

VMAX3 Business Continuity Management Lab Guide

Education Services
March 2015

VMAX3 Business Continuity Management

Lab Guide – Windows 2008 Hosts

March 2015

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Lab Exercise 1: TimeFinder SnapVX Operations

Purpose:	This lab exercise is designed to lead the students through TimeFinder SnapVX Operations using EMC Solutions Enabler SYMCLI, command line interface.
Tasks:	In this lab exercise students will: 1) Create TimeFinder SnapVX snapshots 2) Link snapshots to Target device and access point-in-time data from a Secondary host 3) Restore from snapshot to Source device 4) Restore modified data from Target device to the Source device
References:	EMC® Solutions Enabler TimeFinder® Family Version 8.0.1 CLI User Guide VMAX® and VMAX3™ Family REV 01

Lab 1: Part 1 – Creating Snapshots

Step	Action						
1	Identify the device assigned as the Source for SnapVX snapshots. On the Primary host, find the Standard Volume assigned as your Source and complete the table. Use the commands, sym pd list and syminq to get the information you need. <pre>C:\> sym pd list more</pre> <pre>C:\> syminq</pre> <table><tr><th>Source Device</th><th>PdevName (e.g. PHYSICALDRIVE10)</th><th>SymDevName (e.g. 031)</th></tr><tr><td>Device 1</td><td></td><td></td></tr></table>	Source Device	PdevName (e.g. PHYSICALDRIVE10)	SymDevName (e.g. 031)	Device 1		
Source Device	PdevName (e.g. PHYSICALDRIVE10)	SymDevName (e.g. 031)					
Device 1							

Step	Action
2	On the Primary host: Create a partition, NTFS file system on the Source volume and assign a drive letter. In a command window, execute the <code>diskpart</code> command C:\> diskpart This will bring you to the DISKPART prompt, execute the series of commands as shown below: DISKPART> list disk You should see a listing of all disks. The list will show the disks as Disk #. In step 1 if Device 1 had a physical name of "PHYSICALDRIVE10" then it will be listed as "Disk 10" in the output. DISKPART>select disk # (Select the Disk that corresponds to Source Device 1) Example: DISKPART>select disk 10 DISKPART> list partition Are there any partitions on this disk? _____ There should be no partitions on this disk DISKPART> create partition primary DISKPART> list partition There should one partition DISKPART> select partition 1 DISKPART> list volume Record the drive letters in use: _____ The Volume with the "*" in the first column will not have an associated drive letter DISKPART> format fs=ntfs label=prodfs<SGN> quick Example: DISKPART> format fs=ntfs label=prdofs08 quick DISKPART> assign letter=<choose a letter not in use> Example: DISKPART> assign letter=F DISKPART> list volume Your Volume should now have the Drive letter you assigned DISKPART> exit
3	On the Primary host: Use Windows Explorer to copy the contents of the C:\Program Files\EMC\SYMCLI folder to the Drive Letter of your Production FS. Close Windows Explorer. Flush the file system. C:\> symntctl flush -drive <Production FS Drive letter>: Example: C:\> symntctl flush -drive F:

Step	Action						
4	On the Secondary host: Identify the Device assigned as your Target for SnapVX operations. Record the information about your assigned Target device in the table below. Use the Logical Device Manager to ensure that the target device is a Basic Disk, online and is unallocated. <pre>C:\> sympd list more</pre> <pre>C:\> syminq</pre> <table><tr><th>Target Device</th><th>PdevName (e.g. PHYSICALDRIVE12)</th><th>SymDevName (e.g. 031)</th></tr><tr><td>Device 1</td><td></td><td></td></tr></table>	Target Device	PdevName (e.g. PHYSICALDRIVE12)	SymDevName (e.g. 031)	Device 1		
Target Device	PdevName (e.g. PHYSICALDRIVE12)	SymDevName (e.g. 031)					
Device 1							

Step	Action
5	On the Primary host: Create a Storage Group and add your Source device to the Storage Group. <pre>C:\> symsg -sid <Symmetrix ID> create snapsrc_sg_<SGN></pre> <pre>C:\> symsg -sid <Symmetrix ID> -sg snapsrc_sg_<SGN> add dev <SourceSymDevName></pre> Create another Storage Group and add your Target device to the Storage Group. <pre>C:\> symsg -sid <Symmetrix ID> create snaptgt_sg_<SGN></pre> <pre>C:\> symsg -sid <Symmetrix ID> -sg snaptgt_sg_<SGN> add dev <TargetSymDevName></pre> The Source and Target SymDevNames are three digit numbers that were recorded earlier in steps 1 and 4. Verify that the Storage Groups have been created. <pre>C:\> symsg list -sid <Symmetrix ID></pre> <pre>C:\> symsg show -sid <Symmetrix ID> snapsrc_sg<SGN></pre> <pre>C:\> symsg show -sid <Symmetrix ID> snaptgt_sg<SGN></pre>

Step	Action
6	From the Primary host: Create a SnapVX snapshot. <pre>C:\> symsnapvx -sid <Symmetrix ID> establish -name backup<SGN> -sg snapsrc_sg<SGN></pre> List Snapshot. <pre>C:\> symsnapvx -sid <Symmetrix ID> list</pre> <pre>C:\> symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> How many generations are listed? _____ Is there an expiration date for the snapshot? _____ What is the generation number for this snapshot? _____ Is the snapshot linked to a target? _____
7	On the Primary host: Add more data to the Source device. Use Windows Explorer to copy the contents of the C:\Program Files\EMC\SYMAPI folder to the Drive Letter of your Production FS. Close Windows Explorer. Flush the file system. <pre>C:\> symntctl flush -drive <Production FS Drive letter>:</pre> Example: C:\> symntctl flush -drive F:

Step	Action
8	From the Primary host: Create a second snapshot, using the same name. <pre>C:\> symsnapvx -sid <Symmetrix ID> establish -name backup<SGN> -sg snapsrc_sg<SGN></pre> List the Snapshots. <pre>C:\> symsnapvx -sid <Symmetrix ID> list</pre> <pre>C:\> symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> How many generations are listed? _____ What is the generation number for this snapshot? _____ What is the generation number for the earlier snapshot? _____
9	On the Primary host: Add more data to the Source device. Change to your Source device drive letter. <pre>F:\> symsnapvx -h >symsnapvx.txt</pre> As a simple example, the help page for symsnapvx is redirected to a text file. Change directory to C: and flush the filesystem. <pre>C:\> symntctl flush -drive <Production FS Drive letter>:</pre> Example: C:\> symntctl flush -drive F:

Step	Action												
10	From the Primary host: Create a third snapshot, using the same name. <pre>C:\> symsnapvx -sid <Symmetrix ID> establish -name backup<SGN> -sg snapsrc_sg<SGN></pre> List the Snapshots. <pre>C:\> symsnapvx -sid <Symmetrix ID> list</pre> <pre>C:\> symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> How many generations are listed? _____ What is the generation number for this snapshot? _____ What is the generation number for the earlier snapshot? _____ Record the information for table below. <table><thead><tr><th>Gen</th><th>Total Deltas (Tracks)</th><th>Non-shared (Tracks)</th></tr></thead><tbody><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>	Gen	Total Deltas (Tracks)	Non-shared (Tracks)									
Gen	Total Deltas (Tracks)	Non-shared (Tracks)											
11	From the Primary host: Set the Time-to-Live for generation 2 snapshot. <pre>C:\> symsnapvx -sid <Symmetrix ID> -snapshot_name backup<SGN> -gen 2 -sg snapsrc_sg<SGN> set ttl -delta 2</pre> What is the expiration date now for generation 2? _____												

End of Lab 1 – Part 1

Lab 1: Part 2 – Accessing Snapshot Data from a Secondary Host

Step	Action
1	From the Secondary host: Link the generation 0 snapshot to the target volume. <pre>C:\> symsnapvx -sid <Symmetrix ID> link -snapshot_name backup<SGN> -gen 0 -sg snapsrc_sg<SGN> -lnsg snaptgt_sg<SGN></pre> List details of the linked target. <pre>C:\> symsnapvx -sid <Symmetrix ID> -snapshot_name backup<SGN> -sg snapsrc_sg<SGN> list -linked -detail</pre> What mode has the target been linked in? _____

Step	Action
2	From the Secondary host: Use <code>diskpart</code> to assign drive letter to the target device and access the snapshot data. <pre>C:\> diskpart DISKPART> rescan DISKPART> list disk</pre> You should see a listing of all disks. The list will show the disks as Disk #. If Device 1 had a physical name of "PHYSICALDRIVE12" then it will be listed as "Disk 12" in the output. <pre>DISKPART> select disk # (Select the Disk that corresponds to Target Device 1) DISKPART> list partition</pre> Are there any partitions on this disk? _____ There should be one partition on this disk <pre>DISKPART> select partition 1 DISKPART> list volume</pre> Record the drive letters in use: _____ Does the Volume with an "*" in the first column have a drive letter assigned to it? _____ If Yes – What is the Drive Letter? _____ If No: Assign a drive letter <pre>DISKPART> assign letter=<choose a letter not in use></pre> Example: DISKPART> assign letter=F <pre>DISKPART> list volume</pre> Your Volume should now have the Drive letter you assigned <pre>DISKPART> exit</pre>
3	On the Secondary host, open Windows explorer and you should see the new drive letter you assigned. Verify the availability of data on the target device. What are the folders and file(s) listed? _____ Examine the sequence of the snapshots you created and the corresponding point-in-time data in Lab 1 – Part 1. Is the data in the snapshot consistent with what you would expect? _____

Step	Action
4	From the Secondary host, add more data to the target device. Change to the drive letter assigned to the target and add data. <pre>F:\> symrdf -h > symrdf.txt</pre> As a simple example, the help page for <code>symrdf</code> is redirected to a text file. Change directory to <code>C:</code> and flush the filesystem. <pre>C:\> symntctl flush -drive <Target FS Drive letter>:</pre> Example: <code>C:\> symntctl flush -drive F:</code>
5	From the Secondary host, list details of the linked target. <pre>C:\> symsnapvx -sid <Symmetrix ID> -snapshot_name backup<SGN> -sg snapsrc_sg<SGN> list -linked -detail</pre> Are there modified tracks? _____
6	From the Secondary host: Unmount the filesystem on the target device. <pre>C:\> symntctl umount -drive <Target FS Drive letter>:</pre> Example: <code>C:\> symntctl umount -drive F:</code>
7	From the Secondary host: Relink generation 0 snapshot to the target. <pre>C:\> symsnapvx -sid <Symmetrix ID> relink - snapshot_name backup<SGN> -gen 0 -sg snapsrc_sg<SGN> - lnsq snaptgt_sg<SGN></pre>
8	From the Secondary host: Use <code>diskpart</code> to rescan disks and assign drive letter to the target device as shown in step 2.

Step	Action
9	On the Secondary host, open Windows explorer and you should see the new drive letter you assigned. Verify the availability of data on the target device. What are the folders and file(s) listed? _____ Do you have access the <code>symrdf.txt</code> file that was created in step 4? _____ Close Windows Explorer.
10	To understand the flexibility and ease of use of TimeFinder SnapVX, relink target to a different generation of the snapshot. From the Secondary host: Unmount the filesystem on the target device. <code>C:\> symntctl umount -drive <Target FS Drive letter>:</code> Example: <code>C:\> symntctl umount -drive F:</code> Relink generation 2 snapshot to target. <code>C:\> symsnapvx -sid <Symmetrix ID> relink - snapshot_name backup<SGN> -gen 2 -sg snapsrc_sg<SGN> - lnsq snaptgt_sg<SGN></code> Use <code>diskpart</code> to rescan disks and assign drive letter to target as shown in step 2. Open Windows explorer and examine the content of the target filesystem. What data is available on the target? _____

End of Lab 1 – Part 2

Lab 1: Part 3 – Restoring to Source from Snapshots

Step	Action
1	On the Primary host: Open Windows Explorer and navigate to the drive letter that was assigned to the Source device. Delete the SYMCLI folder. Close Windows Explorer.
2	The very first snapshot – generation 2 contains the SYMCLI folder. We will now restore to source from this snapshot and observe the results. From the Primary host, unmount source drive letter. C:\> symntctl umount -drive <Source FS Drive Letter>: Example: C:\> symntctl umount -drive F:
3	From the Primary host: Restore generation 2 snapshot. C:\> symsnapvx -sid <Symmetrix ID> restore - snapshot_name backup<SGN> -gen 2 -sg snapsrc_sg<SGN> List the snapshots for the Source Storage Group. C:\> symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail Is the generation 2 snapshot now listed as Restore Active? _____
4	On the Primary host, use diskpart to assign drive letter to the source device. Follow the instructions given before. (diskpart > rescan > list disk > select disk # > list partition > select partition 1 > list volume > assign letter=<Source FS Drive letter> > exit)

Step	Action
5	On the Primary host, navigate to the source drive letter. What data is now available on the source device? _____ Does this match your expectation? _____
6	From the Primary host, terminate the restored session. <pre>C:\> symsnapvx -sid <Symmetrix ID> terminate -sg snapsrc_sg<SGN> -snapshot_name backup<SGN> -gen 2 - restored</pre> Did the terminate succeed? Verify by listing the snapshots for the Storage Group. <pre>C:\> symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> Is the original snapshot still available? _____ Do you still have access to the restored data? _____

End of Lab 1 – Part 3

Lab 1: Part 4 – Restoring to Source from Modified Target

Step	Action
1	At this stage you should be accessing both your Source device and Target device. Verify the data available to the Primary host from the Source device. Which folder(s) and/or file(s) are available? _____ Verify the data available to the Secondary host from the Target device. Which folder(s) and/or file(s) are available? _____
2	From the Secondary host, add more data to the Target drive letter. Change to the drive letter assigned to the target and add data. <pre>F:\> symcfg -h > symcfg.txt</pre> As a simple example, the help page for <code>symcfg</code> is redirected to a text file. Change directory to <code>C:</code> and flush the filesystem. <pre>C:\> symntctl flush -drive <Target FS Drive letter>:</pre> Example: <code>C:\> symntctl flush -drive F:</code>
3	In order to restore the Target back to the Source, we have to first create a snapshot of the Target. From the Secondary host: <pre>C:\> symsnapvx -sid <Symmetrix ID> establish -name casc<SGN> -sg snaptgt_sg<SGN></pre>

Step	Action
4	Next we have to link this snapshot to the Source. Before performing this we will stop access to the Source filesystem. From the Primary host: <pre>C:\> symntctl umount -drive <Source FS Drive letter>:</pre> Example: C:\> symntctl umount -drive F:
5	From the Primary host, link snapshot to the Source. <pre>C:\> symsnapvx -sid <Symmetrix ID> link -snapshot_name casc<SGN> -gen 0 -sg snaptgt_sg<SGN> -lnsg snapsrc_sg<SGN></pre> Note: The source of the data is now the Target storage group (-sg) and the link is to the Source storage group (-lnsg).
6	On the Primary host, assign drive letter to the Source device. We have done this a few times. Refer to earlier steps if necessary. Verify data on the Source device. Can you access the file you created <code>symcfg.txt</code> from the Primary host? ____
7	From the Primary host, unlink the snapshot from the Source storage group. <pre>C:\> symsnapvx -sid <Symmetrix ID> unlink -snapshot_name casc<SGN> -sg snaptgt_sg<SGN> -lnsg snapsrc_sg<SGN></pre> Did the command succeed? _____ If it failed, what is the error message? _____

Step	Action
8	From the Primary host, set the link mode to copy and try <code>unlink</code> again. <pre>C:\> symsnapvx -sid <Symmetrix ID> set mode copy - snapshot_name casc<SGN> -gen 0 -sg snaptgt_sg<SGN> - lnsg snapsrc_sg<SGN></pre> <pre>C:\> symsnapvx -sid <Symmetrix ID> unlink - snapshot_name casc<SGN> -gen 0 -sg snaptgt_sg<SGN> - lnsg snapsrc_sg<SGN></pre> Did the <code>unlink</code> command succeed? _____
9	Verify that you can still access the data from the Primary host even after the <code>unlink</code> operation. Can you still access the data? _____

End of Lab Exercise 1

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Lab Exercise 2: SRDF/Synchronous Operations

Purpose:	This lab exercise is designed to lead the students through SRDF/Synchronous Operations using EMC Solutions Enabler SYMCLI, command line interface. During this exercise, operations are performed from the host having access to the source (R1) volumes or the host with access to the target (R2) volumes. In our lab environment, the local host attached to the source VMAX3 array has access to R1 volumes, and the remote host attached to the target VMAX3 array has access to the R2 volumes. SRDF operations may be performed from either host.
Tasks:	In this lab exercise students will: 1) Create dynamic RDF Group 2) Create dynamic RDF pair 3) Perform basic SRDF operations – suspend, resume, change mode 4) Perform SRDF Disaster Recovery operations – failover and failback 5) Perform SRDF Decision Support operations – split, establish and restore
References:	EMC® Solutions Enabler SRDF Family Version 8.0.1 CLI User Guide VMAX® Family REV 01

Lab 2: Part 1 – Initial Setup and Basic Operations

Step	Action																								
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #</td><td></td><td>RDF Group #</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device # (eg. 05F)</td><td></td><td>Remote Device # (eg. 05F)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below <pre>C:\>symcfg -sid <Local SID> list -ra all</pre> Example: C:\> symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #		RDF Group #		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device # (eg. 05F)		Remote Device # (eg. 05F)	
Local VMAX3 Array		Remote VMAX3 Array																							
Local SID		Remote SID																							
RDF Group #		RDF Group #																							
Local RA 1:Port #		Remote RA 1:Port #																							
Local RA 2:Port #		Remote RA 2:Port #																							
Local Device # (eg. 05F)		Remote Device # (eg. 05F)																							
2	From the Local host, create a dynamic RDF group. <pre>C:\> symrdf addgrp -label rdfg<RDF Group #> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfg <RDF Group #> -remote_rdfg <RDF Group #></pre> Example: <pre>C:\> symrdf addgrp -label rdfg10 -sid 83 -remote_sid 25 -dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdfg 10 -remote_rdfg 10</pre>																								

Step	Action										
3	Verify that the dynamic RDF group has been created. <pre>C:\>symcfg -sid <Local SID> list -rdfg all</pre> What is the type of the new RDF group? _____										
4	List the VMAX3 devices that are accessible to your Local and Remote hosts. From the Local host: <pre>C:\> sympd list</pre> From the Remote host: <pre>C:\> sympd list</pre> Verify that the Local and Remote Devices assigned to you (recorded in step 1 – table) are accessible to your respective hosts. Record the information in the table below: <table><tr><th></th><th>Local host PHYSICALDRIVE# e.g. PHYSICALDRIVE7</th><th>Local Device Number e.g. 05F</th><th>Remote host PHYSICALDRIVE# e.g. PHYSICALDRIVE7</th><th>Remote Device Number e.g. 05F</th></tr><tr><td>Assigned Device Pair</td><td></td><td></td><td></td><td></td></tr></table>		Local host PHYSICALDRIVE# e.g. PHYSICALDRIVE7	Local Device Number e.g. 05F	Remote host PHYSICALDRIVE# e.g. PHYSICALDRIVE7	Remote Device Number e.g. 05F	Assigned Device Pair				
	Local host PHYSICALDRIVE# e.g. PHYSICALDRIVE7	Local Device Number e.g. 05F	Remote host PHYSICALDRIVE# e.g. PHYSICALDRIVE7	Remote Device Number e.g. 05F							
Assigned Device Pair											

