

## Primera 同步远程复制配置参考指南

声明:

本文仅作为 HPE 和 H3C 官方文档的补充说明及技术参考，并非替代官方文档，请认真阅读 HPE 和 H3C 官方文档避免出现技术风险。本文并不保证时时更新，文中涉及的一切内容均以官方内容为准。

**存储产品支持部**

——伍雅宁

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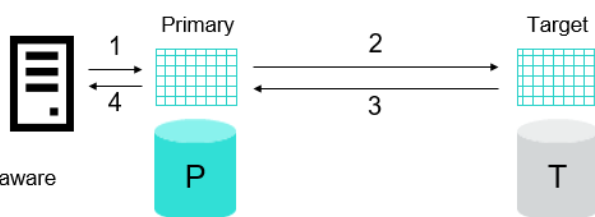
# 同步远程复制原理和拓扑

主机发送 I/O 到主存储缓存后，主存储会立即把数据同步到目标存储缓存，然后目标存储做完缓存镜像后向主存储确认接收到 I/O 后，最后主存储向主机回复接收到 I/O。

## Synchronous mode

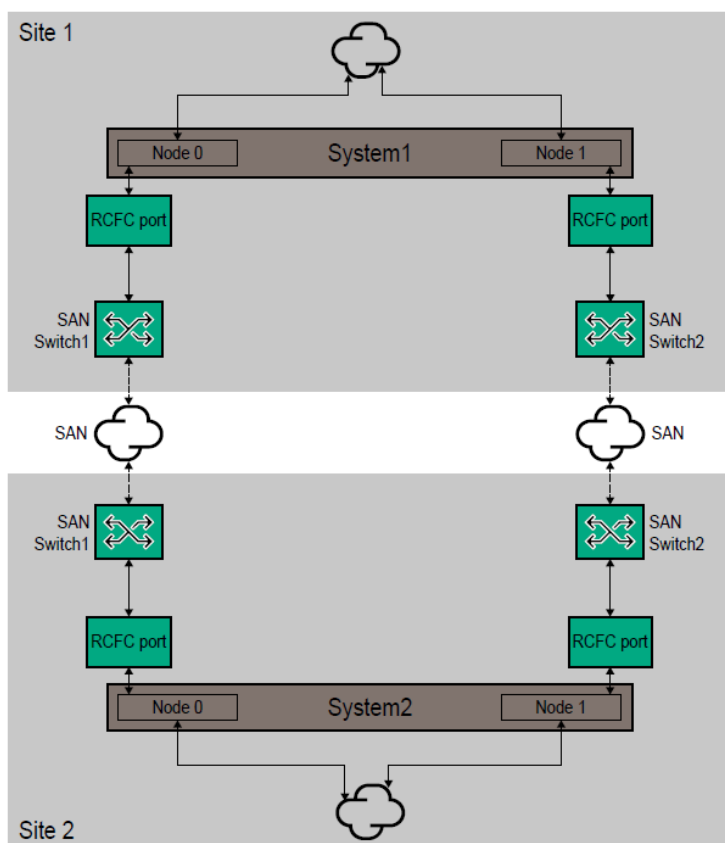
Continuous operation and synchronization

- Real-time Mirror
  - Highest I/O currency
  - Lock-step data consistency
- Space Efficient
  - Thin provisioning/Thin deduped/Compression aware
- Targeted Use
  - Campus-wide business continuity
- Guaranteed Consistency



- 1 : Host server writes I/O to primary write cache
- 2 : Primary array writes I/O to secondary write cache
- 3 : Remote array acknowledges the receipt of the I/O
- 4 : Host I/O acknowledged to host

本次以 RCFC 作为远程复制链路，把两个节点的远程复制端口连接到不同 SAN 交换机上，主存储和目标存储的 0:3:4 端口连接到 1 号交换机，主存储和目标存储的 1:3:4 端口连接到 2 号交换机。



■ Cable the RCFC ports for Remote Copy

## 远程复制链路配置

默认情况下存储FC端口模式为Target，也就是主机端口，使用showportdev命令确认当前这些端口没有被使用，然后把主存储和目标存储端口一对一划分WWPN Zone。把端口离线之后配置为RCFC端口，在命令行下需要使用controlport offline和controlport config rcfc进行配置。配置之后端口模式变为Initiator，查看端口参数可见当前IntCoal参数默认为Enabled。IntCoal解释："Interrupt coalescing" (IntCoal) allows the device driver to delay delivery of the interrupt to the kernel by waiting a short while (around 0.2 ms by default) in order to coalesce other interrupts.

```

C630 cli% showport 0:3:4 1:3:4
N:S:P  Mode State  ---Node_WWN---  -Port_WWN/HW_Addr-  Type Protocol Label Partner FailoverState
0:3:4  target ready  2FF70002AC025C02  20340002AC025C02 free      FC      -    1:3:4      none
1:3:4  target ready  2FF70002AC025C02  21340002AC025C02 free      FC      -    0:3:4      none
-----
2
C630 cli% controlport offline 0:3:4 1:3:4
Are you sure you want to run controlport offline on port 0:3:4?
select q=quit y=yes n=no: y
Are you sure you want to run controlport offline on port 1:3:4?
select q=quit y=yes n=no: y
C630 cli% controlport config rcfc 0:3:4 1:3:4
Are you sure you want to run controlport config rcfc on port 0:3:4 (connection type point)?
select q=quit y=yes n=no: y
Are you sure you want to run controlport config rcfc on port 1:3:4 (connection type point)?
select q=quit y=yes n=no: y
C630 cli% showport 0:3:4 1:3:4
N:S:P  Mode State  ---Node_WWN---  -Port_WWN/HW_Addr-  Type Protocol Label Partner FailoverState
0:3:4  initiator ready  2FF70002AC025C02  20340002AC025C02 free      FC      -    -          -
1:3:4  initiator ready  2FF70002AC025C02  21340002AC025C02 free      FC      -    -          -
-----
2
C630 cli% showportdev all 0:3:4 1:3:4
Illegal integer argument 0:3:4

C630 cli% showportdev all 0:3:4
PtId LpID Hadr ---Node_WWN--- -Port_WWN/HW_Addr- ftrs svpm bbct flen -----vp_WWN----- Name
0xa0600 0x00 0x00 2FF70002AC025C02 20340002AC025C02 0x8800 0x0032 n/a 0x0800 20340002AC025C02 0:3:4
-----
1 total
C630 cli% showportdev all 1:3:4
PtId LpID Hadr ---Node_WWN--- -Port_WWN/HW_Addr- ftrs svpm bbct flen -----vp_WWN----- Name
0x140600 0x00 0x00 2FF70002AC025C02 21340002AC025C02 0x8800 0x0032 n/a 0x0800 21340002AC025C02 1:3:4
-----
1 total
C630 cli% showport -par 0:3:4 1:3:4
N:S:P Connmode ConnType CfgRate MaxRate Class2 UniqNodeWwn VCN IntCoal TMW0 Smart_SAN
0:3:4 rcfc point auto 32Gbps disabled disabled disabled enabled disabled unsupported
1:3:4 rcfc point auto 32Gbps disabled disabled disabled enabled disabled unsupported
-----

```

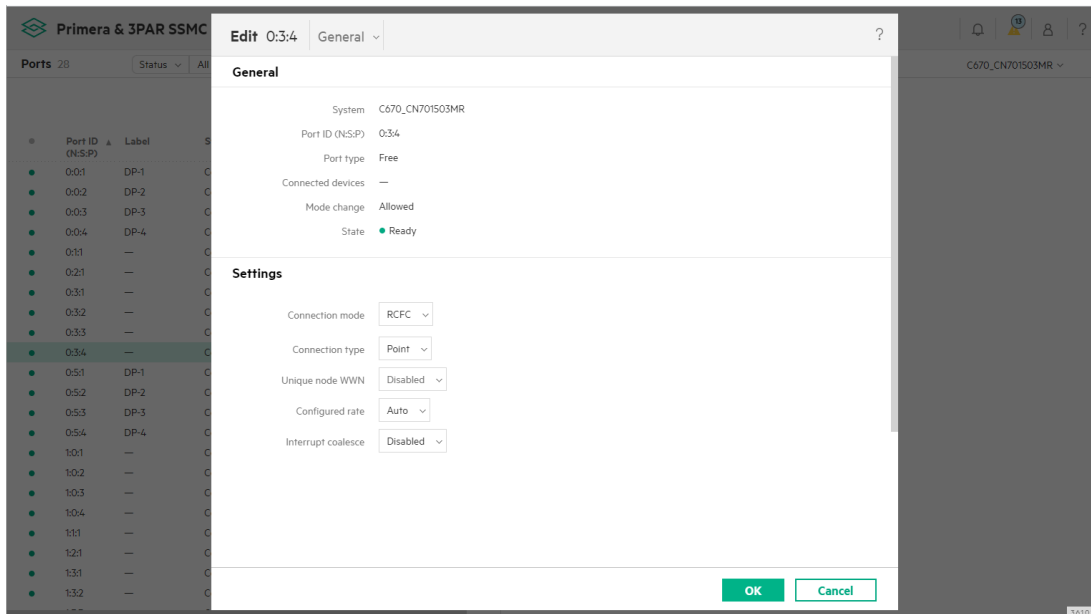
目前 Primera 远程复制手册没有提及这个参数，但参考 3PAR Remote Copy 手册还是建议使用 controlport intcoal disable 禁用这个参数。

```

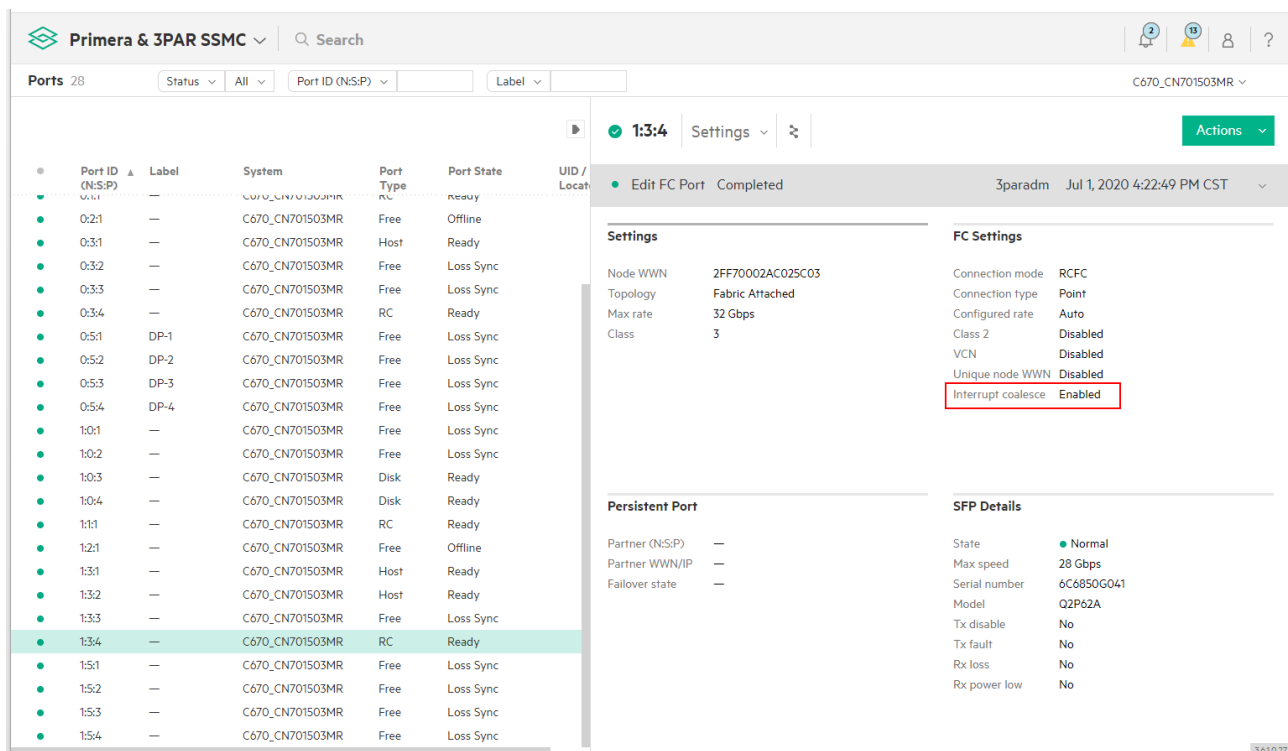
C630 cli% showport -par 0:3:4 1:3:4
N:S:P Connmode ConnType CfgRate MaxRate Class2 UniqNodeWwn VCN IntCoal TMW0 Smart_SAN
0:3:4 rcfc point auto 32Gbps disabled disabled disabled enabled disabled unsupported
1:3:4 rcfc point auto 32Gbps disabled disabled disabled enabled disabled unsupported
-----
2
C630 cli% controlport intcoal disable -f 0:3:4
C630 cli% controlport intcoal disable -f 1:3:4
C630 cli% showport -par 0:3:4 1:3:4
N:S:P Connmode ConnType CfgRate MaxRate Class2 UniqNodeWwn VCN IntCoal TMW0 Smart_SAN
0:3:4 rcfc point auto 32Gbps disabled disabled disabled disabled disabled unsupported
1:3:4 rcfc point auto 32Gbps disabled disabled disabled disabled disabled unsupported
-----
2
C630 cli% █

```

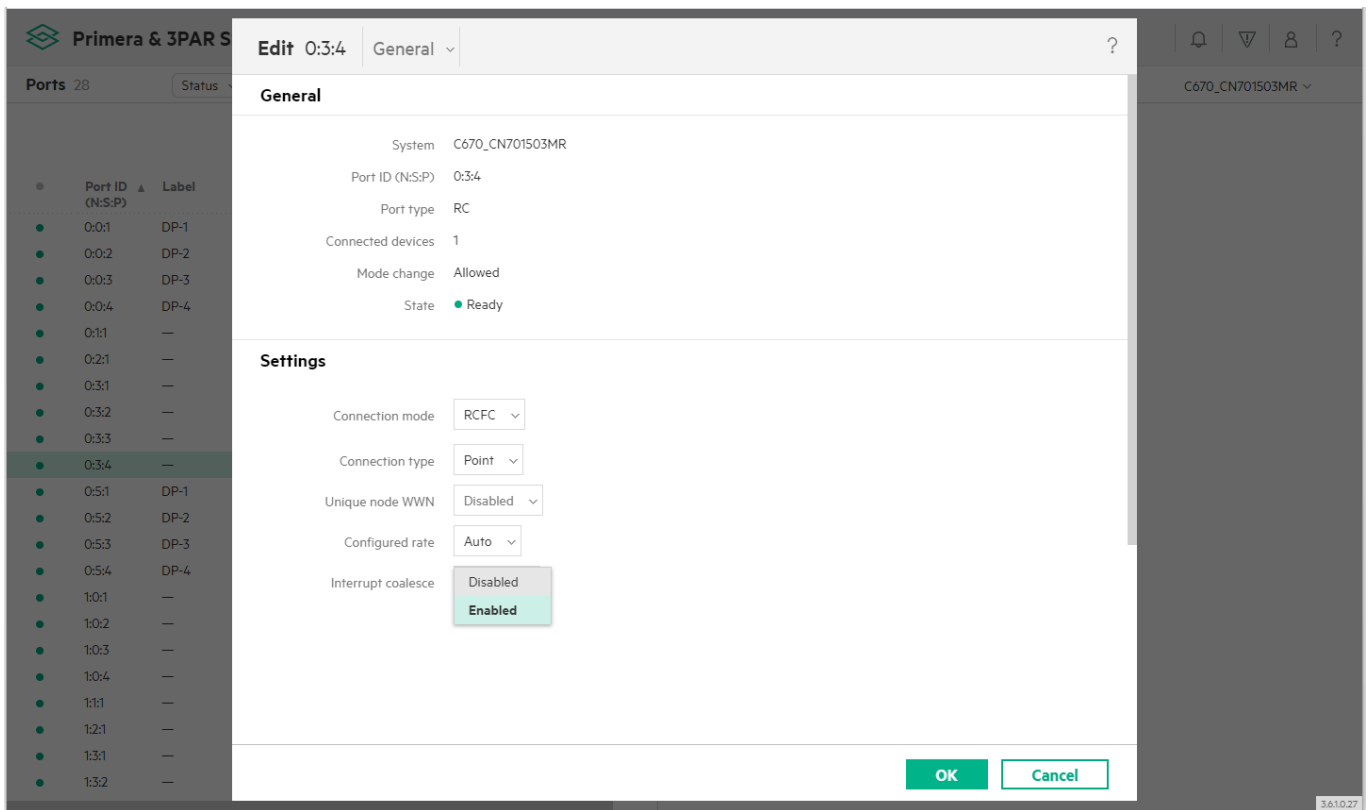
在 SSMC 中也可以选中 FC 端口后点击编辑，把端口连接模式改为 RCFC，然后点击 OK。这里可见在 SSMC 配置 RCFC 端口时 IntCoal 的设置为禁用。



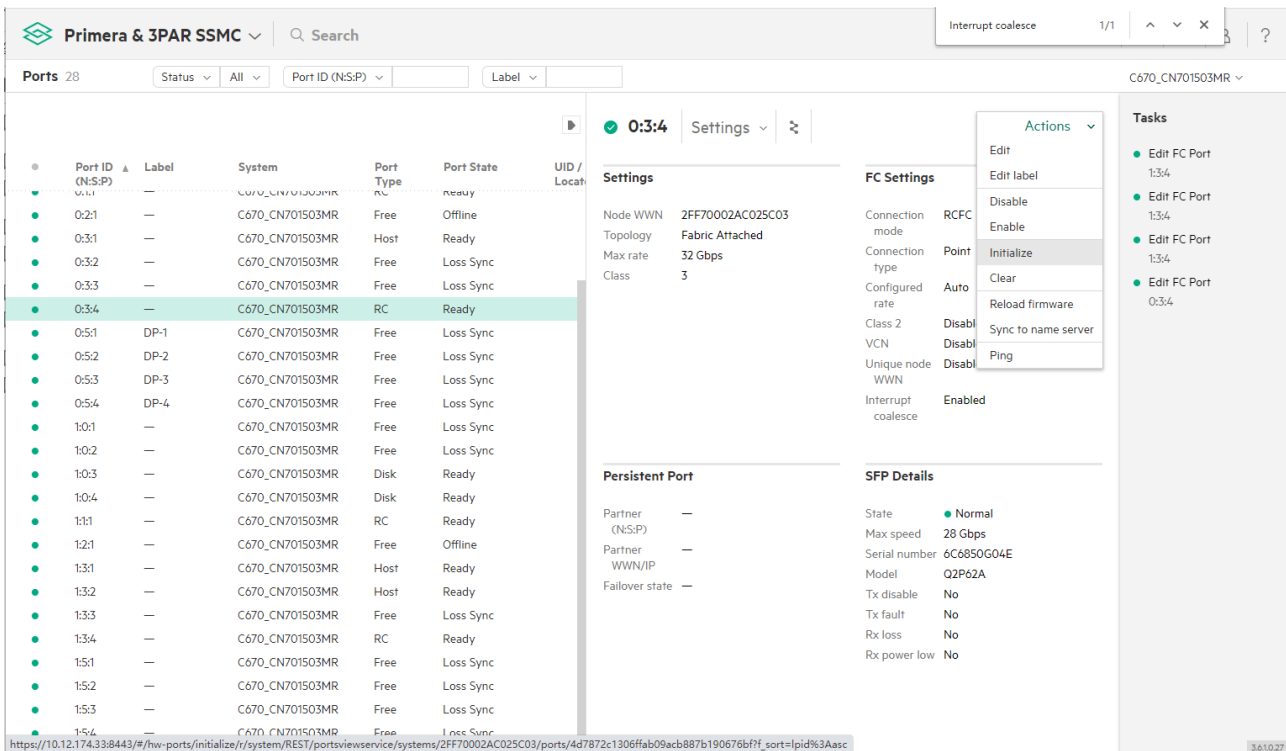
但配置完成之后 IntCoal 参数仍旧是启用状态。



建议编辑端口手动禁用此参数。



把端口配置为 RCFC 之后需要对端口进行初始化。



如果两端 RCFC 端口都初始化完成并且 Zone 配置正确则可以看到对端 RCFC 端口已经 Login。

The screenshot shows the H3C network management interface for a port configuration. The main table lists 28 ports, with port 0:3:4 highlighted in green. The detailed view for port 0:3:4 shows it is in a 'Ready' state. The 'Health' section indicates 'Normal' and 'Ready'. The 'Resources' section shows a throughput rate of 0.00 KBps (<1%) and 32 Gbps. The 'Connected Devices' section shows one system connected to the port.

