

# Module 6: Managing Data Across a Hybrid Cloud

## Exercise 2: Implement a Disaster-Recovery Configuration

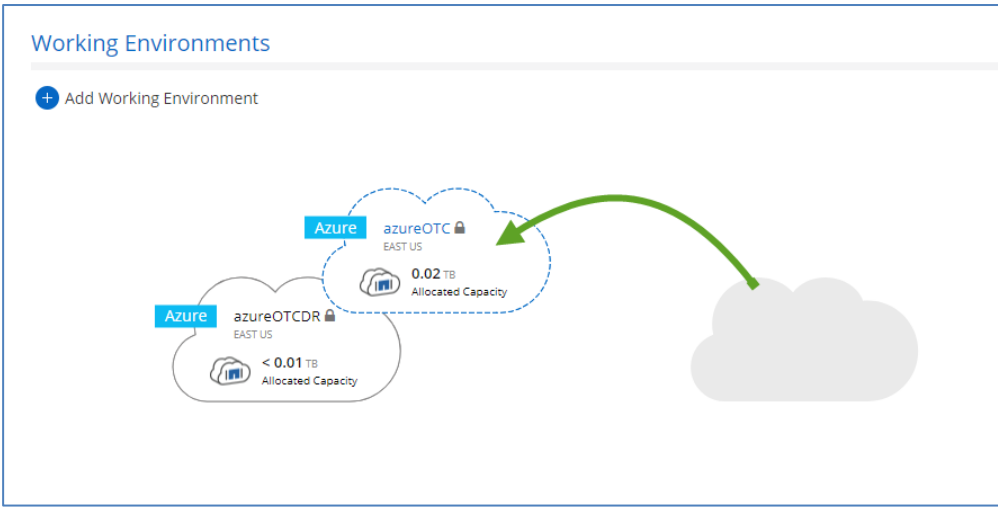
In this exercise, you use Cloud Manager to set up and manage SnapMirror relationships. You also use Cloud Manager to perform a cross-cloud disaster recovery.

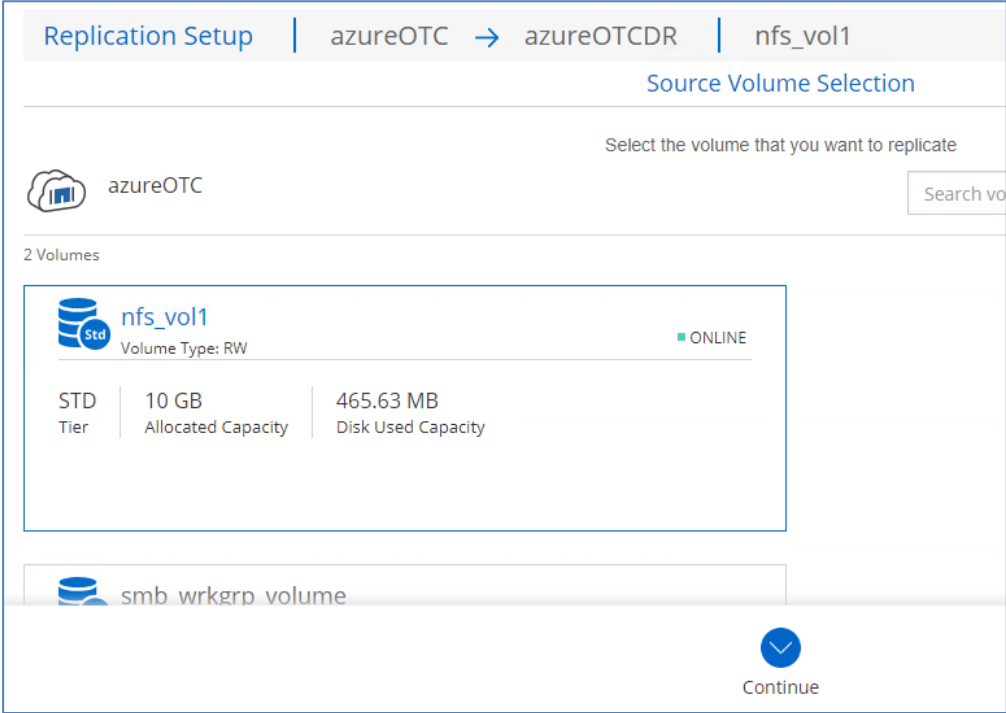
### Objectives

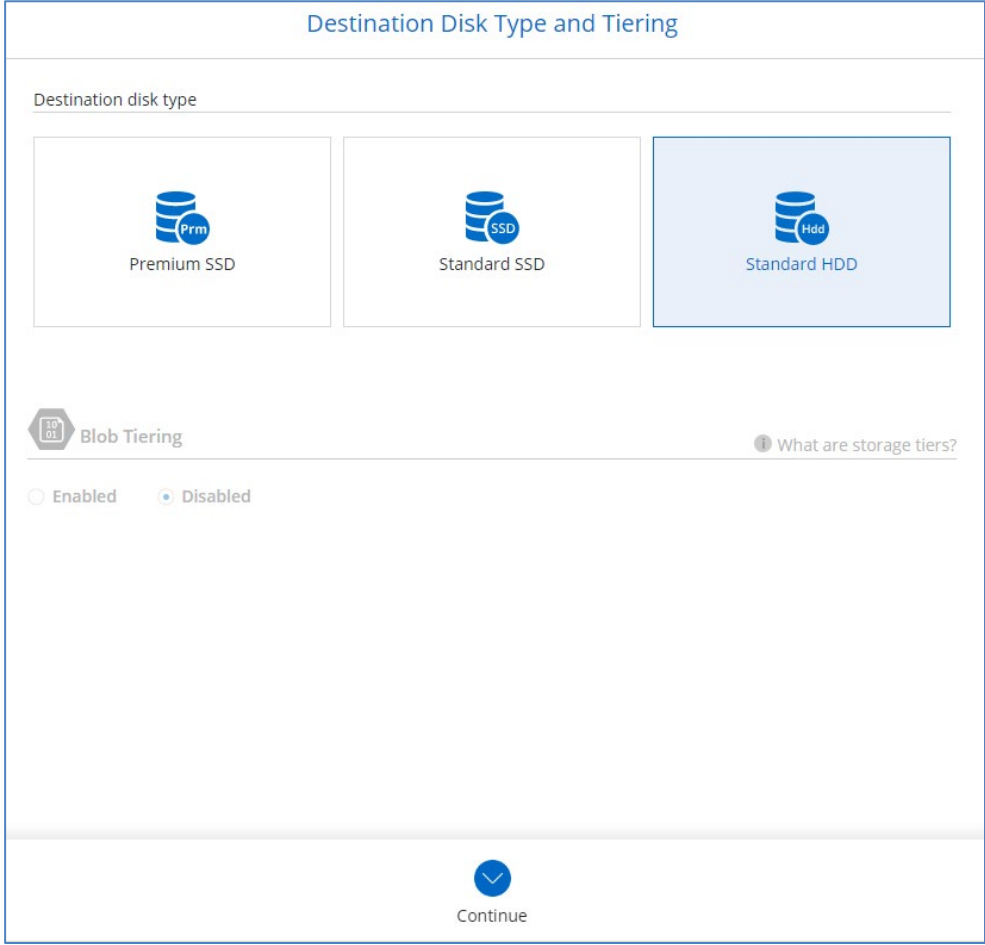
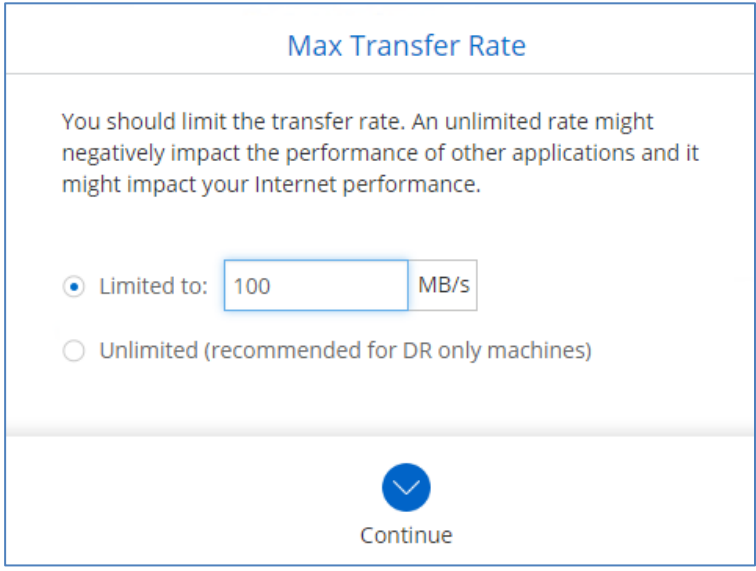
This exercise focuses on enabling you to do the following:

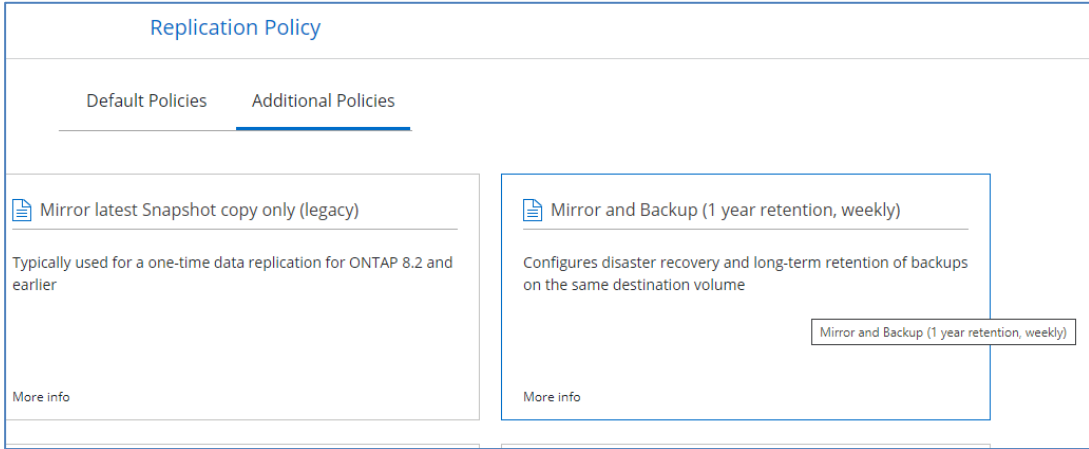
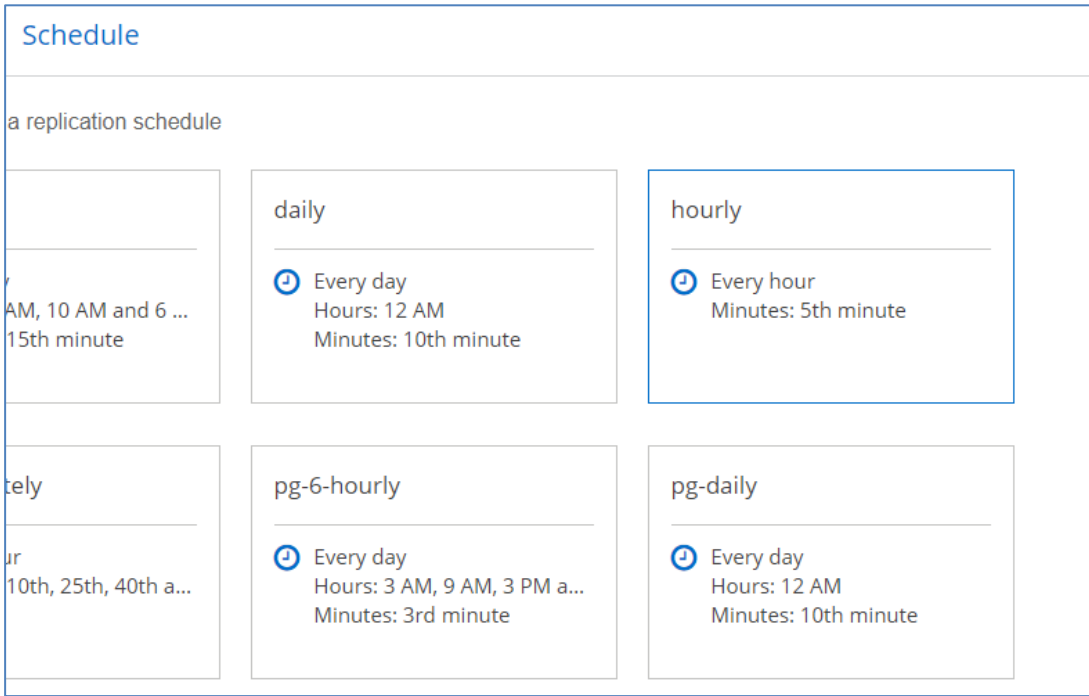
- Use Cloud Manager to implement cross-cloud SnapMirror relationships
- Perform a disaster recovery
- Reset the original SnapMirror relationship