Step	Action
5	On the Local host create a text file that contains the device number of the Local Device # and the Remote Device #. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful <code>createpair</code> operation. For example: <pre>C:\> notepad pair.txt</pre> <pre>05F 05F</pre>
6	From the Local host create a dynamic RDF device pair. <pre>C:\> symrdf -sid <Local SID> createpair -f pair.txt -rdfg <Local RDF Group #> -type r1 -establish -nop</pre> Example: <pre>C:\> symrdf -sid 83 createpair -f pair.txt -rdfg 10 -type r1 -establish -nop</pre>

Step	Action																																	
7	From the Local host, verify that the RDF device pair has been created. C:\> symrdf -sid <Local SID> -f pair.txt -rdfig <Local RDF Group #> query Example: C:\> symrdf -sid 83 -f pair.txt -rdfig 10 query Record the information in the table below: <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the State of the Source R1 Device? _____ What is the State of the Target R2 Device? _____ What is the SRDF mode? _____ What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
8	List the Physical devices accessible to your Local and Remote hosts, again. From the Local host: C:\> symdpd list What is the configuration of your Local device now? _____ From the Remote host: C:\> symdpd list What is the configuration of your Remote device now? _____																																	

Step	Action
9	On the Local host, create a SYMCLI device group of type RDF1 and add your R1 device to it. <pre>C:\> symdg create -type RDF1 srcdg<SGN></pre> Example: C:\> symdg create -type RDF1 srcdg5 <pre>C:\> symdg -g srcdg<SGN> add dev <Local Device #></pre> Example: C:\> symdg -g srcdg5 add dev 059
10	On the Remote host, create a SYMCLI device group of type RDF2 and add your R1 device to it. <pre>C:\> symdg create -type RDF2 tgt dg<SGN></pre> Example: C:\> symdg create -type RDF2 tgt dg5 <pre>C:\> symdg -g tgt dg<SGN> add dev <Remote Device #></pre> Example: C:\> symdg -g tgt dg5 add dev 059
11	Examine the properties of your device groups on both the Local and Remote hosts. The output of the command below is verbose so pipe it through more. On the Local host: <pre>C:\> symdg show srcdg<SGN> more</pre> On the Remote host: <pre>C:\> symdg show tgt dg<SGN> more</pre>

Step	Action																																	
12	From the Local host, change the SRDF mode to Synchronous for the device pair. <pre>C:\> symrdf -g srcdg<SGN> set mode sync</pre> Perform an RDF query and record the information in the table below. <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
13	From the Local host, suspend the RDF links for the device pair and perform an RDF query. <pre>C:\> symrdf -g srcdg<SGN> suspend</pre> <pre>C:\> symrdf -g srcdg<SGN> query</pre> What is the Link state? _____ What is the RDF Pair state? _____																																	

Step	Action
14	On the Local host: Create a partition, NTFS file system on the Source (R1) volume and assign a drive letter. In a command window, execute the <code>diskpart</code> command <code>C:\> diskpart</code> This will bring you to the DISKPART prompt, execute the series of commands as shown below: <code>DISKPART> list disk</code> You should see a listing of all disks. The list will show the disks as Disk #. If Source (R1) Device had a physical name of “PHYSICALDRIVE10” then it will be listed as “Disk 10” in the output. You have recorded your Source device PHYSICALDRIVE# in step 4 of this lab. <code>DISKPART>select disk # (Select the Disk that corresponds to Source (R1) device)</code> Example: <code>DISKPART>select Disk 10</code> <code>DISKPART> list partition</code> Are there any partitions on this disk? _____ There should be no partitions on this disk <code>DISKPART> create partition primary</code> <code>DISKPART> list partition</code> There should be one partition <code>DISKPART> select partition 1</code> <code>DISKPART> list volume</code> Record the drive letters in use: _____ The Volume with the “*” in the first column will not have an associated drive letter <code>DISKPART> format fs=ntfs label=rdffs<SGN> quick</code> Example: <code>DISKPART> format fs=ntfs label=rdffs08 quick</code> <code>DISKPART> assign letter=<choose a letter not in use></code> Example: <code>DISKPART> assign letter=F</code> <code>DISKPART> list volume</code> Your Volume should now have the Drive letter you assigned <code>DISKPART> exit</code>

Step	Action																																	
15	On the Local host, use Windows Explorer to copy the C : \Program Files\EMC\SYMCLI folder to the drive letter of your Source filesystem. Verify that the folder was copied. Close Windows Explorer.																																	
16	On the Local host, perform an RDF query. C : \> symrdf -g srcdg<SGN> query Record the information in the table below. <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there Invalid Tracks? _____ (There should be invalid tracks.) Where are the Invalid Tracks? _____ (Source (R1) View or Target (R2) View) Are the Invalid Tracks R1 Inv Tracks or R2 Inv Tracks? _____ How many Invalid Tracks have accumulated? _____ How do you interpret the Invalid Tracks? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
17	From the Local host, resume RDF links for the device pair and perform an RDF query. C : \> symrdf -g srcdg<SGN> resume C : \> symrdf -g srcdg<SGN> query What is the Link state? _____ Are there any Invalid Tracks? _____ What is the RDF Pair state? _____																																	

End of Lab 2 – Part 1

Lab 2: Part 2 – Disaster Recovery Operations

Step	Action
1	If you normally perform operations using a single device group, the <code>SYMCLI_DG</code> environment variable can be set to your default device group. This eliminates the requirement of specifying the device group using the <code>-g</code> flag. It is also useful to set this variable in scripts. The command <code>symcli -env</code> gives information about all the SYMCLI environment variables that can be set. On the Local host: <pre>C:\> set SYMCLI_DG=srtdg<SGN></pre> On the Remote host: <pre>C:\> set SYMCLI_DG=tgtdg<SGN></pre>
2	From the Local host, verify that the device pair is synchronized. <pre>C:\> symrdf query</pre> Note that as the environment variable has been set to point to <code>srtdg<SGN></code>, we do not have to specify <code>-g srtdg<SGN></code> in the command.
3	We cannot really simulate a disaster. So we will test our disaster recovery readiness. While in a disaster situation it is not possible to “gracefully” shutdown applications and unmount filesystems, it is always less risky to do so whenever possible, for example in a disaster recovery drill. Before enabling read/write access to the R2 device for the remote host, we first unmount the filesystem on the Local host. Un-mount the SRDF Source (R1) device filesystem. On the Local host: <pre>C:\> symntctl umount -drive <Source FS Drive letter>:</pre> Example: <code>C:\> symntctl umount -drive F:</code>

Step	Action																																		
4	Initiate <u>failover</u> of the SRDF volumes by executing the following command from the Remote host. For our test the failover command can be executed from the Local host, as we still have access to the Local host. However, in a true disaster situation, we may not have access to the Local host. On the Remote host: <pre>C:\>symrdf failover</pre> Note - The verbose output from the failover command. Each step is displayed as it is executed. We again do not have to specify <code>-g tgt dg<SGN></code> as we have set the environment variable.																																		
5	Perform an RDF query from the Remote host and record the information in the table below. <pre>C:\> symrdf query</pre> <table><tr><th colspan="5">Target (R2) View</th><th></th><th colspan="4">Source (R1) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the state of the R1 device? _____ What is the state of the Links? _____ What is the state of the R2 device? _____ What is the RDF Pair state? _____	Target (R2) View						Source (R1) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Target (R2) View						Source (R1) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																									

Step	Action
6	We can now verify access to data from the R2 device. On the Remote host: Use <code>diskpart</code> to assign a drive letter to the R2 device. <pre>C:\> diskpart</pre> <pre>DISKPART> rescan</pre> <pre>DISKPART> list disk</pre> You should see a listing of all disks. The list will show the disks as Disk #. If Remote (R2) device had a physical name of "PHYSICALDRIVE10" then it will be listed as "Disk 10" in the output. <pre>DISKPART>select disk # (Select the Disk that corresponds to Remote (R2) device)</pre> Example: <code>DISKPART> select disk 10</code> <pre>DISKPART> list partition</pre> Are there any partitions on this disk? _____ There should be one partition on this disk <pre>DISKPART> select partition 1</pre> <pre>DISKPART> list volume</pre> Record the drive letters in use: _____ Does the Volume with an "*" in the first column have a drive letter assigned to it? _____ If Yes – What is the Drive Letter? _____ If No: Assign a drive letter <pre>DISKPART> assign letter=<choose a letter not in use></pre> Example: <code>DISKPART> assign letter=F</code> <pre>DISKPART> list volume</pre> Your Volume should now have the Drive letter you assigned <pre>DISKPART> exit</pre>

Step	Action																																	
7	On the Remote host, use Windows Explorer to examine the contents of the Filesystem on the R2 device. Do you have access to the same data that was on R1 device before the failover?																																	
8	We will add some new data to the Filesystem on the R2 device, to simulate production after a failover. On the Remote host, use Windows Explorer to copy the folder C:\Program Files\EMC\SYMAPI to the drive letter of the R2 device. Close Windows Explorer.																																	
9	In a <code>FailedOver</code> state, changes made to the R2 device are not propagated to the R1 as the links are set to Not Ready. Perform an RDF query from the Remote host and record the information in the table below. C:\> symrdf query <table><tr><th colspan="4">Target (R2) View</th><th></th><th colspan="4">Source (R1) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there any Invalid Tracks? _____ There should be. Where are the Invalid Tracks? (Source (R1) View or Target (R2) View)_____ Are the Invalid Tracks R1 Inv Tracks or R2 Inv Tracks? _____ How many Invalid Tracks? _____	Target (R2) View					Source (R1) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Target (R2) View					Source (R1) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action																																	
10	We will now resume production work from the R1 device. Prior to performing an SRDF Failback operation, it is important to stop accessing the R2 device. Failback operation will set the state of the R2 device to Write Disabled. If a device that is being actively accessed is set to WD, unpredictable results can happen. On the Remote host: <pre>C:\> symntctl umount -drive <Remote FS Drive letter>:</pre> Example: C:\> symntctl umount -drive F:																																	
11	From the Local host, perform an SRDF Failback operation. <pre>C:\> symrdf failback</pre> Perform an SRDF query and record the information in the table below. <pre>C:\> symrdf query</pre> <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is state of the R1 device? _____ What is the state of the Link? _____ What is the state of the R2 device? _____ What is the RDF Pair state? _____ Are there any Invalid Tracks? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action
12	On the Local host, use diskpart to assign drive letter the R1 device. We have done this a few times. <pre>(diskpart > rescan > list disk > select disk # > list partition > select partition 1 > list volume > assign letter=<Source FS Drive letter> > exit)</pre>
13	On the Local host, use Windows Explorer to examine the contents of the R1 device Filesystem. Does Filesystem contain the additional data that was added to the R2 device File System after the Failover? _____ Close Windows Explorer.

End of Lab 2 – Part 2

Lab 2: Part 3 – Decision Support/Concurrent Access Operations

Step	Action																																		
1	From the Local host, perform an SRDF Split operation. <pre>C:\> symrdf split</pre> Perform an SRDF query and record the information in the table below. <table><tr><th colspan="5">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the state of the R1 device? _____ What is the state of the Link? _____ What is the state of the R2 device? _____	Source (R1) View						Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View						Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																									
2	Both hosts have access to copies of the same information but if either the local or the remote host makes changes to the filesystem, the other host does not reflect the change. Again, this may be useful in situations where you wish to perform tests without impacting production data. From the Remote host, use <code>diskpart</code> to rescan disk and assign drive letter to the R2 device. <pre>(diskpart > rescan > list disk > select disk # > list partition > select partition 1 > list volume > assign letter=<Remote FS Drive letter> > exit)</pre>																																		
3	Use Windows Explorer on Local and Remote hosts to verify that the two have access to identical data.																																		

Step	Action																																	
4	On the Local host, use Windows Explorer to delete the SYMAPI folder from the Source (R1) device. Which folder is available on the Source (R1) device now? _____ Close Windows Explorer. Perform an SRDF query and record the information in the table below. C:\> symrdf query <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there Invalid Tracks? _____ Where are the Invalid Tracks? _____ (Source or Target) What do the Invalid Tracks indicate? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action																																		
5	On the Remote host, use Windows Explorer to delete the SYMCLI folder from the Remote (R2) device. Which folder is available on the Remote (R2) device now? _____ Close Windows Explorer. Perform an SRDF query and record the information in the table below. C:\> symrdf query <table><tr><th colspan="5">Target (R2) View</th><th></th><th colspan="4">Source (R1) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there Invalid Tracks? _____ Where are the Invalid Tracks? _____ What do the Invalid Tracks indicate? _____	Target (R2) View						Source (R1) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Target (R2) View						Source (R1) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																									
6	Prior to resuming SRDF mirroring, it is important to stop accessing the R2 device as it will be set to Write-Disabled. On the Remote host: C:\> symntctl umount -drive <Remote FS Drive letter>: Example: C:\> symntctl umount -drive F:																																		

Step	Action																																	
7	We will perform an SRDF Establish operation to save the changes made to the Source device and discard the changes made to the Remote device. From the Local host: <pre>C:\> symrdf establish</pre> Perform an SRDF query and record the information in the table below. <pre>C:\> symrdf query</pre> <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the state of the R1 device? _____ What is the state of the Link? _____ What is the state of the R2 device? _____ What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
8	To observe the result of an SRDF Restore operation, we will once again perform an SRDF Split to enable Read-Write access to both the Source and Remote devices. From the Local host: <pre>C:\> symrdf split</pre>																																	

Step	Action
9	On the Remote host, use <code>diskpart</code> to rescan disk and assign drive letter to the Remote (R2) device. <pre>(diskpart > rescan > list disk > select disk # > list partition > select partition 1 > list volume > assign letter=<Remote FS Drive letter> > exit)</pre>
10	On the Remote host, use Windows Explorer to examine the contents of the Remote FS. Which folder is available? _____ Is this the same as the folder available on the R1 device? _____ Close Windows Explorer. The SRDF Restore operation will set the Remote (R2) device to Write-Disabled. So it is important to stop accessing the R2 device. Unmount the Remote FS. <pre>C:\> symntctl umount -drive <Remote FS Drive letter>:</pre> Example: C:\> symntctl umount -drive F:
11	On the Local host, use Windows Explorer to delete the SYMCLI folder. Close Windows Explorer.
12	When performing an SRDF Restore operation, the contents of the Source FS will change. So it is important to stop accessing the Source device. We can access the Source device immediately after the Restore command completes. On the Local host: <pre>C:\> symntctl umount -drive <Source FS Drive letter>:</pre> Example: C:\> symntctl umount -drive F:

Step	Action
13	From the Local host, perform an SRDF Restore operation. <pre>C:\> symrdf restore</pre>
14	On the Local host, use diskpart to rescan disk and assign drive letter to the Source (R1) device. <pre>(diskpart > rescan > list disk > select disk # > list partition > select partition 1 > list volume > assign letter=<Source FS Drive letter> > exit)</pre>
15	On the Local host, use Windows Explorer to examine the contents of the Source FS. Is the SYMCLI folder restored? _____ Close Windows Explorer. Unmount Source FS. <pre>C:\> symntctl umount -drive <Source FS Drive letter>:</pre> Example: C:\> symntctl umount -drive F:

End of Lab Exercise 2

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Lab Exercise 3: SRDF/Asynchronous Operations

Purpose:	This lab exercise is designed to lead the students through SRDF/Asynchronous Operations using EMC Solutions Enabler SYMCLI, command line interface.
Tasks:	In this lab exercise students will: 1) Create and remove dynamic RDF Groups 2) Create and delete dynamic RDF pairs 3) Enable and disable SRDF/Asynchronous mode of operation for devices in a device group 4) Configure Concurrent SRDF 5) Create Consistency Group and manage SRDF/A Multi-session Consistency
References:	EMC® Solutions Enabler SRDF Family Version 8.0.1 CLI User Guide VMAX® Family REV 01

Lab 3: Part 1 – Single Session SRDF/A

Step	Action																								
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #</td><td></td><td>RDF Group #</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device # (e.g. 049)</td><td></td><td>Remote Device # (e.g. 049)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below <pre>C:\>symcfg -sid <Local SID> list -ra all</pre> Example: C:\> symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #		RDF Group #		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device # (e.g. 049)		Remote Device # (e.g. 049)	
Local VMAX3 Array		Remote VMAX3 Array																							
Local SID		Remote SID																							
RDF Group #		RDF Group #																							
Local RA 1:Port #		Remote RA 1:Port #																							
Local RA 2:Port #		Remote RA 2:Port #																							
Local Device # (e.g. 049)		Remote Device # (e.g. 049)																							
2	From the Local host, create a dynamic RDF group. <pre>C:\> symrdf addgrp -label rdfg<RDF Group #> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfg <RDF Group #> -remote_rdfg <RDF Group #></pre> Example: <pre>C:\> symrdf addgrp -label rdfg20 -sid 83 -remote_sid 25 -dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdfg 20 -remote_rdfg 20</pre>																								

Step	Action										
3	Verify that the dynamic RDF group has been created. C:\>symcfg -sid <Local SID> list -rdfg all What is the type of the new RDF group? _____										
4	List the VMAX3 devices that are accessible to your Local and Remote hosts. From the Local host: C:\> sympd list From the Remote host: C:\> sympd list Verify that the Local and Remote Devices assigned to you (recorded in step 1 – table) are accessible to your respective hosts. Record the information in the table below: <table><tr><th></th><th>Local host PHYSICALDRIVE# e.g. PHYSICALDRIVE8</th><th>Local Device Number e.g. 049</th><th>Remote host PHYSICALDRIVE# e.g. PHYSICALDRIVE8</th><th>Remote Device Number e.g. 049</th></tr><tr><td>Assigned Device Pair</td><td></td><td></td><td></td><td></td></tr></table>		Local host PHYSICALDRIVE# e.g. PHYSICALDRIVE8	Local Device Number e.g. 049	Remote host PHYSICALDRIVE# e.g. PHYSICALDRIVE8	Remote Device Number e.g. 049	Assigned Device Pair				
	Local host PHYSICALDRIVE# e.g. PHYSICALDRIVE8	Local Device Number e.g. 049	Remote host PHYSICALDRIVE# e.g. PHYSICALDRIVE8	Remote Device Number e.g. 049							
Assigned Device Pair											