Port ID (N:S:P)	Label	System	Port Type	Port State	UID / Locat
0:2:1	—	C670_CN701503MR	Free	Offline	
0:3:1	—	C670_CN701503MR	Host	Ready	
0:3:2	—	C670_CN701503MR	Free	Loss Sync	
0:3:3	—	C670_CN701503MR	Free	Loss Sync	
0:3:4	—	C670_CN701503MR	RC	Ready	
0:5:1	DP-1	C670_CN701503MR	Free	Loss Sync	
0:5:2	DP-2	C670_CN701503MR	Free	Loss Sync	
0:5:3	DP-3	C670_CN701503MR	Free	Loss Sync	
0:5:4	DP-4	C670_CN701503MR	Free	Loss Sync	
1:0:1	—	C670_CN701503MR	Free	Loss Sync	
1:0:2	—	C670_CN701503MR	Free	Loss Sync	
1:0:3	—	C670_CN701503MR	Disk	Ready	
1:0:4	—	C670_CN701503MR	Disk	Ready	
1:1:1	—	C670_CN701503MR	RC	Ready	
1:2:1	—	C670_CN701503MR	Free	Offline	
1:3:1	—	C670_CN701503MR	Host	Ready	
1:3:2	—	C670_CN701503MR	Host	Ready	
1:3:3	—	C670_CN701503MR	Free	Loss Sync	
1:3:4	—	C670_CN701503MR	RC	Ready	
1:5:1	—	C670_CN701503MR	Free	Loss Sync	
1:5:2	—	C670_CN701503MR	Free	Loss Sync	
1:5:3	—	C670_CN701503MR	Free	Loss Sync	
1:5:4	—	C670_CN701503MR	Free	Loss Sync	

在命令行下可以使用 showportdev 确认 FC 端口 Login 状态。使用 showrtransport-rcfc 确认 RCFC 端口状态，两端 RCFC 端口都初始化完成并且 Zone 配置正确后 RCFC 端口状态从 New 变为 ready。

```

C630 cli% showport 0:3:4 1:3:4
N:S:P      Mode State  ---Node_WWN---  -Port_WWN/HW Addr-  Type Protocol Label Partner FailoverState
0:3:4 initiator ready 2FF70002AC025C02 20340002AC025C02 rcfc FC - - -
1:3:4 initiator ready 2FF70002AC025C02 21340002AC025C02 rcfc FC - - -
-----
2
C630 cli% showportdev all 0:3:4
PtID LpID Hadr ---Node_WWN--- -Port_WWN/HW Addr- ftrs svpm bbct flen -----vp_WWN----- Name
0xa0600 0x00 0x00 2FF70002AC025C02 20340002AC025C02 0x8800 0x0032 n/a 0x0800 20340002AC025C02 1:3:4
0xa0700 0x04 n/a 2FF70002AC025C03 20340002AC025C03 0x0000 0x0032 0x0000 n/a 20340002AC025C02 -
-----
2 total
C630 cli% showportdev all 1:3:4
PtID LpID Hadr ---Node_WWN--- -Port_WWN/HW Addr- ftrs svpm bbct flen -----vp_WWN----- Name
0x140600 0x00 0x00 2FF70002AC025C02 21340002AC025C02 0x8800 0x0032 n/a 0x0800 21340002AC025C02 1:3:4
0x140700 0x05 n/a 2FF70002AC025C03 21340002AC025C03 0x0000 0x0032 0x0000 n/a 21340002AC025C02 -
-----
2 total
C630 cli% showrtransport -rcfc
N:S:P Peer_Node_WWN Peer_Port_WWN State
0:3:4 2FF70002AC025C03 20340002AC025C03 new
1:3:4 2FF70002AC025C03 21340002AC025C03 new
C630 cli% controlport rcfc init -f 0:3:4
C630 cli% controlport rcfc init -f 1:3:4
C630 cli% showrtransport -rcfc
N:S:P Peer_Node_WWN Peer_Port_WWN State
0:3:4 2FF70002AC025C03 20340002AC025C03 incomplete
1:3:4 2FF70002AC025C03 21340002AC025C03 incomplete
C630 cli% showrtransport -rcfc
N:S:P Peer_Node_WWN Peer_Port_WWN State
0:3:4 2FF70002AC025C03 20340002AC025C03 ready
1:3:4 2FF70002AC025C03 21340002AC025C03 incomplete
C630 cli% showrtransport -rcfc
N:S:P Peer_Node_WWN Peer_Port_WWN State
0:3:4 2FF70002AC025C03 20340002AC025C03 ready
1:3:4 2FF70002AC025C03 21340002AC025C03 incomplete
C630 cli% showrtransport -rcfc
N:S:P Peer_Node_WWN Peer_Port_WWN State
0:3:4 2FF70002AC025C03 20340002AC025C03 ready
1:3:4 2FF70002AC025C03 21340002AC025C03 ready
C630 cli%
    
```

RCFC 端口配置完成后，使用 checkrlink 命令检查两端连通性和吞吐量，在其中一台存储上使用 checkrlink startserver 本地端口命令，把本地存储作为服务器。这里注意 Local IP Addr 后面的 IPv6 地址，后面要使用到。

```
C670_CN701503MR cli% checkrlink startserver 1:3:4
Starting Server
Test length (secs):      172800
Time now (secs):        1593595001
Min run time (secs):    1593767801
Running link test on:   1:3:4
Local IP Addr:          fe80::2134:2:ac02:5c03
Local Device name:      fcnet2
```

把另外一端作为客户端，使用 checkrlink startclient 本地端口 对端 IPv6 地址开始检测，300 单位是秒。

```
C630 cli% checkrlink startclient 1:3:4 fe80::2134:2:ac02:5c03 300
Running Client Side
Running link test on:  1:3:4
Test length (secs):   300
Destination Addr:     fe80::2134:2:ac02:5c03
Local IP Addr:        fe80::2134:2:ac02:5c02
Local Device name:    fcnet2

-----
Measuring link latency
-----

Average measured latency: 0.108 ms
Pings Lost:              0 %

-----
Starting throughput test, from 1:3:4 -> fe80::2134:2:ac02:5c03
-----

Client connecting to fe80::2134:2:ac02:5c03%fcnet2, TCP port 5001
TCP window size: 1285 KByte (default)
-----
[ 5] local fe80::2134:2:ac02:5c02 port 48870 connected with fe80::2134:2:ac02:5c03 port 5001
[ 4] local fe80::2134:2:ac02:5c02 port 48864 connected with fe80::2134:2:ac02:5c03 port 5001
[ 3] local fe80::2134:2:ac02:5c02 port 48866 connected with fe80::2134:2:ac02:5c03 port 5001
[ 6] local fe80::2134:2:ac02:5c02 port 48868 connected with fe80::2134:2:ac02:5c03 port 5001
```

测试完成后会显示当前两套存储通过此链路产生的吞吐量以及是否适合配置远程复制，使用相同方法测试所有端口确认所有端口可以正常配置远程复制。

```
[ ID] Interval      Transfer      Bandwidth
[ 5] 0.0-300.0 sec 238319104 KBytes 6507648 Kbits/sec
[ 4] 0.0-300.0 sec 238240128 KBytes 6505520 Kbits/sec
[ 3] 0.0-300.0 sec 238240768 KBytes 6505549 Kbits/sec
[ 6] 0.0-300.0 sec 238298240 KBytes 6507036 Kbits/sec
[SUM] 0.0-300.0 sec 953098240 KBytes 26025559 Kbits/sec

=====
TEST SUMMARY from 1:3:4 -> fe80::2134:2:ac02:5c03
Test Started:   Wed Jul 1 17:17:19 CST 2020
Test Finished:  Wed Jul 1 17:22:21 CST 2020
=====

Latency:                0.108 ms
Lost pings:              0 %
Through-put:            > 26025559 Kbits/second
FC Invalid Words (ne):  0
FC CRC Errors (ne):    0
FC Invalid Words (fe):  0
FC CRC Errors (fe):    0

Link 1:3:4 is SUITABLE for Remote Copy Use
=====
```



## 远程复制目标配置

当前远程复制端口配置完成，使用 startcopy 启用远程复制功能，在主存储上配置了远程复制目标后，由于目标存储还没有进行配置，所以 Link 状态为 Down。

```

C630 cli% showport -rcfc
N:S:P      Mode State ----Node_WWN---- ----Port_WWN----  Rate
0:3:4 initiator ready 2FF70002AC025C02 20340002AC025C02 32Gbps
1:3:4 initiator ready 2FF70002AC025C02 21340002AC025C02 32Gbps
-----
      2
C630 cli% showrcopy

Remote Copy System Information
Status: Started, Normal
C630 cli% creatercopytarget C670_CN701503MR FC 2FF70002AC025C03 0:3:4:20340002AC025C03
C630 cli% showrcopy

Remote Copy System Information
Status: Started, Normal

Target Information

Name      ID Type Status Options      Policy
C670_CN701503MR 3 FC  new  2FF70002AC025C03 mirror_config

Link Information

Target      Node Address      Status Options
C670_CN701503MR 0:3:4 20340002AC025C03 Down -
receive    0:3:4 20340002AC025C03 Up -
C630 cli% █
  
```

在目标存储上配置远程复制目标后，使用 showrcopy 可见 Target 状态为 ready，Link 状态为 Up。

```

C670_CN701503MR cli% showport -rcfc
N:S:P      Mode State ----Node_WWN---- ----Port_WWN----  Rate
0:3:4 initiator ready 2FF70002AC025C03 20340002AC025C03 32Gbps
1:3:4 initiator ready 2FF70002AC025C03 21340002AC025C03 32Gbps
-----
      2
C670_CN701503MR cli% creatercopytarget C630 FC 2FF70002AC025C02 0:3:4:20340002AC025C02
C670_CN701503MR cli% showrcopy

Remote Copy System Information
Status: Started, Normal

Target Information

Name ID Type Status Options      Policy
C630 3 FC  ready 2FF70002AC025C02 mirror_config

Link Information

Target      Node Address      Status Options
C630      0:3:4 20340002AC025C02 Up -
receive    0:3:4 20340002AC025C02 Up -
C670_CN701503MR cli% █
  
```

使用 admitrcopylink 把另外一条链路也加入到远程复制目标中。

```
C630 cli% showrcopy

Remote Copy System Information
Status: Started, Normal

Target Information

Name          ID Type Status Options          Policy
C670_CN701503MR 3 FC  ready 2FF70002AC025C03 mirror_config

Link Information

Target      Node  Address          Status Options
C670_CN701503MR 0:3:4 20340002AC025C03 Up      -
receive     0:3:4 20340002AC025C03 Up      -
C630 cli% admitrcopylink C670_CN701503MR 1:3:4:21340002AC025C03
C630 cli% showrcopy

Remote Copy System Information
Status: Started, Normal

Target Information

Name          ID Type Status Options          Policy
C670_CN701503MR 3 FC  ready 2FF70002AC025C03 mirror_config

Link Information

Target      Node  Address          Status Options
C670_CN701503MR 0:3:4 20340002AC025C03 Up      -
C670_CN701503MR 1:3:4 21340002AC025C03 Down    -
receive     0:3:4 20340002AC025C03 Up      -
receive     1:3:4 21340002AC025C03 Up      -
```

两套存储都做完此操作后所有复制目标和链路状态显示正常。

```
C670_CN701503MR cli% showrcopy

Remote Copy System Information
Status: Started, Normal

Target Information

Name ID Type Status Options          Policy
C630 3 FC  ready 2FF70002AC025C02 mirror_config

Link Information

Target      Node  Address          Status Options
C630        0:3:4 20340002AC025C02 Up      -
receive     0:3:4 20340002AC025C02 Up      -
C670_CN701503MR cli% admitrcopylink C630 1:3:4:21340002AC025C02
C670_CN701503MR cli% showrcopy

Remote Copy System Information
Status: Started, Normal

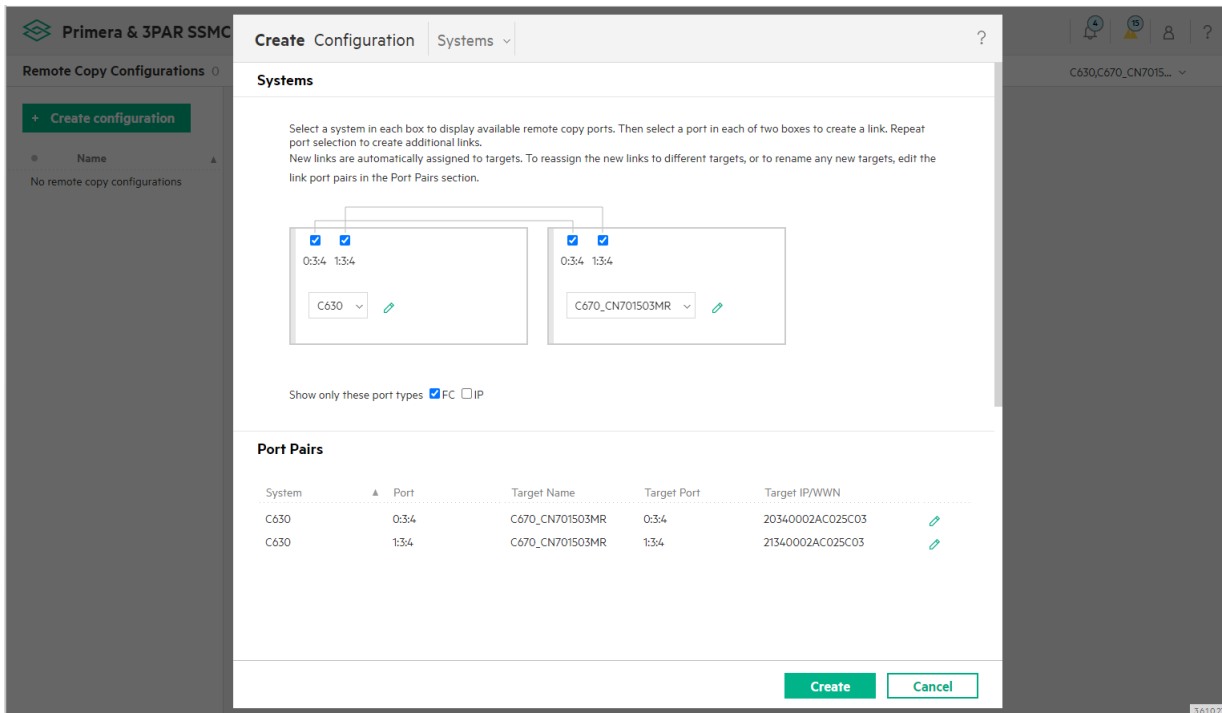
Target Information

Name ID Type Status Options          Policy
C630 3 FC  ready 2FF70002AC025C02 mirror_config

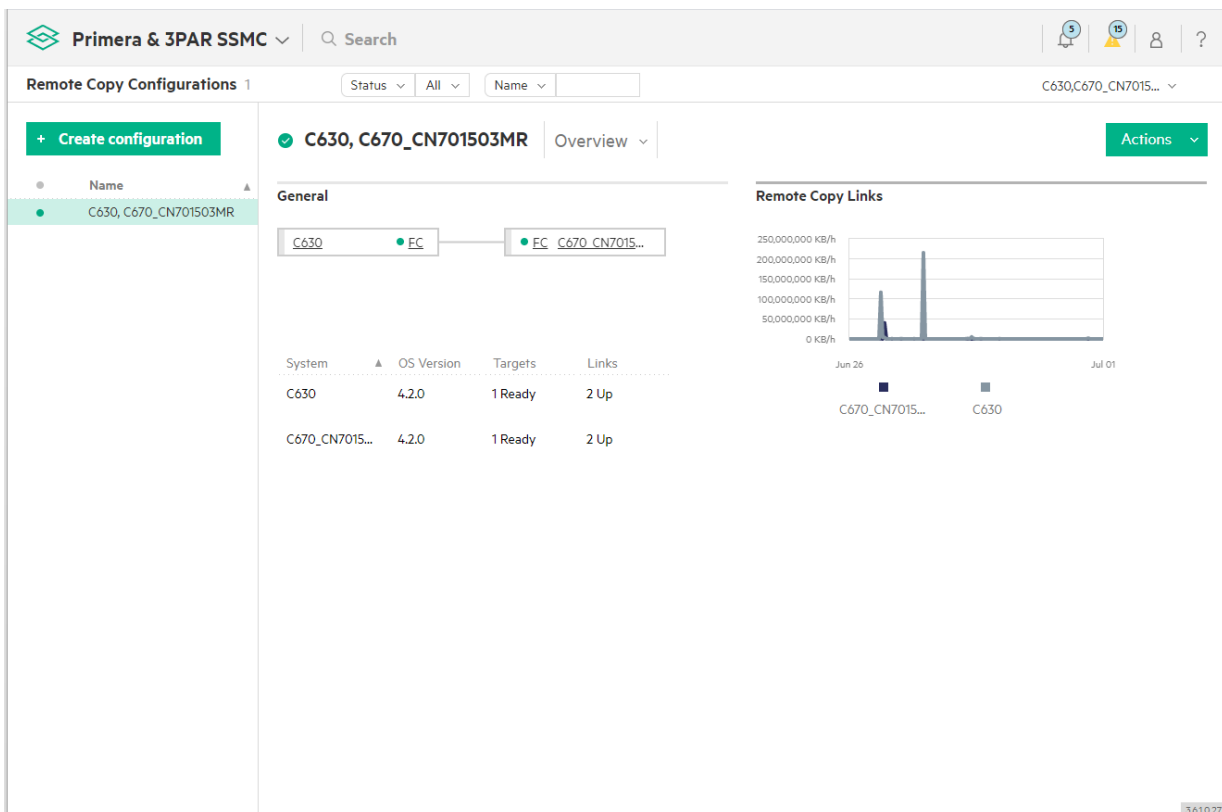
Link Information

Target      Node  Address          Status Options
C630        0:3:4 20340002AC025C02 Up      -
C630        1:3:4 21340002AC025C02 Up      -
receive     0:3:4 20340002AC025C02 Up      -
receive     1:3:4 21340002AC025C02 Up      -
```