### Task 1: Create a SnapMirror Relationship

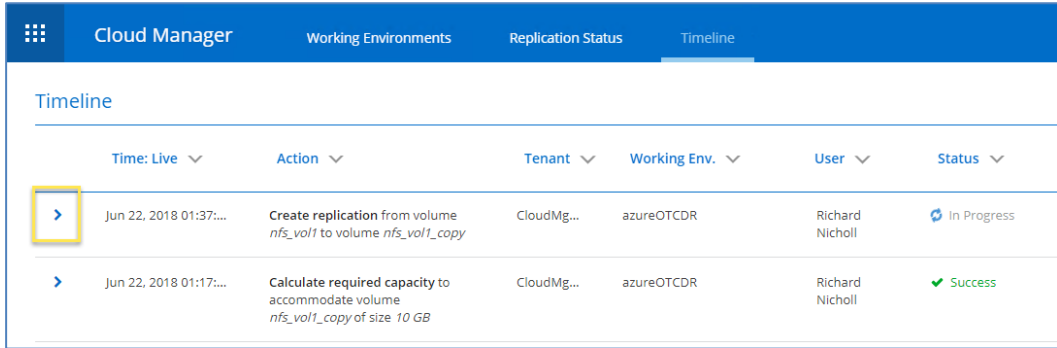
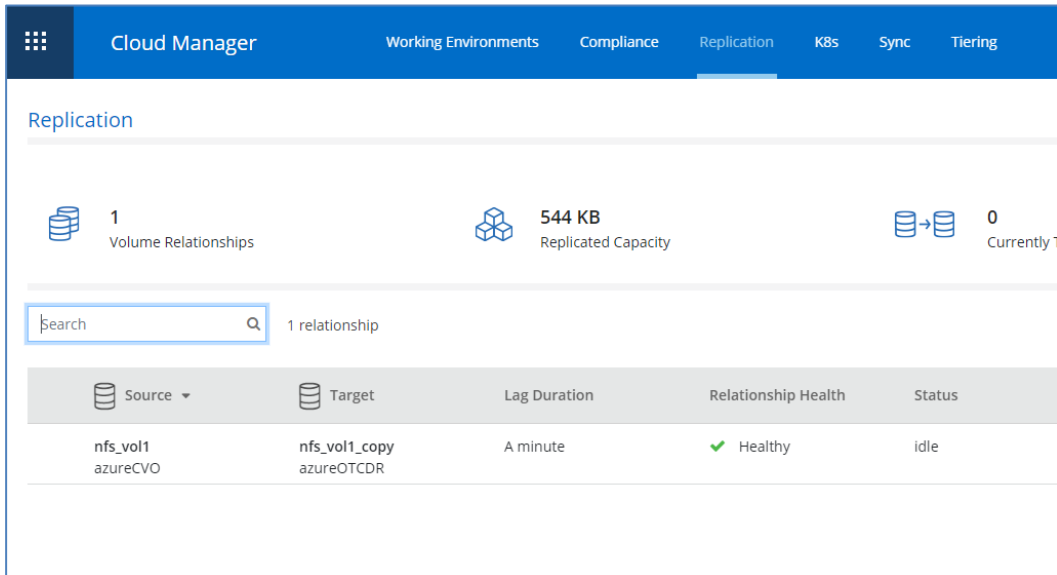
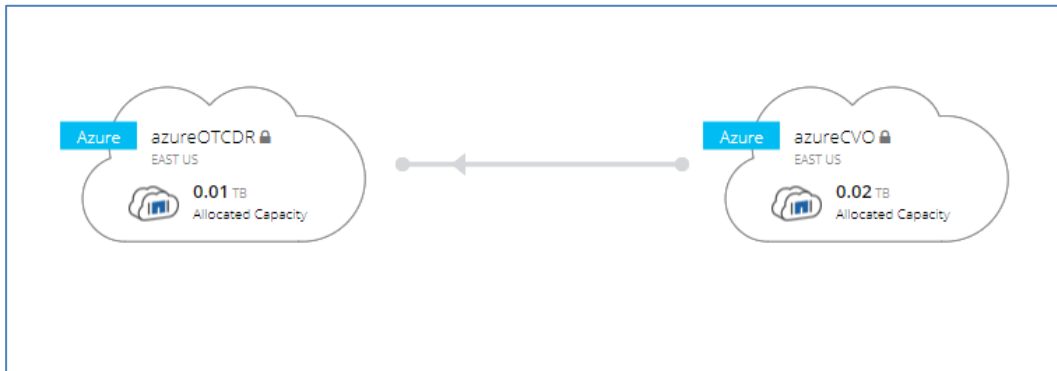
Step	Action
1-1	Return to the Cloud Manager interface from the W2K16-JumpHost.
1-2	<p>Drag the primary Cloud Volumes ONTAP system <b>azureCVO</b> to the disaster recovery Cloud Volumes ONTAP system <b>azureOTCDR</b>.</p> 

Step	Action
1-3	<p>Select <b>nfs_vol1</b>, and then click <b>Continue</b>.</p> 

Step	Action
1-4	<p>On the Destination Disk Type and Tiering page, select Standard HDD, and click <b>Continue</b>.</p> 
1-5	<p>On the Destination Volume Name, leave the defaults, and click <b>Continue</b>.</p>
1-6	<p>On the Max Transfer Rate page, leave the default, and click <b>Continue</b>.</p> 

Step	Action
1-7	On the Replication Policy page, click the <b>Additional Policies</b> tab.
1-8	<p>Click <b>Mirror and Backup (1 year retention, weekly)</b>.</p>  <p>The screenshot shows the 'Replication Policy' page with the 'Additional Policies' tab selected. There are two policy cards. The first card is titled 'Mirror latest Snapshot copy only (legacy)' and describes it as typically used for one-time data replication for ONTAP 8.2 and earlier. The second card is titled 'Mirror and Backup (1 year retention, weekly)' and describes it as configuring disaster recovery and long-term retention of backups on the same destination volume. This second card is highlighted with a blue border, and a callout box points to its title.</p>
1-9	<p>On the Schedule page, click <b>hourly</b>.</p>  <p>The screenshot shows the 'Schedule' page with the heading 'a replication schedule'. There are six schedule options displayed in a grid. The 'hourly' option is highlighted with a blue border. The options are: 'daily' (Every day, Hours: 12 AM, Minutes: 10th minute), 'hourly' (Every hour, Minutes: 5th minute), 'pg-6-hourly' (Every day, Hours: 3 AM, 9 AM, 3 PM a..., Minutes: 3rd minute), 'pg-daily' (Every day, Hours: 12 AM, Minutes: 10th minute), and two partially visible options on the left: 'AM, 10 AM and 6 ... 15th minute' and 'tely' (Every day, Hours: 10th, 25th, 40th a...).</p>
1-10	On the Review & Approve page, select the <b>I understand that Cloud Manager will allocate the appropriate resources to comply with my above requirements</b> checkbox.
1-11	Click <b>More information &gt;</b> .

Step	Action																													
1-12	<p>Read the notification that says that no new Azure resources need to be purchased, and click <b>Close</b>.</p> <div><p>No new Azure resources need to be purchased in order to complete this request.</p><p>Volume <code>nfs_vol1_copy</code> will be created on existing Aggregate <code>aggr1</code>.</p><p>Close</p></div>																													
1-13	<p> No new Azure resources are needed because you already have an aggregate with Standard disks (<code>aggr1</code>) on the destination Cloud Volumes ONTAP system. However, if in the Destination Volume Name and Tiering step, Premium storage was selected, a new aggregate with solid-state drive (SSD) disks would need to be created. Therefore, new Azure disk resources would be acquired during this process.</p>																													
1-14	<p>Review all of your information, and click <b>Go</b>.</p> <div><p>Replication Setup   azureOTC → azureOTCDR   nfs_vol1</p><p>Previous Step ^ Review &amp; Approve</p><p>Review your selection and start the replication process</p><p><input checked="" type="checkbox"/> I understand that Cloud Manager will allocate the appropriate Azure resources to comply with my above requirements. <a href="#">More information &gt;</a></p><table><tr><td>Source</td><td>Destination</td><td></td></tr><tr><td> azureOTC</td><td> azureOTCDR</td><td></td></tr><tr><td> nfs_vol1</td><td> nfs_vol1_copy</td><td></td></tr></table><table><tr><td>Source Volume Allocated Size:</td><td>10 GB</td><td>Destination Thin Provisioning:</td><td>Yes</td></tr><tr><td>Source Volume Used Size:</td><td>465.63 MB</td><td>Max Transfer Rate:</td><td>100 MB/s</td></tr><tr><td>Source Thin Provisioning:</td><td>Yes</td><td>SnapMirror Policy:</td><td>Mirror and Backup</td></tr><tr><td>Destination Volume Allocated Size:</td><td>10 GB</td><td>Replication Schedule:</td><td>hourly</td></tr><tr><td>Destination Volume Tier:</td><td>Standard Storage (HDD)</td><td></td><td></td></tr></table><p>GO</p></div>	Source	Destination		 azureOTC	 azureOTCDR		 nfs_vol1	 nfs_vol1_copy		Source Volume Allocated Size:	10 GB	Destination Thin Provisioning:	Yes	Source Volume Used Size:	465.63 MB	Max Transfer Rate:	100 MB/s	Source Thin Provisioning:	Yes	SnapMirror Policy:	Mirror and Backup	Destination Volume Allocated Size:	10 GB	Replication Schedule:	hourly	Destination Volume Tier:	Standard Storage (HDD)		
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1-15	<p>Double click on either CVO and click <b>Timeline</b> to view the replication progress.</p> <div><p>Azure    Azure Managed Encryption</p><p>        </p><p> Add New Volume</p></div>																													

