MDisks to the mdiskgrp0 pool, the Easy Tier status will be **balanced**. Which means it is balancing I/Os across MDisks in the pools by moving extents from MDisk to MDisk to get it balanced.

If there's only one MDisk in the pool, the status will still be **balanced** (which is the starting case in our lab) though no extents will be moved for a single MDisk pool.

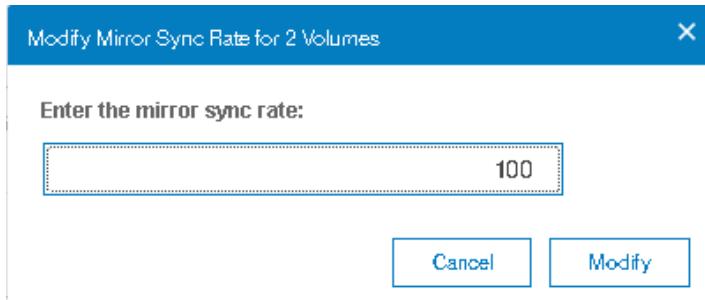
If a non-flash MDisk has been added to the mdiskgrp0 pool, we have a multi-tiered pool and the Easy Tier status is **active**, so Easy Tier is migrating extents among tiers to improve performance.

Child pools inherit the parent pool's Easy Tier function, status, pool status and other information.

---

- \_\_\_ 13. Verify the three ETier volumes (ETier1, ETier2, and ETier3) volumes are listed in the CHILD pool.
  - \_\_\_ 14. Observe that the ETier1 volume and the **ETier2** volume are still being formatted.
  - \_\_\_ 15. Right-click on the ETier2 volume, and select **Properties**. Click the [View more details](#) link to expand the view. What is the Preferred node for the ETier2 volume? \_\_\_\_\_
- 
- \_\_\_ 16. Click **Close**.
  - \_\_\_ 17. To speed up the copy process for the volumes, multi-select the **ETier1** and **ETier2** volumes, right-click the selected volume entries and select **Modify Mirror Sync Rate**.

- \_\_\_ 18. Click the field window and change both volume's sync rate from 50 to **100**. Click **Modify**.



- \_\_\_ 19. Examine the `svctask chvdisk -syncrate` command generated for each volume. Click **Close**.
- \_\_\_ 20. Right-click in the column headings area and add an **ID** column to the display.
- \_\_\_ 21. Multi-select the **ETier** volumes. Right-click and select **Map to Host or Host Cluster**.
- \_\_\_ 22. The Create Mapping window is displayed:
- \_\_\_ a. Select your **WIN** server host.
  - \_\_\_ b. Accept the default to allow the system to assign SCSI LUN IDs. Click **Next**.
  - \_\_\_ c. Verify that the three EasyTier volumes highlighted, and then click **Map Volumes**.
- \_\_\_ 23. Review the `svctask mkvdiskhostmap` commands generated to assign each volume to the WIN host object. Click **Close**.
- \_\_\_ 24. Navigate to **Volumes > Volumes by Host**.
- \_\_\_ 25. Select your **WIN** in the **Host Filter** list. Verify the three **EasyTier** volumes are listed.



### Questions

What is the UID last 3-digits for each volume?

ETier1 \_\_\_\_\_ ETier2 \_\_\_\_\_ ETier3 \_\_\_\_\_

- \_\_\_ 26. Right-click the column header and click the **Easy Tier Status** check box to add to the column display.

\_\_\_ 27. Observe the Easy Tier status for each Easy Tier volume.

Create Volumes		Actions		All Volumes	Filter	Showing 6 volumes   S	
Name	ID	State	Pool	UID	Capacity	Easy Ti	
FA1-WIN2	1	✓ Online	FA1-CHILD	600507680CAB...	6.00 GB	Inactive	
FA1-WIN1	0	✓ Online	FA1-CHILD	600507680CAB...	6.00 GB	Inactive	
FA1-THIN	6	✓ Online	FA1-CHILD	600507680CAB...	50.00 GB	Inactive	
FA1-ETier3	9	✓ Online	FA1-CHILD	600507680CAB...	25.00 GB	Inactive	
FA1-ETier2	8	✓ Online	FA1-CHILD	600507680CAB...	25.00 GB	Inactive	
FA1-ETier1	7	✓ Online	FA1-CHILD	600507680CAB...	25.00 GB	Inactive	



### Teamwork

If no team member has added a non-flash MDisk to the mdiskgrp0 pool, the volumes are presented as *inactive*.

If a team member has added a non-flash MDisk to the mdiskgrp0 pool, the volumes are presented as *active*.



### Information

There is an Easy Tier setting for pools and for VDisk copies, as well as an Easy Tier status for pools and for volumes. The settings for a pool are “**auto [default]**”, “**on**”, “**off**”, or “**measure**”, while the setting for VDisk copies is on (default) or off. The EasyTier status for a pool, or a volume, is either active, inactive, measured or balanced. In addition to the “**active**” and “**balanced**” modes, the **easy\_tier\_status** attribute also presents:

- The status “**measured**” means that Easy Tier statistics are being collected for all volume disks (vdisks) but no extent management is taking place.
- The status “**inactive**” means that Easy Tier is neither collecting statistics nor managing the tiers.

\_\_\_ 28. Minimize the V9000 management GUI.

## Section 2: Change Easy Tier setting for single mdisk

- \_\_\_ 29. Navigate to the V9000 CLI session.
- \_\_\_ 30. Enter the following command syntax to view the Easy Tier settings for your command to view the Easy Tier settings for your `teamsetID`-pools.

```
lsmdiskgrp teamsetID-$i | grep -E "teamsetID|easy"
```

1+1=2

### Example

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>lsmdiskgrp FA1-$i | grep -E
"FA1|easy"
name FA1-DS3KSATA
easy_tier auto
easy_tier_status balanced
parent_mdisk_grp_name FA1-DS3KSATA
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```



### Questions

Record the Easy Tier setting for your child pool. \_\_\_\_\_

- \_\_\_ 31. Enter the `lsvdisk [ID]` command to examine the details of the **ETier3** volume allocated from the **CHILD** pool (scroll down to view the complete output).
- \_\_\_ 32. Observe the **ETier3** volume `easy_tier_status`.



### Teamwork

If the status is **balanced** mode, Easy Tier is balancing I/Os across MDisks in the pool, but since this starts as a single MDisk pool, it won't be moving extents until a non-flash MDisk is added to the pool.

If the status is **active** mode, EasyTier is working to move extents between tiers in a multi-tiered pool for better performance.

- \_\_\_ 33. Enter the following `chvdisk -easytier off` command syntax to change the Easy Tier setting of the ETier3 volume from *balanced* to *measure*.

```
chvdisk -easytier off [teamsetID-ETier3 volume ID or name]
```

---

**1+1=2 Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>chvdisk -easytier off 9
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

---

- \_\_\_ 34. Recall the **lsmdiskgrp -delim , filtervalue name=teamsetID\*** command to examine your pool details. Observe that no changes has occurred in the child pool's Easy Tier status.
  - \_\_\_ 35. Recall the **lsvdisk [ID]** command for ETier3 volume.
  - \_\_\_ 36. Observe that the **easy\_tier\_status** entry has automatically changed from *balanced* to *measured* at the volume level to indicate that Easy Tier won't move extents for this VDisk if another MDisk is added to the pool.
  
  - \_\_\_ 37. Navigate to the V9000 management GUI, and select **Volumes > Volumes by Host**.
  - \_\_\_ 38. Select your **WIN** server in the **Host Filter** list.
  - \_\_\_ 39. Observe that the Easy Tier status for ETier3 volume is now set to *Measured*.
-

## Section 3: Create a Hybrid pool

This procedure creates a multi-tiered storage pool by adding an Enterprise-based MDisk and Nearline-based MDisk to the flash storage pool to define a Hybrid storage pool.



### Information

The Easy Tier function of FlashSystem V9000 allows for significant cost savings by automatically placing data among different storage tiers. The feature can be implemented for internal and external storage.

- \_\_\_ 40. Navigate to the V9000 management GUI, and select **Pools > MDisks by Pool**.
- \_\_\_ 41. Click the (>) symbol to expand the **Unassigned MDisks** view.



### CAUTION

Because there are multiple teams using the same V9000, we recommend that you use the Filter field to search for your team resources, including user name, pool, volume, host, and so on.

- \_\_\_ 42. Right-click on the remaining **`teamsetID-mdisk`** with a capacity size of 100+ GiB.

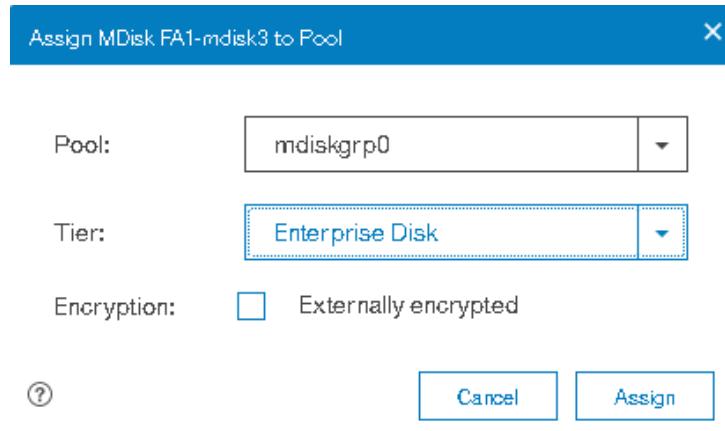


### Reminder

Last digit of the capacity represents your **`teamsetID`**; i.e FA1mdisk# = 101 GB, FA2mdisk#=102, etc.

- \_\_\_ 43. Select **Assign**.
- \_\_\_ 44. From the Assign MDisks to pool panel, complete the following:
  - \_\_\_ a. Select the **mdiskgrp0** pool.
  - \_\_\_ b. Select **Enterprise Disk** as the Tier technology for the pool.
  - \_\_\_ c. Do not check the Externally Encryption box indicating the external storage is doing its own encryption.

- \_\_ d. Click **Assign**.



- \_\_ 45. Examine `svctask chmdisk -tier tier_enterprise` command syntax that is generated. Click **Close**.
- \_\_ 46. Navigate back to the **Unassigned MDisks** view.
- \_\_ 47. Right-click on the remaining unassigned `teamsetID-mdisk` with a capacity size of 50+ GiB (refer to your team data sheet).
- \_\_ 48. Select **Assign**.
- \_\_ 49. From the Assign MDisks to pool panel, complete the following:
  - \_\_ a. Select the **mdiskgrp0** pool.
  - \_\_ b. Select **Nearline Disk** as the Tier technology for the pool.
  - \_\_ c. Do not check the Externally Encryption box to indicate external storage encryption.
  - \_\_ d. Click **Assign**.
- \_\_ 50. Examine `svctask chmdisk -tier tier-nearline` command syntax that is generated. Click **Close**.
- \_\_ 51. Expand the **mdiskgrp0** pool to view the assigned mdisks.
- \_\_ 52. Right-click the column header and click the **Tier** check box to add to the column display.

Name	ID	State	Capacity	Tier	Storage Sys
mdiskgrp0	0	✓ Online	2.08 TiB	Tier 0 Flash	F108A-DS3
FA1-mdisk3	3	✓ Online	101.00 GiB	Enterprise Disk	F108A-DS3
FA1-mdisk6	6	✓ Online	51.00 GiB	Nearline Disk	F108A-DS3



## Troubleshooting

If your MDisks does not appear in the mdiskgrp0, log off the GUI and log back in.



## Note

The **mdiskgrp0** pool is now a multi-tiered hybrid pool with Flash-based, Enterprise-based, and Nearline-based MDisks all in the same pool. Because the Easy Tier setting for the pool defaults to auto, the Easy Tier status of the pool becomes active automatically.



## Teamwork

You are working in a shared environment. You might already see other team mdisks in the **mdiskgrp0** pool. Please do not remove any mdisks that have been added from other team members.

- \_\_\_ 53. Navigate to **Pools > Volumes by Pool**.
- \_\_\_ 54. From the Pool Filter pane, observe that both the **mdiskgrp0** and **CHILD** pools icon are the same.



## Note

The icon represents that the Easy Tier status is now active. Since the child pool was created from the parent pool, it inherits the Easy Tier *active* status.



## Information

An Easy Tier *Active* indicates that automatic data placement is enabled. This allows Easy Tier to collectively measure the host access activities to the data on each storage extent. Based on this analysis, Easy Tier provides a mapping that identifies high activity extents, and then moves the high-activity data according to its relocation plan algorithms.

- \_\_\_ 55. Select the **CHILD** pool from the Pool Filter pane.
- \_\_\_ 56. If Easy Tier status is not listed, add the column view to display it. Observe that all volumes except the ETier3 volume are *Active*.
- \_\_\_ 57. Right-click on your **ETier1** volume. Select **View Member MDisk**.
- \_\_\_ 58. Observe the number of extents allocated for the selected volume.
- \_\_\_ 59. Repeat the process to view the extents of your **ETier2** and **ETier3** volumes.

**Note**

The output shows each VDisk's extents reside on mdisk0 which is Tier 0 flash. Normally when new VDisks are created in a multi-tiered pool, they will be placed on the Enterprise or Nearline tiers unless there is no space available in those tiers. In this case, you created the existing VDisks in the pool when it only had Tier 0 flash. Flash based MDisk extents are usually reserved for the migration of hot extents.

- 
- \_\_\_ 60. Navigate to **Pools > Pools**.
  - \_\_\_ 61. Right-click the **CHILD** pool and rename the pool to **teamsetID-Hybrid**. Click **Rename**.
  - \_\_\_ 62. Examine the generated **svctask chmdiskgrp** CLI command to change the pool name. Click **Close**.
  - \_\_\_ 63. Verify that the **CHILD** pool is now renamed to **Hybrid** pool.
  - \_\_\_ 64. Navigate to the V9000 CLI session.
  - \_\_\_ 65. Enter the **lsmdiskgrp <teamsetID-Hybrid ID or name>** command.
  - \_\_\_ 66. Scroll down to view the Easy Tier information for the **Hybrid** storage pool.



## Questions

Easy Tier breaks down the information into three tiers and four technical types, as listed in the table below.

Tier	Tech Types
ET_Tier1	tier0_flash
ET_Tier2	tier1_flash, tier2_hdd
ET_Tier3	tier3_nearline

Record the following information from the V9000 CLI sessions

Storage pool	teamsetID-Hybrid
<b>tier tier0_flash</b>	
tier_mdisk_count	
tier_capacity	
tier_free_capacity	
<b>tier tier1_flash</b>	
tier_mdisk_count	
tier_capacity	
tier_free_capacity	
<b>tier tier_ enterprise</b>	
tier_mdisk_count	
tier_capacity	
tier_free_capacity	
<b>tier tier_ nearline</b>	
tier_mdisk_count	
tier_capacity	
tier_free_capacity	

---

67. Type **exit** to close the **V9000** CLI session.

## Section 4: Create Windows disks for the mapped volumes

- \_\_\_ 68. From the Admin server desktop, start a remote desktop session to your **WIN** server.
  - \_\_\_ 69. Log in with the WIN server's credentials (refer to the team lab data sheet).
  - \_\_\_ 70. The system might be compelled to issue a security certificate warning on authentication. If so, click **Yes** to continue.
  - \_\_\_ 71. From the **WIN** server, navigate to the **Server Manager > Storage > Disk Management**.
- 



### Troubleshooting

If the system has not automatically discovered the disk, select **Action > Rescan Disks**. If the Initialize Disk window is not displayed, right-click the **Disk# Basic** area, and select **Initialize**.

- \_\_\_ 72. From the Initialize Disk pane, click **OK** to initialize all three disks.
  - \_\_\_ 73. From the WIN server desktop, click the **SDDDSM** icon to open the CLI in the correct folder location.
  - \_\_\_ 74. Enter the `datapath query device` command to correlate the MDisk UID with the disk volumes numbers.
  - \_\_\_ 75. Return to the Disk Management window, right-click the unallocated portion of the disk that correlates to the **ETier1** volume, and click **New Simple Volume**.
  - \_\_\_ 76. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
    - \_\_\_ a. Accept the default capacity value. Click **Next**.
    - \_\_\_ b. Accept the default drive letter. Click **Next**.
    - \_\_\_ c. Relabel the volume as **teamsetID-ETier1**. Click **Next**.
    - \_\_\_ d. Click **Finish** to complete the disk allocation.
  - \_\_\_ 77. Repeat these procedures to create volume labels for the **teamsetID-ETier2** and **teamsetID-ETier3** disks.
- 



### Reminder

Use the SDDDSM `datapath query device` command output to label the correct disk.

- \_\_\_ 78. Verify that all three ETier volumes are listed in the Volume column of the Disk Management pane in the Server Manager window.
- \_\_\_ 79. Type `exit` to close the SDDDSM.

## Section 5: Start IOmeter to run traffic to the volumes

This procedure uses the IOmeter utility to configure the disk parameters to test and measure the input and output (I/O) performance of the Hybrid pool and SATA pool volume behavior.

- \_\_\_ 80. From your **WIN** server Server Manager, right-click on any disk (volume) and click **Explore**.
- \_\_\_ 81. Navigate to the **c:\Software\IOmeter**.
- \_\_\_ 82. Right-click on the **IOmeter.exe** file and select **Create shortcut**. Drag **IOmeter.exe** shortcut icon to the WIN server desktop.
- \_\_\_ 83. Navigate to the WIN server Desktop.
- \_\_\_ 84. Right-click on the desktop **IOmeter** icon and select **Run as administrator** to run IOmeter with administrative privileges.
- \_\_\_ 85. If asked, click '**I Agree**' on Open Source License to proceed.



### Information

IOmeter has 2 basic components, IOmeter and Dynamo. With the start of the IOmeter tool, a Dynamo executable file is generated and placed in the Windows task bar. Dynamo performs the disk I/O operations, records the performance information, and returns the data to IOmeter which then provides a report in the GUI.

More than one copy of a Dynamo can be running at the same time. Each running copy of Dynamo is called a *manager*; each thread within a copy of Dynamo is called a *worker*.

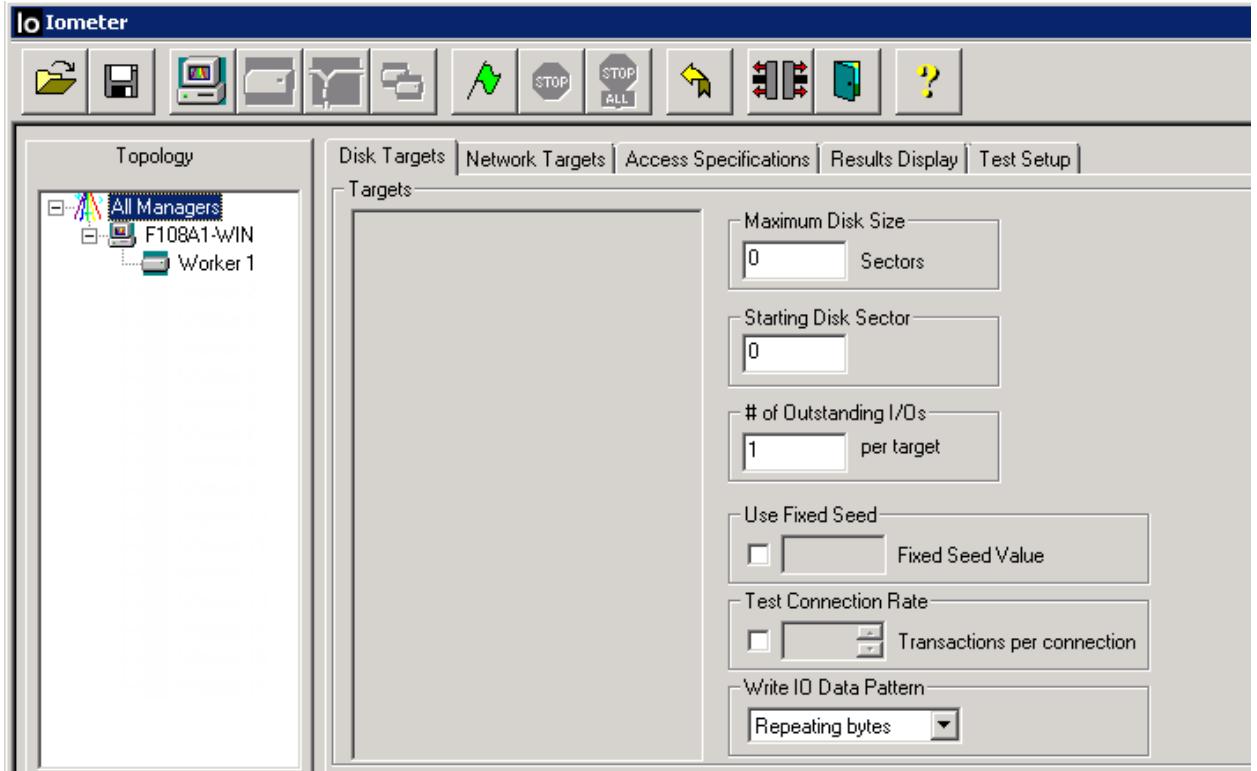
- \_\_\_ 86. Click the Dynamo file icon in the Windows taskbar to view the file details. Wait for Dynamo to connect before proceeding.

```
C:\Software\IOmeter\dynamo -p 1066
Preparing disks...
  ``?\Volume{706efb96-495e-11e8-bb18-00155d060867} preparing.
Preparing disks...
  ``?\Volume{706efb8f-495e-11e8-bb18-00155d060867} preparing.
  ``?\Volume{706efb9d-495e-11e8-bb18-00155d060867} preparing.
  ``?\Volume{706efb8f-495e-11e8-bb18-00155d060867} done.
  ``?\Volume{706efb9d-495e-11e8-bb18-00155d060867} done.
  ``?\Volume{706efb96-495e-11e8-bb18-00155d060867} done.
Worker 0 running Access Spec: F108A1-ETier2
Access specifications for test defined.
Grunt: Grunt data buffer size 1050624 >= 1050624, returning
Worker 1 running Access Spec: F108A1-ETier1+Other
Access specifications for test defined.
Grunt: Grunt data buffer size 32768 >= 32768, returning
Worker 0 setting targets...
Seeding random Number Generator<441214000699>
Worker 1 setting targets...
Seeding random Number Generator<441214061323>
  Generating random data...
Starting...
Beginning to perform I/O...
  Opening targets.
  Opening targets.
```

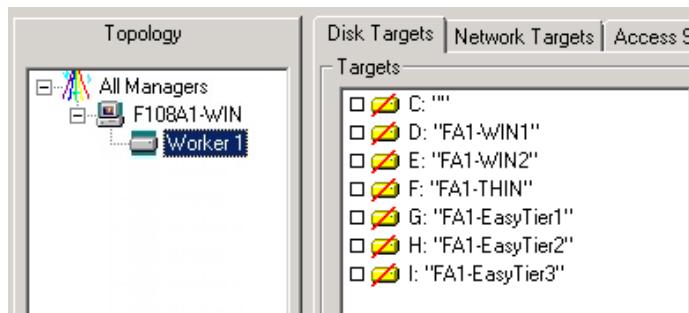
**Important**

**DO NOT** close the Dynamo window, you must leave this application running (only minimize it).

- \_\_\_ 87. Return to the IOmeter interface.
- \_\_\_ 88. Observe that your **WIN** server is listed in the Topology panel. Click (+) symbol to view a list of workers.



- \_\_\_ 89. Select **Worker 1** in the Topology box.
- \_\_\_ 90. The Disk Targets tab is displayed by default. The disks listed represents the logical mounted drives on the **WIN** host.





### Note

The yellow icons with a red slash means that the drive needs to be *prepared* before the test starts.

- 
- \_\_\_ 91. Click the check box next to the `teamsetID-ETier2` disk.
- 



### Information

When preparing an unprepared logical drive, IOmeter uses a sum values (Maximum Disk Size + Starting Disk Sector controls) as an upper bound on the size of `iobw.tst`.

- 
- \_\_\_ 92. From the right of the Disk Targets pane, enter a Maximum Disk Size of **4000000** (6 zeros) to create a **2 GB** `iobw.tst` output file for this worker. This controls how much of the disk IOmeter can use in the desired size in sectors.
- 



### Information

The Starting Disk Sector entry specifies the lowest-numbered disk sector used by the selected worker(s). The default is 0, meaning the first 512-byte sector in the disk or `\iobw.tst` file.

- 
- \_\_\_ 93. Accept the Starting Disk Sector default of **0**.
- 

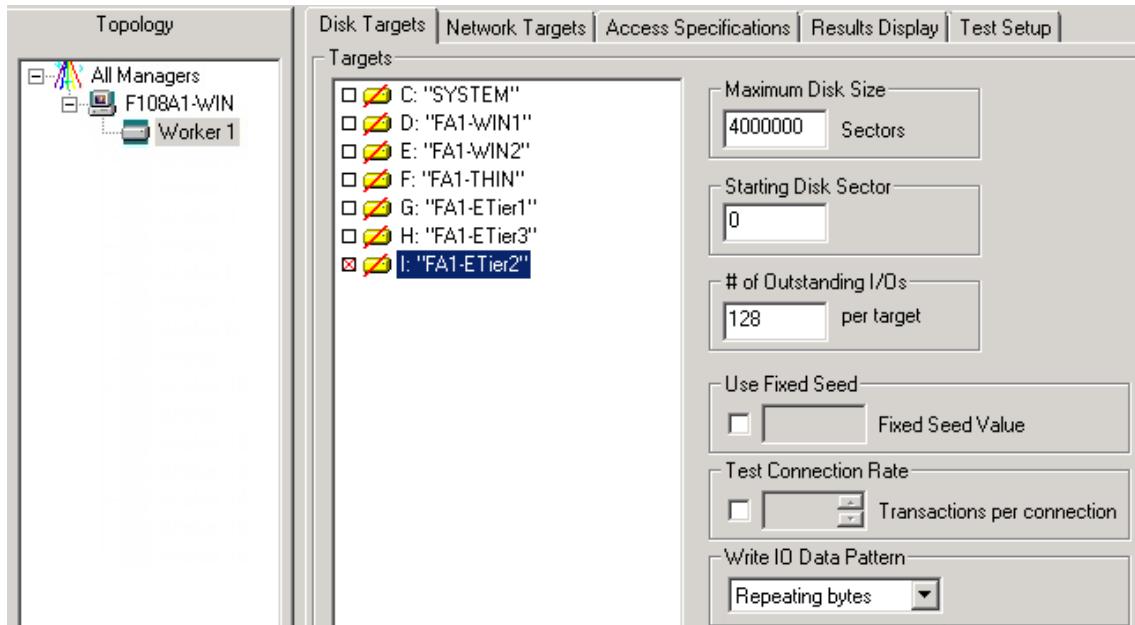


### Information

The # of Outstanding I/Os entry specifies the maximum number of outstanding asynchronous I/O operations *per selected disk* the selected worker(s) will attempt to have active at one time. (The actual queue depth seen by the disks may be less if the operations complete very quickly.)

---

- 94. Enter **128** for the # of Outstanding I/Os per target. Larger block sizes up to 64K will yield more throughput.



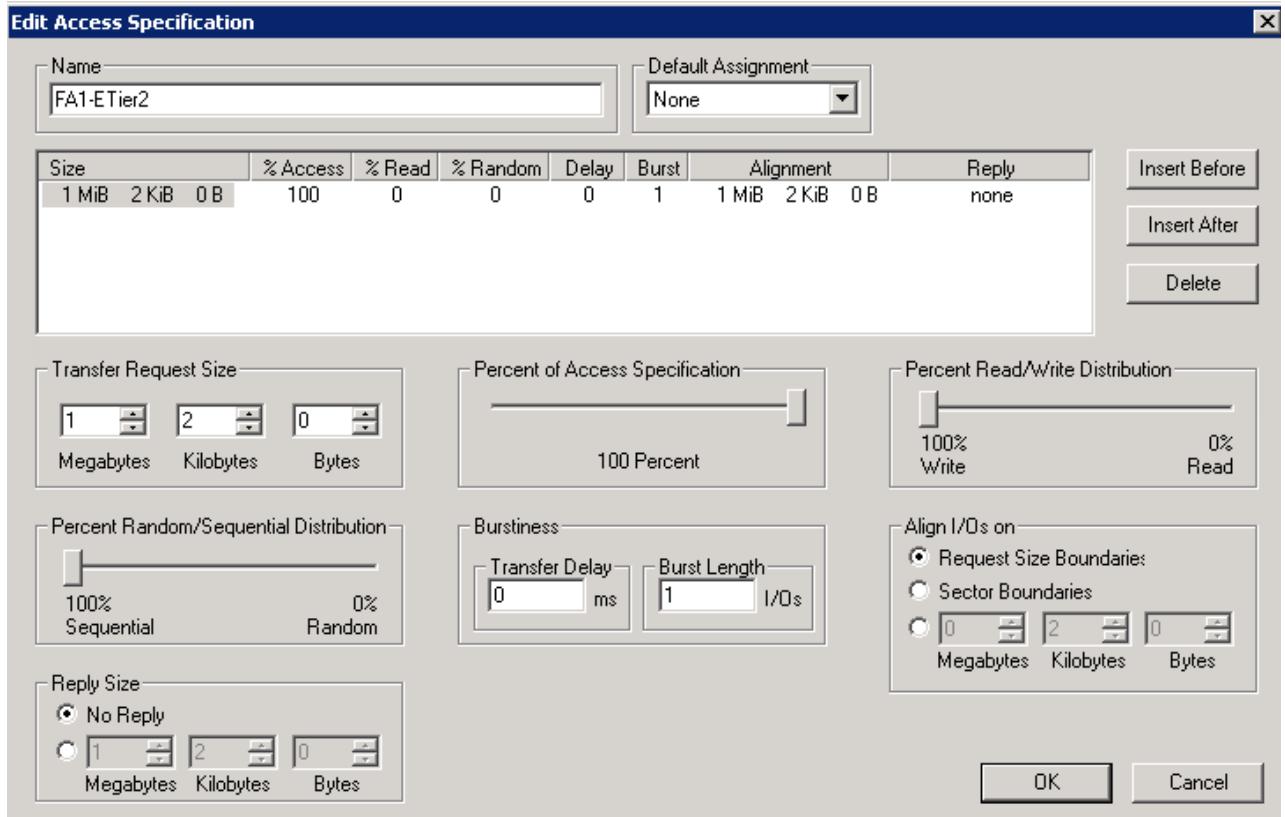
### Information

The Test Connection Rate entry specifies how often the worker(s) open and close their disk(s). The default is Off, meaning that all the disks are opened at the beginning of the test and are not closed until the end of the test.

- 95. Click the **Access Specification** tab.
- 96. From the Global Access Specifications panel list, select the entry called **Default**. Click **Edit Copy**.
- 97. The Edit Access Specification panel appears. Complete the following parameters to create the profile:
- a. Change the Name field to ***teamsetID-ETier2***.
  - b. Adjust the Transfer Request Size to **1 MB and 2 KB**.
  - c. Adjust the Percent Read/Write Distribution to **100% Write**.
  - d. Adjust the Percent Random/Sequential Distribution to **100% Sequential**.
  - e. Accept all other defaults.
- 98. From the Edit Access Specification panel, verify the preconfigured access specifications settings for the ***teamsetID-EasyTier2*** profile.

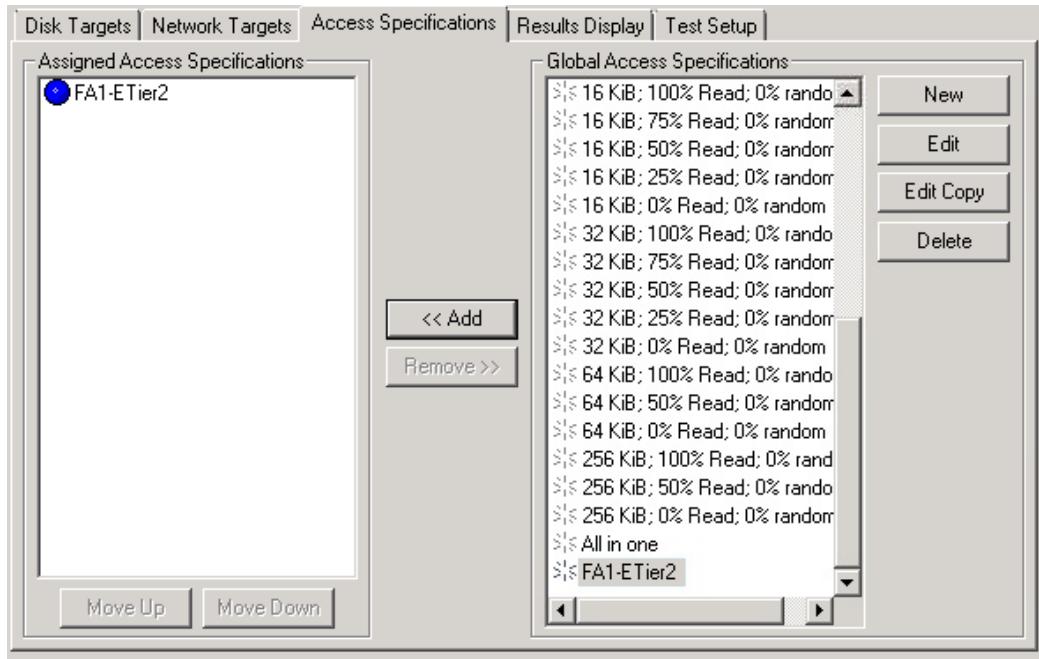
## 1+1=2 Example

- Name: **teamsetID-ETier2**
- Transfer Request size: **1 MB 2 KB**
- Percent Read/Write Distribution: **100% Write**
- Percent Random/Sequential Distribution: **100% Sequential**



99. Click the **OK** to close panel.

- 100.From the Global Access Specifications panel list, scroll down to select the **teamsetID-ETier2** specification profile. Click <<Add to add the selected profile to the Assigned Access Specification panel.

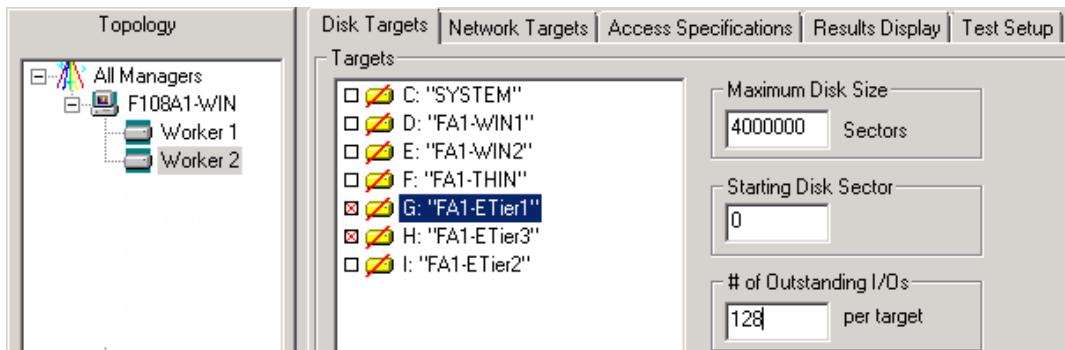


- 101.Return to the Topology panel and select the **Windows** host name.  
 — 102.From the tool bar, click the icon that presents '**Start a New Worker on Selected Manager**'(4th icon).