也可以使用 SSMC 配置，选中两套存储后点击 Remote Copy Configurations，点击 Create configuration，左侧选中主存储并勾选端口，右侧选择目标存储并勾选端口，然后点击 Create。



远程复制目标创建完成。



## 远程复制组配置

可以在主存储上使用 `creatercopygroup` 命令建立模式为同步的远程复制组，以下为示例：

```
Creatercopygroup -usr_cpg ForVmware C670_CN701503MR:SSD_r6 -snp_cpg ForVmware
C670_CN701503MR:SSD_r6 ForVmware C670_CN701503MR:sync
```

可以使用 `admitrcopyvv` 命令把卷加入远程复制组，以下为示例：

```
admitrcopyvv -createvv VMFS5 ForVmware C670_CN701503MR:VMFS5.r (createvv 可以自动创建远程卷)
```

```
C630 cli% showrcopy groups

Remote Copy System Information
Status: Started, Normal
C630 cli% creatercopygroup -usr_cpg ForVmware C670_CN701503MR:SSD_r6 -snp_cpg ForVmware C670_CN701503MR:SSD_r6 ForVmware
C670_CN701503MR:sync
C630 cli% showrcopy groups

Remote Copy System Information
Status: Started, Normal

Group Information
Name          Target          Status  Role  Mode  Options
ForVmware     C670_CN701503MR New     Primary Sync
LocalVV      ID RemoteVV      ID SyncStatus LastSyncTime

C630 cli% admitrcopyvv -createvv VMFS5 ForVmware C670_CN701503MR:VMFS5.r
C630 cli% showrcopy groups

Remote Copy System Information
Status: Started, Normal

Group Information
Name          Target          Status  Role  Mode  Options
ForVmware     C670_CN701503MR New     Primary Sync
LocalVV      ID RemoteVV      ID SyncStatus LastSyncTime
VMFS5        23 VMFS5.r        478 New     NA

C630 cli% █
```

在主存储执行过 `admitrcopyvv` 命令后，目标存储上也创建了相同 WWID 的远程卷。

```
C670_CN701503MR cli% showvv -rcopy

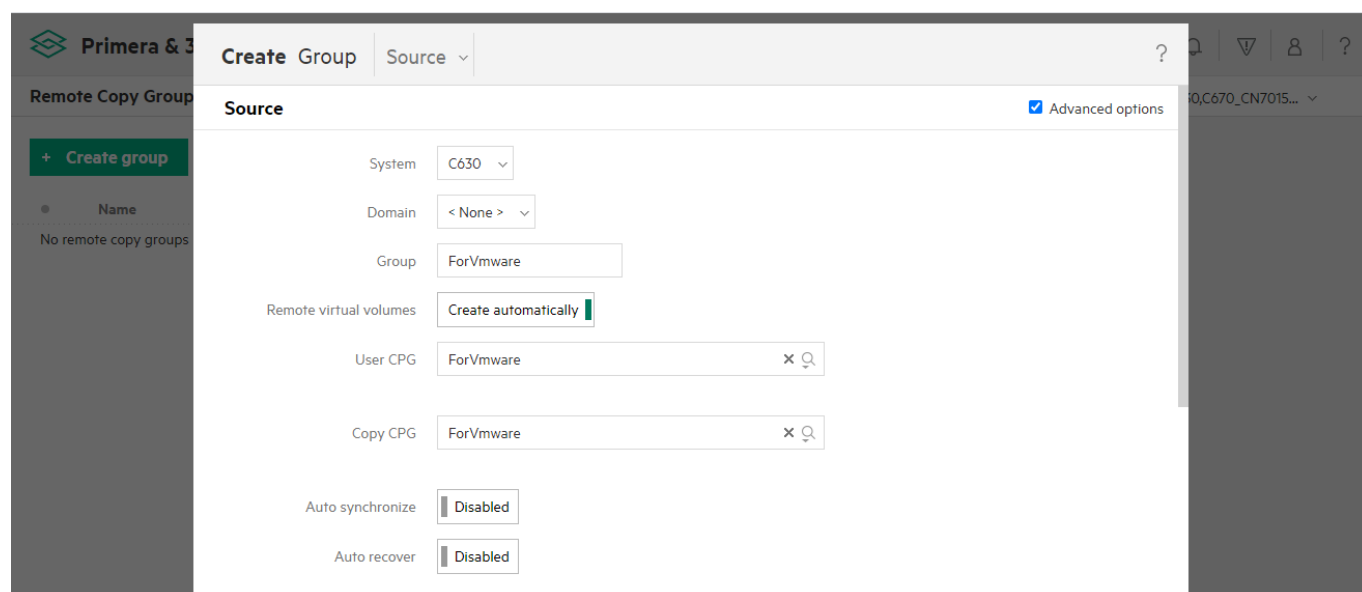
Id Name      Prov Compr Dedup Type CopyOf BsId Rd -Detailed_State- Snp Usr VSize RcopyStatus RcopyGroup
2 .mgmtdata full NA NA base --- 2 RW normal 0 524288 524288 none --
1 .srdata full NA NA base --- 1 RW normal 0 102400 102400 none --
0 admin full NA NA base --- 0 RW normal 0 10240 10240 none --
478 VMFS5.r tppv No No base --- 478 RW normal 512 512 102400 secondary ForVmware.r154626
-----
4 total 512 637440 739328
C670_CN701503MR cli% showrcopy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information
Name          ID Target          Status  Role  Mode  LocalUserCpg LocalSnapCpg RmUserCpg RmSnapCpg Options
ForVmware.r154626 6 C630 New     Secondary Sync SSD_r6 SSD_r6 ForVmware ForVmware
LocalVV      ID RemoteVV      ID SyncStatus Resync_ss Sync_ss VV_iter R_iter S_iter LastSyncTime
VMFS5.r      478 VMFS5 23 New     none none NA NA NA NA

C670_CN701503MR cli% █
```

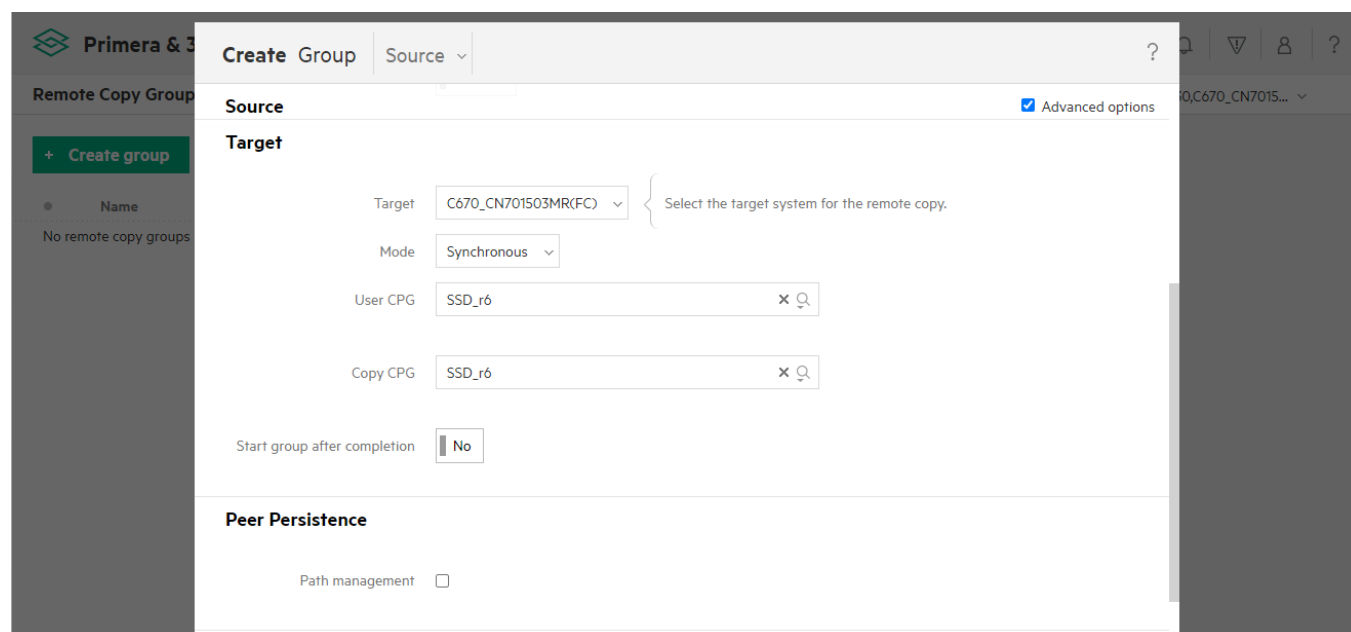
在 SSMC 或使用 `creatercopygroup` 命令创建远程复制组。选择主存储并给远程复制组命名，选择自动创建远程卷，设置远程复制组的 User CPG 和 Copy CPG，auto synchronize 策略可以让远程复制组在故障转移后自动反向同步，auto recover 可以在远程复制链路恢复后自动启动远程复制组。



The screenshot shows the 'Create Group' dialog box in the SSMC interface, specifically the 'Source' configuration tab. The dialog is titled 'Create Group' and has a 'Source' dropdown menu. The 'Advanced options' checkbox is checked. The configuration fields are as follows:

- System: C630
- Domain: < None >
- Group: ForVmware
- Remote virtual volumes: Create automatically
- User CPG: ForVmware
- Copy CPG: ForVmware
- Auto synchronize: Disabled
- Auto recover: Disabled

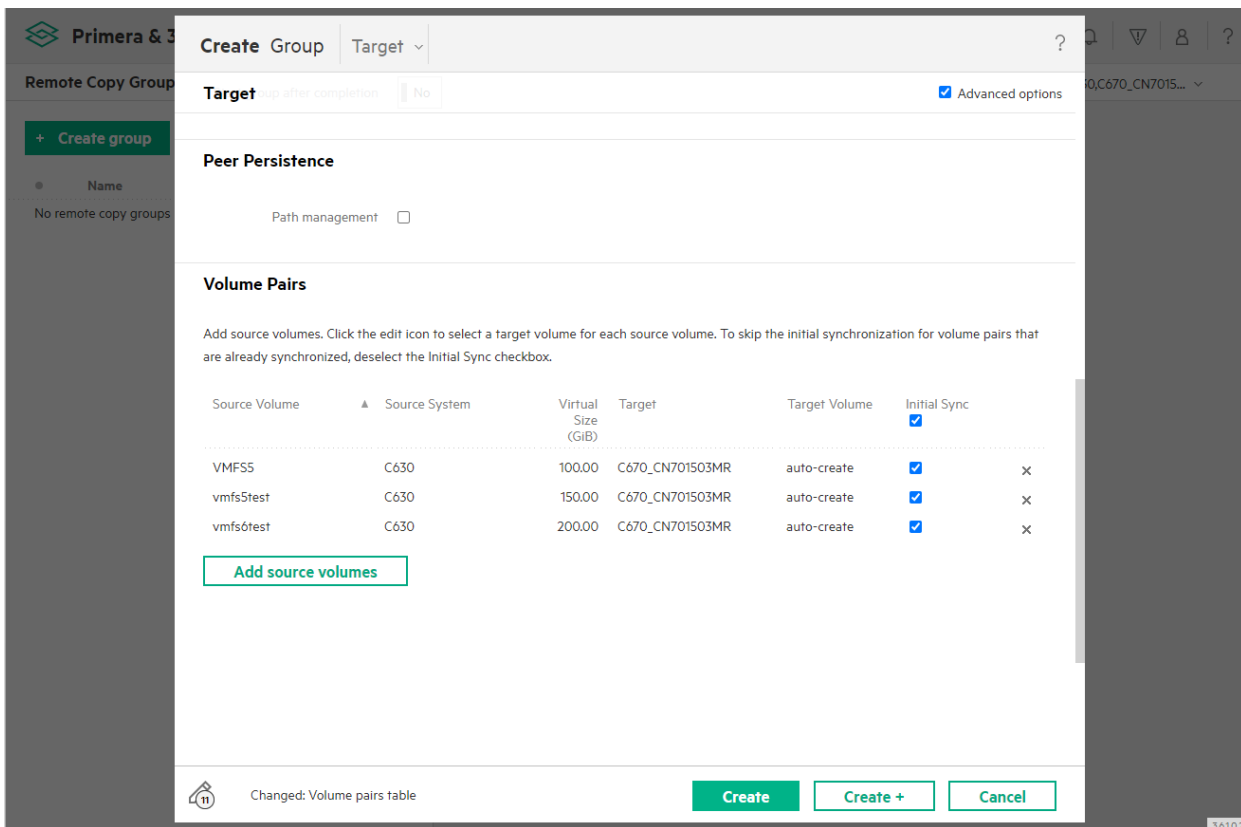
选择复制目标，模式选择同步，选择复制目标的 User CPG 和 Copy CPG，选择是否在创建复制组后自动启动开始同步，本次不配置 Peer Persistence 所以不勾选 Path management。



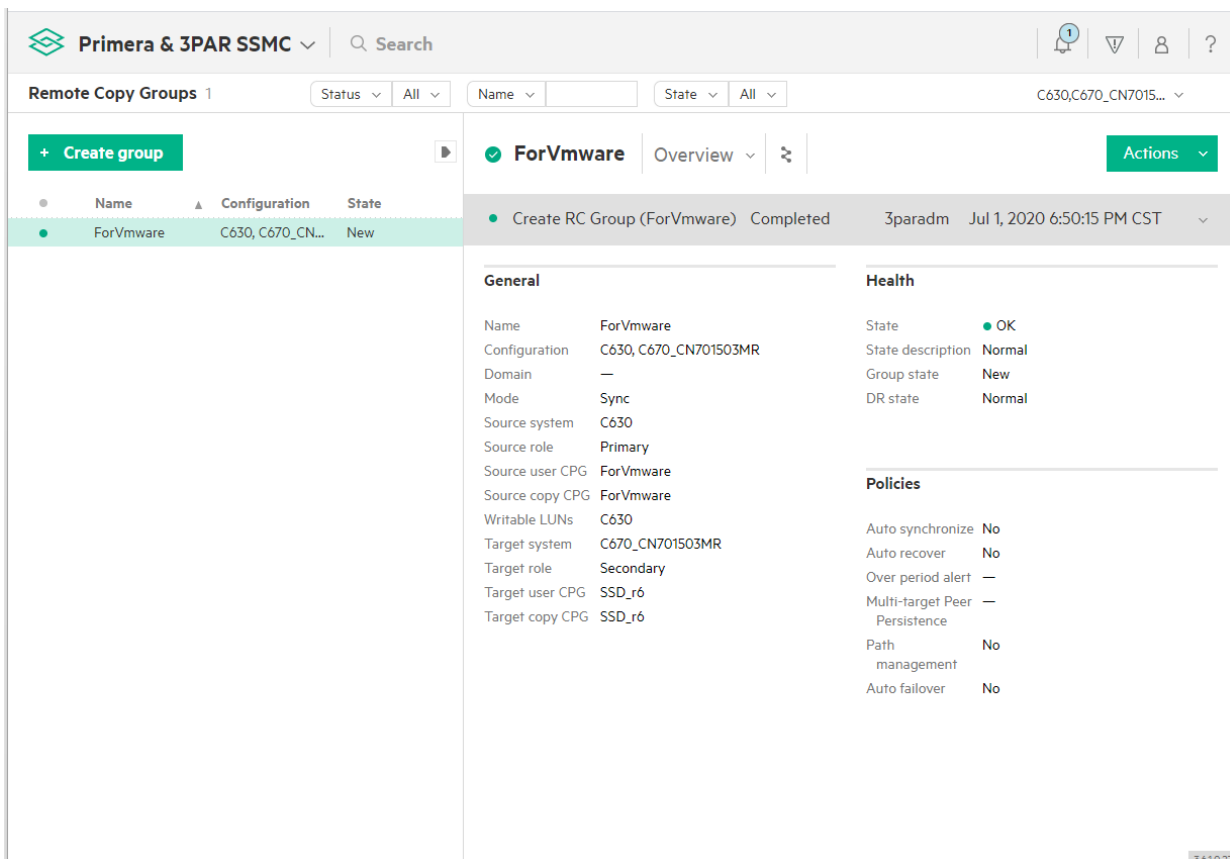
The screenshot shows the 'Create Group' dialog box in the SSMC interface, specifically the 'Target' configuration tab. The dialog is titled 'Create Group' and has a 'Source' dropdown menu. The 'Advanced options' checkbox is checked. The configuration fields are as follows:

- Target: C670\_CN701503MR(FC) (with a note: Select the target system for the remote copy.)
- Mode: Synchronous
- User CPG: SSD\_r6
- Copy CPG: SSD\_r6
- Start group after completion: No
- Peer Persistence: Path management (unchecked)

往复制组添加卷，并点击 Create。



远程复制组创建完成。



# 远程卷同步原理

使用 showrcopy 命令可以比较直观的看到远程复制组的状态，由于还没有开始同步所以主存储当前同步状态为 New。

```
C630 cli% showvv -s VMFS5
-----Snp-----
--(MiB)-- -(% VSize)--
Id Name Prov Compr Dedup Type Rsvd Used Used Wrn Lim Rsvd Used Used Wrn Lim Rsvd Used HostWr VSize Compact Compress
23 VMFS5 tppv No No base 8064 0 0.0 0 0 72448 62223 60.8 0 0 80512 62223 62222 102400 1.65 --
-----Total-----
1 total 8064 0 72448 62223 80512 62223 62222 102400
C630 cli% showrcopy -d groups ForVmware

Remote Copy System Information
Status: Started, Normal

Group Information

Name ID Target Status Role Mode LocalUserCpg LocalSnapCpg RmUserCpg RmSnapCpg Options
ForVmware 7 C670_CN701503MR New Primary Sync ForVmware ForVmware SSD_r6 SSD_r6
LocalVV ID RemoteVV ID SyncStatus Resync_ss Sync_ss VV_iter R_iter S_iter LastSyncTime
VMFS5 23 VMFS5.r 479 New none none NA NA NA NA
vmfs5test 26 vmfs5test.r 480 New none none NA NA NA NA
vmfs6test 27 vmfs6test.r 481 New none none NA NA NA NA

C630 cli% showvv -d VMFS5
Id Name Rd Mstr Prnt Roch Rwch PPrt SPrt PBlkRemain -----VV_WWN----- CreationTime----- Udid
23 VMFS5 RW 1/0/- --- --- --- --- -- 60002AC00000000000000001700025C02 2020-06-19 20:03:49 CST 23
-----
1 total 0
C630 cli% showvv -d rcpy*
no vv listed
C630 cli%
```