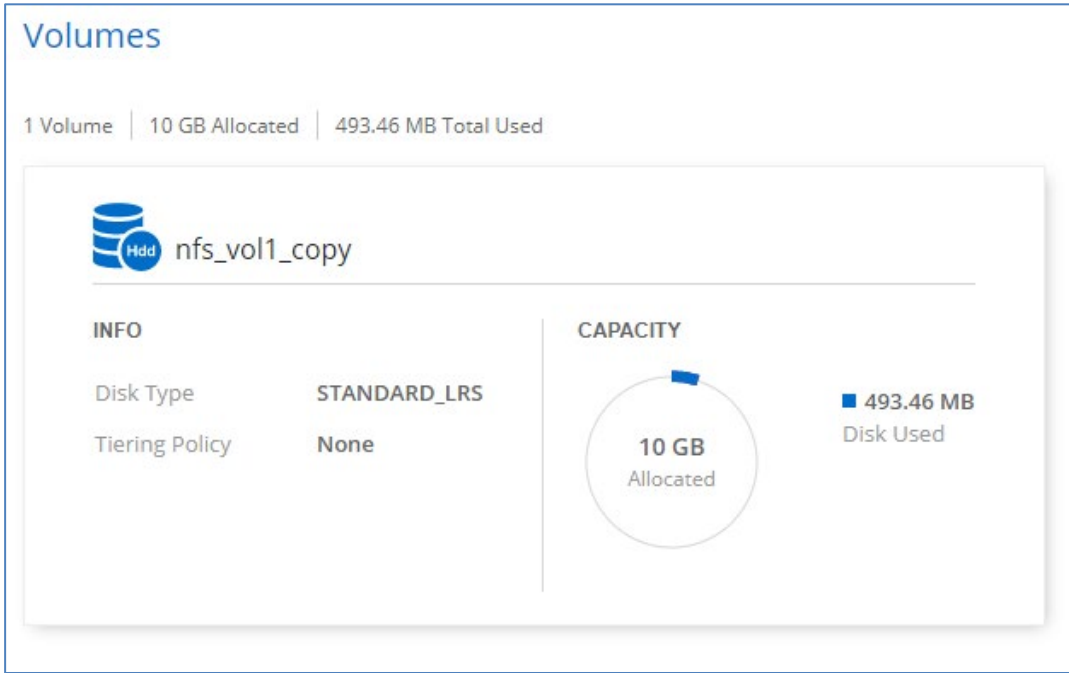
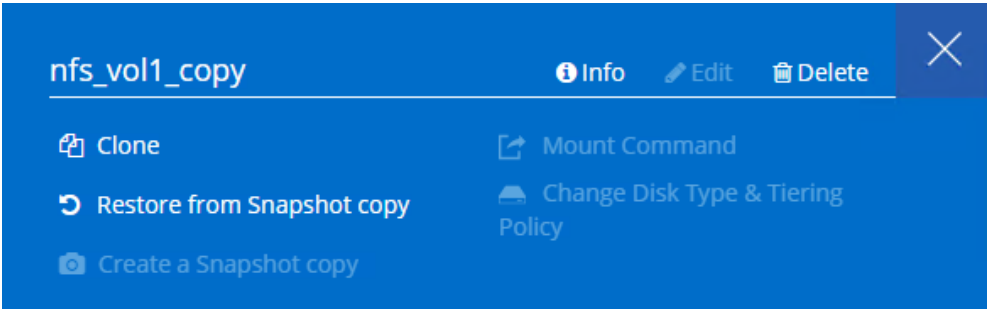
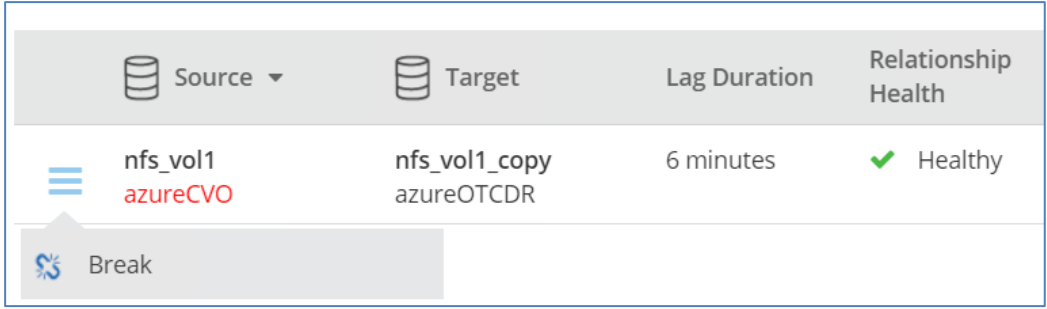
Step	Action
1-16	<p>Click the far-left arrow for the action to view low-level details of a task.</p> 
1-17	<p>Click the <b>Replication</b> tab, and then verify that replication finished (Mirror state is snapmirrored).</p> 
1-18	<p>Click the Working Environments tab to view that the SnapMirror relationship is now displayed graphically as an arrow from the azureCVO system to the azureOTCDR system.</p> 

## Task 2: Simulate Disaster Recovery


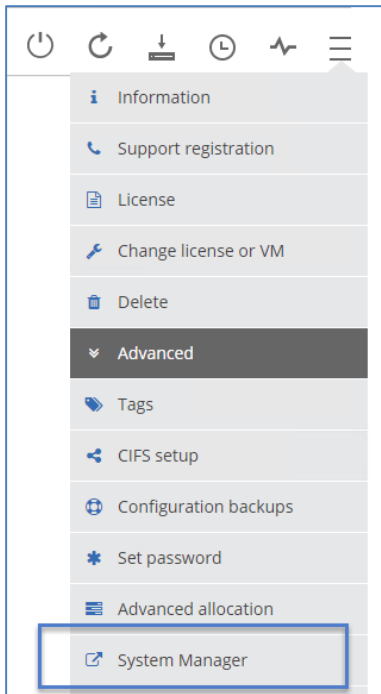
Step	Action
2-1	Return to the Red Hat Enterprise Linux virtual machine (VM) (reminder: username/password is demoadmin/HappyCloud123).
2-2	Enter the nfs_vol1 directory: [demoadmin@rhel77priv ~]\$ <b>cd /mnt/nfs_vol1</b>
2-3	Verify that you see the 500m.test file in the directory: [demoadmin@rhel77priv nfs_vol1]\$ ll -h total 491M -rw-rw-r--. 1 demoadmin demoadmin 489M Apr 30 14:19 500m.test [demoadmin@rhel77priv nfs_vol1]\$
2-4	Create a new file: [demoadmin@rhel74priv nfs_vol1]\$ <b>touch NewFileBeforeDisaster</b>
2-5	Verify that the file was created: [demoadmin@rhel77priv nfs_vol1]\$ ll -h total 491M -rw-rw-r--. 1 demoadmin demoadmin 489M Apr 30 14:19 500m.test -rw-rw-r--. 1 demoadmin demoadmin 0 Apr 30 14:21 NewFileBeforeDisaster [demoadmin@rhel77priv nfs_vol1]\$
2-6	Exit from this directory: [demoadmin@rhel74priv nfs_vol1]\$ <b>cd ..</b>
2-7	Return to Cloud Manger, and click the <b>Replication Status</b> tab.