Step	Action
5	On the Local host create a text file that contains the device number of the Local Device # and the Remote Device #. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful <code>createpair</code> operation. For example: <pre>C:\> notepad pair2.txt</pre> <pre>049 049</pre>
6	From the Local host create a dynamic RDF device pair. <pre>C:\> symrdf -sid <Local SID> createpair -f pair2.txt -rdfg <Local RDF Group #> -type r1 -establish -g asyncdg<SGN> - nop</pre> Note the use of <code>-g asyncdg<SGN></code>. This will create a device group of type R1, named <code>asyncdg<SGN></code> and add your R1 device to it. Example: <pre>C:\> symrdf -sid 83 createpair -f pair2.txt -rdfg 20 -type r1 -establish -g asyncdg5 -nop</pre>

Step	Action																																	
7	From the Local host, verify that the device group and the RDF device pair have been created. <pre>C:\> symdg list</pre> <pre>C:\> symrdf -g asyncdg<SGN> query</pre> Example: <pre>C:\> symrdf -g asyncdg5 query</pre> Record the information in the table below: <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the State of the Source R1 Device? _____ What is the State of the Target R2 Device? _____ What is the SRDF mode? _____ What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action																																		
8	From the Local host, set the SRDF mode to Asynchronous for the device in the Device Group. <pre>C:\> symrdf -g asyncdg<SGN> set mode async</pre> Enable consistency protection. <pre>C:\> symrdf -g asyncdg enable</pre> Perform an SRDF Query to verify status of SRDF/A. <pre>C:\> symrdf -g asyncdg<SGN> query -rdfa</pre> Note: The output is verbose. You can pipe through more to examine the output in detail. Record the information in the table below. <table><tr><th colspan="5">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the RDFA Cycle number? _____ What is the RDFA Session Status? _____ What is the RDFA Minimum Cycle Time? _____ What is the RDF Consistency State? _____ What is the RDF Pair State? _____	Source (R1) View						Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View						Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																									

Step	Action
9	On the Local host: Create a partition, NTFS file system on the Source (R1) volume and assign a drive letter. In a command window, execute the <code>diskpart</code> command <code>C:\> diskpart</code> This will bring you to the DISKPART prompt, execute the series of commands as shown below: <code>DISKPART> list disk</code> You should see a listing of all disks. The list will show the disks as Disk #. If Source (R1) Device had a physical name of “PHYSICALDRIVE8” then it will be listed as “Disk 8” in the output. You have recorded your Source device PHYSICALDRIVE# in step 4 of this lab. <code>DISKPART>select disk # (Select the Disk that corresponds to Source (R1) device)</code> Example: <code>DISKPART>select Disk 8</code> <code>DISKPART> list partition</code> Are there any partitions on this disk? _____ There should be no partitions on this disk <code>DISKPART> create partition primary</code> <code>DISKPART> list partition</code> There should be one partition <code>DISKPART> select partition 1</code> <code>DISKPART> list volume</code> Record the drive letters in use: _____ The Volume with the “*” in the first column will not have an associated drive letter <code>DISKPART> format fs=ntfs label=rdfafs<SGN> quick</code> Example: <code>DISKPART> format fs=ntfs label=rdfafs5 quick</code> <code>DISKPART> assign letter=<choose a letter not in use></code> Example: <code>DISKPART> assign letter=G</code> <code>DISKPART> list volume</code> Your Volume should now have the Drive letter you assigned <code>DISKPART> exit</code>

Step	Action
10	On the Local host, use Windows Explorer to copy the contents of C:\Program Files\EMC to the Source (R1) filesystem.
11	From the Local host, monitor SRDF/A cache usage. <pre>C:\> symstat -type cache -reptype rdfa -sid <Local SID> -i 60 -c 5</pre> What is the System Write Pending Limit? _____ How much cache is available for SRDF/A? _____ How much cache is SRDF/A using? _____
12	We cannot really simulate a disaster. So we will test our disaster recovery readiness. While in a disaster situation it is not possible to “gracefully” shutdown applications and unmount filesystems, it is always less risky to do so whenever possible, for example in a disaster recovery drill. Before enabling read/write access to the R2 device for the remote host, we first unmount the filesystem on the Local host. Un-mount the SRDF Source (R1) device filesystem. On the Local host: <pre>C:\> symntctl umount -drive <Source FS Drive letter>:</pre> Example: C:\> symntctl umount -drive G:
13	In a true disaster situation the Source site/array/host may not be accessible. We have seen in the SRDF/Synchronous lab that we can perform SRDF operations from the R2 side using Device Groups of type RDF2 containing R2 devices. For illustration in this lab, we will perform an SRDF Failover from the Local host. From the Local host: <pre>C:\> symrdf -g asyncdg<SGN> failover -force</pre> Note the use of <code>-force</code> flag. This is required because the RDF group has been enabled for consistency protection.

Step	Action
14	As in SRDF/Synchronous lab we can verify data on the R2 device from the Remote host. On the Remote host, use <code>diskpart</code> to rescan disk and assign drive letter to the Remote (R2) device. <pre>(diskpart > rescan > list disk > select disk # > list partition > select partition 1 > list volume > assign letter=<Remote FS Drive letter> > exit)</pre>
15	On the Remote host, use Windows Explorer to examine the contents of the Remote device filesystem. Close Windows Explorer. The SRDF Failback operation will set the Remote (R2) device to Write-Disabled. So it is important to stop accessing the R2 device. Unmount the Remote FS. <pre>C:\> symntctl umount -drive <Remote FS Drive letter>:</pre> Example: C:\> symntctl umount -drive G:
16	From the Local host, resume SRDF/A mode using the procedure below. If you want to avoid typing <code>-g asyncdg<SGN></code> over and over, set the environment variable! <pre>C:\> symrdf -g asyncdg<SGN> disable C:\> symrdf -g asyncdg<SGN> set mode acp_disk C:\> symrdf -g asyncdg<SGN> failback C:\> symrdf -g asyncdg<SGN> query (verify RDF Pair State Synchronized) C:\> symrdf -g asyncdg<SGN> set mode async C:\> symrdf -g asyncdg<SGN> enable C:\> symrdf -g asyncdg<SGN> query -rdfa</pre>

Step	Action
17	Lab Cleanup: As a preparation for the next lab, perform the cleanup procedure listed below. From the Local host: <pre> C:\> symrdf -g asyncdg<SGN> disable C:\> symrdf -g asyncdg<SGN> suspend C:\> symrdf -sid <Local SID> deletepair -f pair2.txt - rdfg < RDF Group #> C:\> symrdf -sid <Local SID> removegrp -rdfg <RDF Group #> C:\> symdg delete asyncdg<SGN> -force </pre>

End of Lab 3 – Part 1

Lab 3: Part 2 – Concurrent SRDF

Step	Action																																
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #1</td><td></td><td>RDF Group #1</td><td></td></tr><tr><td>RDF Group #2</td><td></td><td>RDF Group #2</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device # (eg. 049)</td><td></td><td>Remote Device #1 (eg. 049)</td><td></td></tr><tr><td></td><td></td><td>Remote Device #2 (e.g 09A)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below <pre>C:\>symcfg -sid <Local SID> list -ra all</pre> Example: C:\> symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #1		RDF Group #1		RDF Group #2		RDF Group #2		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device # (eg. 049)		Remote Device #1 (eg. 049)				Remote Device #2 (e.g 09A)	
Local VMAX3 Array		Remote VMAX3 Array																															
Local SID		Remote SID																															
RDF Group #1		RDF Group #1																															
RDF Group #2		RDF Group #2																															
Local RA 1:Port #		Remote RA 1:Port #																															
Local RA 2:Port #		Remote RA 2:Port #																															
Local Device # (eg. 049)		Remote Device #1 (eg. 049)																															
		Remote Device #2 (e.g 09A)																															
2	From the Local host, create a dynamic RDF group. <pre>C:\> symrdf addgrp -label rdfig<RDF Group #1> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfig <RDF Group #1> -remote_rdfg <RDF Group #1></pre> Example: <pre>C:\> symrdf addgrp -label rdfig30 -sid 83 -remote_sid 25 -dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdfig 30 -remote_rdfg 30</pre>																																

Step	Action
3	On the Local host create a text file that contains the device number of the Local Device # and the Remote Device #1. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful createpair operation. For example: <pre>C:\> notepad pair3.txt</pre> <pre>049 049</pre>
4	From the Local host create a dynamic RDF device pair in Local RDF Group #1. <pre>C:\> symrdf -sid <Local SID> createpair -f pair3.txt -rdfg <Local RDF Group #1> -type r1 -establish -g concdg<SGN> -nop</pre> Note the use of -g concdg<SGN>. This will create a device group of type R1, named concdg<SGN> and add your R1 device to it. Example: <pre>C:\> symrdf -sid 83 createpair -f pair3.txt -rdfg 30 -type r1 -establish -g concdg5 -nop</pre>
5	From the Local host, create another dynamic RDF group. <pre>C:\> symrdf addgrp -label rdfg<RDF Group #2> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfg <RDF Group #2> -remote_rdfg <RDF Group #2></pre> Example: <pre>C:\> symrdf addgrp -label rdfg40 -sid 83 -remote_sid 25 -dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdfg 40 -remote_rdfg 40</pre>

Step	Action
6	On the Local host create another text file that contains the device number of the Local Device # and the Remote Device #2. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful <code>createpair</code> operation. For example: <pre>C:\> notepad pair4.txt</pre> <pre>049 09A</pre>
7	From the Local host create a dynamic RDF device pair. This will add a second R2 mirror to the R1 device to complete the Concurrent SRDF configuration. <pre>C:\> symrdf -sid <Local SID> createpair -f pair4.txt -rdfg <Local RDF Group #2> -type r1 -establish -nop</pre> Example: <pre>C:\> symrdf -sid 83 createpair -f pair4.txt -rdfg 40 -type r1 -establish -nop</pre>
8	From the Local host, set the SRDF mode for the RDF Group #1 to Synchronous. <pre>C:\> symrdf -g concdg<SGN> set mode sync -rdfg <RDF Group #1></pre> Example: <pre>C:\> symrdf -g concdg5 set mode sync -rdfg 30</pre>

Step	Action
9	From the Local host, set the SRDF mode for the RDF Group #2 to Asynchronous. <pre>C:\> symrdf -g concdg<SGN> set mode async -rdfg <RDF Group #2></pre> Example: <pre>C:\> symrdf -g concdg5 set mode async -rdfg 40</pre> Enable Consistency protection for the Asynchronous RDF Group. <pre>C:\> symrdf -g concdg<SGN> enable -rdfg <RDF Group #2></pre>
10	From the Local host, perform an SRDF Query of the Device Group. <pre>C:\> symrdf -g concdg<SGN> query -rdfg all</pre> How many R2 devices are paired with the R1? _____ What is the SRDF mode for the device pair in RDF Group #1? _____ What is the RDF Pair State for the device pair in RDF Group #1? _____ What is the SRDF mode for the device pair in RDF Group #2? _____ What is the RDF Pair State for the device pair in RDF Group #2? _____

Step	Action
11	Lab Cleanup: As a preparation for the next lab, perform the cleanup procedure listed below. From the Local host: <pre>C:\> symrdf -g concdg<SGN> disable -rdfg <RDF Group #2></pre> <pre>C:\> symrdf -g concdg<SGN> split -rdfg all</pre> <pre>C:\> symrdf -g concdg<SGN> deletepair -rdfg <RDF Group #1></pre> <pre>C:\> symrdf -g concdg<SGN> deletepair -rdfg <RDF Group #2></pre> <pre>C:\> symdg delete concdg<SGN> -force</pre> <pre>C:\> symrdf -sid <Local SID> removegrp -rdfg <RDF Group #1></pre> <pre>C:\> symrdf -sid <Local SID> removegrp -rdfg <RDF Group #2></pre> Verify deletion of RDF Pair, Device Group and RDF Groups. <pre>C:\> sympd list</pre> What is the configuration of your Local Device # ? _____ <pre>C:\> symdg list</pre> Is concdg<SGN> listed? _____ <pre>C:\> symcfg -sid <Local SID> list -rdfg all</pre> Are RDF Group #1 and RDF Group #2 listed? _____

End of Lab 3 – Part 2

Lab 3: Part 3 – SRDF/A – Multi-session Consistency (MSC)

Step	Action																																
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #1</td><td></td><td>RDF Group #1</td><td></td></tr><tr><td>RDF Group #2</td><td></td><td>RDF Group #2</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device #1 (e.g. 049)</td><td></td><td>Remote Device #1 (e.g. 049)</td><td></td></tr><tr><td>Local Device #2 (e.g. 09A)</td><td></td><td>Remote Device #2 (e.g. 09A)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below C:\>symcfg -sid <Local SID> list -ra all Example: C:\> symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #1		RDF Group #1		RDF Group #2		RDF Group #2		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device #1 (e.g. 049)		Remote Device #1 (e.g. 049)		Local Device #2 (e.g. 09A)		Remote Device #2 (e.g. 09A)	
Local VMAX3 Array		Remote VMAX3 Array																															
Local SID		Remote SID																															
RDF Group #1		RDF Group #1																															
RDF Group #2		RDF Group #2																															
Local RA 1:Port #		Remote RA 1:Port #																															
Local RA 2:Port #		Remote RA 2:Port #																															
Local Device #1 (e.g. 049)		Remote Device #1 (e.g. 049)																															
Local Device #2 (e.g. 09A)		Remote Device #2 (e.g. 09A)																															
2	From the Local host, create a <u>two</u> dynamic RDF groups. C:\> symrdf addgrp -label rdfg<RDF Group #1> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfg <RDF Group #1> -remote_rdfg <RDF Group #1> C:\> symrdf addgrp -label rdfg<RDF Group #2> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfg <RDF Group #2> -remote_rdfg <RDF Group #2>																																

Step	Action
3	From the Local host, verify that the RDF Groups were created. <pre>C:\> symcfg -sid <Local SID> list -rdfg all</pre>
4	On the Local host, create text file <code>mscpair1.txt</code> that contains the device number of the Local Device #1 and the Remote Device #1. For example: <pre>C:\> notepad mscpair1.txt</pre> <pre>049 049</pre>
5	From the Local host create a dynamic RDF device pair in Local RDF Group #1. <pre>C:\> symrdf -sid <Local SID> createpair -f mscpair1.txt -rdfg <Local RDF Group #1> -type r1 -rdf_mode async -establish -g mscldg<SGN> -nop</pre> Note the use of <code>-g mscldg<SGN></code>. This will create a device group of type R1, named <code>mscldg<SGN></code> and add your R1 device to it. The use of <code>-rdf_mode</code> will override the default of <code>ACP_Disk</code> and the device pair will be placed in SRDF Asynchronous mode. Example: <pre>C:\> symrdf -sid 83 createpair -f mscpair1.txt -rdfg 30 -type r1 -rdf_mode async -establish -g mscldg5 -nop</pre>
6	On the Local host, create another text file <code>mscpair2.txt</code> that contains the device number of the Local Device #2 and the Remote Device #2. For example: <pre>C:\> notepad mscpair2.txt</pre> <pre>09A 09A</pre>

Step	Action
7	From the Local host create a dynamic RDF device pair in Local RDF Group #2. <pre>C:\> symrdf -sid <Local SID> createpair -f mscpair1.txt -rdfg <Local RDF Group #2> -type r1 -rdf_mode async -establish -g msc2dg<SGN> -nop</pre> Note the use of <code>-g msc2dg<SGN></code>. This will create a device group of type R1, named <code>msc2dg<SGN></code> and add your R1 device to it. The use of <code>-rdf_mode</code> will override the default of <code>ACP_Disk</code> and the device pair will be placed in SRDF Asynchronous mode. Example: <pre>C:\> symrdf -sid 83 createpair -f mscpair2.txt -rdfg 40 -type r1 -rdf_mode async -establish -g msc2dg5 -nop</pre>
8	From the Local host, perform an SRDF Query of the two device groups. <pre>C:\> symrdf -g msc1dg<SGN> query</pre> <pre>C:\> symrdf -g msc2dg<SGN> query</pre> Are the two device pairs in Synchronized RDF Pair state? _____
9	On the Local host, verify that the <code>storapid</code> and <code>storrdfd</code> daemons are running. <pre>C:\> stordaeomon list</pre> If not start the daemons: <pre>C:\> stordaeomon start storapid</pre> <pre>C:\> stordaeomon start storrdfd</pre> Verify that the option <code>SYMAPI_USE_RDFD</code> is set to <code>ENABLE</code> in the options file (C:\Program Files\EMC\SYMAPI\Config\options)

Step	Action
10	From the Local host, create a composite group with RDF Consistency. <pre>C:\> symcg create msc<SGN>cg -type RDF1 - rdf_consistency</pre> Verify that the Consistency Group was created. <pre>C:\> symcg list</pre>
11	From the Local host, add the two device groups to the Consistency Group. <pre>C:\> symcg -cg msc<SGN>cg add dg msc1dg<SGN></pre> <pre>C:\> symcg -cg msc<SGN>cg add dg msc2dg<SGN></pre> Examine the properties of the Consistency Group. <pre>C:\> symcg show msc<SGN>cg</pre>
12	From the Local host, enable Multi-session Consistency protection for the Consistency Group. <pre>C:\> symrdf -cg msc<SGN>cg enable</pre>

Step	Action
13	From the Local host, perform an SRDF Query of the Consistency Group. <pre>C:\> symrdf -cg msc<SGN>cg query -rdfa</pre> What is the RDF Consistency Mode? _____ What is the status of the MSC Session? _____ What is the Consistency State? _____ What is the Session Status for <RDF Group #1>? _____ What is the Session Status for <RDF Group #2>? _____ What is the Cycle Number for <RDF Group #1>? _____ What is the Cycle Number for <RDF Group #2>? _____
14	From the Local host, to illustrate MSC we will split one of the RDF Groups in the Consistency Group. As Consistency has been enabled, the split will require the – force option as shown below. <pre>C:\> symrdf -cg msc<SGN>cg split -immediate -force -rdfg <Local SID>:<RDF Group #1></pre> Example: <pre>C:\> symrdf -cg msc<SGN>cg split -immediate -force -rdfg 83:30</pre>

Step	Action
15	From the Local host, perform an SRDF Query of the Consistency Group. <pre>C:\> symrdf -cg msc<SGN>cg query -rdfa</pre> What is the RDF Consistency Mode? _____ What is the status of the MSC Session? _____ What is the Consistency State? _____ What is the Session Status for <RDF Group #1>? _____ What is the Session Status for <RDF Group #2>? _____ What is the RDF Pair state for <RDF Group #1>? _____ What is the RDF Pair state for <RDF Group #2>? _____
16	From the Local host, perform an SRDF Establish operation for the Consistency Group. <pre>C:\> symrdf -cg msc<SGN>cg establish</pre>
17	From the Local host, perform an SRDF Query of the Consistency Group and verify Consistent state for both the SRDF device pairs. <pre>C:\> symrdf -cg msc<SGN>cg query -rdfa -i 10</pre> You can use <Ctrl-c> to abort the command once Consistent state has been reached.

