

VPLEX Management

July 2015

COPYRIGHT

Copyright ©2015 EMC Corporation. All Rights Reserved. Published in the USA. EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license. The trademarks, logos, and service marks (collectively "Trademarks") appearing in this publication are the property of EMC Corporation and other parties. Nothing contained in this publication should be construed as granting any license or right to use any Trademark without the prior written permission of the party that owns the Trademark.

EMC, EMC² AccessAnywhere Access Logix, AdvantEdge, AlphaStor, AppSync ApplicationXtender, ArchiveXtender, Atmos, Authentica, Authentic Problems, Automated Resource Manager, AutoStart, AutoSwap, AVALONidm, Avamar, Bus-Tech, Captiva, Catalog Solution, C-Clip, Celerra, Celerra Replicator, Centera, CenterStage, CentraStar, EMC CertTracker, CIO Connect, ClaimPack, ClaimsEditor, Claralert, cLARIiON, ClientPak, CloudArray, Codebook Correlation Technology, Common Information Model, Compuset, Compute Anywhere, Configuration Intelligence, Configuresoft, Connectrix, Constellation Computing, EMC ControlCenter, CopyCross, CopyPoint, CX, DataBridge, Data Protection Suite, Data Protection Advisor, DBClassify, DD Boost, Dantz, DatabaseXtender, Data Domain, Direct Matrix Architecture, DiskXtender, DiskXtender 2000, DLS ECO, Document Sciences, Documentum, DR Anywhere, ECS, elnput, E-Lab, Elastic Cloud Storage, EmailXaminer, EmailXtender, EMC Centera, EMC ControlCenter, EMC LifeLine, EMCTV, Enginuity, EPFM, eRoom, Event Explorer, FAST, FarPoint, FirstPass, FLARE, FormWare, Geosynchrony, Global File Virtualization, Graphic Visualization, Greenplum, HighRoad, HomeBase, Illuminator, InfoArchive, InfoMover, Infoscape, Infra, InputAccel, InputAccel Express, Invista, Ionix, ISIS, Kazeon, EMC LifeLine, Mainframe Appliance for Storage, Mainframe Data Library, Max Retriever, MCx, MediaStor, Metro, MetroPoint, MirrorView, Multi-Band Deduplication, Navisphere, Netstorage, NetWorker, nLayers, EMC OnCourse, OnAlert, OpenScale, Petrocloud, PixTools, Powerlink, PowerPath, PowerSnap, ProSphere, ProtectEverywhere, ProtectPoint, EMC Proven, EMC Proven Professional, QuickScan, RAPIDPath, EMC RecoverPoint, Rainfinity, RepliCare, RepliStor, ResourcePak, Retrospect, RSA, the RSA logo, SafeLine, SAN Advisor, SAN Copy, SAN Manager, ScaleIO Smarts, EMC Snap, SnapImage, SnapSure, SnapView, SourceOne, SRDF, EMC Storage Administrator, StorageScope, SupportMate, SymmAPI, SymmEnabler, Symmetrix, Symmetrix DMX, Symmetrix VMAX, TimeFinder, TwinStrata, UltraFlex, UltraPoint, UltraScale, Unisphere, Universal Data Consistency, Vblock, Velocity, Viewlets, ViPR, Virtual Matrix, Virtual Matrix Architecture, Virtual Provisioning, Virtualize Everything, Compromise Nothing, Virtuent, VMAX, VMAXe, VNX, VNXe, Voyence, VPLEX, VSAM-Assist, VSAM I/O PLUS, VSET, VSPEX, Watch4net, WebXtender, xPression, xPresso, Xtrem, XtremCache, XtremSF, XtremSW, XtremIO, YottaYotta, Zero-Friction Enterprise Storage.

Revision Date: July 2015

Document Revision History

Rev #	File Name	Date
5.4.1.2	MR-1CN-VPLEXMGMT_labguide	July 2015

Table of Contents

DOCUMENT REVISION HISTORY	3
LAB EXERCISE 1: VPLEX CLUSTER HEALTH CHECK	5
LAB 1: PART 1 – HEALTH CHECK WITH UNISPHERE.....	6
LAB 1: PART 2 - HEALTH CHECK WITH VPLEX CLI	12
LAB EXERCISE 2: PROVISIONING WITH VPLEX.....	15
LAB 2: PART 1 – REGISTER HOST INITIATORS	16
LAB 2: PART 2 – PROVISION STORAGE.....	21
LAB 2: PART 3 – STORAGE VIEW CREATION.....	35
LAB 2: PART 4 – USING PROVISION FROM STORAGE VOLUME WIZARD.....	43
LAB 2: PART 5 – PROVISIONING USING VIAS	49
LAB 2: PART 6 - ENCAPSULATION	61
LAB EXERCISE 3: CREATING DISTRIBUTED DEVICES	77
LAB 3: PART 1 – CREATE DISTRIBUTED DEVICES	78
LAB 3: PART 2 – PROVISIONING DISTRIBUTED STORAGE WITH VIAS.....	104
LAB EXERCISE 4: MOBILITY WITH VPLEX	111
LAB 4: PART 1 – EXTENT MOBILITY.....	112
LAB 4: PART 2 – DEVICE MOBILITY	120
LAB 4: PART 3 – BATCH MOBILITY.....	133
LAB EXERCISE 5: SYSTEM MONITORING	141
LAB 5: PART 1 – SYSTEM MONITORING	142
LAB 5: PART 2 – VIEW PERFORMANCE	143
LAB 5: PART 3 – PERPETUAL MONITORS.....	148
LAB 5: PART 4 - CONFIGURE MONITORS	150

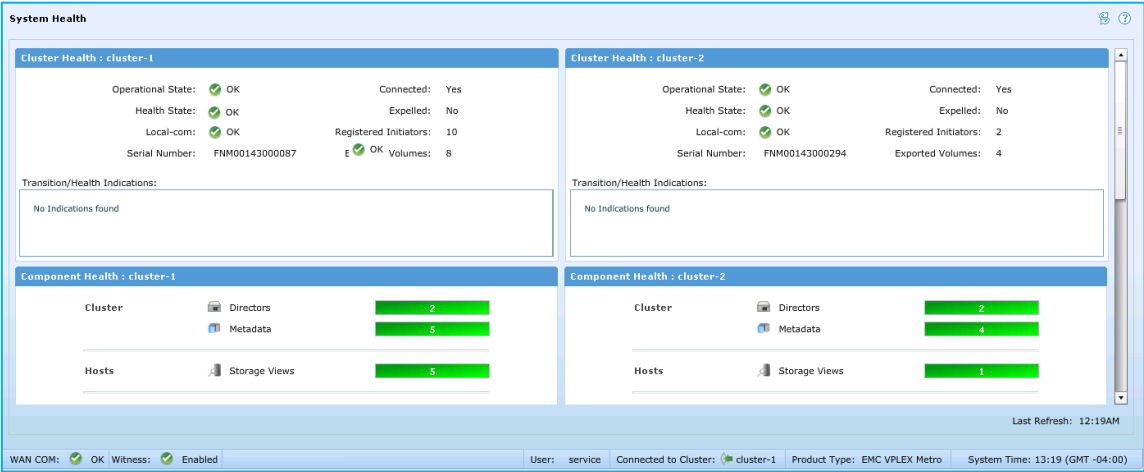
Lab Exercise 1: VPLEX Cluster Health Check

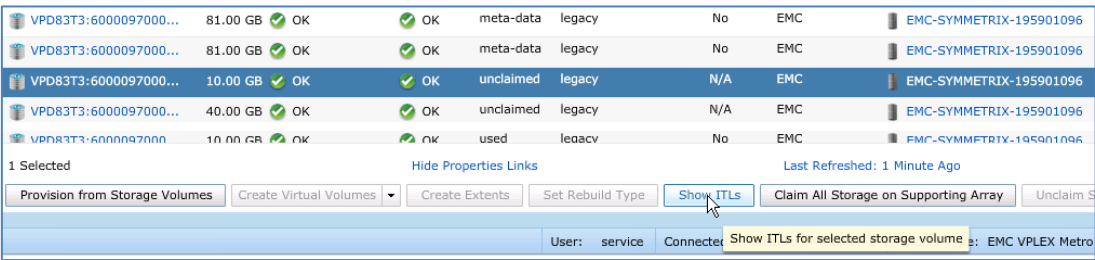
Purpose:	This Lab will verify the overall VPLEX Metro Cluster Health
Tasks:	Health Check using Unisphere Health Check using VPLEX CLI

Lab 1: Part 1 – Health Check with Unisphere

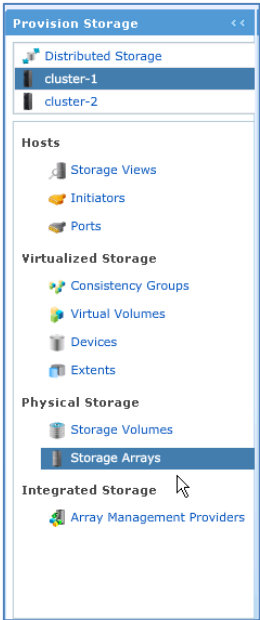
Step	Action
	In this Lab, we will verify the Health and configuration of the VPLEX Cluster. We will check: • VPLEX Cluster Health • FE and BE connectivity • Storage Volume ITLs Use the student Lab Map to obtain the following addresses, along with the user/password • Student Windows Host • VPLEX Cluster Management Address
1.	Log in to your Windows host.
2.	Launch a Web browser session to the VPLEX Cluster Enter the user/password from the student Lab Map

Step	Action
3.	Verify VPLEX Cluster Health From the opening screen the general Status of the VPLEX Cluster can be viewed. From this screen connectivity from Cluster1 to Cluster 2 and VPLEX Witness can be verified. (Metro Only) The status of the cluster hardware and connectivity to the arrays can also be checked. <i>Notice the arrow next to the cluster's management server that you are connected to.</i>
4.	Click the view status details link under the icon for Cluster-1 or 2 Verify the cluster status.

Step	Action
5.	Select Monitoring Select System Health  Wait until the test completes
6.	View the status of the VPLEX Cluster 
	The next steps will verify the health and connectivity of the array volumes connected to VPLEX.
7.	Select Provision Storage from the top tool Bar. Next Select your assigned Cluster (1 or 2) Select Storage Volumes

Step	Action
8.	Select Any Storage Volume  ON the bottom of the window, select Show ITLs

Step	Action																																				
9.	Here is an example of the display Show ITLs Storage Volume Name: VPD83T3:60000970000195901096533030313841 System ID: VPD83T3:60000970000195901096533030313841 ITLs Find < Previous Next > <table><thead><tr><th>Initiator</th><th>1 ▲ Target</th><th>LUN</th></tr></thead><tbody><tr><td>0x50001442a0633010</td><td>0x5000097310112180</td><td>34</td></tr><tr><td>0x50001442a0633010</td><td>0x5000097310112184</td><td>34</td></tr><tr><td>0x50001442a0633011</td><td>0x5000097310112184</td><td>34</td></tr><tr><td>0x50001442a0633011</td><td>0x5000097310112180</td><td>34</td></tr><tr><td>0x50001442b0633010</td><td>0x5000097310112184</td><td>34</td></tr><tr><td>0x50001442b0633010</td><td>0x5000097310112180</td><td>34</td></tr><tr><td>0x50001442b0633011</td><td>0x5000097310112180</td><td>34</td></tr><tr><td>0x50001442b0633011</td><td>0x5000097310112184</td><td>34</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></tbody></table> 0 Selected 8 items Close Use the information from your display to answer the following: How many ITLs are displayed for this storage volume? _____ Is this optimum? _____ Does this give an indication of zoning? _____ Is this configured for an Active-Active Array or Active-Passive? _____	Initiator	1 ▲ Target	LUN	0x50001442a0633010	0x5000097310112180	34	0x50001442a0633010	0x5000097310112184	34	0x50001442a0633011	0x5000097310112184	34	0x50001442a0633011	0x5000097310112180	34	0x50001442b0633010	0x5000097310112184	34	0x50001442b0633010	0x5000097310112180	34	0x50001442b0633011	0x5000097310112180	34	0x50001442b0633011	0x5000097310112184	34									
Initiator	1 ▲ Target	LUN																																			
0x50001442a0633010	0x5000097310112180	34																																			
0x50001442a0633010	0x5000097310112184	34																																			
0x50001442a0633011	0x5000097310112184	34																																			
0x50001442a0633011	0x5000097310112180	34																																			
0x50001442b0633010	0x5000097310112184	34																																			
0x50001442b0633010	0x5000097310112180	34																																			
0x50001442b0633011	0x5000097310112180	34																																			
0x50001442b0633011	0x5000097310112184	34																																			

Step	Action
10.	Located in the left most window under Physical Storage, select Storage Arrays 
11.	Verify that the connectivity has a green check mark. Note the Logical Unit count.
12.	Select Storage Volumes (left window) The total number of Storage Volumes are located in the right corner. Notice the amount match

End of Lab Exercise

Lab 1: Part 2 - Health Check with VPLEX CLI

Step	Action
	This lab will verify the VPLEX Cluster health using VPLEX CLI
1.	Log on to your Windows Management host
2.	From the desktop launch Putty and connect with SSH to your assigned VPLEX Cluster.
3.	Log into the management server (see lab map for the user/password) Launch vplexcli service@VPLEX-Cluster1:~> vplexcli Next log into VPLEX CLI
4.	Run the Health check command Vplexcli:/> health-check Notice this command displays the overall health of the cluster. It also provides the code version, and TLA number for each cluster.
5.	Change to the storage volume context for your assigned cluster. Vplexcli:/> cd clusters/cluster-1/storage-elements/storage-volumes

Step	Action
6.	Perform an ll ll
7.	Displayed is a list of the storage volumes attached to this cluster. Chose a storage volume and perform an ll for that volume. VPllexcli:/clusters/cluster-1/storage-elements/storage-volumes> ll VPD83T3 : 60000970000195901096533030344539 Notice that the exact block size is displayed. Also the number of ITLs that were viewed earlier.
8.	Change back to the root context. VPllexcli:/clusters/cluster-1/storage-elements/storage-volumes> cd /
9.	Run the cluster summary command VPllexcli:/> cluster summary Notice that the clusters are assigned the same Island ID. This is an indication that the clusters are connected. If each one had a unique ID they are

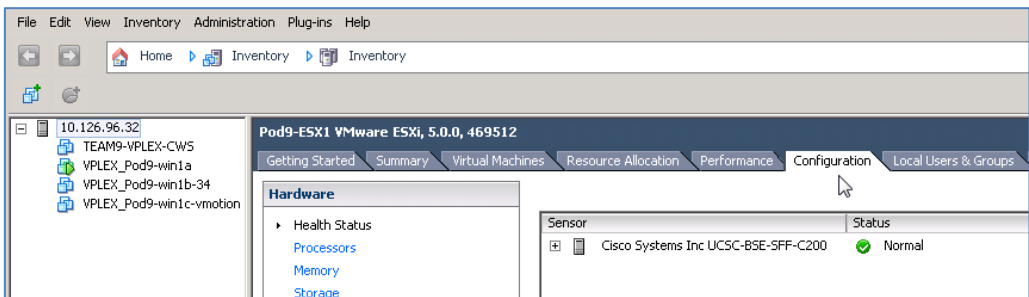
End of Lab Exercise

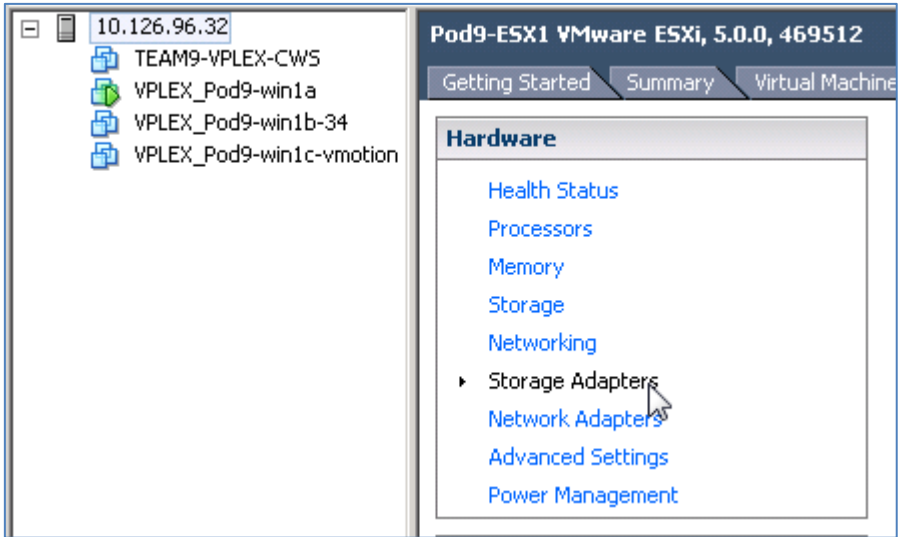
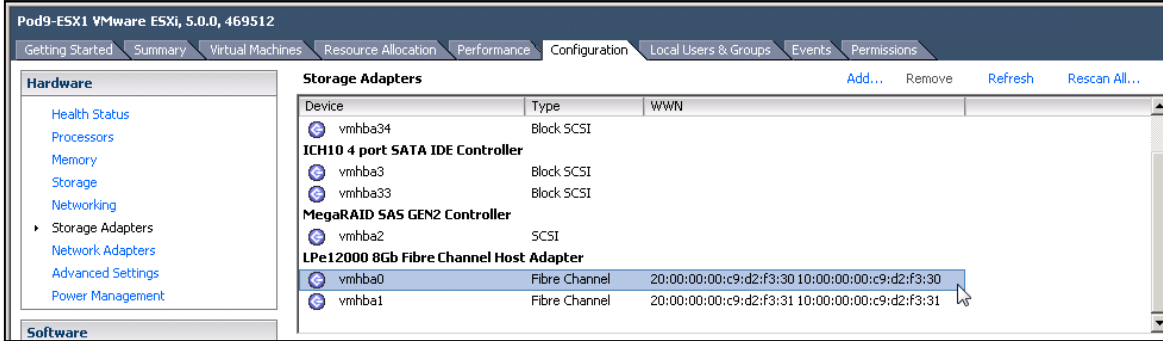
This page intentionally left blank.

Lab Exercise 2: Provisioning with VPLEX

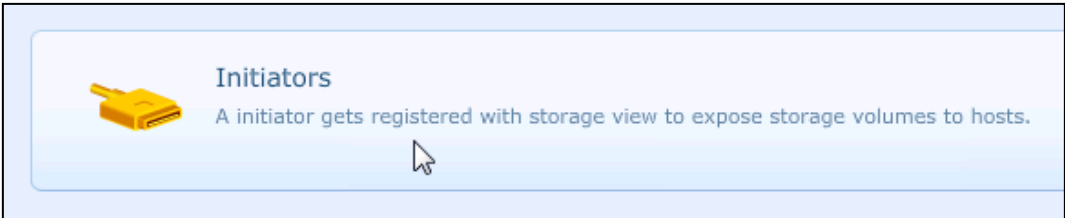
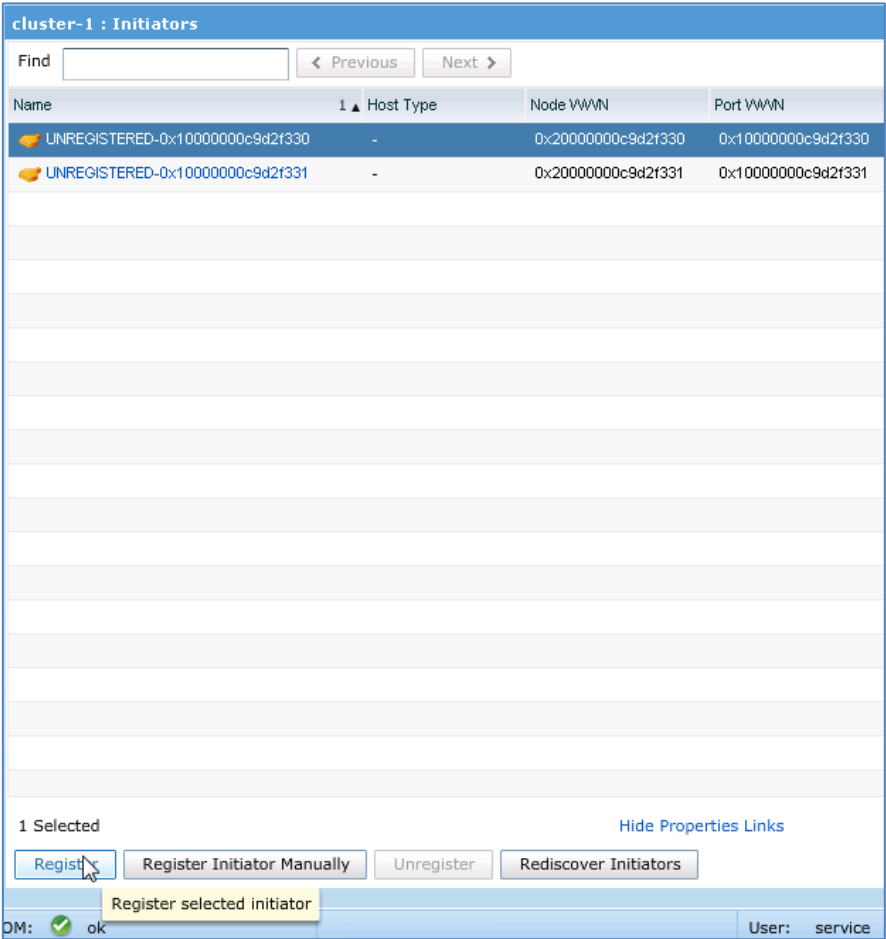
Purpose:	To provision Local Storage from a VPLEX cluster to a host using Advanced Provisioning.
Tasks:	Register Host initiators with VPLEX Create Virtual Volumes from Storage Create Storage Views

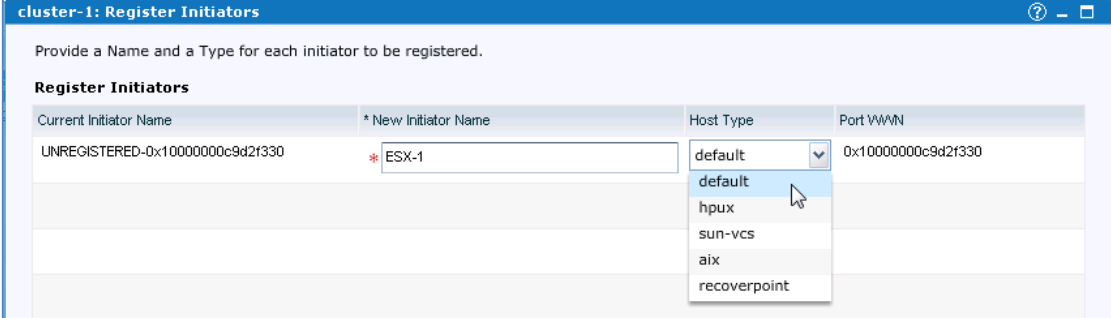
Lab 2: Part 1 – Register Host Initiators

Step	Action
	This Lab will discover and verify the connectivity of the VPLEX Front End Ports Use the student Lab Map to obtain the following addresses, along with the user/password • Student Windows Host • VPLEX Cluster Management Address • ESX Server address user/password
1.	Connect to your assigned Windows Host.
2.	From the desktop, Open VSphere Client and connect to your ESXi Host. (not VCenter Server) See student lab map for login information.
3.	Select the ESX Host in the left window. Select the Configuration Tab.  The screenshot shows the VMware vSphere Client interface. On the left, a tree view displays the inventory structure: 10.126.96.32, TEAM9-VPLEX-CWS, VPLEX_Pod9-win1a, VPLEX_Pod9-win1b-34, and VPLEX_Pod9-win1c-vmotion. The main pane shows the configuration tab for 'Pod9-ESX1 VMware ESXi, 5.0.0, 469512'. The 'Configuration' tab is selected, and the 'Hardware' section is expanded, showing 'Health Status', 'Processors', 'Memory', and 'Storage'. A table at the bottom right shows the status of sensors, with one sensor 'Cisco Systems Inc UCSC-BSE-SFF-C200' listed with a 'Normal' status.

Step	Action
4.	Under Hardware, select the Storage Adapters link. 
5.	In the Right side window Storage Adapters, scroll down to view the Fibre Channel Adapter.  Record the WWNs
6.	From your Windows host, launch an SSH session to your assigned VPLEX Cluster. (Putty is installed on the desktop)
7.	Log in using the user/password from the student lab map.

Step	Action
8.	View the initiator port logins to the VPLEX front-end target ports. <pre>VPlexcli:/> export initiator-port show-logins *</pre> <pre> Plexcli:/> export initiator-port show-logins * 0012482006c9791 Cluster Names Initiator Port Names Target Port Names ----- cluster-1 UNREGISTERED-0x50012482006c9791 P0000000047606330-A0-FC00 P0000000047606330-A0-FC01 P0000000047706330-B0-FC01 P0000000047706330-B0-FC00 </pre> This command will display the host initiators that are connected or zoned to the VPLEX Front End Ports This example displays 1 fabric of an ideal SAN configuration for a single engine The other would contain a different HBA connected to the remaining 4 FE ports. Your display should show the WWN's of the ESX server's HBA's viewed earlier.
9.	Log in to Unisphere for VPLEX by entering the Cluster Management address. <a href="https://<Management_Station_IP>">https://<Management_Station_IP>
10.	Select Provision Storage
11.	Select your assigned Cluster (1 or 2)

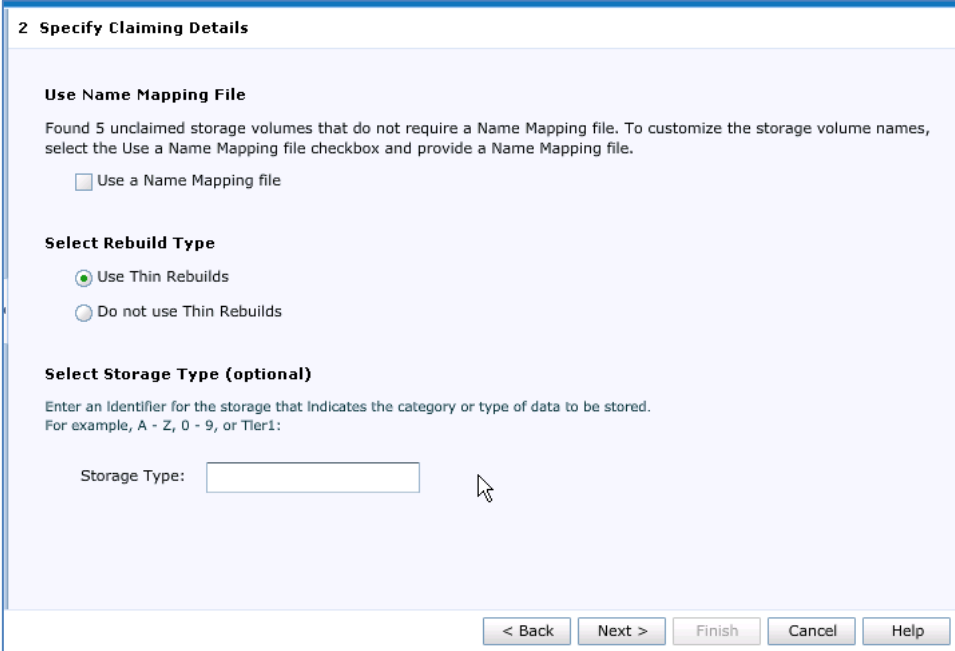
Step	Action
12.	Select Initiators 
13.	Find the WWN of your assigned ESX Host. If listed as unregistered Select it and Click Register If it is already registered click on the link for the initiators and view the properties 
14.	If there no more unregistered initiators , click on the link for the initiators and view the properties

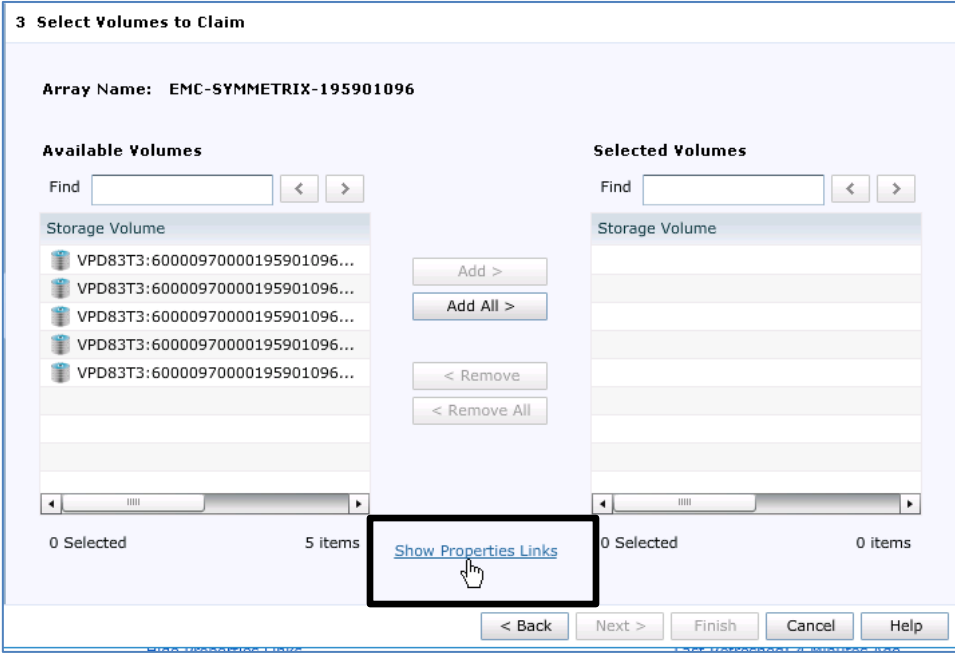
Step	Action
15.	Enter a unique Initiator name (You can use your student number for example student1) Chose the default host type Click OK 

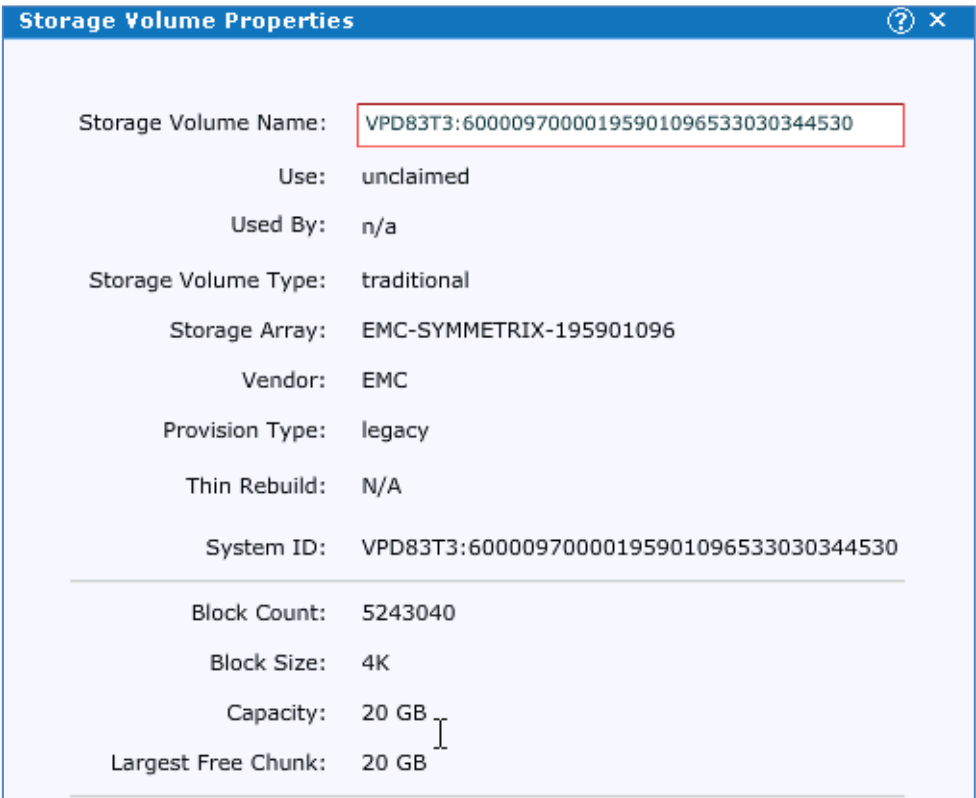
End of Lab Exercise

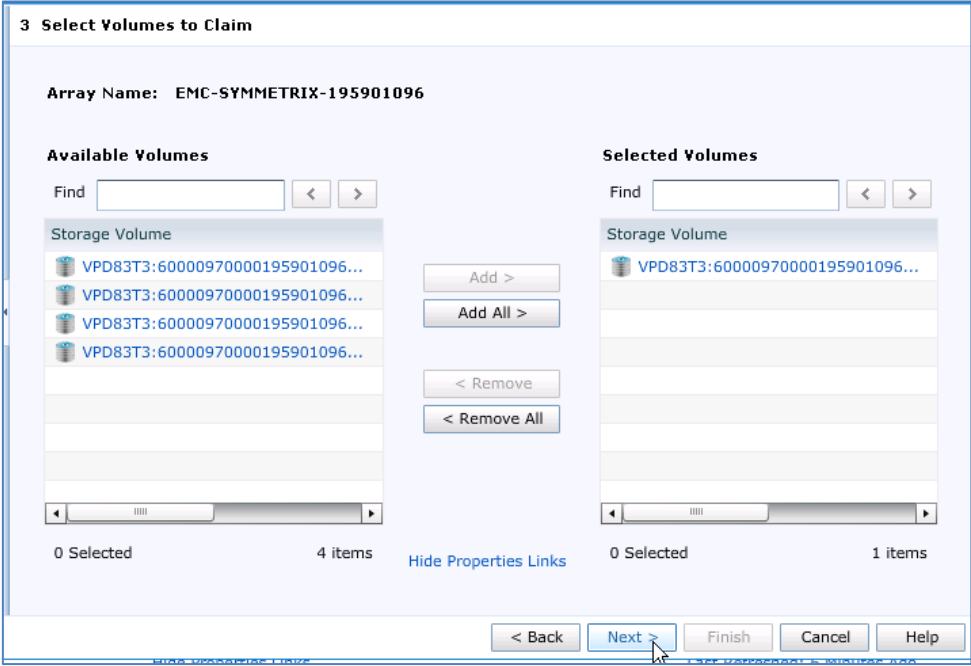
Lab 2: Part 2 – Provision Storage

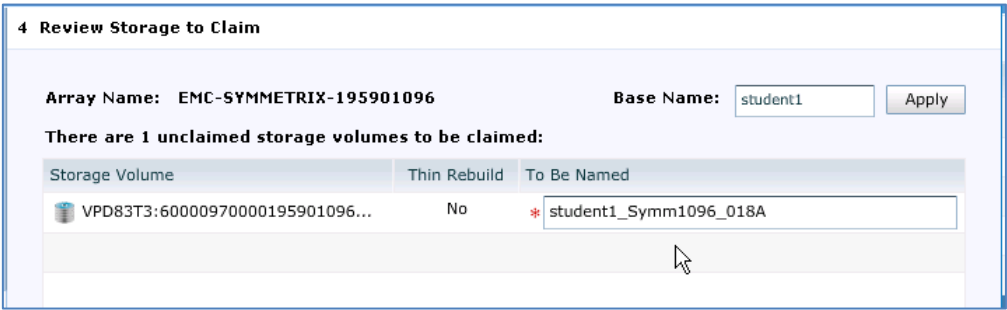
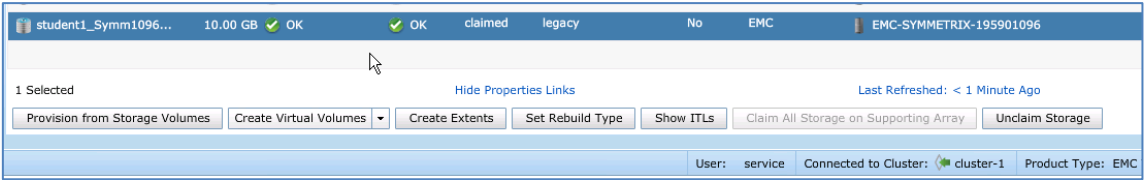
Step	Action
	This lab will use the advanced provisioning method to create a Virtual Volume from an unclaimed Storage Volume masked to VPLEX and provision it to a Host (ESX). It is important that you choose your assigned volumes during the lab exercises. There may be other students sharing the VPLEX Cluster and ESX host at the same time. Use the student Lab Map to obtain the following addresses, along with the user/password • Student Windows Host • VPLEX Cluster Management Address • ESX Server address user/password • Assigned Storage Volumes
1.	Log on to your assigned Windows host
2.	Open a web browser session to Unisphere for VPLEX. Use your assigned Cluster IP address Log in using the user/password from the LAB Map.
3.	Select Provision Storage
4.	Select your assigned Cluster (1 or 2)
5.	Select Storage Volumes
6.	This window should display the storage volumes connected to VPLEX from the Array(s). Notice in the Use column the listings are: claimed, unclaimed, used or meta-data. Select an assigned storage volume that is unclaimed. (refer to the student lab map)