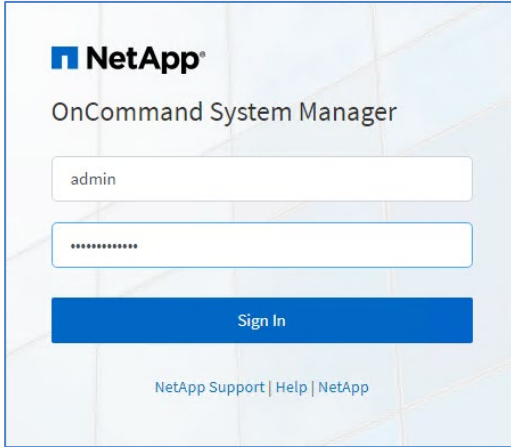
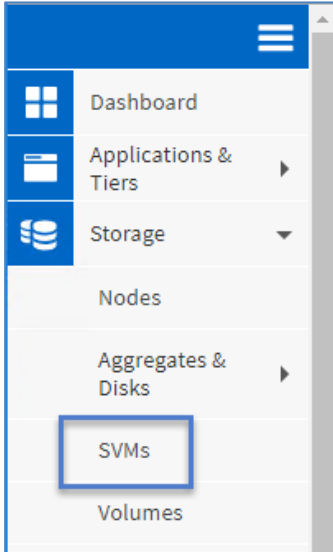
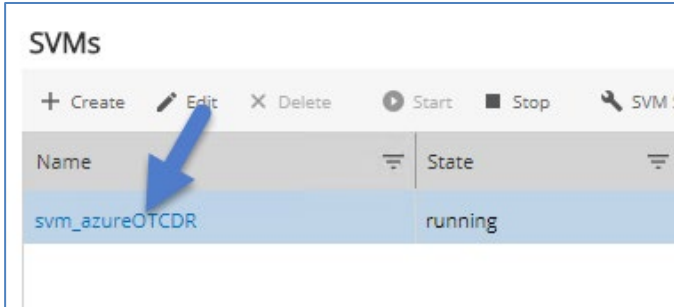
Step	Action						
2-8	<p>Click the menu icon, and then select <b>Update</b> to perform a manual SnapMirror update.</p> <div><div><div>Search</div><div>1 relationship</div></div><div><div>Source</div><div>Target</div></div><div><div>nfs_vol1 azureCVO</div><div>nfs_vol1_copy azureOTCDR</div></div><div><div>Break</div><div>Reverse Resync</div><div>Edit Schedule</div><div>Policy Info</div><div>Edit Max Transfer Rate</div><div>Update</div><div>Delete</div></div></div>						
2-9	<p>Wait for the Status to be idle and the Mirror State to be snapmirrored.</p> <table><thead><tr><th>Status</th><th>Mirror State</th><th>Last Successful Transfer</th></tr></thead><tbody><tr><td>idle</td><td>snapmirrored</td><td>Apr 30, 2020 10:24:02 am 498.22 MB</td></tr></tbody></table>	Status	Mirror State	Last Successful Transfer	idle	snapmirrored	Apr 30, 2020 10:24:02 am 498.22 MB
Status	Mirror State	Last Successful Transfer					
idle	snapmirrored	Apr 30, 2020 10:24:02 am 498.22 MB					
2-10	<p>Simulate a disaster recovery:</p> <div><div><div>a. Click the <b>Working Environments</b> tab.</div><div>b. Double-click the <b>azureCVO</b> system.</div></div><div><div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div>Turn Off</div></div></div></div></div><div><div>c. Click the power icon.</div><div>d. Click <b>Turn Off</b>.</div></div></div>						
2-11	<p>Click the <b>Working Environments</b> tab.</p>						

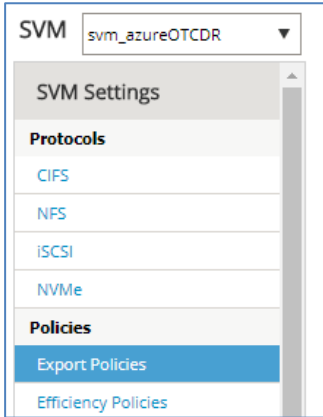
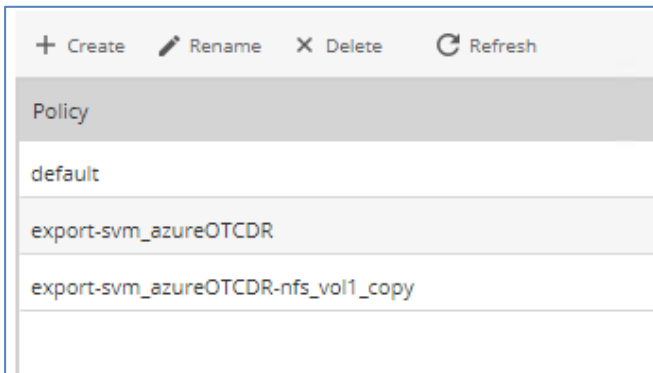
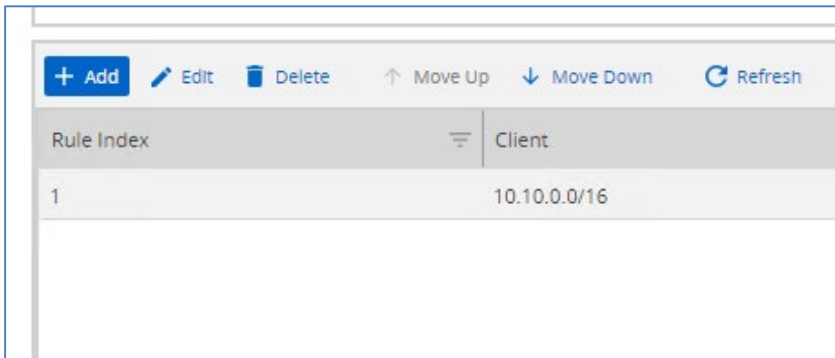


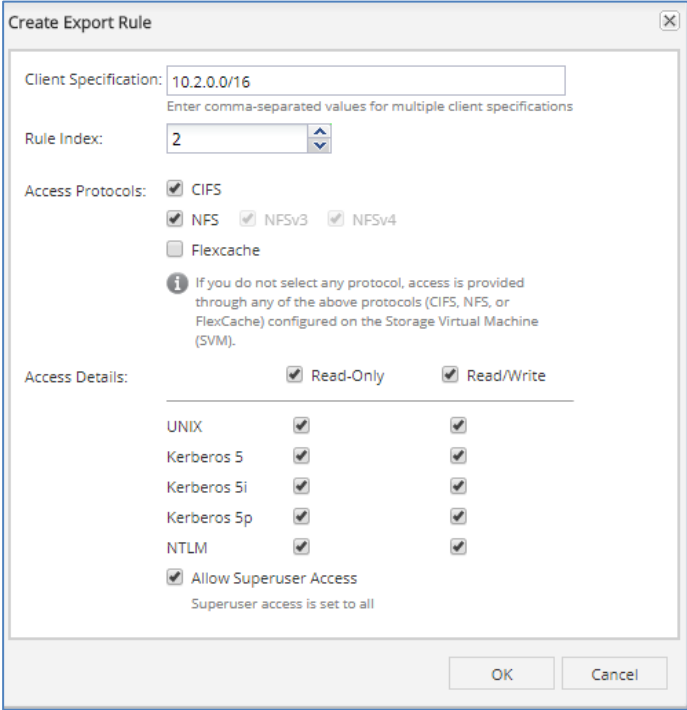
Step	Action
2-12	Wait for the azureCVO system to be in the Turned off state.
2-13	Double-click the <b>azureOTCDR</b> system.
2-14	<p>Verify that you see the volume <code>nfs_vol1_copy</code>.</p> 
2-15	<p>Select the <b>nfs_vol1_copy</b> menu, and verify that currently the mount command is not available.</p> 
2-16	<p>Return to the Replication Status tab and select the <b>Break</b> command.</p> 
2-17	In the Are you sure window, click <b>OK</b> .