目标存储当前同步状态也为 New。

```
C670_CN701503MR cli% showrcopy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information

Name ID Target Status Role Mode LocalUserCpg LocalSnapCpg RmUserCpg RmSnapCpg Options
ForVmware.r154626 7 C630 New Secondary Sync SSD_r6 SSD_r6 ForVmware ForVmware
LocalVV ID RemoteVV ID SyncStatus Resync_ss Sync_ss VV_iter R_iter S_iter LastSyncTime
VMFS5.r 479 VMFS5 23 New none none NA NA NA NA
vmfs5test.r 480 vmfs5test 26 New none none NA NA NA NA
vmfs6test.r 481 vmfs6test 27 New none none NA NA NA NA

C670_CN701503MR cli% showvv -s VMFS5.r
-----Snp-----
--(MiB)-- -(% VSize)--
Id Name Prov Compr Dedup Type Rsvd Used Used Wrn Lim Rsvd Used Used Wrn Lim Rsvd Used HostWr VSize Compact Compress
479 VMFS5.r tppv No No base 512 0 0.0 0 0 512 0 0.0 0 0 1024 0 0 102400 0.00 --
-----Total-----
1 total 512 0 512 0 1024 0 0 102400
C670_CN701503MR cli% showvv -d VMFS5.r
Id Name Rd Mstr Prnt Roch Rwch PPrt SPrt PBlkRemain -----VV_WWN----- CreationTime----- Udid
479 VMFS5.r RW 1/0/- --- --- --- --- -- 60002AC00000000000000001700025C02 2020-07-01 18:54:45 CST 479
-----
1 total 0
C670_CN701503MR cli% showvv -d rcpy*
no vv listed
C670_CN701503MR cli%
```

在主存储上使用 startcopygroup 启动复制组，启动会生成任务 ID，使用 showtask -d 可查看任务详情，此时使用 controlport offline 禁用两个 RCFC 端口。

```
C630 cli% startcopygroup ForVmware
Group ForVmware starts, task ID = 6995 6996 6997
C630 cli% showtask -d 6995
  Id Type          Name      Status Phase   Step -----StartTime----- -FinishTime- -Priority- -User-
6995 remote_copy_sync vmfs6test active  2/3 0/204800 2020-07-01 19:55:49 CST -          n/a      n/a

Detailed status:
2020-07-01 19:55:49 CST Created      task.
2020-07-01 19:55:49 CST Startup      adding full sync of volume vmfs6test in group ForVmware to target C670_CN701503MR to the synchronization list.
2020-07-01 19:55:49 CST Started      full sync of volume vmfs6test (offset 0MB length 204800MB) in group ForVmware to target C670_CN701503MR has started. (sync_vol: none resync_vol: none.)

C630 cli% showrcopy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information

Name      ID Target          Status Role      Mode      LocalUserCpg LocalSnapCpg RmUserCpg RmSnapCpg Options
ForVmware 7 C670_CN701503MR Started Primary Sync      ForVmware ForVmware SSD_r6 SSD_r6
LocalVV   ID RemoteVV       ID SyncStatus Resync_ss Sync_ss VV_iter R_iter S_iter LastSyncTime
VMFS5    23 VMFS5.r         479 Syncing (18%) none none NA NA NA NA
vmfs5test 26 vmfs5test.r     480 Syncing (31%) none none NA NA NA NA
vmfs6test 27 vmfs6test.r     481 Syncing (0%) none none NA NA NA NA

C630 cli% controlport offline -f 0:3:4 1:3:4
```

使用 showalert 可见在两端复制链路心跳超过 5s 后提示远程复制链路宕，在复制链路宕掉 10s 后系统提示远程复制目标宕，

```
Id      : 86
State   : New
Message Code: 0x03a00fa
Time    : 2020-07-01 19:56:35 CST
Severity : Major
Type    : Component state change
Message : Remote Copy Link 14(C670_CN701503MR_1_3_4) Failed (Down Due To Send Error Or Missing Heartbeat {0x1})

Id      : 85
State   : New
Message Code: 0x03a00fa
Time    : 2020-07-01 19:56:35 CST
Severity : Major
Type    : Component state change
Message : Remote Copy Link 13(C670_CN701503MR_0_3_4) Failed (Down Due To Send Error Or Missing Heartbeat {0x1})

Id      : 87
State   : New
Message Code: 0x03900fa
Time    : 2020-07-01 19:56:45 CST
Severity : Major
Type    : Component state change
Message : Remote Copy Target 4(C670_CN701503MR) Failed (All Links To Target Are Down {0x2})

Id      : 88
State   : New
Message Code: 0x00e000a
Time    : 2020-07-01 19:56:45 CST
Severity : Minor
Type    : Task failed
Message : Task 6997 (type "remote_copy_sync", name "VMFS5") has failed (could not sync volume). Please see task status for details.
```



此时在主存储上查看远程复制任务已经失败，由于第一次完整复制没有完成所以同步状态为 NotSynced，主存储上此时没有创建任何快照。

```
C630 cli% showrcopy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information

Name          ID  Target          Status  Role      Mode      LocalUserCpg LocalSnapCpg RmUserCpg  RmSnapCpg  Options
ForVmware     7  C670_CN701503MR Stopped Primary   Sync      ForVmware   ForVmware   SSD_r6     SSD_r6
LocalVV       ID  RemoteVV       ID  SyncStatus Resync_ss Sync_ss     VV_iter  R_iter  S_iter  LastSyncTime
VMFS5         23 VMFS5.r        479 NotSynced  none      none      NA       NA     NA     NA
vmfs5test    26 vmfs5test.r    480 NotSynced  none      none      NA       NA     NA     NA
vmfs6test    27 vmfs6test.r    481 NotSynced  none      none      NA       NA     NA     NA

C630 cli% showvv -d rcpy*
no vv listed
C630 cli% showtask -d 6995
  Id Type          Name          Status Phase Step -----StartTime----- -----FinishTime----- -Priority- -User-
6995 remote_copy_sync vmfs6test failed --- -- 2020-07-01 19:55:49 CST 2020-07-01 19:56:45 CST n/a      n/a

Detailed status:
2020-07-01 19:55:49 CST Created      task.
2020-07-01 19:55:49 CST Startup      adding full sync of volume vmfs6test in group ForVmware to target C670_CN701503MR to the
synchronization list.
2020-07-01 19:55:49 CST Started      full sync of volume vmfs6test (offset 0MB length 204800MB) in group ForVmware to target
C670_CN701503MR has started. (sync_vol: none resync_vol: none.)
2020-07-01 19:56:45 CST Stopped      This synchronization was stopped by the sysmgr.
2020-07-01 19:56:45 CST Failed      sync of volume vmfs6test(vmfs6test) in ForVmware group to target C670_CN701503MR failed
, volume has status UNSYNC.

C630 cli% showvv -d rcpy*
no vv listed
C630 cli% █
```

在目标存储上查看复制组状态也为 NotSynced，目标存储上没有创建快照。

```
C670_CN701503MR cli% showrcopy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information

Name          ID  Target          Status  Role      Mode      LocalUserCpg LocalSnapCpg RmUserCpg  RmSnapCpg  Options
ForVmware.r154626 7 C630           Stopped Secondary Sync      SSD_r6      SSD_r6      ForVmware  ForVmware
LocalVV       ID  RemoteVV       ID  SyncStatus Resync_ss Sync_ss     VV_iter  R_iter  S_iter  LastSyncTime
VMFS5.r       479 VMFS5          23 NotSynced  none      none      NA       NA     NA     NA
vmfs5test.r   480 vmfs5test      26 NotSynced  none      none      NA       NA     NA     NA
vmfs6test.r   481 vmfs6test      27 NotSynced  none      none      NA       NA     NA     NA

C670_CN701503MR cli% showvv -d rcpy*
no vv listed
C670_CN701503MR cli% showvv -d rcpy*
no vv listed
C670_CN701503MR cli% █
```

在主存储上启用 RCFC 端口然后启用复制组，此时系统再次生成复制任务，使用 statrcopy 可以在主存储和目标存储上看到复制吞吐量。

```
C630 cli% controlport rst -f 0:3:4 1:3:4
C630 cli% startcopygroup ForVmware
Group ForVmware starts, task ID = 6999 7000 7001
C630 cli% statrcopy
20:07:35 07/01/2020
-----
Target          Node  Address          IPC  Total(KBytes)  -Throughput(KBytes per sec)-  -Write Same Zero(KBytes per sec)-
                  Current          Average          Current          Average
-----
C670_CN701503MR 0:3:4 20340002AC025C03 RCs013 1252981.32      0.00      0.00      0.00      0.00
C670_CN701503MR 1:3:4 21340002AC025C03 RCs114 1244917.09      0.00      0.00      0.00      0.00
-----
C670_CN701503MR 2497898.40      0.00      0.00      0.00      0.00

receive         0:3:4 20340002AC025C03 RCr015 76863.95       13.25     13.25     0.00      0.00
receive         1:3:4 21340002AC025C03 RCr116 72534.66       13.01     13.01     0.00      0.00
-----
Receive         149398.60      26.26     26.26     0.00      0.00
Send            2497898.40     0.00      0.00      0.00      0.00
-----
Total           2647297.01     26.26     26.26     0.00      0.00
```

```
C670_CN701503MR cli% statrcopy
20:08:51 07/01/2020
-----
Target          Node  Address          IPC  Total(KBytes)  -Throughput(KBytes per sec)-  -Write Same Zero(KBytes per sec)-
                  Current          Average          Current          Average
-----
C630            0:3:4 20340002AC025C02 RCs013 154980.76      0.00      0.00      0.00      0.00
C630            1:3:4 21340002AC025C02 RCs114 150825.73      0.00      0.00      0.00      0.00
-----
C630            305806.48      0.00      0.00      0.00      0.00

receive         0:3:4 20340002AC025C02 RCr015 32617892.53   138838.89   138838.89 100112.82 100112.82
receive         1:3:4 21340002AC025C02 RCr116 32493836.42   138344.49   138344.49 101401.17 101401.17
-----
Receive         65111728.95   277183.38   277183.38 201513.99 201.51
Send            305806.48      0.00      0.00      0.00      0.00
-----
Total           65417535.43   277183.38   277183.38 201513.99 201.51
```

在主存储和目标存储上使用 showrocpy -d 确认同步完成。

```
C630 cli% showrocpy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information

Name      ID  Target          Status  Role  Mode  LocalUserCpg LocalSnapCpg RmUserCpg  RmSnapCpg  Options
ForVmware 7  C670_CN701503MR Started Primary Sync  ForVmware ForVmware SSD_r6  SSD_r6
LocalVV   ID  RemoteVV       ID  SyncStatus Resync_ss Sync_ss VV_iter R_iter S_iter LastSyncTime
VMFS5    23  VMFS5.r        479 Synced      none     none   NA     NA     NA     NA
vmfs5test 26  vmfs5test.r    480 Synced      none     none   NA     NA     NA     NA
vmfs6test 27  vmfs6test.r    481 Synced      none     none   NA     NA     NA     NA

C630 cli% showvv -d rcpy*
no vv listed
C630 cli% showtask -d 6999
  Id Type          Name          Status Phase Step -----StartTime----- -----FinishTime----- -Priority- -User-
6999 remote_copy_sync vmfs6test done   ---  --- 2020-07-01 20:07:28 CST 2020-07-01 20:08:03 CST n/a n/a

Detailed status:
2020-07-01 20:07:28 CST Created task.
2020-07-01 20:07:28 CST Startup adding full sync of volume vmfs6test in group ForVmware to target C670_CN701503MR to the synchronization list.
2020-07-01 20:07:28 CST Started full sync of volume vmfs6test (offset 0MB length 204800MB) in group ForVmware to target C670_CN701503MR has started. (sync_vol: none resync_vol: none.)
2020-07-01 20:08:03 CST Completed sync of volume vmfs6test(vmfs6test) in group ForVmware to target C670_CN701503MR has completed, 262MB of 204800MB transmitted.

C630 cli% █
```



在主存储卷写入数据后再次启动远程复制组，同步完成前远程复制组再次停止，此时主存储创建新的快照（Resync\_ss）并在远程复制组再次启动时与当前最新数据做对比之后把增量数据同步到目标存储，由于复制速度很快下图中快照已经被删除。

```
C630 cli% startrcopygroup ForVmware
Group ForVmware starts, task ID = 7009 7010 7011
C630 cli% showrcopy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information

Name          ID  Target          Status  Role    Mode    LocalUserCpg LocalSnapCpg RmUserCpg  RmSnapCpg  Options
ForVmware     7  C670_CN701503MR Started Primary Sync    ForVmware   ForVmware   SSD_r6     SSD_r6
LocalVV       ID  RemoteVV       ID      SyncStatus Resync_ss Sync_ss    VV_iter  R_iter  S_iter  LastSyncTime
VMFS5         23 VMFS5.r        479    Synced   none      none      NA       NA     NA     NA
vmfs5test.r  26 vmfs5test.r    480    Synced   none      none      NA       NA     NA     NA
vmfs6test     27 vmfs6test.r    481    Synced   none      none      NA       NA     NA     NA

C630 cli% showvv -d rcpy*
no vv listed
C630 cli% █
```

目标存储在主存储启动同步时也会生成快照记录当前数据状态，在同步过程中如果出现同步意外终止可以使用此快照回滚到之前数据状态。在同步完成前如果复制组再次停止不会创建新的快照，快照在同步完成后被删除。鉴于同步复制技术在远程复制组停止（主存储）和启动（目标存储）会使用快照技术，一个远程复制组不建议加入太多卷，避免大量卷同时建立快照造成的 I/O 等待导致主机 I/O 超时。

```
C670_CN701503MR cli% showrcopy -d groups

Remote Copy System Information
Status: Started, Normal

Group Information

Name          ID  Target          Status  Role    Mode    LocalUserCpg LocalSnapCpg RmUserCpg  RmSnapCpg  Options
ForVmware.r154626 7 C630           Started Secondary Sync    SSD_r6     SSD_r6     ForVmware ForVmware
LocalVV       ID  RemoteVV       ID      SyncStatus Resync_ss Sync_ss    VV_iter  R_iter  S_iter  LastSyncTime
VMFS5.r       479 VMFS5          23     Syncing rcpy.7.479.4 none      NA       NA     NA     NA
vmfs5test.r  480 vmfs5test      26     Synced  rcpy.7.480.4 none      NA       NA     NA     NA
vmfs6test.r  481 vmfs6test      27     Synced  rcpy.7.481.4 none      NA       NA     NA     NA

C670_CN701503MR cli% showvv -d rcpy*
Id Name          Rd Mstr Prnt Rch Rwch PPrnt SPPrnt PBlkRemain -----VV_WMN----- -----CreationTime----- Ud
id
485 rcpy.7.479.4 R0 1/0/- 479 --- --- --- -- -- 60002AC00000000000000001E500025C03 2020-07-01 20:29:18 CST 4
85
486 rcpy.7.480.4 R0 1/0/- 480 --- --- --- -- -- 60002AC00000000000000001E600025C03 2020-07-01 20:29:18 CST 4
86
487 rcpy.7.481.4 R0 1/0/- 481 --- --- --- -- -- 60002AC00000000000000001E700025C03 2020-07-01 20:29:18 CST 4
87
-----
--
3 total                                0

C670_CN701503MR cli% showvv -d rcpy*
no vv listed
C670_CN701503MR cli% showrcopy -d groups

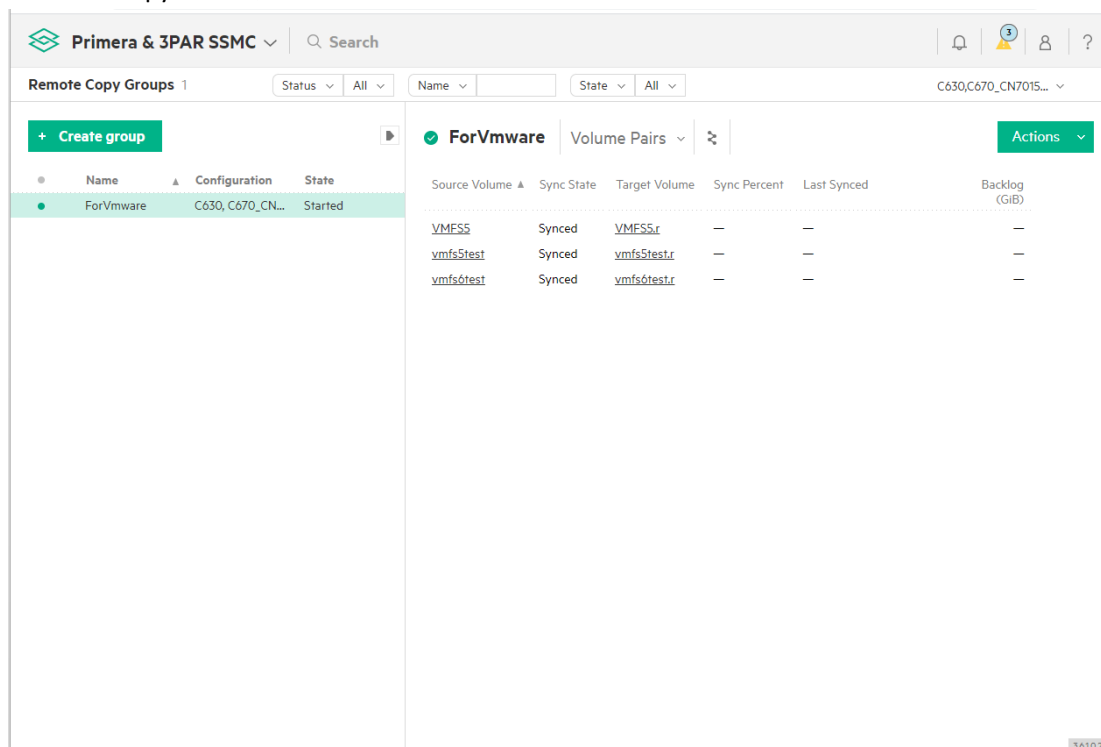
Remote Copy System Information
Status: Started, Normal

Group Information

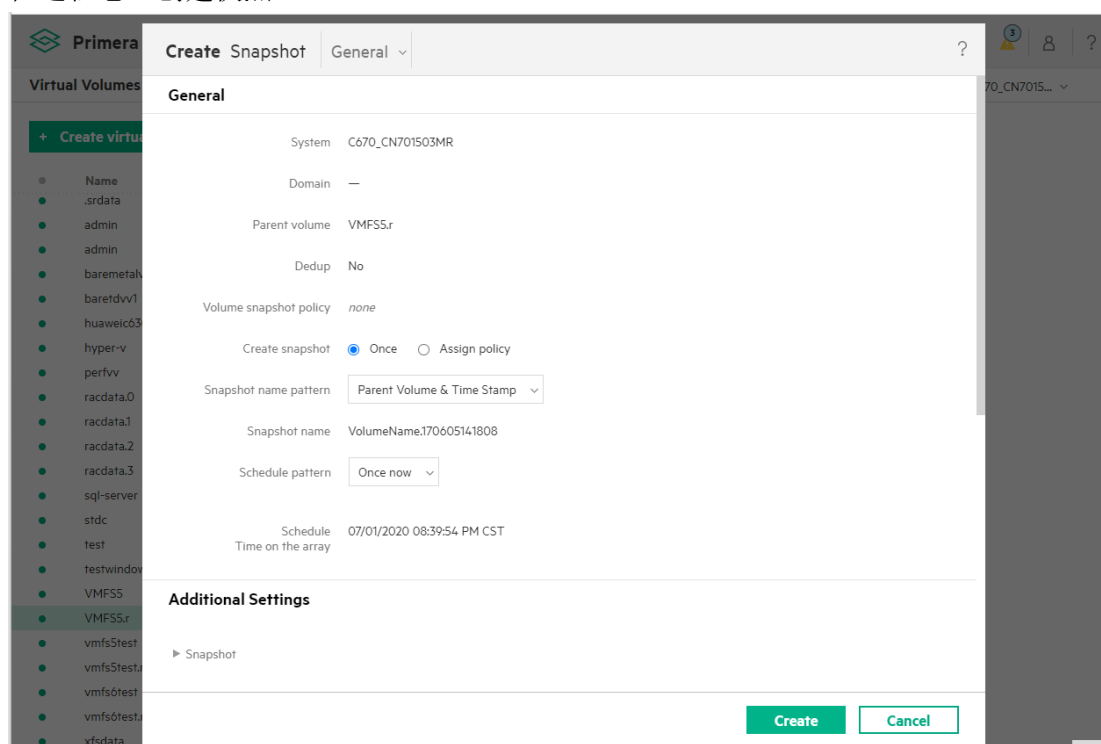
Name          ID  Target          Status  Role    Mode    LocalUserCpg LocalSnapCpg RmUserCpg  RmSnapCpg  Options
ForVmware.r154626 7 C630           Started Secondary Sync    SSD_r6     SSD_r6     ForVmware ForVmware
LocalVV       ID  RemoteVV       ID      SyncStatus Resync_ss Sync_ss    VV_iter  R_iter  S_iter  LastSyncTime
VMFS5.r       479 VMFS5          23     Synced   none      none      NA       NA     NA     NA
vmfs5test.r  480 vmfs5test      26     Synced   none      none      NA       NA     NA     NA
vmfs6test.r  481 vmfs6test      27     Synced   none      none      NA       NA     NA     NA
```