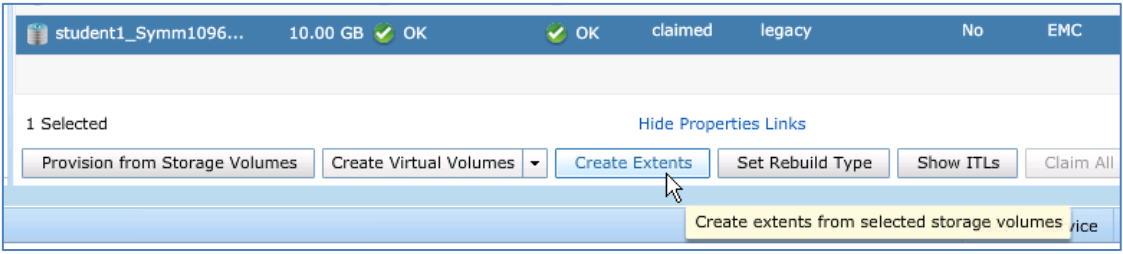
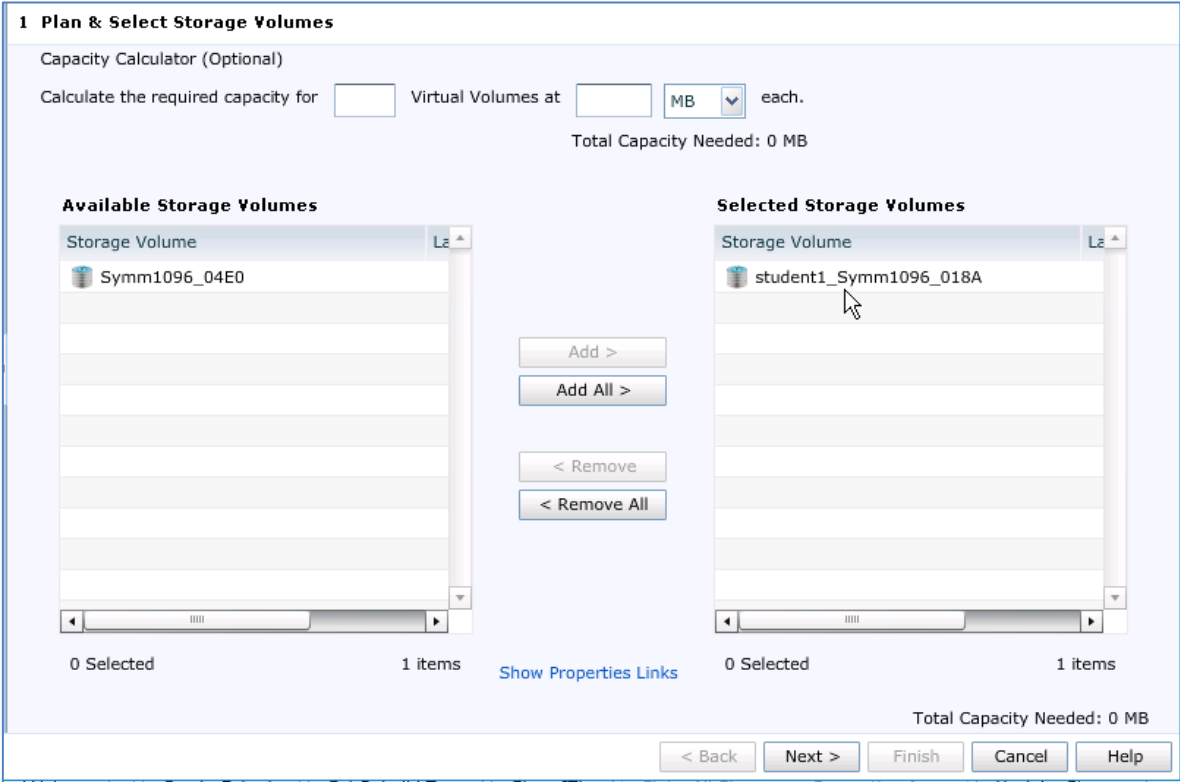
Step	Action
7.	Select Claim All Storage on Supporting Array A wizard should launch.
8.	Choose your assigned Array. Click Next
9.	From the Specify Claiming Details step: Do not Select the box Use a Name Mapping file Select Use Thin Rebuilds Click Next 

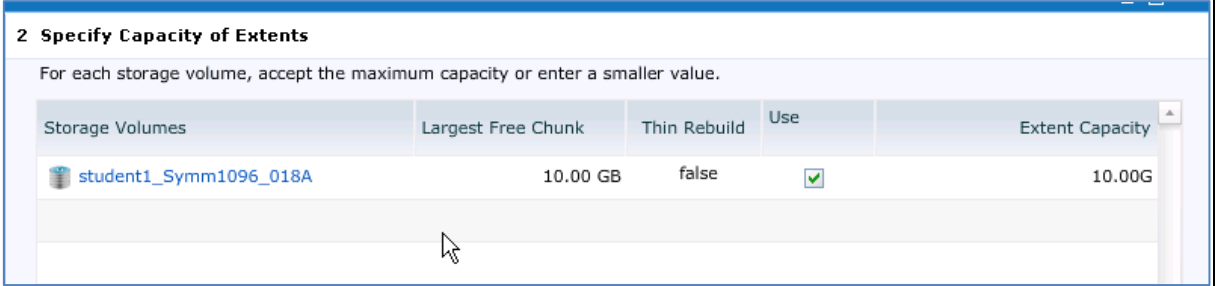
Step	Action
10.	Next is the Select Volumes to Claim step. The volumes presented as a choice are the unclaimed Storage Volumes masked to VPLEX from the selected array. Click on the Show Properties Links so that the Storage Volumes (VPDXXX..) become links. 

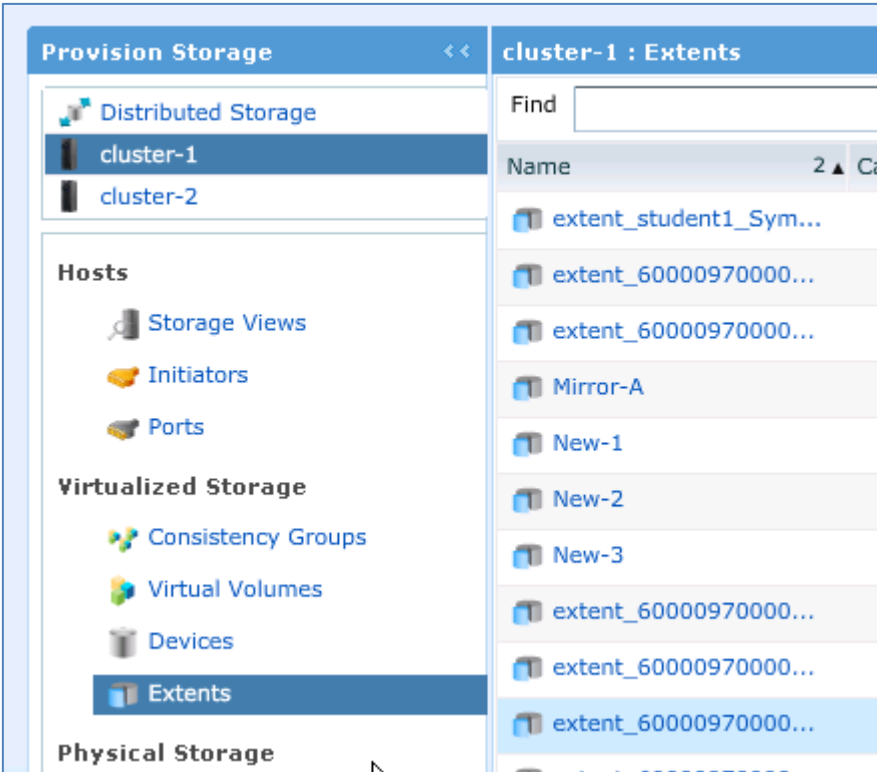
Step	Action
11.	Click on a Storage Volume link. The Properties box appears.  Notice this lists the size of the Storage Volume. Use this method to Identify your assigned Storage Volume size. (See Student Lab Map)

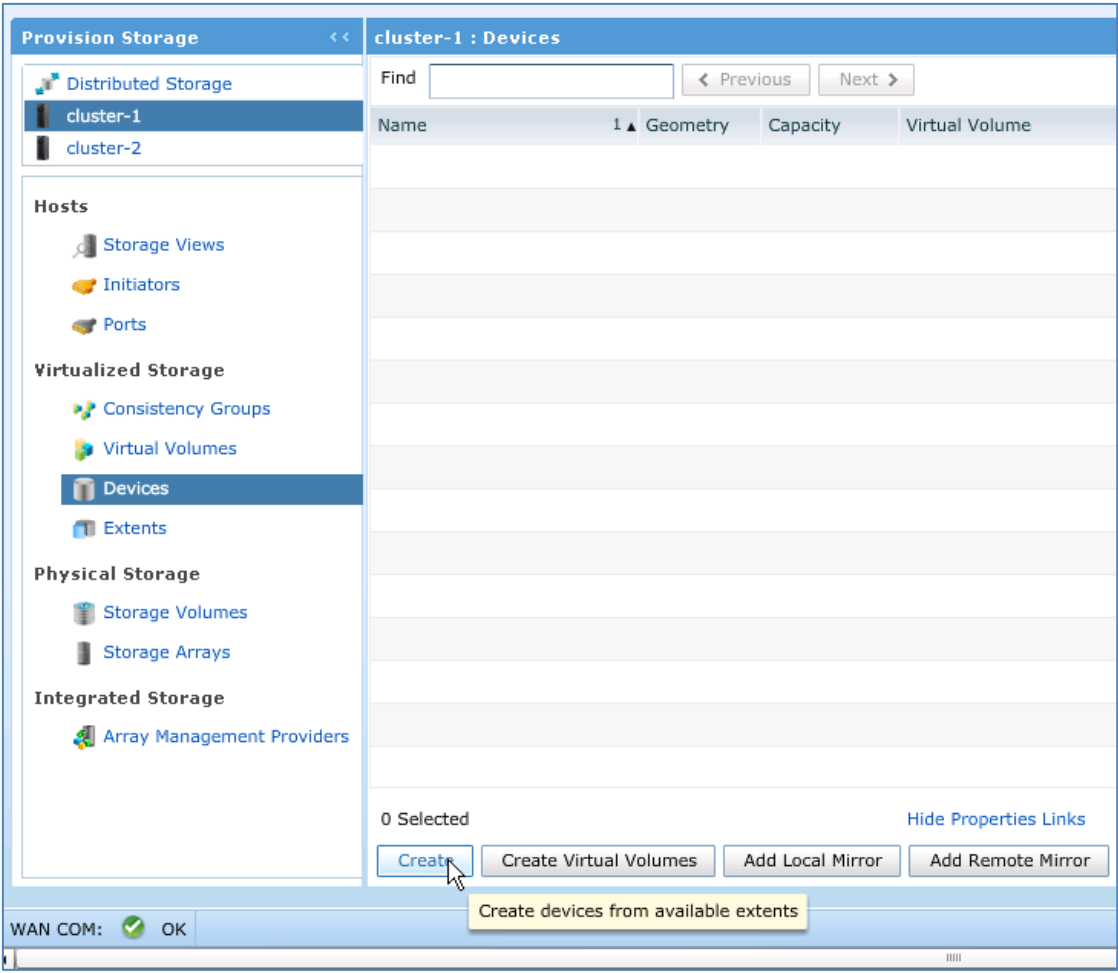
Step	Action
12.	Once you have identified an assigned storage volume, select it and click Add. This will move the Storage Volume to the right box.  Click Next

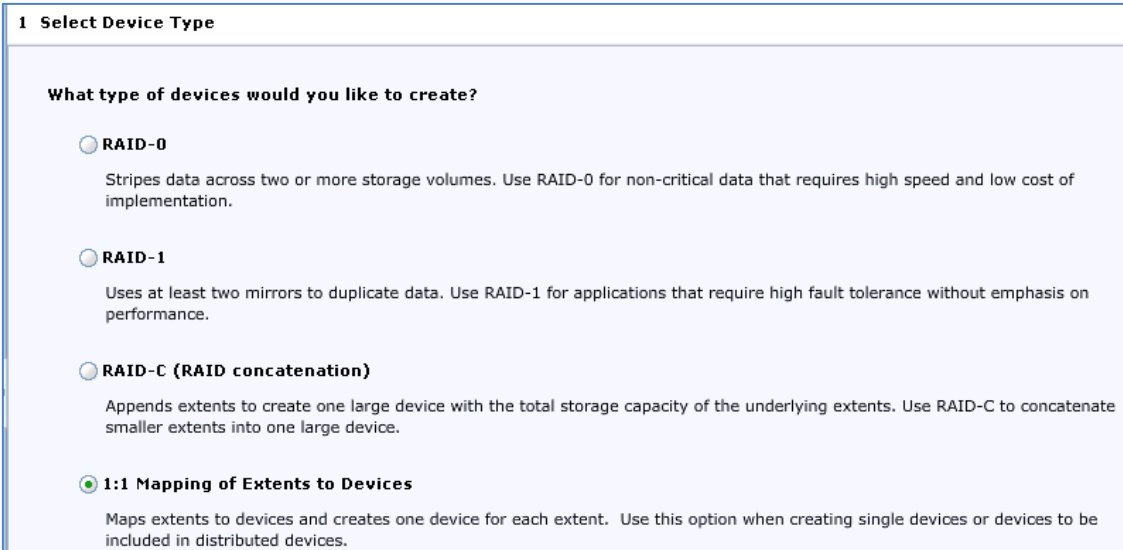
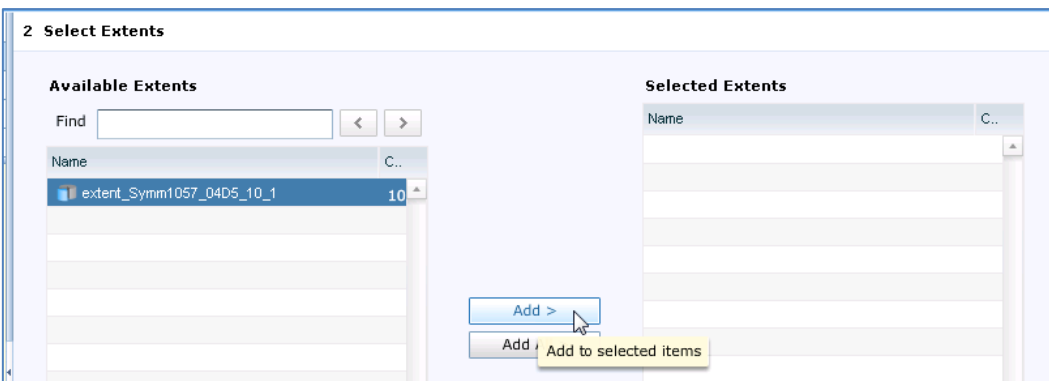
Step	Action
13.	The Review Storage to Claim step appears. This step allows the user to name the Storage Volumes. The default name is array type dependent. In the Base name box enter your assigned student number, for example “student1”. Click Apply Notice the default name was appended to include the base name. This works well for identifying large numbers of volumes of a certain type. If desired you can alter the default name for your own identification. Leave the base name with the student number.  Click Commit Click Close
14.	The Wizard will close and the window will display the new storage volume as claimed and with the new name. 
15.	Extent Creation. Select the previously claimed Storage Volume.

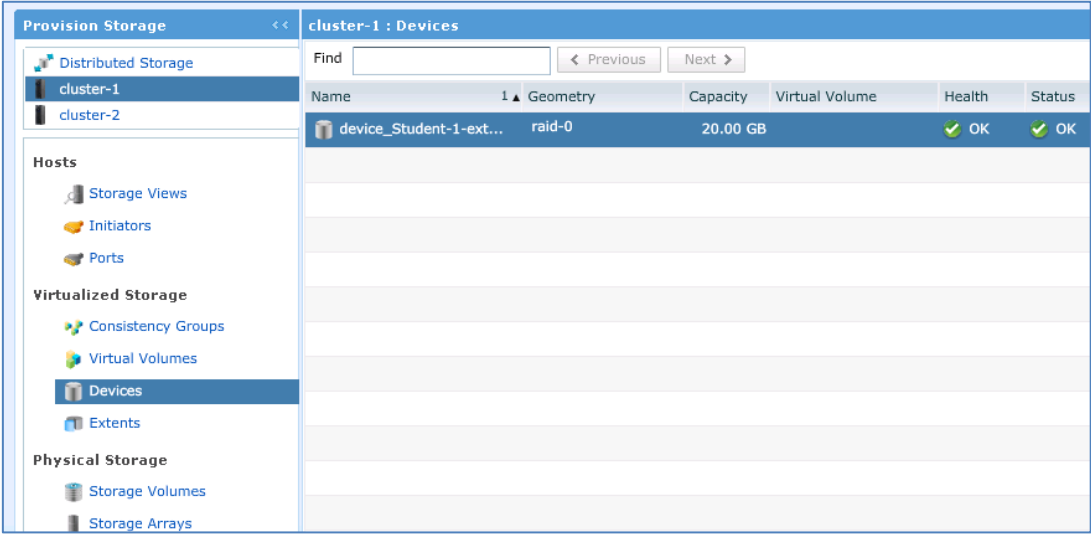
Step	Action
16.	Click Create Extents 
17.	The Wizard should Launch. Notice the selected Storage Volume is already over to the right.  Verify this is correct and Click Next.

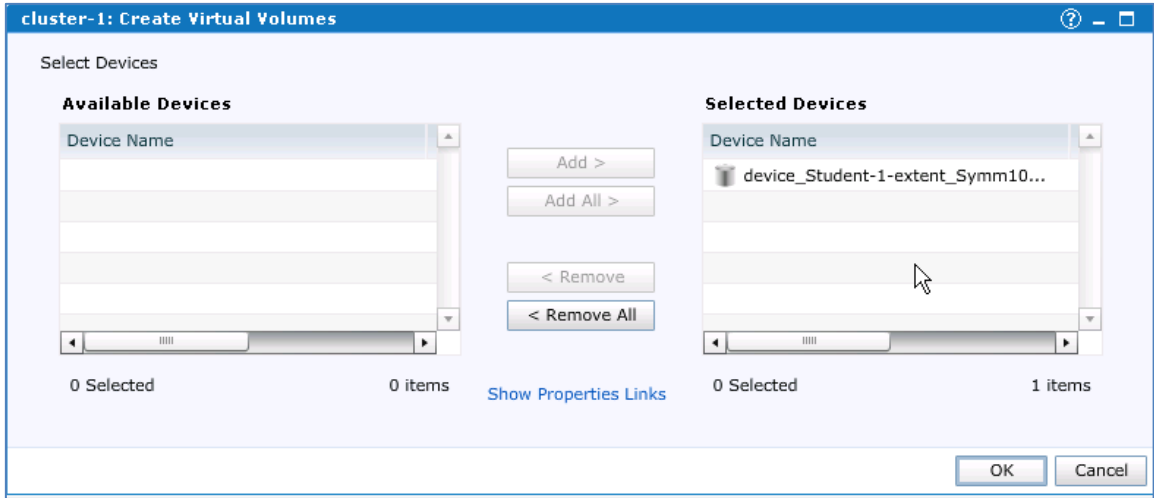
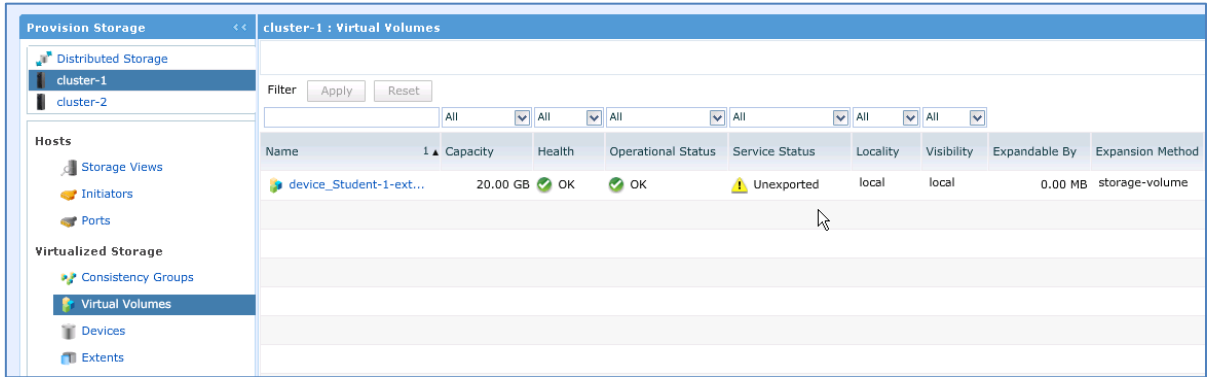
Step	Action
18.	Next you will specify the Capacity of the Extents. This step allows the size of the extent to be configured. Notice the default setting is to use the entire Storage Volume to create the Extent. This can be changed by unselecting the box in the Use column and entering the desired size. For this lab we will keep the default settings and use the maximum size. This is also the setting if the Storage Volume has existing Data on it that is to be retained.  Click Next Click Commit Click Close

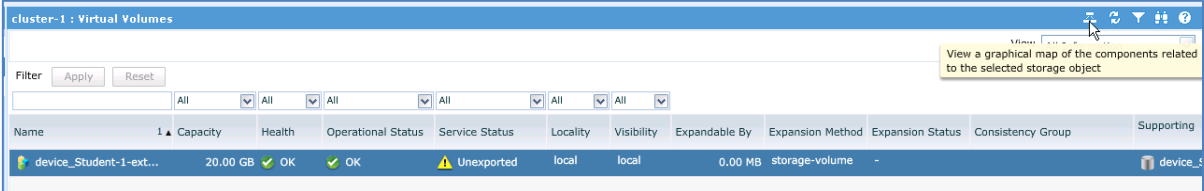
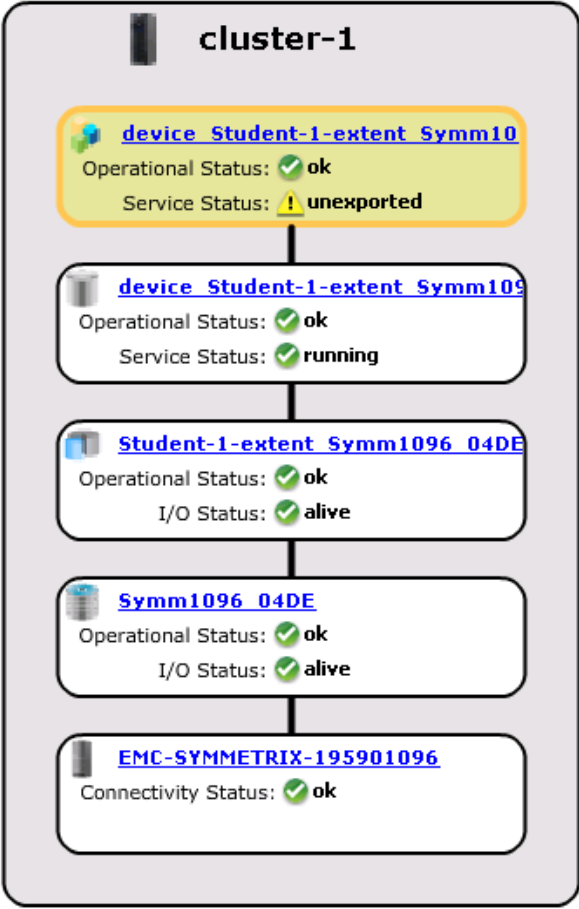
Step	Action
19.	From the left Window Provision Storage select Extents  The screenshot shows the 'Provision Storage' window. On the left, under 'Distributed Storage', 'cluster-1' is selected. Below it, under 'Hosts', 'Storage Views', 'Initiators', and 'Ports' are listed. Under 'Virtualized Storage', 'Consistency Groups', 'Virtual Volumes', and 'Devices' are listed. At the bottom, 'Physical Storage' is listed, and 'Extents' is highlighted. On the right, the 'cluster-1 : Extents' panel is shown with a 'Find' search bar and a list of extents. The list includes 'extent_student1_Sym...', 'extent_60000970000...', 'Mirror-A', 'New-1', 'New-2', 'New-3', and several more 'extent_60000970000...' entries. The last entry in the list is highlighted. The Extent will have the storage volume name preceded by extent. View the extent previously created.

Step	Action
20.	From the left Window Provision Storage select Devices  Select Create

Step	Action																																				
21.	From the selection of Device types to create choose 1:1 Mapping of Extents to Devices  1 Select Device Type What type of devices would you like to create? ☐ RAID-0 Stripes data across two or more storage volumes. Use RAID-0 for non-critical data that requires high speed and low cost of implementation. ☐ RAID-1 Uses at least two mirrors to duplicate data. Use RAID-1 for applications that require high fault tolerance without emphasis on performance. ☐ RAID-C (RAID concatenation) Appends extents to create one large device with the total storage capacity of the underlying extents. Use RAID-C to concatenate smaller extents into one large device. ☒ 1:1 Mapping of Extents to Devices Maps extents to devices and creates one device for each extent. Use this option when creating single devices or devices to be included in distributed devices.																																				
22.	Choose the extent you previously created extent from the list. Click Add  2 Select Extents Available Extents Find < > <table border="1"> <thead> <tr> <th>Name</th> <th>C..</th> </tr> </thead> <tbody> <tr> <td>extent_Symm1057_04D5_10_1</td> <td>10</td> </tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table> Selected Extents <table border="1"> <thead> <tr> <th>Name</th> <th>C..</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table> Add > Add > Add to selected items Click Next	Name	C..	extent_Symm1057_04D5_10_1	10															Name	C..																
Name	C..																																				
extent_Symm1057_04D5_10_1	10																																				
Name	C..																																				

Step	Action
23.	Answer no to Automatically create a virtual volume on each device. This is a time saving step, which will create a Virtual Volume on each top level device created. We will manually create the Virtual Volume in order to get a better understanding of the process. Click Next Click Commit Click Close
24.	The Device should appear in the list of cluster devices.  Notice that the Geometry displayed is Raid 0. When we selected the method for device creation we chose 1:1 mapping. If we had chosen Raid 0, as long as we chose 1 device, it is the same result.

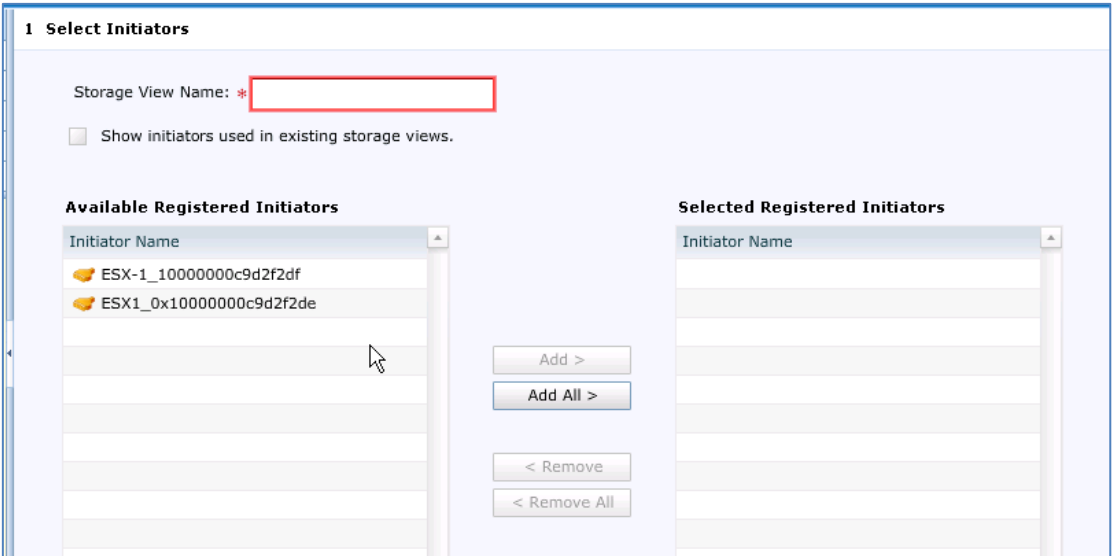
Step	Action
25.	Select the newly created device. Click Create Virtual Volumes at the bottom of the window.  The device should be in the Selected Device list. If not Select it and click add. Click OK The Virtual Volume will be created
26.	Select Virtual Volumes form the left side under Provision Storage.  This will display a list of all the Virtual Volumes. View the Virtual Volume that was previously created. Take note of it's Service Status. (Unexported) this is an indication of it not being a member of a Storage View.

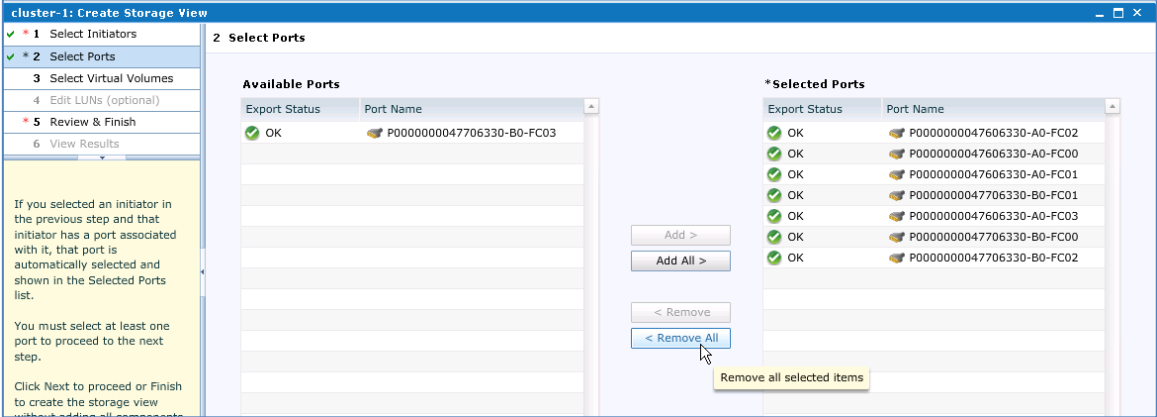
Step	Action
27.	Select your Virtual Volume and Click on the Map symbol in the right top coner of the window. 
28.	A map will be displayed.  The map will display each VPLEX object from the array to the Virtual Volume. The blue links can be used to display the object's properties. This function works for all VPLEX objects.

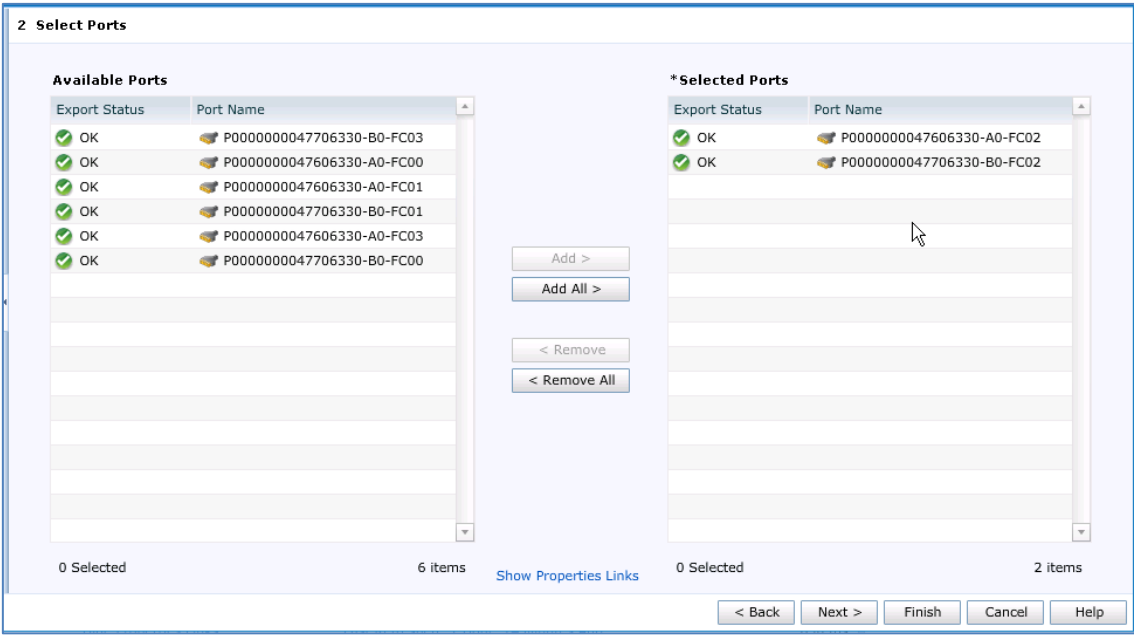
End of Lab Exercise

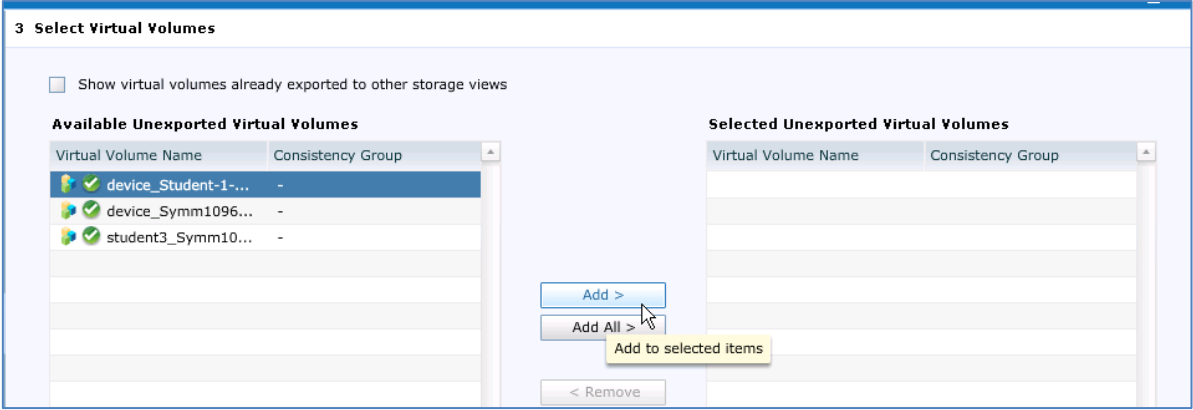
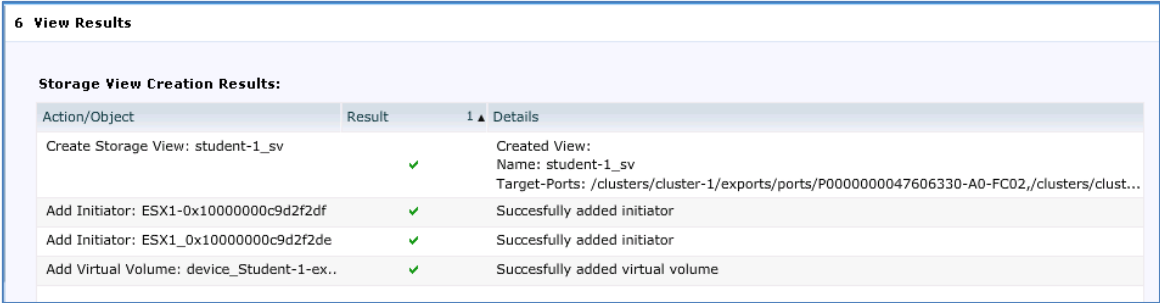
Lab 2: Part 3 – Storage View Creation

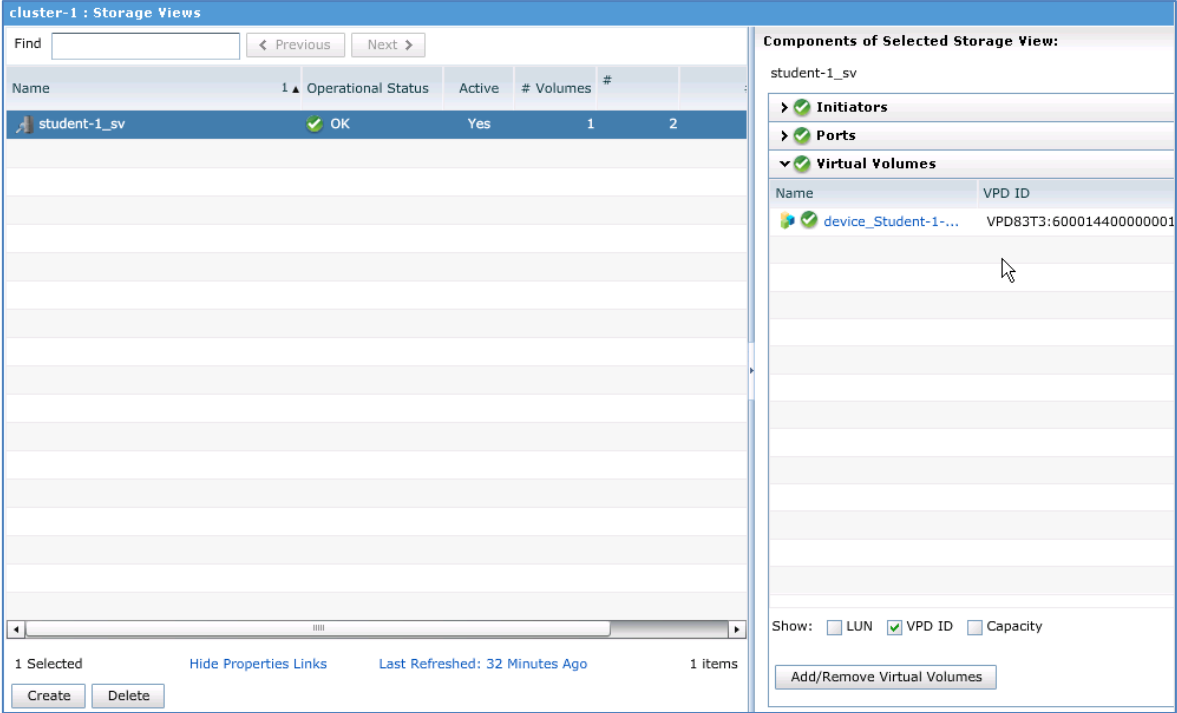
Step	Action
1.	From your Assigned Windows host, launch Unisphere for VPLEX. Log in and select Provision Storage> your assigned cluster>Storage Views.
2.	Click Create We will create a Storage View to provision Virtual Volumes to a host.