- 103.Select **Worker2** that has now been added to the topology.  
 — 104.Click the **Disk Targets** tab. Use the Ctrl key to multi-select the boxes next to **teamsetID-ETier1** and **teamsetID-ETier3** disks.  
 — 105.Define the following values:  
 — a. Maximum Disk Size: **4000000**  
 — b. Starting Disk Sector: 0  
 — c. # of Outstanding I/Os: 128

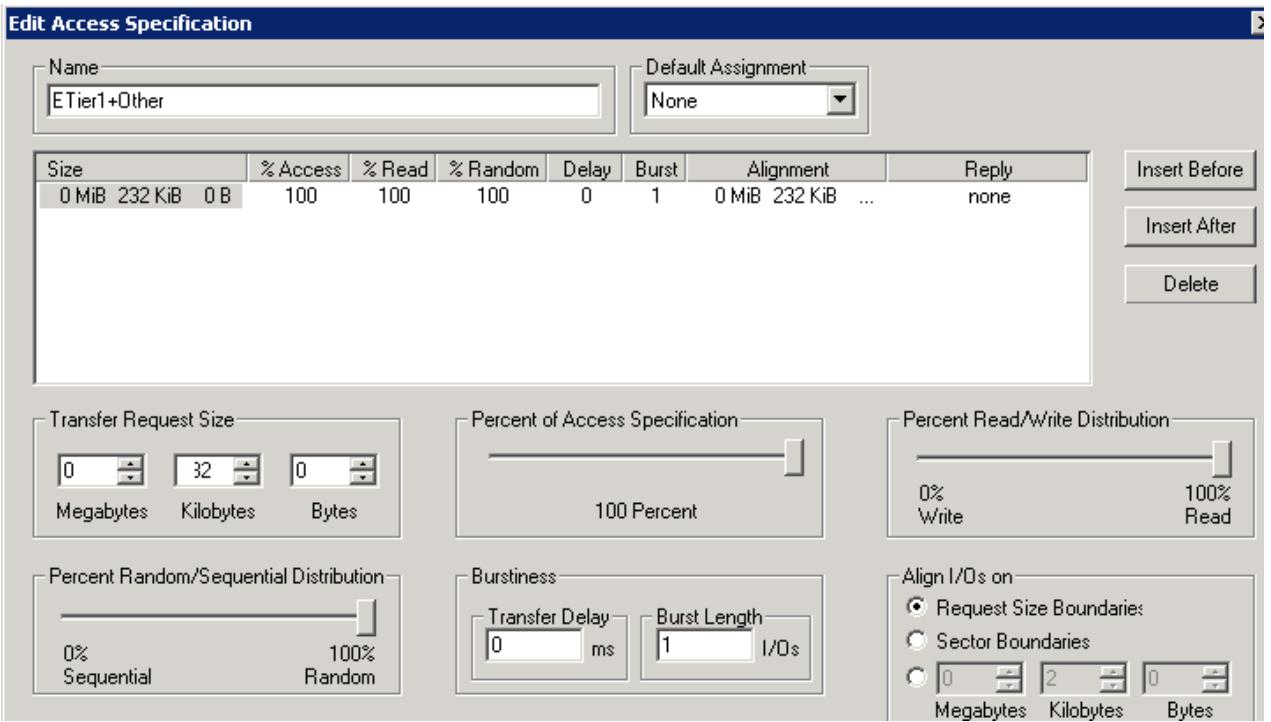
- \_\_\_ d. Accept the other defaults.



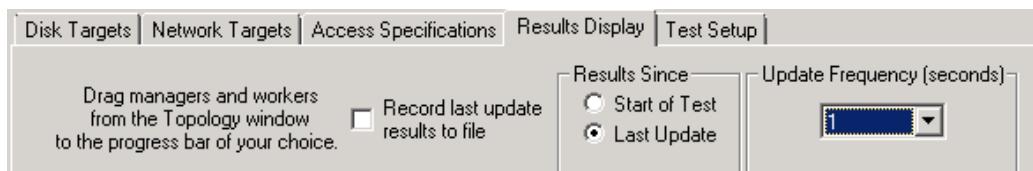
- \_\_\_ 106. Click the **Access Specification** tab.
- \_\_\_ 107. From the Global Access Specifications panel list, select the entry called **Default**. Click **Edit Copy**.
- \_\_\_ a. Change the Name field to ***teamsetID-ETier1+Other***.
  - \_\_\_ b. Adjust the Transfer Request Size to **0 MB** and **32 KB**.
  - \_\_\_ c. Adjust the Percent Read/Write Distribution to **100% Read**.
  - \_\_\_ d. Adjust the Percent Random/Sequential Distribution to **100% Random**.
- \_\_\_ 108. From the Edit Access Specifications panel, verify the preconfigured access specifications settings for the ***teamsetID-ETier1+Other*** profile:

## 1+1=2 Example

- Name: **teamsetID-ETier1+Other**
- Transfer Request size: 0 MB 32 KB
- Percent Read/Write Distribution: 100% Read
- Percent Random/Sequential Distribution: 100% Random



- 109.Click **OK** to close the panel.
- 110.From the Global Access Specifications panel, select the **teamsetID-EasyTier1+Other** specification profile.
- 111.Click <<Add to move it to the Assigned Access Specification panel.
- 112.Click the **Results Display** tab.
- 113.From the *Results Since* pane, select the radio button next to the **Last Update**.
- 114.From the **Update Frequency** (seconds) pane, use the up arrow to set the frequency update to **1** second.

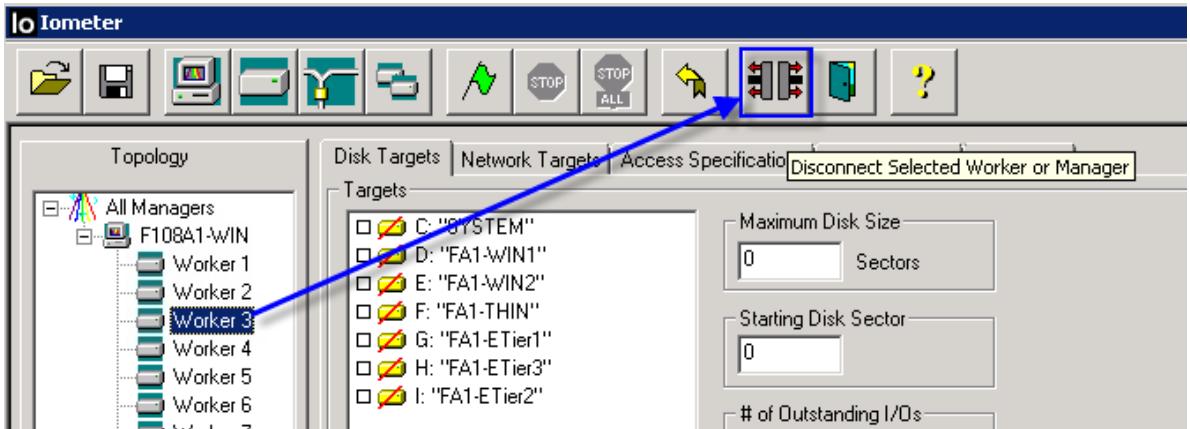


- 115.Return to the Topology pane and select your **Windows** host.

**Note**

IOmeter currently supports the TCP/IP and Virtual Interface Architecture network protocols, and can test network I/O as well" to the end of the sentence.

- 116. If there are more than two workers (or you added one inadvertently), select the worker and click the **Disconnect Worker** icon to remove it.



- 117. Click the Start Test **green flag** icon in the tool bar area to start I/O.



- 118. A standard Save File dialog appears. Change the default **results.csv** file name to **FSV9K-IO.csv**.

- 119. Click **Save** in the Documents folder.

**Note**

Once the IOmeter is stopped, a **FSV9K-IO.csv** file is created with the test samples.

- 120. Close the **Documents** window.
- 121. Navigate to the Dynamo file window that is running the IOmeter disk IO operations.
- 122. Observe that the status indicates *Preparing disk....* Verify that there are no immediate errors shown.

**Important**

**DO NOT** close the Dynamo file window, you must leave this application running (only minimize it).

- 123. Return to the IOmeter application.

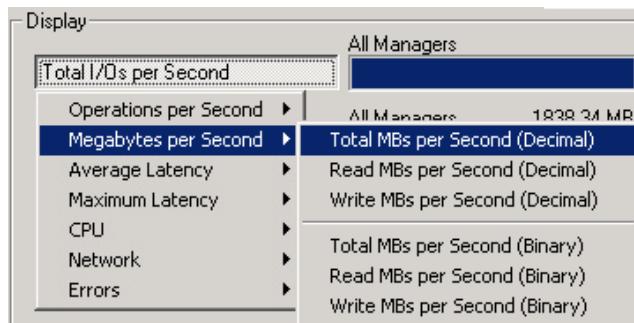
**Note**

You may see a status Preparing Drives displayed in the IOmeter lower right task bar. Typically, this process of *Preparing Drives* might take up to 25 minutes to complete, depending on the number of volumes disks.

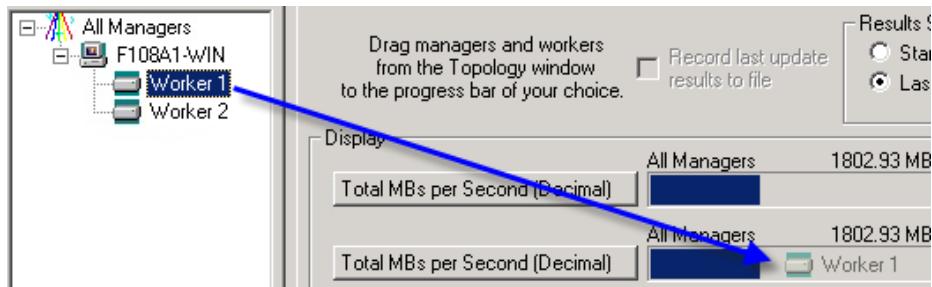
## Section 6: Set IOmeter worker results

This procedure sets the Display section to view the results for each worker or manager.

- 124. From the IOmeter **Results Display** tab, set the Display section as follows:
  - a. Click on **All Managers** in the Topology pane, then click on the **Total I/Os per Second** button in the Display pane. Change the display to **Megabytes per Second > Total MBs per Second (Decimal)**.



- b. Observe the second display button, **Total MBs per Second (Decimal)** for All Managers. From the Topology panel, click and drag **Worker1** (for `teamsetID-EasyTier1`) to the bar chart area and release.



- c. Click the third display button, **Average IO Response Time (ms)**. Change the display to **Megabytes per Second > Total MBs per Second (Decimal)**.
- d. From the Topology panel, click **Worker2** (for `teamsetID-EasyTier1+Other`) and drag to the bar chart area and release.
- e. Click the fourth display button, **Maximum IO Response Time (ms)**. Change the display to **Operations per Second > Total I/Os per Second** for All Managers.
- f. Click the fifth button, **% CPU Utilization (total)**. Change the display to **Average Latency > Average I/Os Response Time (ms)** for All Managers.
- g. Accept the last display option **Total Error Count** for All Managers.

- 
- \_\_\_ 125. Observe that once the volumes are ready, the *Preparing Disks* status changes to *Run 1 of 1* in the lower right corner of the window, and the results page shows activity.



### Important

Notify an instructor if any activity is seen in the Total Error Count bar. The Total number of I/O errors bar indicates errors that have occurred during the test (normally zero). The errors that are counted are only those that cause the ReadFile or WriteFile call to return an error code. IOmeter does not perform data verification to make sure the data was read/written properly.

- 
- \_\_\_ 126. Return to the Dynamo file running. Observe that the dynamo file is now capturing counter statistics on each volume.



### Note

Do not be alarmed with the “*Performance counter percentage is less than zero*” outputs. The Dynamo session has begun to perform I/O by opening targets. Therefore, there are multiple threads writing to the terminal and the OS does not do locking on the terminal streams. |

This can be annoying but it does not affect I/O results.



### Reminder

**DO NOT** close the Dynamo file, leave this window alone (you can minimize it).

- 
- \_\_\_ 127. Navigate to the **Windows Explorer**. Select any **ETier** volume disk that is now being monitored by the IOmeter.
  - \_\_\_ 128. Observe that an **ibow.tst** file has been created with the specified size (or available space, if smaller) at the start of the IOmeter.



### Note

If the file already exists (the drive has already been prepared), changing this control will not resize **ibow.tst**. The **ibow.tst** file must be manually removed after testing is complete.

- 
- \_\_\_ 129. Right-click on any **ETier** volume drive and select **Properties**.
  - \_\_\_ 130. Observe the used and free space capacity. The Maximum Disk Size you specified of 2 GB (4,000,000 sectors) limits the size of **ibow.tst** file to which IOmeter does I/O to disks with file systems.

**Note**

Testing blank volumes is much quicker and provides better information when testing random I/O performance. Random I/O tests on a small volume (file) is not practical, as a larger volume offers better results.

- 
- \_\_\_ 131. Click **Cancel**.
  - \_\_\_ 132. Copy the following folders from `C:\Software\ClassFolders\` to each EasyTier volume to generate some IO activity:
    - \_\_\_ a. Copy to ETier1 volume: `FolderDB-4GB` and `FolderPDF-2MB`
    - \_\_\_ b. Copy to the ETier2 and ETier3 volumes: `FolderPDF-2MB`
  - \_\_\_ 133. Close the **Windows Explorer**.
  - \_\_\_ 134. Return to IOmeter and select the **Disk Targets** tab.
  - \_\_\_ 135. Select each assigned work (Worker 1 and Worker 2). Observe that the drive icon shows a solid yellow (with no slash) when selected. These drives are only shown if they are writable.
  - \_\_\_ 136. Return to the V9000 management GUI.
  - \_\_\_ 137. Navigate to **Monitoring > Performance**. Observe that it displays CPU utilization, network interface traffic statistics, volume, and MDisk activity.

**Note**

The Performance view presents the overall performance metrics for the system environment.

- 
- 138. Compare the Mbps values in the **Volumes quadrant** with the Total Mbps counters in IOmeter.

**Note**

The GUI performance displays metrics at five second intervals. You can adjust the IOmeter Update Frequency slider to this value for a closer comparison.

- 
- 139. From the Performance view, click **System Statistics**. Select the node the is assigned as the preferred node for **ETier2** volume (Worker1). This display is the aggregate performance of volumes that are owned by node1.
  - 140. Compare the Mbps values in the **Volumes quadrant** with the Total MBps of the Worker1 status bar in the IOmeter GUI.

**Optional**

Navigate to your IOmeter and adjust the IOmeter Update Frequency (seconds) value to **5** for a closer comparison.

## Section 7: Stop the IOmeter application

In order to have a good analysis of data, you would normally run IOmeter for at least 24 hours. Since this lab needs to end, you will stop IOmeter, and review a set of data that was previously captured.

- \_\_\_ 141. Navigate to your WIN server **IOmeter** window.
- \_\_\_ 142. From the IOmeter task bar, click the **Stop** icon to stop the IOmeter processing.



- \_\_\_ 143. Click **Start > Log off** to exit from the **WIN** server.
- \_\_\_ 144. Log out of the V9000 management GUI.

## End of exercise

# Exercise 9. Easy Tier and STAT analysis

## Estimated time

00:30

## Overview

In this exercise the student will evaluate the previously collected values from the Easy Tier activity and analyze them with the help of the IBM Storage Tier Advisor Tool (STAT) to make the right decisions for adding Flash drives and getting the most benefit out of this type of drive.

## Objectives

- Use the IBM Storage Tier Advisor Tool (STAT) to analyze the benefit of Easy Tier on volumes and storage pools activity.

## Exercise instructions



### Information

The Easy Tier function was activated on the **HYBRID** storage pool using mdisks assigned from the DS3K storage subsystem. Once Easy Tier is active, a heat map is generated or updated approximately every 24 hours. The STAT tool provides heat distribution maps for volumes with Easy Tier status of *active* or *measured*. Recommendations are also included for storage pools with an Easy Tier status of active.

### Section 1: Check volume status for exploration of Easy Tier

- \_\_\_ 1. From the Admin server desktop, open browser window.
- \_\_\_ 2. Enter the URL of the V9000 management GUI IP address.
- \_\_\_ 3. Log in using your admin credentials (refer to the team lab data sheet).
- \_\_\_ 4. Navigate to the **Volumes > Volumes by Pool**.
- \_\_\_ 5. Verify the Easy Tier status of the **HYBRID** pool is *Active*.
- \_\_\_ 6. Navigate to the **Volumes > Volumes by Host**. Select your **WIN** host.
- \_\_\_ 7. Enter the character string `teamsetID-E` in the **Filter Search** field to locate the ETier volumes.
- \_\_\_ 8. Navigate to the **EasyTier Status** column. Verify the ETier3 volume status is **Measured**.



### Reminder

The **ETier3** volume `easy_tier` setting was set to off. With the pool's `easy_tier` setting of **on**, that results in Easy Tier measuring I/O activity for volumes in the pool, but no extents will be moved for the ETier3 volume.

## Section 2: Download the heat map file

This procedure shows how to download the heat map file. However, this will not be the file you will analyze in the subsequent steps. Instead, you will analyze data that was previously captured.

- \_\_\_ 9. Navigate back to the V9000 management GUI.
- \_\_\_ 10. Navigate to **Settings > Support**, and select **Support Package**.
- \_\_\_ 11. From Support Package pane, click **Manual Upload Instructions** to expand the view.
- \_\_\_ 12. From the Manual Upload Instructions section, click **Download Support Package**.
- \_\_\_ 13. From the Download New Support Package or Log File pane, select **Download Existing Package**.
- \_\_\_ 14. Observe that NODE1 is the default. Enter the text string **easy** into the filter box and press enter.



### Note

Once Easy Tier is active, a heat map is generated or updated approximately every 24 hours. Heat maps are presented in the GUI under the configuration node of the cluster based:

`/dumps/easytier/dpa_heat.serial-1.yymmdd.hhmmss.data`.

Any existing heat data file is overwritten whenever a new heat data file is produced; however, it will include all the information to date for all measured pools and volumes.



### Troubleshooting

If there are no heat maps shown, select NODE 2 as the configuration node of the cluster.

- \_\_\_ 15. Select the easytier/dpa\_heat map file that represents today's date. Click **Download**.

NODE1    ▾   

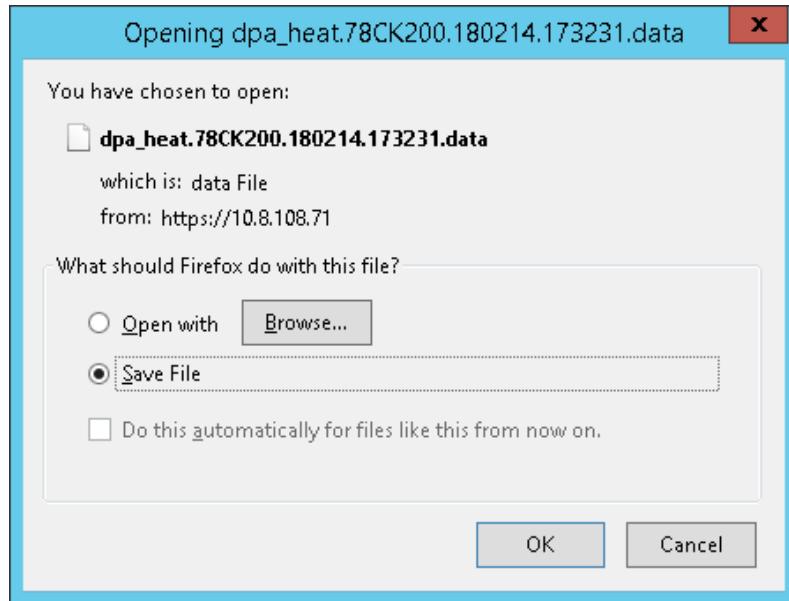
Showing 17 Files | Selecting 1 File

File Name		
/dumps/easytier/dpa_heat.78CK200.180210.084227.data		
/dumps/easytier/dpa_heat.78CK200.180210.234728.data		
/dumps/easytier/dpa_heat.78CK200.180211.201228.data		
/dumps/easytier/dpa_heat.78CK200.180212.193729.data		
/dumps/easytier/dpa_heat.78CK200.180213.193730.data		
/dumps/easytier/dpa_heat.78CK200.180214.173231.data		

**Note**

The GUI executes a task command to synchronize memory cache. The heat map file must be off-loaded by the user and processed with the STAT utility and invoked from a Windows command prompt.

- 16. The Opening dpa\_heat.... window is displayed. Observe the type of data created and the location of the file source.

**Important**

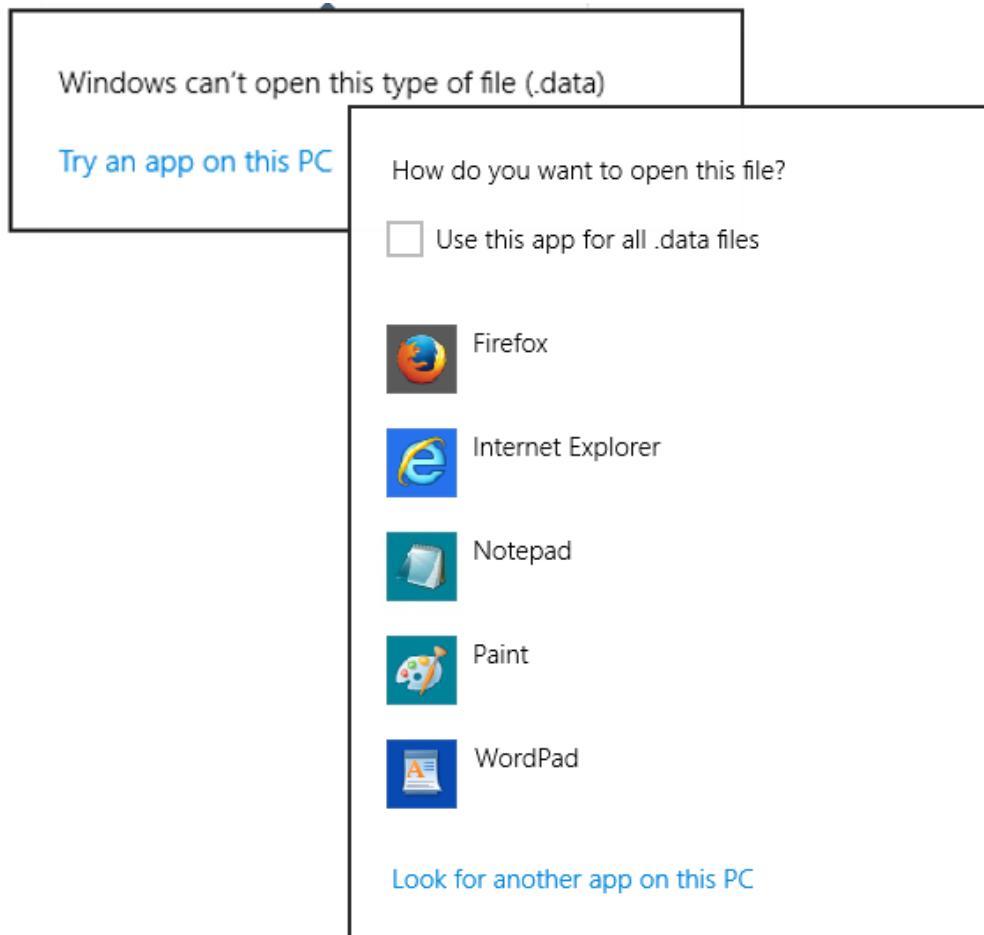
Since you are operating in a shared lab environment, your IOmeter statistics report may not provide a good analysis of Easy Tier operation. Therefore, you will use an heat data file that was previously generated.

- 17. Click **Cancel**.

### Section 3: Open an existing heat map file with the STAT tool

This procedure will process a heat data file that was captured earlier using the same activity parameters that you just described. It also provides the opportunity to navigate through the Storage Tier Advisor tool (STAT).

- \_\_\_ 18. From the Admin server desktop, open the **File Explorer**.
- \_\_\_ 19. Navigate to the `C:\Software\EasyTierHeatMap` folder.
- \_\_\_ 20. Right-click on the `dpa_heat` map file that is in the folder. Select **Open with**.
- \_\_\_ 21. A dialogue box opens. Select “**Try an app on this PC**” and select “**Look for another app on this pc**”.



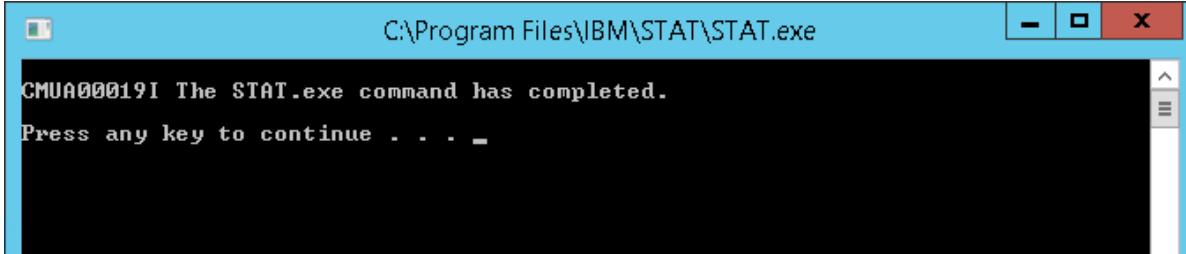
#### Troubleshooting

Depending on the browser, your system may present the option to click **More options**. Select “**Look for another app on this pc**”.

**Note**

Once the heat data file is in the correct directory, you must run the **STAT.exe** to generate the **STAT** HTML reports.

- \_\_\_ 22. Navigate to **C:\Program Files\IBM\STAT**.
- \_\_\_ 23. Select **STAT.exe**. Click the **Open** button.
- \_\_\_ 24. Observe that the **STAT.exe** executable is now highlighted in the Open with box.



- \_\_\_ 25. Press any key to continue.

**Note**

The **STAT** utility processes the Easy Tier heat data file and places the volume heat distributions and configuration recommendations in a default file named **index.html** in which the user can open in a browser to view the System Summary results.

The **index.html** is a default in which the file date might not reflect the heat data files generated date and resides in the same folder as the **STAT.exe**.

- \_\_\_ 26. From the Admin desktop, open File Explorer and navigate to **C:\Program Files\IBM\STAT\index.html**.
- \_\_\_ 27. Double-click **index.html**.

Name	Date modified	Type
Data_files	2/22/2018 1:49 PM	File folder
input_files	2/22/2018 1:35 PM	File folder
license	2/22/2018 1:35 PM	File folder
Uninstall_IBM Storage Tier Advisor Tool	2/22/2018 1:35 PM	File folder
help	9/14/2017 8:38 PM	Text Document
IBM_Storage_Tier_Advisor_Tool_InstallLog	2/22/2018 1:35 PM	Text Document
index	9/14/2017 8:38 PM	HTML File
Release_Notes	11/1/2017 2:08 AM	Text Document
STAT	12/28/2017 1:38 AM	Application
STAT	9/14/2017 8:38 PM	PROPERTIES File
version	12/28/2017 1:49 AM	File

- \_\_\_ 28. Select any browser of choice to open the STAT index.html file.

## Section 4: Review the System Summary of the STAT utility

- \_\_\_ 29. Examine the System Summary of the STAT utility output. This report is based on a specific time period for when data was measured.



### Note

The STAT utility is an HTML interface that provides an illustrated blueprint of your system configuration and associates it with a fluent and comprehensive view of the recommendations.

- \_\_\_ 30. Observe that the first table indicates the reporting system model number and the serial number of the configuration node. It also includes the pools and volumes that were monitored.
- \_\_\_ 31. Observe the overall results of the hot data savings. This indicates that there was not enough I/O operations on specific extents to merit its promotion to Flash/SSDs.

### System Summary

This report is based on data from Wed Feb 14 17:32:31 2018. Easy Tier has been running continuously since Tue Feb 06 16:5:

Storage facility	IBM.2145-78CK200
Total storage pools monitored	3
Total volumes monitored	19
Total capacity monitored	159.0 GiB
Hot data capacity (% of total)	4.5 GiB (2%)
Data validity	Valid
System state	Latest Warmstart: No Warmstart Latest Failback: No Failback

- \_\_\_ 32. Observe that the second table identifies the storage pools by their object ID, capacity, configuration type Tier Status and Data Management.

Storage Pool ID *1	Capacity (GiB)	Configuration	Tier Status* <sup>2</sup>	Data Management Status* <sup>3</sup>
P0	2281	tier0_flash + tier_enterprise + tier_nearline		85 GiB/100.00%   2196GiB
P2	202	tier_enterprise		44 GiB/100.00%   158GiB
P3	102	tier_nearline		30 GiB/100.00%   72GiB

20 Entries Per Page    GO    |< << >> >|    Displaying Page 1

- \_\_\_ 33. Observe the data management status column. This presents how data is managed in the particular extent pool. The output is denoted in various colors: data that is managed by Easy Tier and data that is unallocated.

**Note**

The STAT utility is a self-explanatory report that provides descriptive details about the report.

## **Section 5: Review a three tier pool using the STAT tool**

**Information**

Easy Tier function can support any three-tiered combination thus dividing the workload efficiently between high-speed and cost-effectiveness in the form of Flash/SSD, enterprise, and nearline. With this ability, the Storage Tier Advisor Tool can also support any three-tiered combination.

- 34. Each pool is a hypertext link that can be selected to view the specific pool measured information. Click the **P0 (Pool 0)** entry link.

**Note**

This output provides a detailed distribution of each tier based on the MDisk that constructed the pool, number of IOPS threshold utilization of the MDisk IOPS, and projected utilization of MDisk IOPS for each MDisk of each tier.

- 35. Examine the data output. Review the footnotes to better understand the information displayed.

### **Storage Pool 0000 Performance Statistics and Improvement Recomm**

This report is based on data from Wed Feb 14 17:32:31 2018. Easy Tier has been running continuously since Tue Feb 0

Storage Tier Advisor Tool version: 9.3.0.2

#### **Tier0\_Flash(Average Utilization of Mdisk IOPS is 15%)**

Mdisk ID* <sup>1</sup>	Storage Pool ID	Mdisk type	Number of IOPS Threshold Exceeded* <sup>2</sup>	Utilization of Mdisk IOPS* <sup>3</sup>	Projected Utilization of IOPS* <sup>4</sup>
0	0000	tier0_flash	0	15%	15%

#### **Tier\_Enterprise(Average Utilization of Mdisk IOPS is 0%)**

Mdisk ID* <sup>1</sup>	Storage Pool ID	Mdisk type	Number of IOPS Threshold Exceeded* <sup>2</sup>	Utilization of Mdisk IOPS* <sup>3</sup>	Projected Utilization of IOPS* <sup>4</sup>
3	0000	tier_enterprise	0	0% 1%	0% 1%

#### **Tier\_Nearline(Average Utilization of Mdisk IOPS is 6%)**

Mdisk ID* <sup>1</sup>	Storage Pool ID	Mdisk type	Number of IOPS Threshold Exceeded* <sup>2</sup>	Utilization of Mdisk IOPS* <sup>3</sup>	Projected Utilization of IOPS* <sup>4</sup>
6	0000	tier_nearline	0	6%	6%

- 36. Scroll down the page to display other information links for this pool.

- \_\_\_ 37. Click on the **Workload Distribution Across Tiers** link.

[Workload Distribution Across Tiers](#)

[Recommended tier\\_nearline Configuration](#)

[Volume Heat Distribution](#)

- \_\_\_ 38. Observe the distribution of the workload across tiers. Note the indications of Tier0, Tier1, and Tier2 in the graph.

- \_\_\_ 39. Click on the **Recommended tier nearline Configuration** link.

- \_\_\_ 40. Examine the report data and observe the recommendation and the amount of cold data capacity being allocated.

[Workload Distribution Across Tiers](#)

[Recommended tier\\_nearline Configuration](#)

7.2K\_NL\_4000G\_R10\_W8 ▾

Storage Pool ID	tier_nearline Configuration	Cold Data Capacity (GiB)	Pre Capacity
0000	Existing tier_nearline Mdisk(s) Free Capacity (50.0 GiB)	9.0	

[Volume Heat Distribution](#)

---



### Note

In this example environment, pool ID 0 is the 3 tier pool. Although the pool may contain one NL MDisk, the report might suggest that adding a particular NL drive of size to this pool might improve the pool capacity increase by the listed value. Nearline drives are best suited for archival data that is seldom used.

- \_\_\_ 41. Click on the **Volume Heat Distribution** link.

- 42. Examine the data output. Review the footnotes to better understand the information displayed.

### Volume Heat Distribution

Volume Heat Distribution						
Vdisk ID * <sup>6</sup>	Copy ID * <sup>7</sup>	Configured Size * <sup>8</sup>	IO Percentage of Extent Pool	Tier	Capacity on Tier * <sup>9</sup>	Heat Distribution * <sup>10</sup>
0	0	6.00 GiB	0.94%	Tier0_Flash	0.00 GiB	
				Tier_Enterprise	6.00 GiB	6.00 GiB
				Tier_Nearline	0.00 GiB	
7	0	25.00 GiB	0.14%	Tier0_Flash	25.00 GiB	23.00 GiB
				Tier_Enterprise	0.00 GiB	
				Tier_Nearline	0.00 GiB	
6	0	6.00 GiB	0.19%	Tier0_Flash	2.00 GiB	2.00 GiB
				Tier_Enterprise	4.00 GiB	4.00 GiB
				Tier_Nearline	0.00 GiB	
2	1	1.00 GiB	0.00%	Tier0_Flash	1.00 GiB	1.00 GiB
				Tier_Enterprise	0.00 GiB	
				Tier_Nearline	0.00 GiB	
8	0	25.00 GiB	94.82%	Tier0_Flash	24.00 GiB	23.00 GiB
				Tier_Enterprise	0.00 GiB	
				Tier_Nearline	1.00 GiB	1.00 GiB
9	0	7.00 GiB	0.51%	Tier0_Flash	1.00 GiB	1.00 GiB
				Tier_Enterprise	6.00 GiB	6.00 GiB
				Tier_Nearline	0.00 GiB	
15	0	7.00 GiB	0.16%	Tier0_Flash	0.00 GiB	
				Tier_Enterprise	7.00 GiB	7.00 GiB
				Tier_Nearline	0.00 GiB	
1	1	2.00 GiB	0.98%	Tier0_Flash	0.00 GiB	
				Tier_Enterprise	2.00 GiB	2.00 GiB
				Tier_Nearline	0.00 GiB	
17	0	6.00 GiB	2.25%	Tier0_Flash	0.00 GiB	
				Tier_Enterprise	6.00 GiB	6.00 GiB
				Tier_Nearline	0.00 GiB	



### Information

The **blue** portion of the bar represents the capacity of cold data on the volume.

The **orange** portion of the bar represents the capacity of warm data on the volume.

The **red** portion of the bar represents the capacity of hot data on the volume.

After the volume is managed by the Easy Tier Application, if there were any extent migrations, a **dark purple** portion of the bar would show the capacity of the assign completed data. If there were any volume extents being migrated, a **light purple** portion of the bar represents the capacity of the assign in-progress data.

**Note**

Based on the various VDisks that are allocated, this report indicates heat distributions of some hot extents. In a production environment, the results can vary depending on the timing of the heat map generation as well as other I/O activities occurring.