Step	Action
18	Lab cleanup: From the Local host <pre> C:\> symcg -cg msc<SGN>cg disable C:\> symcg -cg msc<SGN>cg suspend C:\> symcg delete msc<SGN>cg -force C:\> symrdf -sid <Local SID> deletepair -f mscpair1.txt -rdfg <RDF Group #1> C:\> symrdf -sid <Local SID> deletepair -f mscpair2.txt -rdfg <RDF Group #2> C:\> symrdf -sid <Local SID> removegrp -rdfg <RDF Group #1> C:\> symrdf -sid <Local SID> removegrp -rdfg <RDF Group #2> C:\> symdg delete msc1dg<SGN> -force C:\> symdg delete msc2dg<SGN> -force </pre>

End of Lab Exercise 3

End of Lab Exercises on Windows 2008 Hosts

VMAX3 Business Continuity Management Lab Guide – Sun Solaris Hosts

March 2015

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Lab Exercise 1: TimeFinder SnapVX Operations

Purpose:	This lab exercise is designed to lead the students through TimeFinder SnapVX Operations using EMC Solutions Enabler SYMCLI, command line interface.
Tasks:	In this lab exercise students will: 1) Create TimeFinder SnapVX snapshots. 2) Link snapshots to Target device and access point-in-time data from a Secondary host. 3) Restore from snapshot to Source device. 4) Restore modified data from Target device to the Source device.
References:	EMC® Solutions Enabler TimeFinder® Family Version 8.0.1 CLI User Guide VMAX® and VMAX3™ Family REV 01

Lab 1: Part 1 – Creating Snapshots

Step	Action						
1	Identify the device assigned as the Source for SnapVX snapshots. On the Primary host, find the Standard Volume assigned as your Source and complete the table. Use the commands, sympd list and syminq to get the information you need. <pre># sympd list more # syminq</pre> <table><tr><th>Source Device</th><th>PdevName (e.g. emcpower2c)</th><th>SymDevName (e.g. 069)</th></tr><tr><td>Device 1</td><td></td><td></td></tr></table>	Source Device	PdevName (e.g. emcpower2c)	SymDevName (e.g. 069)	Device 1		
Source Device	PdevName (e.g. emcpower2c)	SymDevName (e.g. 069)					
Device 1							

Step	Action
2	On the Primary host: Format the Source device identified in step 1. The partition in the device list shown by the format command may be something other than “c”. So emcpower8c may be listed as emcpower8a. Example: <pre> sun-88-77/> format Searching for disks...done AVAILABLE DISK SELECTIONS: 0. c1t0d0 <DEFAULT cyl 4092 alt 2 hd 128 sec 32> /pci@0,0/pci15ad,1976@10/sd@0,0 23. emcpower2a <DEFAULT cyl 1022 alt 2 hd 128 sec 32> /pseudo/emcp@2 24. emcpower3a <DEFAULT cyl 1022 alt 2 hd 128 sec 32> /pseudo/emcp@3 Specify disk (enter its number): 23 selecting emcpower2a [disk formatted] format> quit </pre>

Step	Action
3	On the Primary host: Create a filesystem on Source device, mount the filesystem and add data to it. Create a filesystem: <pre># newfs -v /dev/rdsk/<Physical Device Name of the Source></pre> Example: # newfs -v /dev/rdsk/emcpower2c Create a mount point: <pre># mkdir /srcfs<SGN></pre> Example: # mkdir /srcfs5 Mount the filesystem: <pre># mount /dev/dsk/<Physical Device Name of the Source> /srcfs<SGN></pre> Example: # /dev/dsk/emcpower2c /srcfs<SGN> Add data to the filesystem on the Source device: The script will create 20 files in the specified directory. Ask your instructor for the path/location of the script on your assigned host. <pre># ./createfiles.sh /srcfs<SGN> 20 -nop</pre> Verify that the files were created: <pre># cd /srcfs<SGN></pre> <pre># ls</pre> <pre># ls -l /srcfs<SGN>/test* wc -l</pre> How many files were created? _____

Step	Action						
4	On the Secondary host: Identify the Device assigned as your Target for SnapVX operations. Record the information about your assigned Target device in the table below. <pre># sympd list more # syminq</pre> <table><tr><th>Target Device</th><th>PdevName (e.g. emcpower3c)</th><th>SymDevName (e.g. 06F)</th></tr><tr><td>Device 1</td><td></td><td></td></tr></table>	Target Device	PdevName (e.g. emcpower3c)	SymDevName (e.g. 06F)	Device 1		
Target Device	PdevName (e.g. emcpower3c)	SymDevName (e.g. 06F)					
Device 1							

Step	Action
5	On the Primary host: Create a Storage Group and add your Source device to the Storage Group. <pre># symsg -sid <Symmetrix ID> create snapsrc_sg_<SGN></pre> <pre># symsg -sid <Symmetrix ID> -sg snapsrc_sg_<SGN> add dev <SourceSymDevName></pre> Create another Storage Group and add your Target device to the Storage Group. <pre># symsg -sid <Symmetrix ID> create snaptgt_sg_<SGN></pre> <pre># symsg -sid <Symmetrix ID> -sg snaptgt_sg_<SGN> add dev <TargetSymDevName></pre> The Source and Target SymDevNames are three digit numbers that were recorded earlier in steps 1 and 4. Verify that the Storage Groups have been created. <pre># symsg list -sid <Symmetrix ID></pre> <pre># symsg show -sid <Symmetrix ID> snapsrc_sg<SGN></pre> <pre># symsg show -sid <Symmetrix ID> snaptgt_sg<SGN></pre>

Step	Action
6	From the Primary host: Create a SnapVX snapshot. <pre># symsnapvx -sid <Symmetrix ID> establish -name backup<SGN> -sg snapsrc_sg<SGN></pre> List Snapshot. <pre># symsnapvx -sid <Symmetrix ID> list</pre> <pre># symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> How many generations are listed? _____ Is there an expiration date for the snapshot? _____ What is the generation number for this snapshot? _____ Is the snapshot linked to a target? _____
7	On the Primary host: Add more data to the Source device. <pre># ./createfiles.sh /srcfs<SGN> 20 -nop</pre> Verify that the files were created: <pre># ls -l /srcfs<SGN>/test* wc -l</pre> How many files are there now? _____

Step	Action
8	From the Primary host: Create a second snapshot, using the same name. <pre># symsnapvx -sid <Symmetrix ID> establish -name backup<SGN> -sg snapsrc_sg<SGN></pre> List the Snapshots. <pre># symsnapvx -sid <Symmetrix ID> list</pre> <pre># symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> How many generations are listed? _____ What is the generation number for this snapshot? _____ What is the generation number for the earlier snapshot? _____
9	On the Primary host: Add more data to the Source device. <pre># ./createfiles.sh /srcfs<SGN> 20 -nop</pre> Verify that the files were created: <pre># ls -l /srcfs<SGN>/test* wc -l</pre> How many files are there now? _____

Step	Action												
10	From the Primary host: Create a third snapshot, using the same name. <pre># symsnapvx -sid <Symmetrix ID> establish -name backup<SGN> -sg snapsrc_sg<SGN></pre> List the Snapshots. <pre># symsnapvx -sid <Symmetrix ID> list</pre> <pre># symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> How many generations are listed? _____ What is the generation number for this snapshot? _____ What is the generation number for the earlier snapshot? _____ Record the information for table below. <table><tr><th>Gen</th><th>Total Deltas (Tracks)</th><th>Non-shared (Tracks)</th></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></table>	Gen	Total Deltas (Tracks)	Non-shared (Tracks)									
Gen	Total Deltas (Tracks)	Non-shared (Tracks)											
11	From the Primary host: Set the Time-to-Live for generation 2 snapshot. <pre># symsnapvx -sid <Symmetrix ID> -snapshot_name backup<SGN> -gen 2 -sg snapsrc_sg<SGN> set ttl -delta 2</pre> <pre># symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> What is the expiration date now for generation 2? _____												

End of Lab 1 – Part 1

Lab 1: Part 2 – Accessing Snapshot Data from a Secondary Host

Step	Action
1	From the Secondary host: Link the generation 0 snapshot to the target volume. <pre># symsnapvx -sid <Symmetrix ID> link -snapshot_name backup<SGN> -gen 0 -sg snapsrc_sg<SGN> -lmsg snaptgt_sg<SGN></pre> List details of the linked target. <pre># symsnapvx -sid <Symmetrix ID> -snapshot_name backup<SGN> -sg snapsrc_sg<SGN> list -linked -detail</pre> What mode has the target been linked in? _____
2	On the Secondary host mount the filesystem from the Target device. <pre># mkdir /tgtfs<SGN></pre> <pre># mount /dev/dsk/<Physical Device Name of Target> /tgtfs<SGN></pre> Example: # mount /dev/dsk/emcpower8c /tgtfs5

Step	Action
3	On the Secondary host, verify the availability of data on the target device. <pre># cd /tgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /tgtfs<SGN>/test* wc -l</pre> How many files are there? _____ Examine the sequence of the snapshots you created and the corresponding point-in-time data in Lab 1 – Part 1. Is the data in the snapshot consistent with what you would expect? _____
4	From the Secondary host, add more data to the target device. <pre># ./createfiles.sh /tgtfs<SGN> 20 -nop</pre> <pre># cd /tgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /tgtfs<SGN>/test* wc -l</pre> How many files are there? _____
5	From the Secondary host, list details of the linked target. <pre># symsnapvx -sid <Symmetrix ID> -snapshot_name backup<SGN> -sg snapsrc_sg<SGN> list -linked -detail</pre> Are there modified tracks? _____

Step	Action
6	From the Secondary host: Unmount the filesystem on the target device. Ensure that you are not in the /tgtfs<SGN> directory. <pre># umount /tgtfs<SGN></pre>
7	From the Secondary host: Relink generation 0 snapshot to the target. <pre># symsnapvx -sid <Symmetrix ID> relink -snapshot_name backup<SGN> -gen 0 -sg snapsrc_sg<SGN> -lnsg snaptgt_sg<SGN></pre>
8	From the Secondary host mount the filesystem on the Target device again. <pre># mount /dev/dsk/<Physical Device Name of Target> /tgtfs<SGN></pre>
9	On the Secondary host, verify the availability of data on the target device. <pre># cd /tgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /tgtfs<SGN>/test* wc -l</pre> How many files are there? _____ Examine the sequence of the snapshots you created and the corresponding point-in-time data in Lab 1 – Part 1. Is the data in the snapshot consistent with what you would expect? _____

Step	Action
10	To understand the flexibility and ease of use of TimeFinder SnapVX, relink target to a different generation of the snapshot. From the Secondary host: Unmount the filesystem on the target device. Ensure that you are not in the /tgtfs<SGN> directory. <pre># umount /tgtfs<SGN></pre> Relink generation 2 snapshot to target. <pre># symsnapvx -sid <Symmetrix ID> relink -snapshot_name backup<SGN> -gen 2 -sg snapsrc_sg<SGN> -lnsg snaptgt_sg<SGN></pre> Mount the filesystem on the Target device again. <pre># mount /dev/dsk/<Physical Device Name of Target> /tgtfs<SGN></pre> Verify availability of data. <pre># cd /tgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /tgtfs<SGN>/test* wc -l</pre> How many files are there? _____ Examine the sequence of the snapshots you created and the corresponding point-in-time data in Lab 1 – Part 1. Is the data in the snapshot consistent with what you would expect? _____

End of Lab 1 – Part 2

Lab 1: Part 3 – Restoring to Source from Snapshots

Step	Action
1	From the Primary host, unmounts the filesystem on the Source device. <pre># umount /srcfs<SGN></pre>
2	From the Primary host: Restore generation 2 snapshot. <pre># symsnapvx -sid <Symmetrix ID> restore -snapshot_name backup<SGN> -gen 2 -sg snapsrc_sg<SGN></pre> List the snapshots for the Source Storage Group. <pre># symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> Is the generation 2 snapshot now listed as Restore Active? _____
4	On the Primary host, mount the filesystem on the Source device. <pre># mount /dev/dsk/<Physical Drive Name of Source> /srcfs<SGN></pre>
5	On the Primary host, verify availability of data. <pre># cd /srcfs<SGN></pre> <pre># ls</pre> <pre># ls -l /srcfs<SGN>/test* wc -l</pre> How many files are there on the source device? _____ Does this match your expectation? _____

Step	Action
6	From the Primary host, terminate the restored session. <pre># symsnapvx -sid <Symmetrix ID> terminate -sg snapsrc_sg<SGN> -snapshot_name backup<SGN> -gen 2 - restored</pre> Did the terminate succeed? _____ Verify by listing the snapshots for the Storage Group. <pre># symsnapvx -sid <Symmetrix ID> list -sg snapsrc_sg<SGN> -detail</pre> Is the original snapshot still available? _____ Do you still have access to the restored data? _____

End of Lab 1 – Part 3

Lab 1: Part 4 – Restoring to Source from Modified Target

Step	Action
1	At this stage you should be accessing both your Source device and Target device. Verify the data available to the Primary host from the Source device. How many files are available? _____ Verify the data available to the Secondary host from the Target device. How many files are available? _____
2	From the Secondary host, add more data to the filesystem on the Target device. <pre># ./createfiles.sh /tgtfs<SGN> 20 -nop</pre> <pre># cd /tgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /tgtfs<SGN>/test* wc -l</pre> How many files are there? _____
3	In order to restore the Target back to the Source, we have to first create a snapshot of the Target. From the Secondary host: <pre># symsnapvx -sid <Symmetrix ID> establish -name</pre> <pre>casc<SGN> -sg snaptgt_sg<SGN></pre>
4	Next we have to link this snapshot to the Source. Before performing this we will stop access to the filesystem on the Source device. From the Primary host: <pre># umount /srcfs<SGN></pre>

Step	Action
5	From the Primary host, link snapshot to the Source. <pre># symsnapvx -sid <Symmetrix ID> link -snapshot_name casc<SGN> -gen 0 -sg snaptgt_sg<SGN> -lnsg snapsrc_sg<SGN></pre> Note: The source of the data is now the Target storage group (-sg) and the link is to the Source storage group (-lnsg).
6	On the Primary host, mount the filesystem on the Source device. <pre># mount /dev/dsk/<Physical Device Name of Source> /srcfs<SGN></pre> Verify data on the Source device. <pre># cd /srcfs<SGN></pre> <pre># ls</pre> <pre># ls -l /srcfs<SGN>/test* wc -l</pre> How many files are there on the source device? _____
7	From the Primary host, unlink the snapshot from the Source storage group. <pre># symsnapvx -sid <Symmetrix ID> unlink -snapshot_name casc<SGN> -sg snaptgt_sg<SGN> -lnsg snapsrc_sg<SGN></pre> Did the command succeed? _____ If it failed, what is the error message? _____

Step	Action
8	From the Primary host, set the link mode to copy and try <code>unlink</code> again. <pre># symsnapvx -sid <Symmetrix ID> set mode copy - snapshot_name casc<SGN> -gen 0 -sg snaptgt_sg<SGN> - lnsg snapsrc_sg<SGN></pre> <pre># symsnapvx -sid <Symmetrix ID> unlink -snapshot_name casc<SGN> -gen 0 -sg snaptgt_sg<SGN> -lnsg snapsrc_sg<SGN></pre> Did the <code>unlink</code> command succeed? _____
9	Verify that you can still access the data from the Primary host even after the <code>unlink</code> operation. Can you still access the data? _____

End of Lab Exercise 1

Lab Exercise 2: SRDF/Synchronous Operations

Purpose:	This lab exercise is designed to lead the students through SRDF/Synchronous Operations using EMC Solutions Enabler SYMCLI, command line interface. During this exercise, operations are performed from the host having access to the source (R1) volumes or the host with access to the target (R2) volumes. In our lab environment, the local host attached to the source VMAX3 array has access to R1 volumes, and the remote host attached to the target VMAX3 array has access to the R2 volumes. SRDF operations may be performed from either host.
Tasks:	In this lab exercise students will: 1) Create dynamic RDF Group 2) Create dynamic RDF pair 3) Perform basic SRDF operations – suspend, resume, change mode 4) Perform SRDF Disaster Recovery operations – failover and failback 5) Perform SRDF Decision Support operations – split, establish and restore
References:	EMC® Solutions Enabler SRDF Family Version 8.0.1 CLI User Guide VMAX® Family REV 01

Lab 2: Part 1 – Initial Set Up and Basic Operations

Step	Action																								
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #</td><td></td><td>RDF Group #</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device # (e.g. 05F)</td><td></td><td>Remote Device # (e.g. 05F)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below <pre>#symcfg -sid <Local SID> list -ra all</pre> Example: # symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #		RDF Group #		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device # (e.g. 05F)		Remote Device # (e.g. 05F)	
Local VMAX3 Array		Remote VMAX3 Array																							
Local SID		Remote SID																							
RDF Group #		RDF Group #																							
Local RA 1:Port #		Remote RA 1:Port #																							
Local RA 2:Port #		Remote RA 2:Port #																							
Local Device # (e.g. 05F)		Remote Device # (e.g. 05F)																							
2	From the Local host, create a dynamic RDF group. <pre># symrdf addgrp -label rdfig<RDF Group #> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfig <RDF Group #> -remote_rdfg <RDF Group #></pre> Example: <pre># symrdf addgrp -label rdfig10 -sid 83 -remote_sid 25 -dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdfig 10 -remote_rdfg 10</pre>																								
3	Verify that the dynamic RDF group has been created. <pre># symcfg -sid <Local SID> list -rdfig all</pre> What is the type of the new RDF group? _____																								

Step	Action										
4	List the VMAX3 devices that are accessible to your Local and Remote hosts. From the Local host: <pre># sympd list</pre> From the Remote host: <pre># sympd list</pre> Verify that the Local and Remote Devices assigned to you (recorded in step 1 – table) are accessible to your respective hosts. Record the information in the table below: <table><tr><td></td><td>Local host emcpower# e.g. emcpower6c</td><td>Local Device Number e.g. 05F</td><td>Remote host emcpower# e.g. emcpower6c</td><td>Remote Device Number e.g. 05F</td></tr><tr><td>Assigned Device Pair</td><td></td><td></td><td></td><td></td></tr></table>		Local host emcpower# e.g. emcpower6c	Local Device Number e.g. 05F	Remote host emcpower# e.g. emcpower6c	Remote Device Number e.g. 05F	Assigned Device Pair				
	Local host emcpower# e.g. emcpower6c	Local Device Number e.g. 05F	Remote host emcpower# e.g. emcpower6c	Remote Device Number e.g. 05F							
Assigned Device Pair											
5	On the Local host create a text file that contains the device number of the Local Device # and the Remote Device #. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful <code>createpair</code> operation. For example: <pre># notepad pair.txt</pre> <pre>05F 05F</pre>										