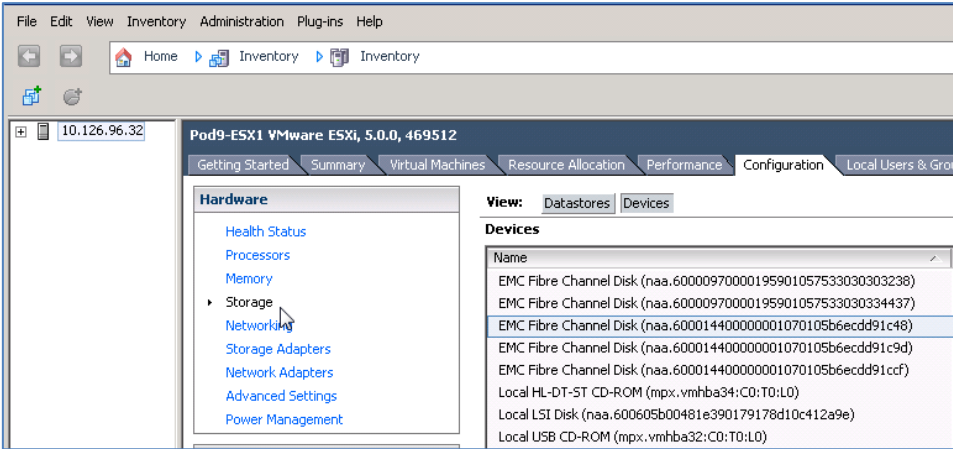
Step	Action
3.	The first step in the wizard is selecting initiators.  Enter a name for the Storage View. Use your student number in the name to identify it for future labs. Example: <i>student-1_Sview</i> Select both initiators and click Add All. If there are no initiators in the displayed window, check the box next to Show initiators used in existing storage views Click next

Step	Action
4.	Next we will select the VPLEX FE ports First we will remove the default ports added to the group.  Click Remove ALL

Step	Action
5.	Next we will select 2 Ports. 1 from director A and 1 from Director B.  <i>We are only selecting 2 ports in this lab environment because we are sharing equipment.</i> Students 3 and 6 can select FE ports A0-FC00 and B0-FC01 Students 4 and 7 can select FE ports A0-FC01 and B0-FC02 Students 5 and 8 can select FE ports A0-FC02 and B0-FC03 <i>The key point to think about is for each initiator in the Storage View, the ports selected must match zoning of the FE SAN. (for a normal production environment it is best to include 4 ports per Storage View, 2 from A and 2 from B)</i> Click Next

Step	Action
6.	The next step is to add virtual Volumes to the Storage View Select your previously created Virtual Volume and Click Add.  Click Next
7.	Change the LUN number to your student number. For example if you are student 2 enter a 2. Leave the Auto-assign checked. Click Next Click Commit
8.	The results should be displayed with successful results.  Click Close

Step	Action
9.	Select your Storage View Notice on the right most Window the components of the Storage View are Displayed. Review the selections by clicking on the component. 
10.	Select Virtual Volumes Check the box VPD ID The number displayed is the UID of the LUN presented to a host. If you remove the VPD number, VPD8s3T3 in this example, that will be the UID seen by the host. Record this number for comparison from the host.

Step	Action
11.	Minimize Unisphere for VPLEX and from your Windows desktop: Open vSphere Client and connect to your ESX Host. See the student Lab Map for the IP address and Login information for the ESX host. <i>Note: do not use the login for vCenter Server, just the ESX server.</i>
12.	Select the Configuration Tab. Select Storage from the Hardware box.  Change the view to Devices Note: <i>At this point we are about to perform a rescan of the host HBA. Because there may be other students sharing the ESX server and at the same point (each ESX host will have 1-3 students) we need to check the progress of the other students so that multiple rescans are not performed at the same time.</i> <i>If you are in a classroom environment you can ask the other students and coordinate a rescan for each. If you are taking the class online you can message the students or the instructor.</i>

Step	Action																												
13.	To the right of the window select Rescan View: Datastores Devices Devices RefreshRescan All... <table><thead><tr><th>Name</th><th>Identifier</th><th>Runtime Name</th><th>Operational State</th><th>LUN</th><th>Type</th><th>Drive Type</th></tr></thead><tbody><tr><td>EMC Fibre Channel Disk (naa.60000970000195901096533030303238)</td><td>naa.60000970000195901096533030303238</td><td>vmhba0:C0:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td><td>vmhba2:C2:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>EMC Fibre Channel Disk (naa.60000970000195901096533030313831)</td><td>naa.60000970000195901096533030313831</td><td>vmhba0:C0:T0:L1</td><td>Mounted</td><td>1</td><td>disk</td><td>Non-SSD</td></tr></tbody></table>	Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type	EMC Fibre Channel Disk (naa.60000970000195901096533030303238)	naa.60000970000195901096533030303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD	EMC Fibre Channel Disk (naa.60000970000195901096533030313831)	naa.60000970000195901096533030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD
Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type																							
EMC Fibre Channel Disk (naa.60000970000195901096533030303238)	naa.60000970000195901096533030303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD																							
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD																							
EMC Fibre Channel Disk (naa.60000970000195901096533030313831)	naa.60000970000195901096533030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD																							
14.	Leave the 2 checkboxes checked and click OK Rescan ☒ Scan for New Storage Devices Rescan all host bus adapters for new storage devices. Rescanning all adapters can be slow. ☒ Scan for New VMFS Volumes Rescan all known storage devices for new VMFS volumes that have been added since the last scan. Rescanning known storage for new file systems is faster than rescanning for new storage. OK Cancel Help																												
15.	View the Recent Tasks window below and wait for completion. The new LUN should be displayed. Verify it is correct by checking the size and the identifier. Ignore the naa in front of the UID. View: Datastores Devices Devices <table><thead><tr><th>Name</th><th>Identifier</th></tr></thead><tbody><tr><td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td></tr><tr><td>EMC Fibre Channel Disk (naa.600014400000000107063301d26d7d52c)</td><td>naa.600014400000000107063301d26d7d52c</td></tr></tbody></table> Compare it to the VPD number of the Virtual Volume in the Storage View.	Name	Identifier	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	EMC Fibre Channel Disk (naa.600014400000000107063301d26d7d52c)	naa.600014400000000107063301d26d7d52c																						
Name	Identifier																												
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4																												
EMC Fibre Channel Disk (naa.600014400000000107063301d26d7d52c)	naa.600014400000000107063301d26d7d52c																												

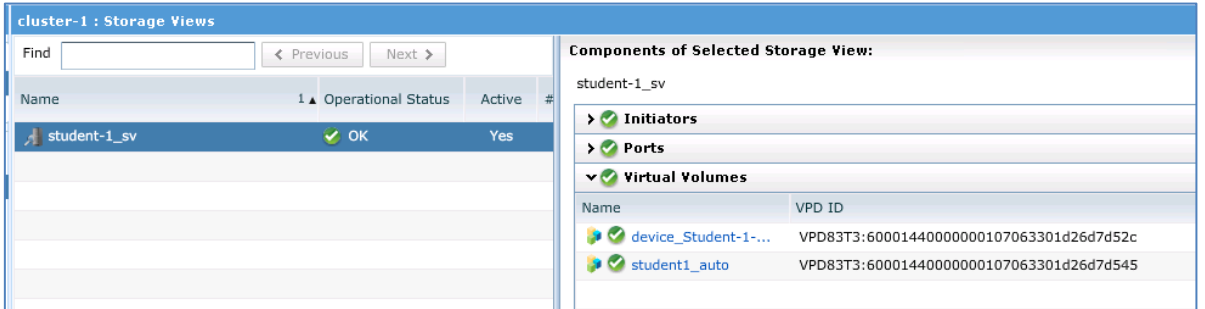
End of Lab Exercise

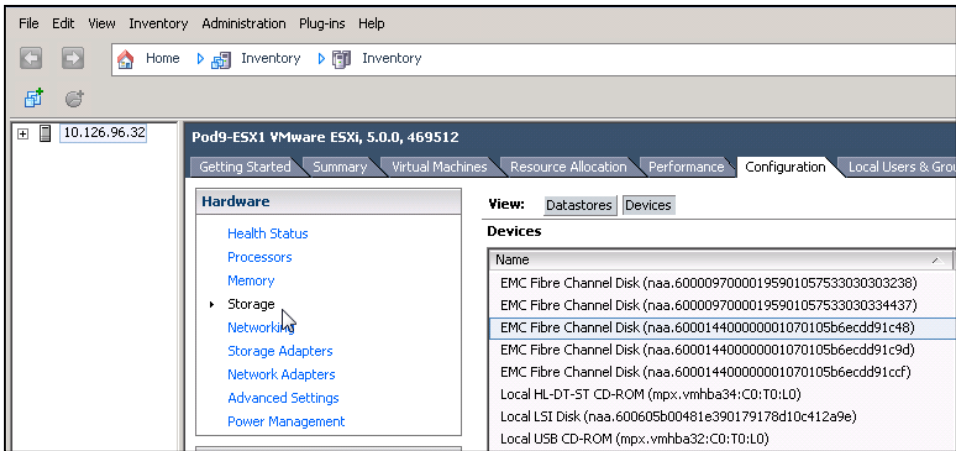
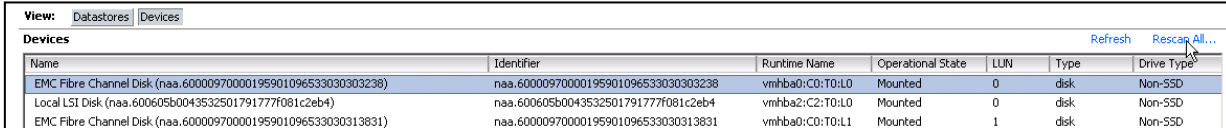
Lab 2: Part 4 – Using Provision from Storage Volume Wizard

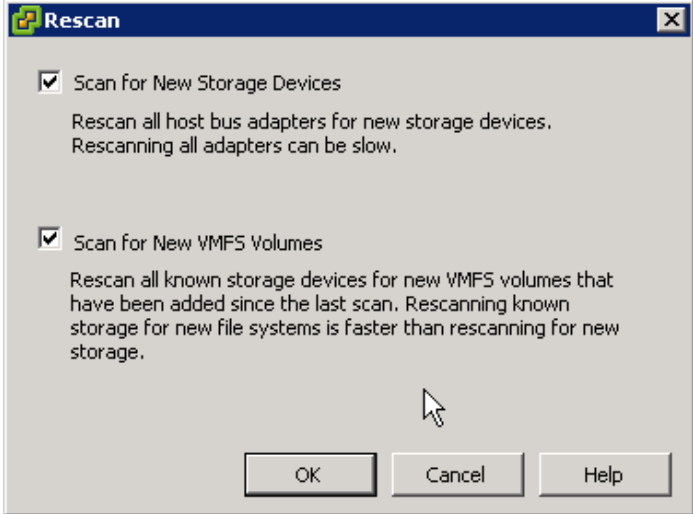
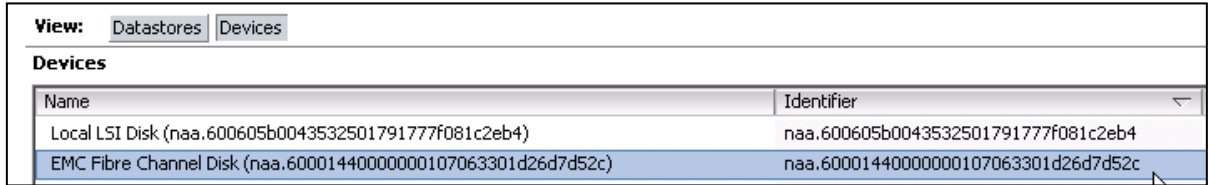
Step	Action
	This Lab will provision Storage using the “Provision from Storage Volume method. This method allows for simpler provisioning with less steps, but there are fewer options. It will require the creation of a local consistency group.
1.	From Unisphere for VPLEX navigate to Provision Storage  Select the Provision from Storage Volume icon.
2.	Check the box Create new consistency group. Click Next

Step	Action
3.	Enter a Consistency Group name. Use your Student number in the name. Select Local Select your assigned Cluster Select Consistency Group: Create a consistency group Consistency Group Name: * student1_cg Consistency Group Type : * ☒ Local Local consistency groups will be synchronous and visible only to the local cluster unless you select the Global visibility checkbox. You can add local or global virtual volumes. Cluster : * cluster-1 ☐ Distributed Click Next
4.	Enter a volume name. Use your student number followed by an _auto Click Next

Step	Action																					
5.	Select an Array attached to your assigned Cluster. Select one of your assigned unclaimed Storage Volumes (See Lab Map) Storage Volumes: Select a storage volume on cluster 'cluster-1'. Source Storage: EMC-SYMMETRIX-195901096 Available Storage Volumes <table><thead><tr><th>Name</th><th>Capacity</th><th>Use</th></tr></thead><tbody><tr><td>Symm1096_04DB</td><td>20.00 GB</td><td>claimed</td></tr><tr><td>Symm1096_04DD</td><td>20.00 GB</td><td>claimed</td></tr><tr><td>Symm1096_04DF</td><td>20.00 GB</td><td>claimed</td></tr><tr><td>VPD83T3:6000097000019590109653303...</td><td>10.00 GB</td><td>claimed</td></tr><tr><td>VPD83T3:6000097000019590109653303...</td><td>10.00 GB</td><td>unclaimed</td></tr><tr><td>VPD83T3:6000097000019590109653303...</td><td>20.00 GB</td><td>unclaimed</td></tr></tbody></table> Click Next	Name	Capacity	Use	Symm1096_04DB	20.00 GB	claimed	Symm1096_04DD	20.00 GB	claimed	Symm1096_04DF	20.00 GB	claimed	VPD83T3:6000097000019590109653303...	10.00 GB	claimed	VPD83T3:6000097000019590109653303...	10.00 GB	unclaimed	VPD83T3:6000097000019590109653303...	20.00 GB	unclaimed
Name	Capacity	Use																				
Symm1096_04DB	20.00 GB	claimed																				
Symm1096_04DD	20.00 GB	claimed																				
Symm1096_04DF	20.00 GB	claimed																				
VPD83T3:6000097000019590109653303...	10.00 GB	claimed																				
VPD83T3:6000097000019590109653303...	10.00 GB	unclaimed																				
VPD83T3:6000097000019590109653303...	20.00 GB	unclaimed																				
6.	Add the new Virtual Volume to your existing Storage View Expose To Hosts: Expose storage to hosts through storage views. Storage View at cluster-1 * ☒ Existing Storage View: student-1_sv ☐ None Click Next																					

Step	Action
7.	A summary page is displayed Review and Click Provision Storage Wait for completion and Click done.
8.	Select your assigned Cluster Select Storage Views
9.	Select your Storage View. Select Virtual Volumes and verify the new Virtual Volume is in the view 
10.	Minimize Unisphere for VPLEX and from your Windows desktop: Open vSphere Client and connect to your ESX Host. See the student Lab Map for the IP address and Login information for the ESX host. <i>Note: do not use the login for vCenter Server, just the ESX server.</i>

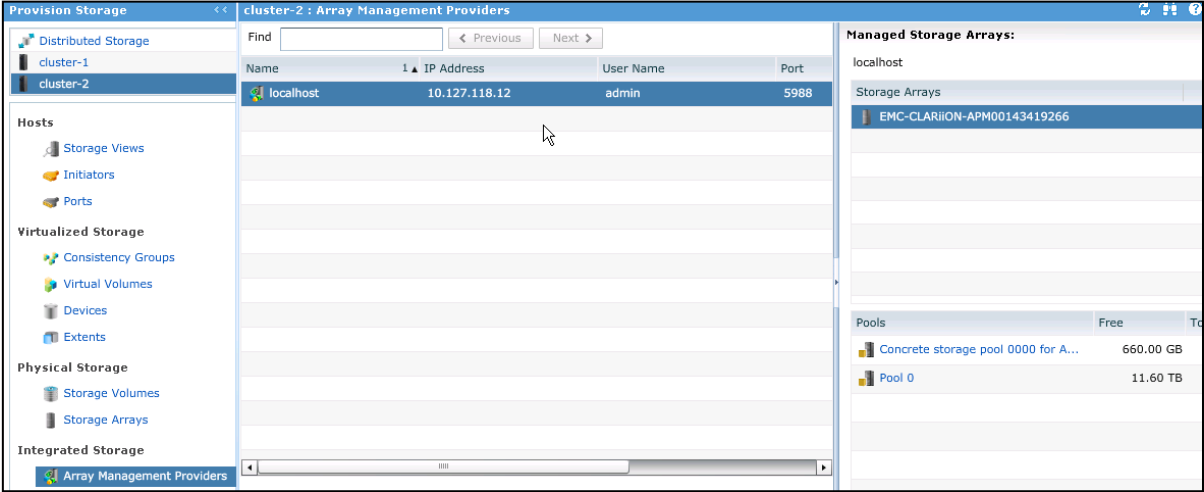
Step	Action																												
11.	Select the Configuration Tab. Select Storage from the Hardware box.  Change the view to Devices Note: <i>At this point we are about to perform a rescan of the host HBA. Because there may be other students sharing the ESX server and at the same point (each ESX host will have 1-3 students) we need to check the progress of the other students so that multiple rescans are not performed at the same time.</i> <i>If you are in a classroom environment you can ask the other students and coordinate a rescan for each. If you are taking the class online you can message the students or the instructor.</i>																												
12.	To the right of the window select Rescan <table><thead><tr><th>Name</th><th>Identifier</th><th>Runtime Name</th><th>Operational State</th><th>LUN</th><th>Type</th><th>Drive Type</th></tr></thead><tbody><tr><td>EMC Fibre Channel Disk (naa.60000970000195901096533030303238)</td><td>naa.60000970000195901096533030303238</td><td>vmhba0:C0:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td><td>vmhba2:C2:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>EMC Fibre Channel Disk (naa.60000970000195901096533030313831)</td><td>naa.60000970000195901096533030313831</td><td>vmhba0:C0:T0:L1</td><td>Mounted</td><td>1</td><td>disk</td><td>Non-SSD</td></tr></tbody></table>	Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type	EMC Fibre Channel Disk (naa.60000970000195901096533030303238)	naa.60000970000195901096533030303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD	EMC Fibre Channel Disk (naa.60000970000195901096533030313831)	naa.60000970000195901096533030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD
Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type																							
EMC Fibre Channel Disk (naa.60000970000195901096533030303238)	naa.60000970000195901096533030303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD																							
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD																							
EMC Fibre Channel Disk (naa.60000970000195901096533030313831)	naa.60000970000195901096533030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD																							

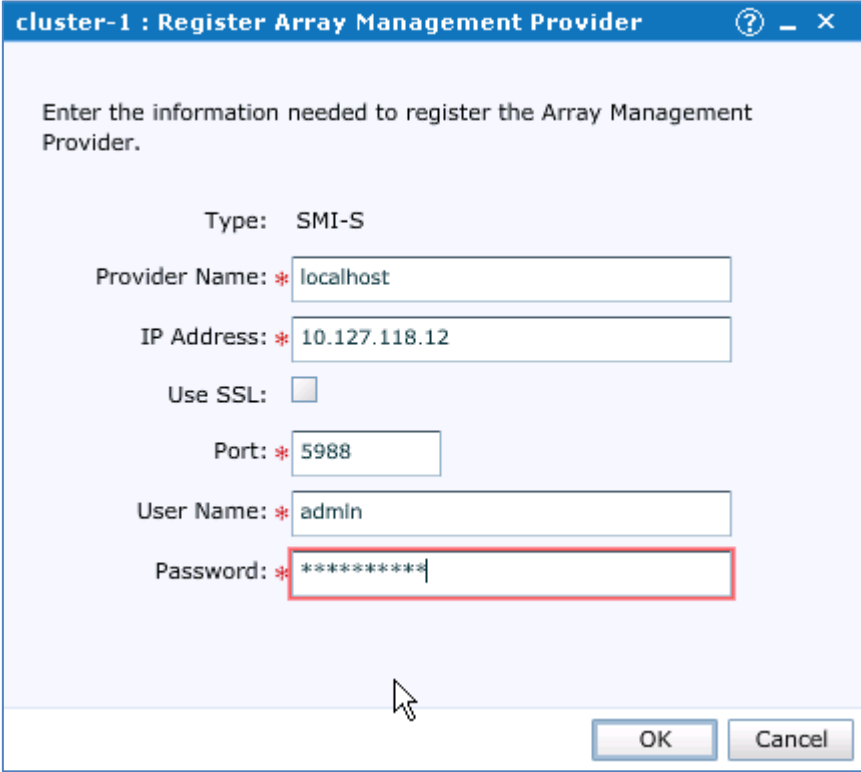
Step	Action						
13.	Leave the 2 checkboxes checked and click OK  The Rescan dialog box has a title bar with a green icon and the word 'Rescan'. It contains two checked checkboxes: 'Scan for New Storage Devices' and 'Scan for New VMFS Volumes'. Below each checkbox is a descriptive text. At the bottom are three buttons: 'OK', 'Cancel', and 'Help'. A mouse cursor is pointing at the 'OK' button.						
14.	View the Recent Tasks window below and wait for completion. The new LUN should be displayed. Verify it is correct by checking the size and the identifier. Ignore the naa in front of the UID.  The Recent Tasks window shows a 'View' dropdown set to 'Devices'. Below is a table with two columns: 'Name' and 'Identifier'. The table lists two devices: 'Local LSI Disk' and 'EMC Fibre Channel Disk'. The 'EMC Fibre Channel Disk' row is highlighted. <table border="1"> <thead> <tr> <th>Name</th><th>Identifier</th></tr> </thead> <tbody> <tr> <td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td></tr> <tr> <td>EMC Fibre Channel Disk (naa.60001440000000107063301d26d7d52c)</td><td>naa.60001440000000107063301d26d7d52c</td></tr> </tbody> </table> Compare it to the VPD number of the Virtual Volume in the Storage View. If the new volumes do not appear click refresh. Or try Rescan again.	Name	Identifier	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	EMC Fibre Channel Disk (naa.60001440000000107063301d26d7d52c)	naa.60001440000000107063301d26d7d52c
Name	Identifier						
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4						
EMC Fibre Channel Disk (naa.60001440000000107063301d26d7d52c)	naa.60001440000000107063301d26d7d52c						

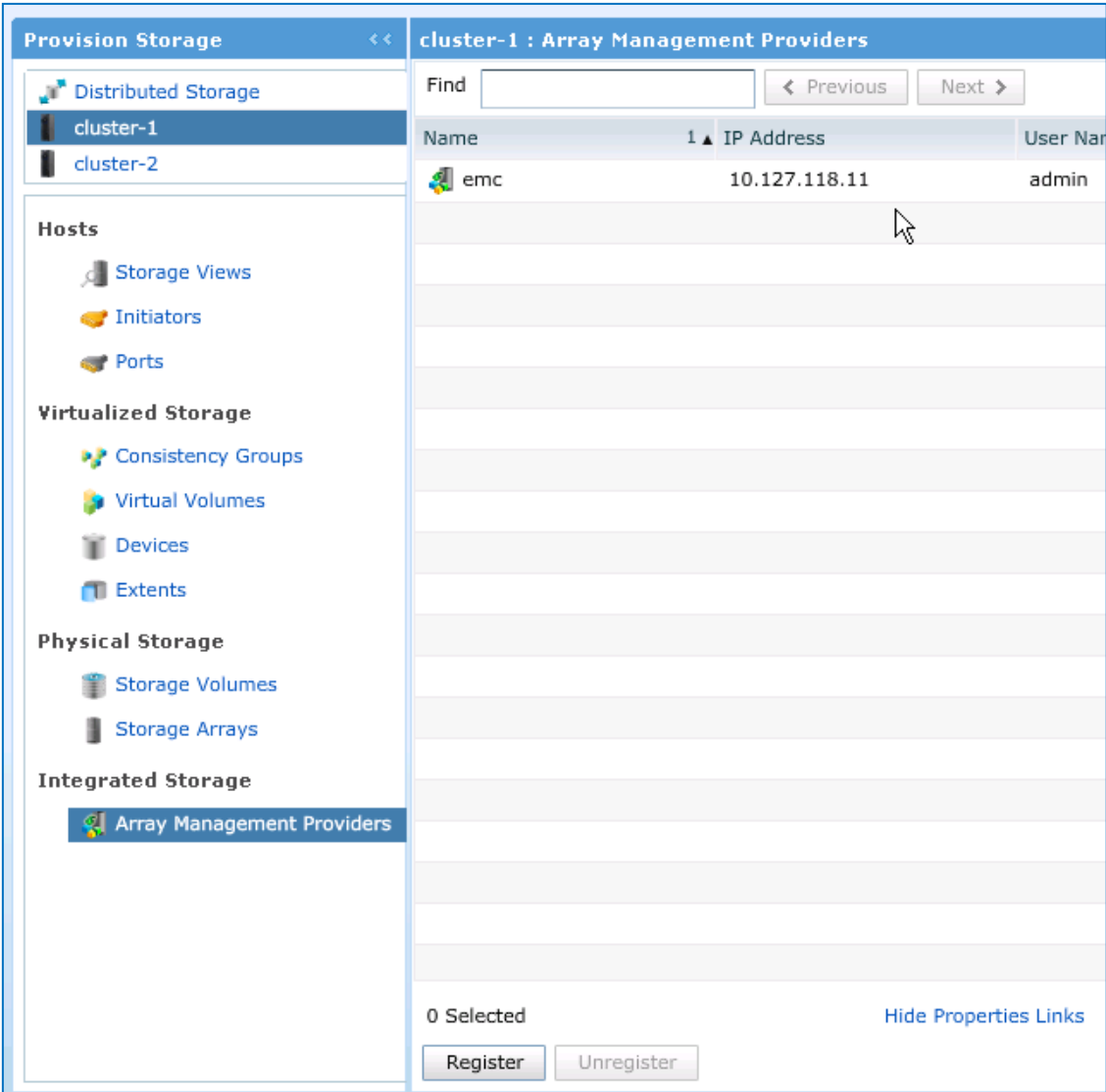
End of Lab Exercise

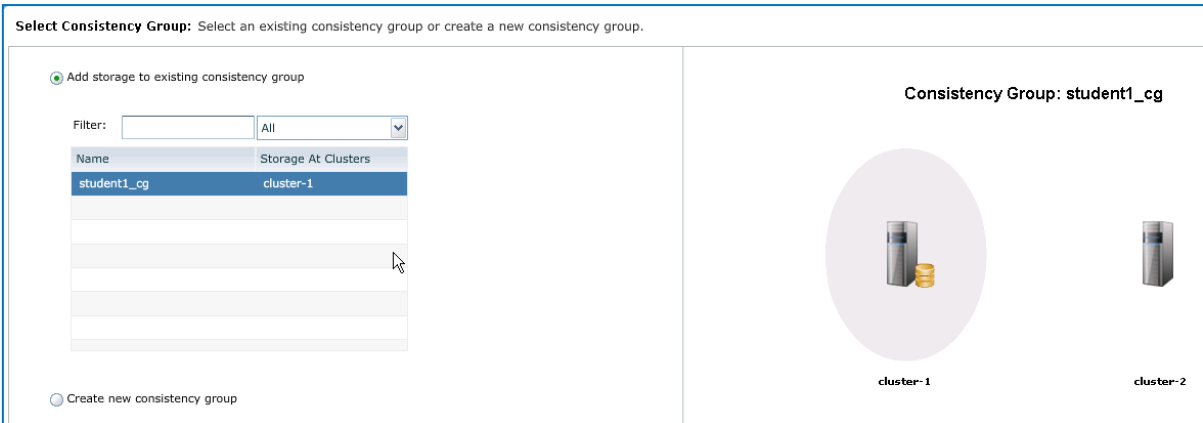
Lab 2: Part 5 – Provisioning using VIAS

Step	Action
	This Lab will provision Storage using the VIAS Method. This method reduces the number of steps required to provision storage using VPLEX. As long as the Array is added to the Array Management Provider, VPLEX can provision, mask, and create Virtual Volumes in a few simple steps.
1.	Open Unisphere for VPLEX Log into your assigned Cluster.
2.	First we will verify if the Array Management Provider is registered with the VPLEX Cluster. This may require coordination between students (3 max) assigned to the same cluster. Ask of message the other students if anyone at this point. Select Provision Storage> Your Assigned Cluster>Array Management Provider Since there may be up to 2 other students sharing this cluster, another student may have already completed the registration.

Step	Action
3.	If there is an AMP already registered, select it. Select the Managed Array View the pools. If there are no AMPs, then proceed to the next step to register. 

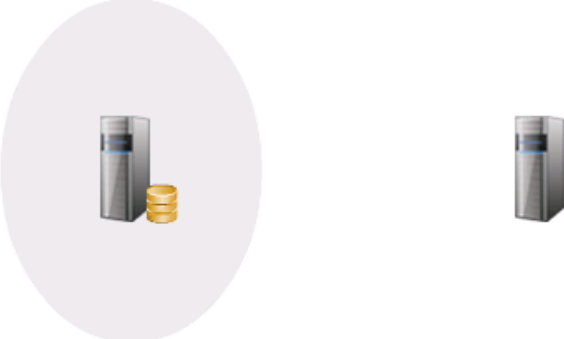
Step	Action
4.	Click Register  Displayed are the default values to use. These match the configuration of the SMI-s provider installed on the Host. . (not including the IP address) See your student Lab Map for IP address Provider name localhost Use SSL unchecked Port 5988 User admin Password #1Password

Step	Action
5.	Verify the AMP is registered with VPLEX and the connectivity has a green check mark.  There should be 1 AMP for each VPLEX Cluster

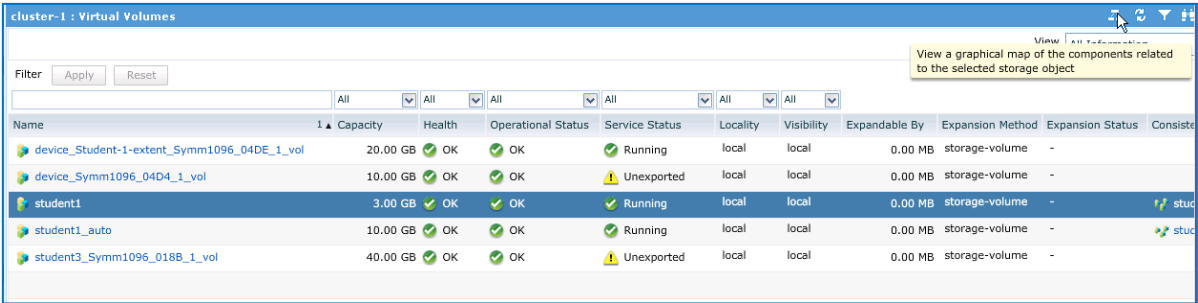
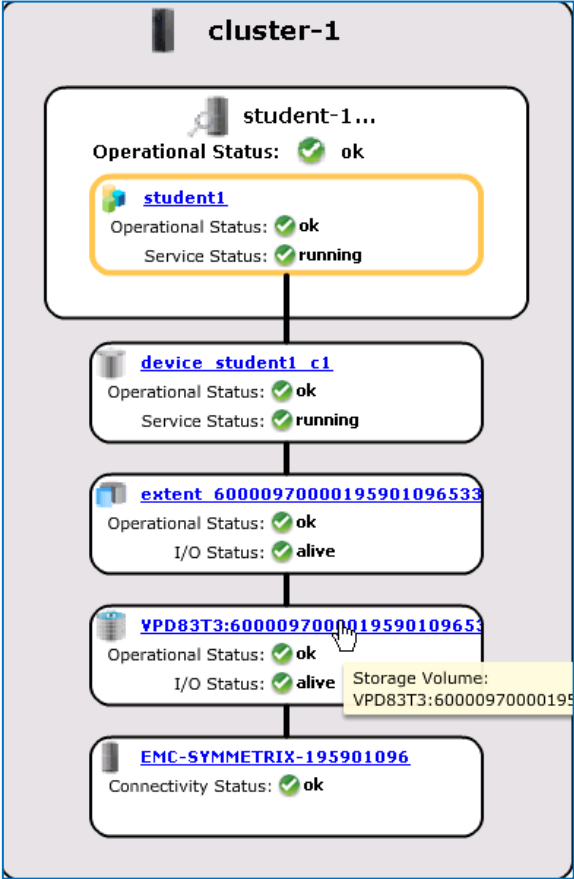
Step	Action
6.	Next we will provision using the VIAS method. Navigate to Provision Storage>Provision from Pools 
7.	We will use the Consistency Group created previously. Select your Consistency Group and click Next.  Note: notice the dark circle around the cluster where the Consistency Group is configured.

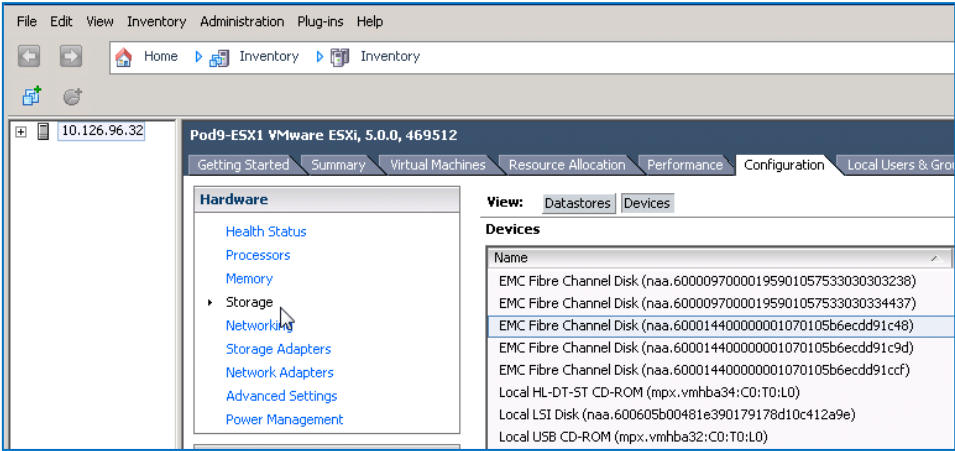
Step	Action
8.	Select 1 for the number of volumes. Change the size (GB) to your assigned volume size. Enter your student number for volume base name. Example: if you are student 1 enter student1. Protection Options: Select high availability options and configure volumes. High Availability: ☐ Enable Mirroring at cluster-1 Number Of Volumes: * 1 Capacity Per Volume: * 3 GB Total Capacity: 3 GB Volume Base Name: * student1 Click Next

Step	Action																								
9.	Select an Array attached to your Cluster and registered with the AMP. Chose a Pool to be used to create the LUN. Use the one with the most free space available. Storage Pools: Select a storage pool at cluster 'cluster-1'. EMC-SYMMETRIX-195901096 Available Storage Pools <table><thead><tr><th>Pools</th><th>Type</th><th>Free</th><th>Total</th></tr></thead><tbody><tr><td>Test</td><td>Thin</td><td>100.00 GB</td><td></td></tr><tr><td>diskgroup1</td><td>Thin</td><td>1.19 TB</td><td></td></tr><tr><td>diskgroup2</td><td>Thin</td><td>169.00 GB</td><td></td></tr><tr><td>diskgroup3</td><td>Thin</td><td>75.50 GB</td><td></td></tr><tr><td>diskgroup4</td><td>Thin</td><td>223.00 GB</td><td></td></tr></tbody></table> Click Next	Pools	Type	Free	Total	Test	Thin	100.00 GB		diskgroup1	Thin	1.19 TB		diskgroup2	Thin	169.00 GB		diskgroup3	Thin	75.50 GB		diskgroup4	Thin	223.00 GB	
Pools	Type	Free	Total																						
Test	Thin	100.00 GB																							
diskgroup1	Thin	1.19 TB																							
diskgroup2	Thin	169.00 GB																							
diskgroup3	Thin	75.50 GB																							
diskgroup4	Thin	223.00 GB																							
10.	Use your previously created Storage View. (make sure it is the correct one, as there may be others for other students. Click Next																								

Step	Action
11.	Review the summary page to verify it is correct. Consistency Group: student1_cg Total Capacity to Provision: 3 GB  cluster-1 cluster-2 Volume Base Name: student1 Storage View: student-1_sv Storage Array: EMC-SYMMETRIX-195901096 Pool: diskgroup4 Click Provision Storage
12.	The results should be successful. Click View Job Status Results: View the results of the provisioning request. Click Provision More  Virtual volumes provisioning job started Provisioning job 'Provision_3_29-05-15-13-06-47' has been started. View Job Status

Step	Action																					
13.	Monitor until the job is complete. Provision Jobs Status <table><tr><th>Name</th><th>Status</th><th>Target Cluster</th><th>Last Updated</th><th>Description</th><th>Creation Date</th><th>Status Details</th></tr><tr><td>Provision_3_29-05-15-13-06-47</td><td>In Progress</td><td>cluster-1</td><td>Fri May 29 13:06:56 UT..</td><td>Provision 1 virtual volume with base nam...</td><td>Fri May 29 13:06:47 UT..</td><td>Provisioning 1 storage volume(s) on storage array(s)</td></tr><tr><td>Provision_2_27-05-15-15-34-56</td><td>Completed</td><td>cluster-1</td><td>Wed May 27 15:36:13 ...</td><td>Provision 1 virtual volume with base nam...</td><td>Wed May 27 15:34:56 ...</td><td>Job Completed. Successfully created 1 virtual volume(s)</td></tr></table>	Name	Status	Target Cluster	Last Updated	Description	Creation Date	Status Details	Provision_3_29-05-15-13-06-47	In Progress	cluster-1	Fri May 29 13:06:56 UT..	Provision 1 virtual volume with base nam...	Fri May 29 13:06:47 UT..	Provisioning 1 storage volume(s) on storage array(s)	Provision_2_27-05-15-15-34-56	Completed	cluster-1	Wed May 27 15:36:13 ...	Provision 1 virtual volume with base nam...	Wed May 27 15:34:56 ...	Job Completed. Successfully created 1 virtual volume(s)
Name	Status	Target Cluster	Last Updated	Description	Creation Date	Status Details																
Provision_3_29-05-15-13-06-47	In Progress	cluster-1	Fri May 29 13:06:56 UT..	Provision 1 virtual volume with base nam...	Fri May 29 13:06:47 UT..	Provisioning 1 storage volume(s) on storage array(s)																
Provision_2_27-05-15-15-34-56	Completed	cluster-1	Wed May 27 15:36:13 ...	Provision 1 virtual volume with base nam...	Wed May 27 15:34:56 ...	Job Completed. Successfully created 1 virtual volume(s)																
14.	Navigate to Provision Storage> Cluster-x (assigned cluster)																					
15.	Select Virtual Volumes Find the Virtual Volume name that was used in the creation wizard.																					