The I/O activity of a thin provisioned volume is measured by Easy Tier and reported by STAT, but its extents are not migrated. Extent movement for a thin-provisioned volume is disabled, even if it resides in a hybrid pool, its hot extents still will not be migrated.

In a production environment, you can use the CLI to examine the Easy Tier setting and status for any VDisk using the `lsvdisk [ID]` command. This output was retrieved from a previously generated heat distribution of an Easy Tier volume.

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>lsvdisk 7
id 7
name FA1-EasyTier1
IO_group_id 0
IO_group_name io_grp0
status online
mdisk_grp_id 1
mdisk_grp_name FA1-Hybrid
capacity 25.00GB
.....
.....
.....
easy_tier on
easy_tier_status active
tier ssd
tier_capacity 5.00GB
tier enterprise
tier_capacity 20.00GB
tier nearline
tier_capacity 0.00MB
compressed_copy no
uncompressed_used_capacity 25.00GB
.....
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

**Optional**

You may explore the STAT System Summary to review the other EasyTier volumes.

- 
- \_\_ 43. Close the browser Storage Tier Advisor Tool window.

- \_\_\_ 44. Click **Log Out** to exit from the V9000 management GUI.
- \_\_\_ 45. Type **exit** to close the V9000 CLI session.

## End of exercise

---

# Exercise 10. V9000 data pool migration

## Estimated time

00:30

## Overview

This exercise reinforces the relationship between volumes and the MDisks providing storage capacity to those volumes. The student will migrate a volume from one storage pool to another and observe the activity as the volume is moving.

## Objectives

- Carry out volume migration from one storage pool to another in the V9000.

# Exercise instructions

## Section 1: Examine current V9000 pool status

This procedure examines the current status of the storage pools before performing data pool migration.

- \_\_\_ 1. From the Admin server desktop, open a browser window.
  - \_\_\_ 2. Enter the URL of your team V9000 management IP address.
  - \_\_\_ 3. Log in using your admin credentials (refer to the team lab data sheet).
  - \_\_\_ 4. Navigate to **Volumes > Volumes by Pool** view.
  - \_\_\_ 5. Navigate to your **SAS pool**. Observe the capacity of the WINA volume.
  - \_\_\_ 6. Right-click the **WINA** volume and click the **View Member MDisks** tab.
- 



### Information

Storage virtualization delivered by the FlashSystem V9000 enables the segregation of application data access from backend storage infrastructure management changes.

The implementation of volumes comprising extent pointers to MDisks (or backend storage) enables data movement transparency relative to application activities. The extent pointers are updated automatically as data is moved with the host server being totally unaware.

Extent pointers facilitate freedom of data movement and enable the rich data migration capabilities provided by the IBM Spectrum Virtualize software.

---



---



### Questions

What is the number of extents allocated for the MDisk?

MDisk# \_\_\_\_\_ MDisk# \_\_\_\_\_

---

- \_\_\_ 7. Click **Close**.
- \_\_\_ 8. Right-click on your **teamsetID-WINA** volume and select **Map to Host or Host Cluster...**
- \_\_\_ 9. The Create Mapping window is displayed>
  - \_\_\_ a. Select your **teamname-WIN** server host. Click **Next**.
  - \_\_\_ b. Verify that the WINA volume is highlighted. Click **Map Volumes** to confirm.
- \_\_\_ 10. Examine the **svctask mkvdiskhostmap** command generated to assign the volume to the WIN host object. Click **Close**.
- \_\_\_ 11. Minimize the V9000 management GUI.
- \_\_\_ 12. From the Admin server desktop, navigate to your **teamname-WIN** remote desktop session.
- \_\_\_ 13. From the WIN server, navigate to **Server Manager > Storage > Disk Management**.

- 
- \_\_\_ 14. Observe that the detected disk is added to the list of disks.



## Troubleshooting

If system did not discover any volumes, right-click the **Disk Management** and select **Rescan Disks**. Then, from the Disk Management view, right-click the left portion of any one of the Unknown Disk of the drive designation. Select **Initialize Disk**.

---

- \_\_\_ 15. Accept the **MBR** default to initialize the disk. Click **OK**.
  - \_\_\_ 16. From the WIN server desktop, click the **SDDDSM** icon to open the command line interface.
  - \_\_\_ 17. Enter the **SDDDSM datapath query device** command to correlate the disk drive.
  - \_\_\_ 18. From the WIN server, navigate back to the **Server Manager > Disk Management** pane.
  - \_\_\_ 19. Right-click the unallocated area of the disk. In the menu list, click **New Simple Volume**.
  - \_\_\_ 20. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
    - \_\_\_ a. Accept the default capacity value. Click **Next**.
    - \_\_\_ b. Accept the default drive letter. Click **Next**.
    - \_\_\_ c. Relabel the volume as **teamsetID-WINA**. Click **Next**.
    - \_\_\_ d. Click **Finish** to complete the disk allocation.
  - \_\_\_ 21. Verify that the WIN server Disk Management window shows that the new disk has been created.
  - \_\_\_ 22. Open an **Explorer** view. Navigate to the **C:\Software\ClassFolders** location.
  - \_\_\_ 23. Copy the **FolderPic-4GB** and **FolderPics-100MB** to your **teamsetID-WINA** volume.
  - \_\_\_ 24. Navigate back to the **C:\Software\ClassFolders** location.
  - \_\_\_ 25. Click to highlight the **FolderPDF-2MB** (*Do not copy yet*). In subsequent steps, you will return here and copy this folder to your **teamsetID-WINA** volume while the pool migration is actively running.
- 



## Reminder

Leave this window open for quick access upon return.

---

## Section 2: Migrate a volume to another pool

This procedure migrates a volume copy to another pool which enables the volume copy's content to be moved from one storage tier to another.

- \_\_\_ 26. Navigate back to the V9000 management GUI.
  - \_\_\_ 27. Navigate to the **Volumes > Volumes by Pool** view.
  - \_\_\_ 28. Select your ***teamsetID-SAS*** pool from the Pool Filter list.
  - \_\_\_ 29. Right-click on any column heading and select **Copy ID**.
- 



### Information

When a volume is created initially, copy ID 0 is assigned to the volume by default.

- 
- \_\_\_ 30. Right-click on your ***teamsetID-WINA*** volume entry and select **Migrate to Another Pool**.
  - \_\_\_ 31. Review the description of the **Migrate Volume Copy** window.
- 



### Information

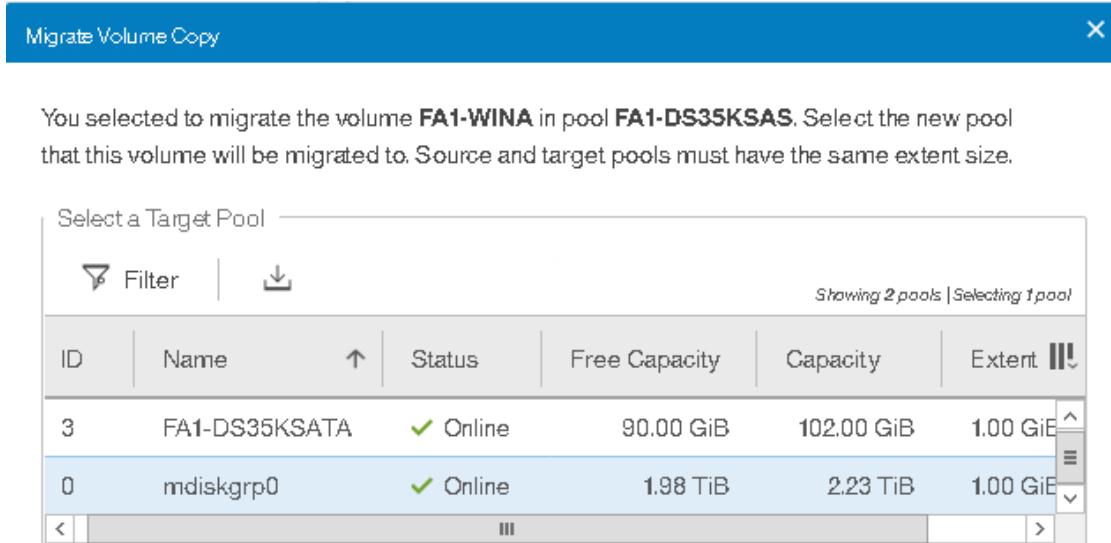
Volume Mirroring enables a volume to have up to two copies of extents. Volume migration is performed at the volume copy level. That is, each volume copy can migrate independently of the other.

Migrating a volume copy to another pool enables a volume copy's content to be moved from one storage tier to another, or one storage system to another; based upon the tier of the MDisks populating the pool.

To migrate to another pool, the extent size of the source and target pools must match. The GUI will only display eligible target pools in the Select a Target Pool list.

- 
- \_\_\_ 32. Right-click the table headings area to add the **ID** and **Extent Size** columns. Uncheck the **Site** option to make the small display more viewable.

- \_\_\_ 33. From the **Migrate Volume Copy** window, select the **mdiskgrp0** pool. Click **Migrate**.



- \_\_\_ 34. Examine that the generated **svctask migratevdisk** command copy 0 of the WINA volume (vdisk) is being migrated to the selected target pool. Click **Close**.
- \_\_\_ 35. Observe that the **Running Tasks** status indicates that a background migration task is in progress.



#### Note

During the migration, the volume copy is listed with the SAS pool. It belongs to the original pool until all of its extents have been migrated to the target pool.

- \_\_\_ 36. Right-click on your **teamsetID-WINA** volume. Select the **View Member MDisks** tab. Review the current MDisk entries.
- \_\_\_ 37. Observe that the extents from the MDisks of the SAS pool are being redistributed to the MDisks of the mdiskgrp0 pool. You have to move fairly quickly to catch the view with both pools in the list. Click **Close**.



#### Note

The process generates a Running Tasks. Once the background migration task is completed, the WINA volume is moved to the other pool in the Volumes by Pool view.

- \_\_\_ 38. Select the **mdiskgrp0** pool. Observe that your **teamsetID-WINA** volume now resides in the mdiskgrp0 pool.



#### Note

At this point, only MDisks in the mdiskgrp0 pool are providing extents to this volume copy.

## Section 3: Write to a volume that is actively migrating to another pool

This section demonstrates that the server host has no idea that the volume is actively moving to another pool. Once the migration task is started, a folder is copied to the migrating volume. There is no affect to the server host in its access to the data while the volume is migrating.

- \_\_\_ 39. From the mdiskgrp0 pool, right-click your ***teamsetID-WINA*** volume entry and select **Migrate to Another Pool**.



### Important

Before moving on to the next step, we recommend that you read ahead. The remaining steps are time-sensitive, therefore, it might be wise to have some of the windows opened for easier access.

- \_\_\_ 40. Select your ***teamsetID-SATA*** pool. Click **Migrate**.
- \_\_\_ 41. Review the generated **svctask migratevdisk** command. Click **Close**.
- \_\_\_ 42. **IMMEDIATELY** navigate back to the ***teamname-WIN*** server host.
- \_\_\_ 43. From the WIN server, copy the **FolderPDF-2MB** folder from the **C:\Software\ClassFolders** location to your ***teamsetID-WINA*** volume.
- \_\_\_ 44. **IMMEDIATELY** return to the V9000 management GUI.
- \_\_\_ 45. From the Volumes by Pool panel, right-click on your ***teamsetID-WINA*** volume and select **Member MDisks** tab. Observe that the migration is still in progress. Click **Close**.
- \_\_\_ 46. Navigate to the WIN server.
- \_\_\_ 47. Open the newly copied folder in the ***teamsetID-WINA*** volume to verify that access to the volume continues through the volume migration process.
- \_\_\_ 48. Navigate back to the mdiskgrp0 pool view. Verify that the WINA volume copy is no longer listed in the mdiskgrp0 pool.
- \_\_\_ 49. Select your **SATA** pool. Verify the WINA volume has been migrated to the target .
- \_\_\_ 50. Select **Monitoring > Background Tasks**. Observe the recently completed migration tasks. The task record will be purged after 60 minutes from its timestamped value.
- \_\_\_ 51. Click **Log Out** from the V9000 management GUI.
- \_\_\_ 52. Navigate back to the ***teamname-WIN*** server.
- \_\_\_ 53. Click **Start > Logoff** to exit from the WIN server.

## End of exercise

---

# Exercise 11. Migrate existing data with Import Wizard GUI

## Estimated time

01:00

## Overview

This exercise exploits the FlashSystem V9000 Import Wizard to migrate existing data to the V9000 environment. The student works directly with the backend storage LUNs from a Windows server to initialize and populate it with data. The LUNs are then migrated to the V9000 and accessed from the Windows server through the V9000.

## Objectives

- Implement migration of existing data (LUN) to the V9000 virtualized environment using the management GUI Import Wizard.

## Exercise instructions

### Section 1: Examine current disk status on the WIN server

This procedure accesses the WIN server and reviews the current disks that are accessed.

- \_\_\_ 1. From the Admin server desktop, double-click on the **Remote Desktop Connection** icon to start a remote desktop session.
  - \_\_\_ 2. Observe the IP address of your WIN server. Click **Connect**.
  - \_\_\_ 3. Log in with your WIN server credentials (refer to the team lab data sheet).
  - \_\_\_ 4. The Enter Password window is displayed. Enter the Administrator password for the **DS3K** storage subsystem (refer to your team data sheet). Click **OK** to continue.
  - \_\_\_ 5. Navigate to **Server Manager > Storage > Disk Management**.
- 



#### Questions

How many disks are currently accessed by the WIN server? \_\_\_\_\_

---

### Section 2: Assign backend LUNs to WIN host

This procedure accesses the backend storage subsystem to assign two LUNs to the WIN server host.

- \_\_\_ 6. From the Admin server desktop, double-click the **DS Storage Manager Client** icon.
  - \_\_\_ 7. From the DS Storage Manager (Enterprise Management) **Devices** tab, double-click the storage subsystem entry representing the **DS3K** backend storage subsystem.
- 



#### Note

If this is the first time you have logged into the DS Storage Manager, the system will prompt you to enter the storage subsystem password to validate the operation. This task only needs to be performed once. If not, skip the next step.

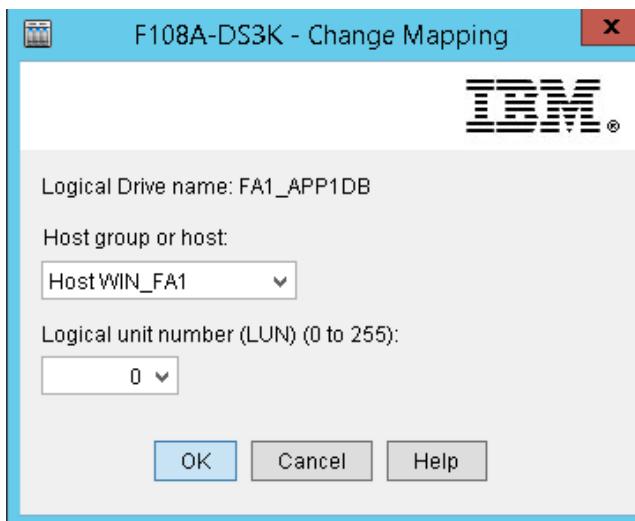
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- \_\_\_ 8. The system might prompt you to set a Monitor password for the storage subsystem. Click **No** to continue.
- \_\_\_ 9. The DS Storage Manager (Subsystem Management) is displayed. From the DS Storage Manager (Subsystem Management) view, click **Host Mappings** tab.
- \_\_\_ 10. Click on the Host Group called **V9KxSET** (where **x** is your team environment ID).
- \_\_\_ 11. Locate the logical drive names of your **FAx\_APP1DB** and **FAx\_APP1LOG** LUNs (where **x** is your team set ID).

- \_\_\_ 12. Right-click on your **FAx\_APP1DB** LUN and select **Change**.

Logical Drive Name	Accessible By	LUN
FA1_AIXCHIPS	Host Group V9KASET	0
<b>FA1_APP1DB</b>	<b>Host Group V9KASET</b>	<b>1</b>
FA1_APP1LOG	Change...	2
FA1_APP2DATA	Group V9KASET	3
FA1_APP3VOL	Group V9KASET	4

- \_\_\_ 13. The Change Mapping window is displayed. Click the **Host Group** window.  
 \_\_\_ 14. From the pull down list, select your Host **WIN\_FAx** server (where **x** is your team set ID).



- \_\_\_ 15. Assign the next default LUN number (example **0**) for this logical drive. Click **OK**.  
 \_\_\_ 16. A warning pop-up window appears. Click **Yes** to confirm that you want to change the mapping.  
 \_\_\_ 17. Enter the storage subsystem **teamname-DS3K** password. Click **OK** (refer to the team lab data sheet).



## Troubleshooting

This task might re-direct you to the DS Storage Manager (Enterprise Management) **Devices** tab. If so, navigate back to the DS Storage Manager (Subsystem Management) **Host Mappings** tab view.

- \_\_\_ 18. Right-click on the **x\_APP1LOG** logical volume in the Defined Mappings pane, and select **Change**.  
 \_\_\_ 19. From the Change Mapping window, click the **Host Group** window. In the pull down list, select your **Host WIN\_x** server.  
 \_\_\_ 20. Assign the next default LUN number for this logical drive. Click **OK**.

- \_\_\_ 21. Click **Yes** in the pop-up window to confirm that you want to change the mapping.
- \_\_\_ 22. Click on your **Host WIN\_FAX** host. Verify that the two **APP1\*** LUNs are now mapped to the team assigned WIN host.

Logical Drive Name	Accessible By	LUN	Logical Drive Capacity	Type
FA1_APP1DB	HostWIN_FA1	0	11.000 GB	Standard
FA1_APP1LOG	HostWIN_FA1	1	11.000 GB	Standard
Access	HostWIN_FA1	31		Access

## Questions

What is the App\* LUNs size and LUN ID?

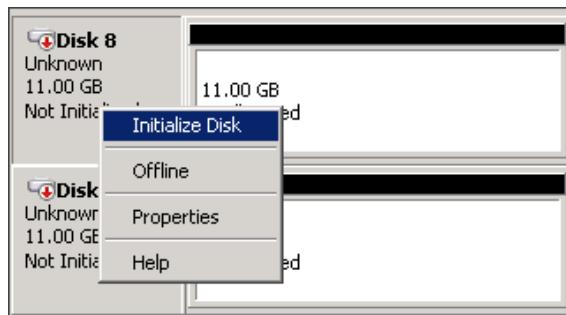
LUN name	Size	LUN#
x_APP1DB		
x_APP1LOG		

- \_\_\_ 23. Minimize the DS Storage Manager session windows.

### Section 3: Initialize the backend LUNs on the WIN server

Once assigned, LUNs are initialized using the WIN server and they are placed offline from the host.

- \_\_\_ 24. Navigate to the WIN server RDP session.
- \_\_\_ 25. Navigate to the **Server Manager > Storage > Disk Management** view.
- \_\_\_ 26. If the disks are not automatically detected, right-click on the **Disk Management** and select **Rescan Disks**.
- \_\_\_ 27. Observe the two new disks added to the list of disks.
- \_\_\_ 28. Right-click the disk designation for either one of the Unknown Disks. Select **Initialize Disk**.



**Note**

The Initialize Disk window may already be displayed if the system automatically discovered the disks.

- \_\_\_ 29. Accept the default selection of **MBR** to initialize both disks. Click **OK**.

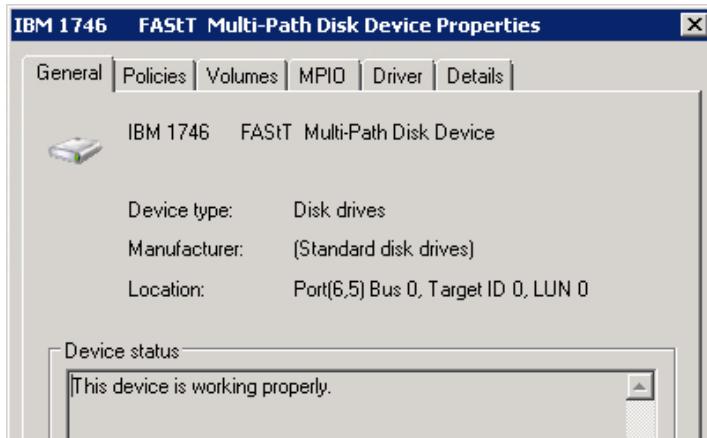
**Note**

Although the two new Windows Basic disks have been initialized, the disk space shows as **Unallocated** because it hasn't been formatted by Windows yet.

## **Section 4: Format the disks on the WIN server**

In this section, you will format the disks from the backend storage on the WIN server. The formatting time may take several minutes, depending on the size of the disk.

- \_\_\_ 30. From the WIN server, right-click in the **Basic** area of the first Unallocated disk. Select **Properties**.
- \_\_\_ 31. In the **General** tab, observe that the device is an IBM 1746 FASST, which is the DS3500 storage subsystem.
- \_\_\_ 32. Locate the reference to the LUN number. Correlate this LUN number to the DS Storage Manager FAX\_APP1DB or FAX\_APP1LOG logical volumes. Click **Cancel**.



- \_\_\_ 33. Right-click in the **Basic** area of the second disk Unallocated. Select **Properties**.
- \_\_\_ 34. In the **General** tab, confirm that the device is also the IBM1746 FastT.
- \_\_\_ 35. Repeat the same process to correlate the LUN number to the FAX\_APP logical volume. Click **Cancel**.



## Questions

What the LUN number for each disk that is associated with the APP1\* LUNs previously recorded?

LUN name	Disk #	LUN#
x_APP1DB		
x_APP1LOG		

- \_\_\_ 36. Right-click the **Unallocated** area of the disk that presents the APP1DB disk. Select **New Simple Volume**.
- \_\_\_ 37. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
  - \_\_\_ a. Accept the default capacity value. Click **Next**.
  - \_\_\_ b. Accept the default drive letter. Click **Next**.
  - \_\_\_ c. Relabel the volume as **teamsetID-APP1DB**. Click **Next**.
  - \_\_\_ d. Click **Finish** to complete the disk allocation.
- \_\_\_ 38. Right-click the **Unallocated** area of the disk that presents the APP1LOG disk. Select **New Simple Volume**.
- \_\_\_ 39. Repeat these procedures to create a volume label for the **teamsetID-APP1LOG** disk.
- \_\_\_ 40. Verify that the Server Disk Management window shows that the APP\* disks have been created.

## Section 5: Copy data to the disks on the WIN server

In this section, you will copy folders on to the newly formatted disks, rename the folders, and then set the disks to offline mode.

- \_\_\_ 41. After the disks have been formatted, open the Windows Explorer and navigate to the **C:\Software\ClassFolders**.
- \_\_\_ 42. Copy the **\FolderDB-300MB** to the APP1DB disk. Rename the copied folder as **APP1DB**.
- \_\_\_ 43. Copy the **\FolderDB-300MB** to the APP1LOG disk. Rename the copied folder as **APP1LOG**.
- \_\_\_ 44. Navigate to the **WIN Server Manager > Storage > Disk Management**.
- \_\_\_ 45. Right-click on **FAX-APP1DB** and select **Offline**.
- \_\_\_ 46. Right-click on **FAX-APP1LOG** and select **Offline**.
- \_\_\_ 47. Right-click the **Disk Management** entry in the tree on the left. In the menu click **Refresh**. Ensure that both disks are now Offline.
- \_\_\_ 48. Minimize the WIN host view.

## Section 6: Assign LUNs from the DS3K to the V9000

In this section, the LUNs on the DS3K will be reassigned from the WIN server to the V9000.

- \_\_\_ 49. Navigate to the **DS Storage Manager > Subsystem Management > Host Mappings**.
- \_\_\_ 50. Click on your **Host WIN-FAX** host in the object tree.
- \_\_\_ 51. Observe that the FAx-APP1DB and FAx-APP1LOG LUNs are still assigned to your WIN Host.

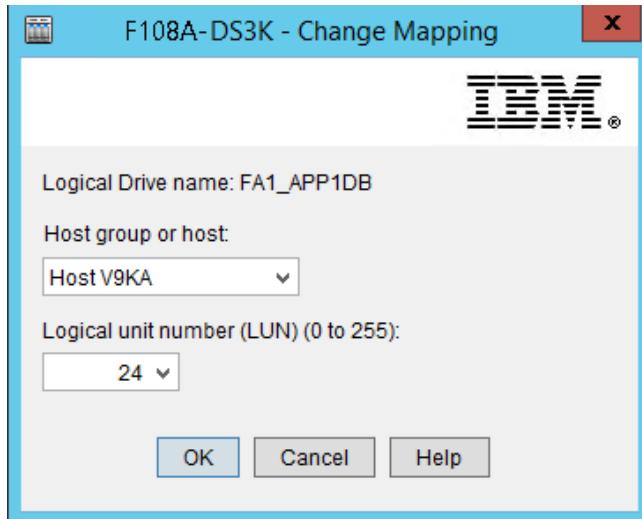


### Note

These logical drives that are currently assigned to the WIN host contain existing data that is to be migrated to the V9000.

V9000 volumes associated with these drives need to be created and then assigned back to the same application host.

- \_\_\_ 52. Right-click on the **x\_APP1DB** LUN and click **Change**.
- \_\_\_ 53. The Change Mapping window is displayed. Click the **Host Group** window. Select the **Host V9Kx** from the list (where **x** is your team environment ID).
- \_\_\_ 54. Observe the assigned LUN number for this logical drive. Click **OK**.



- \_\_\_ 55. Click **Yes** in the pop-up window to confirm that you want to change the mapping.
- \_\_\_ 56. Right-click **FAx\_APP1LOG** LUN and click **Change**.
- \_\_\_ 57. The Change Mapping window is displayed. Click the **Host Group** window and select your **Host V9Kx**.
- \_\_\_ 58. Record the assigned LUN number for this logical drive [ LUN \_\_\_\_ ]. Click **OK**.
- \_\_\_ 59. Click **Yes** in the pop-up window to confirm that you want to change the mapping.
- \_\_\_ 60. Click the **V9Kx** Host Group in the object tree.
- \_\_\_ 61. Verify that your **APP\*** LUNs are now mapped to the team assigned HostV9Kx host group.

- \_\_\_ 62. Click the **Summary > View Storage Subsystem Profile**.
- \_\_\_ 63. Click **Storage > Logical Drives** tab.
- \_\_\_ 64. In the **Find:** field type **x\_app1** (where **x** is your team set ID).
- \_\_\_ 65. Click the Find: field **binoculars** icon several times to locate your **x\_APP1DB** logical drive.
- \_\_\_ 66. Scroll through the logical drive properties for the APP1DB drive to locate its logical drive ID.

Logical Drive name: FA1\_APP1DB

Logical Drive status: Optimal  
Thin provisioned: No

Capacity: 11.000 GB  
Logical Drive ID: 60:08:0e:50:00:2d:92:3a:00:00:3f:4d:57:a0:0e:1e  
Subsystem ID (SSID): 24  
Associated array: 300GB10KArray  
RAID level: 5

LUN: 24  
Accessible By: Host V9KA

Drive media type: Hard Disk Drive

Find: fa1\_app1 Save As... Close

Result: 3 of 4 instances found



This identifier is assigned by the storage subsystem to uniquely identify the logical drive.

- 
- \_\_\_ 67. Repeat the process to view the logical drive properties for the **x\_APP1LOG** drive to locate its logical drive ID.
  - \_\_\_ 68. Click **Close**.
- 



Record the size, LUN ID and the last 4 bytes of the logical drive ID for APP1DB and APP1LOG.

LUN name	Size	LUN #	Last 4 bytes of logical drive ID
x_APP1DB			
x_APP1LOG			

- \_\_\_ 69. Close the DS Storage Manager application.

## Section 7: Rename new MDisks

- \_\_\_ 70. From the Admin server desktop, open a browser window.
  - \_\_\_ 71. Enter the URL of your team V9000 management IP address.
  - \_\_\_ 72. Log in using your admin credentials (refer to the team lab data sheet).
  - \_\_\_ 73. Navigate to **Pools > External Storage**.
  - \_\_\_ 74. Click the (>) symbol to view the list of MDisks detected by the system.
  - \_\_\_ 75. Locate the MDisk entries representing your newly discovered LUNs.
- 



### Hint

Last digit of the capacity represents your **teamsetID**; i.e FA1 = 11 GB, FA2=12, etc.

---



### Optional

If the new LUNs from the DS3K storage subsystem were not automatically discovered (that is, no new MDisk entries from the given storage system),

- \_\_\_ a. Click **Action > Discover Storage** at the top of this view.
  - \_\_\_ b. The `svctask detectmdisk` command generated by the GUI performs device discovery on the SAN to discover newly assigned LUNs. Click **Close**.
- 
- \_\_\_ 76. Observe that each MDisk should have an access mode of *unmanaged* and is from the DS3K storage subsystem.

mdisk1	25	✓ Online	11.00 GiB	Unmanaged	F108A-DS35K
mdisk2	26	✓ Online	11.00 GiB	Unmanaged	F108A-DS35K

---



### Information

Although the MDisks contain existing data, there is no way for the V9000 system to differentiate these *unmanaged* MDisks from those that do not contain existing data.

---

- \_\_\_ 77. Ensure the **ID** and **UID** columns are displayed in this view. Click the **ID** heading to sort the entries by ID.
- \_\_\_ 78. Correlate your newly added MDisk's UID to the Logical Drive ID assigned from the DS Storage Manager interface. This value is displayed in hexadecimal.

**Note**

The LUN numbers presented in the V9000 GUI are displayed in hexadecimal, while the DS Storage Manager uses decimal numbers.

**Information**

It is particularly important to rename these MDisks that contain existing data so that they are not mistaken as LUNs to be used either as free space or LUNs that belong to another applications.

- \_\_\_ 79. Right-click on your first new MDisk by its LUN number. Select **Rename**.
- \_\_\_ 80. Rename the mdisk# to **`teamsetID-APP1DB`**.
- \_\_\_ 81. Examine the GUI generated **`svctask chmdisk -name`** commands. Click **Close**.
- \_\_\_ 82. Right-click on your second new MDisk by its LUN number. Select **Rename**.
- \_\_\_ 83. Rename the mdisk# to **`teamsetID-APP1LOG`**.
- \_\_\_ 84. Examine the GUI generated **`svctask chmdisk -name`** commands. Click **Close**.
- \_\_\_ 85. Right-click any new APP\* MDisk. Select **Properties** and click the [View more details](#) link. Click **Close**.

**Note**

This output provides another alternative to validating the MDisk/LUN correlation.

- \_\_\_ 86. Verify that both of your new MDisk names and its LUN numbers correlates to the original names and LUNs numbers specified in the DS3K.

## **Section 8: Create image volumes with Import wizard**

This procedure uses the Import Wizard to create an image mode volume-MDisk pair.

You will also use a previously allocated migration pool and see that it is automatically reused for subsequent migration operations if the extent size requirement is met. These migration pools are used by both the Migration and Import Wizards.

- \_\_\_ 87. From the **Pools > External Storage** panel, multi-select your **APP1DB** and **APP1LOG** volumes.
- \_\_\_ 88. Right-click in the highlighted area. Click **Import**.

**Note**

The Import Wizard has fewer panes than the Migration Wizard. Its sole mission is to provide a fast path to import existing data into the virtualized environment. Creating host objects and mapping volumes to hosts are separate activities outside the scope of the Import Wizard.

- 
- \_\_\_ 89. The Import MDisk Volume window is displayed. Examine the name that is being assigned to the new volume by the Import Wizard.
- 

**Note**

The name is a composite of the MDisk's external storage subsystem name and the MDisk's LUN number.

- 
- \_\_\_ 90. Rename each volume based on its associated MDisk (LUN) name but append a **\_V** to it.
  - \_\_\_ 91. Accept the default import method as **Import to Temporary pool as image-mode volume**.
- 

**Note**

The **Import to temporary pool as image-mode volume** option allows you to virtualize existing data from the external storage system without migrating the data from the source MDisk (LUN) and then present them to host as image mode volume.

When the temporary pool option is selected, the GUI will either allocate a new migration storage pool or use a previously allocated migration pool (if the pool meets the extent size requirement).

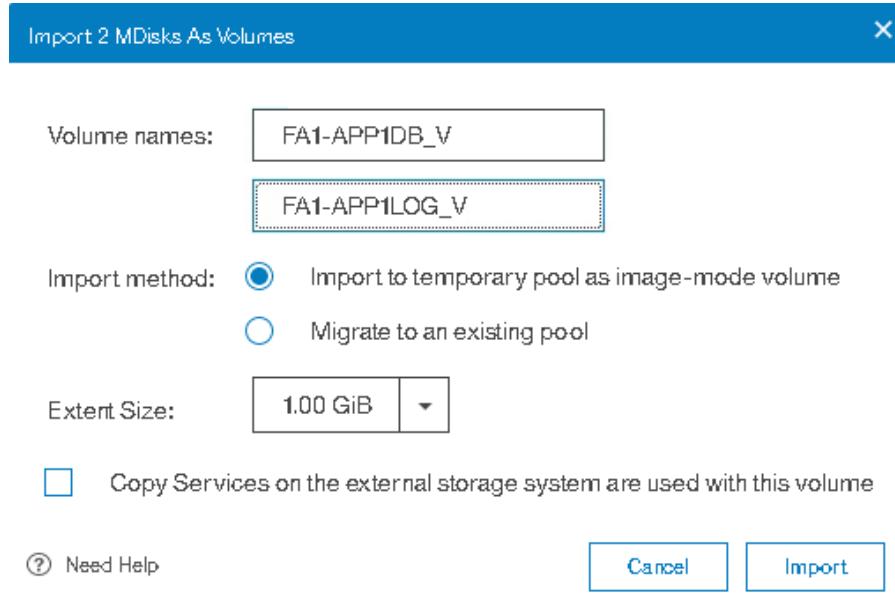
This data will become accessible via IBM FlashSystem V9000 system while still be available on the backend storage subsystem original LUN.

- 
- \_\_\_ 92. Accept the default Extent Size of **1 GB**.
- 

**Note**

The GUI provides an option to select various migration pool's extent size; however, the default extent size is 1 GB.

- \_\_\_ 93. Do not check the **Copy Services** box.



- \_\_\_ 94. Click **Import**.

- \_\_\_ 95. Examine the long command syntax generated. The `mkmdiskgrp` creates a `-MigrationPool_1024` with the extent size of 1024. The `mkvdisk` creates an image of each of the `teamsetID-APP*_V` MDisks and assigns the MDisks to the Migration Pool. Observe the sync rate set for the migration process.



### Information

The MigrationPool\_1024 had been allocated and its extent size matches the temporary pool extent size specification. If the pool already exists then the Import Wizard automatically detects and reuses that pool to contain the volume-MDisk image pairs.

- \_\_\_ 96. Click **Close**.
- \_\_\_ 97. From the External Storage view, observe that the LUNs access mode has changed from *unmanaged* to *image*. The LUNs are now assigned to a Migration Pool.
- \_\_\_ 98. Navigate to **Pools > MDisks by Pools**.
- \_\_\_ 99. Locate and expand the view of your **MigrationPool\_1024** pool.
- \_\_\_ 100. Verify that the mdisks listed correlates to the LUNs used in the Import Migration.
- \_\_\_ 101. Right-click on your **MigrationPool\_1024**. Select **Rename**.
- \_\_\_ 102. Modify the pool name to prepend your `teamsetID-` to the beginning of the MigrationPool\_1024 pool name. Click **Rename**.
- \_\_\_ 103. Review the `svctask chmdiskgrp -name` command generated. Click **Closed**.
- \_\_\_ 104. Hover over the Capacity column red indicator bar for your **MigrationPool\_1024** pool. Observe that the pool is full which indicates a warning.