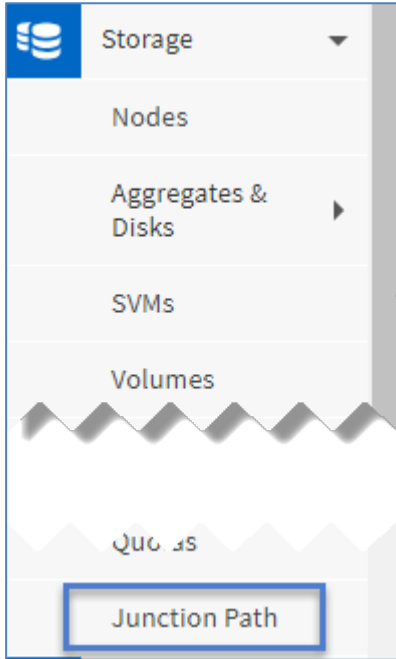
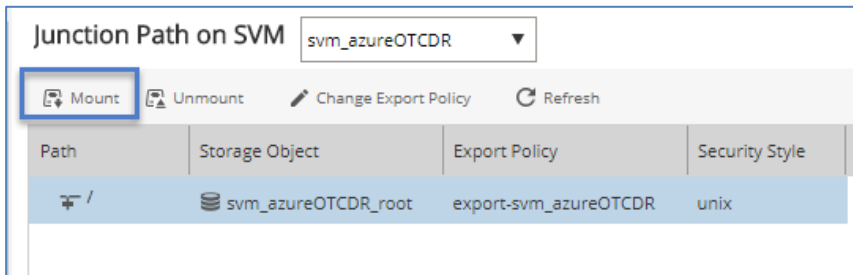
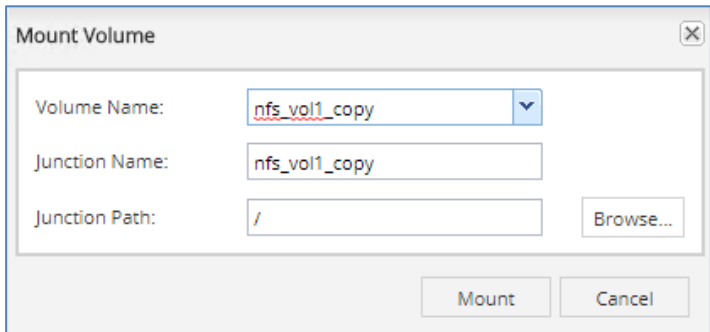


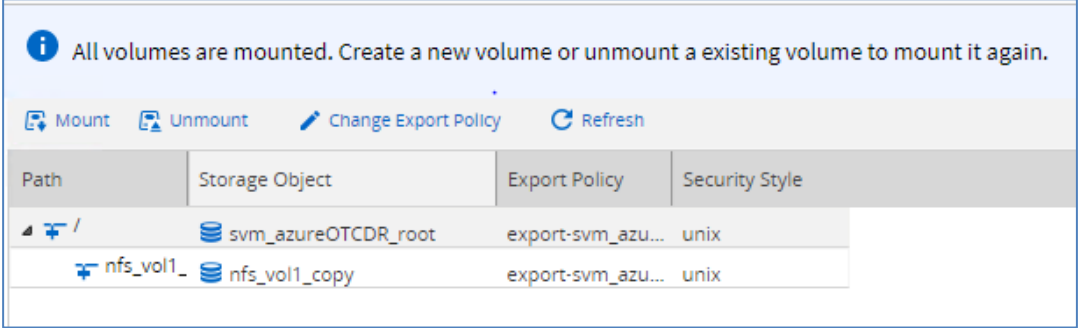
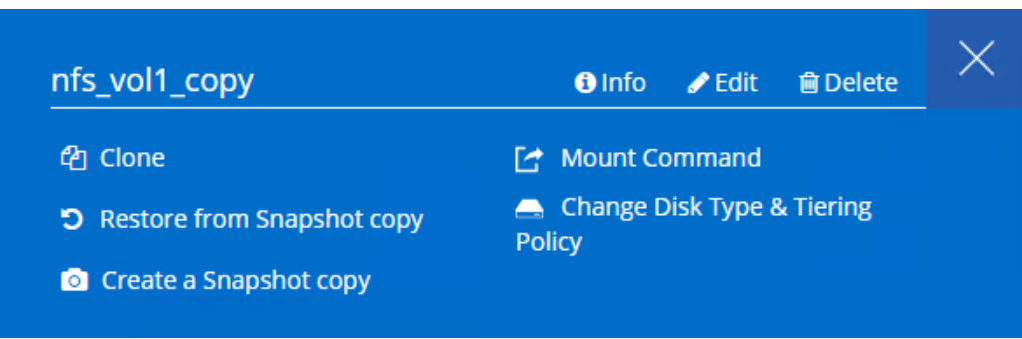
Step	Action
2-23	 <p>In a normal scenario in which you have clients in the Azure DR VNet, this export policy rule is sufficient. However, due to cost, time, and simplicity concerns in this lab environment, you are going to reuse the clients in the NetApp VNet. Therefore, you need to create a rule that allows clients to connect from the 10.2.1.0/24 CIDR range.</p> <p>Also, in all cases, you need to mount the disaster recovery volume into the storage virtual machine (SVM) namespace. You do both of these things in System Manager.</p>
2-24	<p>In the working environment, click the menu icon, and then click <b>Advanced &gt; System Manager</b>.</p> 
2-25	In the Launch System Manager dialog box, click <b>Launch</b> .
2-26	Ignore any security warnings (the appearance is different, depending on the browser that you are using).

Step	Action
2-27	<p>In the System Manger login page, enter the following:</p> <ul style="list-style-type: none"> <li>For User name, enter <b>admin</b>.</li> <li>For Password, enter <b>HappyCloud123</b>.</li> </ul>  <p>The screenshot shows the NetApp OnCommand System Manager login page. It features the NetApp logo at the top, followed by the text 'OnCommand System Manager'. Below this are two input fields: the first contains the text 'admin' and the second contains a series of dots representing a password. A blue 'Sign In' button is positioned below the password field. At the bottom, there are links for 'NetApp Support', 'Help', and 'NetApp'.</p>
2-28	<p>In the left navigation pane, select <b>Storage &gt; SVMs</b>.</p>  <p>The screenshot shows the left navigation pane of the NetApp OnCommand System Manager interface. It has a blue header with a hamburger menu icon. Below the header, there are several menu items: 'Dashboard' (with a grid icon), 'Applications &amp; Tiers' (with a folder icon and a right-pointing arrow), 'Storage' (with a storage icon and a dropdown arrow), 'Nodes', 'Aggregates &amp; Disks' (with a right-pointing arrow), 'SVMs' (which is highlighted with a blue box and a right-pointing arrow), and 'Volumes'.</p>
2-29	<p>Click <b>svm_azureOTCDR</b>.</p>  <p>The screenshot shows the 'SVMs' page in the NetApp OnCommand System Manager. At the top, there is a toolbar with icons for '+ Create', 'Edit', 'X Delete', 'Start', 'Stop', and 'SVM'. Below the toolbar is a table with two columns: 'Name' and 'State'. The table contains one entry: 'svm_azureOTCDR' in the 'Name' column and 'running' in the 'State' column. A blue arrow points to the 'svm_azureOTCDR' entry in the 'Name' column.</p>
2-30	<p>Click <b>NFS</b>.</p>

Step	Action
2-31	<p>In the SVM Settings pane, click <b>Export Policies</b>.</p> 
2-32	<p>Select <b>export-svm_azureOTCDR-nfs_vol1_copy</b>.</p> 
2-33	<p>In the Export Rules at the bottom of the page, click <b>Add</b>.</p> 

Step	Action
2-34	<p>In the Create Export Rule window, do the following:</p> <ul style="list-style-type: none"> <li>For the Client Specification enter, <b>10.2.0.0/16</b>.</li> <li>For the Rule Index, select <b>2</b>.</li> <li>For the Access Protocols, select <b>NFS</b> and <b>CIFS</b>.</li> <li>Leave the rest of the values as the defaults.</li> </ul> 
2-35	Click <b>OK</b> .
2-36	Repeat the same process for <b>export-svm_azureOTCDR</b> .