Step	Action
16.	Select it and click on the Map icon in the top right corner.  This should display a Map.  Click the Link for the Storage Volume
17.	View the Storage Volume properties. Notice the Provision Type is listed as vias. Next we will look at the ESX server to verify connectivity

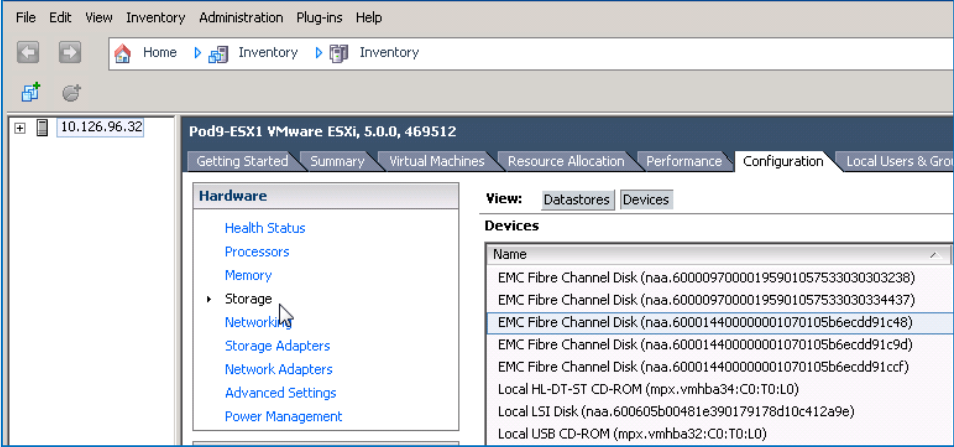
Step	Action
18.	Minimize Unisphere for VPLEX and from your Windows desktop: Open vSphere Client and connect to your ESX Host. See the student Lab Map for the IP address and Login information for the ESX host. <i>Note: do not use the login for vCenter Server, just the ESX server.</i>
19.	Select the Configuration Tab. Select Storage from the Hardware box.  Change the view to Devices Note: <i>At this point we are about to perform a rescan of the host HBA. Because there may be other students sharing the ESX server and at the same point (each ESX host will have 1-3 students) we need to check the progress of the other students so that multiple rescans are not performed at the same time.</i> <i>If you are in a classroom environment you can ask the other students and coordinate a rescan for each. If you are taking the class online you can message the students or the instructor.</i>

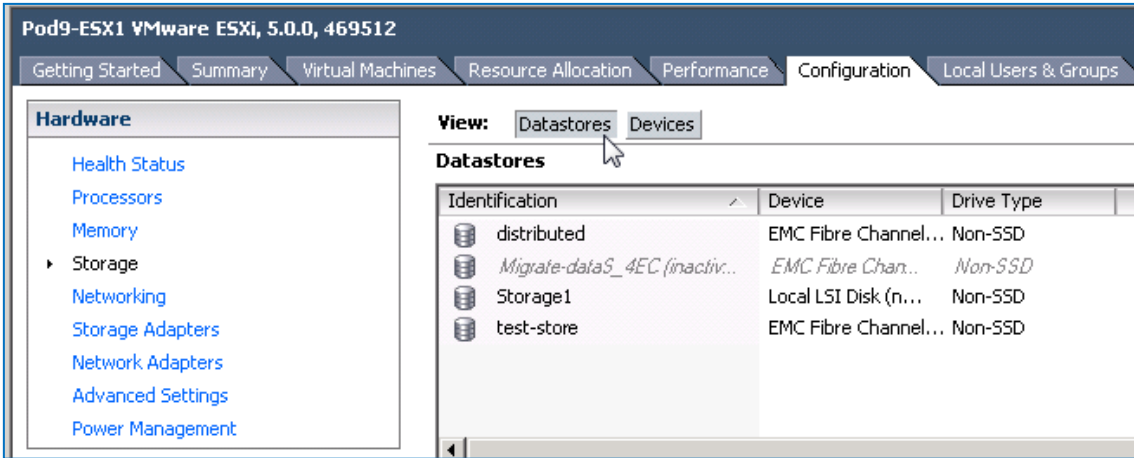
Step	Action																												
20.	To the right of the window select Rescan View: Datastores Devices Devices Refresh Rescan All... <table><thead><tr><th>Name</th><th>Identifier</th><th>Runtime Name</th><th>Operational State</th><th>LUN</th><th>Type</th><th>Drive Type</th></tr></thead><tbody><tr><td>EMC Fibre Channel Disk (naa.600009700001959010965330303238)</td><td>naa.600009700001959010965330303238</td><td>vmhba0:C0:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td><td>vmhba2:C2:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>EMC Fibre Channel Disk (naa.60000970000195901096533030313831)</td><td>naa.60000970000195901096533030313831</td><td>vmhba0:C0:T0:L1</td><td>Mounted</td><td>1</td><td>disk</td><td>Non-SSD</td></tr></tbody></table>	Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type	EMC Fibre Channel Disk (naa.600009700001959010965330303238)	naa.600009700001959010965330303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD	EMC Fibre Channel Disk (naa.60000970000195901096533030313831)	naa.60000970000195901096533030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD
Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type																							
EMC Fibre Channel Disk (naa.600009700001959010965330303238)	naa.600009700001959010965330303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD																							
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD																							
EMC Fibre Channel Disk (naa.60000970000195901096533030313831)	naa.60000970000195901096533030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD																							
21.	Leave the 2 checkboxes checked and click OK Rescan ☒ Scan for New Storage Devices Rescan all host bus adapters for new storage devices. Rescanning all adapters can be slow. ☒ Scan for New VMFS Volumes Rescan all known storage devices for new VMFS volumes that have been added since the last scan. Rescanning known storage for new file systems is faster than rescanning for new storage. OK Cancel Help																												
22.	View the Recent Tasks window below and wait for completion. The new LUN should be displayed. Verify it is correct by checking the size and the identifier. Ignore the naa in front of the UID. View: Datastores Devices Devices <table><thead><tr><th>Name</th><th>Identifier</th></tr></thead><tbody><tr><td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td></tr><tr><td>EMC Fibre Channel Disk (naa.600014400000000107063301d26d7d52c)</td><td>naa.600014400000000107063301d26d7d52c</td></tr></tbody></table> Compare it to the VPD number of the Virtual Volume in the Storage View. If the new volumes do not appear click refresh. Or try Rescan again.	Name	Identifier	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	EMC Fibre Channel Disk (naa.600014400000000107063301d26d7d52c)	naa.600014400000000107063301d26d7d52c																						
Name	Identifier																												
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4																												
EMC Fibre Channel Disk (naa.600014400000000107063301d26d7d52c)	naa.600014400000000107063301d26d7d52c																												

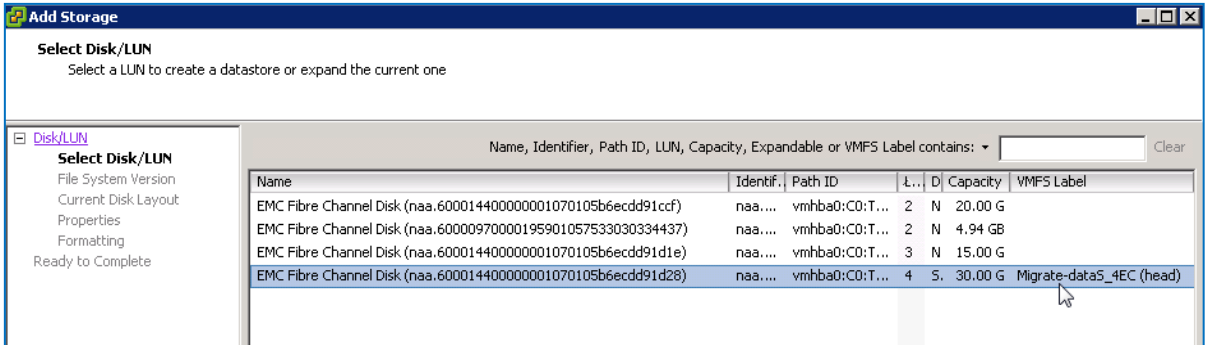
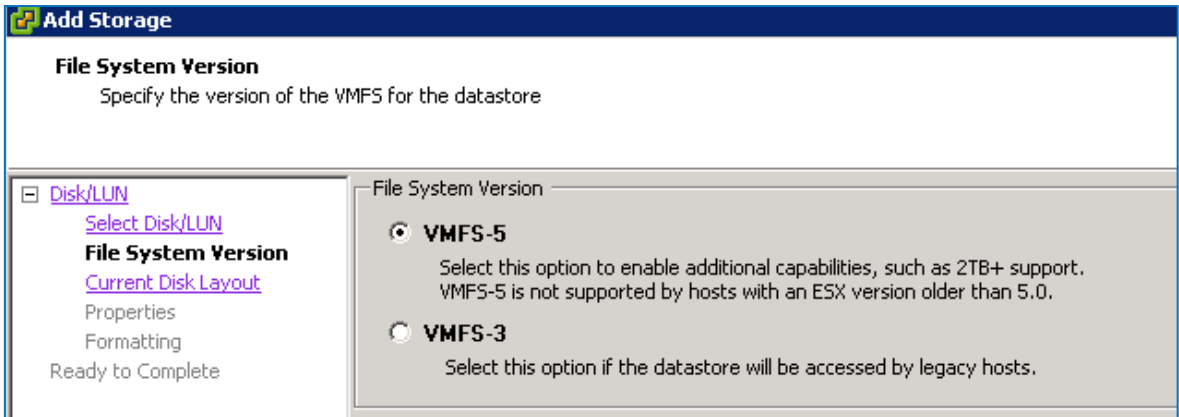
End of Lab Exercise

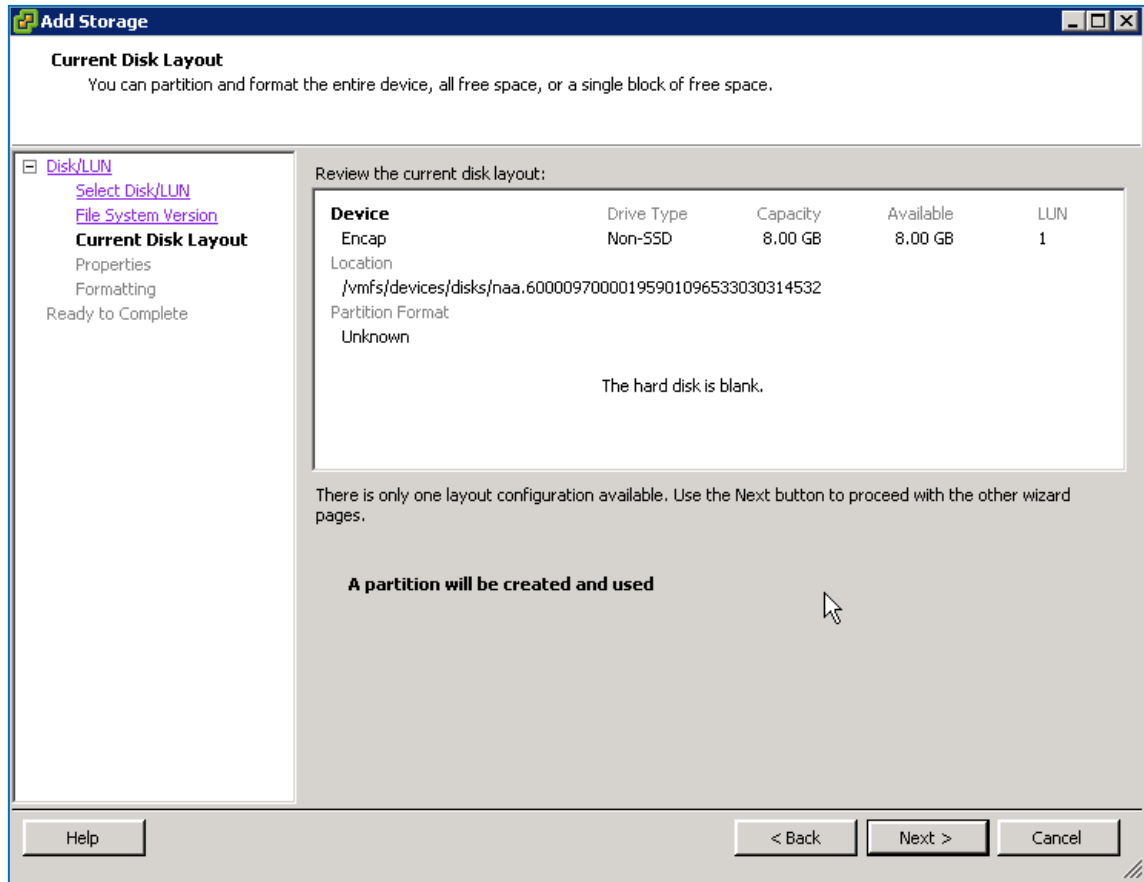
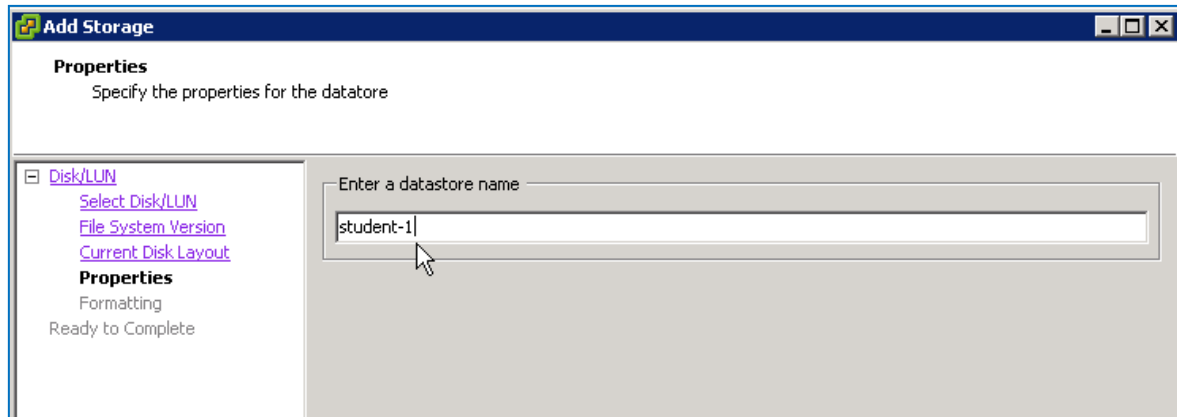
Lab 2: Part 6 - Encapsulation

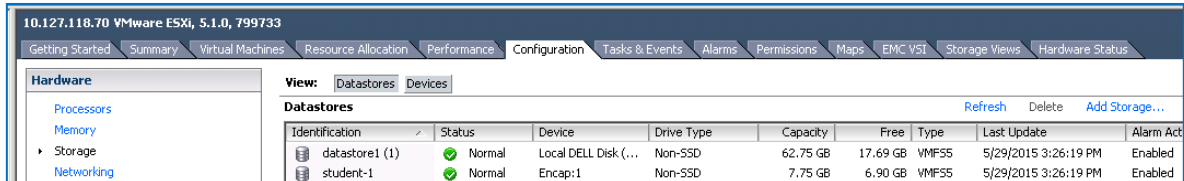
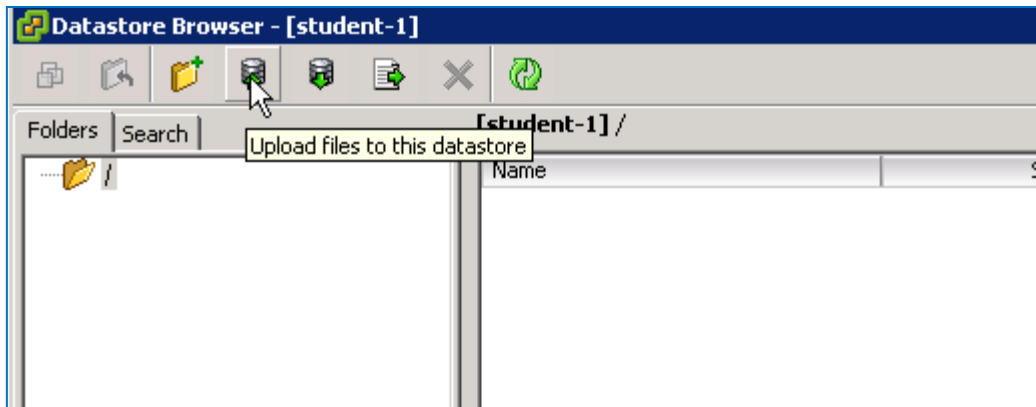
Step	Action
	This Lab will simulate the procedure for migrating volumes containing application data connected to the Host from the array directly into VPLEX. This is meant to provide the student with a simulation of this procedure. There are many other parameters that we cannot address relating to the application, but this does provide an estimate of the process. Information Needed from Lab Map: ESX Server address and user/password Windows Management Host LUN Identifier of directly masked LUN If you are not very familiar with VMware, just follow the exact steps, which are displayed. No real prior knowledge is required.
1.	Open vSphere Client and connect to your ESX Host. See the student Lab Map for the IP address and Login information for the ESX host. <i>Note: do not use the login for vCenter Server, just the ESX server.</i>

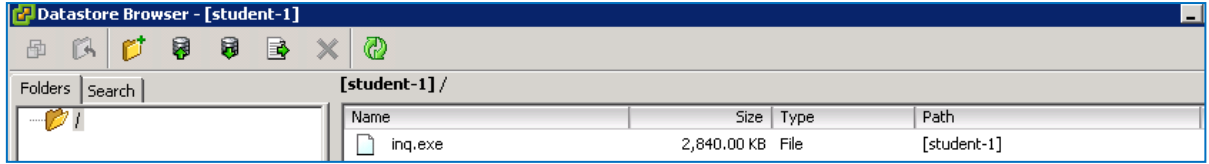
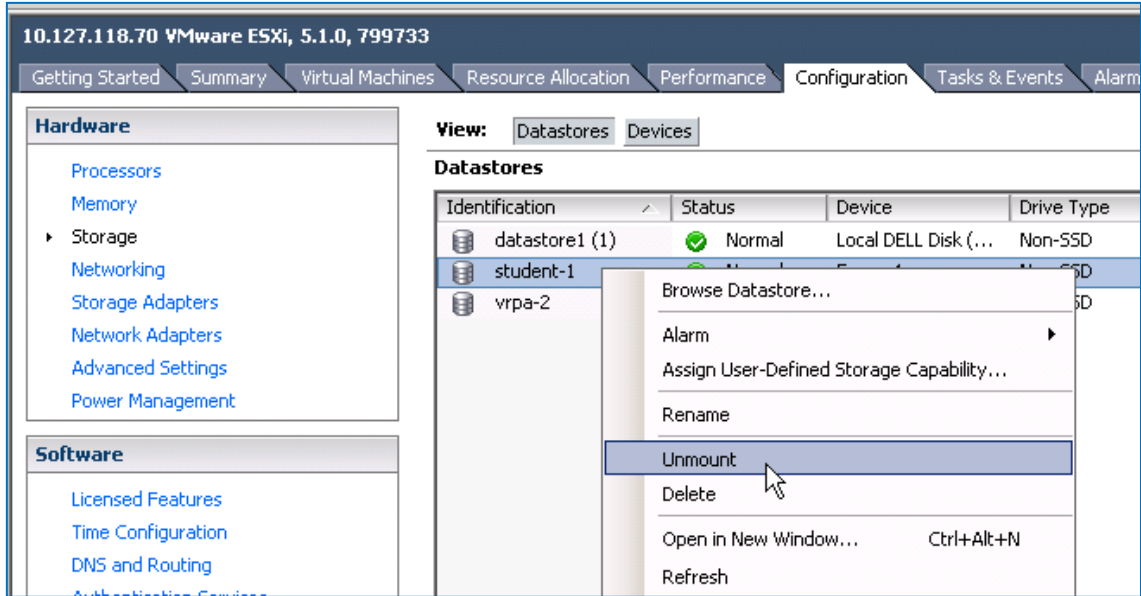
Step	Action
2.	Select the Configuration Tab. Select Storage from the Hardware box. Change the view to Devices  The screenshot shows the VMware vSphere Client interface. The top menu bar includes File, Edit, View, Inventory, Administration, Plug-ins, and Help. The breadcrumb navigation shows Home > Inventory > Inventory. The left sidebar shows the host 10.126.96.32. The main pane is titled 'Pod9-ESX1 VMware ESXi, 5.0.0, 469512'. The 'Configuration' tab is selected. Under the 'Hardware' section, 'Storage' is expanded. The 'View' dropdown is set to 'Devices'. The 'Devices' list shows several storage devices, including EMC Fibre Channel Disks and Local disks.
3.	Look for your assigned LUN masked to the ESX host directly from the Array. Your assigned volume can be found by looking at the size See student Lab Map Compare the UID to the devices you have provisioned from VPLEX. The device provisioned from the Array will have a different UID. <i>Ask instructor if it is not visible.</i> Record the identifier.

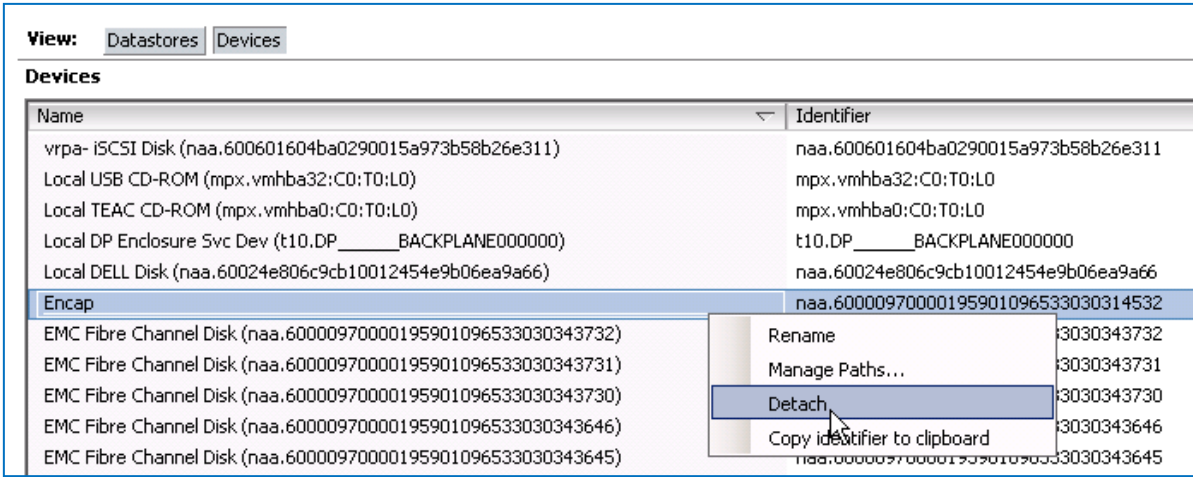
Step	Action															
4.	Change the View to Datastores The screenshot shows the VMware ESXi 5.0.0 Configuration page for host 'Pod9-ESX1'. The 'Configuration' tab is selected. On the left, the 'Hardware' section is expanded, showing links for Health Status, Processors, Memory, Storage (selected), Networking, Storage Adapters, Network Adapters, Advanced Settings, and Power Management. On the right, the 'View' is set to 'Datastores'. A table lists the existing datastores:<table><thead><tr><th>Identification</th><th>Device</th><th>Drive Type</th></tr></thead><tbody><tr><td>distributed</td><td>EMC Fibre Channel...</td><td>Non-SSD</td></tr><tr><td>Migrate-dataS_4EC (inactiv...</td><td>EMC Fibre Chan...</td><td>Non-SSD</td></tr><tr><td>Storage1</td><td>Local LSI Disk (n...</td><td>Non-SSD</td></tr><tr><td>test-store</td><td>EMC Fibre Channel...</td><td>Non-SSD</td></tr></tbody></table>	Identification	Device	Drive Type	distributed	EMC Fibre Channel...	Non-SSD	Migrate-dataS_4EC (inactiv...	EMC Fibre Chan...	Non-SSD	Storage1	Local LSI Disk (n...	Non-SSD	test-store	EMC Fibre Channel...	Non-SSD
Identification	Device	Drive Type														
distributed	EMC Fibre Channel...	Non-SSD														
Migrate-dataS_4EC (inactiv...	EMC Fibre Chan...	Non-SSD														
Storage1	Local LSI Disk (n...	Non-SSD														
test-store	EMC Fibre Channel...	Non-SSD														
5.	Select Add Storage (We will now create a Datastore, which is VMware’s version of a file system) The wizard should launch															
6.	Select Disk/LUN Click Next															

Step	Action
7.	Chose the device that is presented directly from the array.  Refer back to the recorded UID or use the size to identify the correct device. Click Next
8.	Select VMFS-5 

Step	Action
9.	Click Next 
10.	Enter a Datastore name (use student number) 

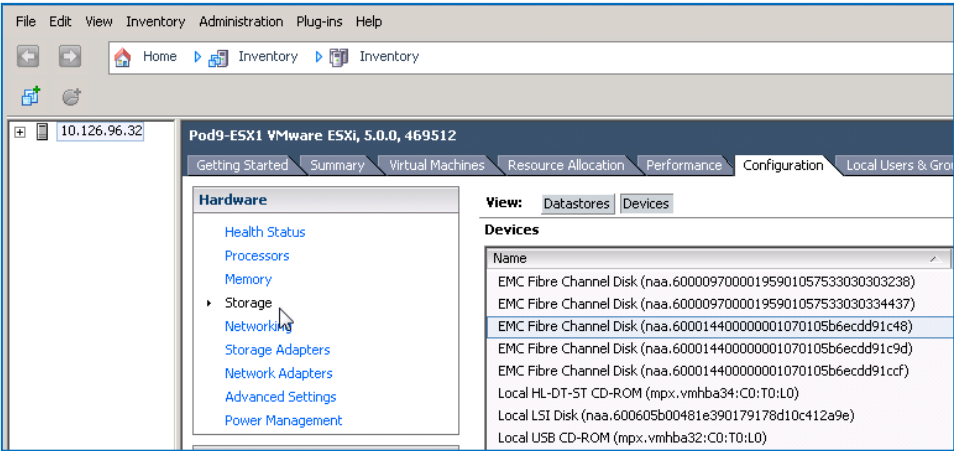
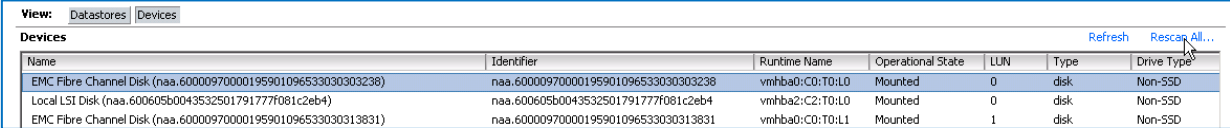
Step	Action
11.	Select Maximum available space Click Next
12.	Task should Complete and Datastore should be visible. 
13.	Right Click on the new Datastore and select Browse Datastore  We will copy a file from your management host to simulate application data or files. Select the pictured icon to upload files. Select upload files

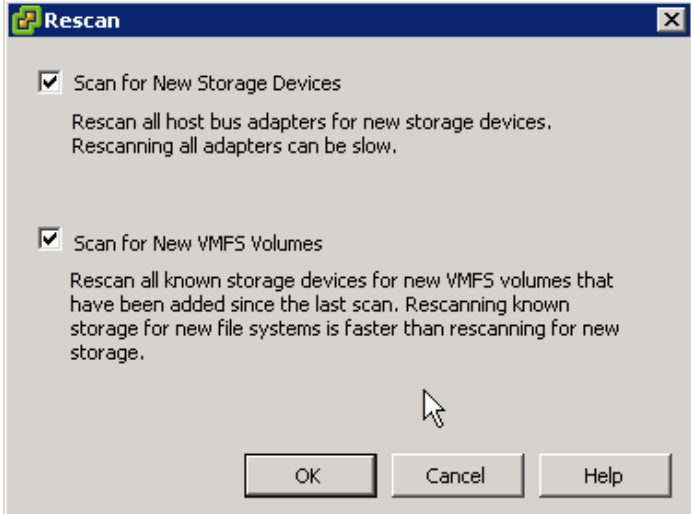
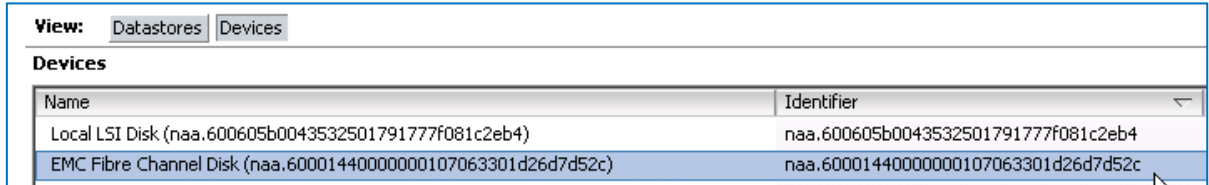
Step	Action
14.	Select any small file, take note of the name, and click Open. Answer yes to the warning. File should upload and be displayed.  Close the browser window
15.	Next we will bring this simulated application data into VPLEX. First we must remove the Datastore and detach the LUN to avoid any conflicts. Right Click on the new Datastore and Select Un mount.  Click OK

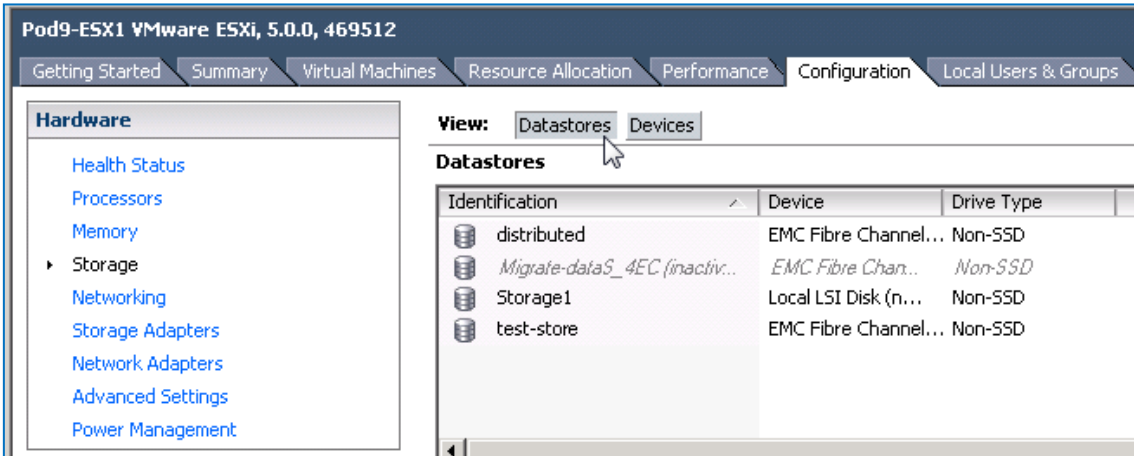
Step	Action
16.	Change the view to Devices.  Right Click on the Device, use the UID and size to verify, and select detach. Click OK to confirm Wait for task completion (bottom window)
17.	Return to Unisphere for VPLEX Navigate to Provision Storage>Cluster-x>Storage Arrays Select your assigned Array and click Rediscover Array Click OK then Close
18.	Select Storage Volumes from the Provision Storage window on the left.
19.	Locate the Storage Volume previously connected to the ESX server Reference the UID recorded earlier. It will have a VPDxxxx in front .