**Note**

The existing data is now currently being managed by the V9000. The volumes are available to be mapped to a host assuming the host object has been defined. Host access causes read/write activity to occur in the DS3K which is the storage subsystem that contains these MDisks. At this point, the volumes can be migrated from image to striped volumes

- 
- \_\_\_ 105.Navigate to **Pools > Volumes by Pools**. Select your **MigrationPool\_1024**.
- 

**Questions**

What is the total allocated capacity value for the MigrationPool\_1024 pool? \_\_\_\_\_

What is current capacity allocated to volumes? \_\_\_\_\_

What is the volume [ID] for each APP\*\_V MDisk? APP1DB \_\_\_\_\_ APP1LOG \_\_\_\_\_

- 
- \_\_\_ 106.Right-click any **APP\*\_V** volume entry. Click **View Member MDisks** tab.
  - \_\_\_ 107.Observe that the extents of the selected APP\*\_V volume that were migrated to the Migration Pool from the **DS3K** storage system.
- 

**Note**

This data also correlates back to the LUNs used in the Import migration process.

- 
- \_\_\_ 108.Click **Close**.

## **Section 9: Map the imported volumes to WIN server**

This procedure maps the Import volumes to the same Windows host where the external storage subsystem LUNs were mapped.

- \_\_\_ 109.From the Volumes by Pools view, multi-select both the **APP1DB\_V** and **APP1LOG\_V** volume entries.
- \_\_\_ 110.Right-click on the selected volume entries. Select **Map to Host or Host Clusters...**
- \_\_\_ 111.The Create Mapping window is displayed.
  - \_\_\_ a. Select your **WIN** host. Click **Next**.
  - \_\_\_ b. Verify that your APP\*\_V volumes are highlighted. Click **Map Volumes** to confirm.
- \_\_\_ 112.Review the **svctask mkvdiskhostmap** command generated for each volumes. Click **Close**.
- \_\_\_ 113.Navigate to **Volumes > Volumes by Host**.
- \_\_\_ 114.Verify that the APP1\*\_V volumes are now assigned to the your WIN host.

## Section 10:Change image to striped volumes with pool to pool migration

At this point, the volume is still owned by the Migration Pool. This procedure migrates the volume to an internal storage pool.

- \_\_\_ 115.Navigate to **Pools > Volumes by Pool**.
- \_\_\_ 116.Select your **SAS** pool from the Pool Filter list.



### Questions

What is the current allocated capacity value for the SAS pool? \_\_\_\_\_

Are there any volumes allocated to the SAS pool? \_\_\_\_\_

- \_\_\_ 117.Select your **MigrationPool\_1024** pool.
- \_\_\_ 118.Multi-select both your **APP1\*\_V** volume entries.
- \_\_\_ 119.Right-click the volume entries and select **Migrate to Another Pool**.
- \_\_\_ 120.The Migrate Volume Copy window is displayed. Select your **SAS** pool. Click **Migrate**.
- \_\_\_ 121.Examine that the generated `svctask migratevdisk` command for each APP\*\_V (MDisk) is being migrated to the selected target pool. Click **Close**.



### Reminder

This will generate a Running Tasks for the duration of the pool migration. While the migration is still in progress, the extents of each volume may still be spread across both pools.

The volume sync rate is set to 80% so this process should not take too long to complete.

- \_\_\_ 122.Observe that the **MigrationPool\_1024** pool Volume Allocation capacity bar shows a continuous decrease from the original capacity of 22 GiB (the capacity of the MDisk).
- \_\_\_ 123.Right-click one of the volume entries. Select **Volume Copy Action** and then select **Properties**.
- \_\_\_ 124.Locate the virtualization type of the volume.Observe that it has changed from *image* to *striped*. Click **Close**.
- \_\_\_ 125.Navigate to your **SAS** pool. Observe that the APP\*\_V volumes are now assigned capacity from the SAS pool.

## Section 11:Validate access of imported volume

- \_\_\_ 126.Navigate to your WIN Server Manager > Storage > Disk Management.
- \_\_\_ 127.Observe the APP\* disk entries representing the newly mapped volumes have been placed *Online*.



## Troubleshooting

If not, then rescan to cause Windows to perform device discovery.

- \_\_\_ 128.Right-click in the **Basic** area of one of the **APP\*** disk that indicates Online. Select **Properties**.
- \_\_\_ 129.Observe that the device type is the IBM 2145, which is the V9000.



## Note

Access to the DS3K LUNs that contain the existing data is now being accessed through the V9000 volume extent pointers.

- \_\_\_ 130.Right-click on one of the **APP\*** disk entries. Click **Explore**. Verify it contains a folder called APP1DB.
- \_\_\_ 131.Open the **SDDDSM** interface on the WIN server desktop and enter the **SDD datapath query device** command to view device information.
- \_\_\_ 132.Validate that the Windows device entries match the V9000 volume UID of the APP1DB and APP1LOG volumes.
- \_\_\_ 133.Click **Start > Log off** to log out from the WIN server.
- \_\_\_ 134.Navigate back to the V9000 management GUI.

## **Section 12:Delete the migration pool MDisk**

This procedure deletes the MDisks that were used in the Import Migration now that the volumes are managed by the V9000.

- \_\_\_ 135.Navigate to **Pools > MDisks by Pools**.
- \_\_\_ 136.Expand the view to your MigrationPool\_1024 pool. Observe that the MDisks used in the Import migration are still members of this pool.
- \_\_\_ 137.Multi-select **mdisk#** and **mdisk#** that correlates to your assigned MDisks from the Migration pool. Right-click the mdisks. Click **Remove**.
- \_\_\_ 138.Review the **svctask rmmdisk** commands generated to remove each the mdisks from your MigrationPool\_1024 pool. Click **Close**.
- \_\_\_ 139.Observe that MigrationPool\_1024 is now empty. It can be used for future data import activity.
- \_\_\_ 140.Navigate to **Pools > External Storage**. Observe that the removed MDisks are now unmanaged mode again.

**Note**

In a production environment, you would need to remove mappings for the LUNs between the storage subsystem and the V9000. This will remove these MDisk entries from the V9000's inventory after the next detectmdisk.

These unmanaged MDisks will continue to be listed as members of the external storage. You will not execute the unmapping of the DS3K LUNs/MDisks in the lab.

---

\_\_ 141.Log out from the V9000 management GUI.

**End of exercise**

---

# Exercise 12. Migrate existing data with Migration Wizard

## Estimated time

01:30

## Overview

This exercise exploits the FlashSystem V9000 Migration Wizard to migrate existing data to the V9000 environment. The student will work directly with the backend storage subsystem LUNs from a Windows server to initialize and populate it with data. The LUNs are then migrated to the V9000 and mapped to the Windows server by using the migration wizard.

## Objectives

- Implement migration of multiple LUNs with existing data to the V9000 virtualized environment using the Migration Wizard.

## Exercise instructions

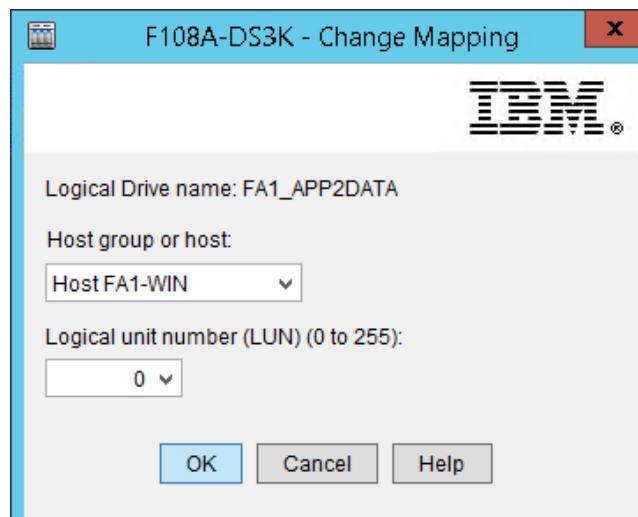
### Section 1: Assign backend LUNs to the team WIN server host

This procedure accesses the backend storage subsystem to assign two LUNs to the WIN server host group. Once assigned, LUNS are initialized using the WIN server and then they are placed offline from the host.

- \_\_\_ 1. From the Admin server desktop, double-click the **DS Storage Manager Client** icon.
- \_\_\_ 2. From the DS Storage Manager (Enterprise Management) **Devices** tab, double-click the storage subsystem entry representing the **DS3K** backend storage subsystem.
- \_\_\_ 3. The system might prompt you to set a Monitor password for the storage subsystem. Click **No** to continue.
- \_\_\_ 4. The DS Storage Manager (Subsystem Management) is displayed. From the DS Storage Manager (Subsystem Management) view, click **Host Mappings** tab.
- \_\_\_ 5. Click on the Host Group called **V9KxSET** (where **x** is your team environment ID).
- \_\_\_ 6. Locate the logical drive names of your **x\_APP2DATA** and **x\_APP3VOL** LUNs (where **x** is your team set ID).
- \_\_\_ 7. Right-click on your **x\_APP2DATA** LUN and select **Change**.

Logical Drive Name	Accessible By	LUN	Logical Drive Capacity
FA1_AIXCHIPS	Host Group V9KASET	0	5.127 GB
FA1_APP2DATA	Group V9KASET	3	11.000 GB
FA1_APP3VOL	Group V9KASET	4	11.000 GB
FA2_AIXCHIPS	Group V9KASET	5	5.127 GB

- \_\_\_ 8. The Change Mapping window is displayed. Click the **Host Group** window.
- \_\_\_ 9. From the pull down list, select your **Host WIN\_x** server (where **x** is your team set ID).



- \_\_\_ 10. Assign the next available LUN number for this logical drive. Click **OK**.
- \_\_\_ 11. A warning pop-up window appears. Click **Yes** to confirm that you want to change the mapping.



### Note

If this is the first time you have logged into the DS Storage Manager, the system will prompt you to enter the storage subsystem password to validate the operation. This task only needs to be performed once. If not, skip the next step.

- \_\_\_ 12. Enter the storage subsystem **DS3K** password. Click **OK**. Refer to the team lab data sheet.



### Note

This task might re-direct you to the DS Storage Manager (Enterprise Management) **Devices** tab. If so, navigate back to the DS Storage Manager (Subsystem Management) **Host Mappings** tab view.

- \_\_\_ 13. Right-click **x\_APP3VOL** LUN and select **Change**.
- \_\_\_ 14. The Change Mapping window is displayed. Click the **Host Group** window. In the pull down list, select your **Host x\_WIN** server (where **x** is your team set ID).
- \_\_\_ 15. Assign the next available LUN number for this logical drive. Click **OK**.
- \_\_\_ 16. Click **Yes** in the pop-up window to confirm that you want to change the mapping. Click on your **Host WIN\_x** host. Verify that the **APP2\*** and the **APP3\*** LUNs are now mapped to the team assigned WIN host

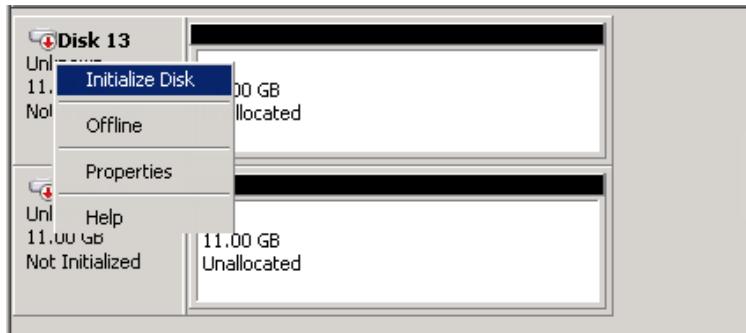
Defined Mappings				
Logical Drive Name	Accessible By	LUN	Logical Drive Capacity	Type
FA1_APP2DATA	HostWIN_FA1	0	11.000 GB	Standard
FA1_APP3VOL	HostWIN_FA1	1	11.000 GB	Standard
Access	HostWIN_FA1	31		Access

- \_\_\_ 17. Minimize the DS Storage Manager session window.

## Section 2: Initialize the backend LUNs on the WIN server

This procedure discovers and initializes the disks from the backend storage subsystem on the WIN server.

- \_\_\_ 18. From the Admin server desktop, double-click on the **Remote Desktop Connection** icon to start a remote desktop session.
- \_\_\_ 19. Observe the IP address of your WIN server. Click **Connect**.
- \_\_\_ 20. Log in with your WIN server credentials (refer to the team lab data sheet).
- \_\_\_ 21. The system might be compelled to issue a security certificate warning on authentication. If so, click **Yes** to continue.
- \_\_\_ 22. Select **Server Manager > Storage > Disk Management**.
- \_\_\_ 23. If the disks are not automatically detected, right-click on the **Disk Management** and select **Rescan Disks**.
- \_\_\_ 24. Observe the two new LUN (APP\*) disks added to the list of disks.
- \_\_\_ 25. Right-click on the left pane of the disk # area for either one of the Unknown Disks. Select **Initialize Disk**.



### Note

This may already be displayed if the system automatically discovered the disks.

- \_\_\_ 26. Accept the default selection of **MBR** to initialize both disks. Click **OK**.



### Note

Although the two new Windows Basic disks have been initialized, the disk space shows as **Unallocated** because it hasn't been formatted by Windows yet.

### Section 3: Format the disks on the WIN server

This procedure uses Windows Disk Management to create partitions on the Windows host server, and mount LUNs to the disk space for use. The formatting time may take several minutes, depending on the size of the disk.

- \_\_\_ 27. From the WIN server, right-click on the right pane of the first Unallocated disk. Select **Properties**.
- \_\_\_ 28. In the **General** tab, observe that the device is an IBM 1746 FAStT, which is the DS3500 storage subsystem.
- \_\_\_ 29. Locate the reference to the LUN number. Click **Cancel**.



- \_\_\_ 30. Right-click on the right pane of the second Unallocated disk. Select **Properties**.
- \_\_\_ 31. In the **General** tab, confirm that the device is also the IBM1746 FastT.
- \_\_\_ 32. Locate the reference to the LUN number. Click **Cancel**.



#### Questions

Record the **LUN** number for each disk that is associated with the APP1\* LUNs previously recorded.

LUN name	Disk #	LUN#
x_APP2DATA		
x_APP3VOL		

- \_\_\_ 33. Right-click the **Unallocated** area of the disk that presents the **APP2DATA** disk. Select **New Simple Volume**.
- \_\_\_ 34. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
  - \_\_\_ a. Accept the default capacity value. Click **Next**.
  - \_\_\_ b. Accept the default drive letter. Click **Next**.
  - \_\_\_ c. Relabel the volume as **teamsetID-APP2DATA**. Click **Next**.
  - \_\_\_ d. Click **Finish** to complete the disk allocation.

- \_\_\_ 35. Right-click the **Unallocated** area of the disk that presents the **APP3VOL** disk. Select **New Simple Volume**.
- \_\_\_ 36. Repeat these procedures to create a volume label for the ***teamsetID*-APP3VOL** disk.
- \_\_\_ 37. Verify that the Server Disk Management window shows that the APP2\* and the APP3\* disks have been created.

## Section 4: Copy data to the disks on the WIN server

This procedure copies data to the Windows server newly formatted disks, renames the folders, and then place the disks offline.

- \_\_\_ 38. After the disks have been formatted, open the Windows Explorer and navigate to the **C:\Software\ClassFolders**.
- \_\_\_ 39. Copy the **\FolderDB-300MB** to the APP2DATA disk. Rename the copied folder as **APP2DATA**.
- \_\_\_ 40. Copy the **\FolderPDF-2MB** to the APP3VOL disk. Rename the copied folder as **APP3VOL**.
- \_\_\_ 41. From the WIN server, navigate to **Server Manager > Storage > Disk Management**.
- \_\_\_ 42. Right-click each newly labeled **APP\*** disk (**x-APP2DATA** and **x-APP3VOG**) and click **Offline**.
- \_\_\_ 43. Right-click the **Disk Management** entry and select **Refresh**. Ensure that both disks are now Offline

## Section 5: Assign LUNs from the DS3K to the V9000

This procedure presents storage to the host by reassigning the LUNs on the DS3K to the V9000 host.

- \_\_\_ 44. Navigate back to the **DS Storage Manager > Subsystem Management > Host Mappings**.
- \_\_\_ 45. Click on your **Host WIN- x**.
- \_\_\_ 46. Observe that the x-APP2DATA and x-APP3VOL LUNs are still assigned to your WIN Host..



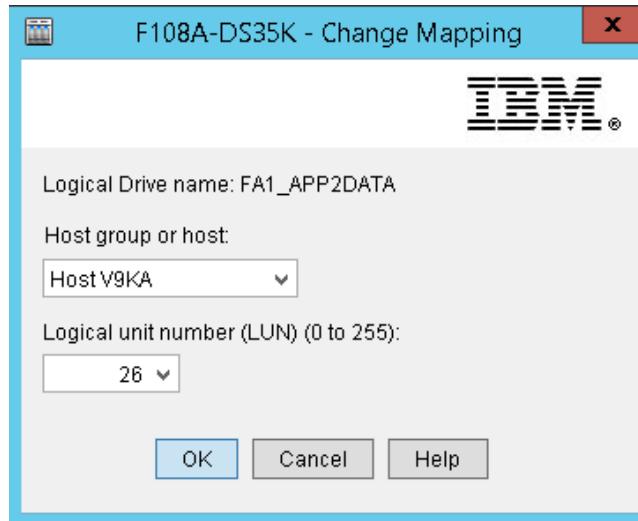
### Note

These logical drives that are currently assigned to the Windows host contain existing data that is to be migrated to the V9000.

V9000 image volumes associated with these drives need to be created and then assigned back to the same application host.

- 
- \_\_\_ 47. Right-click on **x\_APP2DATA** and select **Change**.
  - \_\_\_ 48. The Change Mapping window is displayed. Click the **Host Group** window. Select the **Host V9Kx** from the host group list (where **x** is your team environment ID).

- \_\_\_ 49. Observe the assigned LUN number for this logical drive. Click **OK**



- \_\_\_ 50. Warning pop-up window appears. Click **Yes** to confirm that you want to change the mapping.
- \_\_\_ 51. Right-click on **APP3VOL** and select **Change**.
- \_\_\_ 52. The Change Mapping window is displayed. Click the **Host Group** window and select your **Host V9Kx**.
- \_\_\_ 53. Record the assigned LUN number for this logical drive (LUN \_\_\_\_). Click **OK**.
- \_\_\_ 54. Click **Yes** in the pop-up window to confirm that you want to change the mapping.
- \_\_\_ 55. Click on the **HostV9Kx** in the object tree.
- \_\_\_ 56. Verify that your **APP\*** LUNs are now mapped to the HostV9Kx.
- \_\_\_ 57. Click the **Summary tab**. From the **Summary** tab, click **View Storage Subsystem Profile** in the Monitor pane.
- \_\_\_ 58. Click **Storage > Logical Drives** tab.
- \_\_\_ 59. In the **Find:** field type **x\_app2** (where **x** is your team set ID).
- \_\_\_ 60. Click the **Find:** field **binoculars** icon several times until you locate your **x\_APP2DATA** logical drive.

- \_\_ 61. Scroll through the logical drive properties for the x\_APP2DATA drive to locate its logical drive ID.

The screenshot shows the DS Storage Manager interface. The top navigation bar includes tabs for Storage Subsystem, Storage, Copy Services, Host Mappings, Hardware, All, Disk Pools, Arrays, Logical Drives, Missing Logical Drives, and Logical Hierarchy. The Logical Drives tab is selected. Below the tabs, a search bar contains 'fa1\_app2d' and a 'Find' button. The main pane displays the properties of logical drive FA1\_APP2DATA, which includes:

Logical Drive name:	FA1_APP2DATA
Logical Drive status:	Optimal
Thin provisioned:	No
Capacity:	11.000 GB
Logical Drive ID:	60:08:0e:50:00:2d:92:3a:00:00:3f:5b:57:a0:11:02
Subsystem ID (SSID):	36
Associated array:	500GB7KArray
RAID level:	5
LUN:	27
Accessible By:	Host V9KA
Drive media type:	Hard Disk Drive

At the bottom right of the main pane are 'Save As...' and 'Close' buttons. A message at the bottom left says 'Result: 2 of 2 instances found'.



### Note

This identifier is assigned by the storage system to uniquely identify the logical drive.

- \_\_ 62. Repeat the process to view the logical drive properties for the x\_APP3VOL drive to locate its logical drive ID.  
 \_\_ 63. Click **Close**.



### Questions

Record the size, LUN ID and the last 4 bytes of the logical drive ID for APP2DATA and APP3VOL.

LUN name	Size	LUN #	Last 4 bytes of logical drive ID
x_APP2DATA			
x_APP3VOL			

- \_\_ 64. Close the DS Storage Manager application.

## Section 6: Examine and rename new LUNs on the V9000

This procedure examines the LUNs discovered from the DS3K and renames them on the V9000.

- \_\_\_ 65. From the Admin server desktop, open a browser window.
  - \_\_\_ 66. Enter the URL of your team V9000 management IP address.
  - \_\_\_ 67. Log in using your admin credentials (refer to the team lab data sheet).
  - \_\_\_ 68. Navigate to **Pools > External Storage**.
  - \_\_\_ 69. Click the (>) symbol to view the list of MDisks detected by the system.
- 



### CAUTION

Because there are multiple teams using the same V9000, we recommend that you use the Filter field to search for your team resources, including user name, pool, volume, host, and so on.

- 
- \_\_\_ 70. Locate the MDisk entries representing your newly discovered LUNs.
- 



### Hint

Last digit of the capacity represents your **teamsetID** MDisks (For example: FA1-mdisk = 11 GB, FA2-mdisk=12 GB, and so on.

---



### Optional

If the new LUNs from the DS3K storage system were not automatically discovered (that is, no new MDisk entries from the given storage system),

- \_\_\_ a. Click **Action > Discover Storage** at the top of this view.
  - \_\_\_ b. The **svctask detectmdisk** command generated by the GUI performs device discovery on the SAN to discover newly assigned LUNs. Click **Close**.
- 
- \_\_\_ 71. Observe that each MDisk should have an access mode of *unmanaged* and is from the DS3K storage subsystem.
- 



### Information

Although the MDisks contain existing data, there is no way for the V9000 system to differentiate these *unmanaged* MDisks from those that do not contain existing data.

- 
- \_\_\_ 72. Ensure the **ID** and **UID** columns are displayed in this view. Click the **ID** heading to sort the entries by ID.

- 
- \_\_\_ 73. Correlate your newly added MDisk's UID to the Logical Drive ID assigned from the DS Storage Manager interface. This value is displayed in hexadecimal on the V9000 and decimal in the DS Storage Manger.
- 



### Information

It is particularly important to rename these MDisks that contain existing data so that they are not mistaken as LUNs to be used either as free space or LUNs that belong to another applications.

---

- \_\_\_ 74. Right-click on the first MDisk that correlates to the APP2DATA LUN number. Select **Rename**.
  - \_\_\_ 75. Rename the MDisk to ***teamsetID-APP2DATA***.
  - \_\_\_ 76. Examine the GUI generated **svctask chmdisk -name** commands. Click **Close**.
  - \_\_\_ 77. Right-click on the second MDisk that correlates to the APP3VOL LUN number. Select **Rename**.
  - \_\_\_ 78. Rename the MDisk to ***teamsetID-APP3VOL***.
  - \_\_\_ 79. Examine the GUI generated **svctask chmdisk -name** commands. Click **Close**.
  - \_\_\_ 80. Right-click any new APP\* MDisk. Select **Properties** and click the [View more details](#) link. Click **Close**.
- 



### Note

You can use the Properties view to correlate volumes on the back end storage and the V9000 via LUN number, in addition to UID.

---

- \_\_\_ 81. Verify that both of your new MDisk names and LUN numbers correlate to the original names and LUNS numbers specified in the DS3K.

## Section 7: Migrate LUNs to the V9000 with the Migration Wizard

This procedure migrates LUNs (and the data) from backend storage to the V9000 system by creating V9000 volumes whose extents pointers are directed to these MDisks.

- \_\_\_ 82. From the V9000 management GUI, navigate to **Pools > System Migration**.
- \_\_\_ 83. Click the **Start New Migration** option (top left) to invoke the Migration Wizard.
- \_\_\_ 84. The Storage Migration Wizard Before You Begin screen is displayed.
  - \_\_\_ a. Scroll down and select to check all boxes in the Restrictions pane to confirm.
  - \_\_\_ b. Select to check all boxes associated with the Prerequisites pane. Click **Next** to continue.

**Storage Migration Wizard**

*Attention: To avoid data loss, back up all the data stored on your external storage before using the wizard*

**Restrictions**

The following types of hosts cannot be migrated using this wizard because additional steps are required.

- I am not migrating clustered hosts, including clusters of VMware hosts and VIOS.
- I am not migrating SAN boot images.

**Prerequisites**

- This system is cabled into the SAN of the external storage I want to migrate.
- VMware ESX hosts are set to allow volume copies to be recognized, or I am not using VMware ESX hosts.

 [Need Help](#)

- \_\_\_ c. The Prepare Environment for Migration screen is displayed. Review the requirements for host preparation and SAN zoning. Click **Next**.
- \_\_\_ d. The Map Storage screen is displayed. Review the tasks listed to ensure that the LUNs to be migrated can be discovered by the V9000 on the SAN.



### Note

This list serves as reminders to prepare for the import of existing data to the V9000.

- 
- \_\_\_ e. Click **Next**.
  - \_\_\_ 85. The **svctask detectmdisk** command is generated by the wizard to detect all disks presented to the system. The **lsdiscoverystatus** command obtains a current list of MDisks on the SAN that has been assigned to the V9000. Click **Close**.
  - \_\_\_ 86. The Migrating MDisks screen is displayed. Observe the list of MDisks that have been discovered with the access mode of *unmanaged*.

- 87. Add the **ID** and **Mode** columns to the display. You can de-select Site to provide more viewing area. Click the **ID** column to sort the display.

**Migrating MDisks**

Double-click an MDisk for more detailed information. Select the MDisks you want to migrate, and click Next to start the import.

Name	ID	Status	Capacity	Mode
FA1-APP1DB	25	✓ Online	11.00 GiB	Unmanaged
FA1-APP1LOG	26	✓ Online	11.00 GiB	Unmanaged
FA1-APP2DATA	27	✓ Online	11.00 GiB	Unmanaged
FA1-APP3VOL	28	✓ Online	11.00 GiB	Unmanaged

- 88. Double-click your **APP2DATA** entry. Select the [\*\*View more details\*\*](#) link to verify content.



### Information

This step of the Migration Wizard affords the flexibility of viewing the details for MDisks that have been subsequently assigned to the V9000.

Since you have already verified the MDisk to application correlation and renamed the MDisk appropriately, this step isn't really necessary.

- 
- 89. Click **Close** to return to the wizard.
- 90. Multi-select your **APP2DATA** and **APP3VOL** MDisk entries. Observe the capacity of each MDisk as well as its storage system LUN number.



### Note

It is best practice to migrate or import related MDisks concurrently (such as a database and its log volumes or multi-volume file systems).

- 
- 91. Click **Next**.
- 92. Examine the long command syntax generated. The `svctask mkmdiskgrp` command is used to create a storage pool whose extent size is 8192 MB.

**Note**

Using the largest extent size possible for this pool enables MDisk addressability when importing extremely large capacity LUNs.

- 
- \_\_\_ a. Scroll down to review the two `svctask mkvdisk` commands generated to create two volumes.
- 

**Note**

Each VDisk is paired with its own MDisk and is assigned a virtualization type of image. Both of the newly created VDisks are placed in the migration pool.

- 
- \_\_\_ b. Observe that a size value was not specified in the `mkvdisk` commands.
- 

**Note**

An image volume derives its size from the capacity of its associated MDisk.

**Questions**

Record the last 3-digits of each newly created volume and its volume ID.

---

MDisk Name	Volume Name	Volume ID
x-APP2DATA		
x-APP3VOL		

---

- 
- \_\_\_ 93. Click **Close**.

## Section 8: Map the migrated volumes to a host

At this point, the existing data is said to be managed by the V9000. However it is not fully virtualized yet because each volume's extents are sourced exclusively from one MDisk. The newly created volumes can now be assigned to a host for access.

This procedure uses the Migration Wizard to create a host object and assign a newly created volumes to the host.

- 94. The System Migration Wizard Configure Hosts (optional) screen is displayed. Observe the reminder regarding the device drivers and host system zoning.



### Note

System Migration provides the ability to define a host object, which is a pre-requisite to mapping a volume to a host. This task can also be completed after Storage Migration is complete. The Add Host option redirects you to the Host panel to create a new host, and back to the Storage Migration Wizard once the task is complete. In our case, you have already created the **WIN** host object.

- 95. Right-click on any column, and add the **ID** column to the display.
- 96. Verify that your **WIN** server is defined in the list. Right-click on your **WIN** host and select **Properties**.



### Note

The System Migration Wizard provides to ability to modify a host name, I/O group configuration, view mapped volumes and add or delete port definitions for a host.

- 97. Click **Close**.
- 98. Verify that your **WIN** host is still highlighted. Click **Next**.
- 99. The Map Volumes to Hosts screen is displayed. Modify column view to display the **UID** and **MDisk Name** columns.
- 100. Examine the name that is being assigned to the new APP\* volumes by the Storage Migration Wizard.

### Map Volumes to Hosts (optional)

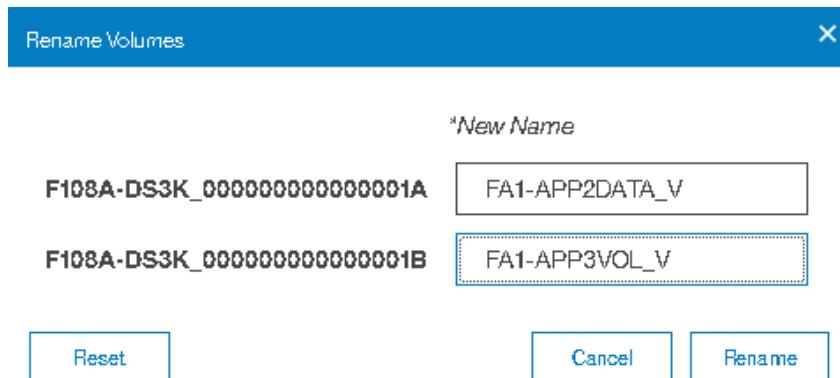
Map your hosts to newly migrated volumes by selecting a volume and clicking Map to Host. After the mapping complete on the hosts to verify the mappings.

Map to Host		Actions	All Volumes	Filter	Show
Name	↑	UID	Host Mappings		Capacity
F108A-DS3K_0000000000000001A		600507680CAB82BE0000000000000000C	No		11.00
F108A-DS3K_0000000000000001B		600507680CAB82BE0000000000000000D	No		11.00

**Note**

The names are based on the storage system name concatenated with its image MDisk LUN number; since each volume is tied to its specific MDisk.

- \_\_\_ 101. Multi-select both APP\* volume entries. Click **Actions** (top left).
- \_\_\_ 102. From the option list, select **Rename**.
- \_\_\_ 103. Rename each volume based on its associated MDisk name but append a **\_V** to it. Click **Rename**.



- \_\_\_ 104. Review the two GUI generated `svctask chvdisk -name` commands to rename the APP\* volumes. Click **Close**.
- \_\_\_ 105. Verify that the APP\* volume names correlate to its original MDisk name. Note that the capacity derives from the size of the corresponding MDisks.
- \_\_\_ 106. Modify the column view to add the **ID** column in the display.

**Note**

The volumes can now be mapped to a host. Once they are mapped you can then scan for new devices on that host.

- \_\_\_ 107. With both volume entries still highlighted. Click **Map to Host** (top left).
- \_\_\_ 108. Select your **WIN** host. Click **Next**.
- \_\_\_ 109. Verify that the APP\*\_V volumes are highlighted. Click **Map Volumes** to confirm.
- \_\_\_ 110. Review the `svctask mkvdiskhostmap` command generated for each volumes. Click **Close**.
- \_\_\_ 111. Observe that the Host Mappings column indicates the volumes have been mapped to your WIN host.

**Stop**

Do not exit the wizard but go to the WIN server remote desktop now.

***Section 9: Validate the migrated disks on Windows server***

- \_\_\_ 112. Navigate to your WIN host. Select **Server Manager > Storage > Disk Management**.
- \_\_\_ 113. Right-click **Disk Management**. Click **Rescan Disks** to view the two new disk entries representing the two volumes.
- \_\_\_ 114. Observe that the **APP\*** disks (**x-APP2DATA** and **x-APP3VOG**) are back **Online**.

**Information**

The new disk drives contain existing data, therefore, Windows will automatically recognizes the volume label of each volume and assigns a default drive letter for each volume.

There might be a slight delay before the drive letter of a volume displays while Windows sorts out the drive letter assignments.

- \_\_\_ 115. Right-click in the right pane of one of the **APP\*** disk that indicates **Online**. Select **Properties**.
- \_\_\_ 116. Observe that the device type has changed to the IBM 2145, which is the V9000. Click **Cancel**.

**Note**

Access to the DS3K LUNs that contain the existing data is now being accessed through the V9000 volume extent pointers.

- \_\_\_ 117. Right-click on one of the new APP\* disk entries. Click **Explore** to view the volume contents.

**Note**

The two volumes should contain existing data created at the beginning of this exercise.

**Optional**

Double-click the **SDDDSM** desktop icon. Enter the **datapath query device** command to validate the serial number of the disk entries with the V9000 volume UID values to confirm that the correct volumes are being viewed.

- \_\_\_ 118. Minimize the WIN server view.

## Section 10:Examine the volume and MDisk type

Since the current GUI view is within the steps of the Migration Wizard, this procedure uses the CLI session to view the object entries of the two volumes and their corresponding MDisks.

- \_\_\_ 119. From the Admin server desktop, open a CLI session to your V9000 management.
- \_\_\_ 120. Log in with your admin credentials (refer to the team lab data sheet).
- \_\_\_ 121. Enter the `lsvdisk -delim , -filtervalue type=image` command syntax to display the `image type` volumes that are recognized by the V9000 system.
- \_\_\_ 122. Enter the `lsmdisk -delim , -filtervalue mode=image` command syntax (or recall previous command and append) to display the MDisks that `image mode` volumes that are recognized by the V9000 system.



### Note

Observe that the virtualization type of the volumes is *image*, and that the MDisk access mode is also *image*. Both the volumes and the MDisks reside in the MigrationPool\_8192.

Technically at this point, the import or data migration process has completed. The host applications can be started. The volume and MDisk image pairs can exist as such for any desired length of time.

---

## Section 11:Migrate image volumes to striped volumes

This procedure migrates image volumes to striped volumes using the Migration Wizard. The volume mirroring function of the V9000 will be used.

Volume Mirroring enables a duplicate set of extents to be created for a volume. Typically these extents are sourced from a different storage pool. This additional set of extents is referred to as copy 1 of a volume because the original copy is called copy 0. Subsequent application writes cause both copies to be updated. As a review, recognize that this is one volume with two copies or two sets of extents and not two separate volumes.