Step	Action																																	
6	From the Local host create a dynamic RDF device pair. <pre># symrdf -sid <Local SID> createpair -f pair.txt -rdfg <Local RDF Group #> -type r1 -establish -nop</pre> Example: <pre># symrdf -sid 83 createpair -f pair.txt -rdfg 10 -type r1 -establish -nop</pre>																																	
7	From the Local host, verify that the RDF device pair has been created. <pre># symrdf -sid <Local SID> -f pair.txt -rdfg <Local RDF Group #> query</pre> Example: <pre># symrdf -sid 83 -f pair.txt -rdfg 10 query</pre> Record the information in the table below: <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the State of the Source R1 Device? _____ What is the State of the Target R2 Device? _____ What is the SRDF mode? _____ What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action
8	List the Physical devices accessible to your Local and Remote hosts, again. From the Local host: <pre># sympd list</pre> What is the configuration of your Local device now? _____ From the Remote host: <pre># sympd list</pre> What is the configuration of your Remote device now? _____
9	On the Local host, create a SYMCLI device group of type RDF1 and add your R1 device to it. <pre># symdg create -type RDF1 srcdg<SGN></pre> Example: # symdg create -type RDF1 srcdg5 <pre># symdg -g srcdg<SGN> add dev <Local Device #></pre> Example: # symdg -g srcdg5 add dev 05F
10	On the Remote host, create a SYMCLI device group of type RDF2 and add your R1 device to it. <pre># symdg create -type RDF2 tgt dg<SGN></pre> Example: # symdg create -type RDF2 tgt dg5 <pre># symdg -g tgt dg<SGN> add dev <Remote Device #></pre> Example: # symdg -g tgt dg5 add dev 05F

Step	Action																																	
11	Examine the properties of your device groups on both the Local and Remote hosts. The output of the command below is verbose so pipe it through more. On the Local host: <pre># symdg show srcdg<SGN> more</pre> On the Remote host: <pre># symdg show tgtdg<SGN> more</pre>																																	
12	From the Local host, change the SRDF mode to Synchronous for the device pair. <pre># symrdf -g srcdg<SGN> set mode sync</pre> Perform an RDF query and record the information in the table below. <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
13	From the Local host, suspend the RDF links for the device pair and perform an RDF query. <pre># symrdf -g srcdg<SGN> suspend</pre> <pre># symrdf -g srcdg<SGN> query</pre> What is the Link state? _____ What is the RDF Pair state? _____																																	

Step	Action
14	On the Local host: Format the Source device identified in step 4. The partition in the device list shown by the format command may be something other than “c”. So emcpower8c may be listed as emcpower8a. Example: <pre> sun-88-77/> format Searching for disks...done AVAILABLE DISK SELECTIONS: 0. clt0d0 <DEFAULT cyl 4092 alt 2 hd 128 sec 32> /pci@0,0/pci15ad,1976@10/sd@0,0 23. emcpower2a <DEFAULT cyl 1022 alt 2 hd 128 sec 32> /pseudo/emcp@2 24. emcpower3a <DEFAULT cyl 1022 alt 2 hd 128 sec 32> /pseudo/emcp@3 Specify disk (enter its number): 24 selecting emcpower2a [disk formatted] format> quit </pre>

Step	Action
15	On the Local host: Create a filesystem on Source device, mount the filesystem and add data to it. Create a filesystem: <pre># newfs -v /dev/rdsk/<Physical Device Name of the Source></pre> Example: # newfs -v /dev/rdsk/emcpower2c Create a mount point: <pre># mkdir /rdfsrfcs<SGN></pre> Example: # mkdir /rdfsrfcs5 Mount the filesystem: <pre># mount /dev/dsk/<Physical Device Name of the Source> /rdfsrfcs<SGN></pre> Example: # /dev/dsk/emcpower2c /rdfsrfcs<SGN> Add data to the filesystem on the Source device: The script will create 20 files in the specified directory. Ask your instructor for the path/location of the script on your assigned host. <pre># ./createfiles.sh /rdfsrfcs<SGN> 100 -nop</pre> Verify that the files were created: <pre># cd /rdfsrfcs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdfsrfcs<SGN>/test* wc -l</pre> How many files were created? _____

Step	Action																																	
16	On the Local host, perform an RDF query. <pre># symrdf -g srcdg<SGN> query</pre> Record the information in the table below. <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there Invalid Tracks? _____ (There should be invalid tracks.) Where are the Invalid Tracks? _____ (Source (R1) View or Target (R2) View) Are the Invalid Tracks R1 Inv Tracks or R2 Inv Tracks? _____ How many Invalid Tracks have accumulated? _____ How do you interpret the Invalid Tracks? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
17	From the Local host, resume RDF links for the device pair and perform an RDF query. <pre># symrdf -g srcdg<SGN> resume</pre> <pre># symrdf -g srcdg<SGN> query</pre> What is the Link state? _____ Are there any Invalid Tracks? _____ What is the RDF Pair state? _____																																	

End of Lab 2 – Part 1

Lab 2: Part 2 – Disaster Recovery Operations

Step	Action
1	If you normally perform operations using a single device group, the <code>SYMCLI_DG</code> environment variable can be set to your default device group. This eliminates the requirement of specifying the device group using the <code>-g</code> flag. It is also useful to set this variable in scripts. The command <code>symcli -env</code> gives information about all the SYMCLI environment variables that can be set. On the Local host: <pre># set SYMCLI_DG=srcdg<SGN></pre> On the Remote host: <pre># set SYMCLI_DG=tgt dg<SGN></pre>
2	From the Local host, verify that the device pair is synchronized. <pre># symrdf query</pre> Note that as the environment variable has been set to point to <code>srcdg<SGN></code>, we do not have to specify <code>-g srcdg<SGN></code> in the command.
3	We cannot really simulate a disaster. So we will test our disaster recovery readiness. While in a disaster situation it is not possible to “gracefully” shut down applications and unmount filesystems, it is always less risky to do so whenever possible, for example in a disaster recovery drill. Before enabling read/write access to the R2 device for the remote host, we first unmount the filesystem on the Local host. Un-mount the SRDF Source (R1) device filesystem. On the Local host, unmounts the filesystem on the R1 device. Ensure that you are not in the <code>/rdsrcfs<SGN></code> directory. <pre># umount /rdsrcfs<SGN></pre> Example: <code># umount /rdsrcfs5</code>

Step	Action																																		
4	Initiate <u>failover</u> of the SRDF volumes by executing the following command from the Remote host. For our test the failover command can be executed from the Local host, as we still have access to the Local host. However, in a true disaster situation, we may not have access to the Local host. On the Remote host: <pre>#symrdf failover</pre> Note: The verbose output from the failover command. Each step is displayed as it is executed. We again do not have to specify <code>-g tgtIdg<SGN></code> as we have set the environment variable.																																		
5	Perform an RDF query from the Remote host and record the information in the table below. <pre># symrdf query</pre> <table><tr><th colspan="5">Target (R2) View</th><th></th><th colspan="4">Source (R1) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the state of the R1 device? _____ What is the state of the Links? _____ What is the state of the R2 device? _____ What is the RDF Pair state? _____	Target (R2) View						Source (R1) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Target (R2) View						Source (R1) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																									

Step	Action
6	We can now verify access to data from the R2 device. On the Remote host, create a mount point and mount the filesystem on the Remote (R2) device. <pre># mkdir /rdftgtfs<SGN></pre> <pre># mount /dev/dsk/<Physical Device Name of Remote device> /rdftgtfs<SGN></pre> Example: # mount /dev/dsk/emcpower3c /rdftgtfs5
7	On the Remote host, verify availability of data on the R2 device filesystem. <pre># cd /rdftgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdftgtfs<SGN>/test* wc -l</pre> Do you have access to the same data that was on R1 device before the failover?
8	We will add some new data to the filesystem on the R2 device, to simulate production after a failover. <pre># ./createfiles.sh /rdftgtfs<SGN> 100 -nop</pre> Verify that the files were created: <pre># cd /rdftgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdftgtfs<SGN>/test* wc -l</pre> How many files are there now? _____

Step	Action																																	
9	In a <code>FailedOver</code> state, changes made to the R2 device are not propagated to the R1 as the links are set to Not Ready. Perform an RDF query from the Remote host and record the information in the table below. <pre># symrdf query</pre> <table><tr><th colspan="4">Target (R2) View</th><th></th><th colspan="4">Source (R1) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there any Invalid Tracks? _____ There should be. Where are the Invalid Tracks? (Source (R1) View or Target (R2) View)_____ Are the Invalid Tracks R1 Inv Tracks or R2 Inv Tracks? _____ How many Invalid Tracks? _____	Target (R2) View					Source (R1) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Target (R2) View					Source (R1) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
10	We will now resume production work from the R1 device. Prior to performing an SRDF Failback operation, it is important to stop accessing the R2 device. Failback operation will set the state of the R2 device to Write Disabled. If a device that is being actively accessed is set to WD, unpredictable results can happen. On the Remote host, unmount the filesystem on the R2 device. Ensure that you are not in the <code>/rdftgtfs<SGN></code> directory. <pre># umount /rdftgtfs<SGN></pre>																																	

Step	Action																																	
11	From the Local host, perform an SRDF Failback operation. <pre># symrdf failback</pre> Perform and SRDF query and record the information in the table below. <pre># symrdf query</pre> <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is state of the R1 device? _____ What is the state of the Link? _____ What is the state of the R2 device? _____ What is the RDF Pair state? _____ Are there any Invalid Tracks? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
12	On the Local host, mount the filesystem on the R1 device. <pre># mount /dev/dsk/<Physical Device Name of Source device> /rdsrcfs<SGN></pre>																																	

Step	Action
13	On the Local host, verify access to data from the R1 device. <pre># cd /rdfsrfcs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdfsrfcs<SGN>/test* wc -l</pre> How many files are there? _____ Does Filesystem contain the additional data that was added to the R2 device filesystem after the Failover? _____

End of Lab 2 – Part 2

Lab 2: Part 3 – Decision Support/Concurrent Access Operations

Step	Action																																		
1	From the Local host, perform an SRDF Split operation. <pre># symrdf split</pre> Perform an SRDF query and record the information in the table below. <table><tr><th colspan="5">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the state of the R1 device? _____ What is the state of the Link? _____ What is the state of the R2 device? _____	Source (R1) View						Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View						Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																									
2	Both hosts have access to copies of the same information but if either the local or the remote host makes changes to the filesystem, the other host does not reflect the change. Again, this may be useful in situations where you wish to perform tests without impacting production data. From the Remote host, mount the filesystem on the R2 device. <pre># mount /dev/dsk/<Physical Device Name of Remote device> /rdftgtfs<SGN></pre>																																		
3	On Local and Remote hosts to verify that the two have access to identical data. How many files are there in the filesystem of the R1 device? _____ How many files are there in the filesystem of the R2 device? _____																																		

Step	Action																																	
4	On the Local host, add more data to the filesystem on the R1 device. <pre># ./createfiles.sh /rdfsrfcs<SGN> 50 -nop</pre> Verify that the files were created: <pre># cd /rdfsrfcs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdfsrfcs<SGN>/test* wc -l</pre> How many files are there now? _____ Perform an SRDF query and record the information in the table below. <pre># symrdf query</pre> <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there Invalid Tracks? _____ Where are the Invalid Tracks? _____ (Source or Target) What do the Invalid Tracks indicate? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action																																	
5	On the Remote host, add more data to the filesystem on the R2 device. <pre># ./createfiles.sh /rdftgtfs<SGN> 100 -nop</pre> Verify that the files were created: <pre># cd /rdftgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdftgtfs<SGN>/test* wc -l</pre> How many files are there now? _____ Perform an SRDF query and record the information in the table below. <pre># symrdf query</pre> <table><tr><th colspan="4">Target (R2) View</th><th></th><th colspan="4">Source (R1) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Are there Invalid Tracks? _____ Where are the Invalid Tracks? _____ What do the Invalid Tracks indicate? _____	Target (R2) View					Source (R1) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Target (R2) View					Source (R1) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								
6	Prior to resuming SRDF mirroring, it is important to stop accessing the R2 device as it will be set to Write-Disabled. On the Remote host, unmounts the filesystem on the R2 device. Ensure that you are not in /rdftgtfs<SGN> directory. <pre># umount /rdftgtfs<SGN></pre>																																	

Step	Action																																		
7	We will perform an SRDF Establish operation to save the changes made to the Source device and discard the changes made to the Remote device. From the Local host: <pre># symrdf establish</pre> Perform an SRDF query and record the information in the table below. <pre># symrdf query</pre> <table><tr><th colspan="5">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the state of the R1 device? _____ What is the state of the Link? _____ What is the state of the R2 device? _____ What is the RDF Pair State? _____	Source (R1) View						Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View						Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																									
8	To observe the result of an SRDF Restore operation, we will once again perform an SRDF Split to enable Read-Write access to both the Source and Remote devices. From the Local host: <pre># symrdf split</pre>																																		
9	On the Remote host, mount the filesystem on the R2 device. <pre># mount /dev/dsk/<Physical Device Name of Remote device> /rdftgtfs<SGN></pre>																																		

Step	Action
10	On the Remote host, add more data to the filesystem on the R2 device. <pre># ./createfiles.sh /rdftgtfs<SGN> 100 -nop</pre> Verify that the files were created: <pre># cd /rdftgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdftgtfs<SGN>/test* wc -l</pre> How many files are there now? _____ The SRDF Restore operation will set the Remote (R2) device to Write-Disabled. So it is important to stop accessing the R2 device. Unmount the filesystem on the R2 device. Ensure that you are not in /rdftgtfs<SGN> directory. <pre># umount /rdftgtfs<SGN></pre>
11	On the Local host, add more data to the filesystem on the R1 device. <pre># ./createfiles.sh /rdfsrcfs<SGN> 50 -nop</pre> Verify that the files were created: <pre># cd /rdfsrcfs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdfsrcfs<SGN>/test* wc -l</pre> How many files are there now? _____

Step	Action
12	When performing an SRDF Restore operation, the contents of the Source FS will change. So it is important to stop accessing the Source device. We can access the Source device immediately after the Restore command completes. On the Local host, unmount the filesystem on the R1 device. Ensure that you are not in /rdfsrfcs<SGN> directory. <pre># umount /rdfsrfcs<SGN></pre>
13	From the Local host, perform an SRDF Restore operation. <pre># symrdf restore</pre>
14	On the Local host, mount the filesystem on the R1 device. <pre># mount /dev/dsk/<Physical Device Name of Source device> /rdfsrfcs<SGN></pre>
15	On the Local host, verify data accessible in the filesystem. <pre># cd /rdfsrfcs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdfsrfcs<SGN>/test* wc -l</pre> How many files are there now? _____ Does this match the files that were there in the filesystem on the R2 device? _____ Unmount the filesystem on the R1 device. Ensure that you are not in /rdfsrfcs<SGN> directory. <pre># umount /rdfsrfcs<SGN></pre>

End of Lab Exercise 2

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Lab Exercise 3: SRDF/Asynchronous Operations

Purpose:	This lab exercise is designed to lead the students through SRDF/Asynchronous Operations using EMC Solutions Enabler SYMCLI, command line interface.
Tasks:	In this lab exercise students will: 1) Create and remove dynamic RDF Groups 2) Create and delete dynamic RDF pairs 3) Enable and disable SRDF/Asynchronous mode of operation for devices in a device group 4) Configure Concurrent SRDF 5) Create Consistency Group and manage SRDF/A Multi-session Consistency
References:	EMC® Solutions Enabler SRDF Family Version 8.0.1 CLI User Guide VMAX® Family REV 01

Lab 3: Part 1 – Single Session SRDF/A

Step	Action																								
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #</td><td></td><td>RDF Group #</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device # (e.g. 049)</td><td></td><td>Remote Device # (e.g. 049)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below <pre>#symcfg -sid <Local SID> list -ra all</pre> Example: # symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #		RDF Group #		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device # (e.g. 049)		Remote Device # (e.g. 049)	
Local VMAX3 Array		Remote VMAX3 Array																							
Local SID		Remote SID																							
RDF Group #		RDF Group #																							
Local RA 1:Port #		Remote RA 1:Port #																							
Local RA 2:Port #		Remote RA 2:Port #																							
Local Device # (e.g. 049)		Remote Device # (e.g. 049)																							
2	From the Local host, create a dynamic RDF group. <pre># symrdf addgrp -label rdffg<RDF Group #> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdffg <RDF Group #> -remote_rdffg <RDF Group #></pre> Example: <pre># symrdf addgrp -label rdffg20 -sid 83 -remote_sid 25 -dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdffg 20 -remote_rdffg 20</pre>																								
3	Verify that the dynamic RDF group has been created. <pre>#symcfg -sid <Local SID> list -rdffg all</pre> What is the type of the new RDF group? _____																								

Step	Action										
4	List the VMAX3 devices that are accessible to your Local and Remote hosts. From the Local host: <pre># sympd list</pre> From the Remote host: <pre># sympd list</pre> Verify that the Local and Remote Devices assigned to you (recorded in step 1 – table) are accessible to your respective hosts. Record the information in the table below: <table><tr><td></td><td>Local host emcpower# e.g. emcpower9c</td><td>Local Device Number e.g. 049</td><td>Remote host emcpower# e.g. emcpower9c</td><td>Remote Device Number e.g. 049</td></tr><tr><td>Assigned Device Pair</td><td></td><td></td><td></td><td></td></tr></table>		Local host emcpower# e.g. emcpower9c	Local Device Number e.g. 049	Remote host emcpower# e.g. emcpower9c	Remote Device Number e.g. 049	Assigned Device Pair				
	Local host emcpower# e.g. emcpower9c	Local Device Number e.g. 049	Remote host emcpower# e.g. emcpower9c	Remote Device Number e.g. 049							
Assigned Device Pair											
5	On the Local host create a text file that contains the device number of the Local Device # and the Remote Device #. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful <code>createpair</code> operation. For example: <pre># notepad pair2.txt</pre> <pre>049 049</pre>										