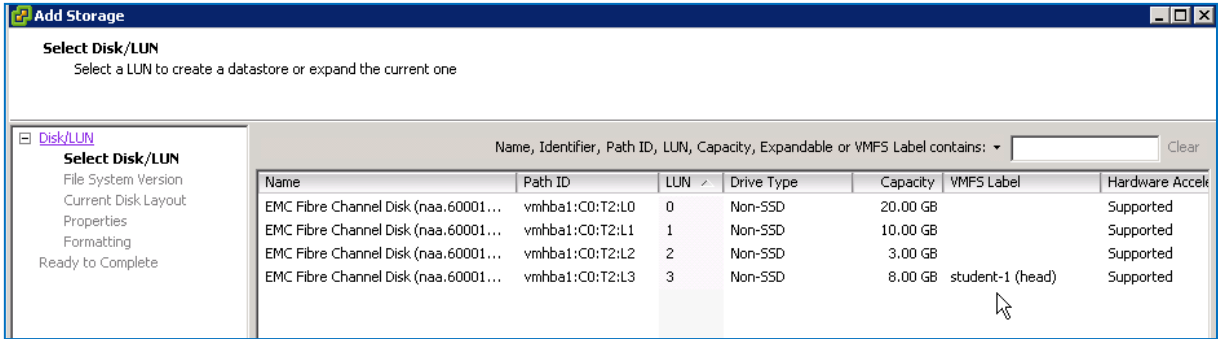
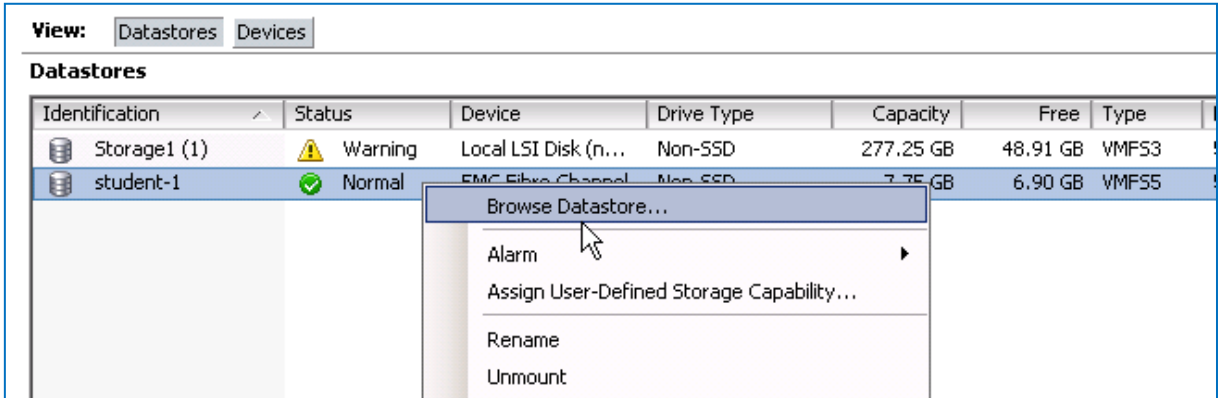
Step	Action
20.	Using Putty from the desktop, Log into VPLEX CLI
21.	Change context to the Storage Volume context for your assigned cluster. <pre>VPLexcli:/> cd clusters/cluster-1/storage-elements/storage-volumes/</pre> <pre>VPLexcli:/clusters/cluster-1/storage-elements/storage-volumes></pre>
22.	List all the Storage Volumes for that cluster. <pre>VPLexcli:/clusters/cluster-1/storage-elements/storage-volumes> ll</pre>
23.	From the list, find the storage volume that was previously presented to the ESX Host. Use the previously recorded UID and the student lab map to identify the volume. The Storage Volume should be un-claimed. Next we will use the “storage-tool compose” command to simply provision
24.	This command will create a Virtual Volume and place it in both a Consistency Group and a Storage View if desired. For this lab we will place the Virtual Volume in a Storage View. First we need to find the exact name of the Storage View we had created earlier. Navigate to the Storage View context and perform a list. <pre>VPLexcli:/> cd clusters/cluster-1/exports/storage-views/</pre> <pre>VPLexcli:/clusters/cluster-1/exports/storage-views> ls</pre>

Step	Action
25.	Record the name of your Storage View
26.	Next we will use the storage-tool compose command to create a Virtual Volume. This Storage Volume presently has data on it that we wish to keep. So we will use Raid-0 as our geometry. <i>Note: If Raid-1 is desired, then it would be required to specify a source for the mirror in order to keep the data.</i> <pre>VPllexcli:/> storage-tool compose --name student1_vv_compose -- geometry raid-0 --storage-volumes VPD83T3:60000970000195901096533030314532 --storage-views /clusters/cluster-1/exports/storage-views/student-1_sv/</pre> Successfully created virtual-volume 'student1_vv_compose'
27.	Next we will verify that the Virtual Volume is in the Storage view. <pre>VPllexcli:/> cd /clusters/cluster-1/exports/storage-views</pre> <pre>VPllexcli:/clusters/cluster-1/exports/storage-views> ll student-1_sv</pre> Substitute the name of your Storage View in the command above. Displayed will be a list of the Virtual Volumes. Verify the name of the previously created Virtual Volume is there.
28.	Return to vSphere Client and your ESX Server. Select your ESX Host

Step	Action
29.	Select the Configuration Tab. Select Storage from the Hardware box.  Change the view to Devices Note: <i>At this point we are about to perform a rescan of the host HBA. Because there may be other students sharing the ESX server and at the same point (each ESX host will have 1-3 students) we need to check the progress of the other students so that multiple rescans are not performed at the same time.</i> <i>If you are in a classroom environment you can ask the other students and coordinate a rescan for each. If you are taking the class online you can message the students or the instructor.</i>
30.	To the right of the window select Rescan 

Step	Action
31.	Leave the 2 checkboxes checked and click OK  The Rescan dialog box has a title bar with a green icon and the word 'Rescan'. It contains two checked checkboxes. The first checkbox is labeled 'Scan for New Storage Devices' with a subtext: 'Rescan all host bus adapters for new storage devices. Rescanning all adapters can be slow.' The second checkbox is labeled 'Scan for New VMFS Volumes' with a subtext: 'Rescan all known storage devices for new VMFS volumes that have been added since the last scan. Rescanning known storage for new file systems is faster than rescanning for new storage.' At the bottom are three buttons: 'OK', 'Cancel', and 'Help'. A mouse cursor is pointing at the 'OK' button.
32.	View the Recent Tasks window below and wait for completion. The new LUN should be displayed. Verify it is correct by checking the size and the identifier. Ignore the naa in front of the UID.  The Recent Tasks window shows the 'Devices' tab selected. It contains a table with two columns: 'Name' and 'Identifier'. The table lists two devices: 'Local LSI Disk (naa.600605b0043532501791777f081c2eb4)' with identifier 'naa.600605b0043532501791777f081c2eb4', and 'EMC Fibre Channel Disk (naa.60001440000000107063301d26d7d52c)' with identifier 'naa.60001440000000107063301d26d7d52c'. The second row is highlighted with a blue background. Compare it to the VPD number of the Virtual Volume that was previously created with the CLI command.. If the new volumes do not appear click refresh. Or try Rescan again.

Step	Action															
33.	Next we will recover the Datastore Change the View to Datastores  The screenshot shows the VMware ESXi 5.0.0 Configuration page for host 'Pod9-ESX1'. The 'Configuration' tab is selected. On the left, under 'Hardware', the 'Storage' section is expanded. On the right, the 'View' is set to 'Datastores'. A table lists the existing datastores: <table><thead><tr><th>Identification</th><th>Device</th><th>Drive Type</th></tr></thead><tbody><tr><td>distributed</td><td>EMC Fibre Channel...</td><td>Non-SSD</td></tr><tr><td>Migrate-dataS_4EC (inactiv...</td><td>EMC Fibre Chan...</td><td>Non-SSD</td></tr><tr><td>Storage1</td><td>Local LSI Disk (n...</td><td>Non-SSD</td></tr><tr><td>test-store</td><td>EMC Fibre Channel...</td><td>Non-SSD</td></tr></tbody></table>	Identification	Device	Drive Type	distributed	EMC Fibre Channel...	Non-SSD	Migrate-dataS_4EC (inactiv...	EMC Fibre Chan...	Non-SSD	Storage1	Local LSI Disk (n...	Non-SSD	test-store	EMC Fibre Channel...	Non-SSD
Identification	Device	Drive Type														
distributed	EMC Fibre Channel...	Non-SSD														
Migrate-dataS_4EC (inactiv...	EMC Fibre Chan...	Non-SSD														
Storage1	Local LSI Disk (n...	Non-SSD														
test-store	EMC Fibre Channel...	Non-SSD														
34.	Select Add Storage The wizard should launch															
35.	Select Disk/LUN Click Next															

Step	Action
36.	Chose the new Virtual Volume just created.  Use the size and the label (should be your student number) to identify.
37.	Select Keep the existing Signature. Click Next Click Finish
38.	The Datastore should appear. (if not click refresh) Right Click the Datastore and Select Browse Datastore. 

Step	Action
39.	Verify the file that was copied earlier is present. This was an example of how to move data from host access outside of VPLEX into VPLEX without any loss. This would be the same procedure for any O.S. Just the mounting of a LUN is host specific.

End of Lab Exercise

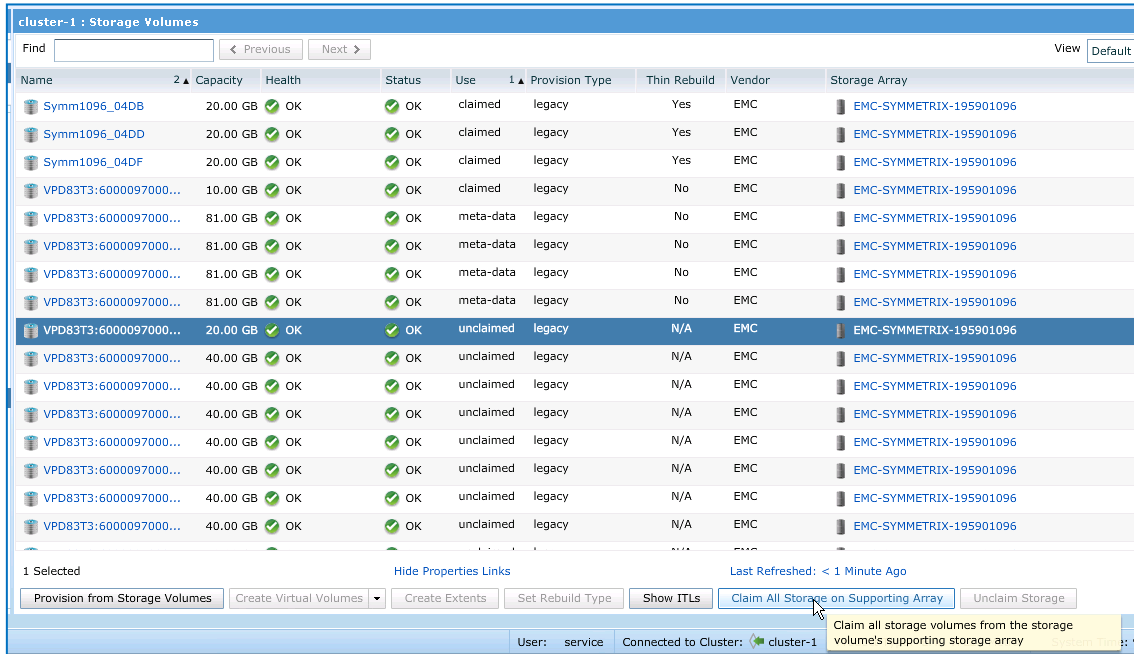
This page intentionally left blank.

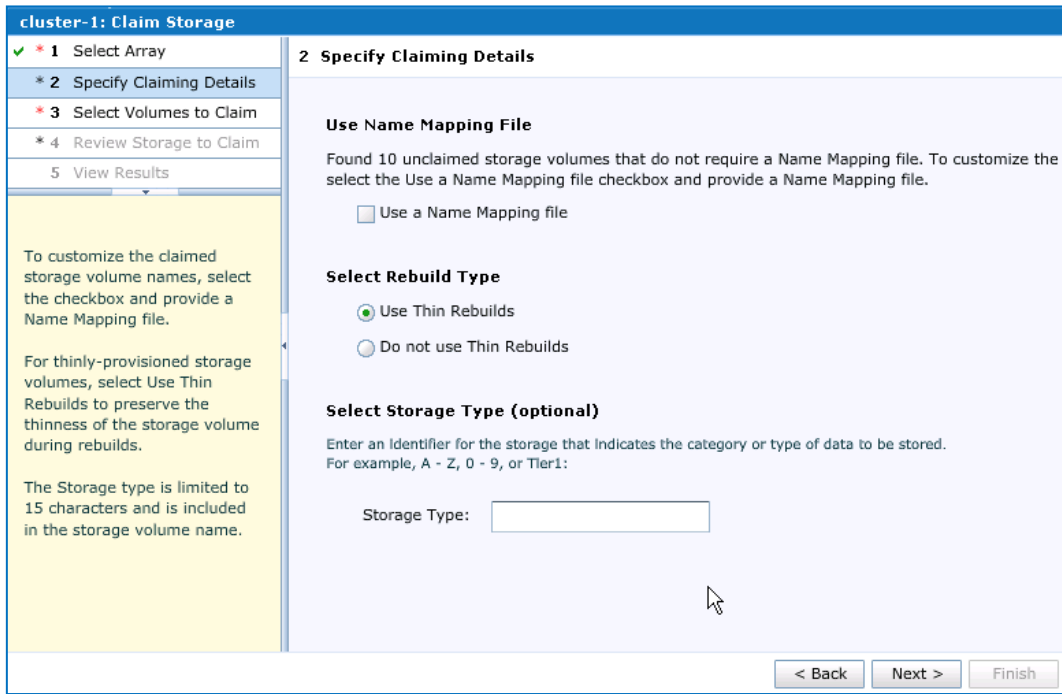
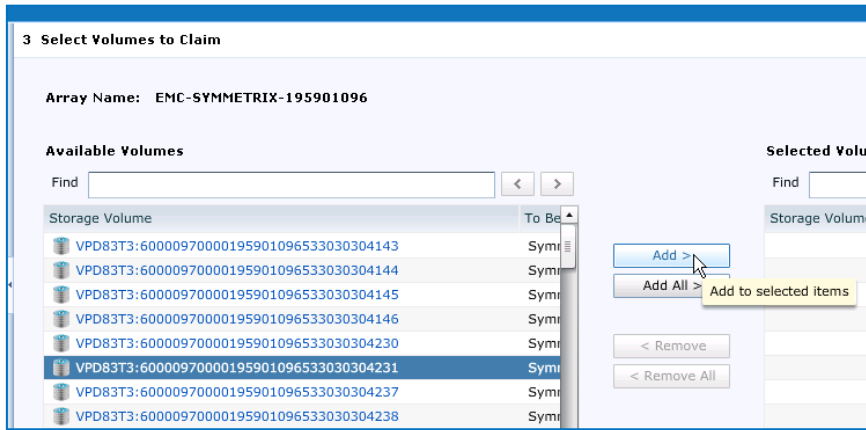
Lab Exercise 3: Creating Distributed Devices

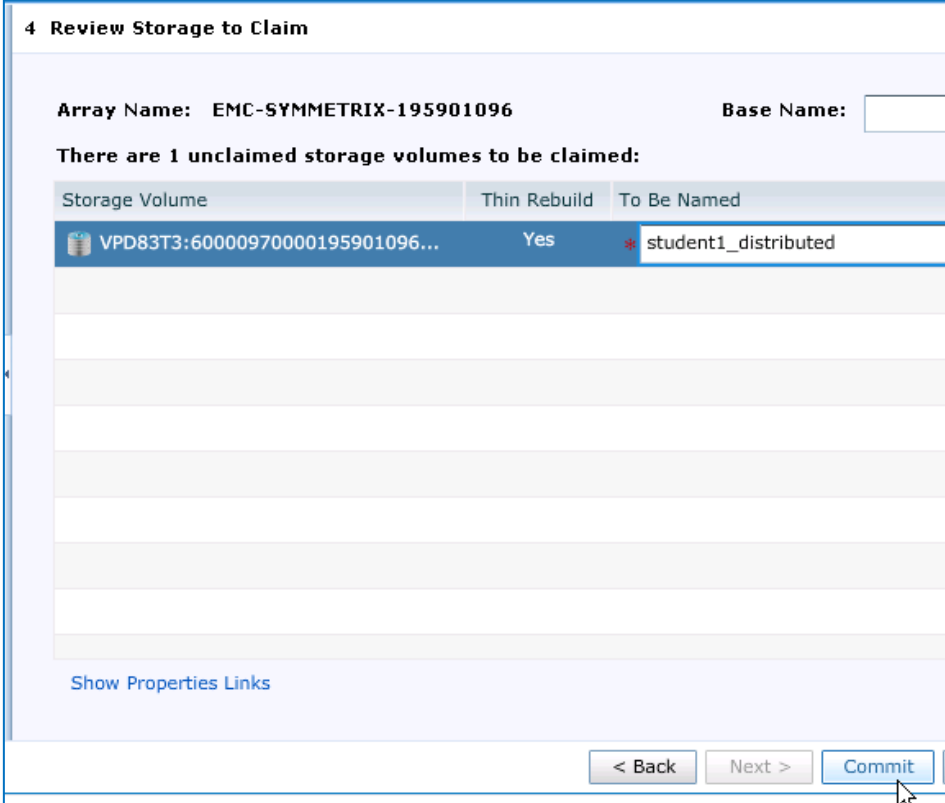
Purpose:	To create Distributed Devices and provision them to a host.
Tasks:	Create Distributed Devices. Create Virtual Volumes Create Consistency Groups

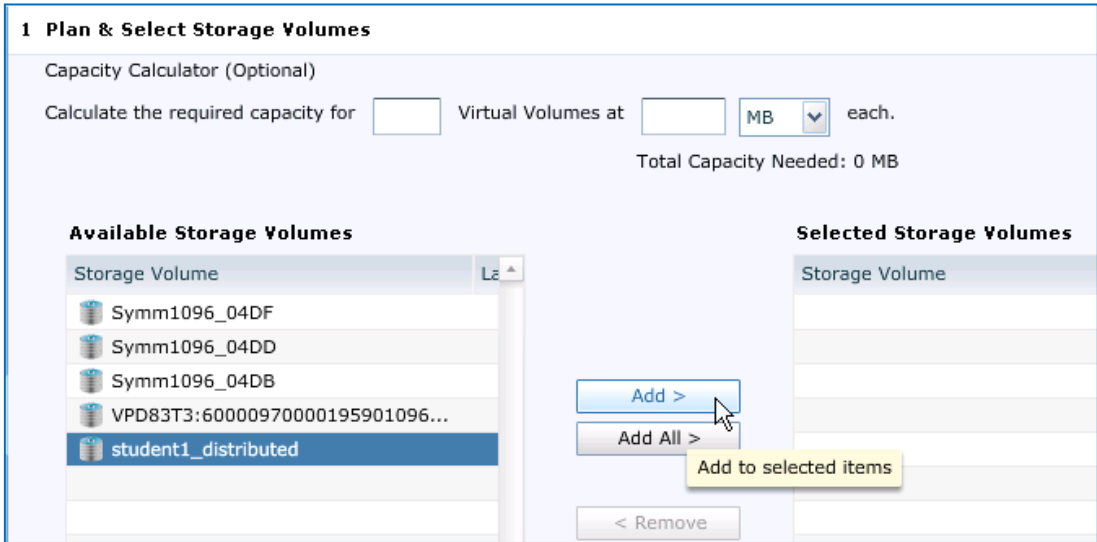
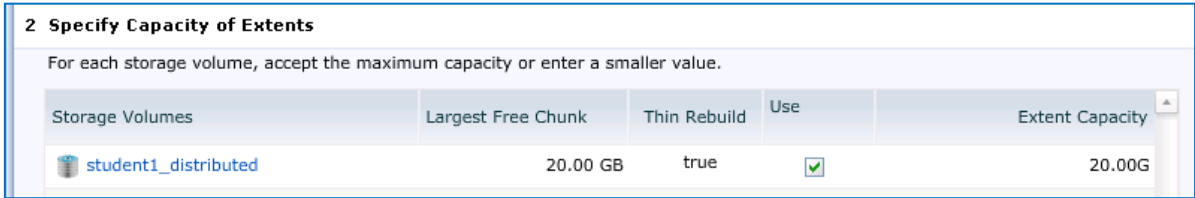
Lab 3: Part 1 – Create Distributed Devices

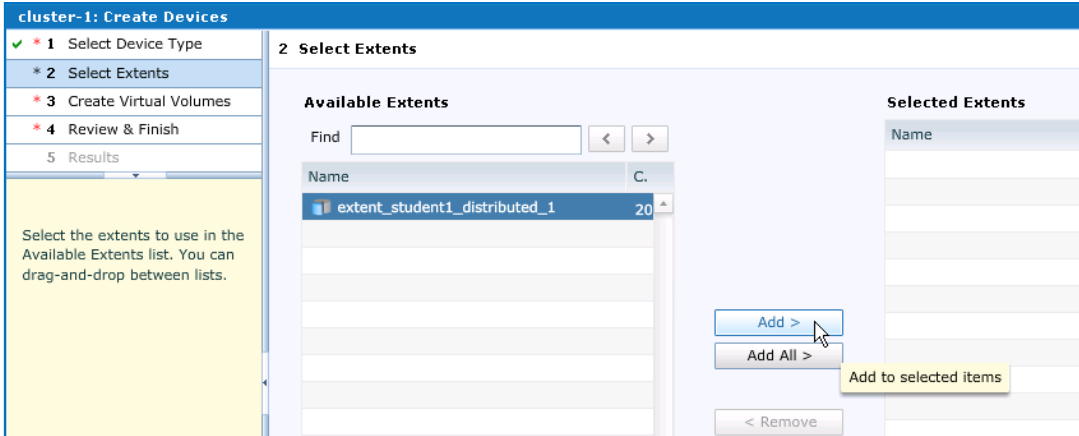
Step	Action
	This Lab will create Distributed Devices and provision them to a host. Information Needed: ESX Server address and user/password Windows Management Host VPLEX Cluster address and user/password Storage Volume assignments
1.	Open Unisphere for VPLEX from your Windows Management Host.
2.	Next we will create Distributed Devices using the Advanced Provisioning method.
3.	Navigate to: Provision Storage>Assigned Cluster>Storage Volumes
4.	View your assigned Storage Volumes. (See Lab Map) Remember that a Storage Volume must be claimed before it can be used in VPLEX. If the “Use” is displayed as used, it already has Extents created on it.
5.	Choose one of your assigned Storage Volumes that is Unclaimed. Record the UID

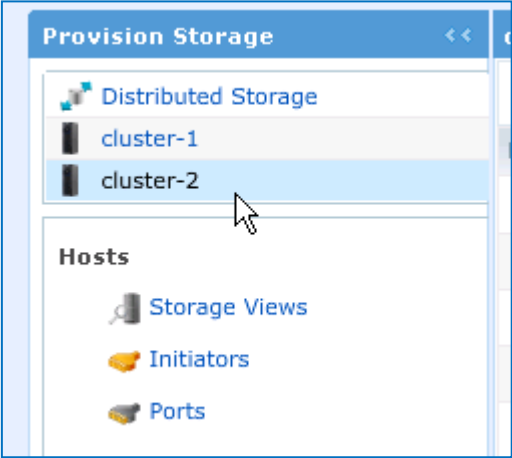
Step	Action
6.	Next we will Claim one of your Assigned Storage Volumes. Select it and Click Claim All Storage on Supporting Array.  The screenshot shows the 'cluster-1 : Storage Volumes' interface. It features a table with columns: Name, Capacity, Health, Status, Use, Provision Type, Thin Rebuild, Vendor, and Storage Array. The table lists 16 storage volumes, including Symm1096_04DB, Symm1096_04DD, Symm1096_04DF, and several VPD83T3:6000097000... volumes. The 'Status' column shows 'OK' for all volumes. The 'Use' column shows 'claimed' for the first three and 'unclaimed' for the rest. The 'Provision Type' is 'legacy' for all. The 'Thin Rebuild' column shows 'Yes' for the first three and 'No' for the next six, and 'N/A' for the last five. The 'Vendor' is 'EMC' for all. The 'Storage Array' is 'EMC-SYMMETRIX-195901096' for all. At the bottom, there are buttons for 'Provision from Storage Volumes', 'Create Virtual Volumes', 'Create Extents', 'Set Rebuild Type', 'Show ITLs', 'Claim All Storage on Supporting Array' (highlighted), and 'Unclaim Storage'. A tooltip for the 'Claim All Storage on Supporting Array' button reads: 'Claim all storage volumes from the storage volume's supporting storage array'.
7.	Select the Array Click Next

Step	Action
8.	For Claiming Details: Select Rebuild Type Use Thin Rebuilds All other boxes can be unchecked  Click Next
9.	Select the Storage Volume to claim. Highlight the Storage Volume to Claim and Click Add (Use the UID recorded in step 5)  Click Next

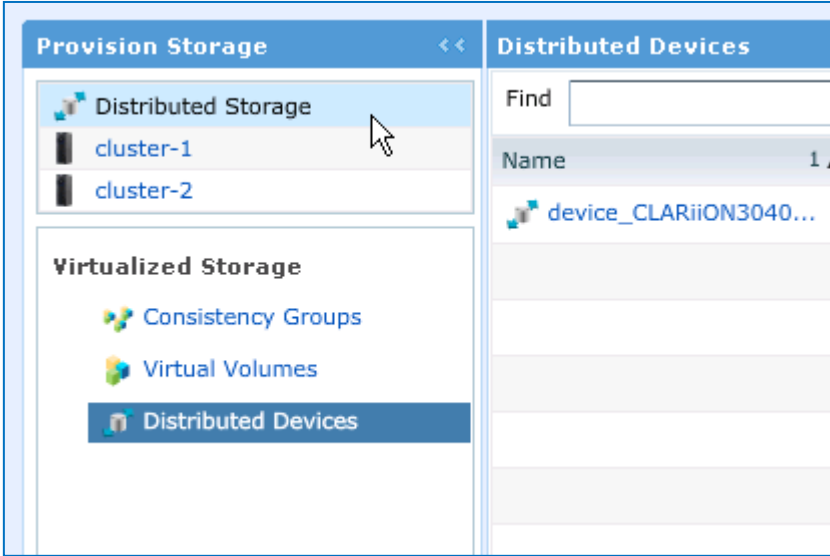
Step	Action
10.	Name the Storage Volume Enter your student number with a _distributed at the end. See example below: 
11.	Click Commit After successful completion click Close
12.	Next we will create Extents Select Extents form the Provision Storage Window on the left. Click Create

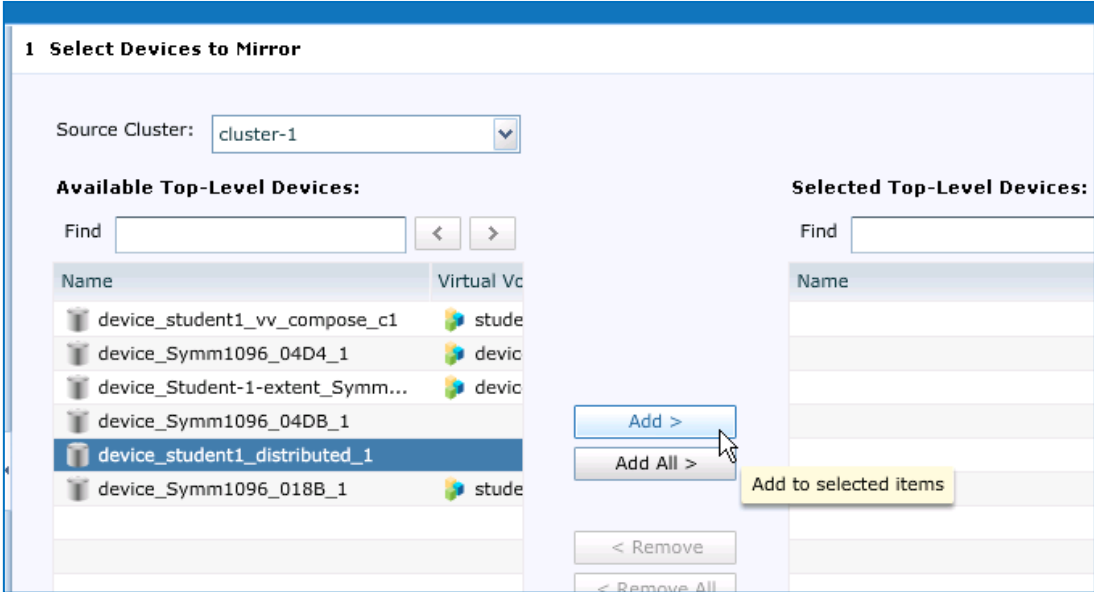
Step	Action
13.	Select your previously claimed Storage Volume and Click Add Click Next 
14.	Provision the entire Storage Volume for the Extent Verify the Largest Free Chunk matches the Extent Capacity (Default settings)  Click Next Click Commit Click Close
15.	Verify the Extent was created

Step	Action
16.	Next we will create a Device on the Extent Select the Extent previously created and Click Create Devices
17.	Choose 1:1 Mapping of Extents to Devices Click Next
18.	Select the Extent previously created and Click Add  Click Next
19.	Answer No to create a Virtual Volume Click Next
20.	Click Commit Click Close

Step	Action
21.	Change Clusters to the opposite cluster. For Example if your assigned Cluster is Cluster-1 and the device that was just created is on Cluster-1, change to Cluster-2 
22.	Repeat Steps 1-19 to create a Device on the other cluster. There is 1 addition to repeating steps -1-19. Step 10 has you name the Storage Volume, when repeating this step on the opposite cluster makes sure that the name is not duplicated. Place an _1 at the end of the name. <i>This is very important to avoid duplicate names.</i> <i>Note: Very important to use your assigned volumes (See Lab Map) on this cluster, as not to impact other students.</i>
23.	Now there are 2 Devices on each cluster that can be used to create Distributed Devices and place Virtual Volumes on those Devices. We will also place those into Storage Views and Consistency Groups at Each cluster. Next we will verify the Block count of each Device Log on to Vplexcli for Cluster-2 (Use putty on the desktop)

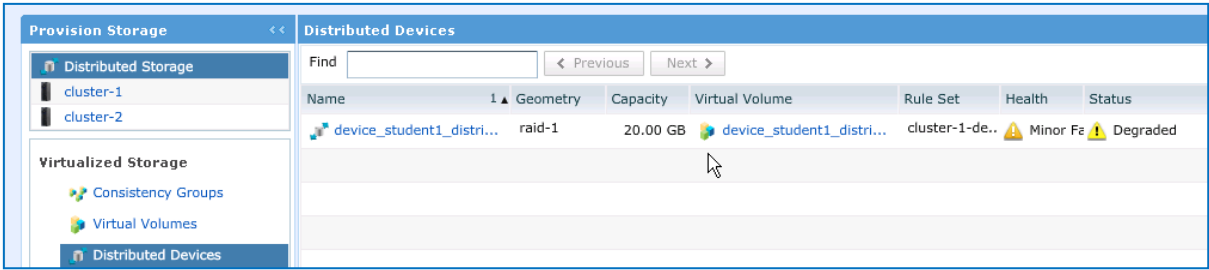
Step	Action
24.	Change directories to /clusters/cluster-2/devices <pre>VPlxcli:/> cd clusters/cluster-2/devices/</pre>
25.	List the devices at that cluster <pre>VPlxcli:/clusters/cluster-2/devices> ls</pre> Find the device that was created in the previous steps.
26.	List the properties of that device to record the block count. <pre>VPlxcli:/clusters/cluster-2/devices> ll device_student1_distributed</pre> Record the Block-count
27.	Repeat the above steps (22-25) for Cluster 1 Record the Block count.

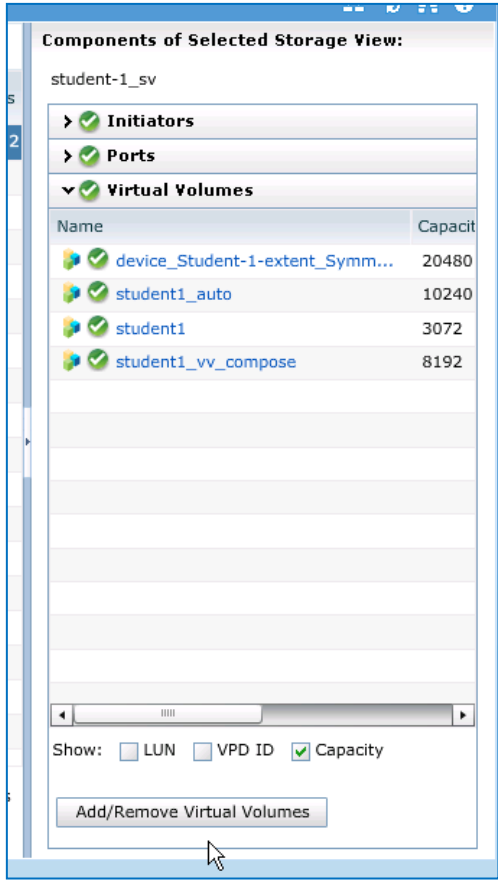
Step	Action
28.	When the distributed Device is created the smaller of the 2 devices that will be mirrored must be the source. Navigate to Distributed Storage from the left most Provision Storage Window 
29.	Select Distributed Devices and Click Create

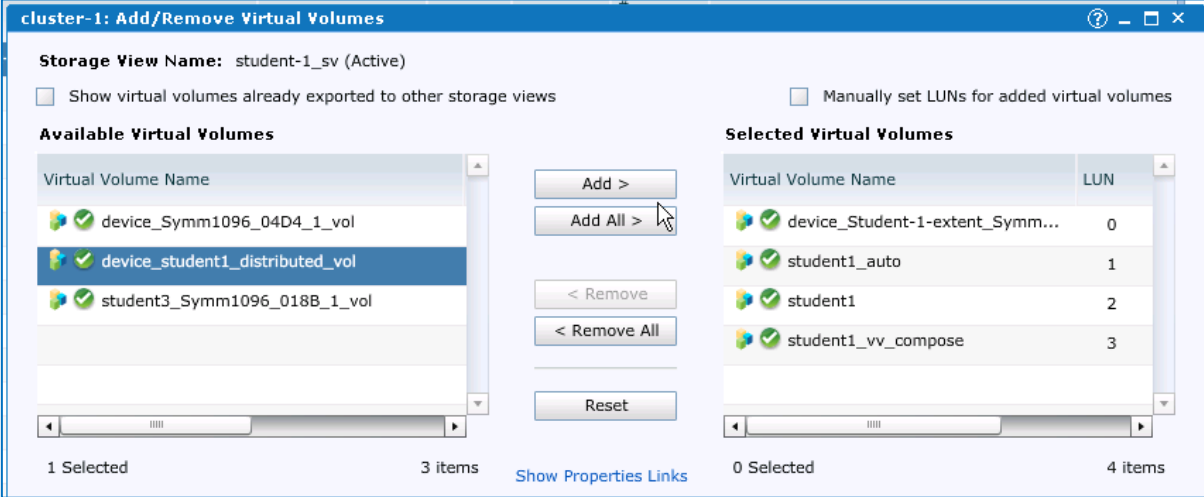
Step	Action
30.	The Wizard should launch. Select a Source Cluster. Use the Cluster that has the device with the smallest block size. (recorded earlier) Click Add to select the device  Click Next

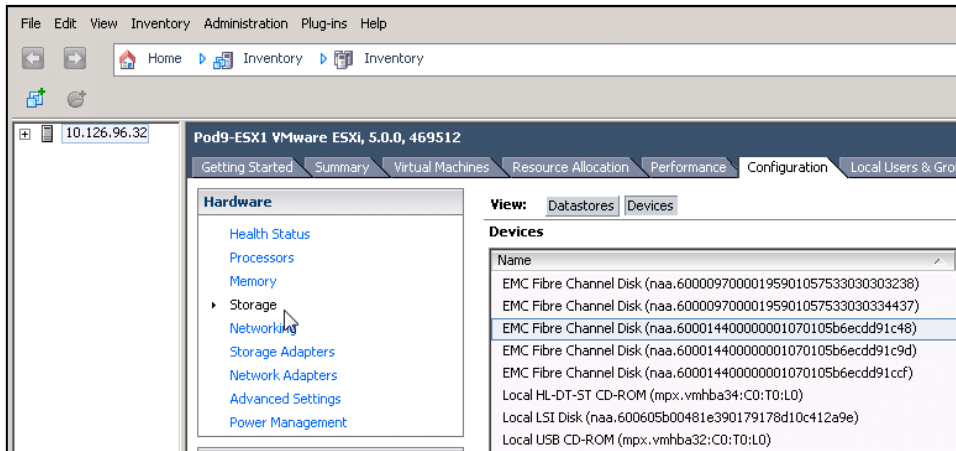
Step	Action																									
31.	Select the 2 devices to form a mirror. The choices are the other devices in the opposite cluster from the source that are as least as large. Select your Devices and Click Add Mirror 2 Select Mirrors Target Cluster: cluster-2 To select appropriate mirrors automatically based on best-fit capacities, click Auto-generate Mirror Mappings. Otherwise, select each source and target to add mirror mappings manually. Auto-Generate Mirror Mappings Selected Devices to Mirror: Find <table><thead><tr><th>Name</th><th>Capacity</th><th>Virtual \</th></tr></thead><tbody><tr><td> device_student1_distributed_1</td><td>20.00 GB</td><td></td></tr><tr><td colspan="3"> </td></tr><tr><td colspan="3"> </td></tr><tr><td colspan="3"> </td></tr></tbody></table> Available Devices to use for Mirroring: Find <table><thead><tr><th>Name</th><th>Capacity</th></tr></thead><tbody><tr><td> device_CLARiiON3040_LUN_00094_...</td><td>20.00 GB</td></tr><tr><td> device_student1_distributed</td><td>20.00 GB</td></tr><tr><td colspan="2"> </td></tr><tr><td colspan="2"> </td></tr></tbody></table> Add Mirror Selected Mirrors: Click Next	Name	Capacity	Virtual \	device_student1_distributed_1	20.00 GB											Name	Capacity	device_CLARiiON3040_LUN_00094_...	20.00 GB	device_student1_distributed	20.00 GB				
Name	Capacity	Virtual \																								
device_student1_distributed_1	20.00 GB																									
Name	Capacity																									
device_CLARiiON3040_LUN_00094_...	20.00 GB																									
device_student1_distributed	20.00 GB																									
32.	Leave the Synchronize Data Box checked Click Next																									

Step	Action
33.	Next we will create a Consistency Group Select Create a Consistency Group. Use your Student number_distributed as the name. Select your assigned Cluster as the Winner for the Rule Set 4 Select Consistency Group or Device Rule Set Select a Consistency Group or a Device Rule Set ☐ Select an existing Consistency Group Consistency Group: * Select a Consistency Group... ☒ Create a Consistency Group Consistency Group Name: * student1 Rule Set: * Winner:cluster-1 (5 seconds) In the event of a cluster or partition failure that lasts more than 5 seconds, on cluster 'cluster-1' only. I/O will be suspended at all other clusters. If VPLEX Witness is deployed and 'cluster-1' fails, the Witness will override groups and continue I/O on the active cluster. ☐ Select a Device Rule Set Rule Set: * Select a Rule Set... You must select a detach rule set to determine which cluster detaches and con... Click Next
34.	View the selections, if correct click Commit Click Close Note: sometimes a failure can occur without an explanation if the wrong source cluster is chosen. If this is the case redo the steps and choose the other cluster as the source.