- \_\_\_ 123. Navigate back to the V9000 management GUI Storage Migration Wizard in progress.
- \_\_\_ 124. The Map Volumes to Hosts screen is displayed. Add the **Virtualization Type** to the display heading. Ensure the APP\* volumes are still highlighted. Click **Next**.
- \_\_\_ 125. The Select Pool screen is displayed. Add the **ID** column to the Select Pool display.
- \_\_\_ 126. Select your **SATA** pool. Observe its pool ID. Click **Next**.
- \_\_\_ 127. Examine the two generated `svctask addvdiskcopy` commands. Another copy or set of extents for the volume is being allocated for each volume in the SATA pool. Click **Close**.
- \_\_\_ 128. The final step of the wizard is displayed. Observe that the progress bar for this migration effort is almost completed. Click **Finish**.

- 129.The System Migration view now lists the two volumes being migrated to the virtualized environment. Add to the column headings to include the **ID**, **In Migration Pool**, and **# of Copies**.

Start New Migration		Actions	Filter		Show
ID	Volume Name	Target Pool	Status	Progress	UID
12	FA1-APP2DATA_V	FA1-DS3KSATA	✓ Online	28%	600507680CAB82BE0000000000000000
13	FA1-APP3VOL_V	FA1-DS3KSATA	✓ Online	28%	600507680CAB82BE0000000000000000

- 130.Observe the Progress column status bar which indicates that the volume synchronization background tasks are in progress.
- 131.Observe the # of Copies column which indicates that each volume has two copies. The original image type copy in the migration pool and a second copy in the target SATA pool.
- 132.Navigate to **Pools > Volumes by Pool**.
- 133.Click **MigrationPool\_8192** in the Pool Filter list.
- 134.Observe that two MDisks and two volume copies reside in this pool and its Volume Allocation capacity bar shows 100% utilization.
- 135.Add to the display the **Pool** column and verify that each copy of the volume is in its own pool.



### Note

The Volume Allocation status bar now reflects the updated allocated capacity at the system level.

- 136.Right-click the **copy 0** version of the **APP2DATA\_V** entry. Select **Properties**, and click the [View more details](#) link. Observe that the virtualization type of the volume.
- 137.Right-click the **copy 1** version of the **APP2DATA\_V** entry. Select **Properties**, and click the [View more details](#) link. Observe that the virtualization type of the volume.



### Questions

Record the Virtualization type of the following volumes:

APP2DB\_V Copy 0 \_\_\_\_\_

APP2DB\_V Copy 1 \_\_\_\_\_

- 138.Right-click the volume name for the **APP2DATA\_V** entry. Select **View Member MDisks**. The default view for this tab shows the extent distribution for **Both Copies** of the volume.
- 139.Click **Both Copies** and select each copy in the drop-down list to view extents per each copy.



### Information

The extent size for the MigrationPool\_8192 is 8192 MB. Thus only two extent pointers are needed for the image copy. An extent size of 1 GB was chosen for the other pools. Thus the striped copy requires more extent pointers to address volume.

- \_\_\_ 140.Click **Close**.
- \_\_\_ 141.Navigate to **Hosts > Volumes by Host**.
- \_\_\_ 142.Select your **WIN** server. Verify that the APP\*\_V volumes created earlier through the Migration Wizard are listed.



### Information

When a volume has two copies, reads and writes occur on the primary copy which by default is copy 0. The GUI flags the primary copy with an asterisk. To maintain the mirror, copy 1 is updated with writes but is not used for reads.

In some scenario, it might be desirable to drive both reads and writes to copy 1 which is the destination copy of the data migration effort. This switch can be done easily.

- \_\_\_ 143.Right-click **Copy 1** of the **APP2DATA\_V** volume. Select **Make Primary**.
- \_\_\_ 144.Review the generated **svctask chvdisk -primary** command. This task will make copy 1 with read and write copy access. Copy 0 will be updated with write activity but no longer used for reads. Click **Close**.
- \_\_\_ 145.Right-click **Copy 1** of the **APP3VOL\_V** volume. Select **Make Primary**.
- \_\_\_ 146.Review the **svctask chvdisk -primary** command generated. Click **Close**.
- \_\_\_ 147.Navigate to your **WIN** server **C:\Software\classFolders**.
- \_\_\_ 148.Copy the **\FolderPics-100MB** to the APP3VOL volume to generate some write activity.



### Note

This new write activity will cause both copies of the volume to be updated. The host is totally unaware that two sets of extents exist for the volume.

- \_\_\_ 149.Navigate to the V9000 management GUI.
- \_\_\_ 150.Navigate to **Pools > MDisks by Pools**.
- \_\_\_ 151.Observe that the capacity bar of the MigrationPool\_8192 has no free capacity.

**Note**

The two MDisks have an access mode of image as all their extents are associated with copy 0 of the two volumes.

- 
- \_\_\_ 152.Observe the capacity bar and capacity utilization numbers of the SAS pool. Copy 1 for the two volumes has increased the consumed capacity of this pool.
  - \_\_\_ 153.Navigate to **Pools > Volumes by Pools**.
  - \_\_\_ 154.To speed up the copy process, right-click on the **APP2DATA\_V** volume entry:
    - \_\_\_ a. Select **Modify Mirror Sync Rate**.
    - \_\_\_ b. Change the sync rate from 50 to **100**. Click **Modify**.
  - \_\_\_ 155.Examine the **svctask chvdisk -syncrate** command. Click **Close**.
  - \_\_\_ 156.Right-click on the **APP3VOL\_V** volume entry.
    - \_\_\_ a. Select **Modify Mirror Sync Rate**.
    - \_\_\_ b. Change the sync rate from 50 to **100**. Click **Modify**.
  - \_\_\_ 157.Examine the **svctask chvdisk -syncrate** command. Click **Close**.

**Note**

The two synchronization tasks should complete fairly quickly.due to the increase in the copy rate.

---

## Section 12:Finalize the migration of the volumes

- \_\_\_ 158.From the Admin server, navigate to **Pools > System Migration**.
- \_\_\_ 159.Verify that the progress bars for the two volumes contain **100%**, that is, if the background synchronization for the two volume copies in the target pool has completed.



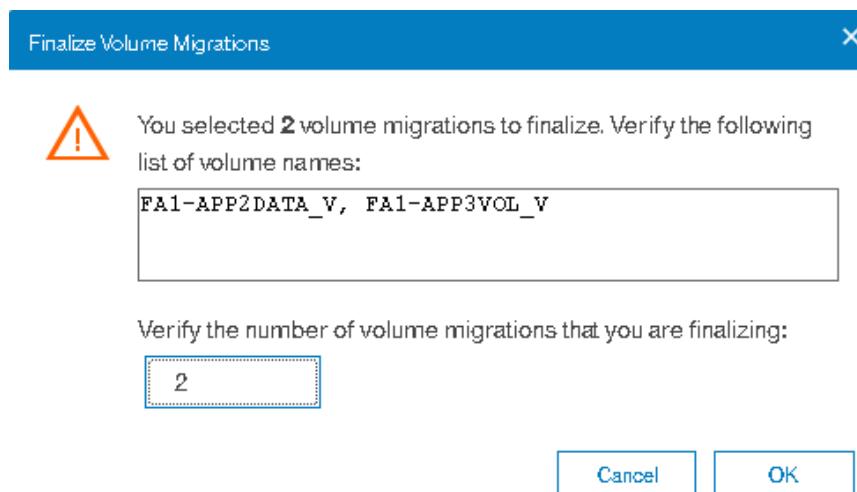
### Note

Subsequent writes cause both copies to be updated so that the data in the original LUNs are still maintained to currency.

- \_\_\_ 160.Multi-select both volume entries. Right-click and select **Finalize**.

ID	Volume Na... ↑	Target Pool	Status	Progress	UID
12	FA1-APP2DATA_V	FA1-DS3KSATA_	✓ Online	100%	<span style="border: 1px solid #ccc; padding: 2px;">Start New Migration</span>
13	FA1-APP3VOL_V	FA1-DS3KSATA_	✓ Online	100%	<span style="border: 1px solid #ccc; padding: 2px;">Start Migration</span>

- \_\_\_ 161.The finalize process deletes copy 0 of each volume. The GUI requires confirmation for object deletions. Enter a **2** in the **Finalize Volume Migrations** box then click **OK** to delete the two copies.



- \_\_\_ 162.Examine the two `svctask rmvdiskcopy` commands generated to delete copy 0 of each volume. Click **Close**.

**Note**

This invocation of the Migration Wizard has completed. Observe that the existing data from the original two LUNs has become V9000 managed and virtualized. The System Migration view is now reset for subsequent migration requests.

- 
- \_\_\_ 163. Navigate to **Volumes > Volumes by Host**. Click **WIN** server in the host filter. If required, add **ID** and **Copy ID** to the display.
  - \_\_\_ 164. Examine the volume entries. Only copy 1 is left. The host is not aware that copy 0 has been deleted. Reads and writes are now sourced from copy 1 of each volume.
  - \_\_\_ 165. Navigate to **Pools > MDisks by Pools**.
  - \_\_\_ 166. Observe that the **MigrationPool\_8192** no longer includes your MDisks.
- 

**Teamwork**

When an image type volume is deleted, its corresponding MDisk is automatically removed from the storage pool. Do not delete the **MigrationPool\_8192** as it might be a shared resource.

- 
- \_\_\_ 167. Navigate to **Pools > External Storage**. Locate the APP2DATA and APP3VOG MDisks.
- 

**Questions**

What is the value of the mode attribute for of the APP2DATA and APP3VOL MDisks? \_\_\_\_\_

---

**Note**

The removed MDisks now have an access mode of unmanaged. When the APP\* LUNs are unassigned to the V9000 from the DS3K, these MDisk entries will be deleted automatically the next time a Discover Storage (or detectmdisk from the CLI) function is invoked.

The Migration Wizard can then be invoked to import the next set of related external storage LUNs, or use an alternative to the Migration Wizard which is the Import Wizard.

- 
- \_\_\_ 168. **Log out** from the V9000 management GUI session.
  - \_\_\_ 169. Exit from the V9000 management CLI session.
  - \_\_\_ 170. Click **Start > Logoff** to exit from the WIN server.

**End of exercise**

---

# Exercise 13. Migrate existing data with Import Wizard CLI

## Estimated time

00:45

## Overview

This exercise exploits the FlashSystem V9000 Import Wizard CLI interface to migrate existing data to the V9000 environment. The student will work directly with the backend storage LUN from an AIX server to initialize and populate it with data. The LUN will be then migrated to the V9000 and accessed from the AIX server through the V9000.

## Objectives

- Carry out the migration of LUNs to the V9000 virtualized environment using the V9000 Import Wizard CLI interface.

# Exercise instructions

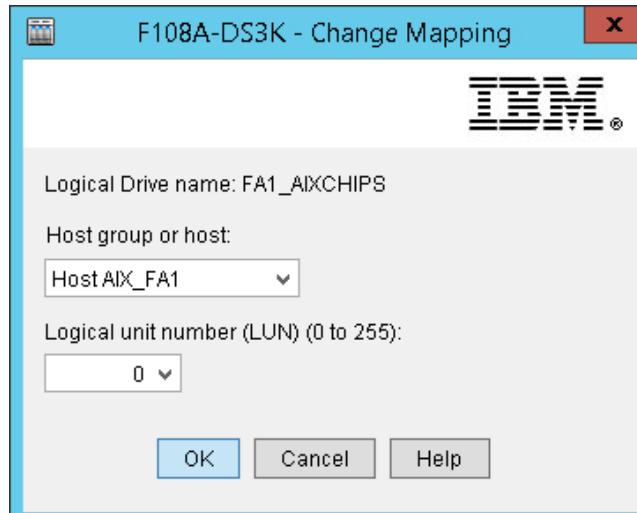
## Section 1: Assign backend LUN to AIX host group

This procedure accesses the backend storage subsystem to assign one LUN to the AIX server host. Once assigned, the LUN is initialized using the AIX server and they are placed offline from the host.

- 1. From the Admin server desktop, double-click the **DS Storage Manager Client** icon.
- 2. From the DS Storage Manager (Enterprise Management) **Devices** tab, double-click the storage subsystem entry representing the **DS3K** backend storage subsystem.
- 3. The system might prompt you to set a Monitor password for the storage subsystem. Click **No** to continue.
- 4. The DS Storage Manager (Subsystem Management) displayed. From the DS Storage Manager (Subsystem Management) view, click **Host Mappings** tab.
- 5. Click on the Host Group called **V9KxSET** (where **x** is your team environment ID).
- 6. Locate the logical drive named **x\_AIXCHIPS** (where **x** is your team set ID).
- 7. Right-click **x\_AIXCHIPS** and select **Change**.

Logical Drive Name	Accessible By	LUN	Logical Drive Capacity	Type
FA1_AIXCHIPS	Host Group V9KASET	0	5.127 GB	Standard
FA2_AIXCHIPS	Host Group V9KASET	5	5.127 GB	Standard
FA2_APP1DB	Host Group V9KASET	6	12.000 GB	Standard

- 8. The Change Mapping window is displayed. Click the **Host Group** window.
- 9. From the pull down list, select your Host **AIX\_x** server (where **x** is your team set ID).
- 10. Accept the default LUN number (example 0) for this logical drive. Click **OK**.



- 
- \_\_\_ 11. A warning pop-up window appears. Click **Yes** to confirm that you want to change the mapping.



### Note

If this is the first time you have logged into the DS Storage Manager, the system will prompt you to enter the storage subsystem password to validate the operation. This task only needs to be performed once. If not, skip the next step.

- 
- \_\_\_ 12. Enter the storage subsystem password. Click **OK** (refer to the team lab data sheet).



### Troubleshooting

This task might re-direct you to the DS Storage Manager (Enterprise Management) **Devices** tab. If so, navigate back to the DS Storage Manager (Subsystem Management) **Host Mappings** tab view.

- 
- \_\_\_ 13. Click on your **Host AIX\_x** host. Verify that the **AIXCHIPS** LUN is now mapped to the team assigned AIX host.

Logical Drive Name	Accessible By	LUN	Logical Drive Capacity	Type
FA1_AIXCHIPS	Host AIX_FA1	0	5.127 GB	Standard
Access	Host AIX_FA1	31		Access



### Questions

What is the App\* LUNs size and LUN ID?

LUN name	Size	LUN#
x_AIXCHIPS		

- 
- \_\_\_ 14. Minimize the DS Storage Manager session window.

## Section 2: Initialize the backend LUN on the AIX server

This procedure discovers and initializes the LUN directly from the backend storage device on the AIX server. Once the LUN is initialized and data is written on the LUN, the LUN is placed offline to the AIX host and removed from host access.



### Attention

Scripts have been provided to make this process a bit quicker and easier.

- \_\_\_ 15. From the Admin server desktop, open an SSH session to your AIX server.
- \_\_\_ 16. Login with the assigned credentials (refer to the team lab data sheet).
- \_\_\_ 17. Enter the `ls` command to view a list of files in the directory. Locate the `course-scripts` folder.
- \_\_\_ 18. Enter the `PATH=$PATH:/course-scripts` command to add the `/course-scripts` directory to the command path variable.
- \_\_\_ 19. Enter the `ls /course-scripts` command to list the files in this directory.



### Questions

Record the each file listed. You will used these files to sequentially execute the next following steps.

---



---



---

- \_\_\_ 20. Enter the `1-scandisk` script command to list the disk configuration and discover the new LUN.
- 



### Example

```
# 1-scandisk
hdisk0 Available           Virtual SCSI Disk Drive
hdisk1 Available 73-T1-01 MPIO FC 2145
```

Compare the difference between the report above vs the report below.

```
hdisk0 Available           Virtual SCSI Disk Drive
hdisk1 Available 73-T1-01 MPIO FC 2145
hdisk2 Available 73-T1-01 MPIO DS3500 Disk
*****
Note the added hdisk number which represents the new external storage.
Enter the command '2-createdisk X' (Where X is the number of the hdisk).
*****
#
#
```



## Questions

Record the new `hdisk` number \_\_\_\_\_

- 21. Enter the `2-createdisk x` script command to create the logical volume, logical volume log, file system and mount point of `/CHIPSVGMP`. (Where `x` is the number associated with the new discovered hdisk)

1+1=2

## Example

```
# 2-createdisk 2
Create logical volume on hdisk2
rootvg
F108A1VG
hdisk0      00f71842dd6380b4          rootvg        active
hdisk1      00f71842d701c078         F108A1VG     active
hdisk2      00f71842e0208765           None
CHIPSVG
hdisk0      00f71842dd6380b4          rootvg        active
hdisk1      00f71842d701c078         F108A1VG     active
hdisk2      00f71842e0208765           CHIPSVG     active
CHIPSVG:
LV NAME      TYPE      LPs      PPs      PVs   LV STATE      MOUNT POINT
  hdisk2      U8233.E8B.101842R-V51-C383-T1-W500507680C2457C0-L0  MPIO FC
2145
      Manufacturer.....IBM
      Machine Type and Model....2145
      ROS Level and ID.....0000
      Device Specific.(Z0).....0000063268181002
      Device Specific.(Z1).....020320e
      Serial Number.....600507680C8382BE00000000000000000000000000000000
Based on the parameters chosen, the new /CHIPSVGMP JFS file system
is limited to a maximum size of 134217728 (512 byte blocks)
```

New File System size is 524288

CHIPSVG:

LV NAME	TYPE	LPs	PPs	PVs	LV STATE	MOUNT POINT
loglv01	jfslog	1	1	1	closed/syncd	N/A
lv01	jfs	32	32	1	closed/syncd	/CHIPSVGMP

\*\*\*\*\*
Logical volume is created on the added hdisk with mount point /CHIPSVGMP.  
Take note of the LV NAME of loglvXX.

Enter the command '3-mountdisk XX' to mount the LV  
(where XX is the LV name number).

\*\*\*\*\*#



## Questions

Record the number in the LV Name `loglv##` \_\_\_\_\_

- \_\_\_ 22. Enter the `3-mountdisk ##` script command to mount the CHIPSVGMP volume to the AIX system.

(Where `##` is the number associated with the LV Name [loglv##])

**1+1=2**

## Example

```
# 3-mountdisk 01
Mount logical volume on /dev/loglv01
/dev/lv01          /CHIPSVGMP      jfs  Aug 31 23:03 rw,log=/dev/loglv01
CHIPSVG:
LV NAME          TYPE     LPs    PPs    PVs  LV STATE    MOUNT POINT
loglv01          jfslog   1      1      1    open/syncd   N/A
lv01             jfs     32     32     1    open/syncd   /CHIPSVGMP
CHIPSVG:
PV_NAME          PV STATE    TOTAL PPs    FREE PPs    FREE DISTRIBUTION
hdisk2            active      767        734        154..120..153..153..154
*****
Logical volume is mounted with mount point /CHIPSVGMP.
Enter the command '4-loaddisk' to create two files on the volume.
*****
```

- 23. Enter the **4-loaddisk** script command to change directory to the new mount point and to write some files to the volume.

### 1+1=2 Example

```
# 4-loaddisk
Copy files to hdisk
lost+found

file1.txt  file2.txt  lost+found
CHIPSVG:
PV_NAME      PV STATE      TOTAL PPs   FREE PPs   FREE DISTRIBUTION
hdisk2        active       767          734        154..120..153..153..154

*****
Two files are created on the Logical volume.
Enter the command '5-remdisk X' to export and remove the hdisk
(Where X is the number of the hdisk).
*****
#
```

### Questions

Record the `hdisk` number \_\_\_\_\_

- \_\_\_ 24. Enter the **5-remdisk #** script command to unmount and set the volume offline.

(Where **#** is the number associated with the new discovered hdisk)

**1+1=2**

### Example

```
# 5-remdisk 2
Removing hdisk2
rootvg
F108A1VG
CHIPSVG
rootvg
F108A1VG
hdisk0      00f71842dd6380b4          rootvg      active
hdisk1      00f71842d701c078          F108A1VG   active
hdisk2      00f71842e0208765          None        None

hdisk2 deleted

hdisk0 Available           Virtual SCSI Disk Drive
hdisk1 Available 83-T1-01 MPIO FC 2145

*****
VG is set offline and exported. hdisk2 is removed
*****
#
```

## Section 3: Assign AIX LUN from the host object to the V9000

This procedure reassigns the LUN on the DS3K storage device to the V9000.

- \_\_\_ 25. Navigate back to the **DS Storage Manager > Subsystem Management > Host Mappings**.
- \_\_\_ 26. Select your **AIX\_x** host group in the object tree (where **x** is your team set ID).
- \_\_\_ 27. Locate your **x\_AIXCHIPS** logical drive (where **x** is your team set ID). Refer to the team lab data sheet.



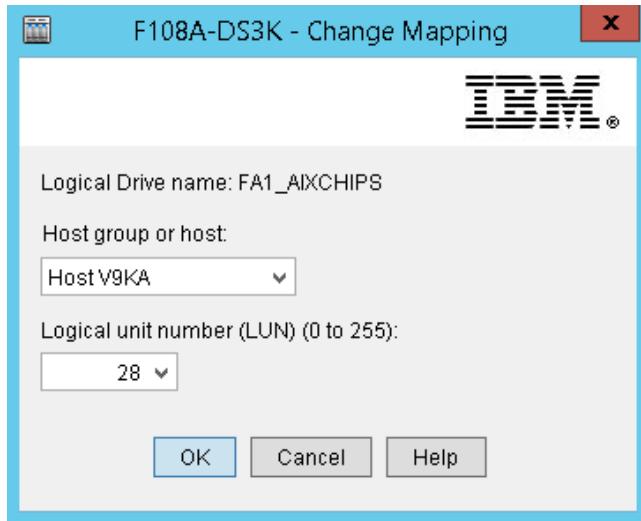
### Note

This logical drive that is currently assigned to the AIX host contains existing data that is to be migrated to the V9000.

V9000 volumes associated with these drives need to be created and then assigned back to the same application host.

- \_\_\_ 28. Right-click on **x\_AIXCHIPS** and select **Change**.
- \_\_\_ 29. The Change Mapping window is displayed. Click the pulldown in the **Host group or Host** window.

- \_\_\_ 30. From the pull down list, select the **HostV9Kx** host (where **x** is your team environment ID). Refer to the team lab data sheet.



- \_\_\_ 31. Accept the default LUN number for this logical drive. Click **OK**.  
 \_\_\_ 32. Warning pop-up window appears. Click **Yes** to confirm that you want to change the mapping.  
 \_\_\_ 33. Click the **Host V9Kx** n the object tree to verify that the LUN has been mapped.



## Questions

What is the AIXCHIPS Logical Drive capacity? \_\_\_\_\_

- \_\_\_ 34. Navigate to **Summary > View Storage Subsystem Profile** in the Monitor pane.  
 \_\_\_ 35. Click **Storage > Logical Drives** tab.  
 \_\_\_ 36. In the **Find:** field, type **x\_aixchips**.  
 \_\_\_ 37. Click the **Find:** field **binoculars** icon several time until Logical Drive name. **x\_AIXCHIPS** is displayed (where **x** is the team set ID).

- \_\_\_ 38. Observe the logical drive properties for the AIXCHIPS drive to locate its logical drive ID.

Logical Drive name:	FA1_AIXCHIPS
Logical Drive status:	Optimal
Thin provisioned:	No
Capacity:	5.127 GB
Logical Drive ID:	60:08:0e:50:00:2d:26:6a:00:00:8b:1f:5a:66:72:9a
Subsystem ID (SSID):	12
Associated array:	300GB10KArray
RAID level:	5
LUN:	28
Accessible By:	Host V9KA



### Note

This identifier is assigned by the storage system to uniquely identify the logical drive.



### Questions

Record the last 4 bytes of the logical drive ID for the x\_AIXCHIPS LUN.

LUN name	LUN #	Last 4 bytes of logical drive ID
x_AIXCHIPS		

- \_\_\_ 39. Click **Close**.

- \_\_\_ 40. Close the DS Storage Manager application.

## Section 4: Import existing AIX data LUN with the V9000 CLI

This procedure uses the V9000 management CLI to import data on an existing LUN previously created by the AIX server. For learning purposes, the CLI provides an opportunity for a closer and more leisurely examination of the image access mode MDisk and its corresponding image virtualization type volume.

- \_\_\_ 41. From the Admin server, open an SSH session to your team V9000 CLI management.
- \_\_\_ 42. Log in using your admin credentials.
- \_\_\_ 43. Enter the `detectmdisk` commands to perform device discovery
- \_\_\_ 44. Enter the `lsmdisk -delim , | grep <last 4 digits of logical drive id>` command previously recorded to list MDisks with an access mode of unmanaged.

**1+1=2**

### Example

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>lsmdisk -delim , -filtervalue
mode=unmanaged | grep f47f
27,mdisk1,online,unmanaged,,,5.1GB,0000000000000001A,DS3500,60080e50002d266a0
000975b5ad6f47f00000000000000000000000000000000,tier_enterprise,no,,,,no,no,
no,no
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

- \_\_\_ 45. Enter the `lsmdisk [ID]` command to list the unmanaged MDisk entry whose controller Logical ID number correlated to the AIXCHIPS LUN recorded previous.

(Where `##` is the number associated with the Logical ID number assigned from the DS3K storage system)



### Questions

What is the MDisk ID? \_\_\_\_\_

What is the MDisk name? \_\_\_\_\_

- \_\_\_ 46. Validate the UID of the MDisk to ensure that it is the LUN of interest from the providing storage device.
- \_\_\_ 47. Enter the `chmdisk -name teamsetID-AIXCHIPS [mdiskID or name]` command syntax to rename the MDisk to `teamsetID-AIXCHIPS` to match its storage device and application name.
- \_\_\_ 48. Enter the `lsmdisk -delim , -filtervalue name=teamsetID-AIX*` command syntax to list the MDisk to ensure that it has been correctly renamed.
- \_\_\_ 49. Enter the `lsmdiskgrp -delim , -filtervalue name=teamsetID*` command syntax to list your storage pools.

**Note**

If the MigrationPool\_1024 pool does not exist, enter the following command syntax to create a storage pool called MigrationPool\_1024 using an extent size of 1 GB. Otherwise, continue to the next step.

```
mkmdiskgrp -encrypt no -ext 1024 -name teamsetID-MigrationPool_1024
```

- 
- \_\_\_ 50. Examine the IDs and extent sizes of each pool. Locate your MigrationPool\_1024. Confirm that this pool is currently empty of MDisks and volumes.
- 

**Questions**

What is the `teamsetID-MigratePool_1024` [ID]? \_\_\_\_\_

- 
- \_\_\_ 51. Enter the `lsiogrp` command to view the number of volumes (vdisks) that are owned by each I/O group.
  
  - \_\_\_ 52. Enter the following `mkvdisk` command syntax to import or create an image type volume. The command syntax specifies the I/O group as 0, the migration pool as the pool in which the volume will reside in, the AIXCHIPS MDisk that contains the incoming existing data, a volume name as `teamsetID-AIXCHIPSV`, and a volume type of `image`.

```
mkvdisk -iogrp [ID] -mdiskgrp [ID] -mdisk teamsetID-AIXCHIPS -name
teamsetID-AIXCHIPS_V -vtype image
```

**Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>mkvdisk -iogrp 0 -mdiskgrp 4 -mdisk
FA1-AIXCHIPS -name FA1-AIXCHIPS_V -vtype image
Virtual Disk, id [12], successfully created
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

**Questions**

What is the Virtual disk ID number? \_\_\_\_\_

- 
- \_\_\_ 53. Using the Virtual Disk ID, enter the `lsvdisk [ID]` command to list the details of the new volume by its ID value.
  - \_\_\_ 54. Verify that the vdisk has been assigned to the Migration\_1024 pool.

**Note**

The volume type is image and it is currently tied to exactly one MDisk ID; AIXCHIPS. The volume's capacity is derived from the capacity of the MDisk.

**Questions**

What is the capacity of the AIXCHIPS vdisk? \_\_\_\_\_

- \_\_\_ 55. Enter the `lsmdisk teamsetID-AIXCHIPS` command to list the details of the AIXCHIPS MDisk. Observe that it now has an access mode of image.

**Questions**

What is the capacity of the AIXCHIPS mdisk? \_\_\_\_\_

- \_\_\_ 56. Enter the `lsmdiskgrp [ID]` command to list the details of your MigrationPool\_1024.
- \_\_\_ 57. Observe that it has exactly one MDisk and one volume (vdisk). The pool's capacity is derived from the MDisk's capacity.
- \_\_\_ 58. Enter the following command syntax to assign the volume to the AIX host.

```
mkvdiskhostmap -host teamname-AIX teamsetID-AIXCHIPS_V
```

**Example**

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>mkvdiskhostmap -host F108A1-AIX
F11-AIXCHIPS_V
Virtual Disk to Host map, id [1], successfully created
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

- \_\_\_ 59. Enter the `lshostvdiskmap teamname-AIX` command to list the volumes that are assigned to this host.

**Questions**

What are the last four digits of the VDisk's UID for the AIXCHIPS\_V volume? \_\_\_\_\_

What are the last four digits of the VDisk's UID for the previously assigned AIX volume? \_\_\_\_\_

## Section 5: Access the MDisk from the AIX server

- \_\_\_ 60. Navigate back to the SSH session with the AIX server.
  - \_\_\_ 61. Enter the `cfgmgr` command to perform host device discovery.
  - \_\_\_ 62. Enter the `lsdev -Cc disk` to list the disk devices. Observe the second 2145 hdisk number. This number will be referred as **z**.
- 

1+1=2

### Example

```
# cfgmgr
# lsdev -Cc disk
hdisk0 Available           Virtual SCSI Disk Drive
hdisk1 Available 73-T1-01 MPIO FC 2145
hdisk2 Available 73-T1-01 MPIO FC 2145
```

---



---



### Questions

Record the last hdisk number \_\_\_\_\_

- \_\_\_ 63. Enter the SDDPCM `pcmpath query device` command to list the hdisks and validate hdisk[z's] SERIAL: number with its volume UID. (Where **z** is the hdisk number)
- 

1+1=2

### Example

```
# pcmpath query device 3

DEV#:    3  DEVICE NAME: hdisk2  TYPE: 2145  ALGORITHM: Load Balance
SERIAL: 600507680CB982BE000000000000000013  VENDOR: IBM  SIZE: 5.13 GB

=====
Path#      Adapter/Path Name          State   Mode   Select  Errors
0*        fscsi0/path0            OPEN    NORMAL  9       0
1         fscsi0/path1            OPEN    NORMAL  10      0
2         fscsi1/path2            OPEN    NORMAL  9       0
3*        fscsi1/path3            OPEN    NORMAL  9       0
#

```

---

- \_\_\_ 64. Enter the `lspv` command to list the physical volumes.

- \_\_\_ 65. Enter the `importvg -y CHIPSVG hdiskz` to import the volume group associated with hdisk.  
 (Where `z` is the hdisk number)
- \_\_\_ 66. Re-Enter the `lspv` list the physical volumes.
- 

### Example

```
# lspv
hdisk0      00f71842dd6380b4          rootvg      active
hdisk1      00f71842d701c078          F108A1VG   active
hdisk2      00f71842e685c5d4          CHIPSVG    active
#
```

---

- \_\_\_ 67. Enter the `lsvg -l CHIPSVG` command to list the logical attributes of the volume group to obtain its mount point.
- 

### Example

```
# lsvg -l CHIPSVG
CHIPSVG:
LV NAME      TYPE     LPs    PPs    PVs   LV STATE    MOUNT POINT
loglv01     jfslog    1      1      1    closed/syncd N/A
lv01        jfs       32     32     1    closed/syncd /CHIPSVGMP
#
```

---

- \_\_\_ 68. Enter the `mount /CHIPSVGMP` command to mount its mount point.  
 \_\_\_ 69. Enter the `lsvg -l CHIPSVG` command to list the volume group again.
- 

### Example

```
# mount /CHIPSVGMP
# lsvg -l CHIPSVG
CHIPSVG:
LV NAME      TYPE     LPs    PPs    PVs   LV STATE    MOUNT POINT
loglv01     jfslog    1      1      1    open/syncd  N/A
lv01        jfs       32     32     1    open/syncd /CHIPSVGMP
#
```

---

**Note**

As the mount command is processed, the LV State progressed from closed to open.

- 
- \_\_\_ 70. Enter the `cd /CHIPSVGMP` command to change the directory to the volume group's mount point
  - \_\_\_ 71. Enter the command `ls` list the existing data.
  - \_\_\_ 72. Enter `cat file#.txt` command for each cat file to view the file content.
- 

**Example**

```
# cat file1.txt
This file is being written before migration to V9000
# cat file2.txt
This file is to keep track how many potatochips I ate ;)
#
```

- 
- \_\_\_ 73. Enter the `pmpath query device z` to view the disk paths and the path Select counts. command. (Where `z` is the device number)

## **Section 6: Migrate from image to striped mode using the CLI**

Up to this point, the image type volume and all of its data extents are residents of the image mode MDisk. This procedure uses the V9000 CLI to migrate the volume from image to striped.

- \_\_\_ 74. Navigate back to the V9000 CLI management session.
  - \_\_\_ 75. Enter the following commands to confirm the data extent relationships between the AIXCHIPSV volume and the AIXCHIPS MDisk.
    - \_\_\_ a. `lsvdiskextent teamsetID-AIXCHIPS_V`
    - \_\_\_ b. `lsmdiskextent teamsetID-AIXCHIPS`
    - \_\_\_ c. `lsfreeextents teamsetID-AIXCHIPS`
- 

**Note**

Observe all the extents (of 1024 MB each) of the volume reside on the same MDisk. All extents of the MDisk are being used by the same volume as there is no free space on the MDisk.

The migration from image to striped will complete fairly quickly. Be prepared to access the AIX PuTTY session as we will want to enter a `copy` command on AIX while the migration is in progress.

- 
- \_\_\_ 76. Enter the `lsmdiskgrp -delim , -filtervalue name=teamsetID*` command to list your pools.