Step	Action																																	
6	From the Local host create a dynamic RDF device pair. <pre># symrdf -sid <Local SID> createpair -f pair2.txt -rdfg <Local RDF Group #> -type r1 -establish -g asyncdg<SGN> -nop</pre> Note the use of <code>-g asyncdg<SGN></code>. This will create a device group of type R1, named <code>asyncdg<SGN></code> and add your R1 device to it. Example: <pre># symrdf -sid 83 createpair -f pair2.txt -rdfg 20 -type r1 -establish -g asyncdg5 -nop</pre>																																	
7	From the Local host, verify that the device group and the RDF device pair have been created. <pre># symdg list</pre> <pre># symrdf -g asyncdg<SGN> query</pre> Example: <pre># symrdf -g asyncdg5 query</pre> Record the information in the table below: <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the State of the Source R1 Device? _____ What is the State of the Target R2 Device? _____ What is the SRDF mode? _____ What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action																																	
8	From the Local host, set the SRDF mode to Asynchronous for the device in the Device Group. <pre># symrdf -g asyncdg<SGN> set mode async</pre> Enable consistency protection. <pre># symrdf -g asyncdg enable</pre> Perform an SRDF Query to verify status of SRDF/A. <pre># symrdf -g asyncdg<SGN> query -rdfa</pre> Note: The output is verbose. You can pipe through more to examine the output in detail. Record the information in the table below. <table><tr><th colspan="4">Source (R1) View</th><th></th><th colspan="4">Target (R2) View</th><th>Modes</th><th>RDF</th></tr><tr><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>Links</th><th>Sym Dev</th><th>State</th><th>R1 Inv Tracks</th><th>R2 Inv Tracks</th><th>MACE</th><th>Pair State</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> What is the RDFA Cycle number? _____ What is the RDFA Session Status? _____ What is the RDFA Minimum Cycle Time? _____ What is the RDF Consistency State? _____ What is the RDF Pair State? _____	Source (R1) View					Target (R2) View				Modes	RDF	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State											
Source (R1) View					Target (R2) View				Modes	RDF																								
Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	Links	Sym Dev	State	R1 Inv Tracks	R2 Inv Tracks	MACE	Pair State																								

Step	Action
9	On the Local host: Format the Source device identified in step 4. The partition in the device list shown by the format command may be something other than “c”. So emcpower9c may be listed as emcpower9a. Example: <pre> sun-88-77/> format Searching for disks...done AVAILABLE DISK SELECTIONS: 0. clt0d0 <DEFAULT cyl 4092 alt 2 hd 128 sec 32> /pci@0,0/pci15ad,1976@10/sd@0,0 23. emcpower2a <DEFAULT cyl 1022 alt 2 hd 128 sec 32> /pseudo/emcp@2 24. emcpower3a <DEFAULT cyl 1022 alt 2 hd 128 sec 32> /pseudo/emcp@3 Specify disk (enter its number): 24 selecting emcpower2a [disk formatted] format> quit </pre>

Step	Action
10	On the Local host: Create a filesystem on Source device, mount the filesystem and add data to it. Create a filesystem: <pre># newfs -v /dev/rdsk/<Physical Device Name of the Source></pre> Example: # newfs -v /dev/rdsk/emcpower9c Create a mount point: <pre># mkdir /rdfasrcfs<SGN></pre> Example: # mkdir /rdfasrcfs5 Mount the filesystem: <pre># mount /dev/dsk/<Physical Device Name of the Source> /rdfasrcfs<SGN></pre> Example: # /dev/dsk/emcpower2c /rdfasrcfs<SGN> Add data to the filesystem on the Source device: The script will create 20 files in the specified directory. Ask your instructor for the path/location of the script on your assigned host. <pre># ./createfiles.sh /rdfasrcfs<SGN> 100 -nop</pre> Verify that the files were created: <pre># cd /rdfasrcfs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdfasrcfs<SGN>/test* wc -l</pre> How many files were created? _____

Step	Action
11	From the Local host, monitor SRDF/A cache usage. <pre># symstat -type cache -reptype rdfa -sid <Local SID> -i 60 -c 5</pre> What is the System Write Pending Limit? _____ How much cache is available for SRDF/A? _____ How much cache is SRDF/A using? _____
12	We cannot really simulate a disaster. So we will test our disaster recovery readiness. While in a disaster situation it is not possible to “gracefully” shut down applications and unmount filesystems, it is always less risky to do so whenever possible, for example in a disaster recovery drill. Before enabling read/write access to the R2 device for the remote host, we first unmount the filesystem on the Local host. Un-mount the SRDF Source (R1) device filesystem. Ensure that you are not in /rdfasrcfs<SGN> directory. On the Local host: <pre># umount /rdfasrcfs<SGN></pre>
13	In a true disaster situation the Source site/array/host may not be accessible. We have seen in the SRDF/Synchronous lab that we can perform SRDF operations from the R2 side using Device Groups of type RDF2 containing R2 devices. For illustration in this lab, we will perform an SRDF Failover from the Local host. From the Local host: <pre># symrdf -g asyncdg<SGN> failover -force</pre> Note the use of <code>-force</code> flag. This is required because the RDF group has been enabled for consistency protection.

Step	Action
14	As in SRDF/Synchronous lab we can verify data on the R2 device from the Remote host. On the Remote host, create a mount point directory and mount the filesystem on the R2 device. <pre># mkdir /rdfatgtfs<SGN></pre> <pre># mount /dev/dsk/<Physical Device Name of Remote device> /rdfatgtfs<SGN></pre>
15	On the Remote host, verify contents of the Remote device filesystem. <pre># cd /rdfatgtfs<SGN></pre> <pre># ls</pre> <pre># ls -l /rdfatgtfs<SGN>/test* wc -l</pre> How many files are there? _____ The SRDF Failback operation will set the Remote (R2) device to Write-Disabled. So it is important to stop accessing the R2 device. Unmount the filesystem on the R2 device. Ensure that you are not in /rdfatgtfs<SGN> directory. <pre># umount /rdfatgtfs<SGN></pre>

Step	Action
16	From the Local host, resume SRDF/A mode using the procedure below. If you want to avoid typing <code>-g asyncdg<SGN></code> over and over, set the environment variable! <pre># symrdf -g asyncdg<SGN> disable # symrdf -g asyncdg<SGN> set mode acp_disk # symrdf -g asyncdg<SGN> failback # symrdf -g asyncdg<SGN> query (verify RDF Pair State Synchronized) # symrdf -g asyncdg<SGN> set mode async # symrdf -g asyncdg<SGN> enable # symrdf -g asyncdg<SGN> query -rdfa</pre>
17	Lab Cleanup: As a preparation for the next lab, perform the cleanup procedure listed below. From the Local host: <pre># symrdf -g asyncdg<SGN> disable # symrdf -g asyncdg<SGN> suspend # symrdf -sid <Local SID> deletepair -f pair2.txt -rdfg <RDF Group #> # symrdf -sid <Local SID> removegrp -rdfg <RDF Group #> # symdg delete asyncdg<SGN> -force</pre>

End of Lab 3 – Part 1

Lab 3: Part 2 – Concurrent SRDF

Step	Action																																
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #1</td><td></td><td>RDF Group #1</td><td></td></tr><tr><td>RDF Group #2</td><td></td><td>RDF Group #2</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device # (e.g. 049)</td><td></td><td>Remote Device #1 (e.g. 049)</td><td></td></tr><tr><td></td><td></td><td>Remote Device #2 (e.g. 09A)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below <pre>#symcfg -sid <Local SID> list -ra all</pre> Example: # symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #1		RDF Group #1		RDF Group #2		RDF Group #2		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device # (e.g. 049)		Remote Device #1 (e.g. 049)				Remote Device #2 (e.g. 09A)	
Local VMAX3 Array		Remote VMAX3 Array																															
Local SID		Remote SID																															
RDF Group #1		RDF Group #1																															
RDF Group #2		RDF Group #2																															
Local RA 1:Port #		Remote RA 1:Port #																															
Local RA 2:Port #		Remote RA 2:Port #																															
Local Device # (e.g. 049)		Remote Device #1 (e.g. 049)																															
		Remote Device #2 (e.g. 09A)																															
2	From the Local host, create a dynamic RDF group. <pre># symrdf addgrp -label rdg<RDF Group #1> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfg <RDF Group #1> -remote_rdfg <RDF Group #1></pre> Example: <pre># symrdf addgrp -label rdg30 -sid 83 -remote_sid 25 -dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdfg 30 -remote_rdfg 30</pre>																																

Step	Action
3	On the Local host create a text file that contains the device number of the Local Device # and the Remote Device #1. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful <code>createpair</code> operation. For example: <pre># notepad pair3.txt 049 049</pre>
4	From the Local host create a dynamic RDF device pair in Local RDF Group #1. <pre># symrdf -sid <Local SID> createpair -f pair3.txt - rdfg <Local RDF Group #1> -type r1 -establish -g concdg<SGN> -nop</pre> Note the use of <code>-g concdg<SGN></code>. This will create a device group of type R1, named <code>concdg<SGN></code> and add your R1 device to it. Example: <pre># symrdf -sid 83 createpair -f pair3.txt -rdfg 30 - type r1 -establish -g concdg5 -nop</pre>
5	From the Local host, create another dynamic RDF group. <pre># symrdf addgrp -label rdfg<RDF Group #2> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfg <RDF Group #2> - remote_rdfg <RDF Group #2></pre> Example: <pre># symrdf addgrp -label rdfg40 -sid 83 -remote_sid 25 - dir 1E:8,3E:8 -remote_dir 1E:8,3E:8 -rdfg 40 - remote_rdfg 40</pre>

Step	Action
6	On the Local host create another text file that contains the device number of the Local Device # and the Remote Device #2. Local devices are listed in the first column and Remote devices are listed in the second column. The Local device will become R1 and the Remote will device become R2 after a successful <code>createpair</code> operation. For example: <pre># notepad pair4.txt 049 09A</pre>
7	From the Local host create a dynamic RDF device pair. This will add a second R2 mirror to the R1 device to complete the Concurrent SRDF configuration. <pre># symrdf -sid <Local SID> createpair -f pair4.txt - rdfg <Local RDF Group #2> -type r1 -establish -nop</pre> Example: <pre># symrdf -sid 83 createpair -f pair4.txt -rdfg 40 - type r1 -establish -nop</pre>
8	From the Local host, set the SRDF mode for the RDF Group #1 to Synchronous. <pre># symrdf -g concdg<SGN> set mode sync -rdfg <RDF Group #1></pre> Example: <pre># symrdf -g concdg5 set mode sync -rdfg 30</pre>

Step	Action
9	From the Local host, set the SRDF mode for the RDF Group #2 to Asynchronous. <pre># symrdf -g concdg<SGN> set mode async -rdfg <RDF Group #2></pre> Example: <pre># symrdf -g concdg5 set mode async -rdfg 40</pre> Enable Consistency protection for the Asynchronous RDF Group. <pre># symrdf -g concdg<SGN> enable -rdfg <RDF Group #2></pre>
10	From the Local host, perform an SRDF Query of the Device Group. <pre># symrdf -g concdg<SGN> query -rdfg all</pre> How many R2 devices are paired with the R1? _____ What is the SRDF mode for the device pair in RDF Group #1? _____ What is the RDF Pair State for the device pair in RDF Group #1? _____ What is the SRDF mode for the device pair in RDF Group #2? _____ What is the RDF Pair State for the device pair in RDF Group #2? _____

Step	Action
11	Lab Cleanup: As a preparation for the next lab, perform the cleanup procedure listed below. From the Local host: <pre># symrdf -g concdg<SGN> disable -rdfg <RDF Group #2> # symrdf -g concdg<SGN> split -rdfg all # symrdf -g concdg<SGN> deletepair -rdfg <RDF Group #1> # symrdf -g concdg<SGN> deletepair -rdfg <RDF Group #2> # symdg delete concdg<SGN> -force # symrdf -sid <Local SID> removegrp -rdfg <RDF Group #1> # symrdf -sid <Local SID> removegrp -rdfg <RDF Group #2></pre> Verify deletion of RDF Pair, Device Group and RDF Groups. <pre># sympd list</pre> What is the configuration of your Local Device # ? _____ <pre># symdg list</pre> Is concdg<SGN> listed? _____ <pre># symcfg -sid <Local SID> list -rdfg all</pre> Are RDF Group #1 and RDF Group #2 listed? _____

End of Lab 3 – Part 2

Lab 3: Part 3 – SRDF/A – Multi-session Consistency (MSC)

Step	Action																																
1	Fill in all of the fields with the appropriate information for both the Source and Target VMAX3 arrays. The SIDs, RDF directors and port numbers, RDF Group numbers and the devices to be configured as R1 and R2 will be provided by your instructor. <table><tr><th colspan="2">Local VMAX3 Array</th><th colspan="2">Remote VMAX3 Array</th></tr><tr><td>Local SID</td><td></td><td>Remote SID</td><td></td></tr><tr><td>RDF Group #1</td><td></td><td>RDF Group #1</td><td></td></tr><tr><td>RDF Group #2</td><td></td><td>RDF Group #2</td><td></td></tr><tr><td>Local RA 1:Port #</td><td></td><td>Remote RA 1:Port #</td><td></td></tr><tr><td>Local RA 2:Port #</td><td></td><td>Remote RA 2:Port #</td><td></td></tr><tr><td>Local Device #1 (e.g. 049)</td><td></td><td>Remote Device #1 (e.g. 049)</td><td></td></tr><tr><td>Local Device #2 (e.g. 09A)</td><td></td><td>Remote Device #2 (e.g. 09A)</td><td></td></tr></table> The configured remote adapters for SRDF can be listed using the command below <pre>#symcfg -sid <Local SID> list -ra all</pre> Example: # symcfg -sid 483 list -ra all	Local VMAX3 Array		Remote VMAX3 Array		Local SID		Remote SID		RDF Group #1		RDF Group #1		RDF Group #2		RDF Group #2		Local RA 1:Port #		Remote RA 1:Port #		Local RA 2:Port #		Remote RA 2:Port #		Local Device #1 (e.g. 049)		Remote Device #1 (e.g. 049)		Local Device #2 (e.g. 09A)		Remote Device #2 (e.g. 09A)	
Local VMAX3 Array		Remote VMAX3 Array																															
Local SID		Remote SID																															
RDF Group #1		RDF Group #1																															
RDF Group #2		RDF Group #2																															
Local RA 1:Port #		Remote RA 1:Port #																															
Local RA 2:Port #		Remote RA 2:Port #																															
Local Device #1 (e.g. 049)		Remote Device #1 (e.g. 049)																															
Local Device #2 (e.g. 09A)		Remote Device #2 (e.g. 09A)																															
2	From the Local host, create a <u>two</u> dynamic RDF groups. <pre># symrdf addgrp -label rdfrg<RDF Group #1> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfrg <RDF Group #1> -remote_rdfg <RDF Group #1></pre> <pre># symrdf addgrp -label rdfrg<RDF Group #2> -sid <Local SID> -remote_sid <Remote SID> -dir <Local RA1:Port#>,<Local RA2:Port#> -remote_dir <Remote RA1:Port#>,<Remote RA2:Port#> -rdfrg <RDF Group #2> -remote_rdfg <RDF Group #2></pre>																																

Step	Action
3	From the Local host, verify that the RDF Groups were created. <pre># symcfg -sid <Local SID> list -rdfg all</pre>
4	On the Local host, create text file <code>mscpair1.txt</code> that contains the device number of the Local Device #1 and the Remote Device #1. For example: <pre># notepad mscpair1.txt</pre> <pre>049 049</pre>
5	From the Local host create a dynamic RDF device pair in Local RDF Group #1. <pre># symrdf -sid <Local SID> createpair -f mscpair1.txt -rdfg <Local RDF Group #1> -type r1 -rdf_mode async -establish -g mscldg<SGN> -nop</pre> Note the use of <code>-g mscldg<SGN></code>. This will create a device group of type R1, named <code>mscldg<SGN></code> and add your R1 device to it. The use of <code>-rdf_mode</code> will override the default of <code>ACP_Disk</code> and the device pair will be placed in SRDF Asynchronous mode. Example: <pre># symrdf -sid 83 createpair -f mscpair1.txt -rdfg 30 -type r1 -rdf_mode async -establish -g mscldg5 -nop</pre>
6	On the Local host, create another text file <code>mscpair2.txt</code> that contains the device number of the Local Device #2 and the Remote Device #2. For example: <pre># notepad mscpair2.txt</pre> <pre>09A 09A</pre>

Step	Action
7	From the Local host create a dynamic RDF device pair in Local RDF Group #2. <pre># symrdf -sid <Local SID> createpair -f mscpair1.txt - rdfg <Local RDF Group #2> -type r1 -rdf_mode async - establish -g msc2dg<SGN> -nop</pre> Note the use of <code>-g msc2dg<SGN></code>. This will create a device group of type R1, named <code>msc2dg<SGN></code> and add your R1 device to it. The use of <code>-rdf_mode</code> will override the default of <code>ACP_Disk</code> and the device pair will be placed in SRDF Asynchronous mode. Example: <pre># symrdf -sid 83 createpair -f mscpair2.txt -rdfg 40 - type r1 -rdf_mode async -establish -g msc2dg5 -nop</pre>
8	From the Local host, perform an SRDF Query of the two device groups. <pre># symrdf -g msc1dg<SGN> query # symrdf -g msc2dg<SGN> query</pre> Are the two device pairs in Synchronized RDF Pair state? _____
9	On the Local host, verify that the <code>storapid</code> and <code>storrdfd</code> daemons are running. <pre># stordaeomon list</pre> If not start the daemons: <pre># stordaeomon start storapid # stordaeomon start storrdfd</pre> Verify that the option <code>SYMAPI_USE_RDFD</code> is set to <code>ENABLE</code> in the options file (C:\Program Files\EMC\SYMAPI\Config\options)

Step	Action
10	From the Local host, create a composite group with RDF Consistency. <pre># symcg create msc<SGN>cg -type RDF1 -rdf_consistency</pre> Verify that the Consistency Group was created. <pre># symcg list</pre>
11	From the Local host, add the two device groups to the Consistency Group. <pre># symcg -cg msc<SGN>cg add dg msc1dg<SGN></pre> <pre># symcg -cg msc<SGN>cg add dg msc2dg<SGN></pre> Examine the properties of the Consistency Group. <pre># symcg show msc<SGN>cg</pre>
12	From the Local host, enable Multi-session Consistency protection for the Consistency Group. <pre># symrdf -cg msc<SGN>cg enable</pre>
13	From the Local host, perform an SRDF Query of the Consistency Group. <pre># symrdf -cg msc<SGN>cg query -rdfa</pre> What is the RDF Consistency Mode? _____ What is the status of the MSC Session? _____ What is the Consistency State? _____ What is the Session Status for <RDF Group #1>? _____ What is the Session Status for <RDF Group #2>? _____ What is the Cycle Number for <RDF Group #1>? _____ What is the Cycle Number for <RDF Group #2>? _____