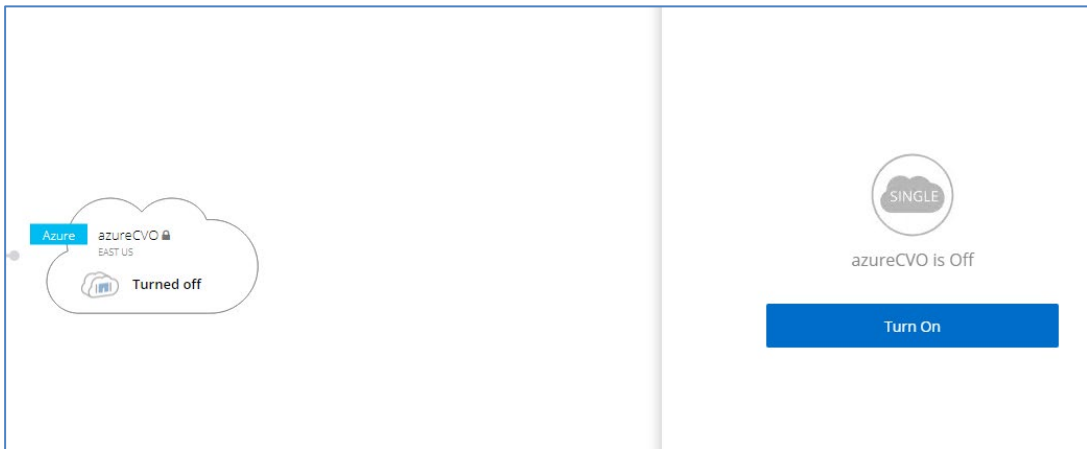
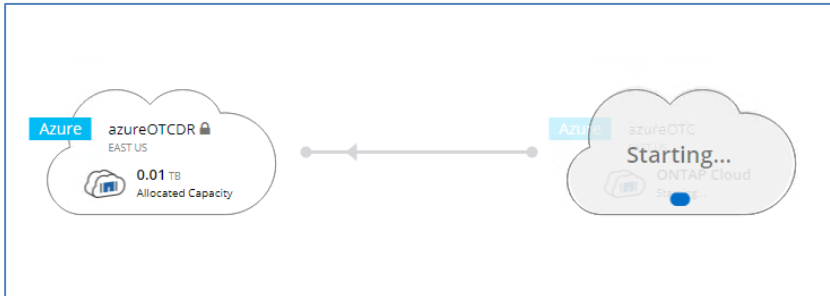
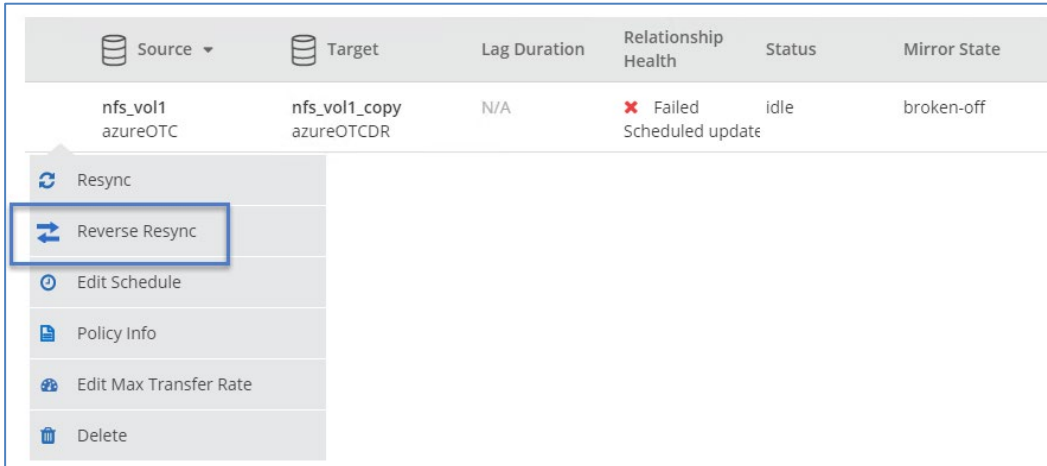
Step	Action								
2-37	<p>In the left navigation pane, select <b>Storage &gt; Junction Path</b>.</p> 								
2-38	<p>Click <b>Mount</b>.</p>  <table><thead><tr><th>Path</th><th>Storage Object</th><th>Export Policy</th><th>Security Style</th></tr></thead><tbody><tr><td>/</td><td>svm_azureOTCDR_root</td><td>export-svm_azureOTCDR</td><td>unix</td></tr></tbody></table>	Path	Storage Object	Export Policy	Security Style	/	svm_azureOTCDR_root	export-svm_azureOTCDR	unix
Path	Storage Object	Export Policy	Security Style						
/	svm_azureOTCDR_root	export-svm_azureOTCDR	unix						
2-39	<p>You will see a flash on your screen, what you do not see is this screenshot below.</p> 								



Step	Action
2-40	<p>The volume is mounted.</p> 
2-41	Return to Cloud Manager.
2-42	<p>Select the <b>nfs_vol1_copy</b> menu, and then click <b>Mount Command</b>.</p> 
2-43	Click <b>Copy</b> .
2-44	<p>Return to the Red Hat Enterprise Linux VM, and enter the following command:</p> <pre>[demoadmin@rhel74priv ~]\$ sudo mkdir /mnt/nfs_vol1_copy</pre>
2-45	<p>Return to the Secure Shell (SSH) session, and right-click to paste the command:</p> <ol style="list-style-type: none"> <li>Add <b>sudo</b> to the beginning of the command.</li> <li>Replace &lt;dest_dir&gt; with <b>/mnt/nfs_vol1_copy</b>.</li> <li>Press <b>Enter</b>.</li> </ol> <p>Example command:</p> <pre>[demoadmin@rhel74priv ~]\$ sudo mount 10.10.1.7:/nfs_vol1_copy /mnt/nfs_vol1_copy</pre> <pre>[sudo] password for demoadmin: <b>HappyCloud123</b></pre>
2-46	<p>Enter the command:</p> <pre>[demoadmin@rhel74priv ~]\$ cd /mnt/nfs_vol1_copy</pre>

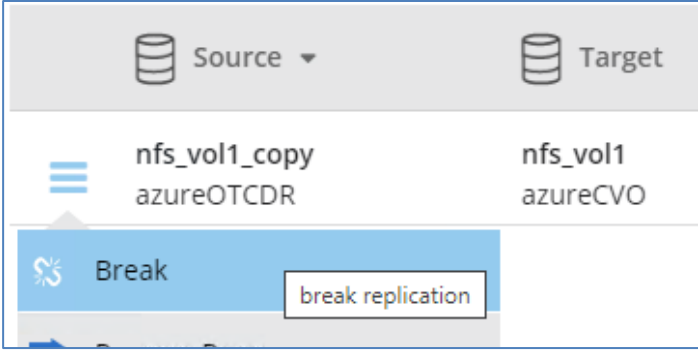
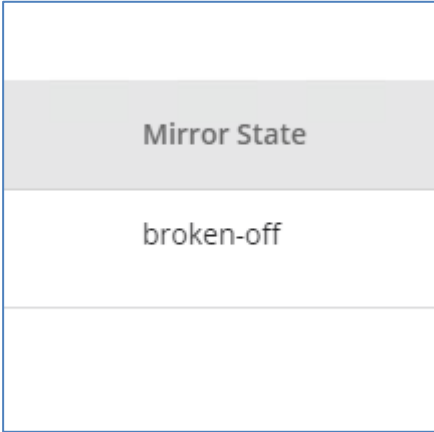
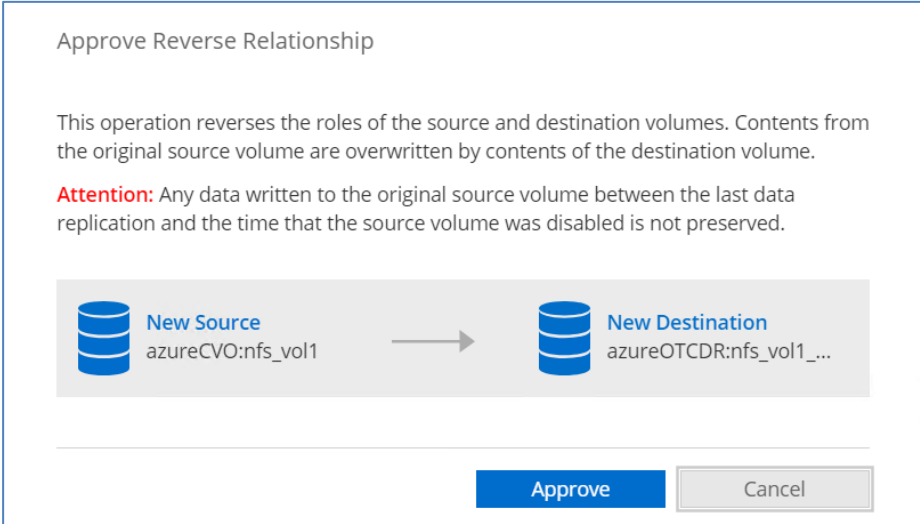