## Questions

What is the SATA pool ID? \_\_\_\_\_

- \_\_\_ 77. Enter the following command syntax to migrate the AIXCHIPS\_V volume to the SATA pool.

```
migratevdisk -mdiskgrp [satapoolID] -vdisk teamsetID-AIXCHIPS_V
```

**1+1=2**

## Example

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>migratevdisk -mdiskgrp 3 -vdisk FA1-AIXCHIPS_V
```

- \_\_\_ 78. Enter the **lsmigrate** to monitor the migration progress.
- \_\_\_ 79. Recall the following commands to examine the volume and MDisk extent distributions during migration. Then move quickly to the AIX PuTTY session.
- \_\_\_ a. **lsvdiskextent teamsetID-AIXCHIPS\_V**
  - \_\_\_ b. **lsmdiskextent teamsetID-AIXCHIPS**
  - \_\_\_ c. **lsfreeextents teamsetID-AIXCHIPS**
- \_\_\_ 80. Navigate back to the AIX SSH session.
- \_\_\_ 81. Enter the **cp -r /usr/man /CHIPSVGMP/** command to copy a file directory to the volume group to generate I/O activity. Ignore any warning messages from the copy operation.

**1+1=2**

## Example

```
# cp -r /usr/man /CHIPSVGMP/
cp: mklost+found.htm: No such file or directory
cp: Rsh.htm: No such file or directory
#
```

- \_\_\_ 82. Enter the **pcmpath query device z** command to changes to the Select field indicating the number of times an I/O was directed to each path for the device. (Where **z** is the device number)
- \_\_\_ 83. Navigate back to the V9000 CLI management session.
- \_\_\_ 84. After migration completes, recall previous commands to list the extent distributions of the volume and MDisk again.
- \_\_\_ a. **lsvdiskextent teamsetID-AIXCHIPS\_V**

- b. `lsmdiskextent teamsetID-AIXCHIPS`
  - c. `lsfreeextents teamsetID-AIXCHIPS`
- 

**Note**

The extents of the AIXCHIPS\_V volume are now striped across the MDisks of the SATA pool. The AIXCHIPS MDisk is not providing extents to any volume and has free extents.

- 
- 85. Re-call the `lsvdisk -delim , -filtervalue name=teamsetID-AIX*` command to list your AIXCHIPS\_V VDisk.
  - 86. Verify that the AIXCHIPS\_V has changed to a striped virtualization type.
  - 87. Enter the `lsmdisk -delim , -filtervalue name=teamsetID-AIX*` command to list the AIXCHIPS MDisk.
- 

**Questions**

Record the AIXCHIPS access mode \_\_\_\_\_

Record the AIXCHIPS capacity \_\_\_\_\_

- 
- 88. Enter the `lsmdiskgrp [migrationpoolID]` command to list the details of the storage pool that contains the AIXCHIPS MDisk.
  - 89. Enter the following command syntax to remove AIXCHIPS MDisk from its pool.  
`rmmdisk -mdisk teamsetID-AIXCHIPS teamsetID-MigrationPool_1024`
  - 90. Enter the `rmmdiskgrp [migrationpoolID or name]` command to delete your empty MigrationPool\_1024.
  - 91. Enter the `lsmdiskgrp -delim , -filtervalue name=teamsetID*` command syntax to confirm that your Migration\_1024 pool has been removed from the list of system pools.
  - 92. Type `exit` the V9000 CLI session.
  - 93. Type `exit` to close the AIX server session.
  - 94. From the Admin server desktop, open a browser window.
  - 95. Enter the URL of your V9000 management IP address.
  - 96. Log in using your admin credentials.
  - 97. Navigate to the **Pools > Volumes by Pools**, and select you SATA pool in the pool filter.
  - 98. Observe that your AIXCHIPS\_V volume is now included in the volume displays.
  - 99. Log out from the V9000 management GUI.

**End of exercise**

---

# Exercise 14. Real-time Compression and the IBM Comprestimator

## Estimated time

00:45

## Overview

This exercise explores the functions provided by Real-time Compression to reduce capacity consumption. The student creates a compressed volume, migrates a current volume to a compressed volume, uses the IBM Comprestimator tool, analyzes the capacity utilization of compressed volumes, and views the performance impact of compression.

## Objectives

- Create a compressed volume using the V9000 management GUI.
- Use the IBM Comprestimator utility to identify candidate volumes for compression.
- Convert an existing volume to a compressed volume.

## Exercise instructions

### Section 1: Explore Real-time Compression indicators in the GUI

- \_\_\_ 1. From the Admin server desktop, open a browser window.
- \_\_\_ 2. Enter the URL of your team V9000 management IP address.
- \_\_\_ 3. Log in using your admin credentials (refer to the team lab data sheet).

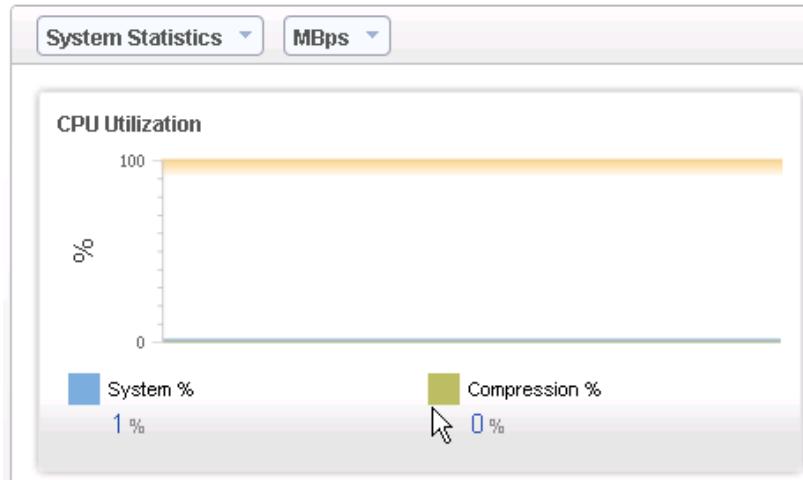


#### Information

FlashSystem V9000 base software license includes: IBM FlashCopy, Easy Tier, Real-time Compression and mirroring. Two Compression Accelerators must be installed in each FlashSystem V9000 Control Enclosure in the configuration. Real-time Compression license is required per external storage subsystem support.

Real-time Compression is activated for an I/O group when the first volume copy with the compressed attribute is allocated in the I/O group. The compression feature is automatically deactivated when the last compressed volume copy is removed from the I/O group.

- \_\_\_ 4. Navigate to **Monitor > Performance**. Examine the CPU utilization value.
- \_\_\_ 5. Click the check box associated with the **Compression %** to prepare for subsequent viewing of compression statistics.



- \_\_\_ 6. Navigate to **Volumes > Volumes by Pool**.
- \_\_\_ 7. Select your **HYBRID** pool (a child pool of the mdiskgrp0 pool) from the Pool Filter list.
- \_\_\_ 8. Examine the list of volumes and the allocated capacity for this pool.

**Note**

Some of the volumes in this pool are fully allocated. The percentage value shown in the capacity bar is the percent of extents from the pool allocated to VDisks in the pool, which distinguish between space allocated from the pool vs. space consumed by data compared to the total physical capacity of the pool.

- 
- \_\_\_ 9. Examine the thin-provisioned volumes that resides in this pool and their allocation.
- 

**Note**

For pool allocation metrics (allocated or real capacity) is the amount of storage allocated to VDisks from the pool. While the capacity or virtual capacity represents the sum of space hosts see for their volumes. Thin provisioning allows the virtual capacity to exceed the pool's allocated capacity.

- 
- \_\_\_ 10. Navigate to **Volumes > Volumes by Host**.
  - \_\_\_ 11. Select your **WIN** host. Examine the volumes that have been mapped to this host.
- 

**Hint**

You can use the **Filter Search** field to search for your team resources, including user name, pool, volume, host, and so on.

---

## Section 2: Create a compressed volume

- \_\_\_ 12. From your **WIN** host, click **Create Volumes**.
- \_\_\_ 13. Select the **Custom** preset.
- \_\_\_ 14. Create a volume and assign it to a storage pool using the following parameter:
  - \_\_\_ a. Volume copy type: **Accept default None**
  - \_\_\_ b. Pool: ***teamsetID*-Hybrid**
  - \_\_\_ c. Caching I/O group, Preferred node and Accessible I/O groups: **Accept all defaults**.
  - \_\_\_ d. Quantity: **1**.
  - \_\_\_ e. Capacity: **50 GiB**
  - \_\_\_ f. Volume name: ***teamsetID*-COMP** (Refer to the team lab data sheet)
  - \_\_\_ g. Capacity savings: **Compressed**.
  - \_\_\_ h. Compressed section: **Accept all defaults**
    - Real capacity: 2=% of Virtual Capacity
    - Automatically to expand: Enabled
    - Warning threshold: Enabled = 80% of Virtual Capacity
  - \_\_\_ i. General section: **Accept defaults**
    - Cached mode: Enabled
    - OpenVMS UDID: Leave blank



### Note

Automatic allows the system to automatically assign volumes to an I/O group for caching and accessibility.

- \_\_\_ j. Verify that the volume Summary information is correct.

**Create Volumes**

Basic      Mirrored      **Custom**

Create preset volumes with all options available to customize.

**Volume Location**

Volume copy type:

Pool:

Caching I/O group:  Preferred node:  Accessible I/O groups:

**Volume Details**

Quantity:  Capacity:  GiB Name: FA1-COMP

Capacity savings:

**Compressed**

Real capacity:  % of Virtual capacity

Automatically expand:  Enabled

Warning threshold:  Enabled  % of Virtual capacity

**General**

Cache mode:

OpenVMS UDID:

**Summary**

1 volume in pool FA1-Hybrid

Caching I/O group: Automatic

Preferred node: Automatic

Accessible I/O group: Only the caching I/O group

1 volume

Volume name: FA1-COMP

Capacity Savings: Compressed

Compression:

Real capacity: 2% of virtual capacity

Automatically expand: Enabled

Warning threshold: 80 % of virtual capacity

Format volume: Enabled

Cache mode: Enabled

OpenVMS UDID: None

Capacity:

Total real capacity: 1.00 GiB

Total virtual capacity: 50.00 GiB

**Questions**

How much physical (real) space is allocated for the new compressed volume? \_\_\_\_\_

- k. Click **Create and Map**.
15. Examine the generated **svctask mkvdisk** command syntax used to create the compressed volume.

**Note**

Like thin-provisioned volumes, compressed volumes have virtual, real, and used capacities. Compressed volumes have an additional attribute called **-compressed** which indicates the volume data is automatically compressed as written.

16. Click **Continue**.
17. The Create Mapping window is displayed.
- a. Select your **WIN** host. Click **Next**.
- b. Verify that your **COMP** volume is highlighted. Click **Map Volumes**.

- \_\_\_ 18. Examine the `svctask mkvdiskhostmap` command generated to map the volume to the WIN host. Note that the host ID and volume IDs are referenced in the output. Click **Close**.
  - \_\_\_ 19. Confirm that the **COMP** volumes has been mapped to your WIN host.
- 



### Information

The FlashSystem V9000 GUI uses the compression icon as an eye-catcher to flag the volume as a compressed volume.

- \_\_\_ 20. Right-click the **COMP** volume entry. Select **Volume Copy Action**.
  - \_\_\_ 21. Select **Properties** from the pop-up list to view volume details. Click the [View more details](#) link to expand the view.
- 



### Information

A newly allocated compressed volume starts with a very small amount of real capacity allocated (GUI default is 2% of virtual).

- \_\_\_ 22. Hover the mouse pointer over the capacity allocation bar.
- 



### Questions

What is the allocated capacity value for the COMP volume? \_\_\_\_\_

- \_\_\_ 23. Click **Close**.
  - \_\_\_ 24. Right-click your **COMP** volume entry. Select **View Member MDisks**. Examine the volume's extent distribution.
- 



### Note

A compressed volume is also a striped volume, and its extents are distributed across the MDisks of the pool. Since the volume was created in a Hybrid (CHILD) pool, its extents are being sourced from the mdiskgrp0 (Parent) pool in this example.

- \_\_\_ 25. Click **Close**.
- \_\_\_ 26. Right-click the **COMP** volume entry. Select **Properties**.
- \_\_\_ 27. Click the [View more details](#) link to expand the volume detail view. Locate the Preferred node value.



## Questions

What is the preferred node for the COMP volume? \_\_\_\_\_

- \_\_\_ 28. Click **Close**.
- \_\_\_ 29. Navigate to **Volumes > Volumes by Pool**.
- \_\_\_ 30. Select the **HYBRID** pool.
- \_\_\_ 31. Right-click on any column and add **Real Capacity**, **Used Capacity**, and **Compression Savings**, columns to the display.
- \_\_\_ 32. Examine the number of volumes currently assigned to your Hybrid pool.
- \_\_\_ 33. Examine the two capacity bars for the Hybrid pool. Hover the mouse pointer over the Pool Allocation bar to view the virtual capacity for the pool.

## Section 3: Access the compressed volume from a host server

- \_\_\_ 34. From the Admin server desktop, double-click on the **Remote Desktop Connection** icon to start a remote desktop session.
- \_\_\_ 35. Observe the IP address of your WIN server. Click **Connect**.
- \_\_\_ 36. Log in with your WIN server credentials (refer to the team lab data sheet).
- \_\_\_ 37. The system might be compelled to issue a security certificate warning on authentication. If so, click **Yes** to continue.
- \_\_\_ 38. Navigate to **Server Manager > Storage > Disk Management**.



## Troubleshooting

If the system has not automatically discovered the disk, select **Action > Rescan Disks**. Then, right-click on the left pane of the disk number, and select **Initialize**.

- \_\_\_ 39. Accept the **MBR** default and click **OK** to continue.
- \_\_\_ 40. Right-click on the right pane of the unallocated area of the new disk. In the menu list, click **New Simple Volume**.
- \_\_\_ 41. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
  - \_\_\_ a. Accept the default capacity value. Click **Next**.
  - \_\_\_ b. Accept the default drive letter. Click **Next**.
  - \_\_\_ c. Relabel the volume as ***teamsetID-COMP***. Click **Next**.
  - \_\_\_ d. Click **Finish** to complete the disk allocation.
- \_\_\_ 42. Examine the list of disks on the WIN host. Locate the two disk entries named ***teamsetID-THIN*** and ***teamsetID-COMP***.



## Questions

Record the Windows drive letters for the following volumes:

THIN \_\_\_\_\_ COMP \_\_\_\_\_

- 
- \_\_\_ 43. Open Windows Explorer and navigate to your `C:\Software\ClassFolders\`. Copy the **FolderDB-4GB** to the THIN volume.



## Important

The next few steps will be time-sensitive. Recommend that you read ahead before you execute the steps.

- 
- \_\_\_ 44. Copy all the folders from the **THIN** disk to the **COMP** disk to ensure that the consumed capacity of the two volumes will be identical (***Do not*** wait for the copy to get going. Immediately move to the next step).
  - \_\_\_ 45. Navigate back to the **V9000 Monitoring > Performance** view.
  - \_\_\_ 46. Observe the performance indicators (bottom tray) of the GUI. Examine the Latency, Bandwidth, and IOPS activities that is occurring while the folders are being copied to the **COMP** volume drive.
  - \_\_\_ 47. From the **Performance** view, examine CPU utilization for the Compressed %.
- 



## Note

This represents the performance that is being performed by the preferred node of the volume.

- 
- \_\_\_ 48. Hover the mouse pointer over the compression graph to view compression CPU utilization statistics that is being captured at 5-second intervals.
- 



## Note

The compression CPU utilization statistics are at 5-second intervals. Due to cache de-staging, there should still be some activity associated with Compression CPU utilization even after the copy activity has completed on the WIN host.

- 
- \_\_\_ 49. Navigate back to your **WIN** server and confirm that the folders have been copied to the **COMP** volume.
  - \_\_\_ 50. Right-click in the **Windows Explorer** view of the **COMP** volume to open its properties notebook. Review the volume's used versus free space values as tracked by Windows.

- \_\_\_ 51. Right-click in the **Windows Explorer** view of the **THIN** volume to open its properties notebook. Review the volume's used versus free space values as tracked by Windows.
  - \_\_\_ 52. Compare the volume properties for the **THIN** volume to the **COMP** volume. The used space should be the same. The free space might vary slightly.
  - \_\_\_ 53. Click **OK** to close each display.
  - \_\_\_ 54. Navigate back to your **V9000 management GUI**.
  - \_\_\_ 55. Navigate to **Volumes > Volumes by Pool**.
  - \_\_\_ 56. Examine the **HYBRID** pool allocation capacity usage and compression savings details.
- 



### Note

The consumed percentage is a ratio of consumed capacity divided by total write capacity. Since there is only one compressed volume in the pool at the moment, the capacity savings is presented at the pool level.

- 
- \_\_\_ 57. Locate the **COMP** volume entry and examine the change in the **Capacity**, **Real Capacity**, **Used Capacity**, and **Compression Savings** columns.
- 



### Questions

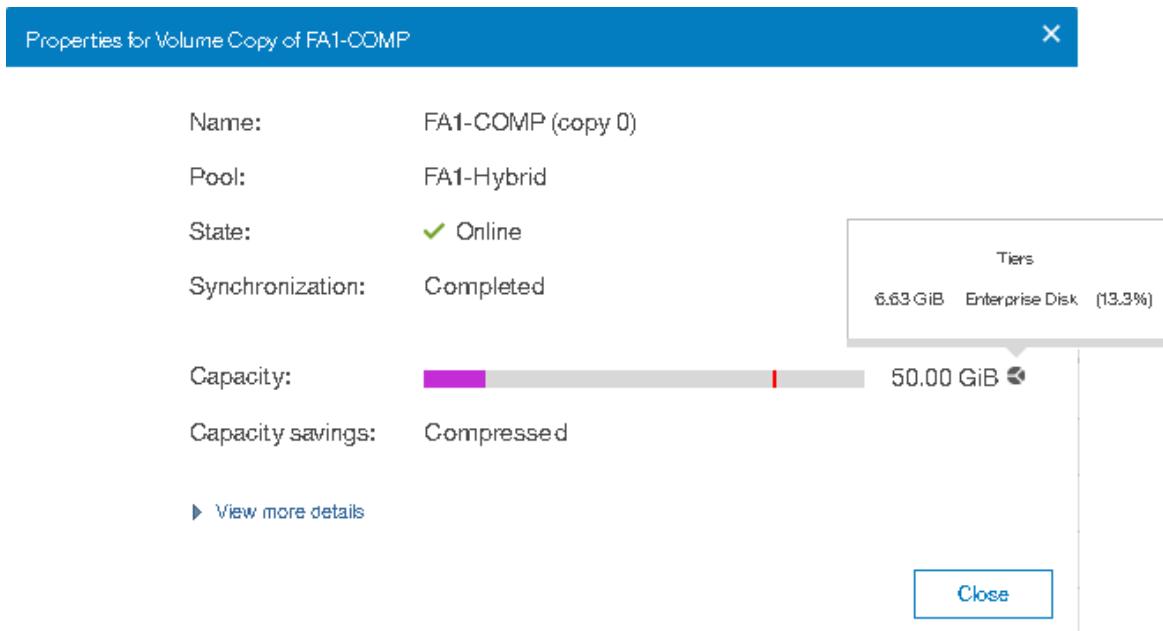
What is the physical amount of Real Capacity allocated? \_\_\_\_\_

What is the physical amount of Used Capacity allocated? \_\_\_\_\_

What is the percentage of compression saving? \_\_\_\_\_ / \_\_\_\_\_

- 
- \_\_\_ 58. Right-click the **COMP** volume entry. Select **Volume Copy Action**. Select **Properties** and click the [View more details](#) link to expand the view.

- \_\_\_ 59. Hover the mouse pointer over the icon to the right of the capacity value. A bubble pop up is displayed.



- \_\_\_ 60. Click **Close**.
- \_\_\_ 61. Right-click the **THIN** volume entry. Select **Volume Copy Action**. Select **Properties** and click the [View more details](#) link to expand the view.
- \_\_\_ 62. Hover the mouse pointer over the icon to the right of the capacity value. A bubble pop up is displayed.
- \_\_\_ 63. Compare the values between the **COMP** volume and the **THIN** volume. Click **Close**.
- \_\_\_ 64. Navigate to the **Dashboard**.
- \_\_\_ 65. Select the **Node Comparison** box located towards the top right of the window.
- \_\_\_ 66. Click on the compressed option for **CPU Utilization**, and then select the **System** box located towards the top right of the window.
- \_\_\_ 67. Observe the Compression Ratio.



## Questions

This value reflects the overall compressed savings for all compressed volumes created on the system.

From the Dashboard, you can view all compressed volumes using the [View Compressed Volumes](#) link located under the Volume Capacity pane.

## Section 4: Determine candidate volumes for compression

This procedure uses the IBM Comprestimator utility to assess if existing volumes are good candidates for Real-time Compression whether they are on the V9000 or not.



### Note

This utility performs read-only statistical sampling and analysis on block devices accessible from the host where the utility is installed.

Given the Comprestimator is sampling existing data volumes; the estimated compression ratio becomes more accurate or meaningful on volumes that contain as much relevant active application data as possible. Previously deleted old data on the volume or empty volumes not initialized with zeros are subject to sampling and will affect the accuracy of the compression ratio.

- \_\_\_ 68. From the **Volumes > Volumes by Pool** window, select **Action >Space Savings > Estimated Compressed Savings**.
- \_\_\_ 69. The Estimated Capacity Savings window is displayed. Observe the estimated capacity saving that can be achieved with compression enabled. This estimation is based on the overall storage capacity.



### Information

The Estimated Compressed Savings feature allows you to analysis for potential savings that can be used to determine whether purchasing a compression license for the system will be necessary to reduce storage cost.

- \_\_\_ 70. Click the [Run an estimate now](#) link to began analyzing compression savings. The system will start to analyze for compression savings.
- \_\_\_ 71. Right-click on any column and add **Estimated Compressed Savings**, **Estimated Compressed Savings %**, **Estimated Thin Savings**, and **Estimated Thin Savings %**columns to the display.
- \_\_\_ 72. Navigate back to the **WIN** server RDP session.
- \_\_\_ 73. Navigate to **Server Management > Storage**.
- \_\_\_ 74. Right-click on **Disk Management** and select **Refresh**.
- \_\_\_ 75. From the Disk Management Volume List + Graphical View. Adjust the columns to view the current capacity utilization and free space of the **WIN1** and **WIN2** volumes.

Disk Management - Volume List + Graphical View						
Volume	Layout	Type	File S...	Status	Capacity	Free Space
FA1-WIN1 (J:)	Simple	Basic	NTFS	Healthy (Prim...)	6.00 GB	1.97 GB
FA1-WIN2 (E:)	Simple	Basic	NTFS	Healthy (Prim...)	5.97 GB	5.91 GB
FA1-WIN1 (D:)	Simple	Basic	NTFS	Healthy (Prim...)	5.97 GB	5.91 GB
FA1-THIN (F:)	Simple	Basic	NTFS	Healthy (Prim...)	49.87 GB	45.01 GB

**Note**

The WIN1 and WIN2 volumes that are mapped to the WIN server contain existing data.

- 
- \_\_\_ 76. Minimize the **WIN Server Management** view.
  - \_\_\_ 77. Open a the Command Prompt window on the WIN server desktop.
  - \_\_\_ 78. Enter the `cd \software\comp*` command to navigate to the **Comprestimator** folder location
  - \_\_\_ 79. Enter `comprestimator -h` command to view a list of help syntax for the comprestimator commands.
  - \_\_\_ 80. Observe that **FLASHSYSTEM** is a supported storage system type in the comprestimator tool.
- 

**Note**

Users have the ability to set the number of flash modules in the simulated system using the `--flash-modules N`, and set the size of the flash modules in the simulated system using the `--flash-module-size [SMALL|MEDIUM|LARGE]`.

The FLASHSYSTEM storage type is supported only under the 9846-AE3 model. For this part of the exercise we will use SVC.

- 
- \_\_\_ 81. Enter the `comprestimator -l` command to list the devices using the **comprestimator** command.
- 

**Note**

The `-l` parameter lists available disk numbers in Windows. The Comprestimator analyzes any block device accessible from the host where it is executing. Those entries with 2145 represent V9000 volumes.

- 
- \_\_\_ 82. Navigate to **Server Management > Storage > Disk Management**. Observe that for each disk the Comprestimator drive number matches its Windows disk number.
- 

**Questions**

Record the Disk numbers for the following volumes:

WIN1 volume \_\_\_\_\_ WIN2 volume \_\_\_\_\_

- 
- \_\_\_ 83. Navigate back to the Comprestimator command prompt window on the WIN server.

- 84. Enter the command to run the Comprestimator for the **WIN1** volume and display the results in paragraph form.
- 

### 1+1=2 Example

```
comprestimator -n [disk#] -P -s SVC
```

(Where the **#** identifies the Windows disk number and **-P** requests the output to be in easier to read paragraph format, and the **-s** is the storage system type (only used SVC as the storage type).

```
C:\Software\Comprestimator>comprestimator -n 1 -P -s SVC
```

```
Analysis started at: 01/09/2016 16:40:54.750683
```

```
Device Name:
```

```
1&7f6ac24&0&363030353037363830433832383243313038  
303030303030303030303030303234
```

Sample #:	3400
Size(GB) :	6.0
Compressed Size(GB) :	4.0
Total Savings(GB) :	2.0
Total Savings:	32.5%
Compression Savings:	0.0%
Compression Accuracy Range:	5.0%
Thin Provisioning Savings:	32.5%

---