Step	Action
14	From the Local host, to illustrate MSC we will split one of the RDF Groups in the Consistency Group. As Consistency has been enabled, the split will require the –force option as shown below. <pre># symrdf -cg msc<SGN>cg split -immediate -force -rdfg <Local SID>:<RDF Group #1></pre> Example: <pre># symrdf -cg msc<SGN>cg split -immediate -force -rdfg 83:30</pre>
15	From the Local host, perform an SRDF Query of the Consistency Group. <pre># symrdf -cg msc<SGN>cg query -rdfa</pre> What is the RDF Consistency Mode? _____ What is the status of the MSC Session? _____ What is the Consistency State? _____ What is the Session Status for <RDF Group #1>? _____ What is the Session Status for <RDF Group #2>? _____ What is the RDF Pair state for <RDF Group #1>? _____ What is the RDF Pair state for <RDF Group #2>? _____
16	From the Local host, perform an SRDF Establish operation for the Consistency Group. <pre># symrdf -cg msc<SGN>cg establish</pre>

Step	Action
17	From the Local host, perform an SRDF Query of the Consistency Group and verify Consistent state for both the SRDF device pairs. <pre># symrdf -cg msc<SGN>cg query -rdfa -i 10</pre> You can use <Ctrl-c> to abort the command once Consistent state has been reached.
18	Lab cleanup: From the Local host <pre># symcg -cg msc<SGN>cg disable # symcg -cg msc<SGN>cg suspend # symcg delete msc<SGN>cg -force # symrdf -sid <Local SID> deletepair -f mscpair1.txt -rdfg <RDF Group #1> # symrdf -sid <Local SID> deletepair -f mscpair2.txt -rdfg <RDF Group #2> # symrdf -sid <Local SID> removegrp -rdfg <RDF Group #1> # symrdf -sid <Local SID> removegrp -rdfg <RDF Group #2> # symdg delete msc1dg<SGN> -force # symdg delete msc2dg<SGN> -force</pre>

End of Lab Exercise 3

End of Lab Exercises on Sun Hosts

VMAX3 Business Continuity Management

Lab Guide – VMware ESXi VMFS Datastore Replication

March 2015

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Lab Exercise 1: TimeFinder SnapVX replication of VMFS Datastore

Purpose:	Use Unisphere for VMAX to perform TimeFinder SnapVX replication of a VMware vSphere VMFS datastore. The VMFS datastore resides on a VMAX3 device and contains a Virtual Machine.
Tasks:	In this lab exercise, students will: 1) Identify and correlate the Source and Target VMAX3 devices accessible to their assigned Primary and Secondary ESXi servers respectively. 2) Create a VMFS Datastore on the Source device and deploy a Virtual Machine. 3) Use TimeFinder SnapVX to create a snapshot of the Source device and link the snapshot to the Target device accessible to the Secondary ESXi server. 4) Mount the Datastore on Target device, on the Secondary ESXi server and power-on the Virtual Machine on the Secondary ESXi server.
References:	TimeFinder SnapVX Lecture Module

Lab 1: Part 1 – Identify Source and Target devices, create a VMFS Datastore on the Source device, and deploy a Virtual Machine

Step	Action
1	You will first login to a Windows server. The instructor will provide you with the procedure to login to this Windows server. The Windows server has: Internet Explorer VMware vSphere client

Step	Action																						
2	Following information will be provided by the instructor: <table border="1"> <tr> <td>Student Group Number (SGN)</td><td></td></tr> <tr> <td>Unisphere for VMAX Server IP Address</td><td>IP: _____</td></tr> <tr> <td>Unisphere for VMAX Username & Password</td><td>Username/Password: _____</td></tr> <tr> <td>VMAX3 SID</td><td></td></tr> <tr> <td>Primary ESXi Server: (Host with access to Source Device)</td><td>IP: _____ Username & Password: _____</td></tr> <tr> <td>Primary ESXi Storage Group Name</td><td></td></tr> <tr> <td>Source Device</td><td></td></tr> <tr> <td>Secondary ESXi Server: (Host with access to Target Device)</td><td>IP: _____ Username & Password: _____</td></tr> <tr> <td>Secondary ESXi Storage Group Name</td><td></td></tr> <tr> <td>Target Device</td><td></td></tr> <tr> <td>Location and file name of Student VM OVA</td><td></td></tr> </table>	Student Group Number (SGN)		Unisphere for VMAX Server IP Address	IP: _____	Unisphere for VMAX Username & Password	Username/Password: _____	VMAX3 SID		Primary ESXi Server: (Host with access to Source Device)	IP: _____ Username & Password: _____	Primary ESXi Storage Group Name		Source Device		Secondary ESXi Server: (Host with access to Target Device)	IP: _____ Username & Password: _____	Secondary ESXi Storage Group Name		Target Device		Location and file name of Student VM OVA	
Student Group Number (SGN)																							
Unisphere for VMAX Server IP Address	IP: _____																						
Unisphere for VMAX Username & Password	Username/Password: _____																						
VMAX3 SID																							
Primary ESXi Server: (Host with access to Source Device)	IP: _____ Username & Password: _____																						
Primary ESXi Storage Group Name																							
Source Device																							
Secondary ESXi Server: (Host with access to Target Device)	IP: _____ Username & Password: _____																						
Secondary ESXi Storage Group Name																							
Target Device																							
Location and file name of Student VM OVA																							

Step	Action				
3	Use Unisphere for VMAX to identify and correlate your assigned Source device: Login to the Unisphere for VMAX Server: From your desktop launch Internet Explorer and connect to https://<Unisphere_ServerIP>:8443 Use the login credentials provided in step 2. In the landing page select the VMAX3 SID recorded in step 2. This should take you to SID > Storage > Storage Groups Dashboard. Select “Total”. This gives a listing of all the Storage Groups defined. Identify and select your Primary ESXi Storage Group. Select “View Details”. In the “View Details” page, select “Volumes” from “Related Objects” panel. From the list of devices, select the Source device assigned to you in step 2. Select “View Details”. Record the WWN of the Source device. <table border="1"> <tr> <td>Source Device (e.g. 0A8)</td><td>WWN (e.g. 60000970000196800225533030304138)</td></tr> <tr> <td></td><td></td></tr> </table> Minimize Unisphere for VMAX window.	Source Device (e.g. 0A8)	WWN (e.g. 60000970000196800225533030304138)		
Source Device (e.g. 0A8)	WWN (e.g. 60000970000196800225533030304138)				

Step	Action
4	Login to the Primary ESXi Server. Launch the vSphere client by double clicking on the VMware vSphere Client icon on the desktop and login to your Primary ESXi Server. IP address/Name: <Primary ESXi Server IP> Username: root Password: <Primary ESXi Server Password> If necessary, select the check box "Install this certificate and do not display any security warnings" and then click Ignore to proceed with login.
5	On your Primary ESXi Server, select "Configuration" tab. Select "Storage" from the "Hardware" panel. Select "Devices" tab. In the list of devices, identify the naa number that matches with the WWN you recorded in step 3. Record the Runtime Name for the device: _____ Example:vmhba33 : C0 : T0 : L9

Step	Action
6	Create a Datastore on the Source Device: Select the “Datastores” tab. Select “Add Storage...” to launch the Add Storage Wizard. Choose Disk/LUN for the Storage Type and then click “Next”. In the Select Disk/LUN screen: Select the EMC disk with the LUN number that matches the L# in the Runtime name of your Source device in step 5, the capacity should also match. Then click “Next”. Choose VMFS-5 for File System Version, and then click “Next”. Click Next on the Current Disk Layout screen. Type in a unique name for your datastore: Production_Datastore<SGN>. Click “Next”. Choose the Maximum available space. Click “Next”. Click “Finish” in the Ready to Complete screen. Your Production_Datastore should appear in the Datastores listing.

Step	Action
7	Deploy a VM on your Production Datastore: Click “File” in the top level menu and choose “Deploy OVF Template ...” Use the Browse button to locate the Student VM OVA template file. Once the file has been selected click “Open” in the file selector window to return to the Deploy OVF Template dialog. Click “Next”. Click “Next” in the OVF Template Details screen. Type in a name for your Student VM: StudentVM<SGN>. Click “Next”. Select your Production_Datastore<SGN> in the Storage screen. Click “Next”. Choose “Thin Provision” for the Disk Format. Click “Next”. Check the “Power on after deployment” box in the Ready to Complete screen. Click “Finish”. The Deploying screen will appear. Watch the progress and then close the window after a successful deployment. Contact the instructor if the deployment fails.

Step	Action
8	Confirm that the Virtual machine resides on the Production Datastore: Select Production Datastore. Right-click and select “Browse Datastore”. Select the VM (e.g. StudentVM<SGN>) folder. You should see StudentVM<SGN>.vmx and other related files. Close the Datastore Browser. In the tree panel click the + to drill down into your Primary ESXi Server. The StudentVM should be seen in the tree panel. Please contact the instructor if this is not the case. Select the StudentVM in the tree panel and then select the “Summary” tab in the Main panel. Is the VM Powered on? _____ (It should be – Click the “Power On” link in the “Commands” section if it is Powered Off) What Storage is the VM using? _____ It should only be using storage from your Production Datastore. Please contact the instructor if this is not the case.
9	Login to StudentVM and add data. Right click the StudentVM and choose “Open Console”. This will open a VM console window. Login to the StudentVM with a username of “student” and password of “student”. Right click the desktop of the StudentVM and choose “Create Folder”. Give the folder a name of Production_Data. Log off the Student VM – select “System > Log Out student > Log Out”. Close out the VM console window by clicking on the X in the top right corner.

Step	Action				
10	Use Unisphere for VMAX to identify and correlate your assigned Target device: Login to the Unisphere for VMAX Server: From your desktop launch Internet Explorer and connect to https://<Unisphere_ServerIP>:8443 Use the login credentials provided in step 2. In the landing page select the VMAX3 SID recorded in step 2. This should take you to SID > Storage > Storage Groups Dashboard. Select “Total”. This gives a listing of all the Storage Groups defined. Identify and select your Secondary ESXi Storage Group. Select “View Details”. In the “View Details” page, select “Volumes” from “Related Objects” panel. From the list of devices, select the Source device assigned to you in step 2. Select “View Details”. Record the WWN of the Source device. <table border="1"> <tr> <td>Target Device (e.g. 0A9)</td><td>WWN (e.g. 60000970000196800225533030304139)</td></tr> <tr> <td></td><td></td></tr> </table> Minimize Unisphere for VMAX window.	Target Device (e.g. 0A9)	WWN (e.g. 60000970000196800225533030304139)		
Target Device (e.g. 0A9)	WWN (e.g. 60000970000196800225533030304139)				

Step	Action
11	Login to the Secondary ESXi Server. Launch the vSphere client by double clicking on the VMware vSphere Client icon on the desktop and login to your Secondary ESXi Server. IP address/Name: <Secondary ESXi Server IP> Username: root Password: <Secondary ESXi Server Password> If necessary, select the check box "Install this certificate and do not display any security warnings" and then click Ignore to proceed with login.
12	On your Secondary ESXi Server, select "Configuration" tab. Select "Storage" from the "Hardware" panel. Select "Devices" tab. In the list of devices, identify the naa number that matches with the WWN you recorded in step 10. Record the Runtime Name for the device: _____ Example:vmhba33 : C0 : T0 : L5

End of Lab 1 – Part 1

Lab 1: Part 2 – Create TimeFinder SnapVX Snapshots Using Unisphere for VMAX

Step	Action
1	Use Unisphere for VMAX to create a Storage Group for the Source device. In Unisphere for VMAX navigate to SID > Storage > Storage Groups Dashboard > Storage Select “Create SG” at the bottom of the screen. In the Provision Storage wizard: Enter a name for the Storage Group: <code>esxisrcsg<SGN></code> Select the Pencil icon next to the “Storage Resource Pool” field and select “None”. Note that the Service Level will be automatically set to “None” as well. From the pull down menu for “Add to Job List”, select “Run Now”.

Step	Action
2	Add your Source device to the SG you just created. From the list of Storage Groups, select the SG you created in step 1. Select “View Details” from the bottom of the screen. Select “Volumes – empty” in the “Related Objects” panel on top right of the screen. Select “Add Volumes to SG” in the Volumes page. In the “Add Volumes to Storage Group Wizard”, enter the device number of the Source device (e.g. 0A8) in the “Volume id” field. Select the “Include Volumes in Storage Group” checkbox. Select “Find Volumes>”. Select your Source device in the “Select Volumes” page. Select “Add to SG”.
3	Use Unisphere for VMAX to create a Storage Group for the Target device. In Unisphere for VMAX navigate to SID > Storage > Storage Groups Dashboard > Storage Select “Create SG” at the bottom of the screen. In the Provision Storage wizard: Enter a name for the Storage Group: <code>esxitgtsg<SGN></code> Select the “pencil” icon next to the “Storage Resource Pool” field and select “None”. Note that the Service Level will be automatically set to “None” as well. From the pull down menu for “Add to Job List”, select “Run Now”.

Step	Action
4	Add your Target device to the SG you just created. From the list of Storage Groups, select the SG you created in step 3. Select “View Details” from the bottom of the screen. Select “Volumes – empty” in the “Related Objects” panel on top right of the screen. Select “Add Volumes to SG” in the Volumes page. In the “Add Volumes to Storage Group Wizard”, enter the device number of the Source device (e.g. 0A9) in the “Volume id” field. Select the “Include Volumes in Storage Group” checkbox. Select “Find Volumes>”. Select your Source device in the “Select Volumes” page. Select “Add to SG”.
5	Use Unisphere for VMAX to create TimeFinder SnapVX snapshot. Select “Data Protection” on the top of the screen. This displays the Protection Dashboard (SID > Data Protection > Protection Dashboard). Select “Unprotected”. Select your Source device SG (esxisrcsg<SGN>). Select “Protect” in the bottom of the screen. In the “Protect Storage Group – esxisrcsg<SGN>” wizard, select “Point In Time Protection > Using SnapVX” for the “Select Protection Type” step. Click “Next”. In the “Snapshot Details” step, select “Create New Snapshot”. Enter a name for the snapshot: VMFS_backup<SGN> In the “Finish” step, select “Run Now” from the “Add to Job List” pull down menu.

Step	Action
6	Login to StudentVM and add more data. From your Primary ESXi server, right click the StudentVM and choose “Open Console”. This will open a VM console window. Login to the StudentVM with a username of “student” and password of “student”. Right click the desktop of the StudentVM and choose “Create Folder”. Give the folder a name of More_Production_Data. Log off the Student VM – select “System > Log Out student > Log Out”. Close out the VM console window by clicking on the X in the top right corner.
7	Use Unisphere for VMAX to create another TimeFinder SnapVX snapshot. Select “Data Protection” on the top of the screen. This displays the Protection Dashboard (SID > Data Protection > Protection Dashboard). Your Source SG (esxisrcsg<SGN>) should be listed in the “Application Protection” section of the screen. Select your Source device SG (esxisrcsg<SGN>). Select “Create Snapshot” in the bottom of the screen. In the “SnapVX – Create Snapshot – esxisrcsg<SGN>” dialog, select “Reuse Existing Snapshot”. Your first snapshot VMFS_backup<SGN> should be displayed in the list. Select the VMFS_backup<SGN> snapshot. From the “Add to Job List” pull down menu, select “Run Now”.

Step	Action
8	Use Unisphere for VMAX to Link snapshot to Target. From the “Application Protection” section, double-click your Source device SG (esxisrcsg<SGN>). In SID > Data Protection > TimeFinder > TimeFinder/SnapVX > esxisrcsg<SGN> screen, note the two snapshots listed for the Storage Group. The number in parenthesis after the creation time indicates the generation number of the snapshot. Select the snapshot that corresponds to generation 1. Select “Link” action. In the “SnapVX – Link to Storage Group – VMFS_backup<SGN>” dialog, select “Select existing target storage group”. Your Storage Group with the Target device (esxitgtsg<SGN>) should be listed. Select your Target Storage Group. Select “Run Now” from the “Add to Job List” pull down menu. Note that there is a check mark now for “Linked” field in the listing.

End of Lab 1 – Part 2

Lab 1: Part 3 – Access Linked Target from Secondary ESXi Server

Step	Action
1	Go back to the VMware vSphere client window that was logged into the Secondary ESXi Server .
2	Rescan the Secondary ESXi Server. Select the “Configuration” tab in the Main panel. Select “Storage” from the “Hardware” panel. The view should default to the “Datastores” view. Select “Rescan All...” to launch the Rescan window. Make sure that the both boxes are checked and then click “OK” to scan for new storage devices and VMFS volumes. Check the Recent Tasks area in the bottom of the screen to make sure the Rescan completes.

Step	Action
3	Mount the SnapVX replica of the Production Datastore on the Secondary ESXi by assigning a new signature. You should still be in the Configuration Datastores view of the Secondary ESXi. Select “Add Storage ...” to launch the Add Storage wizard. Choose Disk/LUN for the Storage Type and then click “Next”. In the Select Disk/LUN screen examine the VMFS Label column of the available devices. One of the devices should show the name of your Production_Datastore<SGN>. Note the LUN value for this device. This LUN value should match the L# you had recorded for the Runtime name of your Target device in Part 1 Step 12. Select this device and then click “Next”. Choose “Assign a New Signature” in the Select VMFS Mount Options screen and then click “Next”. Click “Finish” in the Ready to Complete screen. Monitor the Recent Tasks at the bottom of the screen to make sure the resignature and mount succeeds. If the operation succeeds you should see a new datastore listed. The datastore will have a name that starts with snap-xxxxxxx followed by the name of your Production_Datastore<SGN>.
4	Add VM on replica datastore to the inventory on the Secondary ESXi Server. Right click the replica Production_Datastore and choose “Browse Datastore”. This will launch the Datastore Browser window. Click the VM folder in the left panel of the Datastore Browser. The files in the folder should be listed on the right. Right click the StudentVM.vmx file and choose “Add to Inventory”. Choose all the defaults in the Add To Inventory dialog. Click “Next”, “Next”, “Finish” on the three successive screens. Close out of the Datastore Browser by clicking on the X in the top right corner.

Step	Action
5	Power on Virtual Machine on replica Datastore. In the tree panel click the + to drill down into your Secondary ESXi Server. The StudentVM you just added to the inventory should be seen in the tree panel. Select the StudentVM in the tree panel and then select the “Summary” tab in the Main panel. The VM should be Powered Off. Click the “Power On link” in the “Commands” section to power it on. Choose “I copied it” when prompted with the Virtual Machine Message and click “OK”. What Storage is the VM using? _____ It should only be using storage from the replica Production Datastore.
6	Login to the VM on the replica datastore and examine data. Right click the StudentVM and choose “Open Console”. This will open a VM console window. Login to the StudentVM with a username of “student” and password of “student”. What data folder(s) are accessible from the desktop of the replica VM? _____ How will you explain the folder(s) that are accessible? _____ Shut down the VM – Click System > Shut Down > Shut Down. Close out the VM console window by clicking on the X in the top right corner.
7	Close the vSphere Client windows for both the Primary and Secondary ESXi servers.