Step	Action
<b>2-47</b>	<p>Verify that the 1G.test and NewFileBeforeDisaster exist in the volume:</p> <pre>[demoadmin@rhel77priv nfs_voll_copy]\$ ll -h total 491M -rw-rw-r--. 1 demoadmin demoadmin 489M Apr 30 14:19 500m.test -rw-rw-r--. 1 demoadmin demoadmin    0 Apr 30 14:21 NewFileBeforeDisaster [demoadmin@rhel77priv nfs_voll_copy]\$</pre>
<b>2-48</b>	<p>Write a new file into the volume:</p> <pre>[demoadmin@rhel74priv nfs_voll_copy]\$ touch NewFileWhileinDR</pre>

## Task 3: Restore a SnapMirror Relationship

Step	Action												
3-1	Return to the Working Environments page in Cloud Manager.												
3-2	Select <b>azureCVO</b> , and then click <b>Turn On</b> . 												
3-3	Wait for the azureCVO system to become available. 												
3-4	Click the <b>Replication</b> tab.												
3-5	Click the <b>Menu</b> icon and then select <b>Reverse Resync</b> . This action writes the new data that was written to the <code>nfs_vol1_copy</code> during disaster recovery back to the <code>nfs_vol1</code> .  <table><thead><tr><th>Source</th><th>Target</th><th>Lag Duration</th><th>Relationship Health</th><th>Status</th><th>Mirror State</th></tr></thead><tbody><tr><td>nfs_vol1 azureOTC</td><td>nfs_vol1_copy azureOTCDR</td><td>N/A</td><td>Failed Scheduled update</td><td>idle</td><td>broken-off</td></tr></tbody></table>	Source	Target	Lag Duration	Relationship Health	Status	Mirror State	nfs_vol1 azureOTC	nfs_vol1_copy azureOTCDR	N/A	Failed Scheduled update	idle	broken-off
Source	Target	Lag Duration	Relationship Health	Status	Mirror State								
nfs_vol1 azureOTC	nfs_vol1_copy azureOTCDR	N/A	Failed Scheduled update	idle	broken-off								

Step	Action														
3-6	<p>Read the Approve Reverse Relationship text, and then click <b>Approve</b>.</p> <div><p>Approve Reverse Relationship</p><p>This operation reverses the roles of the source and destination volumes. Contents from the original source volume are overwritten by contents of the destination volume.</p><p><b>Attention:</b> Any data written to the original source volume between the last data replication and the time that the source volume was disabled is not preserved.</p><div><div> <b>New Source</b> azureOTCDR:nfs_vol1_...</div><div>→</div><div> <b>New Destination</b> azureCVO:nfs_vol1</div></div><div><div>Approve</div><div>Cancel</div></div></div>														
3-7	<p>You can view the status in the Timeline tab. Wait for the Status to be success.</p> <div><p>Timeline</p><table><tr><th>Time: Live</th><th>Action</th><th>Tenant</th><th>Working Env.</th><th>User</th><th>Status</th></tr><tr><td>&gt; Jun 22, 2018 05:37:...</td><td>Reverse resync replication on volume <i>nfs_vol1_copy</i></td><td>CloudMg...</td><td>azureOTCDR</td><td>Richard Nicholl</td><td>✓ Success</td></tr></table></div>	Time: Live	Action	Tenant	Working Env.	User	Status	> Jun 22, 2018 05:37:...	Reverse resync replication on volume <i>nfs_vol1_copy</i>	CloudMg...	azureOTCDR	Richard Nicholl	✓ Success		
Time: Live	Action	Tenant	Working Env.	User	Status										
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3-8	<p>Click the Replication Status tab, and verify that the Relationship Health is Healthy.</p> <div><table><tr><th>Source</th><th>Target</th><th>Lag Duration</th><th>Relationship Health</th><th>Status</th><th>Mirror State</th><th>Last Successful Transfer</th></tr><tr><td>nfs_vol1_copy azureOTCDR</td><td>nfs_vol1 azureCVO</td><td>A few seconds</td><td>✓ Healthy</td><td>idle</td><td>snapmirrored</td><td>Apr 30, 2020 02:54:08 pm 9.94 KB</td></tr></table></div>	Source	Target	Lag Duration	Relationship Health	Status	Mirror State	Last Successful Transfer	nfs_vol1_copy azureOTCDR	nfs_vol1 azureCVO	A few seconds	✓ Healthy	idle	snapmirrored	Apr 30, 2020 02:54:08 pm 9.94 KB
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nfs_vol1_copy azureOTCDR	nfs_vol1 azureCVO	A few seconds	✓ Healthy	idle	snapmirrored	Apr 30, 2020 02:54:08 pm 9.94 KB									
3-9	<p>Click the Working Environments tab, and verify that the arrow that represents the SnapMirror relationship now has the source as azureOTCDR system and the destination as the azureOTC system.</p> <div><div><div>Azure</div><div>azureOTCDR</div><div>EAST US</div><div>0.01 TB Allocated Capacity</div></div><div>→</div><div><div>Azure</div><div>azureCVO</div><div>EAST US</div><div>0.02 TB Allocated Capacity</div></div></div>														
3-10	<p>Click the <b>Replication Status</b> tab.</p>														

Step	Action
3-11	<p>You need to revert the SnapMirror relationship to its original configuration. Click the menu icon, and then select <b>Break</b>.</p> 
3-12	<p>In the window that asks “Are you sure you want to break the relationship between ‘nfs_vol1_copy’ and ‘nfs_vol1,’” click <b>OK</b>.</p>
3-13	<p>Verify that the Mirror State is broken-off.</p> 
3-14	<p>Click the menu icon, and then select <b>Reverse Resync</b>.</p>
3-15	<p>In the Approve Reverse Relationship window, click <b>Approve</b>.</p> 

Step	Action
<b>3-16</b>	Click the Working Environments tab, and verify that the arrow has reverted to the source being azureCVO and the destination being azureOTCDR.
<b>3-17</b>	 <p>You should now be able to mount the original nfs_vol1 volume and verify that it contains all the data, including the <b>NewFileWhileinDR</b> file. Also, you should be able to write data to nfs_vol1.</p>
<b>3-18</b>	Break and delete the SnapMirror relationship, then shut down and delete <b>azureOTCDR</b> .

**End of Exercise**