```
C:\Software\Comprestimator>
```

### Questions

What is the volume Size? \_\_\_\_\_

What is the Compressed Size? \_\_\_\_\_

What is the percentage for Compression Savings? \_\_\_\_\_

What is the Compression Accuracy Range? \_\_\_\_\_

What is the percentage for Thin Provisioning Savings? \_\_\_\_\_

**Note**

The data content of this volume is primarily photos or pre-compressed data. The Comprestimator results indicate that this volume's content is not a good candidate for further compression since the estimated compression savings is 0.0%.

---

- \_\_\_ 85. Enter the command to run the Comprestimator for the **WIN2** volume and display the results in paragraph form.

**comprestimator -n [disk#] -P -s SVC**

(Where **disk#** is the disk number for the volume)

---

**Questions**

What is the volume Size? \_\_\_\_\_

What is the Compressed Size? \_\_\_\_\_

What is the percentage for Compression Savings? \_\_\_\_\_

What is the Compression Accuracy Range? \_\_\_\_\_

What is the percentage for Thin Provisioning Savings? \_\_\_\_\_

---

---

**Note**

The data content of this volume is database oriented and is generally ideal for compression. The Comprestimator output for this volume suggests this is true. A compression savings of 45% or more is the guideline to compress the volume.

---

- \_\_\_ 86. Leave the Comprestimator command prompt window open.

## Section 5: Convert an existing volume to a compressed volume

The Volume Mirroring function of V9000 can be deployed to convert an existing volume to compressed. This conversion is transparent and non-disruptive to host processing.

- \_\_\_ 87. Navigate back to the V9000 management GUI.
- \_\_\_ 88. Navigate to **Volumes > Volumes by Pool**. Select your **HYBRID** pool.



### Questions

What is the current Volume Allocation capacity of the HYBRID pool \_\_\_\_\_?

- \_\_\_ 89. Right-click the **WIN2** volume. Click **Modify Capacity Savings**.
- \_\_\_ 90. The Modify Capacity Savings window is displayed. Select **Compression**. Click **Modify**.
- \_\_\_ 91. Examine the **svctask addvdiskcopy** command generated to add the **-compressed** syntax to change WIN2 to a compressed volume. Click **Close**.
- \_\_\_ 92. Verify that WIN2 volume has been created as a compressed volumes.



### Note

The Volume Allocation capacity bar has been updated with the allocation of the COMP volume copies (fully allocated and compressed). As the volume synchronization process continues, the pool allocation will show an incline and then a decline in its capacity.

The Compression Savings capacity reflects the total amount of compressed savings at the pool level. It will also show an increase and decrease in the compression savings during the volume synchronization process. Once complete, it will only reflect the capacity used for metadata and the compressed bytes of the compressed volume, the fully allocated volume will be deleted.

#### During synchronization



#### After synchronization



- \_\_\_ 93. Observe that the primary copy is identified by an asterisk mark.
  - \_\_\_ 94. Right-click **WIN2 Copy 0** volume. Click **Properties** to view the volume details for the **Capacity Savings** field. Click **Close**.
  - \_\_\_ 95. Right-click **WIN2 Copy 1** volume. Click **Properties** to view the volume details for the **Capacity Savings** field. Click **Close**.
  - \_\_\_ 96. Locate the **COMP** volume entry and examine the **Compression Savings** column.
- 



### Note

The compression savings values shown should be the same values shown under the compression savings bar. This reflects the percentage of uncompressed capacity that is no longer used after compression, followed by the removal of the number of repetitive bytes. These values will change once write activity occurs on the volume.

- 
- \_\_\_ 97. Navigate to the **Monitoring > Performance**.
  - \_\_\_ 98. Click the **System Statistics** drop-down (top left) and select the preferred **NODE#** of the COMP volume.
  
  - \_\_\_ 99. Right-click **WIN2** volume. Select **Properties**. Click the [View more details](#) link to view the volume details for the preferred node.
- 



### Questions

What is the preferred node for the WIN2 volume? \_\_\_\_\_

---



### Optional

If volume synchronization is still in process, you can speed up the copy process.

- Right-click on the **WIN#** volume. Select **Modify Mirror Sync Rate**.
  - Change the default syncrate from 50 to **100**. Click **Modify**.
  - Examine the **svctask chvdisk -syncrate** command. Click **Close**.
- 

- \_\_\_ 100. Navigate back to the **Monitoring > Performance** view. Observe the CPU utilization for compression generated by the volume copy synchronization.
- 



### Reminder

Ensure that the check box for the **Compression %** is checked. The default view provides statistics at the system level that is for all nodes in the cluster.

---

- \_\_\_ 101. Use the drop-down menu to change the reporting from the System Statistics to the preferred **NODE#** of the **WIN2** volume.
  - \_\_\_ 102. Observe the compression being performed by the volume preferred node.
- 



### Note

If no other compression activity is occurring, when the CPU utilization of **Compression %** goes down to zero, copy 1's synchronization with copy 0 has completed.

- 
- \_\_\_ 103. Return to **Volumes > Volumes by Pool**.
  - \_\_\_ 104. Select the **HYBRID** pool. Verify that the **WIN2** volume is a single volume entry.
  - \_\_\_ 105. Locate the **Compression Savings** column.
- 



### Questions

What is the Compression Savings percentage for the **WIN2** volume? \_\_\_\_\_

- 
- \_\_\_ 106. Navigate to the **WIN** server and to a Command Prompt window.
  - \_\_\_ 107. Recall the `comprestimator -n disknum -P -s SVC` command. Append the command to run the Comprestimator for the **WIN2** volume.  
Where *disknum* is the disk number for the volume)
- 



### Questions

What is the Compression Savings percentage for the **WIN2** volume? \_\_\_\_\_

The percentage might not be of great value as there was no change in the data.

- 
- \_\_\_ 108. Compare the Comprestimator's estimated compression savings value with the actual value report by the GUI.
  - \_\_\_ 109. Navigate to the V9000 management GUI.
  - \_\_\_ 110. Navigate to **Volumes > Volumes by Pool**. Select the **HYBRID** pool.
  - \_\_\_ 111. Navigate to the **Win1** volume. Locate the **Estimated Compressed Savings**, **Estimated Compressed Savings %**, **Estimated Thin Savings**, and **Estimated Thin Savings %** columns to the display.
  - \_\_\_ 112. Observe the estimated capacity savings that could be achieved for **WIN1** volume if the system had a compression license.



## Information

You are working with small capacity values in this lab environment. The IBM Comprestimator is a powerful tool to identify suitable volumes that may contain existing data for compression. As a benefit, it improves the capacity utilization efficiency across all storage tiers and prolongs the current storage infrastructure investment.

- 
- \_\_\_ 113.Log out from the V9000 management GUI session.
  - \_\_\_ 114.Type `exit` to close the V9000 CLI session.
  - \_\_\_ 115.Click **Start > Log off** to log out from the WIN server.

## End of exercise

---

# Exercise 15. FlashCopy and consistency groups

## Estimated time

01:15

## Overview

This exercise implements FlashCopy with two mappings contained in a consistency group. The FlashCopy Backup is used to illustrate incremental FlashCopy.

## Objectives

- Implement a consistency group containing a two-volume FlashCopy mapping pair with the backup preset.
- Carry out incremental FlashCopy for mappings that are contained in a consistency group and revalidate updated content.
- Evaluate reports to identify FlashCopy mapping attributes.

# Exercise instructions

## Section 1: Review data content on selected volumes

- 1. From the Admin server desktop, open a browser window.
  - 2. Enter the URL of your V9000 management IP address.
  - 3. Log in using your admin credentials. Refer to the team lab data sheet.
  - 4. Navigate to **Volumes > Volumes by Host**.
  - 5. Select your **WIN** host from the Host Filter list.
  - 6. Locate your **WIN1** and **WINA** volumes.
- 



### Hint

You can sort the volume list using the **Filter Search** field by entering the character string **teamsetID-W**. Or you can click on the Name column to sort alphabetically.



### Questions

Records the last couple of bytes of the volume UID for these volumes:

WIN1 volume UID \_\_\_\_\_ WINA volume UID \_\_\_\_\_

- 
- 7. From the Admin server desktop, open an RDP session to your **WIN** server.
  - 8. Log in with the server's credentials (refer to the team lab data sheet).
  - 9. Navigate to **Server Manager > Storage > Disk Management** view.
  - 10. Verify both WIN1 and WINA volume disks are listed.
  - 11. Navigate to your WINA drive, and right-click and select **Explorer**. Note the folders that are listed.
  - 12. Navigate to the **C:\Software\ClassFolders** location.
  - 13. Copy the **Folder PDF-2MB** and **FolderPics-100MB** to the WIN1 drive.
- 



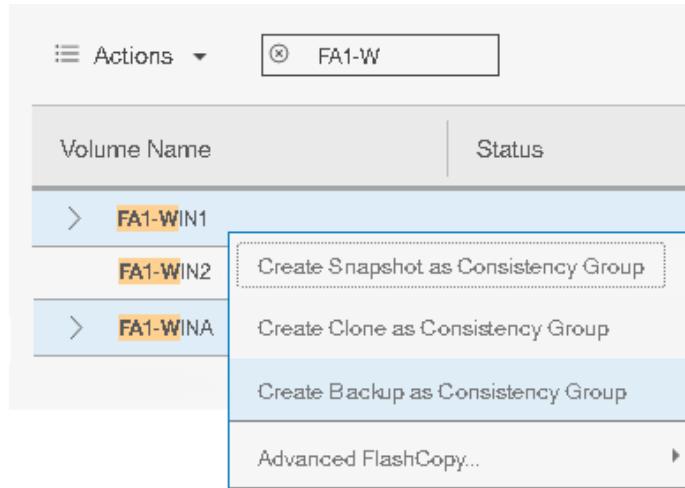
### Note

At this point both WIN1 and WINA drives should contain the same folders. If any folders are missing from the volumes, copy the folders from the **C:\Software\ClassFolders** location.

## Section 2: Define and perform FlashCopy for two related volumes

The WIN1 and WINA volumes will be treated as related volumes with write dependencies within the same application. This procedure creates a FlashCopy consistency group to contain the FlashCopy mappings for both volumes.

- \_\_\_ 14. Navigate to the V9000 management GUI.
- \_\_\_ 15. From the **Volumes > Volumes by Host** view, right-click the **WINA** volume, and select **Modify Capacity Savings**.
- \_\_\_ 16. The Modify Capacity Savings window is displayed. Select **Compression**. Click **Modify**.
- \_\_\_ 17. Examine the generated `svctask addvdiskcopy -compressed` command syntax. Click **Close**.
- \_\_\_ 18. Observe the Running Task Volume Synchronization has started. Right-click on the WINA again and select **Modify Mirror Sync Rate**.
- \_\_\_ 19. If required, change the WINA volume sync rate from 50 to **100**. Click **Modify**.
- \_\_\_ 20. Examine the `svctask chvdisk -syncrate` command. Click **Close**.
- \_\_\_ 21. Navigate to **Copy Services > FlashCopy**.
- \_\_\_ 22. Enter the character string `teamsetID-W` in the **Filter Search** field to locate the WIN volumes.
- \_\_\_ 23. Use the Ctrl key to multi-select both of your **WIN1** and **WINA** volume entries.
- \_\_\_ 24. Right-click in the highlighted area of the selected volumes. Select **Create Backup as Consistency Group**.



- \_\_\_ 25. Examine the `svctask` commands generated. This is a long string task log, scroll to the top to view the list of commands. The `mkfcconsistgrp` creates a backup as consistency group (*do not click Close yet*). The `mkvdisk` creates the first target volume in the consistency group and the `-mdiskgrp` parameter specifies the storage pool as the same pool as the source. The `mkfcmap` creates a new FlashCopy mapping to map the source volume to the target volume for subsequent copying. The mapping also defines the mapping as an `-incremental` and sets the background `-cleanrate` and `-copyrate`.



## Questions

Complete the following questions from these task commands for the source volume WIN1:

- What is the ID of the created consistency group container? \_\_\_\_\_
- What is the FlashCopy target volume name and ID created? \_\_\_\_\_
- What is the storage pool of the volume? \_\_\_\_\_
- What is the FlashCopy mapping ID \_\_\_\_\_
- What is the copyrate? \_\_\_\_\_

- 
- 26. Scroll down to examine the next `mkvdisk` issued to create the second target volume in the consistency group. This command also set to `-autoexpand` and adds a `-compressed` task to the target volume. Since `teamsetID-WINA` is a compressed volume, its target is also created with the compressed attribute.



## Questions

Complete the following question from the these task commands the source volume WINA:

- What is the FlashCopy target volume name and ID created? \_\_\_\_\_  
 What is the FlashCopy mapping ID \_\_\_\_\_  
 What is the copyrate? \_\_\_\_\_

- 
- 27. Scroll to the bottom of the log to review the `svctask startfcconsistgrp` syntax. The `startfcconsistgrp` syntax is generated to automatically start the consistency group process. The `-prep 1` prepares all of the mappings at one time by its object ID.



## Information

**Consistency groups** address the requirement to preserve point-in-time data consistency across multiple volumes for applications that include related data that spans multiple volumes. For these volumes, Consistency Groups maintain the integrity of the FlashCopy data by ensuring that “dependent writes” are run in the application’s intended sequence.

- 
- 28. Click **Close**.  
 — 29. Locate your **WIN1** and **WINA** volumes that are now in the consistency group.  
 — 30. Click the (>) symbols to display each volume the details. Observe the target volume that was created for each FlashCopy mapping relationship.

- 31. Observe the status and the progress of the background copy for each mapping. The **fccstgrp0** default name is assigned for this Consistency Group..

Volume Name	Status	Progress	Capacity	Group
FA1-WIN1			6.00 GiB	
FA1-WIN1_01	Copying	9%		fccstgrp0
FA1-WIN1_01			6.00 GiB	
FA1-WIN2			6.00 GiB	
FA1-WINA			6.00 GiB	
FA1-WINA_01	Copying	9%		fccstgrp0
FA1-WINA_01			6.00 GiB	

## ?

### Questions

What are the names of the targets that were created in each FlashCopy mapping relationships?

WIN1 volume \_\_\_\_\_

WINA volume \_\_\_\_\_

## i

### Information

The status of the consistency group was automatically triggered by the **startfcconsistgrp** command. The progress is established by the **-copyrate** that defaults to 50.

## !

### Note

A Running Tasks is generated in background for the FlashCopy operation and volume formatting.

Given the embedded progress bars available with each FlashCopy mapping entry, it is not necessary to use the Running Task status pod for progress information to monitor the progress of each source and target volume mapping relationship.

- 32. Navigate to **Copy Services > Consistency Groups**.
- 33. Observe the icon associated with your **fccstgrp#** default name. Click the (>) symbol associated with your **fccstgrp#** default name to examine the group details.
- 34. Right-click the consistency group name. Click **Rename**.
- 35. Enter a new name of **teamsetID-FCCG1**. Click **Rename**.

- \_\_\_ 36. Examine the `svctask chfcconsistgrp` command generated. Click **Close**.
- \_\_\_ 37. Verify that the name change has occurred successfully.



### Reminder

Right-click on any column heading to modify the display view.

- \_\_\_ 38. Observe the copy status of the group and the Flash Time (the background copy start date and time).



### Note

The two mappings contained in the consistency group are detailed in the display area each with its own name, status, and progress.

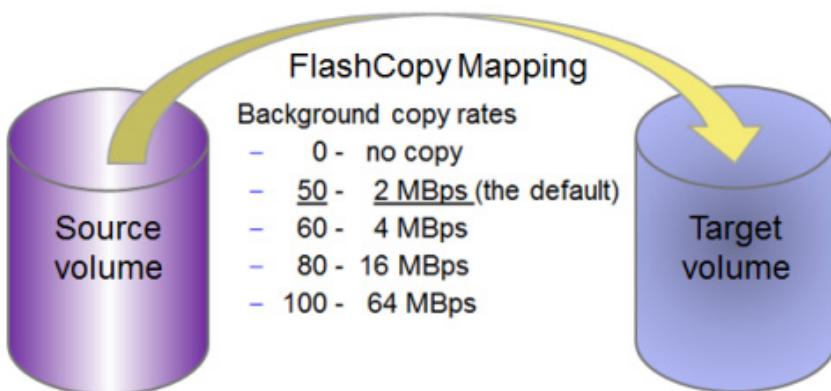
- \_\_\_ 39. Right-click on any column heading. Click the **ID**, **Incremental**, and **Background Copy Rate** check boxes to add them to display.

Mapping Name	↑	ID	Status	Source Volu...	Target Volume	Progress
Not in a Group	-					
fcmap0	1	Copying				<b>Flash Time:</b> Feb 14, 2018, 1:56:24 PM
fcmap1	0	Copying	FA1-WINA	FA1-WINA_01		<div style="width: 30%;">30%</div>
fcmap1	1	Copying	FA1-WIN1	FA1-WIN1_01		<div style="width: 27%;">27%</div>



### Information

The Backup preset creates incremental FlashCopy mappings with a default background copy rate of 50. The background copyrate copies at a default 2 Mbps (50) to up to 64 Mbps.



- \_\_\_ 40. Navigate to the **WIN** server desktop.
  - \_\_\_ 41. From **c:\ Software\ClassFolders**, copy the **FolderDB-300MB** folder to both the **WIN1** volume and the **WINA** volume.
- 



### Note

This will generate some additional write activity on both volumes.

- 
- \_\_\_ 42. Navigate to the V9000 management GUI.
  - \_\_\_ 43. Navigate to **Copy Services > FlashCopy Mappings** to review a list of all the FlashCopy mappings defined in the system.
  - \_\_\_ 44. Observe that the **Group** column identifies the consistency group that contains your mappings.
  - \_\_\_ 45. Right-click on the column headings and add the **ID**, **Incremental**, and **Background Copy Rate** columns to the display heading area.
- 



### Questions

What is the ID of the FlashCopy mapping that contains the **WIN1** volume? \_\_\_\_\_

- 
- \_\_\_ 46. Right-click on any one of your FlashCopy mapping. Observe that the *Start* and *Stop* options are not active.
- 



### Information

Mappings that reside in consistency groups cannot be started at the individual mapping level.

- 
- \_\_\_ 47. Observe the change in the copyrate between the mapping relationship. Recall that **WINA** was created as a compressed source/target pair.

Create FlashCopy Mapping		Actions		Filter	
Mapping Name	ID	Status	Source Vol...	Target Volume	Progress
fcmap1	1	Copying	FA1-WIN1	FA1-WIN1_01	<div style="width: 44%;">44%</div>
fcmap0	0	Copying	FA1-WINA	FA1-WINA_01	<div style="width: 48%;">48%</div>

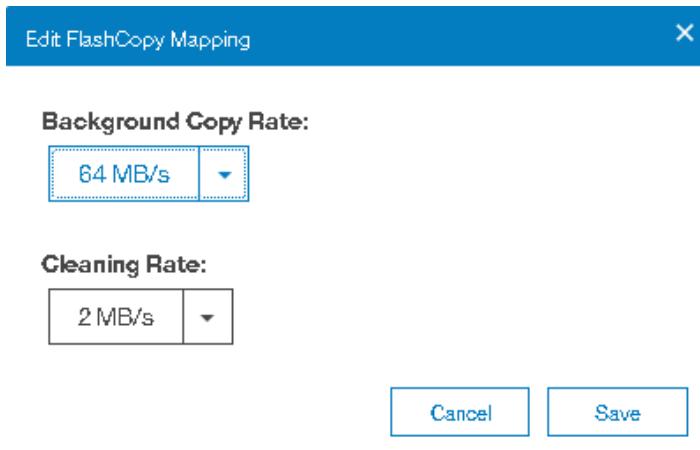


### Reminder

After about one minute into the copying process, the progress for WINA (compressed volume pair) shows a much higher percentage value than that of the WIN1 (fully allocated volume pair). Your view may differ, depending on the volume ID.

Recall a compressed volume is a type of thin-provisioned volume and thus the deallocated space of the volume is tracked by metadata and does not need to be copied.

- \_\_\_ 48. Right-click the **fcmap#** that is associated to **WIN1** FlashCopy mapping.
- \_\_\_ 49. The copy rate of a mapping can be changed dynamically. Select **Edit Properties** in the pop-up menu.
- \_\_\_ 50. The Edit FlashCopy Mapping windows is displayed. Observe that the default settings of 2 MB/s (50%) for both the Background Copy Rate and the Cleaning Rate.
- \_\_\_ 51. Click the down arrow to increase the Background Copy Rate from 2 MB/s (default) to **64 MB/s**.
- \_\_\_ 52. Click **Save**.



- \_\_\_ 53. Examine the **svctask chfcmap** command with **-copyrate** that is used to increase the copy rate to 100 for the mapping whose ID you had recorded earlier. Click **Close**.
- \_\_\_ 54. Navigate to **Monitoring > Performance** to view compression CPU utilization activity during the copy.



### Information

The FlashCopy layer is above *lower cache* in the *IBM Spectrum Virtualize* software stack, which can benefit from read prefetching and coalescing writes to backend storage. Also, preparing FlashCopy is faster because *upper cache* write data does not have to go directly to backend storage but to lower cache layer. Therefore, performance has been significantly improved.

- \_\_\_ 55. Navigate to **Copy Services > Consistency Groups**, and expand the view. Examine the Consistency Group view.

- 
- \_\_\_ 56. Observe the changes in copy progress for your FCCG1 Consistency Group.



### Note

With the change in the copy rate, the **fcmap# (WIN1)** mappings has completed much faster than the **fcmap# WINA** mappings, which are both compressed.

- 
- \_\_\_ 57. Observe that with **fcmap# (WIN1)** background copy completed, the status of the individual mapping changed to Copied.



### Information

Since the mapping is incremental, once the background copy is complete, additional bitmap for the volume tracks changes to the source since the last flash start time, for the next time the mapping is started, and records the differences between the source and target volume. However, if the connection to both nodes in the I/O group that the mapping is assigned to is lost, the source and target volumes will become *offline*.

- 
- \_\_\_ 58. Right-click on the **fcmap# (WINA)** FlashCopy mapping. Select the **Edit Properties** option.
  - \_\_\_ 59. Click the down arrow to increase the Background Copy Rate from 2 MB/s (default) to **64 MB/s**.
  - \_\_\_ 60. Examine the **svctask chfcmap** command with **-copyrate** that is used to increase the mapping copy rate to 100. Click **Close**.
  - \_\_\_ 61. Once both FlashCopy mappings have been completed. Observe that the Consistency Group status changes to Copied.



### Information

When a Consistency Group has a status of *Idle*, *Copied*, or *Copying* the target volume can be mapped to a host and used. The source volume can remain online, active, and accessible by an application for reads and writes.

---

## Section 3: Map FlashCopy volumes to a host

This procedure maps the FlashCopy volumes on the WIN host.

- \_\_\_ 62. From the V9000 management GUI, navigate to **Volumes > Volumes**.
- \_\_\_ 63. Enter the character string **teamsetID-W** in the **Filter Search** field.
- \_\_\_ 64. Multi-select both of your **WIN1\_01** and **WINA\_01** FlashCopy target volumes.
- \_\_\_ 65. Right-click the selected entries. Click **Map to Host or Host Cluster**.
- \_\_\_ 66. From the Create Mapping window:
  - \_\_\_ a. Select your **WIN** host object. Click **Next**.

- \_\_\_ b. Verify that the WINx\_01 target volumes are highlighted. Click **Map Volumes**.
  - \_\_\_ 67. Review the `svctask mkvdiskhostmap` commands generated to map the two target volumes to the WIN host. Click **Close**.
  - \_\_\_ 68. Navigate to **Hosts > Mappings**. Observe the menu option located in the top left of the Mappings window.
- 



### Note

Host mapping provides an alternative view to all host volumes and their assigned SCSI ID. The *Private Mappings* is the default view that lists all host accessed volume. You also have the option to view *Shared Mappings* between hosts or *All Host Mappings* for a collective view of both.

- \_\_\_ 69. Enter the character string `teamsetID-W` in the **Filter Search** field.
  - \_\_\_ 70. Verify that both FlashCopy target volumes have been assigned to the WIN host.
- 



### Questions

What is the last 3-digits of the WINx\_01 volumes UID? **WIN1\_01 \_\_\_\_\_ WINA\_01 \_\_\_\_\_**

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## Section 4: Verify volume access on a host server

This procedure validates access to the volumes on the WIN host.

- \_\_\_ 71. Navigate to the **WIN** server desktop.
  - \_\_\_ 72. Navigate to **Server Manager > Storage > Disk Management**.
- 



### Troubleshooting

If the volumes have not been discovered by Windows automatically, select from **Action** pull-down menu **Rescan Disks**.

- \_\_\_ 73. Locate the newly discovered (WINx\_01 volumes) disks.
- \_\_\_ 74. If the disks are *Offline*, right-click on the left pane of each disk and select **Online**.
- \_\_\_ 75. Verify that the two new disks with volume labels that match the source volumes **WIN1** and **WINA** are displayed.

**Note**

Windows allows both source and target volumes in this configuration to be labeled the same only when the disks are formatted as Basic disks (that is, not Dynamic disks). The server will automatically assign the next available drive letter. If the volume is not labeled correctly, right-click on the disk.

**Questions**

Record the drive letters that are assigned to source/target pair:

**WIN1** volume \_\_\_\_ and **WIN1\_01** volume \_\_\_\_

**WINA** volume \_\_\_\_ and **WINA\_01** volume \_\_\_\_

- \_\_\_ 76. From the WIN server desktop, double-click to the SDDDSM icon.
- \_\_\_ 77. Enter the `datapath query device` command to display information about the devices.
- \_\_\_ 78. Locate the disk# for each (WINx\_01) FlashCopy mapping target volume.
- \_\_\_ 79. Verify that the serial number for each target volume entry matches the V9000 UID of the WIN1\_01 and WINA\_01 volumes.
- \_\_\_ 80. Open the Windows Explorer view. Compare the contents of the **target** volumes (with WIN1\_01 and WINA\_01) those of the two **source** volumes on this server.
- \_\_\_ 81. Observe that the **FolderDB-300MB** resides only on each of the source volumes.

**Questions**

Why was **FolderDB-300MB** not copied to each of the target volumes?

**Answer:** FlashCopy is a point-in-time copy. The **FolderDB-300MB** folder was written to the source volumes WIN1 and WINA after their FlashCopy mappings were started.

- \_\_\_ 82. From the WIN server, rename **FolderDB-300MB** to **FolderDB\_X** on the WIN1 and WINA source volumes.

## Section 5: Unmap the FlashCopy volumes from the host

This procedure unmaps the FlashCopy volumes to prepare to experiment with the incremental FlashCopy function which resynchronizes the content of target volumes to those of the source volumes.

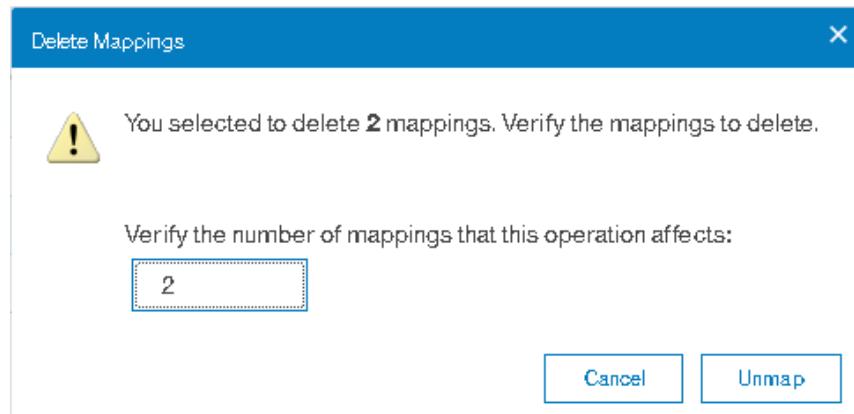
- \_\_\_ 83. Navigate to the `C:\Software\ClassFolders` location, copy the **FolderDB-300MB** folder to both the WIN1 and WINA **target** volumes.



### Note

Before resuming with FlashCopy we need to prevent host access to the target volumes by removing the mapping of WIN1\_01 and WINA\_01 volumes to the WIN host. It is not a good idea to start a FlashCopy mapping to a target volume that is in use.

- \_\_\_ 84. Navigate to **Server Manager > Storage > Disk Management**.
- \_\_\_ 85. Right-click on the left pane of each of the target disks (**WIN1\_01** and **WINA\_01**). Click **Offline**.
- \_\_\_ 86. Navigate to the V9000 management GUI.
- \_\_\_ 87. Navigate to the **Host > Mappings** view.
- \_\_\_ 88. Multi-select both of your **WINx\_01** target volumes. Right-click on a selected area and select **Unmap Volumes**.
- \_\_\_ 89. The Delete Mappings window is displayed.
  - \_\_\_ a. Confirm that the two volume mappings are being removed from the **WIN** host.
  - \_\_\_ b. Enter **2** in the dialogue box to verify that the target volumes will no longer be accessible from the WIN host.
  - \_\_\_ c. Click **Unmap**.



- \_\_\_ 90. Examine the `svctask rmvdiskhostmap` commands generated by the GUI to remove these two target volumes from the WIN host object. Click **Close**.
- \_\_\_ 91. Navigate to the WIN server's **Disk Management** view.
- \_\_\_ 92. Right-click **Disk Management**. Click **Rescan Disks**.

- \_\_\_ 93. Verify that the two unmapped volumes are no longer listed in Windows Disk Management.

## Section 6: Display FlashCopy status

This procedure examines a couple of values associated with a FlashCopy mapping that are not available with the GUI before starting the incremental copy.

- \_\_\_ 94. From the Admin server desktop, open an SSH session to your V9000 management CLI.  
 \_\_\_ 95. Log in using the **admin** credentials.  
 \_\_\_ 96. Enter the `lsfcmap -delim ,` command to list the FlashCopy mapping status.



### Questions

What is fcmap WIN1 [volumeID]? \_\_\_\_\_ What is fcmap WINA [volumeID]? \_\_\_\_\_

- \_\_\_ 97. Enter the `lsfcmap -delim , [WIN1 volumeID]` command to list the FlashCopy detail and mapping status for **WIN1** volume.



### Questions

What is the WIN1 volume value for the **difference** field? \_\_\_\_\_

What is the WIN1 volume value for the **grain\_size** field? \_\_\_\_\_



### Information

Observe the grain size value of 256 for this FlashCopy mapping. This is the default grain size for non-compressed volumes defined in FlashCopy mappings.

Remember, you had copied the same folder to each of the source volumes after the background copies started. This is the reason for the differences between the source and target volumes. Incremental copy can be used to synchronize these volumes by only copying those areas that have changed.

- \_\_\_ 98. Recall the `lsfcmap -delim , [WINA volumeID]` command to list the FlashCopy detail and mapping status for **WINA** volume.



### Questions

What is the WINA volume value for the **difference** field? \_\_\_\_\_

What is the WINA volume value for the **grain\_size** field? \_\_\_\_\_

**Note**

The percentage of the grains have changed since the last FlashCopy operation. The grains represent the changed data areas that would need to be copied from the source volume to the target volume.

Locate the grain\_size entry value of 64 or 64 KB for this mapping. The WINA volume is a compressed volume. To optimize FlashCopy performance for compressed volumes, the system automatically assigns the 64 KB grain size as the default for mappings that contain a compressed volume.

- \_\_\_ 99. Enter the `lsfcconsistgrp teamsetID-FCCG1` command to list the consistency group details.
- \_\_\_ 100. Minimize the view of the V9000 CLI.

## **Section 7: Perform Incremental FlashCopy**

This procedure examines the relationship between the source and target volumes after the background copy completes.

- \_\_\_ 101. Navigate to the V9000 management GUI browser session.
- \_\_\_ 102. Navigate to **Copy Services > Consistency Groups**.

**Questions**

What is the current copy status of the consistency group \_\_\_\_\_?

What was the original start time (Flash Time:) for this consistency group \_\_\_\_\_?

**Information**

Mappings within a consistency group can be only started at the consistency group level. This process cannot be done by right-clicking an individual mapping to attempt to start the mapping.

- \_\_\_ 103. Right-click on your **FCCG1** consistency group entry. Click **Start** to restart the consistency group.
- \_\_\_ 104. Examine the generated `svctask startfcconsistgrp` command to start the consistency group. This is the same command used previously to start the FlashCopy consistency group. Click **Close**.
- \_\_\_ 105. Expand the view of your consistent group to examine the mappings of the FCCG1 consistency group pane.
- \_\_\_ 106. Observe the initial copy progress percentage. Compare this percentage to the CLI `lsfcmap difference` value recorded early.

- 
- \_\_\_ 107. Observe the **Flash Time:** value has been updated from the previous copy.



### Note

Because the FlashCopy Backup preset is defined as incremental FlashCopy, only the grains that have changed need to be copied.

Since only a subset of the volume's data needs to be copied, the copy operations will complete fairly quickly. The increased background copy rate of 100 (64 MBps) also contributes to faster completion.

- 
- \_\_\_ 108. After the background copy operations of both volumes are completed, observe that the consistency group returns to the status of Copied.



### Note

The content of each source and target volume pair is identical, or synchronized, so that there is no difference between the source and target volumes.

- 
- \_\_\_ 109. Navigate to the V9000 management CLI SSH session.
  - \_\_\_ 110. Recall the `lsfcmap -delim , [WIN1 volumeID]` command to list one of the mapping details.
  - \_\_\_ 111. Recall the `lsfcmap -delim , [WINA volumeID]` command to list one of the mapping details.
  - \_\_\_ 112. Observe the current value in the **difference** field of the mapping.



### Questions

Record the values of the **difference** field \_\_\_\_\_ and **grain\_size** field\_\_\_\_\_.

Incremental FlashCopy enabled the source and target volumes to be resynchronized without the overhead of a complete or 100% copy.

- 
- \_\_\_ 113. Navigate to the V9000 management GUI browser session.
  - \_\_\_ 114. From the V9000 management GUI, navigate to **Volumes > Volumes**.
  - \_\_\_ 115. Enter the character string `teamsetID-W` in the **Filter Search** field.
  - \_\_\_ 116. Multi-select your **WIN1\_01** and **WINA\_01** FlashCopy target volumes.
  - \_\_\_ 117. Right-click the selected entries. Click **Map to Host or Host Cluster...**
  - \_\_\_ 118. From the Create Mapping window:
    - \_\_\_ a. Select your **WIN** host server. Click **Next**.
    - \_\_\_ b. Verify the **WINx\_01** target volumes are highlighted. Click **Map Volumes**.

- \_\_\_ 119.Examine the `svctask mkvdiskhostmap` commands. Click **Close**.
  - \_\_\_ 120.Navigate to **Volumes > Volumes by Host**.
  - \_\_\_ 121.Click your **WIN** host. Confirm that the two **WINx\_01** target volumes have been assigned. Observe the last couple of bytes of the UID of each volume.
  - \_\_\_ 122.Navigate to the **WIN** server desktop.
  - \_\_\_ 123.Navigate to **Server Manager > Storage > Disk Management**.
- 



### Troubleshooting

If the volumes have not been discovered by Windows automatically, select from **Action** pull-down menu **Rescan Disks**.

- 
- \_\_\_ 124.Locate the (WINx\_01 volumes) disks. If the disks are *Offline*, right-click on each disk and select **Online**.
  - \_\_\_ 125.Verify that the two new disks with volume labels that match the source volumes **WIN1** and **WINA** are displayed.
  - \_\_\_ 126.Examine the contents of both volumes using the Windows Explorer. The target volumes are now synchronized with their respective source volumes.
  - \_\_\_ 127.From Explorer, right-click on the **WIN1** volume disk and Select **Rename**.
  - \_\_\_ 128.Rename the **WIN1** volume disk to **WIN\_01** to match the V9000 management GUI FlashCopy target volume name. Press enter to confirm.
  - \_\_\_ 129.Repeat the procedure to rename the **WINA** volume disk to **WINA\_01** to match the V9000 management GUI FlashCopy target volume name.
- 



### Information

Since it is defined with the incremental option, differences between the source and target volumes of this mapping are still tracked by V9000 FlashCopy.



### Optional

You can validate read/write access by copying the **FolderDB-300MB** folder from the **C:\Software\ClassFolders** drive to the newly expanded volume.

After the **WIN1** volume has been expanded and its target expanded as well, a FlashCopy mapping for this volume can be redefined into the original consistency group.

- 
- \_\_\_ 130.Click **Start > Logoff** to exit from the WIN server.
  - \_\_\_ 131.Log Out from the V9000 management GUI.

## End of exercise

---

# Exercise 16.FlashCopy Snapshot monitoring user roles and access

## Estimated time

00:45

## Overview

This exercise implements FlashCopy Snapshot to create a point-in-time copy of a volume mapping contained in a consistency group, and configures that volume on the Windows Admin VM as an iSCSI volume. This exercise also validates user roles (or authority) based on user groups.

## Objectives

- Carry out FlashCopy snapshot in a consistency group to assign two-volume FlashCopy mapping pair.
- Differentiate between the user roles on the FlashSystem V9000.

## Exercise instructions

### Section 1: Define a Consistency group with Snapshot FlashCopy mapping

Before testing the new user names, we need to define a FlashCopy mapping using the CLI.

- \_\_ 1. Open an SSH session to your V9000 management CLI.
  - \_\_ 2. Log in using your **admin** credentials. Refer to the team lab data sheet.
  - \_\_ 3. Enter the `lsvdisk -delim , -filtervalue name=teamsetID*` command to view the list of your system volumes.
  - \_\_ 4. Locate the your **WIN2** volume.
- 



#### Questions

What is the WIN2 volume ID [**volume\_ID**]? \_\_\_\_\_

- \_\_ 5. Recall the `lsvdisk -delim ,` command and append it with the `[volumeID]` to view the WIN2 volume details.
- 



#### Questions

Records the last couple of bytes of the WIN2 volume UID \_\_\_\_\_

What is the WIN2 pool ID [**mdisk\_grp\_id**]? \_\_\_\_\_

- \_\_ 6. Minimize the V9000 CLI session.
  - \_\_ 7. From the Admin server desktop, open an RDP session to your **WIN** server.
  - \_\_ 8. Log in with the server's credentials. Refer to the team lab data sheet.
  - \_\_ 9. Navigate to **Server Manager > Storage > Disk Management** view.
  - \_\_ 10. Verify that the WIN2 volume disk is listed.
  - \_\_ 11. Open an **Explorer** view to the WIN2 disk. Verify that the disk contains the **FolderDB-4GB**.
  - \_\_ 12. Double-click **FolderDB-4GB** to examine the folder content.
- 



#### Questions

How many DB folders are listed? \_\_\_\_\_

- \_\_ 13. Minimize the **WIN** server view.
- \_\_ 14. Navigate back to your V9000 CLI session.

- \_\_\_ 15. Enter the following command syntax to create a 6 GB stripe volume name **teamsetID-WIN2\_SNAPSHOT** and place it in the same pool as WIN2.

```
mkvdisk -mdiskgrp 1 -iogrp 0 -size 6 -unit gb -name teamsetID-WIN2_SNAPSHOT
```

### 1+1=2 Example