End of Lab Exercise 1

Lab Exercise 2: SRDF/S Disaster Recovery for a VMFS Datastore

Purpose:	Use Unisphere for VMAX to perform SRDF/S Disaster Recovery operations for a VMware vSphere VMFS Datastore. The VMFS datastore resides on a SRDF R1 device and contains a Virtual Machine. The SRDF R2 Device on the remote VMAX3 is presented to an ESXi Server at the remote location.
Tasks:	In this lab exercise, students will: 1) Identify and correlate the SRDF R1 and R2 VMAX3 devices accessible to their assigned Primary and Remote ESXi servers respectively. 2) Create a VMFS Datastore on the R1 device and deploy a Virtual Machine. 3) Perform an SRDF Failover operation to simulate Disaster Recovery. 4) Mount the Datastore on the R2 device, to the Secondary ESXi server and power-on the Virtual Machine on the Remote ESXi server.
References:	SRDF/Synchronous Operations Lecture Module.

Lab 2: Part 1 - Identify R1 and R2 devices, create a VMFS Datastore on the R1 device, and deploy a Virtual Machine

Step	Action
1	You will first login to a Windows server. The instructor will provide you with the procedure to login to this Windows server. The Windows server has: Internet Explorer VMware vSphere client

Step	Action																								
2	Following information will be provided by the instructor: <table border="1"> <tr> <td>Student Group Number (SGN)</td><td></td></tr> <tr> <td>Unisphere for VMAX Server IP Address</td><td>IP: _____</td></tr> <tr> <td>Unisphere for VMAX Username & Password</td><td>Username/Password: _____</td></tr> <tr> <td>Local VMAX3 SID</td><td></td></tr> <tr> <td>Remote VMAX3 SID</td><td></td></tr> <tr> <td>Primary ESXi Server: (Host with access to SRDF R1 Device)</td><td>IP: _____ Username & Password: _____</td></tr> <tr> <td>Primary ESXi Storage Group Name</td><td></td></tr> <tr> <td>R1 Device number (e.g. 059)</td><td></td></tr> <tr> <td>Remote ESXi Server: (Host with access to SRDF R2 Device)</td><td>IP: _____ Username & Password: _____</td></tr> <tr> <td>Remote ESXi Storage Group Name</td><td></td></tr> <tr> <td>R2 Device number (e.g. 059)</td><td></td></tr> <tr> <td>Location and file name of Student VM OVA</td><td></td></tr> </table>	Student Group Number (SGN)		Unisphere for VMAX Server IP Address	IP: _____	Unisphere for VMAX Username & Password	Username/Password: _____	Local VMAX3 SID		Remote VMAX3 SID		Primary ESXi Server: (Host with access to SRDF R1 Device)	IP: _____ Username & Password: _____	Primary ESXi Storage Group Name		R1 Device number (e.g. 059)		Remote ESXi Server: (Host with access to SRDF R2 Device)	IP: _____ Username & Password: _____	Remote ESXi Storage Group Name		R2 Device number (e.g. 059)		Location and file name of Student VM OVA	
Student Group Number (SGN)																									
Unisphere for VMAX Server IP Address	IP: _____																								
Unisphere for VMAX Username & Password	Username/Password: _____																								
Local VMAX3 SID																									
Remote VMAX3 SID																									
Primary ESXi Server: (Host with access to SRDF R1 Device)	IP: _____ Username & Password: _____																								
Primary ESXi Storage Group Name																									
R1 Device number (e.g. 059)																									
Remote ESXi Server: (Host with access to SRDF R2 Device)	IP: _____ Username & Password: _____																								
Remote ESXi Storage Group Name																									
R2 Device number (e.g. 059)																									
Location and file name of Student VM OVA																									

Step	Action				
3	Use Unisphere for VMAX to identify and correlate your assigned R1 device: Login to the Unisphere for VMAX Server: From your desktop launch Internet Explorer and connect to https://<Unisphere_ServerIP>:8443 Use the login credentials provided in step 2. In the landing page select the Local VMAX3 SID recorded in step 2. This should take you to SID > Storage > Storage Groups Dashboard. Select “Total”. This gives a listing of all the Storage Groups defined. Identify and select your Primary ESXi Storage Group. Select “View Details”. In the “View Details” page, select “Volumes” from “Related Objects” panel. From the list of devices, select the R1 device assigned to you in step 2. Select “View Details”. Record the WWN of the R1 device. <table border="1"> <tr> <td>R1 Device (e.g. 059)</td><td>WWN (e.g. 60000970000196800483533030303539)</td></tr> <tr> <td></td><td></td></tr> </table> Minimize Unisphere for VMAX window.	R1 Device (e.g. 059)	WWN (e.g. 60000970000196800483533030303539)		
R1 Device (e.g. 059)	WWN (e.g. 60000970000196800483533030303539)				

Step	Action
4	Login to the Primary ESXi Server. Launch the vSphere client by double clicking on the VMware vSphere Client icon on the desktop and login to your Primary ESXi Server. IP address/Name: <Primary ESXi Server IP> Username: root Password: <Primary ESXi Server Password> If necessary, select the check box “Install this certificate and do not display any security warnings” and then click Ignore to proceed with login.
5	On your Primary ESXi Server, select “Configuration” tab. Select “Storage” from the “Hardware” panel. Select “Devices” tab. In the list of devices, identify the naa number that matches with the WWN you recorded in step 3. Record the Runtime Name for the device: _____ Example:vmhba33 : C0 : T0 : L6

Step	Action
6	Create a Datastore on the R1 Device: Select the “Datastores” tab. Select “Add Storage...” to launch the Add Storage Wizard. Choose Disk/LUN for the Storage Type and then click “Next”. In the Select Disk/LUN screen: Select the EMC disk with the LUN number that matches the L# in the Runtime name of your R1 device in step 5, the capacity should also match. Then click “Next”. Choose VMFS-5 for File System Version, and then click “Next”. Click Next on the Current Disk Layout screen. Type in a unique name for your datastore: RDF_Datastore<SGN>. Click “Next”. Choose the Maximum available space. Click “Next”. Click “Finish” in the Ready to Complete screen. Your RDF_Datastore should appear in the Datastores listing.

Step	Action
7	Deploy a VM on your RDF_Datastore: Click “File” in the top level menu and choose “Deploy OVF Template ...” Use the Browse button to locate the Student VM OVA template file. Once the file has been selected click “Open” in the file selector window to return to the Deploy OVF Template dialog. Click “Next”. Click “Next” in the OVF Template Details screen. Type in a name for your Student VM: RDFStudentVM<SGN>. Click “Next”. Select your RDF_Datastore<SGN> in the Storage screen. Click “Next”. Choose “Thin Provision” for the Disk Format. Click “Next”. Check the “Power on after deployment” box in the Ready to Complete screen. Click “Finish”. The Deploying screen will appear. Watch the progress and then close the window after a successful deployment. Contact the instructor if the deployment fails.

Step	Action
8	Confirm that the Virtual machine resides on the RDF_Datastore: Select RDF_Datastore. Right-click and select “Browse Datastore”. Select the VM (e.g. RDFStudentVM<SGN>) folder. You should see RDFStudentVM<SGN>.vmx and other related files. Close the Datastore Browser. In the tree panel click the + to drill down into your Primary ESXi Server. The RDFStudentVM should be seen in the tree panel. Please contact the instructor if this is not the case. Select the RDFStudentVM in the tree panel and then select the “Summary” tab in the Main panel. Is the VM Powered on? _____ (It should be – Click the “Power On” link in the “Commands” section if it is Powered Off) What Storage is the VM using? _____ It should only be using storage from your RDF_Datastore. Please contact the instructor if this is not the case.
9	Login to RDFStudentVM and add data. Right click the RDFStudentVM and choose “Open Console”. This will open a VM console window. Login to the RDFStudentVM with a username of “student” and password of “student”. Right click the desktop of the RDFStudentVM and choose “Create Folder”. Give the folder a name of R1_Data. Log off the Student VM – select “System > Log Out student > Log Out”. Close out the VM console window by clicking on the X in the top right corner.

Step	Action				
10	Use Unisphere for VMAX to identify and correlate your assigned R2 device: Login to the Unisphere for VMAX Server (if necessary). From your desktop launch Internet Explorer and connect to <a href="https://<Unisphere_ServerIP>:8443">https://<Unisphere_ServerIP>:8443 Use the login credentials provided in step 2. In the landing page select the Remote VMAX3 SID recorded in step 2. This should take you to SID > Storage > Storage Groups Dashboard. Select “Total”. This gives a listing of all the Storage Groups defined. Identify and select your Remote ESXi Storage Group. Select “View Details”. In the “View Details” page, select “Volumes” from “Related Objects” panel. From the list of devices, select the R2 device assigned to you in step 2. Select “View Details”. Record the WWN of the R2 device. <table border="1"> <tr> <td>R2 Device (e.g. 059)</td><td>WWN (e.g. 60000970000196800225533030303539)</td></tr> <tr> <td></td><td></td></tr> </table> Minimize Unisphere for VMAX window.	R2 Device (e.g. 059)	WWN (e.g. 60000970000196800225533030303539)		
R2 Device (e.g. 059)	WWN (e.g. 60000970000196800225533030303539)				

Step	Action
11	Login to the Remote ESXi Server. Launch the vSphere client by double clicking on the VMware vSphere Client icon on the desktop and login to your Remote ESXi Server. IP address/Name: <Remote ESXi Server IP> Username: root Password: <Remote ESXi Server Password> If necessary, select the check box “Install this certificate and do not display any security warnings” and then click Ignore to proceed with login.
12	On your Remote ESXi Server, select “Configuration” tab. Select “Storage” from the “Hardware” panel. Select “Devices” tab. In the list of devices, identify the naa number that matches with the WWN you recorded in step 10. Record the Runtime Name for the device: _____ Example:vmhba33:C0:T0:L7

End of Lab 2 – Part 1

Lab 2: Part 2 – Use Unisphere for VMAX to Create a Device Group, Add the R1 Device to it, and Perform an SRDF Failover Operation

Step	Action
1	Use Unisphere for VMAX to create a Device Group. In Unisphere for VMAX, select the Local VMAX3 SID. From “Data Protection” select “Replication Groups and Pools”. Select “Device Groups”. Select “Create”. In the “Create Device Group” wizard, step 1, enter a name for the Device Group: esxir1dg<SGN> Select Device Group Type “R1” from the drop-down menu. Click “Next”. In step 2 Select Source, choose “Select volumes manually” from the drop-down menu. For “Select Source Vol Type”, choose “STD” from the drop-down menu. Scroll through the list and select the R1 device assigned to you. Select “Add to Group”. Click “Finish”.

Step	Action
2	In Unisphere for VMAX, from “Data Protection”, select “SRDF”. This will display the list of Device Groups that have been created from this instance of Unisphere for VMAX. The Device Group you created in step 1 should be listed. What is the state? _____ (It should be Synchronized). Select your Device Group and select “View Details”. What is the SRDF Mode? _____ (It should be Synchronous). If the mode is not Synchronous, then select the device and click “>>”. Select “Set Mode” from the list of operations. From the drop-down for “SRDF Mode” select “Synchronous”. Select “Run Now” from the “Add to Job List” drop-down.

Step	Action
3	In preparation for the planned SRDF Failover, shut down RDFStudentVM, remove VM from Primary ESXi inventory and unmount RDF_Datastore. From the vSphere client window that was logged into the Primary ESXi server: Right click the RDFStudentVM and choose Open Console. This will open a VM console window. Login to the RDFStudentVM with a username of “student” and password of “student”. The R1_Data folder created earlier should exist on the VM’s desktop. Shut down the RDFStudentVM – Click System > Shut Down > Shut Down. Close out the VM console window by clicking on the X in the top right corner. Right click the RDFStudentVM in the tree panel of the vSphere client and choose “Remove from Inventory”. Click “Yes” in the confirmation dialog. Click the Primary ESXi server in the tree panel and select the “Configuration” tab in the Main panel. Then select “Storage” in the “Hardware” panel. The view should default to the Datastores view. Right click the RDF_Datastore and choose “Unmount”. Click “OK” in the confirmation dialog.
4	In Unisphere for VMAX, from the Device Group list, select your Device Group and click “>>”. Select “Failover” from the list of operations. In “Failover – Device Group” dialog, select “Run Now” from the “Add to Job List” drop-down.
5	Minimize your browser window.

End of Lab 2 – Part 2

Lab 2: Part 3 – Access VM on Remote ESXi Server after SRDF Failover

Step	Action
1	Go back to the VMware vSphere client window that was logged into the Remote ESXi Server .
2	Rescan the Remote ESXi Server. Select the “Configuration” tab in the Main panel. Select “Storage” from the “Hardware” panel. The view should default to the “Datastores” view. Select “Rescan All...” to launch the Rescan window. Make sure that the both boxes are checked and then click “OK” to scan for new storage devices and VMFS volumes. Check the Recent Tasks area in the bottom of the screen to make sure the Rescan completes.

Step	Action
3	Mount the SRDF replica of the RDF_Datastore on the Remote ESXi by keeping the existing signature. You should still be in the Configuration Datastores view of the Secondary ESXi. Select “Add Storage ...” to launch the Add Storage wizard. Choose Disk/LUN for the Storage Type and then click “Next”. In the Select Disk/LUN screen examine the VMFS Label column of the available devices. One of the devices should show the name of your RDF_Datastore<SGN>. Note the LUN value for this device. This LUN value should match the L# you had recorded for the Runtime name of your Target device in Part 1 Step 12. Select this device and then click “Next”. Choose “Keep the existing Signature” in the “Select VMFS Mount Options” screen and then click “Next”. Click “Finish” in the Ready to Complete screen. Monitor the Recent Tasks at the bottom of the screen to make sure the resignature and mount succeeds. If the operation succeeds you should see a new datastore listed. The datastore will have the same name RDF_Datastore<SGN>. This is because we did not assign a new signature.
4	Add VM on replica datastore to the inventory on the Remote ESXi Server. Right click the replica RDF_Datastore and choose “Browse Datastore”. This will launch the Datastore Browser window. Click the VM folder in the left panel of the Datastore Browser. The files in the folder should be listed on the right. Right click the RDFStudentVM.vmx file and choose “Add to Inventory”. Choose all the defaults in the Add To Inventory dialog. Click “Next”, “Next”, “Finish” on the three successive screens. Close out of the Datastore Browser by clicking on the X in the top right corner.

Step	Action
5	Power on Virtual Machine on replica Datastore. In the tree panel click the + to drill down into your Remote ESXi Server. The RDFStudentVM you just added to the inventory should be seen in the tree panel. Select the RDFStudentVM in the tree panel and then select the “Summary” tab in the Main panel. The VM should be Powered Off. Click the “Power On link” in the “Commands” section to power it on. Choose “I copied it” when prompted with the Virtual Machine Message and click “OK”. What Storage is the VM using? _____ It should only be using storage from the replica Production Datastore.
6	Login to the VM on the replica Datastore and examine data. Right click the RDFStudentVM and choose “Open Console”. This will open a VM console window. Login to the RDFStudentVM with a username of “student” and password of “student”. What data folder is accessible from the desktop of the replica VM? _____ To simulate continuing production work from the R2 device, right-click the desktop of the VM and choose “Create Folder”. Give the folder a name of R2_Data. We will shut down the VM in preparation for a planned SRDF Failback operation. Shut down the VM – Click System > Shut Down > Shut Down. Close out the VM console window by clicking on the X in the top right corner.

Step	Action
7	Remove VM from Remote ESXi server inventory and unmount the replica Datastore. Right click the RDFStudentVM in the tree panel of the vSphere client and choose “Remove from Inventory”. Click “Yes” in the confirmation dialog. Click the Remote ESXi server in the tree panel and select the “Configuration” tab in the Main panel. Then select “Storage” in the “Hardware” panel. The view should default to the Datastores view. Right click the RDF_Datastore and choose “Unmount”. Click “OK” in the confirmation dialog.
8	Close the vSphere client that is logged into the Remote ESXi server.

End of Lab 2 – Part 3

Lab 2: Part 4 – Use Unisphere for VMAX to Perform an SRDF Failback Operation, Power-on VM from the R1 Datastore

Step	Action
1	In Unisphere for VMAX, from “Data Protection”, select “SRDF”. This will display the list of Device Groups that have been created from this instance of Unisphere for VMAX. What is the state? _____ (It should be FailedOver). Select your Device Group and click “>>”. Select “Failback” from the list of operations. In “Failback – Device Group” dialog, select “Run Now” from the “Add to Job List” drop-down.
2	Go back to the VMware vSphere client window that was logged into the Primary ESXi Server.
3	Rescan the Primary ESXi Server. Select the “Configuration” tab in the Main panel. Select “Storage” from the “Hardware” panel. The view should default to the “Datastores” view. Select “Rescan All...” to launch the Rescan window. Make sure that the both boxes are checked and then click “OK” to scan for new storage devices and VMFS volumes. Check the Recent Tasks area in the bottom of the screen to make sure the Rescan completes.

Step	Action
4	Mount the restored RDF_Datastore on the Primary ESXi server. You should still be in “Datastores” view of the “Configuration” tab. Right-click the greyed out RDF_Datastore and choose “Mount”. Monitor the Recent Tasks at the bottom of the screen to make sure the mount succeeds.
5	Add VM on the Datastore to the inventory on the Primary ESXi Server. Right click the replica RDF_Datastore and choose “Browse Datastore”. This will launch the Datastore Browser window. Click the VM folder in the left panel of the Datastore Browser. The files in the folder should be listed on the right. Right click the RDFStudentVM.vmx file and choose “Add to Inventory”. Choose all the defaults in the Add To Inventory dialog. Click “Next”, “Next”, “Finish” on the three successive screens. Close out of the Datastore Browser by clicking on the X in the top right corner.
6	Power on Virtual Machine on the Datastore. In the tree panel click the + to drill down into your Primary ESXi Server. The RDFStudentVM you just added to the inventory should be seen in the tree panel. Select the RDFStudentVM in the tree panel and then select the “Summary” tab in the Main panel. The VM should be Powered Off. Click the “Power On link” in the “Commands” section to power it on. Choose “I copied it” when prompted with the Virtual Machine Message and click “OK”. What Storage is the VM using? _____ It should only be using storage from the replica Production Datastore.

Step	Action
7	Login to the VM on the Datastore and examine data. Right click the RDFStudentVM and choose “Open Console”. This will open a VM console window. Login to the RDFStudentVM with a username of “student” and password of “student”. What data folder(s) is accessible from the desktop of the replica VM? _____ You should have access to both the R1_Data and the R2_Data folders. Shut down the VM – Click System > Shut Down > Shut Down. Close out the VM console window by clicking on the X in the top right corner.
8	Close the vSphere client that is logged into the Primary ESXi server.

End of Lab Exercise 2

End of Lab Exercises on ESXi hosts