# 远程复制卷验证

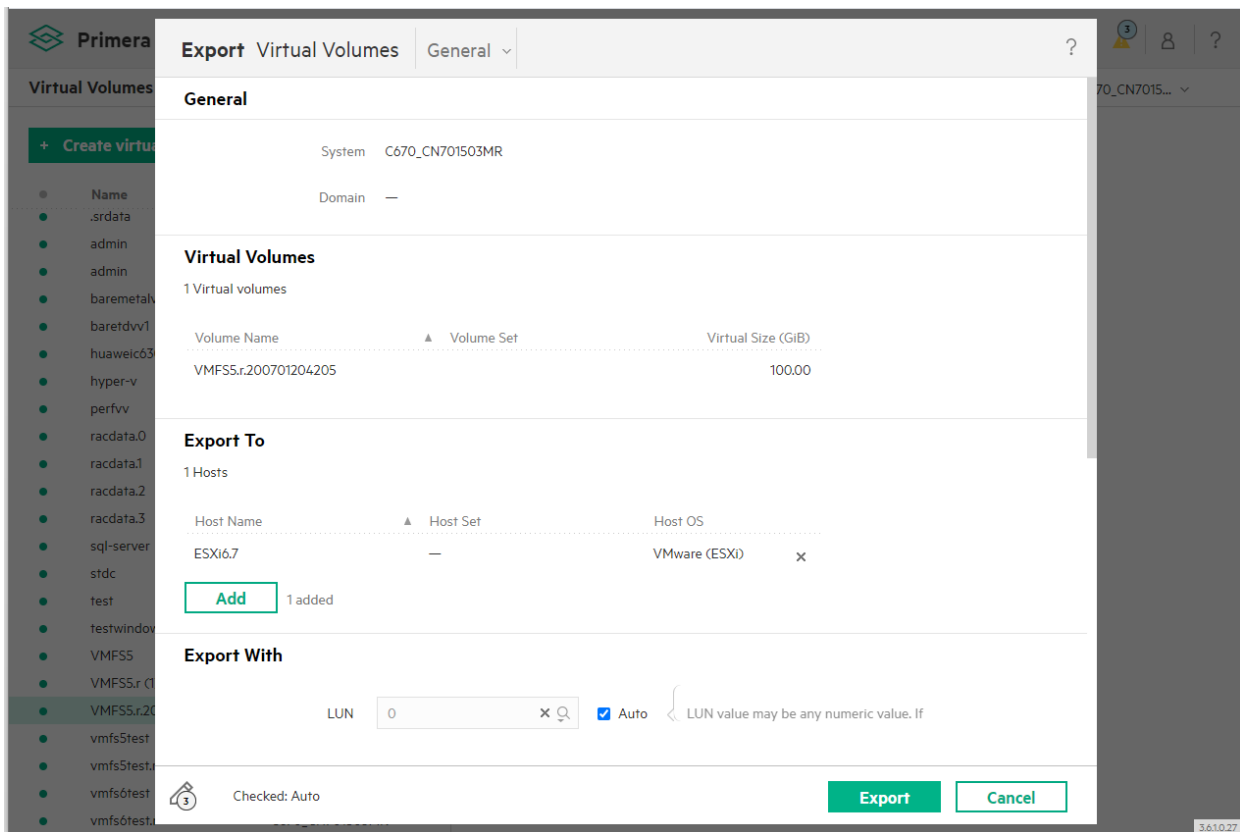
由于远程卷无法直接映射并使用，所以对远程卷做快照来进行验证数据有效性。首先确认远程复制组中卷的同步状态是 Synced。如果链路经常存在不稳定情况，可以使用 `checkcopyvv` 检查一下远程卷的数据一致性，语法是 `checkcopyvv -v 本地 VV 名称 复制目标: 远程卷名称`，比如 `checkvv -v VMFS5 C630:VMFS5.r`。



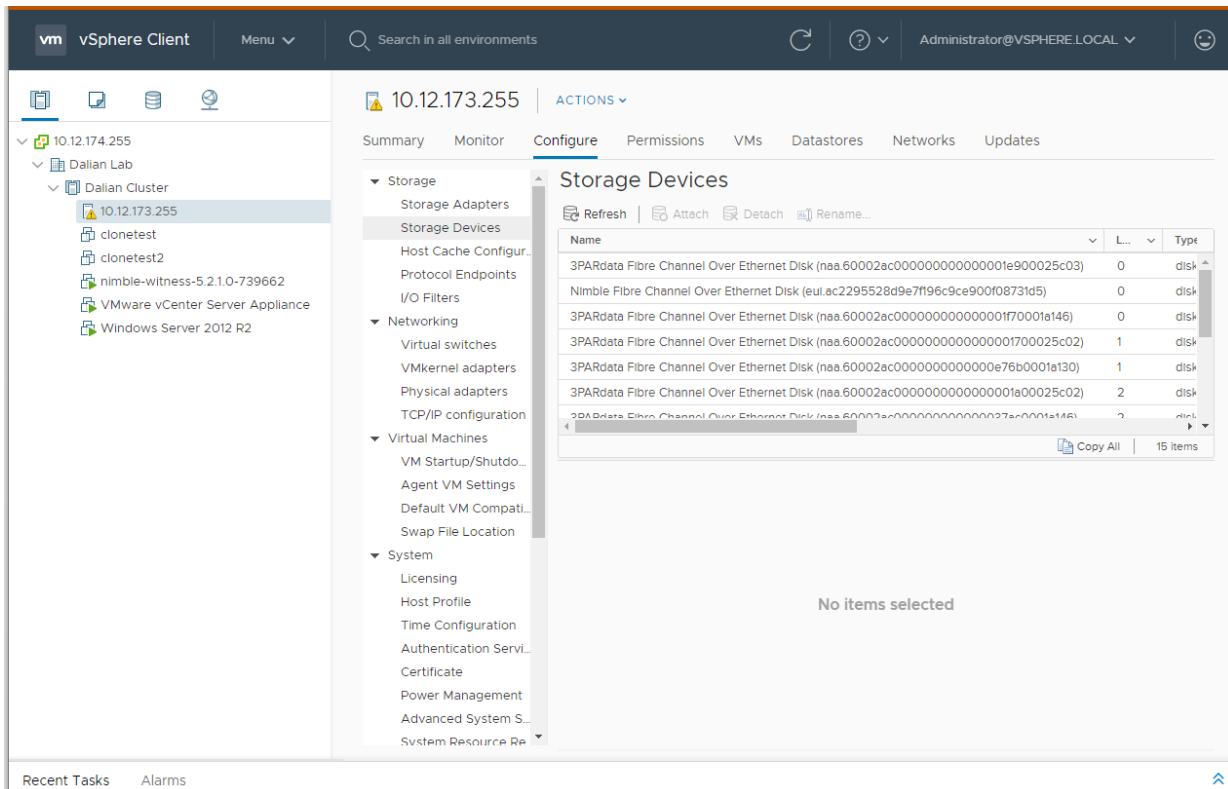
在远程卷上创建快照。



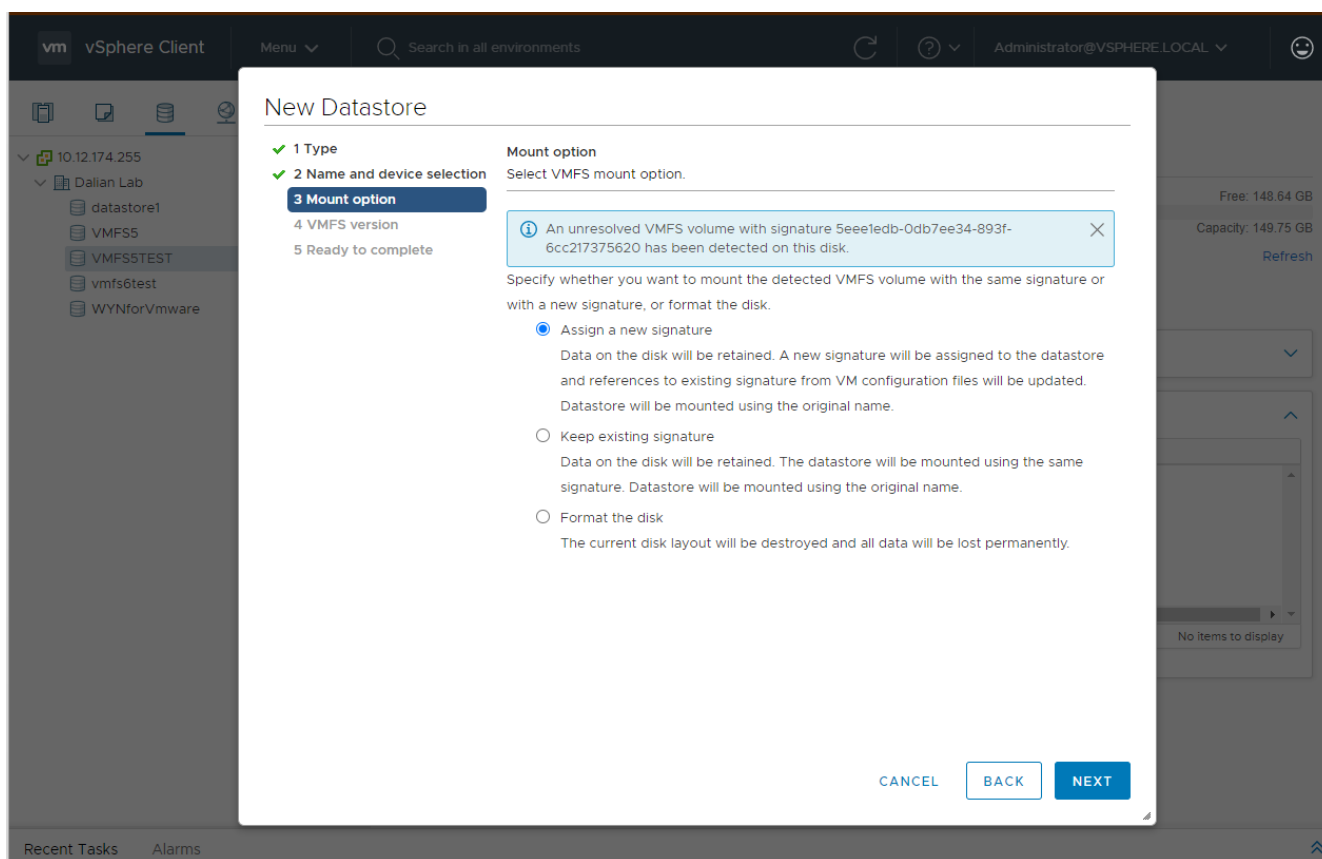
然后映射给主机，此处使用 VMware ESXi 环境作为测试，其他环境方法类似。



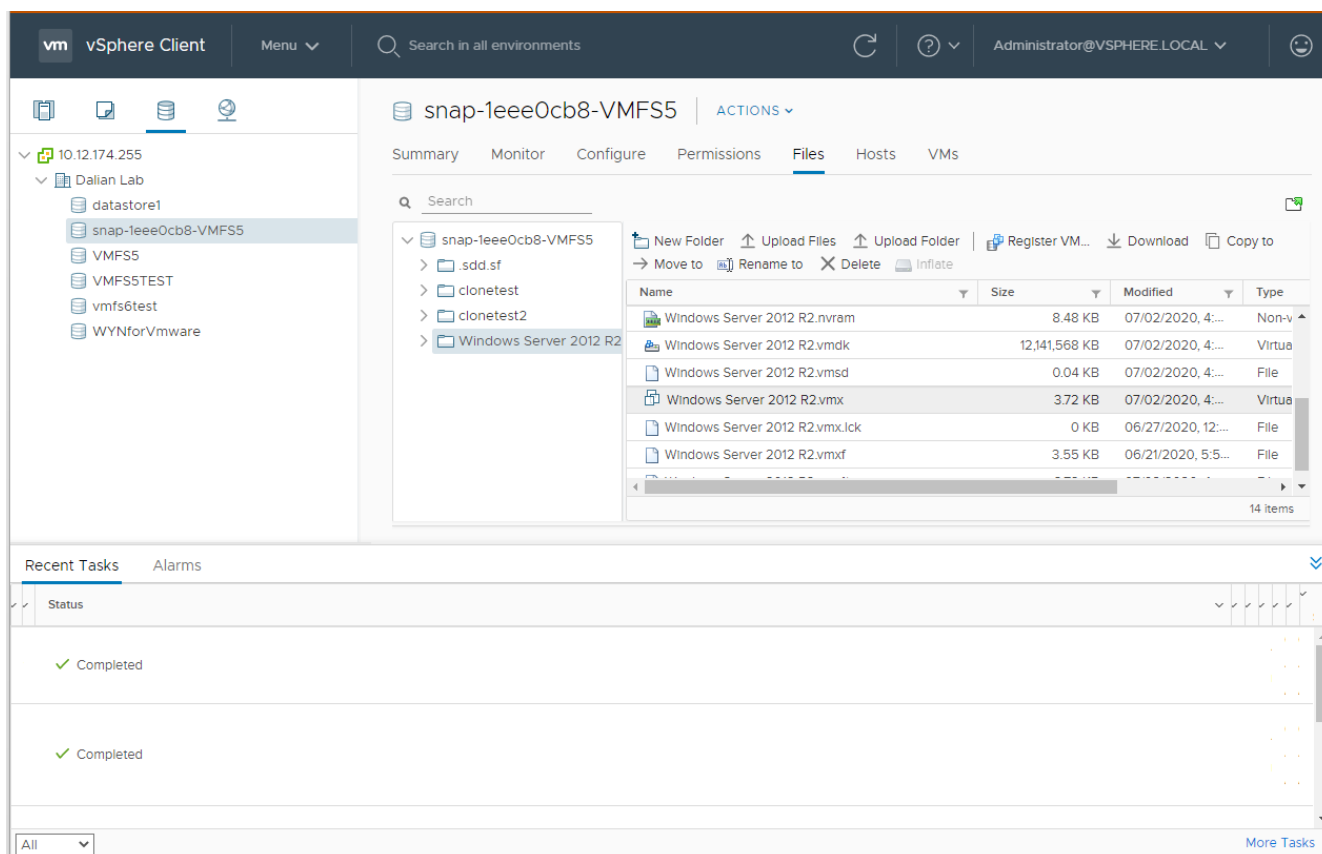
在 VMware ESXi 主机上确认已经扫描到远程卷的快照。



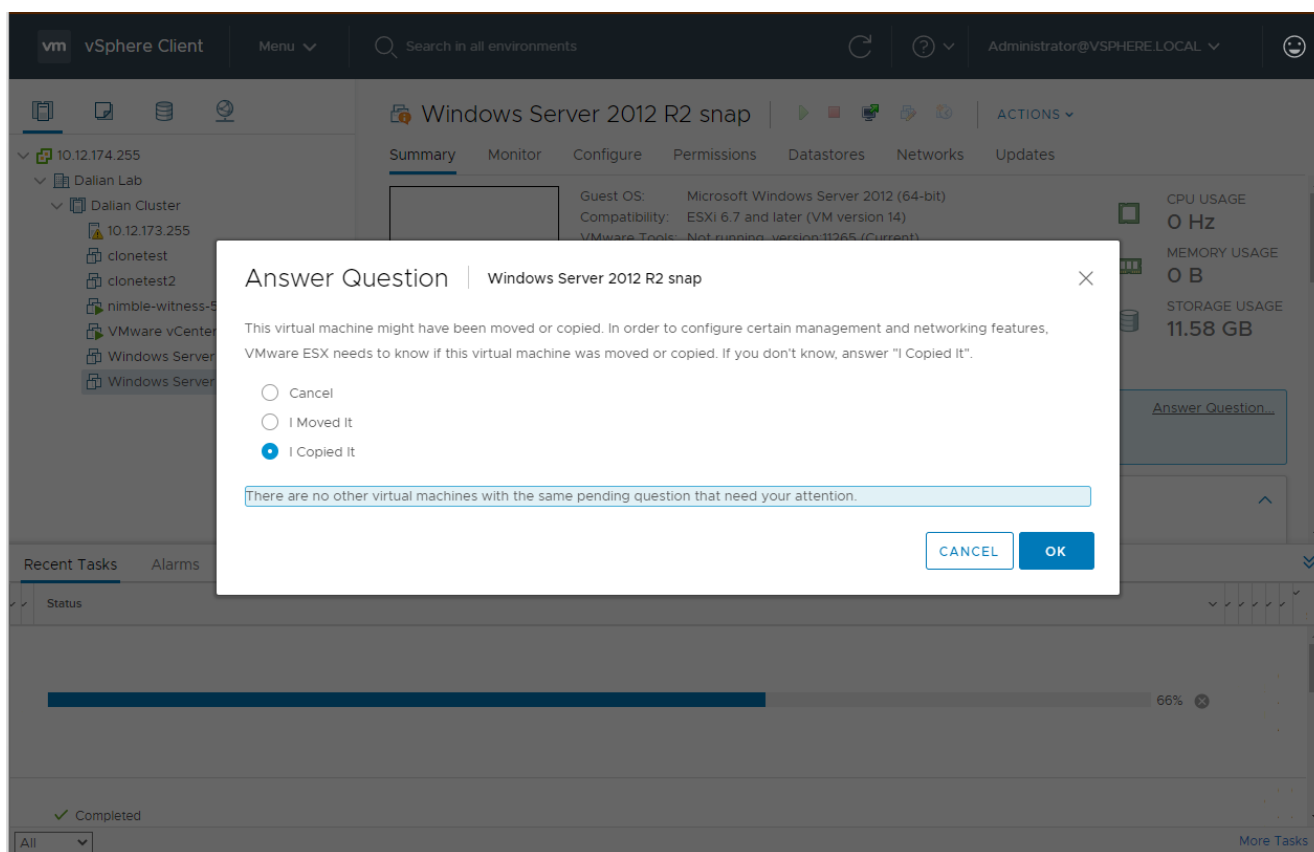
挂载 Datastore，这里注意由于源卷仍旧在使用，所以需要分配一个新的签名。