Step	Action
35.	Select Distributed Devices  The state of the device is degraded until the synchronization is complete
36.	Change view to your assigned Cluster Select Storage Views

Step	Action										
37.	Select your Storage View and Change the Components view to Virtual Volumes  Components of Selected Storage View: student-1_sv > Initiators > Ports > Virtual Volumes <table border="1"> <thead> <tr> <th>Name</th><th>Capacity</th></tr> </thead> <tbody> <tr> <td>device_Student-1-extent_Symm...</td><td>20480</td></tr> <tr> <td>student1_auto</td><td>10240</td></tr> <tr> <td>student1</td><td>3072</td></tr> <tr> <td>student1_vv_compose</td><td>8192</td></tr> </tbody> </table> Show: ☐ LUN ☐ VPD ID ☒ Capacity Add/Remove Virtual Volumes	Name	Capacity	device_Student-1-extent_Symm...	20480	student1_auto	10240	student1	3072	student1_vv_compose	8192
Name	Capacity										
device_Student-1-extent_Symm...	20480										
student1_auto	10240										
student1	3072										
student1_vv_compose	8192										

Step	Action
38.	Click Add/Remove Virtual Volumes Add the Distributed Virtual Volume into the Storage View  Click OK Click Close
39.	Minimize Unisphere for VPLEX and from your Windows desktop: Open vSphere Client and connect to your ESX Host. See the student Lab Map for the IP address and Login information for the ESX host. <i>Note: do not use the login for vCenter Server, just the ESX server.</i>

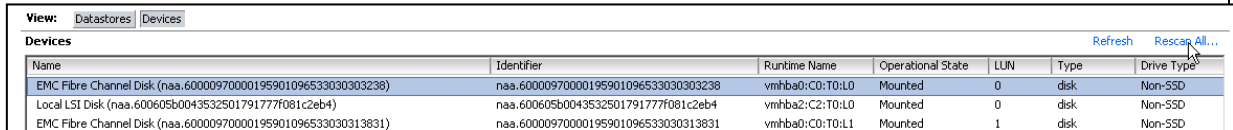
Step	Action
40.	Select the Configuration Tab. Select Storage from the Hardware box. 

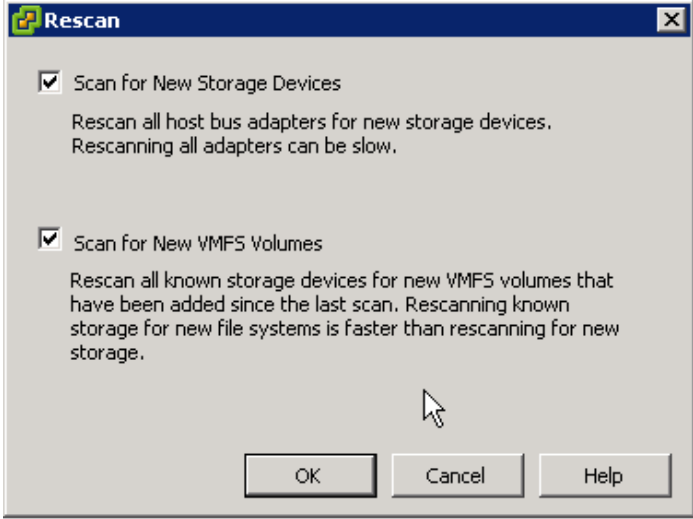
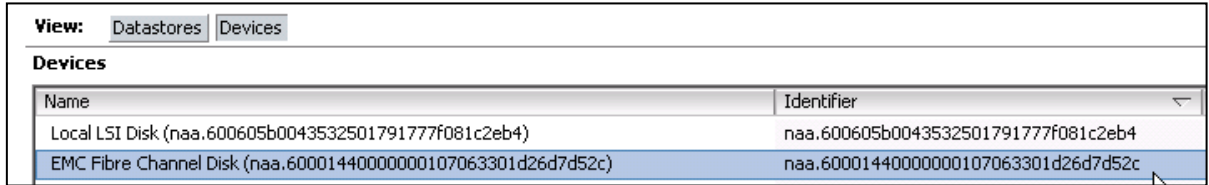
Change the view to **Devices**

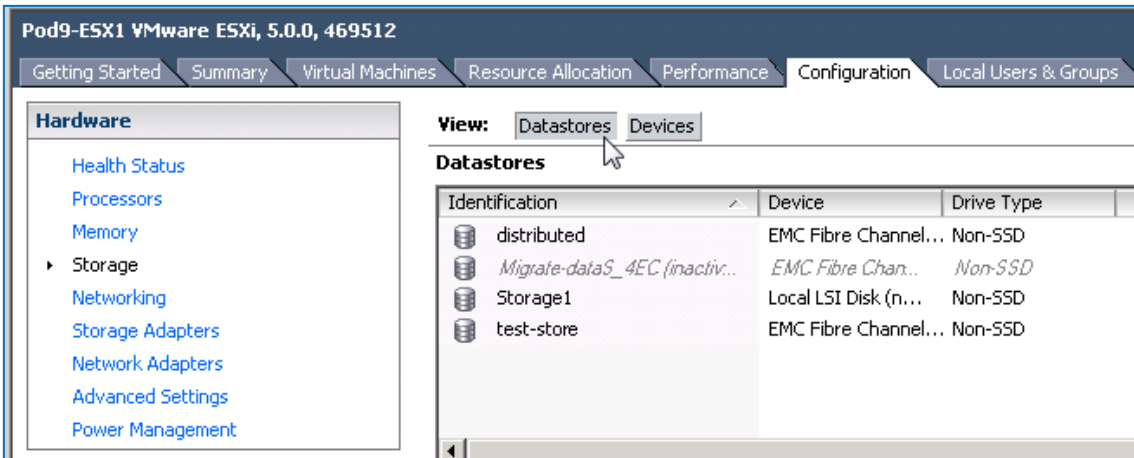
Note:

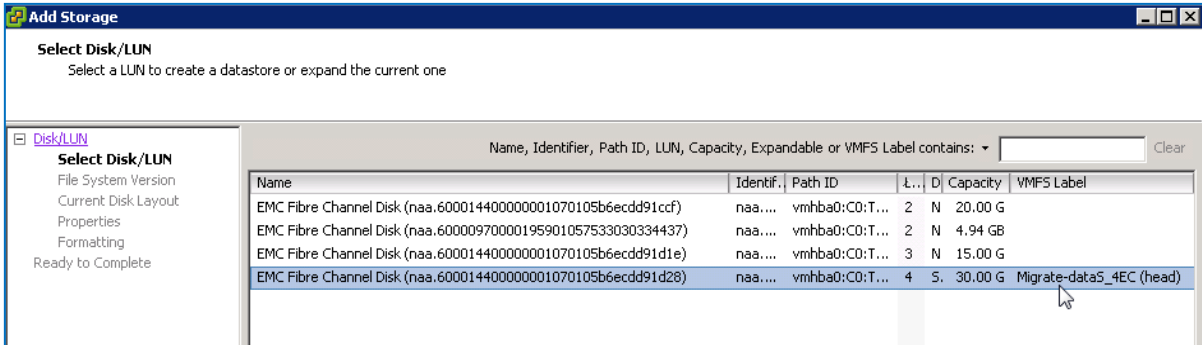
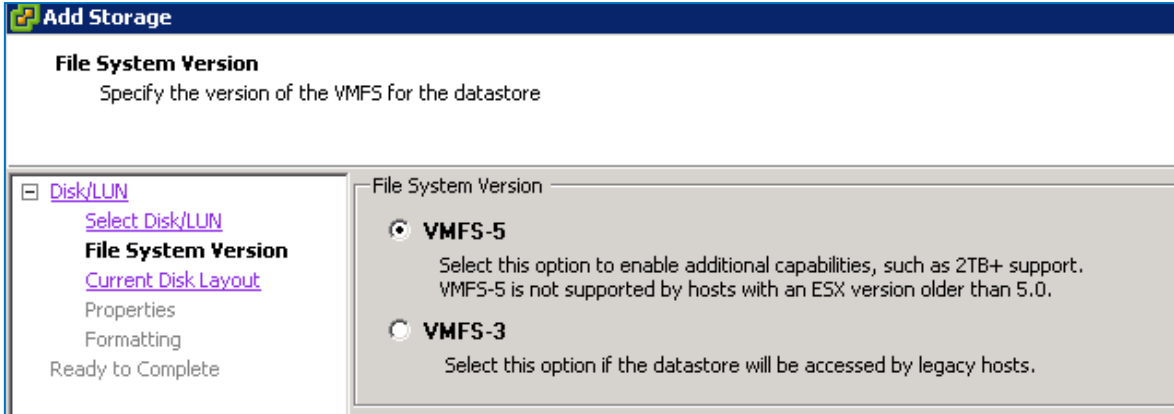
At this point we are about to perform a rescan of the host HBA. Because there may be other students sharing the ESX server and at the same point (each ESX host will have 1-3 students) we need to check the progress of the other students so that multiple rescans are not performed at the same time.

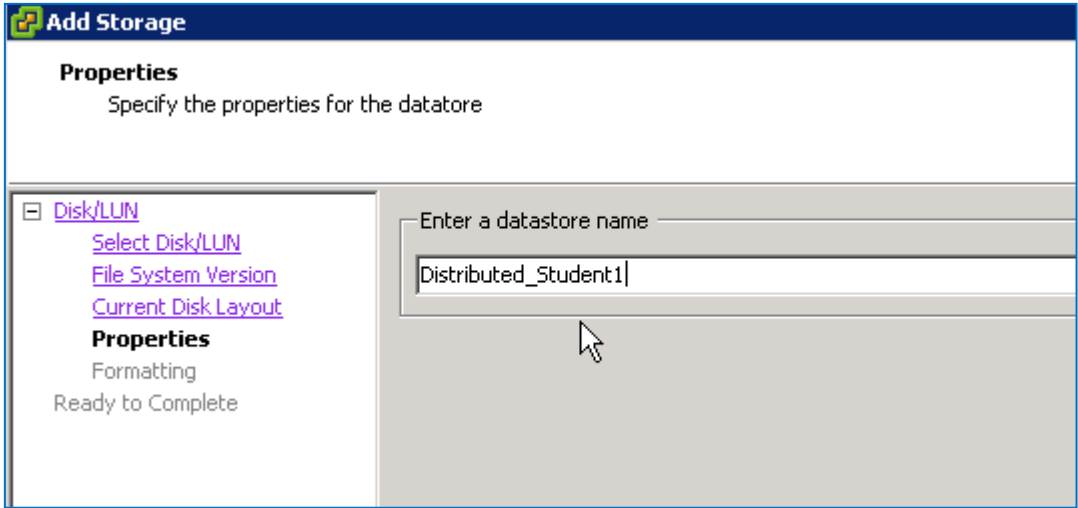
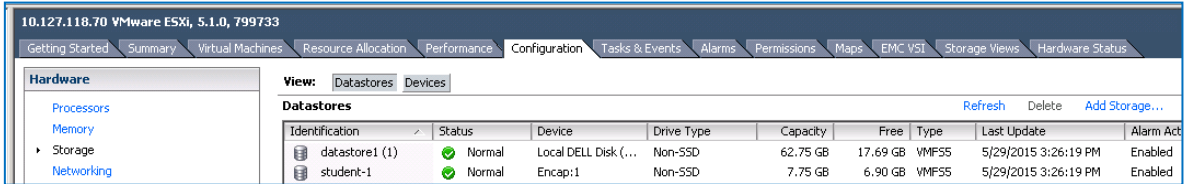
If you are in a classroom environment you can ask the other students and coordinate a rescan for each. If you are taking the class online you can message the students or the instructor.

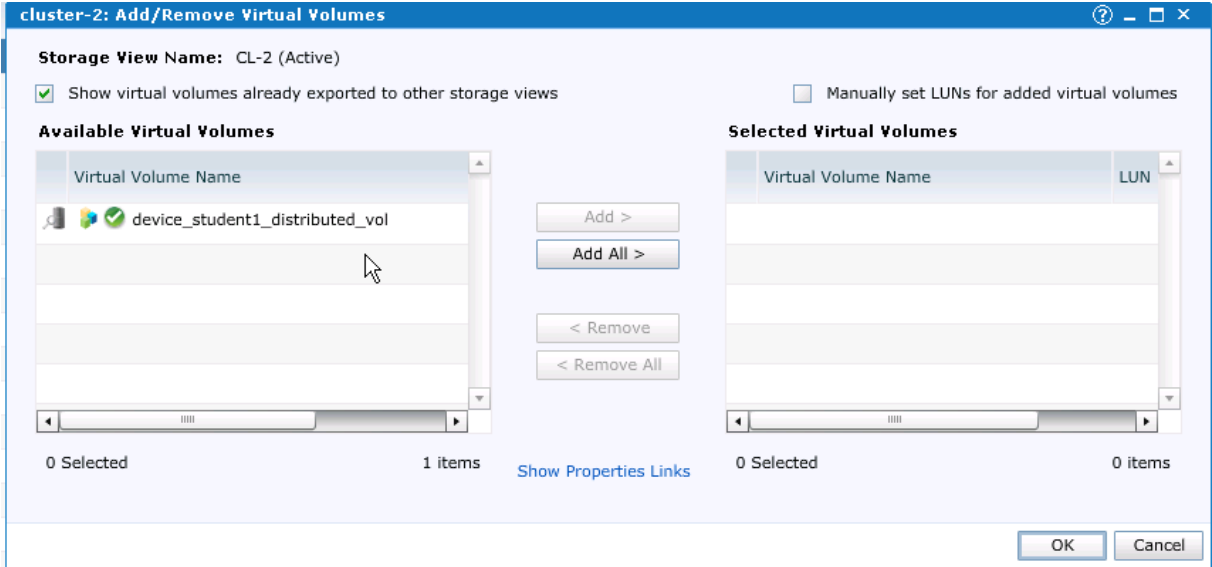
41.	To the right of the window select Rescan  <table><tr><th colspan="7">View: Datastores Devices</th></tr><tr><th colspan="7">Devices</th></tr><tr><th>Name</th><th>Identifier</th><th>Runtime Name</th><th>Operational State</th><th>LUN</th><th>Type</th><th>Drive Type</th></tr><tr><td>EMC Fibre Channel Disk (naa.60000970000195901096533030303238)</td><td>naa.60000970000195901096533030303238</td><td>vmhba0:C0:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td><td>vmhba2:C2:T0:L0</td><td>Mounted</td><td>0</td><td>disk</td><td>Non-SSD</td></tr><tr><td>EMC Fibre Channel Disk (naa.6000097000019590109653303030313831)</td><td>naa.6000097000019590109653303030313831</td><td>vmhba0:C0:T0:L1</td><td>Mounted</td><td>1</td><td>disk</td><td>Non-SSD</td></tr></table>	View: Datastores Devices							Devices							Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type	EMC Fibre Channel Disk (naa.60000970000195901096533030303238)	naa.60000970000195901096533030303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD	EMC Fibre Channel Disk (naa.6000097000019590109653303030313831)	naa.6000097000019590109653303030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD
View: Datastores Devices																																											
Devices																																											
Name	Identifier	Runtime Name	Operational State	LUN	Type	Drive Type																																					
EMC Fibre Channel Disk (naa.60000970000195901096533030303238)	naa.60000970000195901096533030303238	vmhba0:C0:T0:L0	Mounted	0	disk	Non-SSD																																					
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	vmhba2:C2:T0:L0	Mounted	0	disk	Non-SSD																																					
EMC Fibre Channel Disk (naa.6000097000019590109653303030313831)	naa.6000097000019590109653303030313831	vmhba0:C0:T0:L1	Mounted	1	disk	Non-SSD																																					

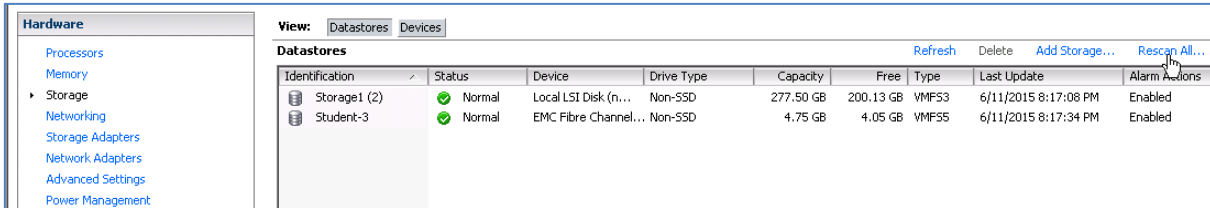
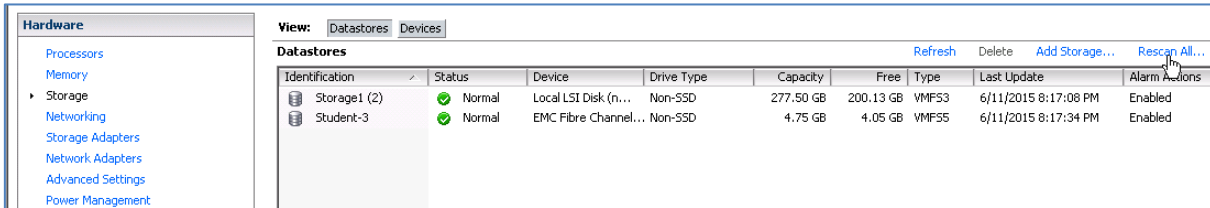
Step	Action						
42.	Leave the 2 checkboxes checked and click OK  The Rescan dialog box has a title bar with a green icon and a close button. It contains two checked checkboxes: 'Scan for New Storage Devices' and 'Scan for New VMFS Volumes'. Below each checkbox is a descriptive text. At the bottom are three buttons: 'OK', 'Cancel', and 'Help'. A mouse cursor is pointing at the 'OK' button.						
43.	View the Recent Tasks window below and wait for completion. The new LUN should be displayed. Verify it is correct by checking the size and the identifier. Ignore the naa in front of the UID.  The Recent Tasks window shows the 'Devices' tab. It contains a table with two columns: 'Name' and 'Identifier'. The table lists two devices: 'Local LSI Disk' and 'EMC Fibre Channel Disk'. The 'EMC Fibre Channel Disk' row is highlighted. <table border="1"> <thead> <tr> <th>Name</th><th>Identifier</th></tr> </thead> <tbody> <tr> <td>Local LSI Disk (naa.600605b0043532501791777f081c2eb4)</td><td>naa.600605b0043532501791777f081c2eb4</td></tr> <tr> <td>EMC Fibre Channel Disk (naa.60001440000000107063301d26d7d52c)</td><td>naa.60001440000000107063301d26d7d52c</td></tr> </tbody> </table> Compare it to the VPD number of the Virtual Volume for the new Distributed Device in the Storage View.	Name	Identifier	Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4	EMC Fibre Channel Disk (naa.60001440000000107063301d26d7d52c)	naa.60001440000000107063301d26d7d52c
Name	Identifier						
Local LSI Disk (naa.600605b0043532501791777f081c2eb4)	naa.600605b0043532501791777f081c2eb4						
EMC Fibre Channel Disk (naa.60001440000000107063301d26d7d52c)	naa.60001440000000107063301d26d7d52c						

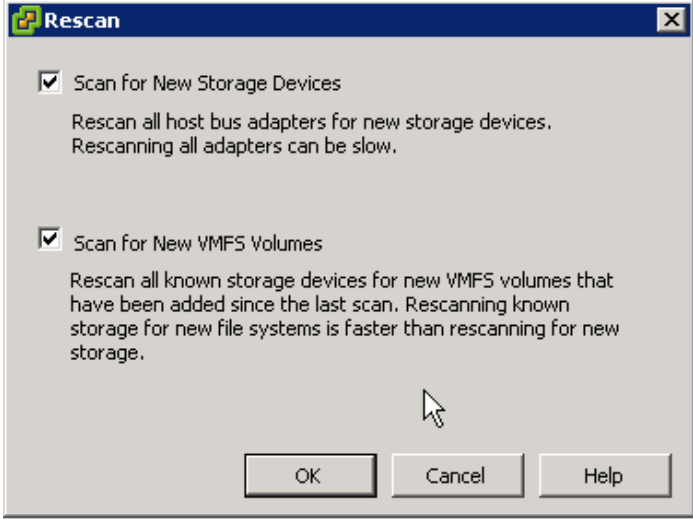
Step	Action
44.	Change the View to Datastores 
45.	Next we will use the ESX Hosts attached to both clusters to demonstrate the features of Distributed Devices. Select Add Storage (We will now create a Datastore, which is VMware’s version of a file system) The wizard should launch
46.	Select Disk/LUN Click Next

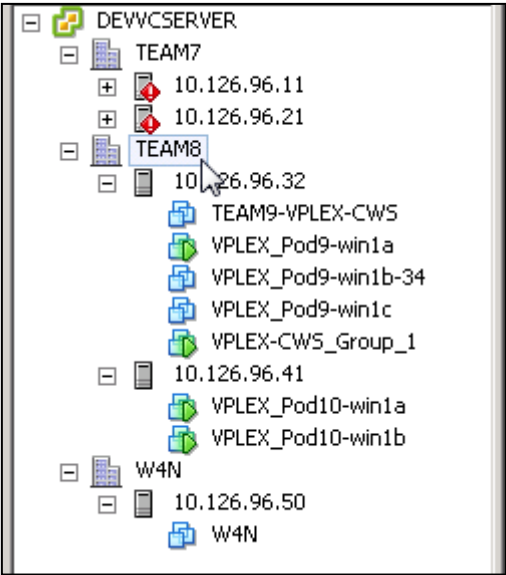
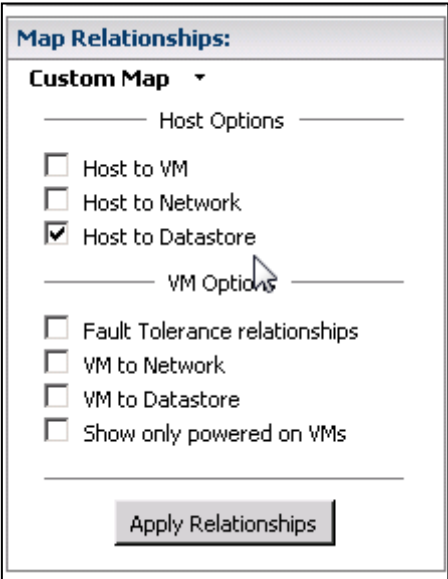
Step	Action
47.	Chose the new device that is presented from the array.  Use the size to identify the correct device. Click Next
48.	Select VMFS-5 

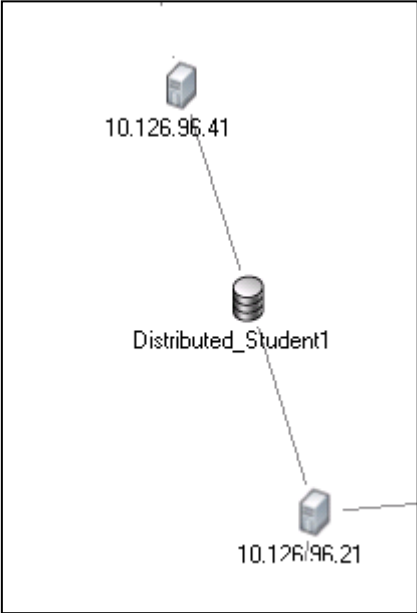
Step	Action
50.	Enter a Datastore name (use distributed_student number) 
51.	Select Maximum available space Click Next
52.	Task should complete and Datastore should be visible. 
53.	Next we will add the Virtual Volume on the opposite cluster to the Storage View already created. (Any one)

Step	Action
54.	Change the view under Provision Storage to the opposite cluster you are assigned. Example if your student Lab Map has Cluster-1 as your assigned cluster change to cluster 2
55.	Select the existing Storage View Change the components window to the right to Virtual Volumes. Select Add/Remove Virtual Volumes
56.	Add the Virtual Volume from the distributed Device that was created earlier.  Check the Box "Show virtual volumes already exported to other storage views" Click Ok Answer yes to the warning about exporting a volume already in another Storage View.
57.	Change your vSphere Client to the ESX host in the opposite cluster See the Lab Map for user/password

Step	Action
58.	Select the Configuration Tab. Select Storage from the Hardware box.  Change the view to Datastores Note: <i>At this point we are about to perform a rescan of the host HBA. Because there may be other students sharing the ESX server and at the same point (each ESX host will have 1-3 students) we need to check the progress of the other students so that multiple rescans are not performed at the same time.</i> <i>If you are in a classroom environment you can ask the other students and coordinate a rescan for each. If you are taking the class online you can message the students or the instructor.</i>
59.	To the right of the window select Rescan 

Step	Action
60.	Leave the 2 checkboxes checked and click OK 
61.	View the Recent Tasks window below and wait for completion. The new DataStore should be displayed. Verify it is correct by checking the size and name. Compare the name to step 49. This is a demonstration of the ability of VPLEX to provision storage from 2 different clusters at 2 different locations as Active Active. If the Datastore does not appear here are some simple steps to fix the issue. • Rescan again • Change views from Datastore to Devices and verify the device (check size and UID number is displayed) • Use the Add Storage Wizard (steps 44-51) pick the same device UID and keep existing Signature.
62.	Close the vSphere Client connection to the ESX host. Log in to vCenter Server (See Lab Map for user/password)

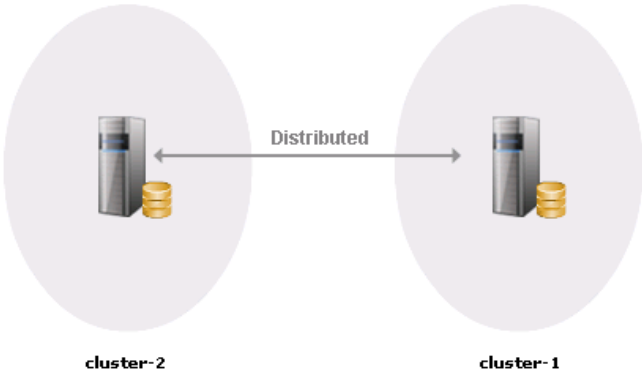
Step	Action
63.	From vCenter Server, select the Datacenter that stores the ESX Hosts  <i>It uses the building icon.</i>
64.	Select the Maps Tab Change the Map Relationships to Display only Host to Datastore  Click Apply Relationships

Step	Action
65.	The Map displays the Distributed volume as the same disk. <i>Hint: look at the storage view previously used. Notice the UID for the Virtual Volumes are the same at both clusters.</i>  The diagram illustrates a distributed storage architecture. At the top, a node with IP address 10.126.96.41 is connected to a central distributed volume icon labeled 'Distributed_Student1'. This volume is then connected to a second node at the bottom with IP address 10.126.96.21. The entire setup is enclosed in a rectangular frame.

End of Lab Exercise

Lab 3: Part 2 – Provisioning Distributed Storage with VIAS

Step	Action
	This Lab will demonstrate how to provision Distributed Storage ant both VPLEX Clusters using the VIAS method of provisioning.
1.	Open Unisphere for VPLEX on your assigned Cluster. Log in using the user/password from your student Lab Map.
2.	Navigate to Provision Storage> Select Provision from Pools.
3.	The Wizard should launch. Select Next

Step	Action
4.	Enter a Consistency Group Name. Use your student number followed by _distributed. Select Distributed Select Consistency Group: Create a consistency group Consistency Group Name: * student1_distributed Consistency Group Type : * ☐ Local Local consistency groups will be synchronous and visible only to the local cluster unless you select the Global visibility checkbox. You can add local or global virtual volumes. Cluster : Select a Cluster... ▼ ☒ Distributed Distributed consistency groups will be synchronous and visible to all clusters. You can add only distributed virtual volumes. Detach Rule : * Winner:cluster-1 (5 seconds) ▼ In the event of a cluster or partition failure that lasts more than 5 seconds, this rule-set will result in I/O continuing on cluster 'cluster-1' only. I/O will be suspended at all other clusters. If VPLEX Witness is deployed and 'cluster-1' fails, the Witness will override this setting for synchronous consistency groups and continue I/O on the active cluster. Change the Detach Rule to Winner (your assigned cluster) Verify the Dark Circle is around both Clusters. Consistency Group: student1_distributed  The diagram illustrates a distributed consistency group setup. Two clusters, labeled 'cluster-2' and 'cluster-1', are shown. Each cluster contains a server icon and a stack of disks. A double-headed arrow labeled 'Distributed' connects the two clusters, indicating that the consistency group is visible to both. The clusters are enclosed in light purple ovals.

Step	Action
5.	Click Next
6.	Change the Number of Volumes to 1 Make the size your assigned size (see Lab Map) Add Student_<student number> to the Volume Base Name. Protection Options: Select high availability options and configure volumes. High Availability: ☐ Enable Mirroring at cluster-2 ☐ Enable Mirroring at cluster-1 Mirroring across clusters is already enabled. Number Of Volumes: * 1 Capacity Per Volume: * 2 GB v Total Capacity: 2 GB Volume Base Name: * Student_1 Click Next

Step	Action																												
7.	Select the Array for Cluster-2 Select a Storage Pool Storage Pools: Select a storage pool at cluster 'cluster-2'. EMC-CLARiiON-APM00143419266 Available Storage Pools <table><thead><tr><th>Pools</th><th>Type</th><th>Free</th><th>Total</th></tr></thead><tbody><tr><td>Concrete storage pool 0000 ..</td><td>Thick</td><td>660.00 GB</td><td></td></tr><tr><td>Pool 0</td><td>Thick/Thin</td><td>11.60 TB</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></tbody></table> Pool 0 Click Next	Pools	Type	Free	Total	Concrete storage pool 0000 ..	Thick	660.00 GB		Pool 0	Thick/Thin	11.60 TB																	
Pools	Type	Free	Total																										
Concrete storage pool 0000 ..	Thick	660.00 GB																											
Pool 0	Thick/Thin	11.60 TB																											
8.	Select the Array for Cluster-1 Select a Storage Pool Storage Pools: Select a storage pool at cluster 'cluster-1'. EMC-SYMMETRIX-195901096 Available Storage Pools <table><thead><tr><th>Pools</th><th>Type</th><th>Free</th><th>Total</th></tr></thead><tbody><tr><td>Test</td><td>Thin</td><td>101.00 GB</td><td></td></tr><tr><td>diskgroup1</td><td>Thin</td><td>1.19 TB</td><td></td></tr><tr><td>diskgroup2</td><td>Thin</td><td>130.00 GB</td><td></td></tr><tr><td>diskgroup3</td><td>Thin</td><td>33.40 GB</td><td></td></tr><tr><td>diskgroup4</td><td>Thin</td><td>172.00 GB</td><td></td></tr></tbody></table> Click Next	Pools	Type	Free	Total	Test	Thin	101.00 GB		diskgroup1	Thin	1.19 TB		diskgroup2	Thin	130.00 GB		diskgroup3	Thin	33.40 GB		diskgroup4	Thin	172.00 GB					
Pools	Type	Free	Total																										
Test	Thin	101.00 GB																											
diskgroup1	Thin	1.19 TB																											
diskgroup2	Thin	130.00 GB																											
diskgroup3	Thin	33.40 GB																											
diskgroup4	Thin	172.00 GB																											

Step	Action
9.	View the Warning for VNX Arrays Storage Pools: Specify provisioning type. You selected at least one VNX pool that supports creating both thick and thin LUNs. By default, VIAS will create thick LUNs from pools on VNX arrays that have thick/thin capabilities. Select the check box below if you would like VIAS to attempt to provision thin LUNs from the pools which support both thick and thin provisioning. If you select this check box, and any of the VNX-based legs do not support thin provisioning, VIAS will create a thick LUN. ☒ Attempt provisioning of thin LUNs Check the Box Attempt provisioning of thin LUNs Click Next
10.	Select None for Storage Views for both Clusters. Expose To Hosts: Expose storage to hosts through storage views. Storage View at cluster-2 * ☐ Existing Storage View: ☒ None Storage View at cluster-1 * ☐ Existing Storage View: student-1 ☒ None Click Next

Step	Action
11.	Click Provision Storage The Job should run, or it will be queued if other jobs are running. Results: View the results of the provisioning request. Click Provision More to provision more storage, or click Done to close the wizard. ✔ Consistency group student1_distributed created ✔ Set detach rule ✔ Virtual volumes provisioning job started Provisioning job 'Provision_1_14-06-15-21-12-20' has been started. View the job status in the Monitoring > Provision Jobs section. View Job Status
12.	Click the View Job Status link to check the progress

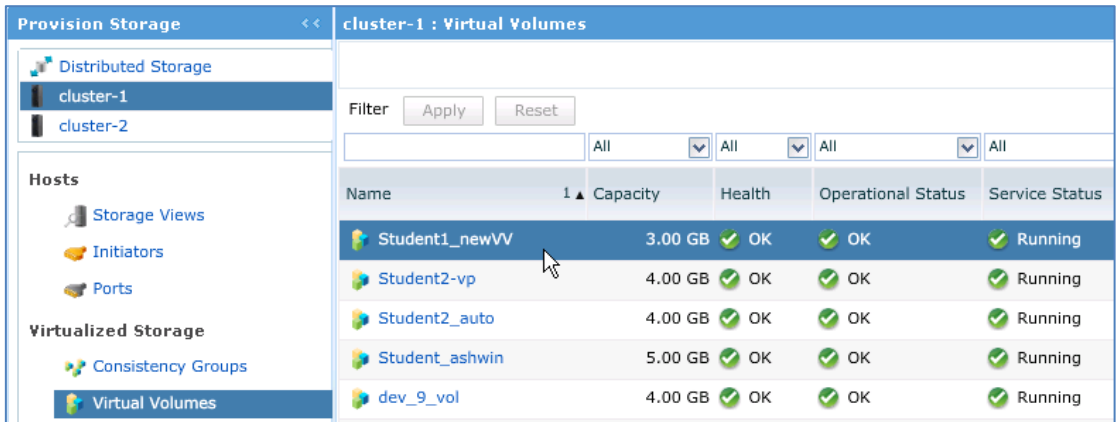
End of Lab Exercise

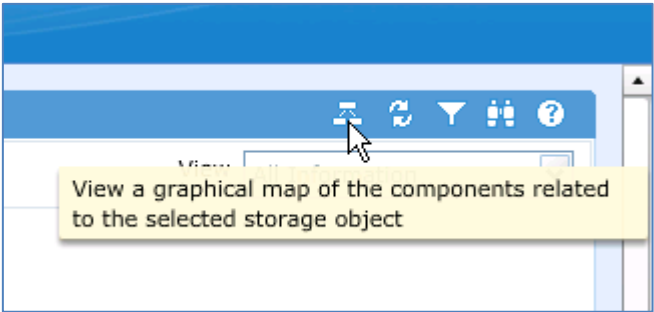
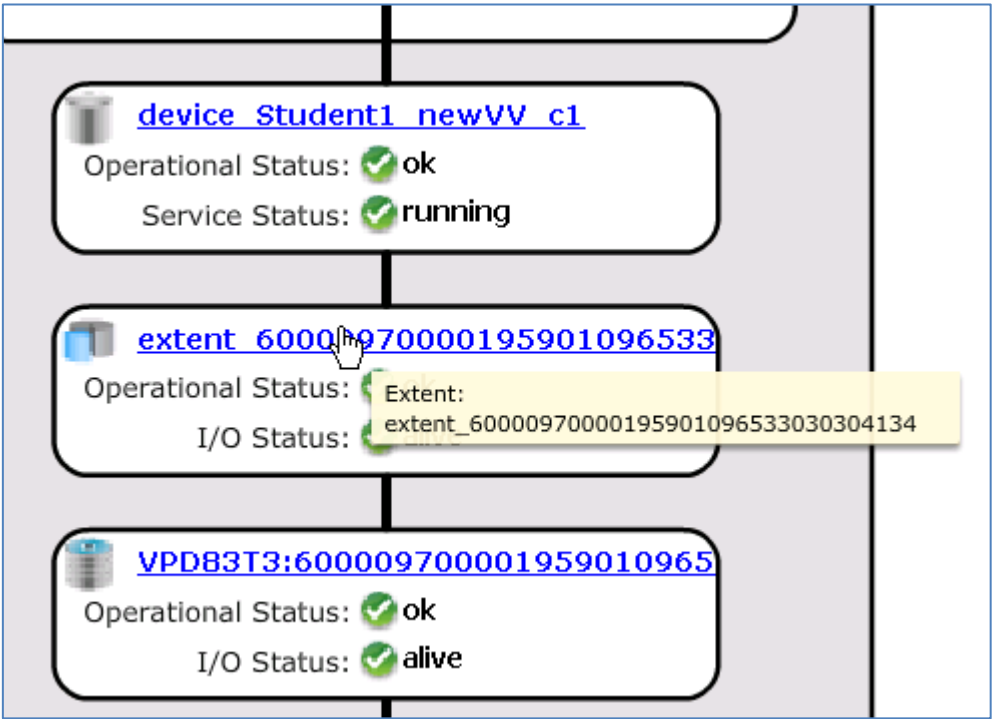
This page intentionally left blank.