```
IBM_FlashSystem:F108A-V9K:F108A1-admin>mkvdisk -mdiskgrp 1 -iogrp 0 -size 6 -unit gb -name FA1-WIN2_SNAPSHOT
Virtual Disk, id [18], successfully created
IBM_FlashSystem:F108A-V9K:F108A1-admin>
```

### Questions

What is WIN2\_SNAPSHOT [volume\_id]? \_\_\_\_\_

- \_\_\_ 16. To prepare for a faster copy process, enter the **chvdisk -syncrate 100 [volumeID]** command syntax to modify the mirror synch rate for the WIN2\_SNAPSHOT volume to **100**.
- \_\_\_ 17. Enter the **lsvdisk [volume\_id]** command to verify the details of the WIN2\_SNAPSHOT volume.
- \_\_\_ 18. Enter the **mkfccconsistgrp -name teamsetID-FCTEST1** command syntax to create a consistency group name **teamsetID-FCTEST1**.
- \_\_\_ 19. Enter the **lsfccconsistgrp [ID]** for your **FCTEST1** group to view the consistency group details.



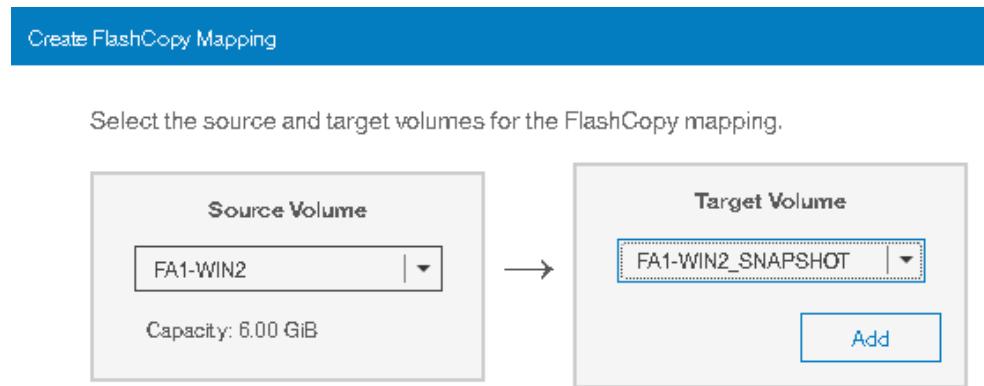
### Note

For any group that has just been created, the status reported is empty.

- \_\_\_ 20. Exit the V9000 management CLI session.
- \_\_\_ 21. From the Admin server desktop, open a browser window.
- \_\_\_ 22. Enter the URL of your V9000 management IP address.
- \_\_\_ 23. Log in using your **admin** ID (refer to the team lab data sheet).
- \_\_\_ 24. Navigate to **Copy Service > Consistency Groups**.
- \_\_\_ 25. Observe that your **FCTEST1** consistency group is empty.
- \_\_\_ 26. Right-click on your **FCTEST1** consistency group and select **Create FlashCopy Mapping**.

\_\_\_ 27. The Create FlashCopy Mapping window is displayed.

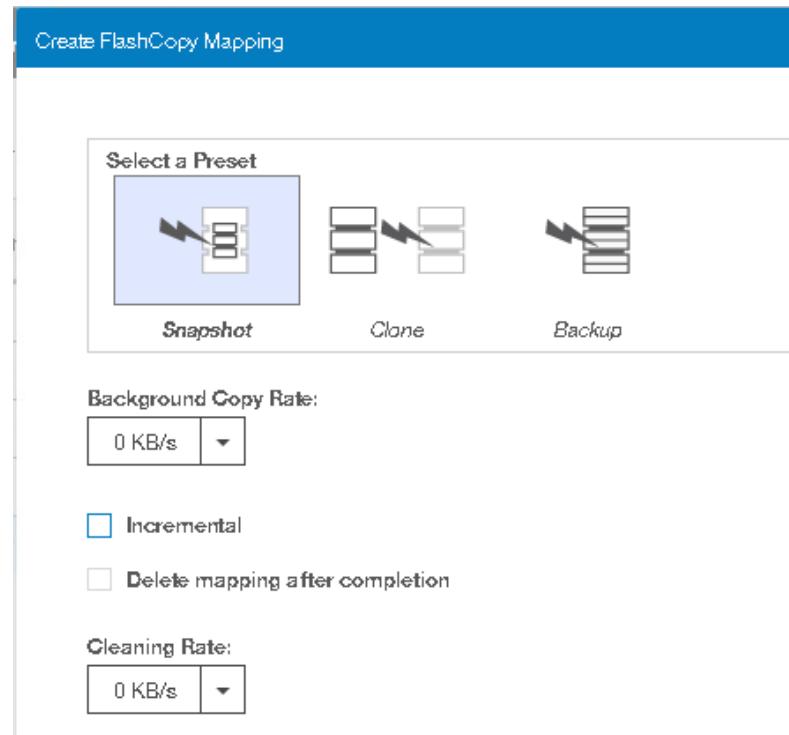
- \_\_\_ a. Select the **WIN2** volume that is mapped to the WIN server.
- \_\_\_ b. Select the new **WIN2\_SNAPSHOT** volume created. Click **Add**.



- \_\_\_ c. Observe that the WIN2 and the WIN2\_SNAPSHOT volumes are being established in a one direction flash copy mapping relationship. Click **Next** to continue.

FA1-WIN2  $\Rightarrow$  FA1-WIN2\_SNAPSHOT ✖

- \_\_\_ d. Select the **Snapshot** preset as the FlashCopy mapping type.
- \_\_\_ e. Accept all default settings. Click **Finish**.



\_\_\_ 28. Examine the **svctask mkfcmap** commands generated to create the FlashCopy mapping relationship with a **-cleanrate** and **-copyrate** of **0**. Click **Close**.

- \_\_\_ 29. Click the (>) symbol to display the **FCTEST1** consistency group details. Observe the default fcmap name assigned to the FlashCopy mapping relationship.

FA1-FC...	2	Idle or Copied
fcmap2	2	Idle FA1-WIN2 FA1-WIN2_SNAP 0%

- \_\_\_ 30. Right-click on the **FCTEST1** consistency group and select **Start**.
- \_\_\_ 31. Examine the `svctask startfcconsistgrp -prep` command. Click **Close**.
- \_\_\_ 32. Right-click the **fcmap#** that is associated to **WIN2** FlashCopy mapping. Select **Edit Properties** to change the copy rate of a mapping.
- \_\_\_ 33. The Edit FlashCopy Mapping windows is displayed. Recall that the settings of 0 % was applied for both the **Background Copy Rate** and the **Cleaning Rate**.
- \_\_\_ 34. Click the down arrow to increase the Background Copy Rate to **64 MB/s**. Click **Save**.
- \_\_\_ 35. Examine the `svctask chfcmap` command with **-copyrate** that is used to increase the copy rate to 100 for the mapping whose ID you had recorded earlier. Click **Close**.
- \_\_\_ 36. Navigate back to your WIN server. Navigate to the WIN2 disk **FolderDB-4GB** explorer view.
- \_\_\_ 37. Multi-select any of the two DB folders listed. Right-click and select **Delete**. Click **Yes** to confirm you wish to delete. Click **Yes** to confirm you wish to permanently delete folders as they are too large for the Recycle Bin.



## Questions

Record the DB folders you deleted from the FolderDB-4GB folder:

---



---

## Section 2: Define iSCSI ports on the V9000 system

- \_\_\_ 38. Navigate to the V9000 management GUI browser session.
- \_\_\_ 39. Navigate to **Settings > Network**. Click **iSCSI** in the Network filter list. Observe the iSCSI Name (IQN) displayed for each node.
- \_\_\_ 40. Click **Ethernet Ports** in the Network filter list. Observe the configured IP addresses for **Node 1 Port 1** and **Node 2 Port 1** entry. The following IP addresses will be used to define an iSCSI host on the V9000.



## Questions

What is the *io\_grp* listed? \_\_\_\_\_

What is the IP address for Node 1 Port 1? \_\_\_\_\_

What is the IP address for Node 2 Port 1? \_\_\_\_\_

## Section 3: Connect the iSCSI host to the V9000



### Requirements

The Microsoft iSCSI Initiator, MS MPIO multipath support, and SDDDSM driver support for V9000 must already be installed on the Windows server.

- \_\_\_ 41. Navigate to the Admin server desktop. Select the Windows Start menu, click the **Server Manager** tile or from the Windows system tray, click **Server Manager**.
- \_\_\_ 42. The Server Manager window is displayed. Select **Local Server**.
- \_\_\_ 43. Scroll down to the **Services** pane. In the filter field type `micro`.
- \_\_\_ 44. Verify the Microsoft iSCSI Initiator Service status is *Running*.

SERVICES					
Filtered results   3 of 145 total					
Server Name	Display Name	Service Name	Status	Start Type	
ADMINVM	Microsoft iSCSI Initiator Service	MSiSCSI	Running	Automatic	
ADMINVM	Microsoft Storage Spaces SMP	smphost	Stopped	Manual	
ADMINVM	Microsoft Software Shadow Copy Provider	swprv	Stopped	Manual	



### Troubleshooting

If the **Microsoft Initiator Service** not running, right-click on the entry and select **Start Services**.

- \_\_\_ 45. Minimize the Server manager view.
- \_\_\_ 46. From the Admin server desktop, double-click the **iSCSI Initiator** icon on the desktop.

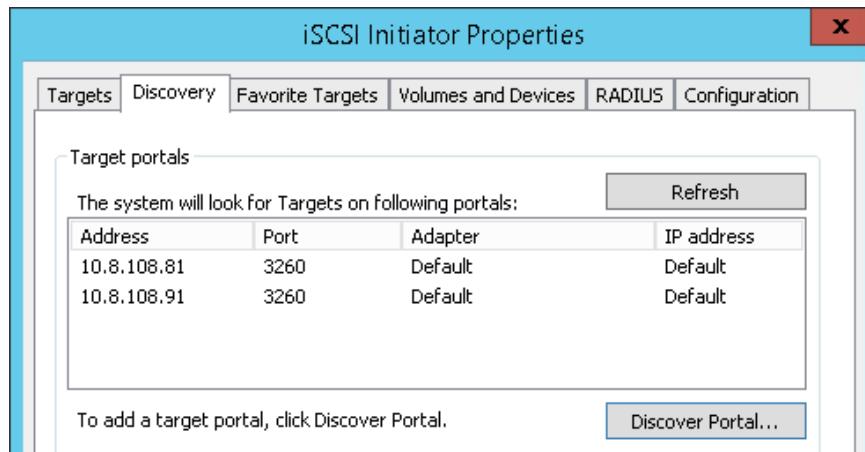


### Optional

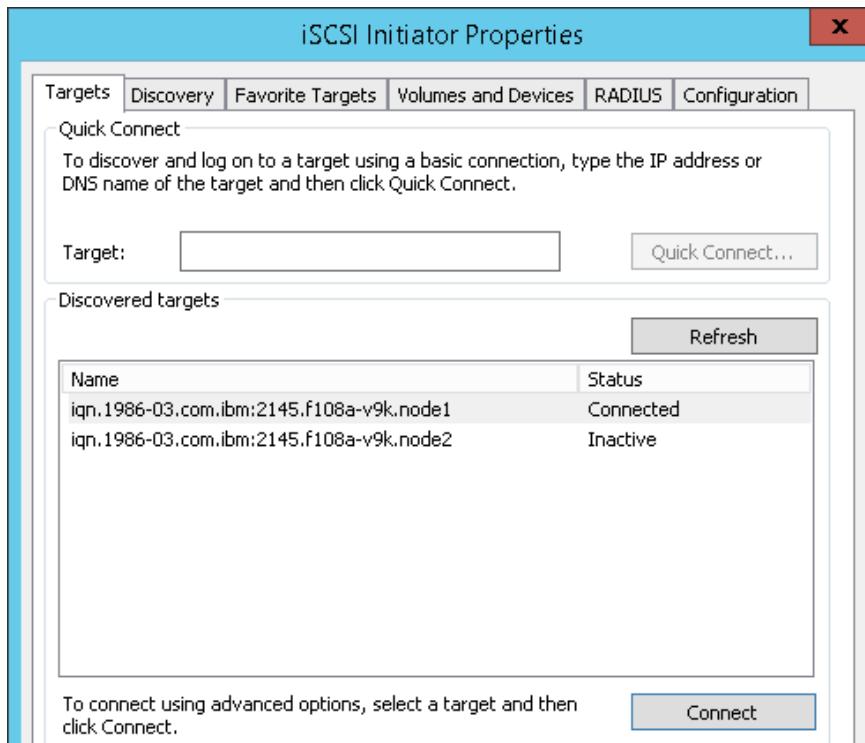
Another path to start the iSCSI Initiator is to click **Start > Control Panel > View by Small icons > iSCSI Initiator**.

- \_\_\_ 47. Click the **Configuration** tab. Observe the value of the Initiator Node Name (or IQN) for the host.
- \_\_\_ 48. Click the **Discovery** tab.
- \_\_\_ 49. The Discover Target Portal window is displayed. Click **Discover Portal**.

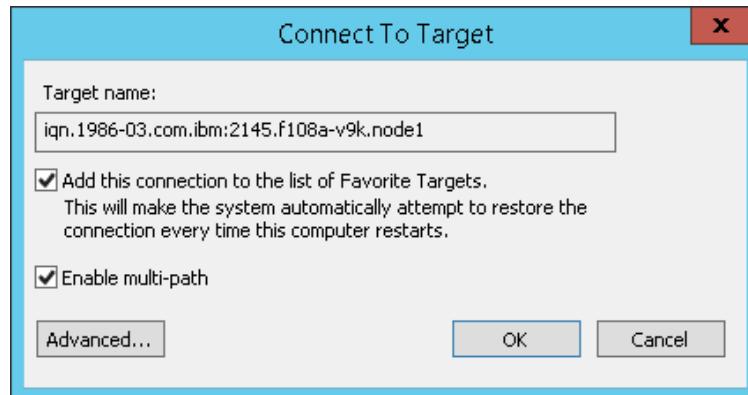
- \_\_\_ 50. Enter the iSCSI IP address of **Node 1 Port 1** of the V9000 system. Leave the default port number of **3260**. Click **OK**.
- \_\_\_ 51. Click **Discover Portal**. Enter the iSCSI IP address of **Node 2 Port 1** of the V9000 system. Leave the default port number of **3260**. Click **OK**.
- \_\_\_ 52. Verify that the iSCSI IP addresses for both Nodes' Port 1 have been added in the Target Portals box.



- \_\_\_ 53. Select the **Targets** tab. Under the Discovered targets pane, observe that the V9000 IQN were discovered automatically by the iSCSI initiator.
- \_\_\_ 54. Observe that the ports status are currently Inactive.
- \_\_\_ 55. Select the first target and click **Connect**.



- \_\_\_ 56. The Connect to Target window is displayed. Select both check boxes so that this connection is automatically restored at system boots and that **Multipath** is enabled. Click **OK**.



- \_\_\_ 57. Repeat this procedure to connected to second target port for Node 2.  
\_\_\_ 58. Verify that both target status are now Connected.



### Reminder

The IQN value of the Admin server is needed later in the GUI to create the Admin server host object.

- \_\_\_ 59. Return to the **Configuration** tab and click **Change** to open the Initiator Node Name Change pop-up.  
\_\_\_ 60. Observe the already highlighted IQN value. *Do not change anything*. Use the Ctrl+C keys to copy the IQN value to the clip board. Click **Cancel**.  
\_\_\_ 61. Click **OK** to close the iSCSI Initiator Properties notebook.

## Section 4: Create an iSCSI host resource on the V9000

- \_\_\_ 62. Navigate to the V9000 management GUI browser session.  
\_\_\_ 63. Navigate to **Hosts > Hosts**.  
\_\_\_ 64. Click the **Add Host** option (top left of the window).  
\_\_\_ 65. From the Add Hosts pop-up window, define a Windows-attached iSCSI host using the following information:  
\_\_\_ a. Enter **teamname-iSCSI** as the WIN host name (refer to the team lab data sheet).  
\_\_\_ b. Click to create an **iSCSI** host connection type.  
\_\_\_ c. Click in the **iSCSI host IQN** field. Right-click and select **Paste** to copy your WIN IQN value.

- \_\_\_ d. Accept all other defaults. Click **Add**.

Add Host

Required Fields

Name: FA1-iSCSI

Host connections:  Fibre Channel  iSCSI

iSCSI host IQN: iqn.1991-05.com.microsoft:adminvm + -

---

Optional Fields

CHAP authentication:

CHAP secret: Enter 1 to 79 characters

CHAP username: Enter 1 to 32 characters

Host type: Generic

I/O groups: All

Host cluster: No Host Cluster Selected

Cancel Add



## Troubleshooting

If the IQN value did not copy, perform the following:

- Open the **iSCSI Initiator** on the desktop. Click the **Configuration** tab. Click **Change**.
- From the iSCSI Initiator Name Change pop-up window, use the Ctrl+C keys to copy the highlighted IQN value to the clip board. Click **Cancel**.

- 
- \_\_\_ 66. Examine the `mkhost` command with the `-iscsiname` parameter used to create the iSCSI host object. Click **Close**.
  - \_\_\_ 67. Observe that the host status shows Degraded until there is a mapped volume.
  - \_\_\_ 68. Navigate to **Hosts > Ports by Host**.
  - \_\_\_ 69. Click the **iSCSI** host entry in the Host Filter list.
  - \_\_\_ 70. Verify the IQN port name value matches the IQN value previously copied from the Admin server. Do not be alarmed with a value of *offline* or *inactive* in the **Status** column.

## Section 5: Map volumes to the host

This procedure maps the FlashCopy snapshot volume on the WIN host.

- \_\_\_ 71. From the V9000 management GUI, navigate to **Volumes > Volumes**.
- \_\_\_ 72. Right-click on the **WIN2\_SNAPSHOT** volume entry and select **Map to Host or Host Cluster**.
- \_\_\_ 73. The Create Mapping window is displayed:
  - \_\_\_ a. Select your **iSCSI** host server. Click **Next**.
  - \_\_\_ b. Verify that the **WIN2\_SNAPSHOT** is highlighted. Click **Map Volumes**.
- \_\_\_ 74. Review the `svctask mkvdiskhostmap -force` command generated to map the snapshot volume to the iSCSI host. Click **Close**.
- \_\_\_ 75. Navigate to **Volumes > Volumes by Host**.
- \_\_\_ 76. Click the **iSCSI** host to verify that the **WIN2\_SNAPSHOT** volume is listed.
- \_\_\_ 77. Log Out from the V9000 management GUI.

## Section 6: Verify volume access on the Admin server

This procedure validates access to the volumes on the iSCSI host.

- \_\_\_ 78. Navigate back to your **Admin Server Manager**. Select **File and Storage Service**.
- \_\_\_ 79. To discover the volume, select **Volumes > Disks**. From the Disks pane, click on the **TASK** option pull-down menu (top right) and select **Rescan Storage**.



### Hint

You can also right-click anywhere in the **File and Storage Service > Volume** view. Select **Rescan Storage** and then select **Disks**.

- 
- \_\_\_ 80. The Rescan Storage window appears. Click **Yes** to confirm.
  - \_\_\_ 81. Observe that a disk/LUN representing the **WIN2\_SNAPSHOT** volume (IBM 2145 Multi-Path) has been detected.
- 



### Note

The default status for the newly-created LUN in Disk management is Unknown and Offline.

- 
- \_\_\_ 82. Right-click on the new disk, and select the **Bring Online** option.
  - \_\_\_ 83. The Bring Disk Online pop-up window is display. Click **Yes** to confirm that your understand.

**Note**

Observe the Task Progress generated to bring disk online. Task will disappear when completed.

Server Name	Name	Task	Progress	Status
adminvm	IBM 2145 Multi-P	Bringing the disk online	<div style="width: 100%;"> </div>	Running

- \_\_\_ 84. Verify the disk is now Online

Number	Virtual Disk	Status	Capacity	Unallocated	Partition	Subsystem	Bus Type	Name
0	adminvm (2)	Online	40.0 GB	0.00 B	MBR	SAS	SAS	VMware Virtual disk S...
1		Online	6.00 GB	1.00 MB	MBR	iSCSI	iSCSI	IBM 2145 Multi-Path...

**Questions**

Record the disk number that has been assigned to **WIN2\_SNAPSHOT** volume: \_\_\_

- \_\_\_ 85. From the Admin desktop, open the SDDDSM command prompt.
- \_\_\_ 86. Enter the **datapath query device** command do display information about the devices.
- \_\_\_ 87. Verify that the serial numbers of the single SSD disk entry matches the V9000 volume UID values of the WIN2\_SNAPSHOT volume. Observe there are two paths for the disk; from the host Ethernet adapter port to each V9000 node's iSCSI IP port.
- \_\_\_ 88. Type **exit** to close the SSD command prompt.
- \_\_\_ 89. From the Admin server desktop, click the **File Explorer** icon in the system tray.
- \_\_\_ 90. Locate the assigned disk drive. Examine the contents of WIN2\_SNAPSHOT volume.

**Note**

The content of the FolderDB-4GB folder has the original number of folders that were located on the WIN2 (source) volume when the FlashCopy operation first started.

- \_\_\_ 91. Right-click on the WIN2 (SNAPSHOT) volume. Select **Properties**.
- \_\_\_ 92. Change the volume name to **`teamsetID-WIN2_SNAPSHOT`** to match the volume name on the V9000.

**Optional**

Navigate to the **WIN** server. Compare the content between the two servers volume content.

**Note**

At this point, you have taken a snapshot of the original database, and created a duplicate on a different server under a different DB name.

## **Section 7: Test the copy operator user access**

This procedure experiments with the authority allowed with the copy operator role.

- \_\_\_ 93. From the Admin server desktop, open a browser window.
- \_\_\_ 94. Enter the URL of your V9000 management IP address.
- \_\_\_ 95. Log in using your **`teamname-copyop`** credentials. This user ID was created previously created.

**Information**

Users in the CopyOperator group have full view or monitor capability but have no authority to create objects. This user role is designed to manage copy services operations. It has the authority to start, modify, and stop existing FlashCopy mappings and Remote Copy relationships.

- \_\_\_ 96. Navigate to **Pools > MDisks by Pools**.
- \_\_\_ 97. Hover the mouse pointer over the **Create Pool** option. Observe that this option is grayed out and disabled, which is not permitted for your user role.
- \_\_\_ 98. Right-click on any pool to view its supported menu options.
- \_\_\_ 99. Navigate to **Volumes > Volumes**.
- \_\_\_ 100. Observe that the **Create Volumes** option is disabled.

- \_\_\_ 101.Right-click on any volume to view its supported menu options.
- \_\_\_ 102.Navigate to **Hosts > Hosts**.
- \_\_\_ 103.Observe that the **Add Hosts** option is also disabled.
- \_\_\_ 104.Right-click on any host to view its supported menu options.
- \_\_\_ 105.Navigate to **Copy Services > Consistency Group**.
- \_\_\_ 106.Expand the view of your FCTEST1 consistency group. Right-click the **fcmap#** related to the WIN2 volume. Observe that the **Start** option is disabled.
- \_\_\_ 107.Right-click the **FCTEST1** consistency group entry. Click **Start** to start the copy.
- \_\_\_ 108.Review the **svctask startfcconsistgrp** command. Click **Close**.
- \_\_\_ 109.Log out from the **V9000** management GUI.
- \_\_\_ 110.From the Admin server desktop, open a PuTTY session.
  - \_\_\_ a. Select your **V9000** saved session. Click **Load**.
  - \_\_\_ b. From the PuTTY navigation tree, select **Connection > SSH > Auth**.
  - \_\_\_ c. Delete the key entry in the **Private key file** box.Click **Open**.
- \_\_\_ 111.Log in as **teamname-copyop** credentials.
- \_\_\_ 112.Enter the **lsfccconsistgrp** command to list the FlashCopy consistency groups.
- \_\_\_ 113.Enter the following commands to rename the **teamsetID-FCTEST1** mapping to **teamsetID-FCCG2**.
 

```
chfccconsistgrp -name teamsetID-FCCG2 teamsetID-FCTEST1
```
- \_\_\_ 114.Enter the **lsconsistgrp** command to verify the name change.
- \_\_\_ 115.Enter the **stopfccconsistgrp teamsetID-FCCG2** command to stop the **teamsetID-FCCG2** mapping.
- \_\_\_ 116.Recall the **lsfccconsistgrp** to verify the FlashCopy mapping status has returned to **idle\_or\_copied**.
- \_\_\_ 117.Enter **rmfccconsistgrp teamsetID-FCCG2** command to attempt to delete the mapping.



### Note

The Copy Operator role has the authority to start, stop, change attributes of FlashCopy mappings and Remote Copy relationships. But it lacks the authority to create or delete these objects.

## Section 8: Test the monitor user access

The Monitor role can view information but does not have the ability to perform actions.

This procedure experiments with the authority allowed with the monitor role.

- \_\_\_ 118.Navigate to the **V9000** management GUI browser session.
- \_\_\_ 119.Log in using your **teamname-monitor** credentials.
- \_\_\_ 120.Navigate to **Copy Services > Consistency Group**.
- \_\_\_ 121.Right-click your **FCCG2** consistency group to attempt to start the mapping.
- \_\_\_ 122.Observe that all tasking operation are disabled.
- \_\_\_ 123.Navigate to **Access > Audit Log**.
- \_\_\_ 124.Observe that a history of action commands performed on the systems and identified by user name is available for any user role.
- \_\_\_ 125.Click **Log Out** from the **V9000** management GUI.
- \_\_\_ 126.Type **exit** to close the **V9000** CLI session.

## End of exercise

---

# Exercise 17.FlashCopy to the cloud

## Estimated time

00:30

## Overview

This exercise implements Transparent Cloud Tiering on the V9000 to an OpenStack cloud server, create a cloud snapshot of a volume, and recover the volume snapshot from the cloud.

## Objectives

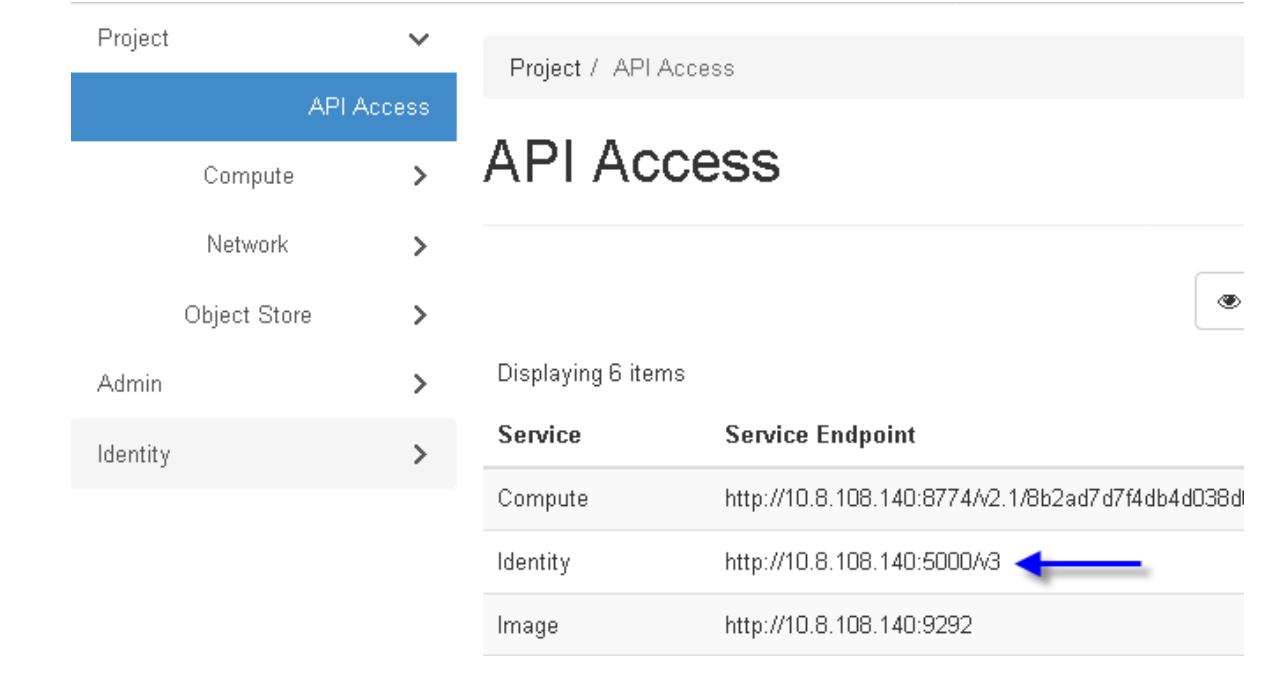
- Enable Transparent Cloud Tiering connection from the V9000 to an OpenStack Swift service provider.
- Create and map a volume to host object using the management GUI.
- Carry out a cloud snapshot volume on the V9000 to transfer to and recover from the cloud.

# Exercise instructions

## Section 1: Verify OpenStack Swift access

This procedure verifies that the OpenStack Swift service has been configured and running. OpenStack Swift provides a set of standard interfaces that can be used to create private cloud solutions.

- \_\_\_ 1. From the Admin server desktop, open a browser window.
- \_\_\_ 2. Enter the URL of the Cloud server (refer to your team lab data sheet).
- \_\_\_ 3. Log in using your team cloud credentials.
- \_\_\_ 4. From the OpenStack Dashboard, navigate to **Project > API Access**.
- \_\_\_ 5. From the API Access service list, locate the Keystone Identity to verify that the service is running.



The screenshot shows the OpenStack API Access interface. The left sidebar lists services: Compute, Network, Object Store, Admin, and Identity. The Identity service is selected, indicated by a grey background. The main content area displays the 'API Access' page with the title 'API Access'. Below the title, it says 'Displaying 6 items'. A table lists the service and its endpoint:

Service	Service Endpoint
Compute	http://10.8.108.140:8774/v2.1/8b2ad7d7f4db4d038d
Identity	http://10.8.108.140:5000/v3 ←
Image	http://10.8.108.140:9292



### Note

OpenStack Object Storage service (openstack-swift) is deployed with Keystone authentication to valid users and identify their resources.



### Note

The GUI shows the latest Keystone Identity service version supported. However, FlashSystem V9000 currently support v2.0. OpenStack also has 2.0 running which is being deprecated. Keystone Identity service version 2.0 is used to enable Transparent Cloud Tiering on the V9000.



## Questions

Record the Keystone Identity service endpoint URL using the v2.0 instead of the v3.

<http://> \_\_\_\_\_

## Section 2: Enable Transparent Cloud Tiering

Before data can be copied to cloud storage, a connection to the cloud service provider must be configured from the system. This procedure establishes a Transparent Cloud Tiering (TCT) connection between the FlashSystem V9000 and the OpenStack Swift service provider.



## Teamwork

Since you are working in a shared resource environment, the Transparent Cloud Tiering feature is pre-configured for you. You will use a simulation to complete the enablement process for TCT.

- \_\_\_ 6. From your Admin desktop, double-click on the **TCT Simulation html**.
- \_\_\_ 7. From the simulated V9000 management GUI, click **Dashboard**.
- \_\_\_ 8. Navigate to **Settings**. Click the scroll bar.
- \_\_\_ 9. Navigate to **System > Transparent Cloud Tiering**.
- \_\_\_ 10. Select **Enable Cloud Connection**.
- \_\_\_ 11. The Enable Cloud Connection Welcome is displayed. Click **Next** to continue.
- \_\_\_ 12. From the Cloud Service Provider pane, select **OpenStack Swift** as the cloud provider. Click **Next**.
- \_\_\_ 13. From the Cloud Provider Settings pane, enter the following settings:
  - \_\_\_ a. Tenant: **TCT-Cloud** (Press the **Enter** key)
  - \_\_\_ b. Select the User name field: **admin** (Press the **Enter** key)
  - \_\_\_ c. Password: **admin** (Press the **Enter** key)
  - \_\_\_ d. Keystone Identity Service Endpoint IP address: (*http://x.x.x.x:5000/v2.0* - information previously recorded). (Press the **Enter** key)
  - \_\_\_ e. Container Prefix: **V9K** (Press the **Enter** key)
  - \_\_\_ f. SSL Certification and Keystone: **Accept defaults**

\_\_ g. Encryption: **De-select to disable**

Cloud Provider Settings

OpenStack Swift account

Tenant:	TCT-Cloud
User name:	admin
Password:	*****
<input type="checkbox"/> Show characters	
Endpoint:	http://10.8.108.141:5000/v2.0
Container prefix:	V9K
SSL Certificate:	<input type="button" value="..."/>
Keystone:	<input checked="" type="checkbox"/> Enable
Encryption	<input type="checkbox"/> Enable

Bandwidth

- \_\_ h. Click the scroll bar to view the other settings. **Accept all defaults.**
- \_\_ i. Click **Next** to continue.
- \_\_ j. Examine the **svctask mkcloudaccountswift** command generated to establish connection from the V9000 to an OpenStack Swift service provider. Click **Close**.
- \_\_ k. Review the TCT settings. Click **Finish**.
- \_\_ l. Close the browser tab or window to end the simulation.
- \_\_ 14. From the Admin server desktop, open a browser window.
- \_\_ 15. Enter the URL of your V9000 management IP address.
- \_\_ 16. Log in using your **teamname-admin** credentials.
- \_\_ 17. Navigate to **Settings > System > Transparent Cloud Tiering**.



### Information

Transparent Cloud Tiering is a licensed function that enables volume data to be copied and transferred to cloud storage. The system supports creating connections to cloud service providers to store copies of volume data in private or public cloud storage.

- \_\_ 18. Observe that Transparent Cloud Tiering is already configured and online.
- \_\_ 19. Click the **Account Information** link to view configuration details.

**Important**

Do not make any modifications outside of what has been instructed, as this might disable the environment for others.

### **Section 3: Create a volume and map volume to WIN**

This procedure creates a basic volume and map volume to WIN host.

- \_\_\_ 20. Navigate to **Volumes > Volumes by Pool**.
- \_\_\_ 21. Select your **teamsetID-Hybrid** pool from the Pool Filter list. Examine the pool Volume Allocation bar.
- \_\_\_ 22. From the Volumes by Pool pane, click **Create Volumes**.
- \_\_\_ 23. The Create Volumes panel is displayed. From the Create Volumes panel select the **Basic** preset and complete the following:
  - \_\_\_ a. Select the **teamsetID-Hybrid** pool for the volumes.
  - \_\_\_ b. Create one **6 GiB** volume.
  - \_\_\_ c. Name the volume **teamsetID-TCT** (refer to the team lab data sheet).
  - \_\_\_ d. Capacity savings: **None**.
  - \_\_\_ e. Accept the I/O group default: **Automatic**
  - \_\_\_ f. Verify that the volume Summary information is correct. Click **Create and Map**.
- \_\_\_ 24. Review the **svctask mkvdisk** commands generated for each volume created. Click **Continue**.
- \_\_\_ 25. The Create Mapping window is displayed:
  - \_\_\_ a. Select your **WIN** host. Click **Next**.
  - \_\_\_ b. Observe the highlighted **WIN** volume. Click **Map Volumes**.
- \_\_\_ 26. Examine the **svctask mkvdiskhostmap** command generated to map volume to the host. Note that the host ID and volume ID are referenced in the output. Click **Close**.

**Questions**

What is the TCT volume UID? \_\_\_\_\_

## Section 4: Access volume from the WIN server

- \_\_\_ 27. From the Admin server desktop, start an RDP session to your **WIN** server.
  - \_\_\_ 28. Login using the server credentials (refer to the team lab data sheet).
  - \_\_\_ 29. From the WIN server, click the **Server Manager** icon.
  - \_\_\_ 30. Navigate to **Storage > Disk Management**.
- 



### Troubleshooting

If the new disk has not yet been automatically discovered by Windows, select from the Actions pane (on the far right), select **Disk Management > Rescan Disks**.

- \_\_\_ 31. If the Initialize Disk window is not displayed, right-click on the left pane of the **Disk#** area, and select **Initialize**. Otherwise if the Initialize Disk window is displayed, go to the next step.
- \_\_\_ 32. From the Initialize Disk pop-up window, accept the **MBR** default and click **OK** to continue.
- \_\_\_ 33. Right-click on the right pane of the unallocated disk. In the menu list, click **New Simple Volume**.
- \_\_\_ 34. The New Simple Volume Wizard welcome screen is displayed. Click **Next**.
  - \_\_\_ a. Accept the default capacity value. Click **Next**.
  - \_\_\_ b. Accept the default drive letter. Click **Next**.
  - \_\_\_ c. Relabel the volume as **teamsetID-TCT**. Click **Next**.
  - \_\_\_ d. Click **Finish** to complete the disk allocation.
- \_\_\_ 35. Right-click the **TCT** disk entry and select **Properties**.
- \_\_\_ 36. Observe that the volume has been defined by Windows as a fully allocated 6 GB disk.
- \_\_\_ 37. Open an **Explorer** view. Navigate to the **C:\Software\ClassFolders** location.
- \_\_\_ 38. Copy the **FolderDB-4GB**, **FolderDB-300MB**, and **FolderPDF-2MB** to the TCT volume.

## Section 5: Create a cloud snapshot

This procedure creates a full snapshot of a volume on the system which is copied and transferred to the cloud storage.

- \_\_\_ 39. Return to the V9000 management GUI.
  - \_\_\_ 40. Navigate to **Volumes > Volumes by Host**.
  - \_\_\_ 41. Select your **WIN** host.
  - \_\_\_ 42. Right-click on your **TCT** volume, and select **Cloud Volumes > Create Cloud Snapshot**.
- 



### Information

The system supports two types of cloud snapshots:

When a cloud snapshot is created for the first time for a volume, a **full snapshot** of all data is copied to the cloud storage.

**Incremental snapshot** only contains the changed data from the last time the cloud snapshot was created for a selected volume. Incremental-only snapshots are quicker to complete than a full snapshot.

- 
- \_\_\_ 43. From the Create Cloud Snapshot of Volume pane:
    - \_\_\_ a. Select **Complete a full snapshot**.
    - \_\_\_ b. Accept the default to '**Go to Cloud Volume to manage cloud-related tasks of all volumes**'.
    - \_\_\_ c. Click **Create**.
  - \_\_\_ 44. Examine the **svctask chvdisk** command syntax generated to establish the cloud connection between the V9000 and the cloud service provider. Click **Close**.
  - \_\_\_ 45. Observe the status of your TCT volume. Note the GUI has redirected you to the **Volumes > Cloud Volumes** window.
- 



### Note

A Restore Status (equivalent to the volume `backup_status` attribute) of copying indicates a snapshot operation is in progress and data is being transferred to the cloud. When all the data is transferred to the cloud the status will be ready. After a ready status, one can restore the volume if necessary. If the volume contains a large amount of data, and or the network bandwidth between the Spectrum Virtualize system and the cloud provider is limited, transferring the data can take a long time.

- 
- \_\_\_ 46. Hover the mouse pointer over each column to view its description.
  - \_\_\_ 47. Once the snapshot copying is complete, observe the change in your TCT volume snapshot size, snapshot status and the restore status.

**Note**

The snapshot size indicates the amount of storage in use for the snapshot version of the volume. The timestamp indicates the date and time the data was backed up to the cloud. The Restore Status indicates whether a restore can be performed for the volume. A restore status of *Available* indicates it can be restored. The Snapshot Count indicates the number of restore points from which a restore can be performed.

- 
- \_\_\_ 48. Navigate to your OpenStack Swift service provider.
  - \_\_\_ 49. Select **Project > Object Store > Containers**.
- 

**Note**

OpenStack Swift provides a fully-distributed storage solution that is used to store any kind of static data or binary object, such as media files, large datasets, and disk images. The Object Storage service organizes these objects through containers.

- 
- \_\_\_ 50. Observe the instance that represents your V9K container.
  - \_\_\_ 51. Hover the mouse pointer over each V9K container ID to locate the container that correlates to your V9000 TCT volume UID.
  - \_\_\_ 52. Select your V9K container ID to review the details.
- 

**Note**

Containers store object data with extensive meta-data. In this case, the object is a VDisk snapshot with meta-data including the snapshot time and size among other information. Object storage is not hierarchical like a Windows or Unix file tree with nesting of folders.

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## Section 6: Restore data from the Cloud

This procedure recovers data loss using the cloud snapshot version of the original data.

- \_\_\_ 53. From your WIN server, open Windows Explorer and navigate to your TCT volume disk.



### Questions

Record the folders listed:

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- \_\_\_ 54. Delete all but one folder from the TCT volume disk.
- \_\_\_ 55. Rename the remaining folder as **MINE**, and then close Windows Explorer.
- \_\_\_ 56. Navigate to **Server Manager > Storage > Disk Management**.



### Note

In the event that a drive has failed, the first step is to make sure the drive is unmounted. This will make it easier for Swift Object Storage to work around the failure until it has been resolved.

- \_\_\_ 57. Right-click on the left pane of the TCT disk. Select **Offline**.
- \_\_\_ 58. Navigate to the V9000 management GUI.
- \_\_\_ 59. From the Volumes > Cloud Volumes window, right-click on your TCT volume and select **Restore**.
- \_\_\_ 60. Select the snapshot version that presents your TCT volume to be restored. Click **Next**.
- \_\_\_ 61. Select **Restore directly to the production volume**. Click **Next**.
- \_\_\_ 62. Review the summary information. Click **Finish**.
- \_\_\_ 63. Examine the `svctask restore volume` command generated to restore the volume from the cloud service provider. Click **Close**.
- \_\_\_ 64. Observe the change in the cloud volume snapshot status and restore status.



### Note

The snapshot version replaces the current data that exists on production volume with the data that is stored on the cloud storage. The production volume goes offline during the restore operations. Data is not fully restored to the production volume until the changes are committed.

The snapshot version and volume that it is being restored to must be the same size. A snapshot cannot be deleted while it is being used for a restore.

- \_\_\_ 65. Return to your WIN server.

- \_\_\_ 66. Navigate to **Server Manager > Storage > Disk Management**.
  - \_\_\_ 67. Right-click on the TCT disk. Select **Online**.
  - \_\_\_ 68. Verify that the TCT disk has restored the original files.
  - \_\_\_ 69. Navigate to the V9000 management GUI.
  - \_\_\_ 70. Observe that your TCT volume snapshot status and restore status have returned to *Ready* and *Available* respectively.
- 



### Information

Cloud volume snapshot are ideal for providing a remote vault for volume snapshots to restore data in case of a site disaster.

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- \_\_\_ 71. Click **Log Out** from the V9000 management GUI.
- \_\_\_ 72. Click **Start > Logoff** to exit from the WIN server.
- \_\_\_ 73. Select your **team ID** and **Sign Out** from the OpenStack Swift GUI.

## End of exercise



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