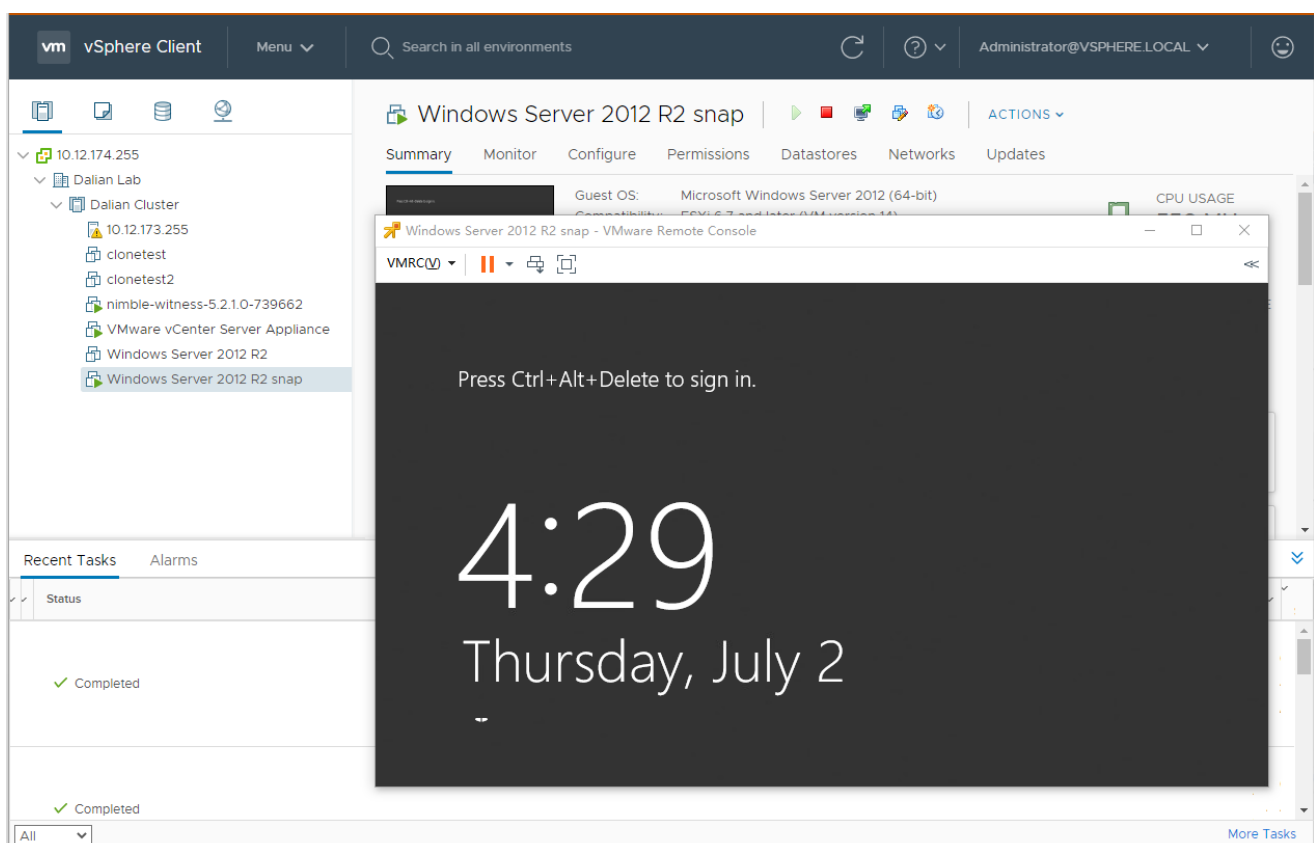
Datastore 挂载完成后可以尝试关闭之前的虚拟机并注册此 Datastore 的虚拟机。



启动虚拟机时需要回答问题，这里选择 I Copied it。



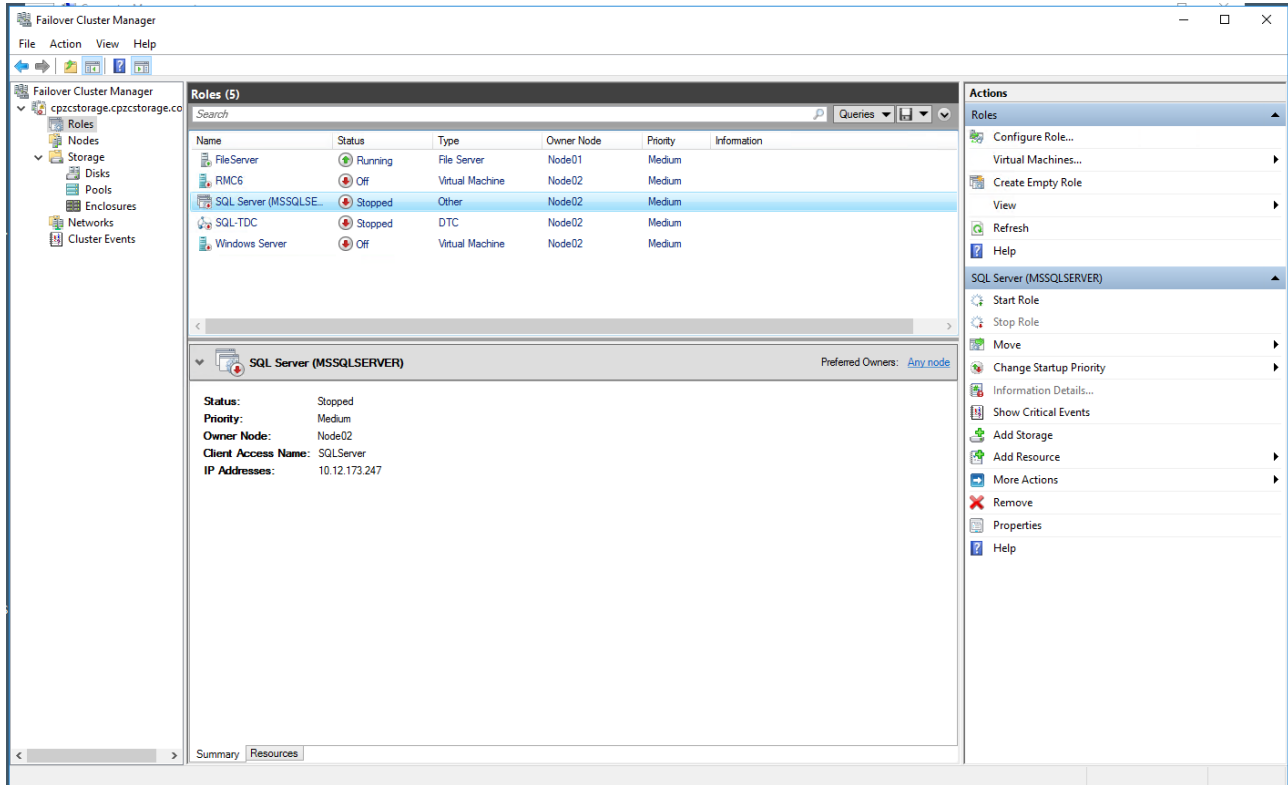
确认虚拟机可以正常启动。



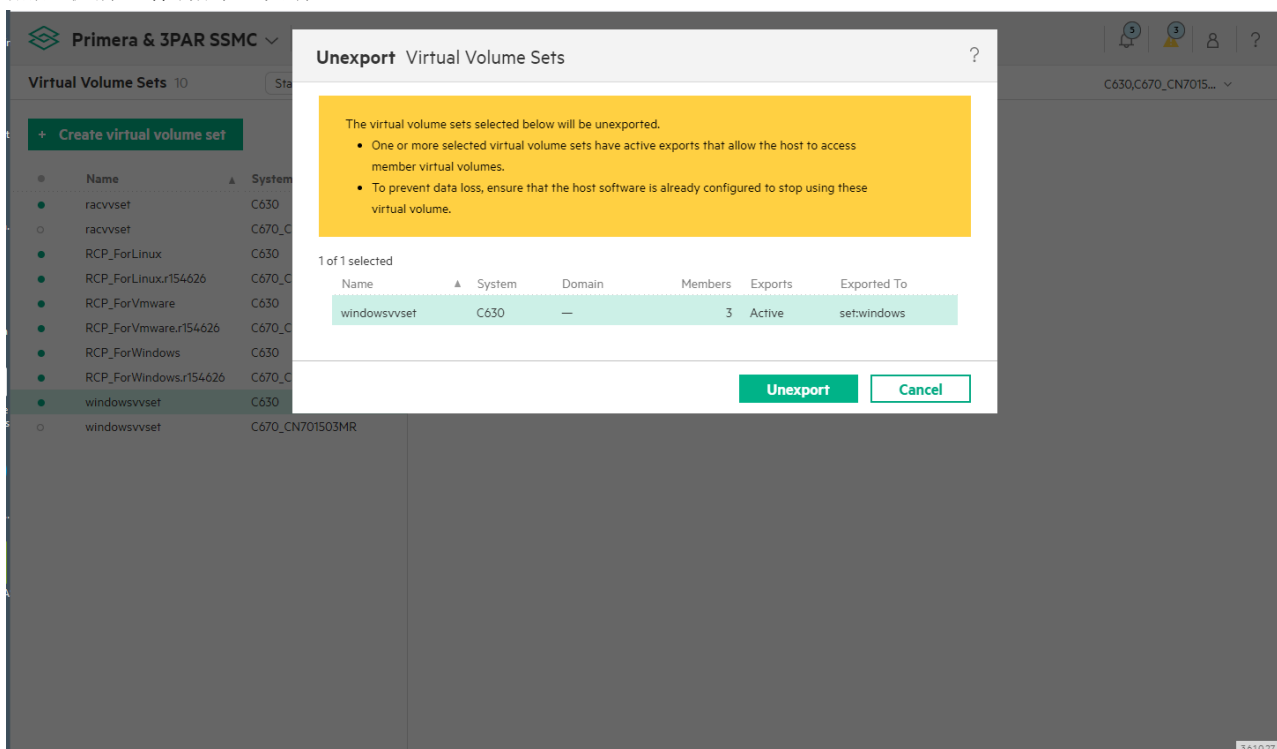


# 故障转移和恢复

由于并没有配置 Peer Persistent，卷只从主存储中映射，所以即使是同步复制，故障转移也需要先停止业务。



然后取消主存储的卷映射。



在 SSMC 中确认远程复制组中卷的状态为已同步，然后停止远程复制组。

Remote Copy Groups 3

Name	Configuration	State
ForLinux	C630, C670_CN...	Started
ForVmware	C630, C670_CN...	Started
ForWindows	C630, C670_CN...	Started

Source Volume	Sync State	Target Volume	Sync Percent	Last Synced	Backlog (GiB)
hyper-v	Synced	hyper-vr	—	—	—
sql-server	Synced	sql-server.r	—	—	—
stdc	Synced	stdc.r	—	—	—

Actions: Create, Edit, Delete, Start, Stop, Sync, Failover, Switch failover, Switchover, Revert failover, Recover, Restore, Start Peer Motion

URL: https://10.12.174.33:8443/#/rc-groups/stop/r/remotecopy/REST/rcviewservice/clusters/55ded7156cda07219beb43e3ab4b58cc/groupcombs/0a6796559dbee6aa309ee83ae22dc832?f\_sort=sourceGroupName%3Aasc

当前主存储角色为 Primary，目标存储角色为 Secondary，点击 Actions-Failover。

Remote Copy Groups 3

Name	Configuration	State
ForLinux	C630, C670_CN...	Started
ForVmware	C630, C670_CN...	Started
ForWindows	C630, C670_CN...	Stopped

ForWindows Overview

**General**

Name	ForWindows
Configuration	C630, C670_CN701503MR
Domain	—
Mode	Sync
Source system	C630
Source role	Primary
Source user CPG	ForWindows
Source copy CPG	ForWindows
Writable LUNs	C630
Target system	C670_CN701503MR
Target role	Secondary
Target user CPG	SSD_r6
Target copy CPG	SSD_r6

**Health**

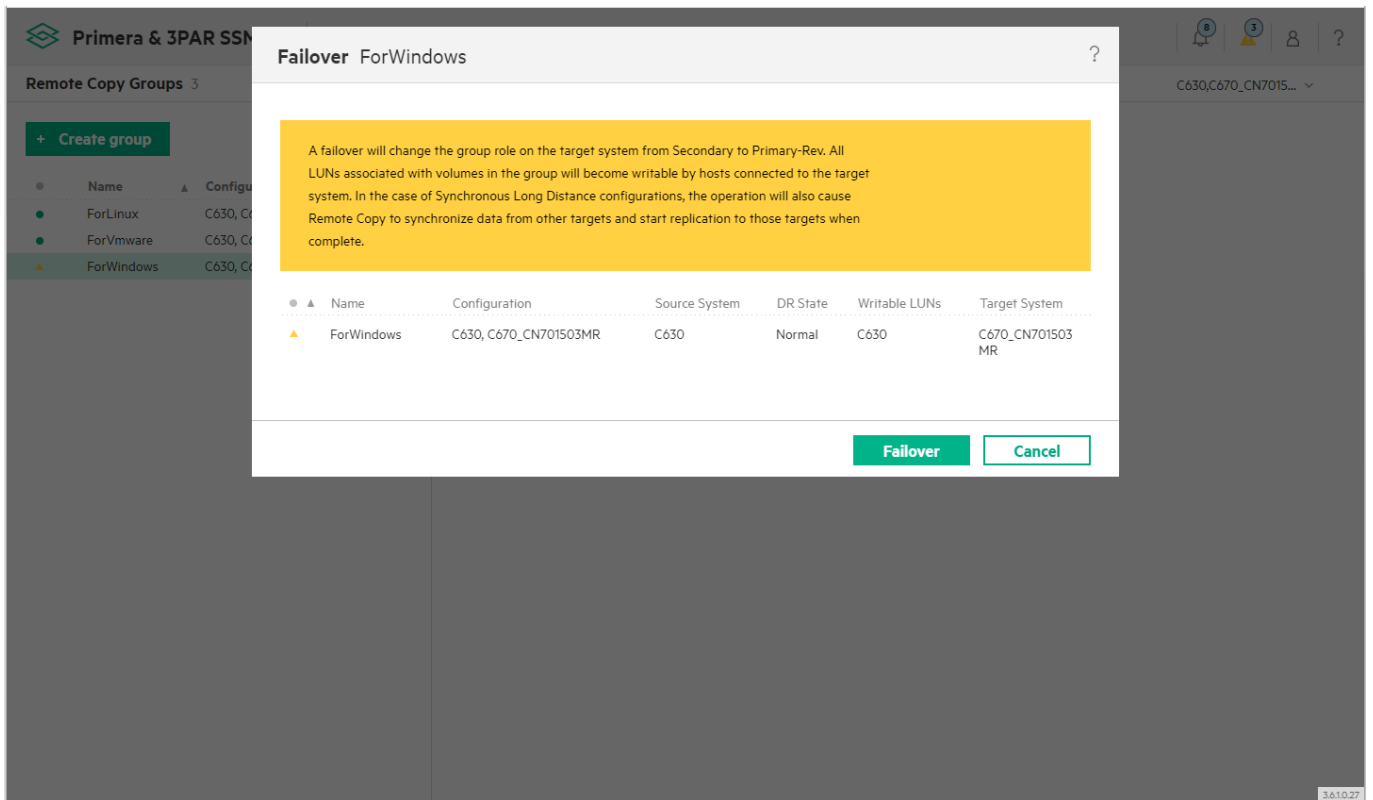
State	Warning
State description	Replication stopped
Group state	Stopped
DR state	Normal