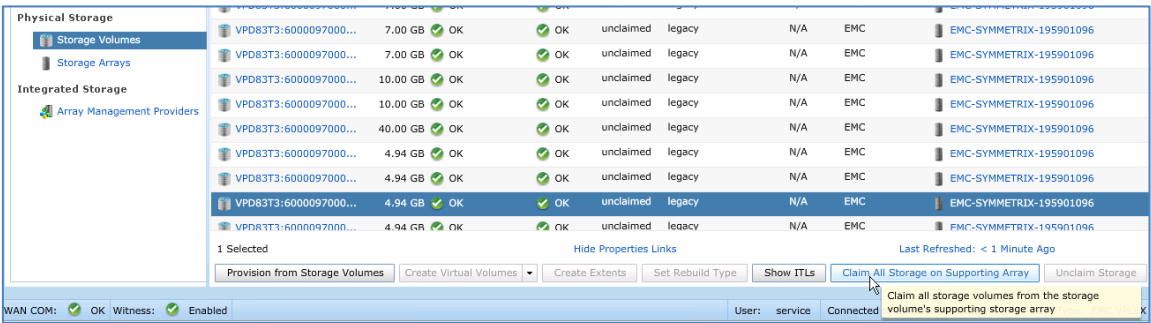
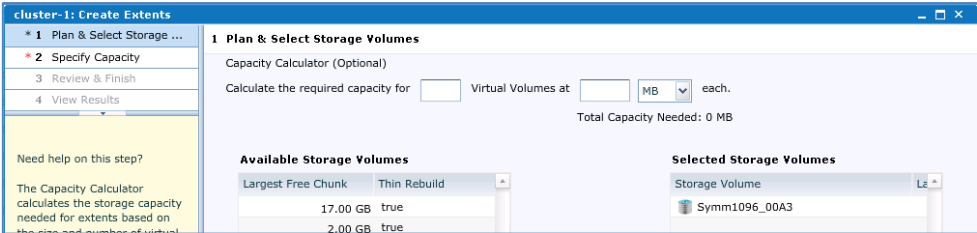
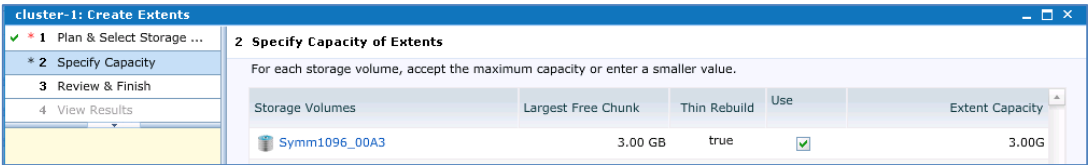
Lab Exercise 4: Mobility with VPLEX

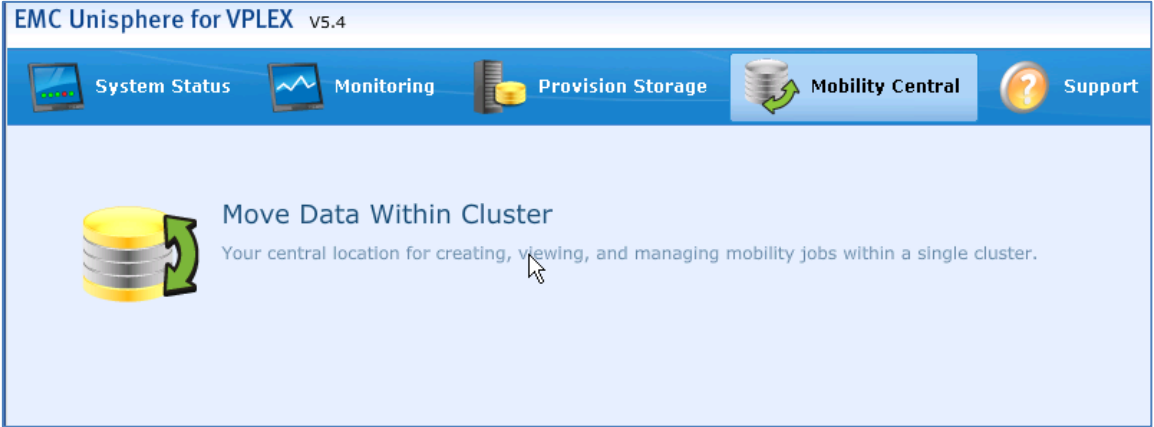
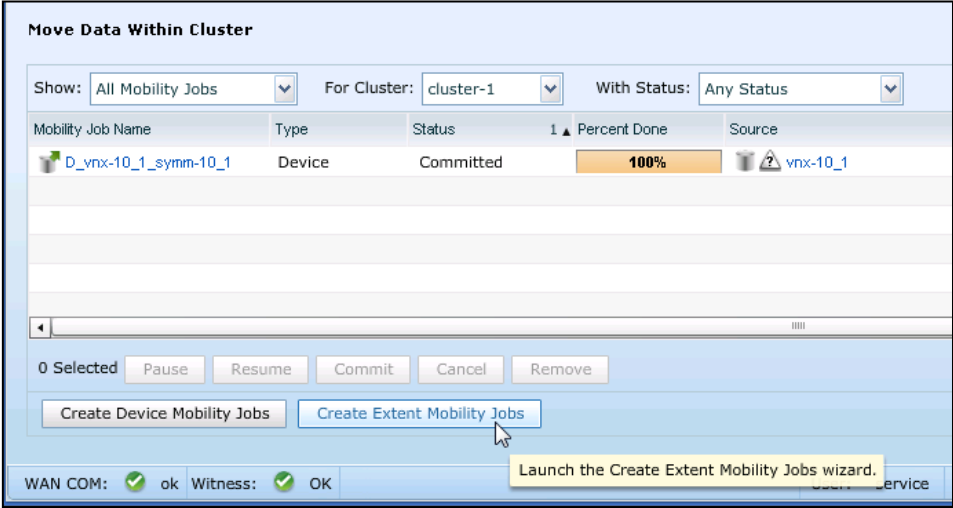
Purpose:	To create Data Mobility jobs using the CLI and GUI. To determine the differences between the functions in the CLI versus the GUI Mobility operations. You will create mobility jobs in the CLI and GUI. You will perform batch mobility and monitor the rebuild status.
Tasks:	• Perform extent Mobility • Perform Device Mobility • Perform Batch Mobility
References:	EMC VPLEX CLI and Administration Guides

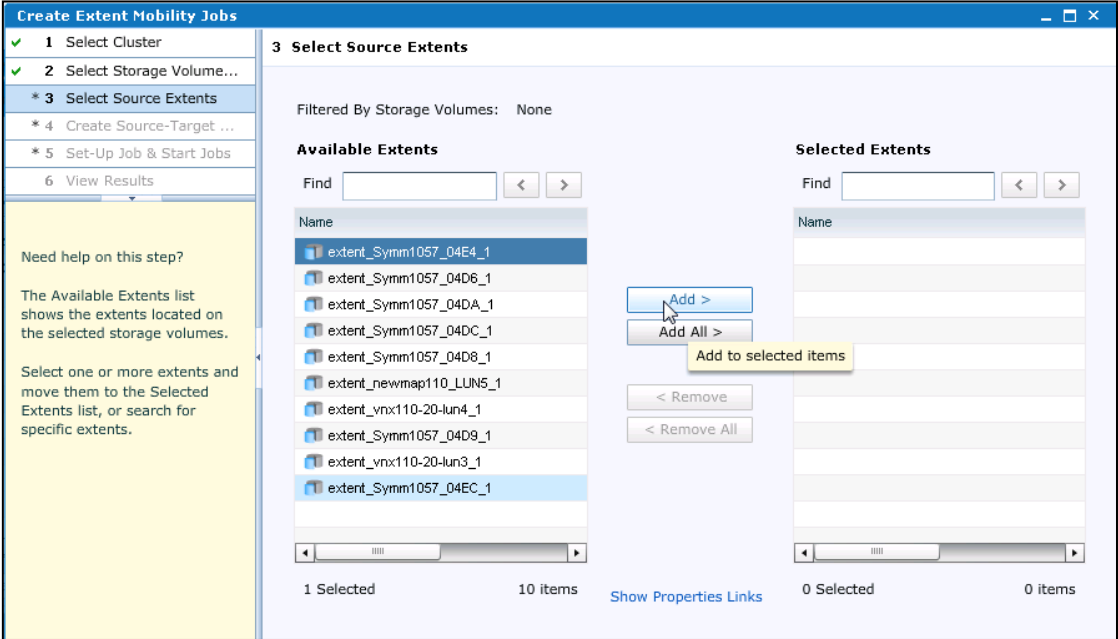
Lab 4: Part 1-Extent Mobility

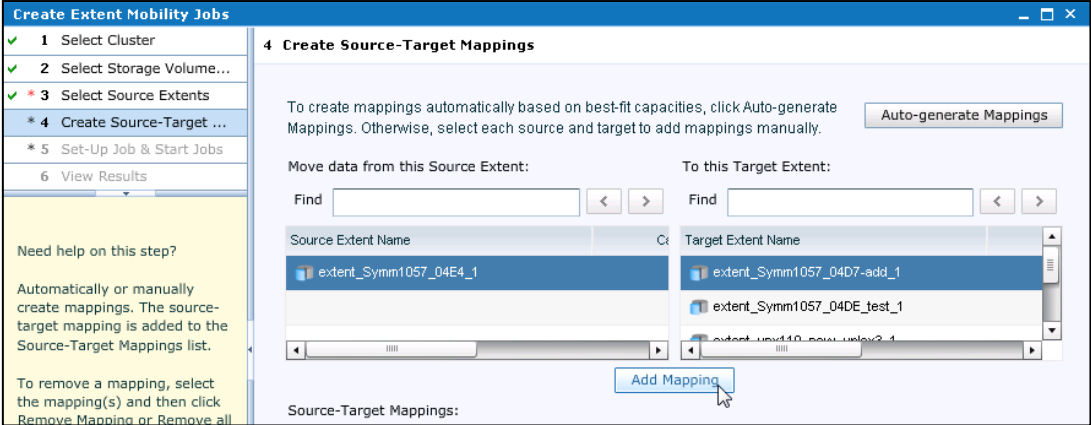
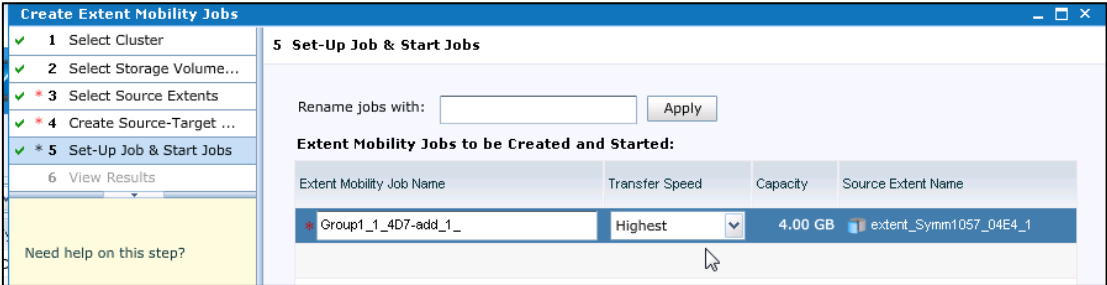
Step	Action
	This lab will cover the process for performing Extent Mobility.
1.	Log in to Unisphere for VPLEX
2.	Navigate to: Provision Storage>Assigned Cluster>Virtual Volumes
3.	Select one of your Local Virtual Volumes previously created. Make sure it's status is "running"  This Virtual Volume is provisioned to a Host. This Lab will move the Extent from one Storage Volume to another, without disruption.

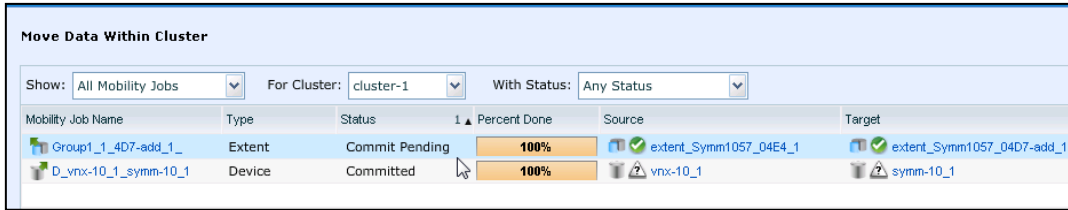
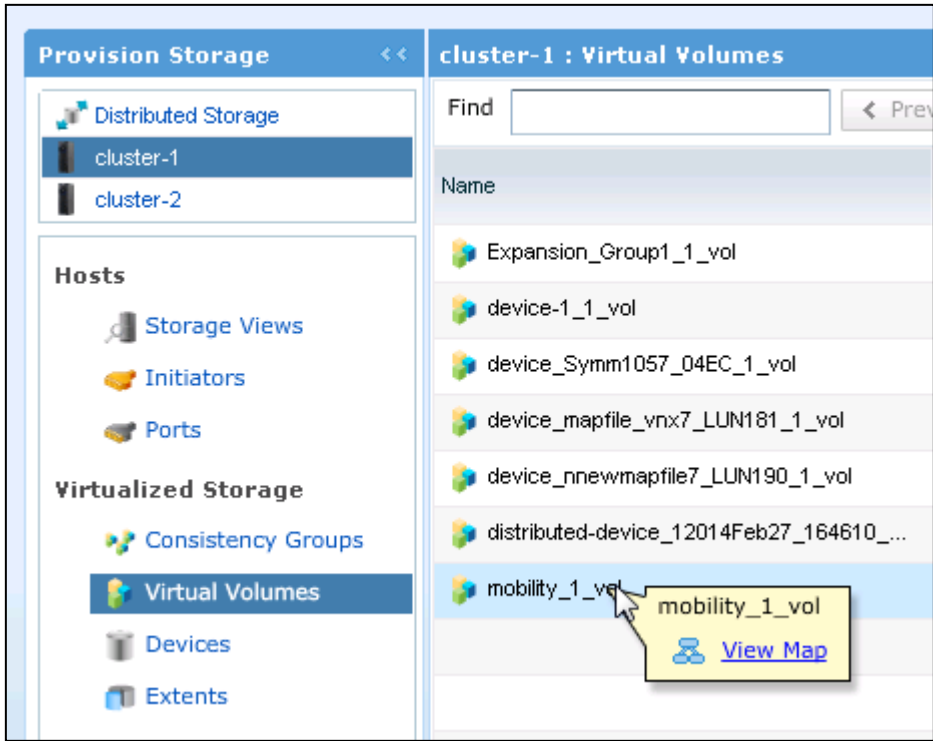
Step	Action
4.	Click on the Map Icon in the right corner. 
5.	A Map of the all the VPlex objects are displayed. Record the name of the Extent. _____  This will be the Source for our Migration. The name can also be discovered from the CLI using the “show-use-hierarchy -t” command.

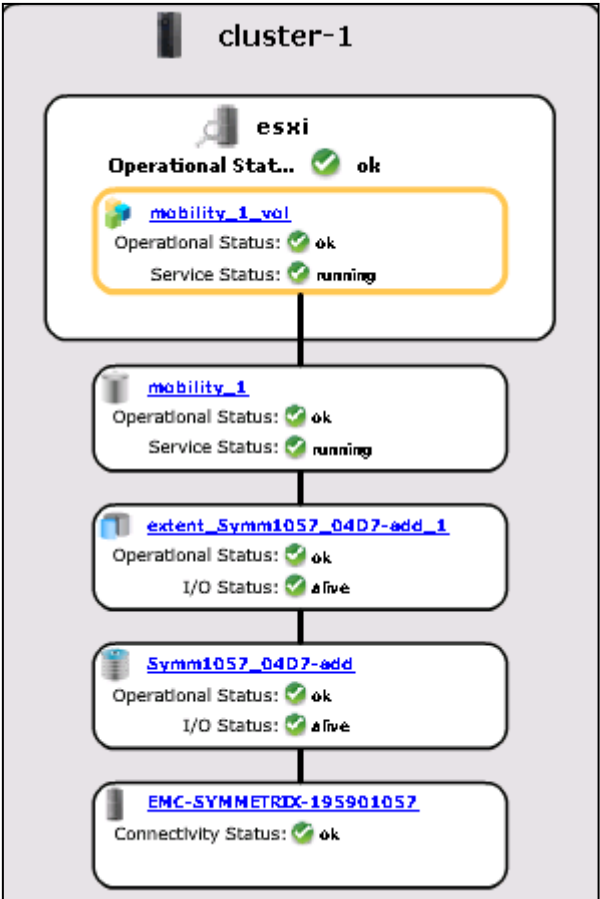
Step	Action
6.	Claim one of your assigned Storage Volumes See Lab Map. (see previous lab for steps if required)  The screenshot shows the Veeam Storage Volumes interface. On the left, there is a navigation pane with 'Storage Volumes' selected. The main area displays a table of storage volumes. The table has columns for Name, Size, Status, Health, Type, Format, RAID, and Array. One volume is selected. At the bottom, there are buttons for 'Provision from Storage Volumes', 'Create Virtual Volumes', 'Create Extents', 'Set Rebuild Type', 'Show ITLs', 'Claim All Storage on Supporting Array' (highlighted), and 'Unclaim Storage'. A tooltip for the 'Claim All Storage on Supporting Array' button reads: 'Claim all storage volumes from the storage volume's supporting storage array'.
7.	Create a new Extent. Use the Storage Volume just claimed. Select Extents, then Click Create  The screenshot shows the 'cluster-1: Create Extents' dialog box. The 'Plan & Select Storage Volumes' step is active. It includes a 'Capacity Calculator (Optional)' section with fields for 'Calculate the required capacity for' and 'Virtual Volumes at'. Below this, there are sections for 'Available Storage Volumes' and 'Selected Storage Volumes'. The 'Selected Storage Volumes' section shows 'Symm1096_00A3' selected. Click Next
8.	Select the entire Storage Volume to create the Extent.  The screenshot shows the 'cluster-1: Create Extents' dialog box. The 'Specify Capacity of Extents' step is active. It includes a table with columns for 'Storage Volumes', 'Largest Free Chunk', 'Thin Rebuild', 'Use', and 'Extent Capacity'. The row for 'Symm1096_00A3' shows '3.00 GB' for 'Largest Free Chunk', 'true' for 'Thin Rebuild', a checked box for 'Use', and '3.00G' for 'Extent Capacity'. Click Finish then Commit Verify there is an Extent of your assigned size

Step	Action
9.	Navigate to Mobility Central>Move Data Within the Cluster 
10.	Click Create Extent Mobility Jobs 
11.	Select your assigned Cluster and Click Next
12.	Skip the optional step 2 Click Next

Step	Action
13.	Select the Source Extent Use the extent that was recorded in the previous steps.  Click Next

Step	Action
14.	Chose the empty extent that was created in step 7 for the target. Highlight both and Click Add Mapping  Click Next
15.	Edit the Job name with your Student number. Use Highest Transfer speed  Click Start Click Close

Step	Action
16.	Monitor the Mobility Job until the status changes to Commit Pending.  Click Commit Click Ok Click Close
17.	Navigate back to Provision Storage>Cluster-x>Virtual Volumes. Select the Virtual Volume that was used in the previous steps. Highlight the volume to view the map 

Step	Action
18.	Review the Map and notice the extent has changed.  <pre> graph TD subgraph cluster-1 esxi[esxi] --> mobility_1_vol[mobility_1_vol] mobility_1_vol --> mobility_1[mobility_1] mobility_1 --> extent[extent_Symm1057_04D7-add_1] extent --> symm[Symm1057_04D7-add] symm --> emc[EMC-SYMMETRDX-195901057] end </pre> The diagram illustrates the configuration of a storage cluster named 'cluster-1'. It shows a hierarchical structure of components and their operational states: esxi: Operational Status: ✔ ok mobility_1_vol: Operational Status: ✔ ok, Service Status: ✔ running mobility_1: Operational Status: ✔ ok, Service Status: ✔ running extent_Symm1057_04D7-add_1: Operational Status: ✔ ok, I/O Status: ✔ alive Symm1057_04D7-add: Operational Status: ✔ ok, I/O Status: ✔ alive EMC-SYMMETRDX-195901057: Connectivity Status: ✔ ok

End of Lab Exercise

Lab 4: Part 2 – Device Mobility

Step	Action
	This Lab will perform Device Mobility across clusters.
1.	Log in to Unisphere for VPLEX
2.	Navigate to: Provision Storage>Assigned Cluster>Virtual Volumes
3.	Select one of your local Virtual Volumes previously created. Make sure it’s status is “running”

Provision Storage

Distributed Storage

cluster-1

cluster-2

Hosts

Storage Views

Initiators

Ports

Virtualized Storage

Consistency Groups

Virtual Volumes

cluster-1 : Virtual Volumes

Filter

Apply

Reset

All

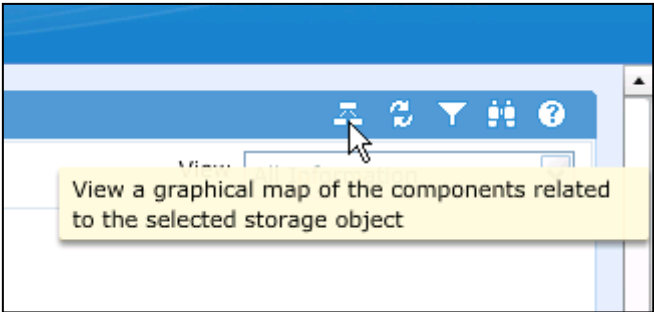
All

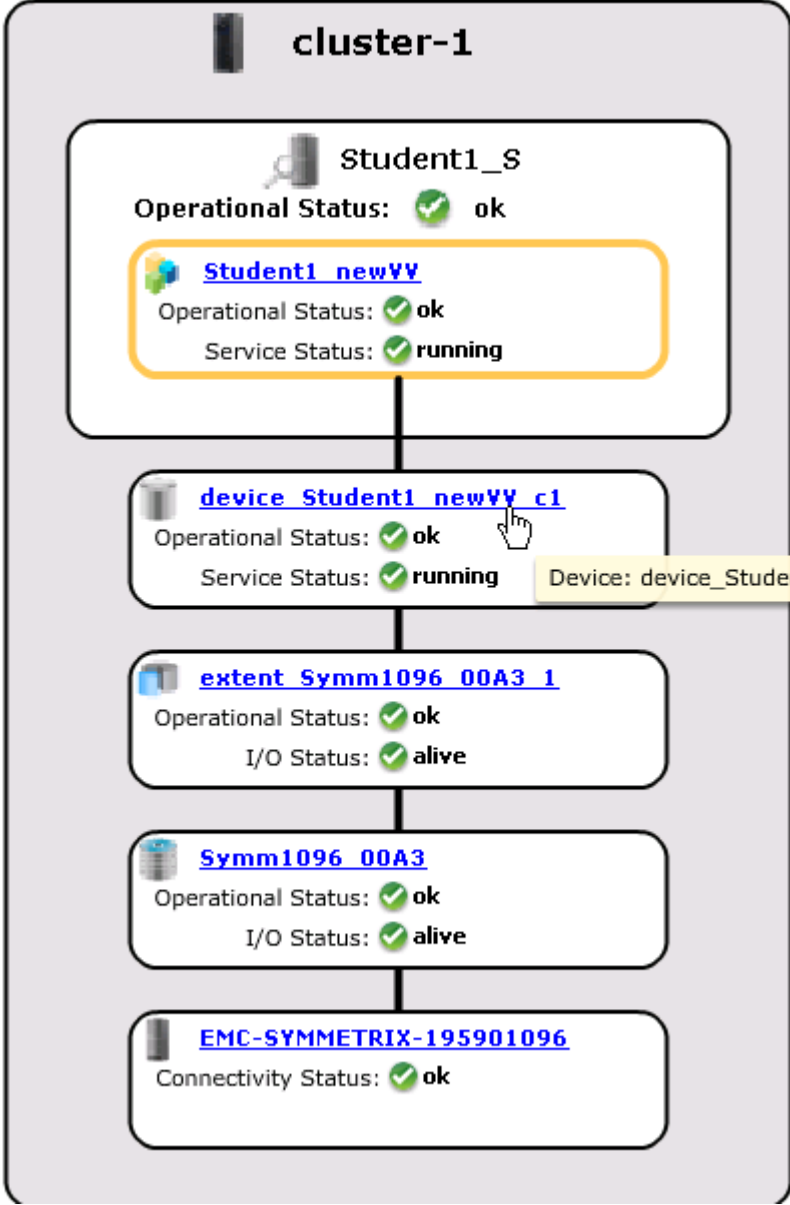
All

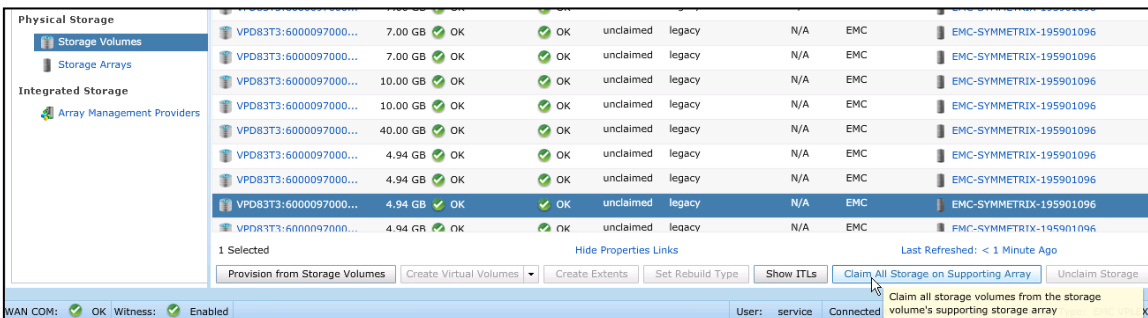
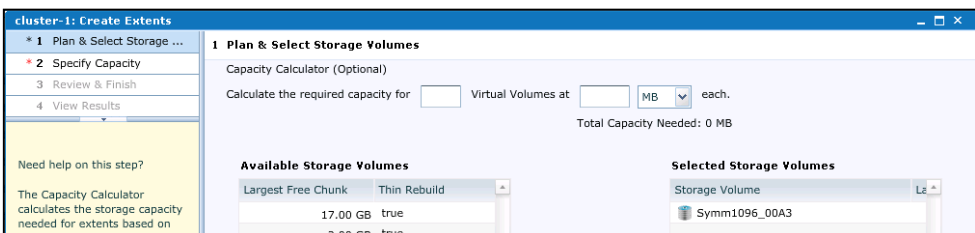
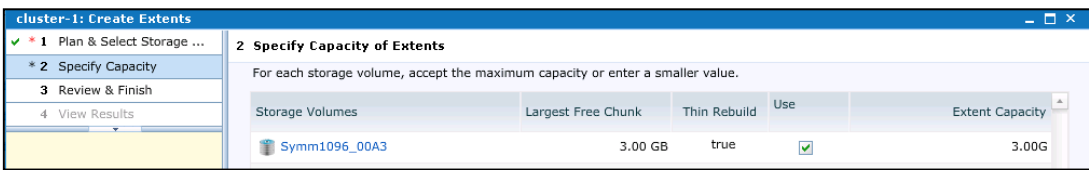
All

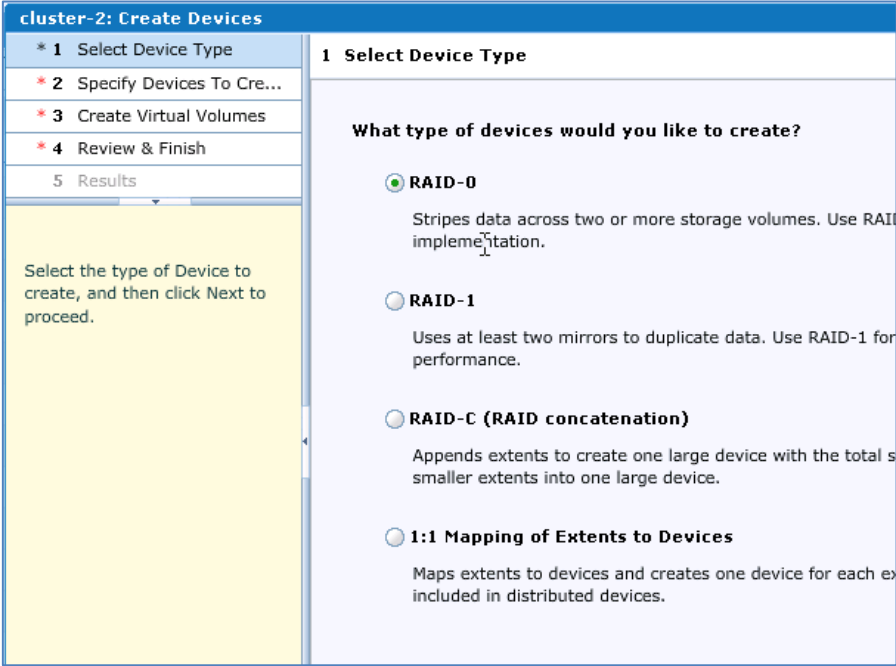
Name	Capacity	Health	Operational Status	Service Status
Student1_newVV	3.00 GB	OK	OK	Running
Student2-vp	4.00 GB	OK	OK	Running
Student2_auto	4.00 GB	OK	OK	Running
Student_ashwin	5.00 GB	OK	OK	Running
dev_9_vol	4.00 GB	OK	OK	Running

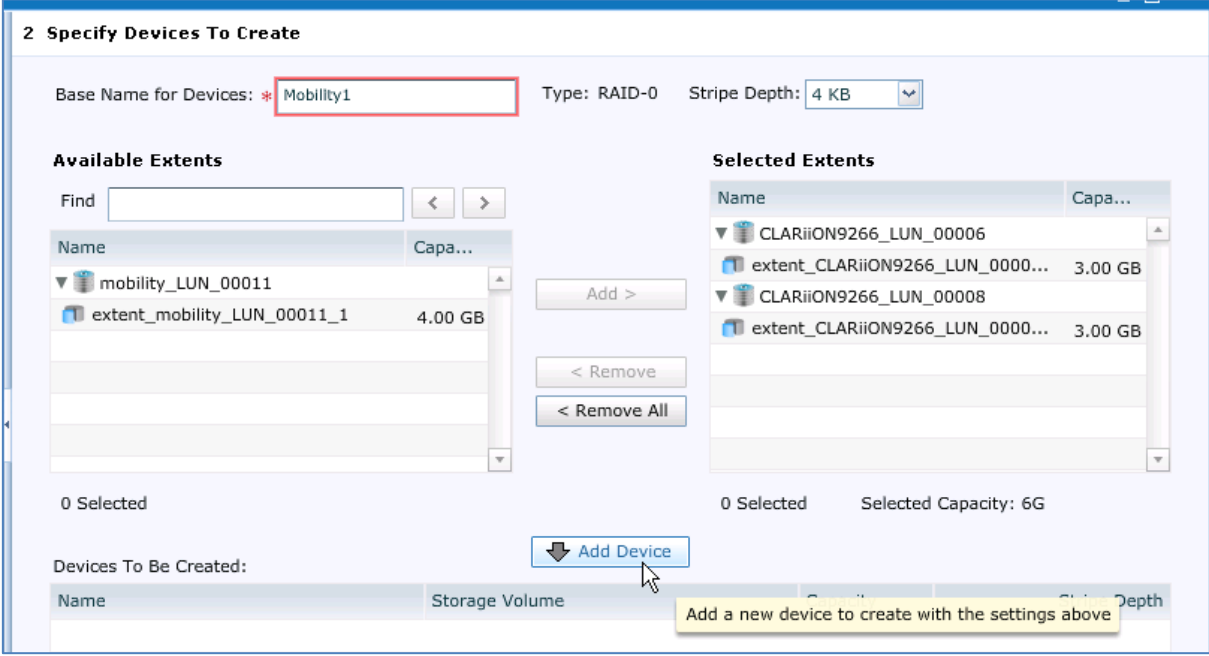
This Virtual Volume is provisioned to a Host. This Lab will move the Device without disruption.

Step	Action
4.	Click on the Map Icon in the right corner. 

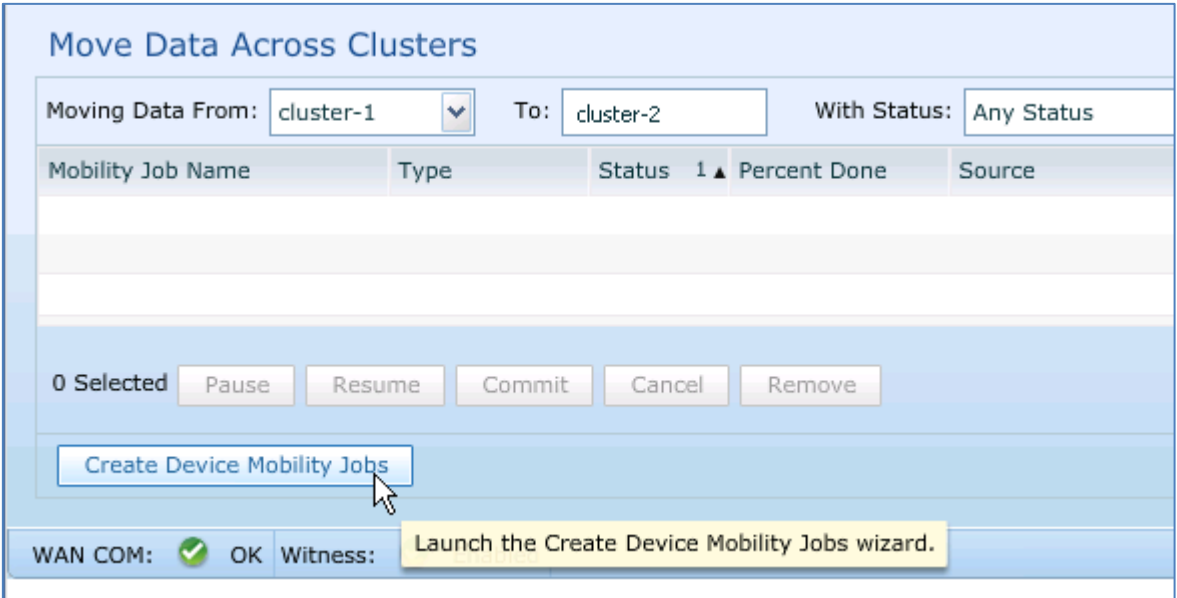
Step	Action
5.	A Map of the all the VPLEX objects are displayed.  <pre> graph TD cluster1[cluster-1] --> Student1_S[Student1_S Operational Status: ok] Student1_S --> Student1_newVV[Student1_newVV Operational Status: ok Service Status: running] Student1_newVV --> device_Student1_newVV_c1[device Student1_newVV_c1 Operational Status: ok Service Status: running] device_Student1_newVV_c1 --> extent_Symm1096_00A3_1[extent Symm1096_00A3_1 Operational Status: ok I/O Status: alive] extent_Symm1096_00A3_1 --> Symm1096_00A3[Symm1096_00A3 Operational Status: ok I/O Status: alive] Symm1096_00A3 --> EMC_SYMMETRIX_195901096[EMC-SYMMETRIX-195901096 Connectivity Status: ok] </pre>
6.	Record the Device Name
7.	Navigate to: Provision Storage>opposite Cluster>Storage Volumes Example: If you assigned Cluster is 1 then navigate to 2

Step	Action
8.	Claim two of your assigned Storage Volumes See Lab Map. (see previous lab for steps if required) 
9.	Create 2 new Extents. Use the Storage Volumes just claimed. Select Extents, then Click Create  Click Next
10.	Select the entire Storage Volume to create each Extent.  Click Finish then Commit Verify there are 2 Extents of your assigned size

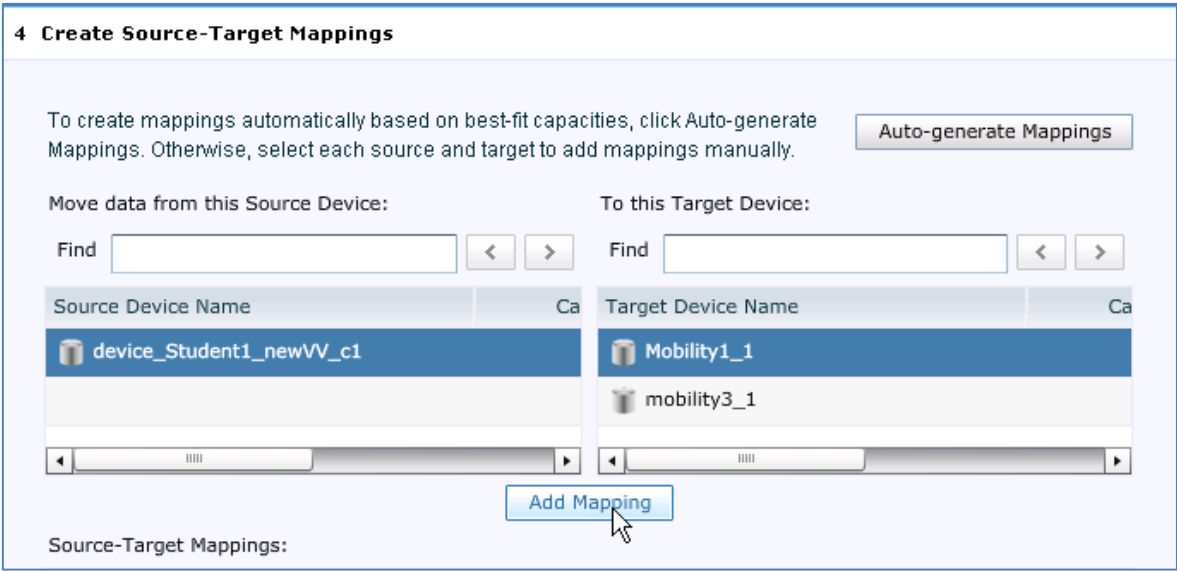
Step	Action
11.	Next we will use those 2 Extents to create a Raid-0 Device. The end result will be that the device size will be twice your assigned size. Navigate to Devices and Select Create The Wizard should launch.
12.	Select Raid-0  Click Next

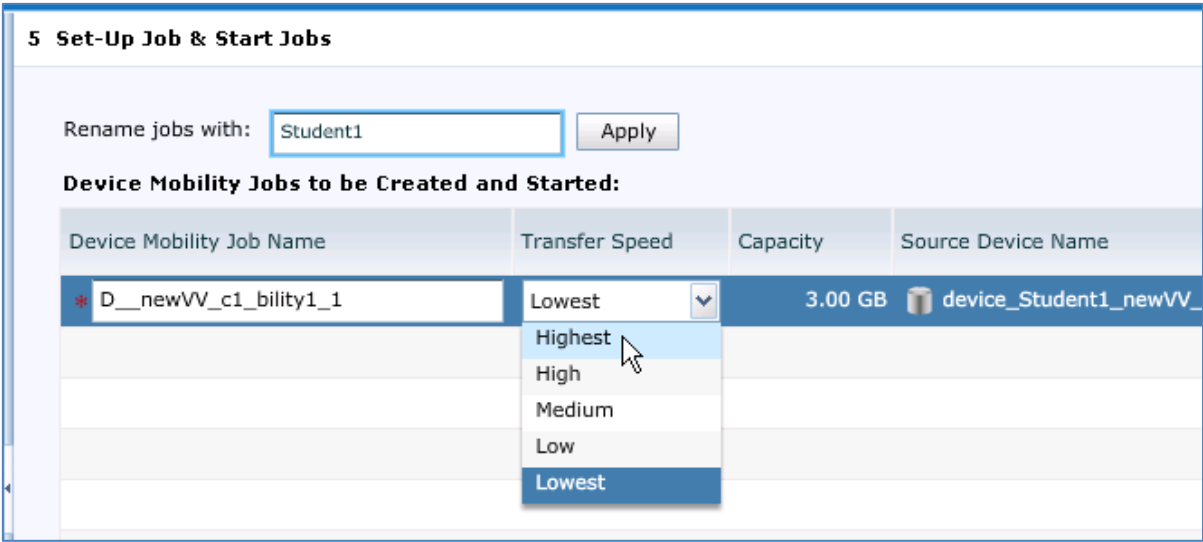
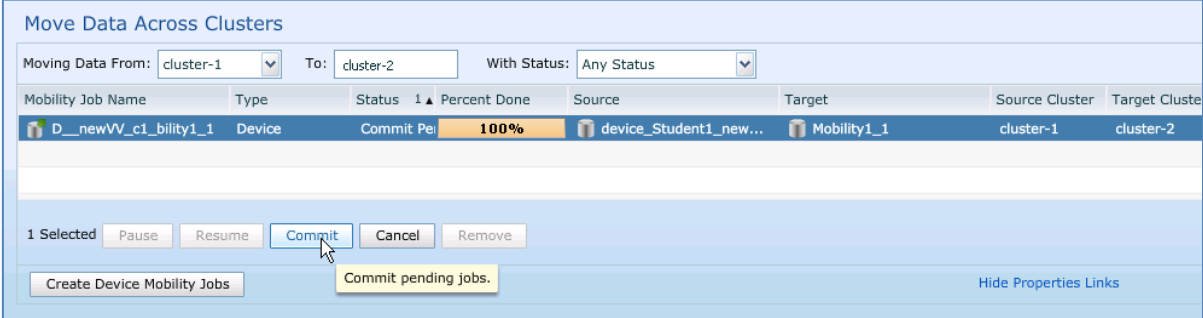
Step	Action
13.	Enter Mobility followed by your student number for Base name. Select your 2 Extents and click Add. (be sure to verify the size)  Click Add Device Click Next
14.	Answer no to “Automatically create a virtual volume on each device” Click Next

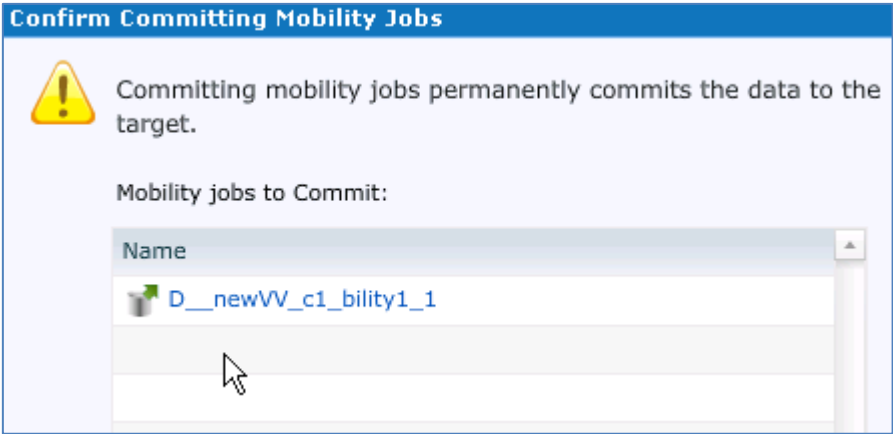
Step	Action																								
15.	Review and Finish 4 Review & Finish Base Name for Devices: * Mobility1 Apply <table><thead><tr><th>Name</th><th>Type</th><th>Stripe</th><th>Storage Volumes</th><th>Capacity</th><th>Virtual Volume?</th></tr></thead><tbody><tr><td>▼ Mobility1_1</td><td>raid-0</td><td>4 KB</td><td></td><td>6.00 GB</td><td>No</td></tr><tr><td> extent_CLARiiON9266_LUN_00006_1</td><td></td><td></td><td>CLARiiON9266_LUN_00006</td><td>3.00 GB</td><td></td></tr><tr><td> extent_CLARiiON9266_LUN_00008_1</td><td></td><td></td><td>CLARiiON9266_LUN_00008</td><td>3.00 GB</td><td></td></tr></tbody></table> Click Commit There should now be a new Device (2x the assigned size)	Name	Type	Stripe	Storage Volumes	Capacity	Virtual Volume?	▼ Mobility1_1	raid-0	4 KB		6.00 GB	No	extent_CLARiiON9266_LUN_00006_1			CLARiiON9266_LUN_00006	3.00 GB		extent_CLARiiON9266_LUN_00008_1			CLARiiON9266_LUN_00008	3.00 GB	
Name	Type	Stripe	Storage Volumes	Capacity	Virtual Volume?																				
▼ Mobility1_1	raid-0	4 KB		6.00 GB	No																				
extent_CLARiiON9266_LUN_00006_1			CLARiiON9266_LUN_00006	3.00 GB																					
extent_CLARiiON9266_LUN_00008_1			CLARiiON9266_LUN_00008	3.00 GB																					
16.	Select Mobility Central> Move Data Across Clusters.  Mobility Central  Support mobility jobs within a single cluster.  Move Data Across Clusters Your central location for creating, viewing, another. 																								

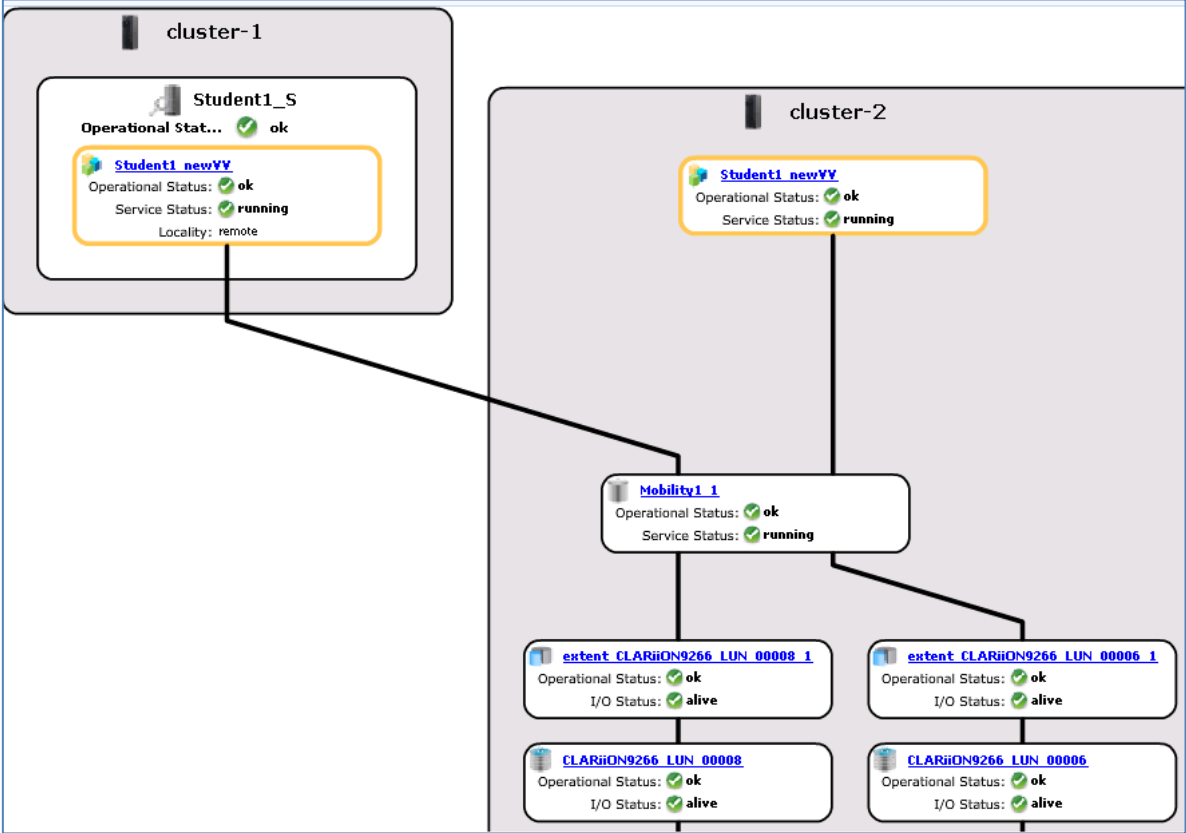
Step	Action
17.	Select Create Device Mobility Jobs (bottom of the display) 
18.	Select your assigned Cluster in the “From” box  Click Next
19.	Click Next in the Select Virtual Volumes Window

Step	Action
20.	Select the Device recorded in Step 6 and click Add 3 Select Source Devices Filtered By Virtual Volumes: None Available Devices Find < > Name device_Nav-Cluster1-6gb_2 device_Nav-Cluster1-6gb_1 device_Student2_Symm1096_00A6_ device_Symm1096_00A9_1 device_Symm1096_00AC_Student_.. device_encap_1 Add > Add All > < Remove < Remove All Selected Devices Find < > Name device_Student1_newVV_c1 Click Next

Step	Action
21.	Highlight the 2 devices and Click Add Mapping  There will be a warning displayed about the target being larger than the source. Click Yes The 2 Devices should be displayed at the bottom of the window. Click Next

Step	Action
22.	Rename the job with your Student number.  Change the Transfer Speed to Highest Click Start Click Close
23.	The job will be displayed, monitor the progress  When the percent done reaches 100% Click Commit. What steps will this cause?

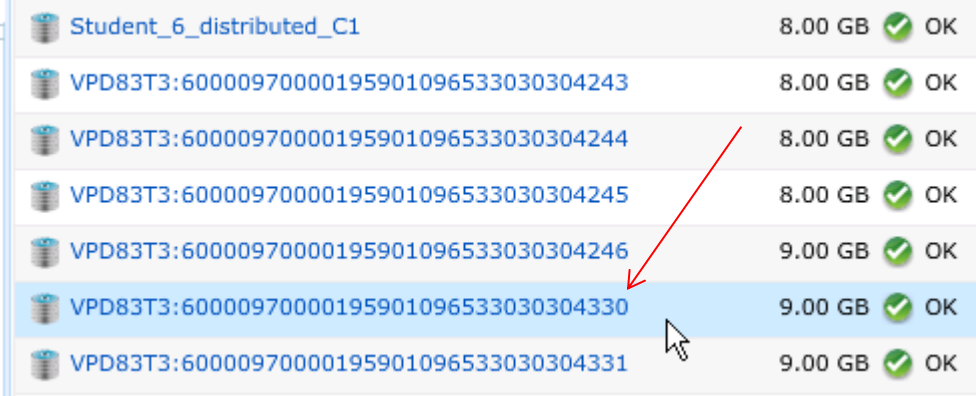
Step	Action
24.	Click Ok to confirm  <i>Notice the job will remain in the list until removed.</i>

Step	Action
25.	Return to Provision Storage>Cluster-x>Virtual Volumes Select the Virtual Volume from step 3 and display the map (icon in right corner)  Notice the Virtual Volume is running on Storage on the opposite Cluster. Also note there is a new Virtual Volume in that cluster. This could be placed in a Storage View at that cluster also.
26.	Optional step: If time allows move the device back to the original Cluster.

End of Lab Exercise

Lab 4: Part 3 – Batch Mobility

Step	Action
	This lab will cover how to perform batch mobility jobs. It will demonstrate this using the device mobility feature within a single cluster. We will only use 2 Devices for demonstration, but VPLEX allows for many more.
1.	Log into vplexcli for your assigned cluster
2.	Navigate to the Storage Volume context for your assigned cluster <pre>Vplexcli:/> cd clusters/cluster-1/storage-elements/storage-volumes/</pre> List the Storage Volumes <pre>Vplexcli:/clusters/cluster-1/storage-elements/storage-volumes ll</pre>
3.	Find 2 unclaimed Storage Volume of your assigned size Next we will use the <code>storage-tool compose</code> command to create a virtual volume on each of these Storage Volumes. Use the following command to create a Virtual Volume. Use your student number in the Virtual Volume name as per example. <pre>Vplexcli:/clusters/cluster-1/storage-elements/storage-volumes> storage-tool compose --name student3_vv_mobility -g raid-0 -d VPD83T3:60000970000195901096533030304331</pre> Successfully created virtual-volume 'student3_vv_mobility' For this lab we will not place the Virtual Volume in a Storage View. Take note of the name as this will be needed later.

Step	Action
4.	Repeat the above command to create another Virtual Volume. Hint: use an different name Keep the vplexcli session open Take note of the name as this will be needed later.
5.	Log in to Unisphere for VPLEX to your assigned Cluster.
6.	Navigate to Provision Storage>Assigned Cluster>Storage Volumes We will create 2 devices of your assigned size for use with Batched mobility
7.	From this screen note the Name of 2 of your Assigned Storage Volumes.  Select Claim All Storage on Supporting Array
8.	Select the Array and Click Next
9.	Select Use Thin Rebuilds and Click Next

Step	Action
10.	Select the 2 Storage Volumes previously identified and click Add. Click Next Click Commit Click Close
11.	Select the 2 Storage Volumes just Claimed and Click Create Extents
12.	They should appear in the Selected Storage Volumes window on the right. Click Next
13.	Leave the Use box checked and Click Finish Click Commit Click close
14.	Navigate to the Extents window Select the 2 Extents just created and Click create Devices.
15.	Select 1:1 Mapping of Extents to Devices Click Next Select your 2 Extents and click Add Click Next

Step	Action
16.	Answer No to create Virtual Volumes Click Next Click Commit 2 Devices will be created Click Close
17.	Navigate to Devices The 2 new Devices are displayed
18.	Log in to vplexcli for your assigned cluster. Next, create a batched mobility plan to move the data We will use the batch-migrate create plan CLI command to accomplish this
19.	.Next we will identify the 2 Source Devices and the 2 Target Devices Use the following command for your assigned cluster. Vplexcli:/> ll clusters/cluster-1/devices/ 2 will have Virtual Volumes on them created in Steps 3 and 4 2 will be your assigned size and will not have Virtual Volumes on them. These will be the Targets Record the names: Sources_____ Targets_____

Step	Action
20.	Next we will create a batch migration plan file. Change to the devices context for your assigned cluster. <pre>Vplexcli:/> cd clusters/cluster-1/devices</pre> Run the following command to create the plan file <pre>Vplexcli:/clusters/cluster-1/devices> batch-migrate create-plan student1_migrate.txt --sources device_student3_vv2_mobility_c1,device_student3_vv_mobility_c1 --targets device_Symm1096_00BF_1,device_Symm1096_00C0_1</pre> The result should have created the file and returned this message: <pre>Wrote file /var/log/Vplex/cli/student1_migrate.txt. Please review and edit this file, and run this command in the check- plan phase afterward.</pre>
21.	Next we will check the plan file using the <code>batch-migrate check-plan</code> command. <pre>Vplexcli:/clusters/cluster-1/devices> batch-migrate check-plan --file student1_migrate.txt</pre> A message will be displayed that the plan passed.

Step	Action
22.	Next we will start the migration. This command will start the transfer, but not commit the changes. The transfer size is specified. Transfer-size is the size of the region in cache that is used to service the migration. Transfer-size can be as small 40K, as large as 128 MB, and must be a multiple of 4K. The default value is 128 K. A larger transfer-size results in higher performance for the migration, but may negatively impact front-end I/O. A smaller transfer-size results in lower performance for migration, but creates less impact on front-end I/O and response times for hosts. <pre> VPlexcli:/clusters/cluster-1/devices> batch-migrate start --file student1_migrate.txt --transfer-size 128M Started device migration 'BR0_0'. Started device migration 'BR0_1'. Started 2 of 2 migrations.</pre>

Step	Action
23.	Next use the <code>summary</code> command to check progress. <pre>VPLexcli:/clusters/cluster-1/devices> batch-migrate summary --file student1_migrate.txt</pre> Processed 2 migrations from batch migration BR0: <pre> committed: 0 complete: 2 in-progress: 0 queued: 0 paused: 0 error: 0 cancelled: 0 no-record: 0 </pre> Run the command over until the status is complete. Remember that complete is not committed. Batch Mobility jobs can be also viewed in Unisphere.
24.	Next we will commit the jobs. <pre>VPLexcli:/clusters/cluster-1/devices> batch-migrate commit --file student1_migrate.txt</pre> Committed 2 of 2 migrations Use the summary command to check the status. The jobs will list as committed.

Step	Action
25.	We can view the devices to see that the source devices now will not have Virtual Volumes, but the targets will. <pre>VPLEXcli:/clusters/cluster-1/devices> ll</pre> Verify by using the source and target names recorded earlier.
26.	Next we will run the clean command. For device migrations, cleaning dismantles the source device down to its storage volumes. The storage volumes that are no longer in use are unclaimed. <pre>VPLEXcli:/clusters/cluster-1/devices> batch-migrate clean --file student1_migrate.txt</pre> Cleaned 2 of 2 migrations
27.	View the Devices for your assigned cluster. <pre>VPLEXcli:/clusters/cluster-1/devices> ll</pre> Notice the original source devices have been deleted.
28.	Next we will remove the records of the Mobility jobs. <pre>VPLEXcli:/clusters/cluster-1/devices> batch-migrate remove --file student1_migrate.txt</pre> Removed 2 of 2 migrations

End of Lab Exercise

Lab Exercise 5: System Monitoring

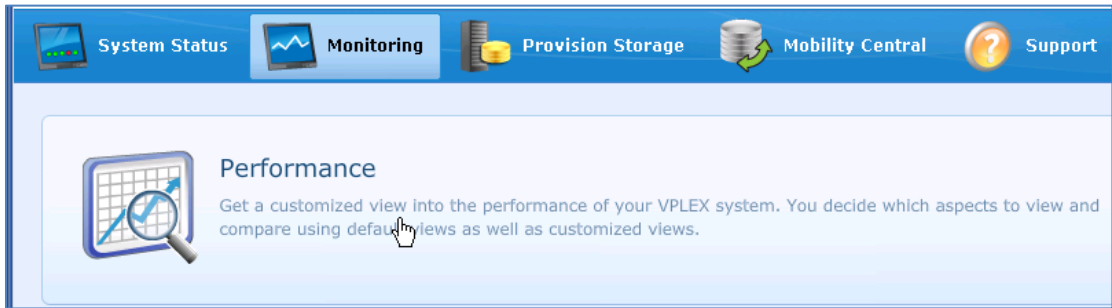
Purpose:	To use tools and features in VPLEX for monitoring the environment and performance.
Tasks:	• Use the CLI to check Cluster Health • View VPLEX Performance Monitors using Unisphere
References:	• Student Guide • EMC VPLEX CLI and Administration Guides

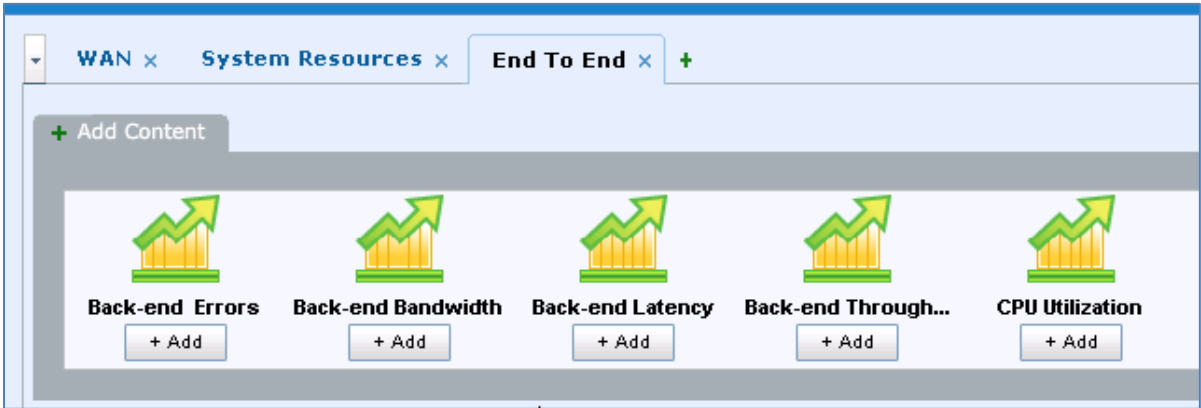
Lab 5: Part 1 System Monitoring

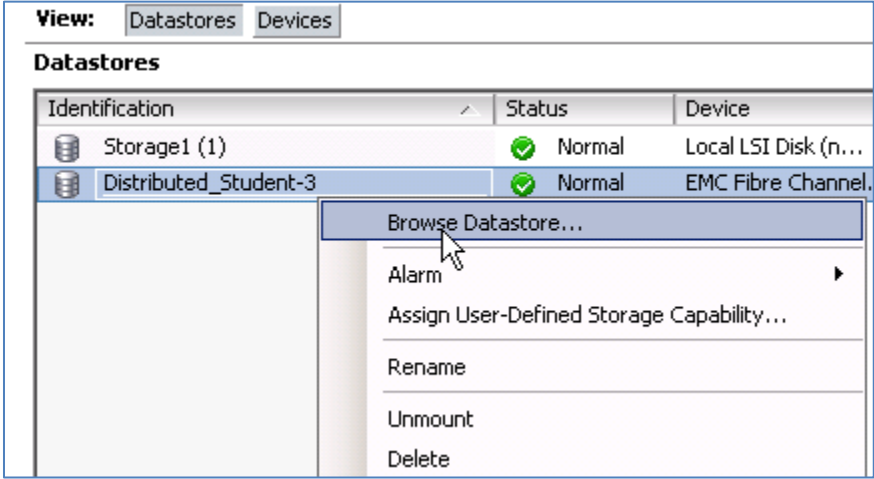
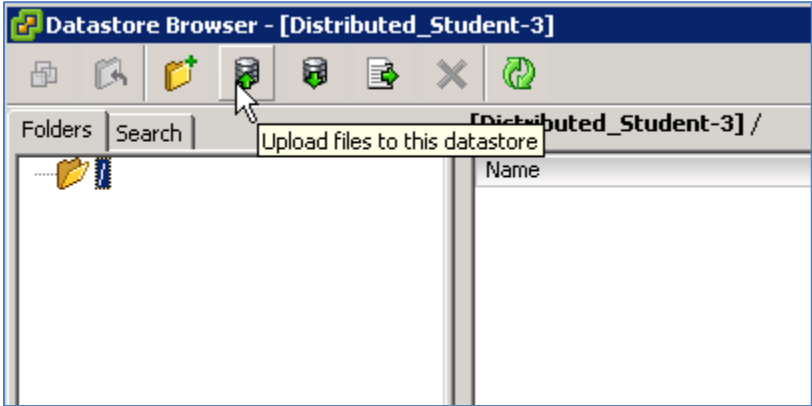
Step	Action
1.	Log in to the VPLEX using the VPLEXCLI
2.	Use the following commands to monitor the VPLEX environment. Use additional commands as you think would be helpful: health-check director uptime rebuild status ll /**/storage-views
3.	Use the drill-down command to follow the Virtual Volume assigned to an ESX host to its various entities. Document these here. Virtual Volume _____ Device _____ Extent _____ Storage Volume _____
4.	Use the proper commands to determine the health of each of these entities.
5.	Listed are some additional commands which can be used to monitor the health of VPLEX. Health of Virtual Volumes virtual-volume summary Health and state of FE ports export port summary Health state of storage views export storage-view summary Storage volumes attached to the BE by specific director connectivity director <director name> Ex: connectivity director director-2-1-A Shows which ports can communicate with each other. connectivity show
6.	Please use the above commands to verify the health of the VPLEX Cluster.

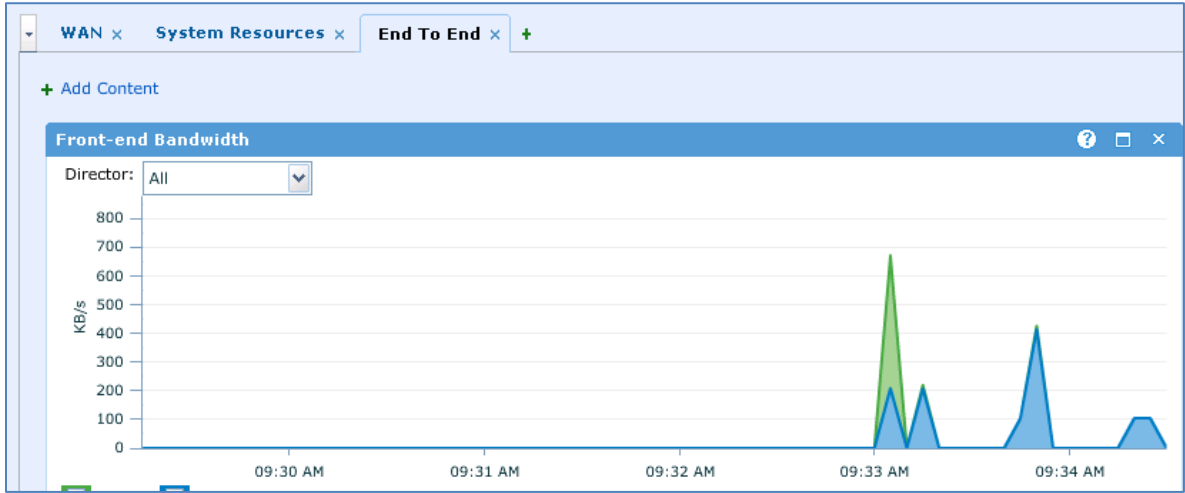
End of Lab Exercise

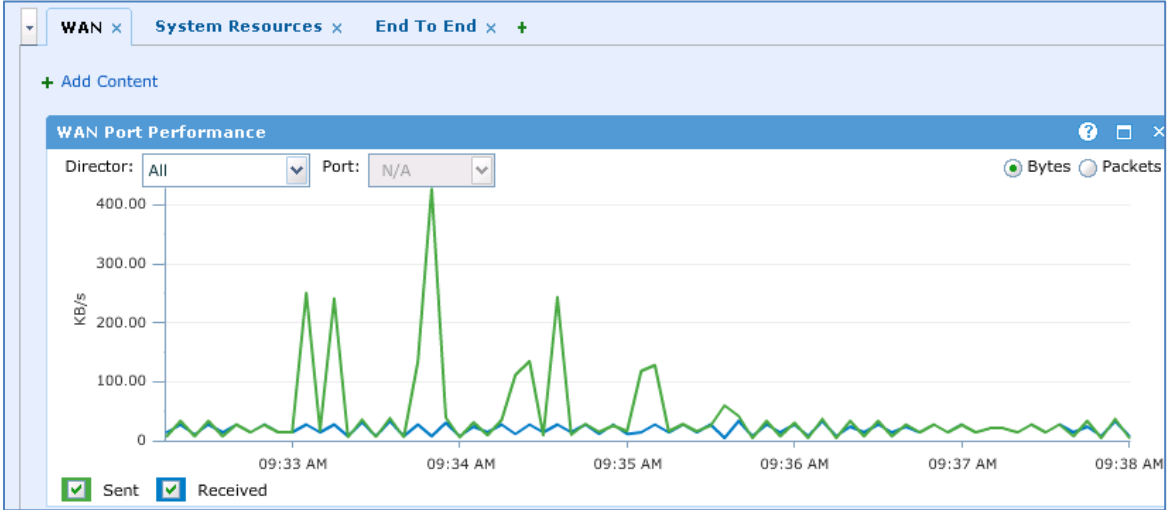
Lab 5: Part 2 – View Performance

Step	Action
	This Lab will display the performance monitoring capabilities of Unisphere for VPLEX.
1.	Log into Unisphere for VPLEX. Use your assigned Cluster.
2.	Navigate to Monitoring. Click the Performance Icon. 
3.	Change tabs to End to End View the display of real time performance statistics.

Step	Action
4.	Click the Add Content link  View the different options for configuring the performance charts..
5.	Next we will generate I/O to see the different categories display data. Open V Center Client from your Windows desktop Log into your assigned ESX host.
6.	Select your Host on the Left and select the Configuration Tab. In the Hardware Window select Storage and change the view to Datastores.

Step	Action
7.	Select the Datastore created on the Distributed Virtual Volume in Lab 3 step 49. This can be identified by the name (Distributed_student#) Right Click on the Datastore and Select Browse Datastore 
8.	We will now upload a file(s) to the Datastore to generate I/O to both the local cluster and across the WAN. From the Datastore Browser select the upload Icon  Select Upload File

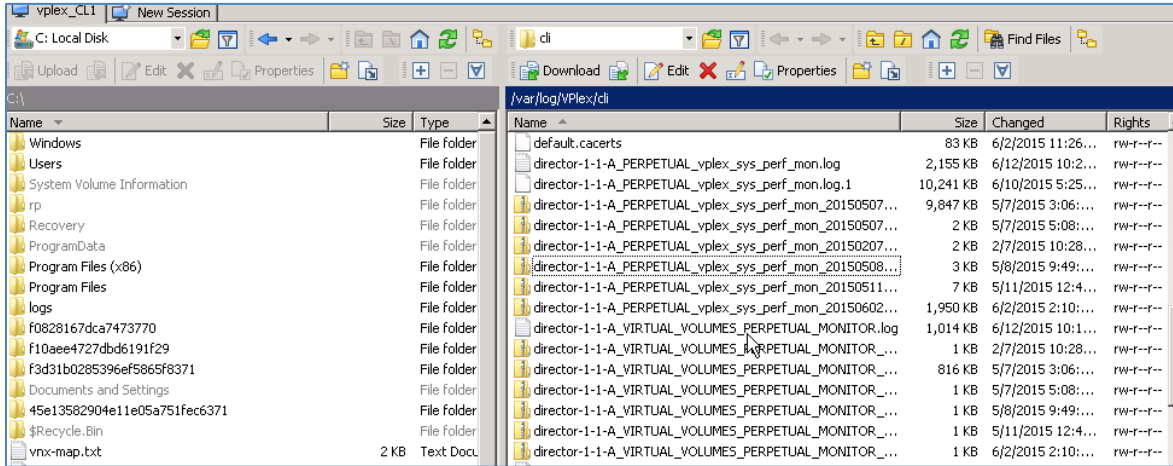
Step	Action
9.	Chose any files from the local hard drive. Click open Click yes to the warning This will copy the files to the Datastore and in turn create I/O to VPLEX
10.	Return to Unisphere From the End to End Tab View the different performance windows, such as Front-end Bandwidth  The screenshot shows the Unisphere interface with the 'End To End' tab selected. A sub-window titled 'Front-end Bandwidth' is open, showing a line graph of bandwidth in KB/s. The y-axis ranges from 0 to 800 KB/s. The x-axis shows time from 09:30 AM to 09:34 AM. The graph shows a significant peak in bandwidth around 09:33 AM, reaching approximately 650 KB/s. There are also smaller peaks around 09:32 AM and 09:34 AM. The 'Director' dropdown is set to 'All'.

Step	Action
11.	Change Tab to WAN View the WAN Performance  The screenshot displays the 'WAN Port Performance' window. At the top, there are tabs for 'WAN', 'System Resources', and 'End To End'. Below the tabs is a '+ Add Content' button. The main area shows a line graph with 'KB/s' on the y-axis (0 to 400.00) and time on the x-axis (09:33 AM to 09:38 AM). A green line represents 'Sent' data, showing several peaks, with the highest peak reaching approximately 400 KB/s at 09:34 AM. A blue line represents 'Received' data, which remains relatively flat and low. The legend at the bottom indicates 'Sent' (green square) and 'Received' (blue square). The top right of the graph area has radio buttons for 'Bytes' (selected) and 'Packets'.
12.	This can be repeated by copying more files.

End of Lab Exercise

Lab 5: Part 3 – Perpetual Monitors

Step	Action
	This Lab will review the location of the VPLEX Perpetual Monitor files on the VPLEX Cluster Management Server.
1.	From your assigned Windows Desktop Launch WinSCP
2.	Enter the Ip address of your assigned VPLEX Cluster, along with the user/password
3.	The Management Server Directory is on the Right and the local drive for the Windows host is on the left. Navigate to the /var/log/VPlex/cli directory

Step	Action
4.	Scroll down to view the perpetual monitor files.  The files all begin with the director number, such as director-1-1-A. <i>The files with the folder icon are archived; the files that end in .log are active.</i>
5.	Choose a director file and drag it to your desktop. Open the file with WordPad and view the contents. This gives you an idea of the information contained in the file. The file extension should be changed to .csv for viewing in a spreadsheet program.

End of Lab Exercise

Lab 5: Part 4 - Configure Monitors

Step	Action
	In this lab we will use the vplexcli to create individual monitors. We will create a Monitor for an individual Storage Volume. This individual data is not available in the Perpetual Monitor Files.
1.	Log in to your assigned cluster VPLEX Management Server.
2.	Change to the /var/log/Vplex/cli/ directory. service@VPLEX-Cluster1:/> cd /var/log/Vplex/cli
3.	Create a Directory using your assigned student number. service@VPLEX-Cluster1:/var/log/Vplex/cli> mkdir student1
4.	Log into the Vplexcli
5.	Find the Virtual Volume that was distributed. It should have the word distributed in the name. We will use this to identify the Storage Volume it is built on. Use the one from your assigned cluster. Vplexcli:/> ll clusters/cluster-1/virtual-volumes/ Once the correct volume is located use the following command to find the Storage Volume from your assigned cluster that is created on. Vplexcli:/> show-use-hierarchy -t /clusters/cluster-1/virtual-volumes/student_1_Distributed_1_vol Record the Storage Volume from your cluster.

Step	Action
6.	Next Create a monitor for the Storage volume that was recorded earlier <pre>Vplexcli:/>monitor create -n student_1_mon -- director/engines/engine-1-1/directors/director-1-1-A --stats storage-volume.* --targets /clusters/cluster- 1/storage-elements/storage- volumes/Distributed_student-1/</pre> Successfully created 1 monitor(s) out of 1
7.	Next we will create a Sink for the Monitor. <pre>Vplexcli:/monitoring/directors/director-1-1-A/monitors>monitor add- file-sink -n student-1_sink --monitor director-1-1- A_student_1_mon --file /var/log/Vplex/cli/student1/student-1.csv</pre> Change directories to / <pre>Vplexcli://> cd /</pre> <pre>Vplexcli:/></pre>
8.	Now we will Display the Monitor This syntax will display one monitor (use the one previously created) <pre>Vplexcli:/>ls /monitoring/directors/*/monitors/director- 1-1-A_student_1_mon</pre> This will display all monitors <pre>Vplexcli:/>ls /monitoring/directors/*/monitors</pre>
9.	Write data using previous method from Lab 5 part 2 steps 6-9

Step	Action
10.	This command will Force a poll no matter what the configured interval is. Run VPLexcli:/>monitor collect director-1-1-A_student_1_mon
11.	Use Winscp to download the monitor output file to your Windows Host to view the File.

End of Lab Exercise

END OF LAB