**Policies**

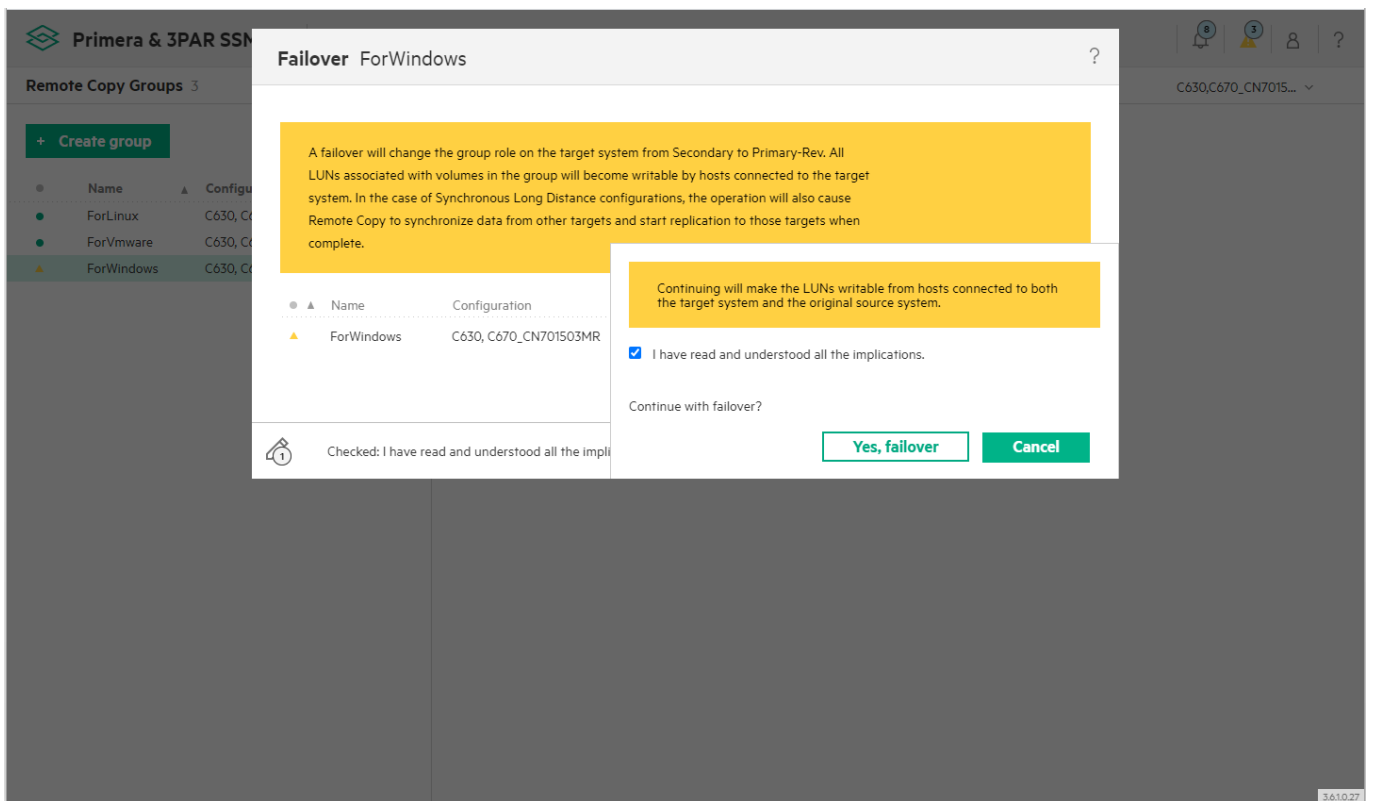
Auto synchronize	No
Auto recover	No
Over period alert	—
Multi-target Peer Persistence	—
Path management	No
Auto failover	No

Actions: Create, Edit, Delete, Start, Stop, Sync, Failover, Switch failover, Switchover, Revert failover, Recover, Restore, Start Peer Motion

点击 Failover。



勾选 I have read and understood all the implications, 点击 Yes, failover。



此时主存储角色仍旧为 Primary，目标存储角色为 Primary-Rev，此时两端均可读写。

**Remote Copy Groups** 3

Search: [ ]

Filters: Status: All, Name: [ ], State: All

Location: C630,C670\_CN7015...

**+ Create group**

Name	Configuration	State
ForLinux	C630, C670_CN...	Started
ForVmware	C630, C670_CN...	Started
<b>ForWindows</b>	C630, C670_CN...	Stopped

**ForWindows** Overview [ ] [ ]

**Actions** [ ]

Remote Copy Failover (ForWindows.r154626) Completed 3paradm Jul 1, 2020 9:22:24 PM CST

General		Health	
Name	ForWindows	State	Warning
Configuration	C630, C670_CN701503MR	State description	Secondary has become primary-rev
Domain	—	Group state	Stopped
Mode	Sync	DR state	Failover
Source system	C630		
Source role	Primary		
Source user CPG	ForWindows		
Source copy CPG	ForWindows		
Writable LUNs	C630, C670_CN701503MR		
Target system	C670_CN701503MR		
Target role	Primary-Rev		
Target user CPG	SSD_r6		
Target copy CPG	SSD_r6		

**Policies**

Auto synchronize	No
Auto recover	No
Over period alert	—
Multi-target Peer Persistence	—
Path management	No
Auto failover	No

此时除了主存储上在停止远程复制组时创建快照，目标存储在故障转移后也创建了快照。

**Virtual Volumes** 40

Search: [ ]

Filters: Status: All, Name: [ ], Type: All

Location: C630,C670\_CN7015...

**+ Create virtual volume**

Name	System
racdata.2.r	C670_CN701503MR
racdata.3	C630
racdata.3.r	C670_CN701503MR
rcpy.8.7.4	C630
rcpy.8.16.4	C630
rcpy.8.17.4	C630
<b>rcpy.8.490.4</b>	C670_CN701503MR
rcpy.8.491.4	C670_CN701503MR
rcpy.8.492.4	C670_CN701503MR
sql-server (1)	C630
sql-server.r (1)	C670_CN701503MR
stdc (1)	C630
stdc.r (1)	C670_CN701503MR
test	C630
testwindows	C630
VMFSS	C630
VMFSS.r (1)	C670_CN701503MR
VMFSS.r.200701204205	C670_CN701503MR
vmfs5test	C630
vmfs5test.r	C670_CN701503MR
vmfs6test	C630
vmfs6test.r	C670_CN701503MR
xfldata	C630

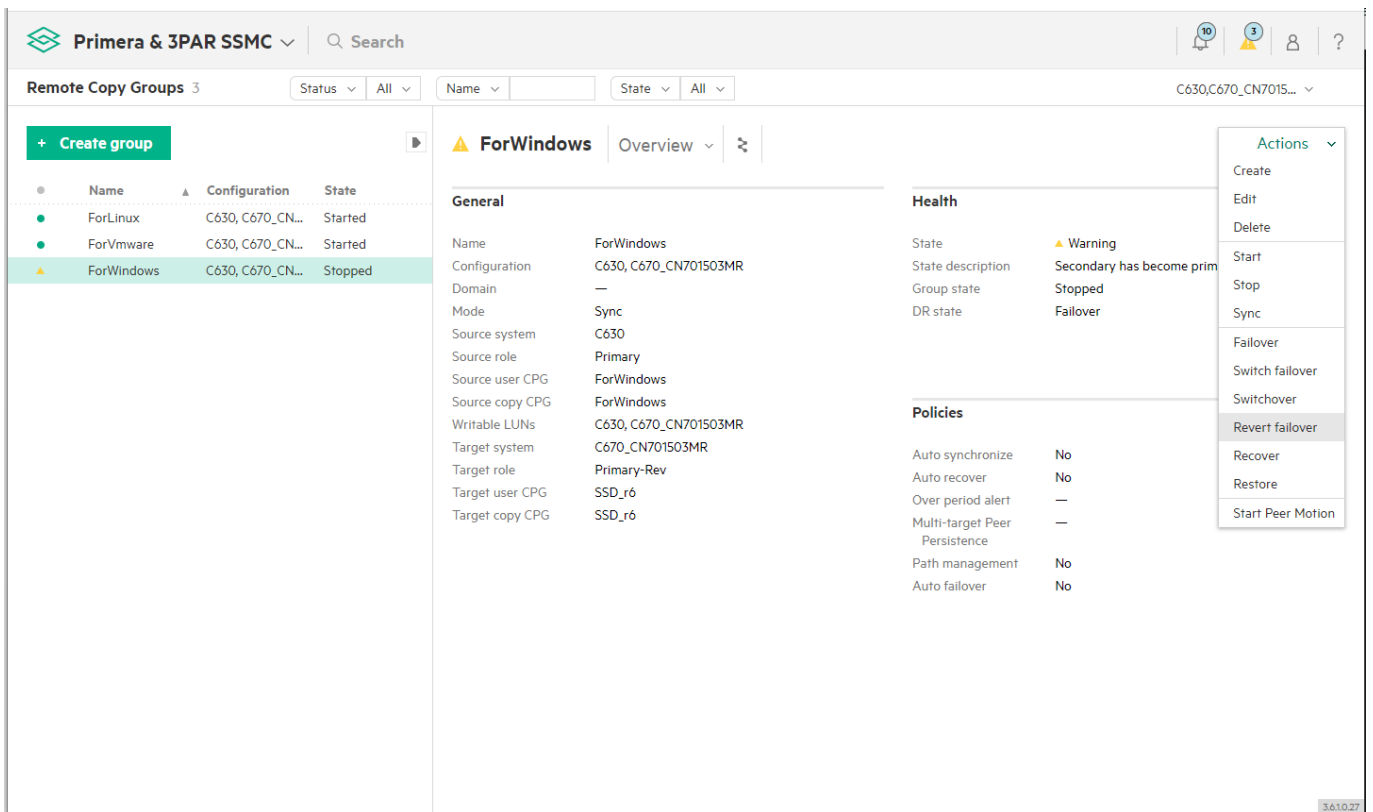
**rcpy.8.490.4** Settings [ ] [ ]

**Actions** [ ]

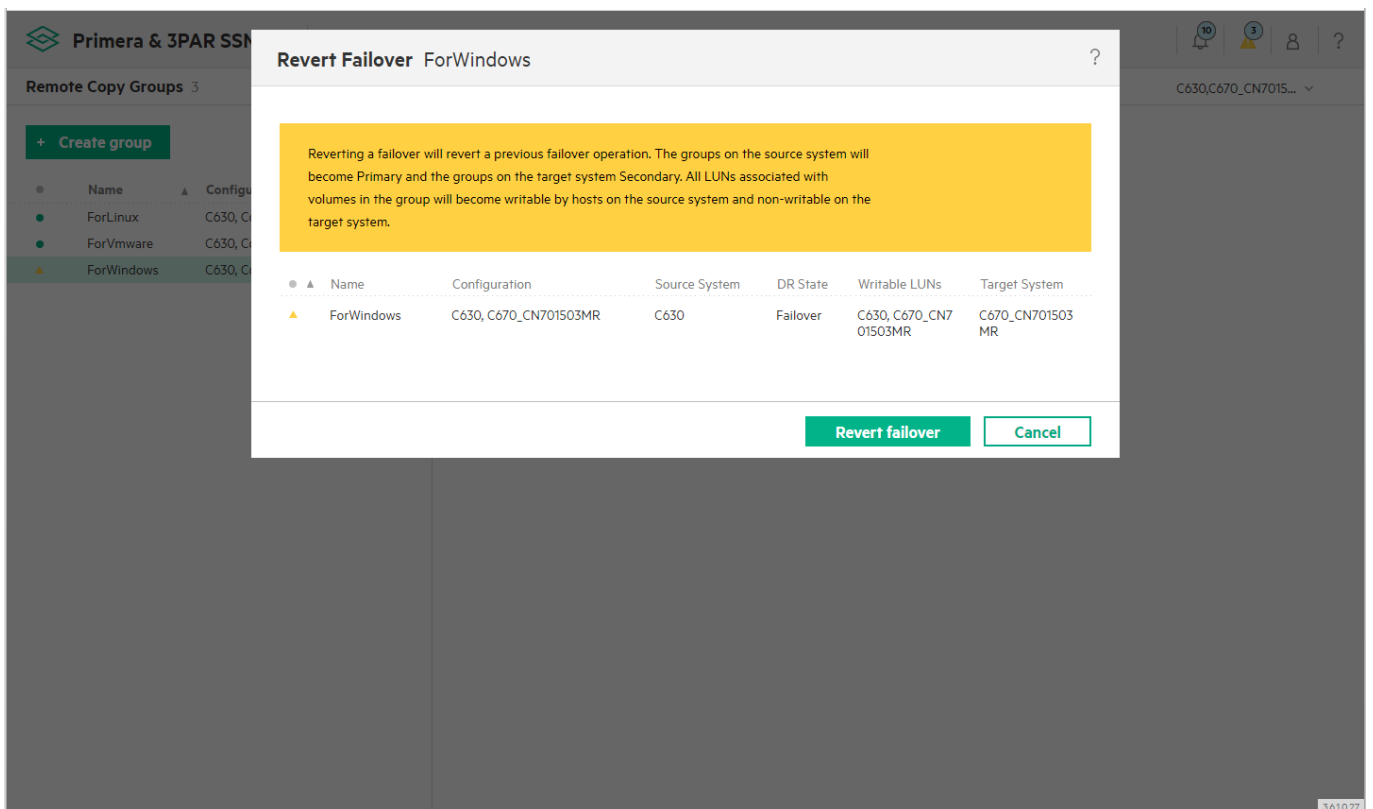
Capabilities		Special attributes	
Adaptive flash cache	—	Stale snapshots	Not allowed
Adaptive optimization	—	Restrict export to one host	No
Priority optimization	—	Zero detect	Disabled
Remote copy	ForWindows	Data integrity field	3PAR DIF

Allocation		History	
User space warning	—	Creation time	Jul 1, 2020 9:22:24 PM CST
User space limit	—	Retention time	—
Copy space warning	—	Expiration time	—
Copy space limit	—		

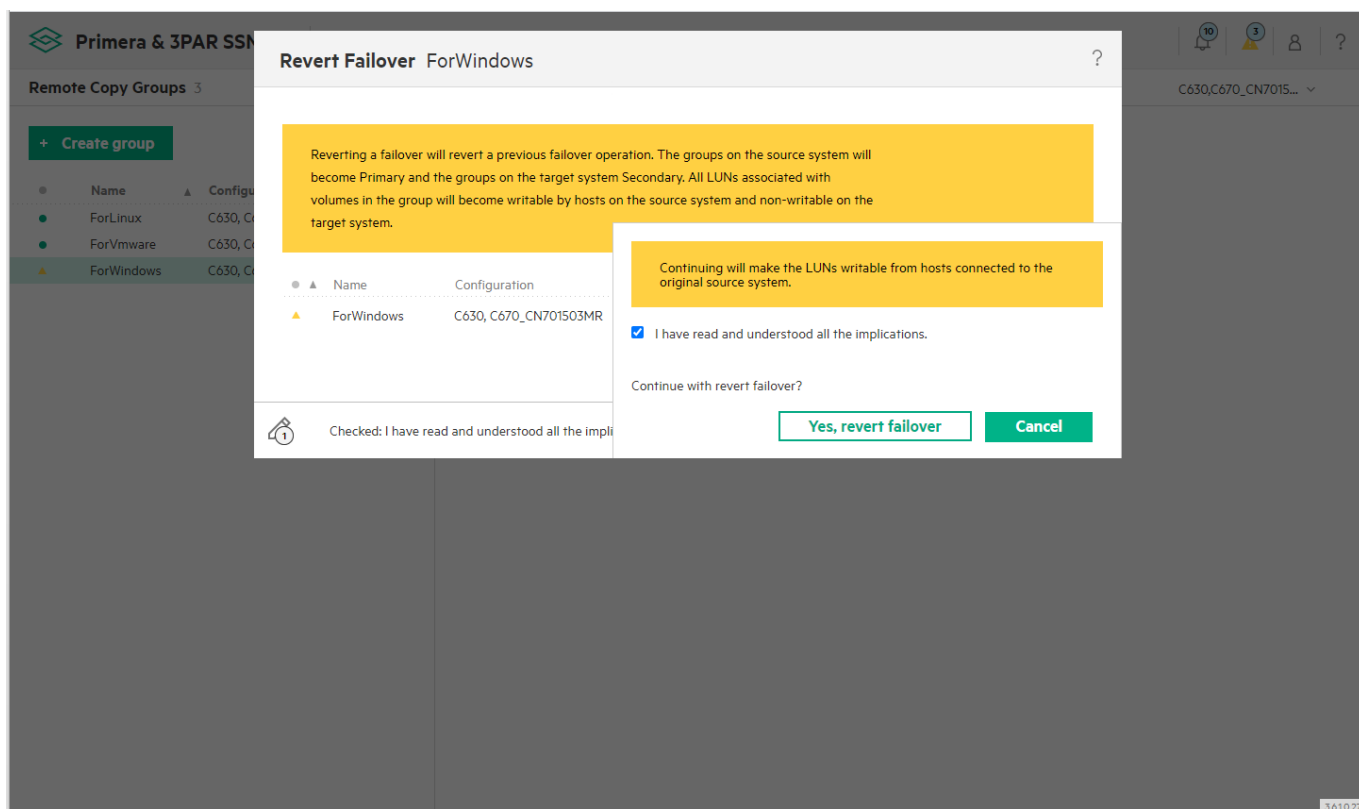
如果此时想回退故障转移前的状态，可以使用 Revert failover。



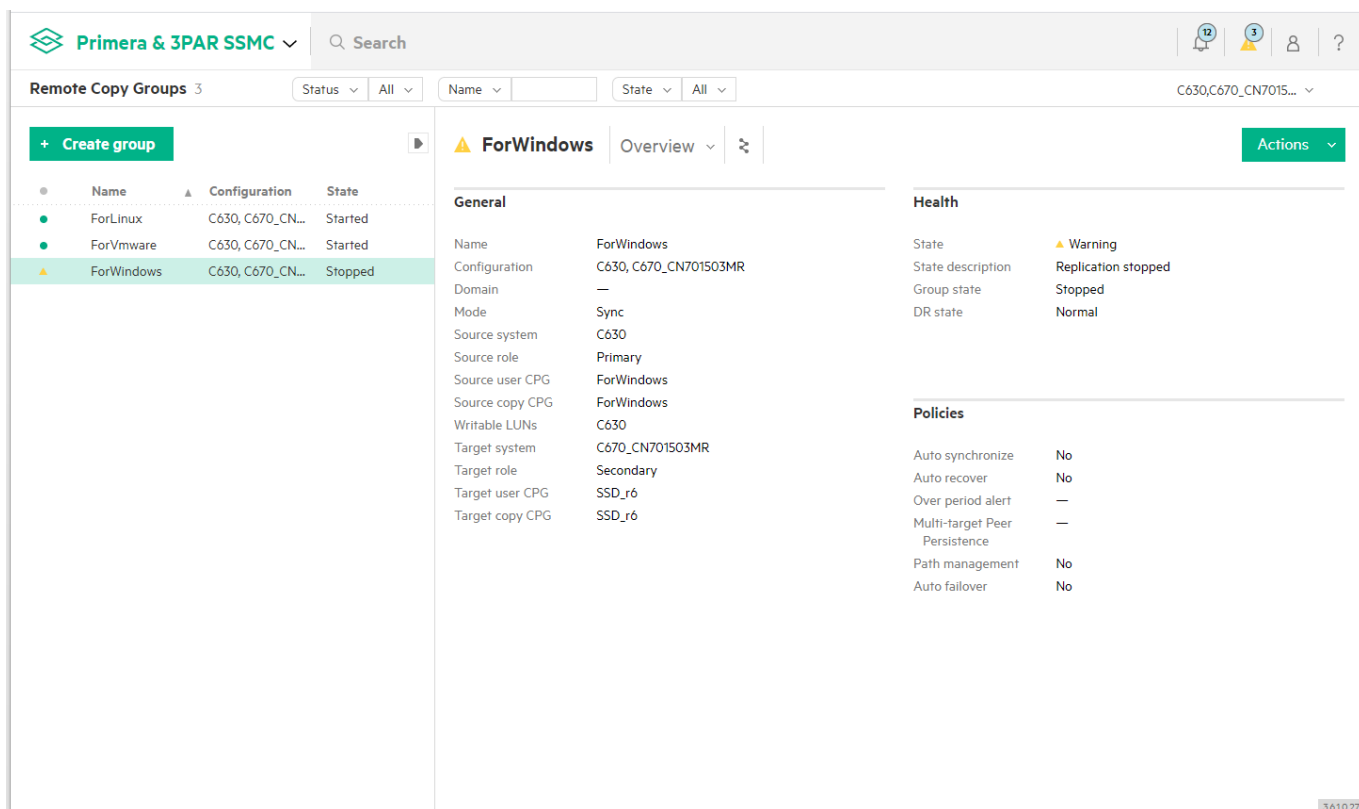
点击 Revert failover。



勾选 I have read and understood all the implications, 点击 Yes, revert failover。



此时主存储角色仍旧为 Primary，目标存储角色为 Secondary。



此时由于远程复制组仍旧在停止状态，主存储上保留的快照仍旧是故障转移前停止远程复制组时创建的快照。

The screenshot shows the H3C SSMC interface for a virtual volume named 'rcpy.8.7.4'. The interface includes a search bar, navigation tabs, and a list of virtual volumes on the left. The main panel displays the following details:

Virtual Volumes	
Name	System
racdata.2.r	C670_CN701503MR
racdata.3	C630
racdata.3.r	C670_CN701503MR
<b>rcpy.8.7.4</b>	<b>C630</b>
rcpy.8.16.4	C630
rcpy.8.17.4	C630
rcpy.8.490.4	C670_CN701503MR
rcpy.8.491.4	C670_CN701503MR
rcpy.8.492.4	C670_CN701503MR
sql-server (1)	C630
sql-server.r (1)	C670_CN701503MR
stdc (1)	C630
stdc.r (1)	C670_CN701503MR
test	C630
testwindows	C630
VMF55	C630
VMF55.r (1)	C670_CN701503MR
VMF55.r.200701204205	C670_CN701503MR
vmfs5test	C630
vmfs5test.r	C670_CN701503MR
vmfs6test	C630
vmfs6test.r	C670_CN701503MR
xfldata	C630

Capabilities	
Adaptive flash cache	—
Adaptive optimization	—
Priority optimization	—
Remote copy	ForWindows

Special attributes	
Stale snapshots	Not allowed
Restrict export to one host	No
Zero detect	Disabled
Data integrity field	3PAR DIF

Allocation	
User space warning	—
User space limit	—
Copy space warning	—
Copy space limit	—

History	
Creation time	Jul 1, 2020 9:18:28 PM CST
Retention time	—
Expiration time	—

目标存储也仍旧保留故障转移后创建的快照。

The screenshot shows the H3C SSMC interface for a virtual volume named 'rcpy.8.490.4'. The interface includes a search bar, navigation tabs, and a list of virtual volumes on the left. The main panel displays the following details:

Virtual Volumes	
Name	System
racdata.2.r	C670_CN701503MR
racdata.3	C630
racdata.3.r	C670_CN701503MR
rcpy.8.7.4	C630
rcpy.8.16.4	C630
rcpy.8.17.4	C630
<b>rcpy.8.490.4</b>	<b>C670_CN701503MR</b>
rcpy.8.491.4	C670_CN701503MR
rcpy.8.492.4	C670_CN701503MR
sql-server (1)	C630
sql-server.r (1)	C670_CN701503MR
stdc (1)	C630
stdc.r (1)	C670_CN701503MR
test	C630
testwindows	C630
VMF55	C630
VMF55.r (1)	C670_CN701503MR
VMF55.r.200701204205	C670_CN701503MR
vmfs5test	C630
vmfs5test.r	C670_CN701503MR
vmfs6test	C630
vmfs6test.r	C670_CN701503MR
xfldata	C630

Capabilities	
Adaptive flash cache	—
Adaptive optimization	—
Priority optimization	—
Remote copy	ForWindows

Special attributes	
Stale snapshots	Not allowed
Restrict export to one host	No
Zero detect	Disabled
Data integrity field	3PAR DIF

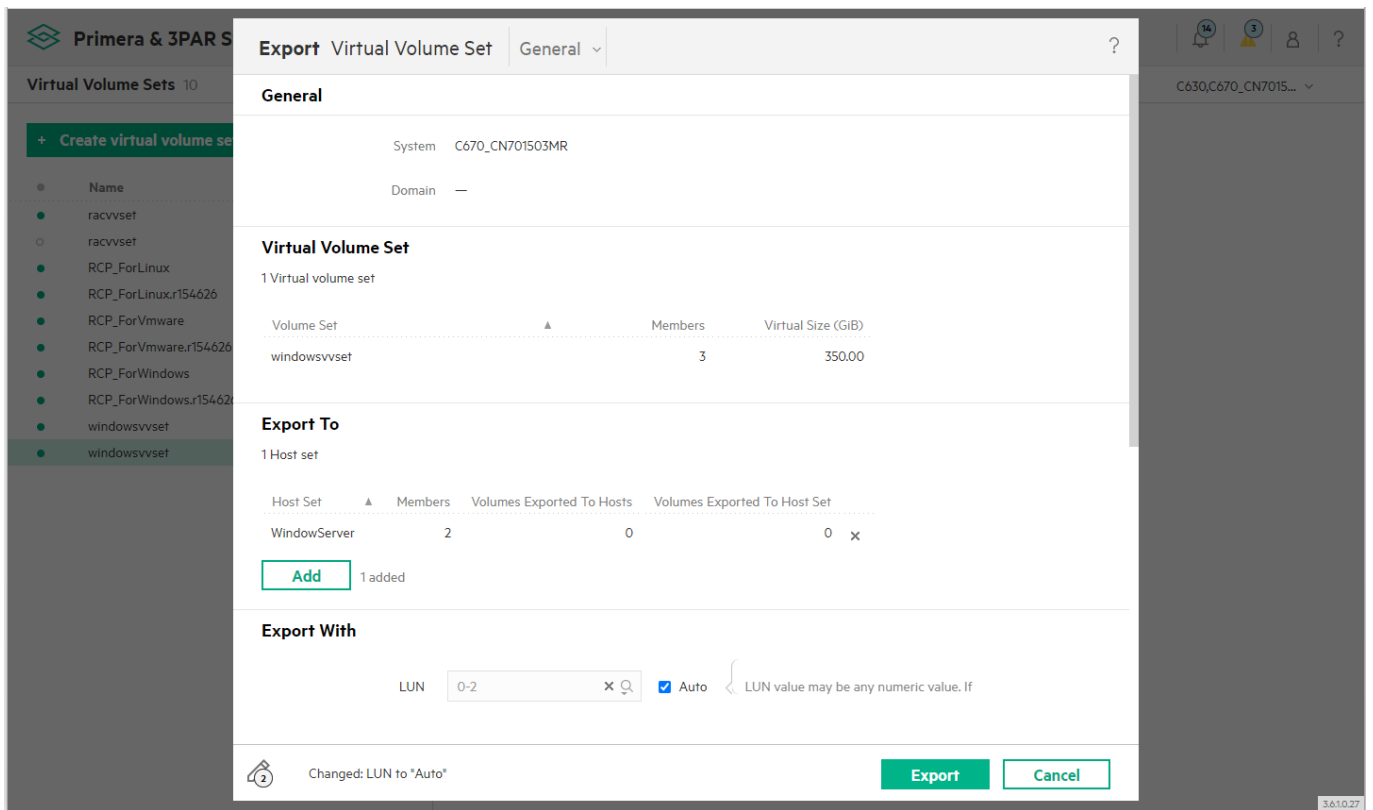
  

Allocation	
User space warning	—
User space limit	—
Copy space warning	—
Copy space limit	—

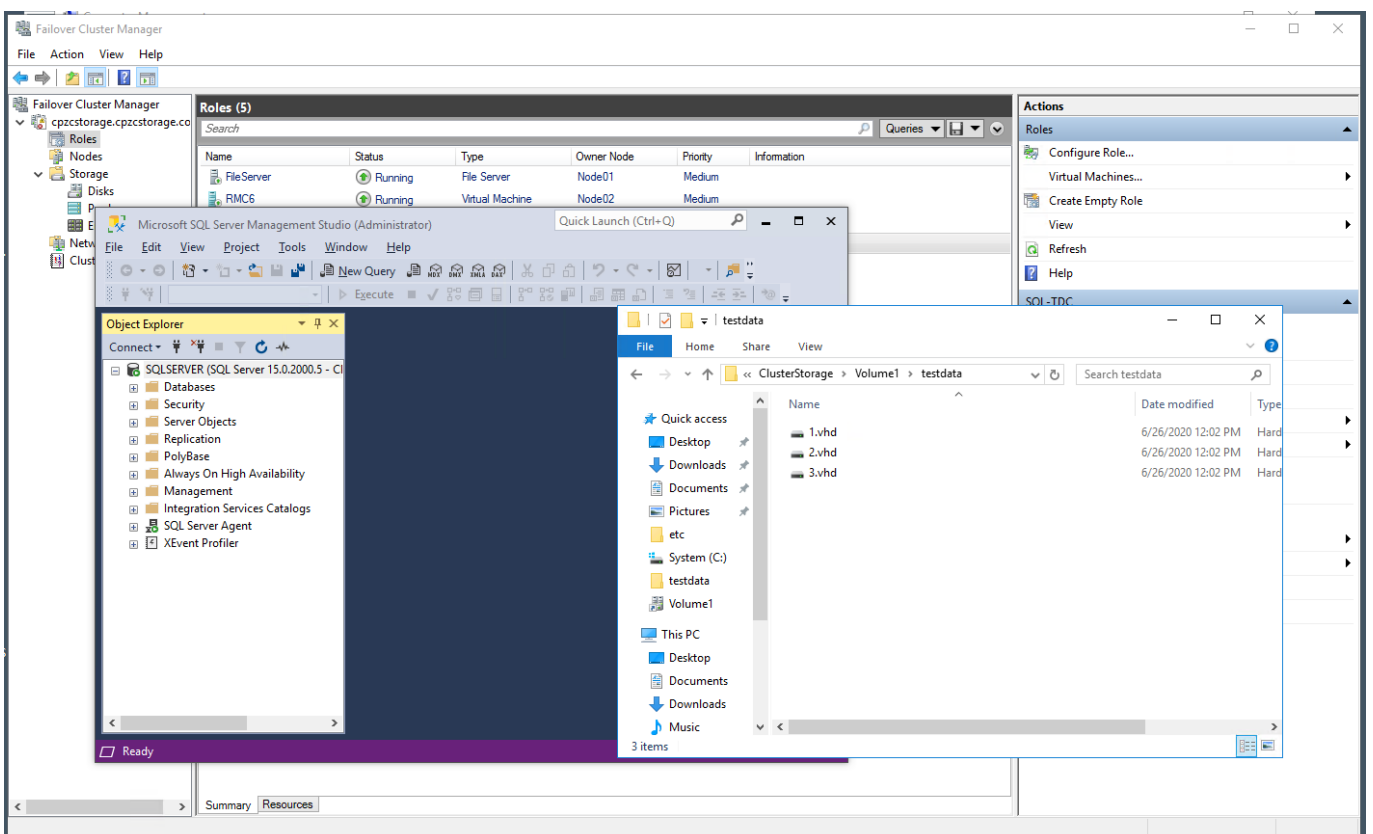
  

History	
Creation time	Jul 1, 2020 9:22:24 PM CST
Retention time	—
Expiration time	—

再次故障转移并映射远程卷。



确认主机挂载远程卷可以正常启动应用，然后写入新数据。





此时使用 Recover 功能反向同步主存储上的卷。

The screenshot shows the 'Remote Copy Groups' page in the H3C management console. The 'ForWindows' group is selected, and the 'Recover' action is highlighted in the 'Actions' dropdown menu.

Name	Configuration	State
ForLinux	C630, C670_CN...	Started
ForVmware	C630, C670_CN...	Started
ForWindows	C630, C670_CN...	Stopped

General		Health	
Name	ForWindows	State	Warning
Configuration	C630, C670_CN701503MR	State description	Secondary has become prim
Domain	—	Group state	Stopped
Mode	Sync	DR state	Fallover
Source system	C630		
Source role	Primary		
Source user CPG	ForWindows		
Source copy CPG	ForWindows		
Writable LUNs	C630, C670_CN701503MR		
Target system	C670_CN701503MR		
Target role	Primary-Rev		
Target user CPG	SSD_r6		
Target copy CPG	SSD_r6		

Policies	
Auto synchronize	No
Auto recover	No
Over period alert	—
Multi-target Peer Persistence	—
Path management	No
Auto failover	No

点击 Yes, recover。

The screenshot shows the 'Recover ForWindows' dialog box. The dialog contains a warning message and a checkbox for 'Do not start groups after role reversal is completed'. The 'Yes, recover' button is highlighted.

**Recover ForWindows**

A recovery will reverse replication and synchronize the delta changes from the target system to the primary system for groups. The group role on the source system will become Secondary-Rev. All LUNs associated with volumes in the group will become non-writable by hosts connected to the source system.

Name	Configuration
ForWindows	C630, C670_CN701503MR

Do not start groups after role reversal is completed

I have read and understood all the implications.

Continue with recover?

**Yes, recover** **Cancel**

此时主存储角色变为 Secondary-Rev，目标存储角色仍旧为 Primary-Rev。

The screenshot shows the 'Remote Copy Groups' page in the H3C management console. The 'ForWindows' group is selected, and its configuration is displayed in the 'General' tab. The 'Health' tab shows a warning state due to the reversed replication direction.

General		Health	
Name	ForWindows	State	Warning
Configuration	C630, C670_CN701503MR	State description	Direction of replication reversed
Domain	—	Group state	Started
Mode	Sync	DR state	Recover
Source system	C630		
Source role	Secondary-Rev		
Source user CPG	ForWindows		
Source copy CPG	ForWindows		
Writable LUNs	C670_CN701503MR		
Target system	C670_CN701503MR		
Target role	Primary-Rev		
Target user CPG	SSD_r6		
Target copy CPG	SSD_r6		

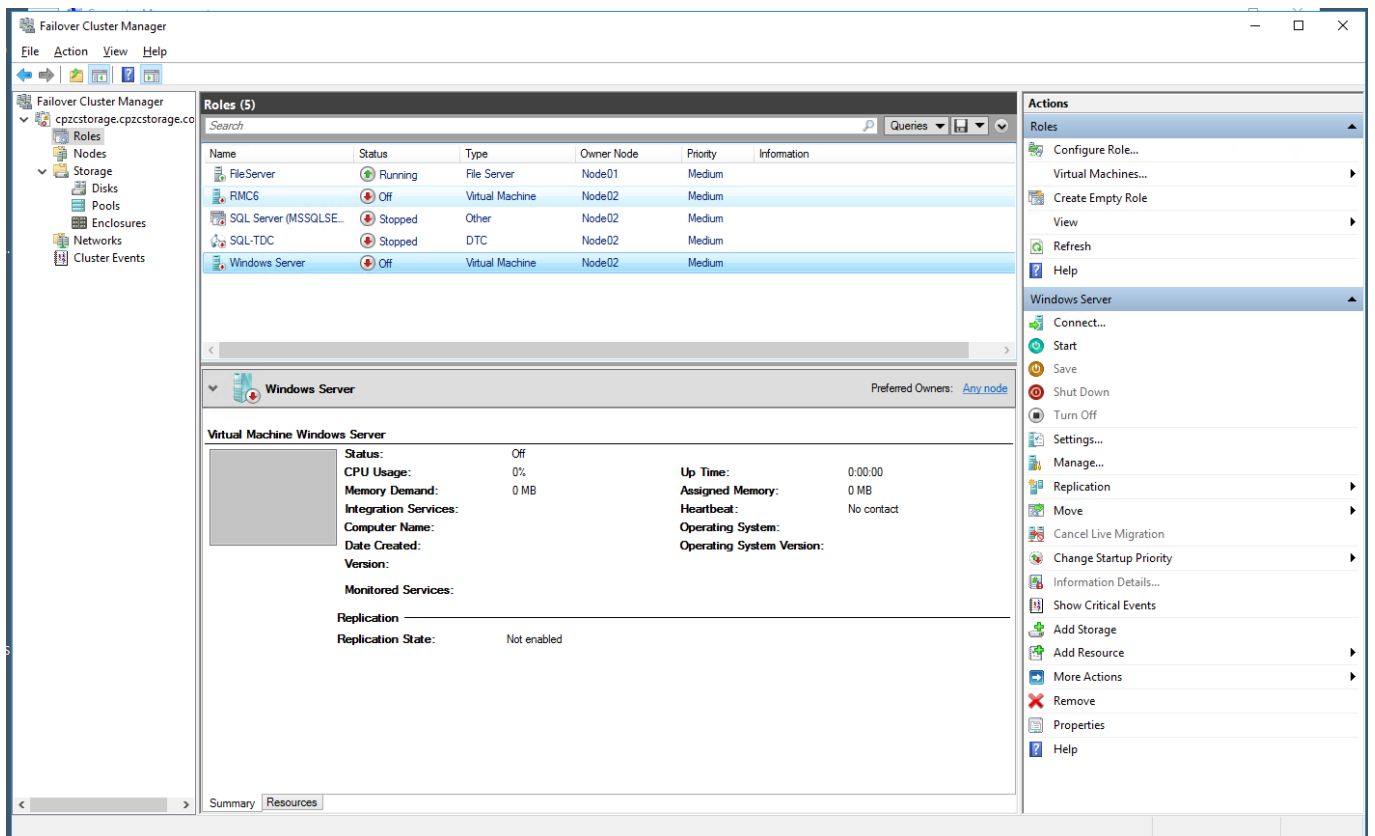
Policies	
Auto synchronize	No
Auto recover	No
Over period alert	—
Multi-target Peer Persistence	—
Path management	No
Auto failover	No

同步完成后两端存储上的快照都被删除。

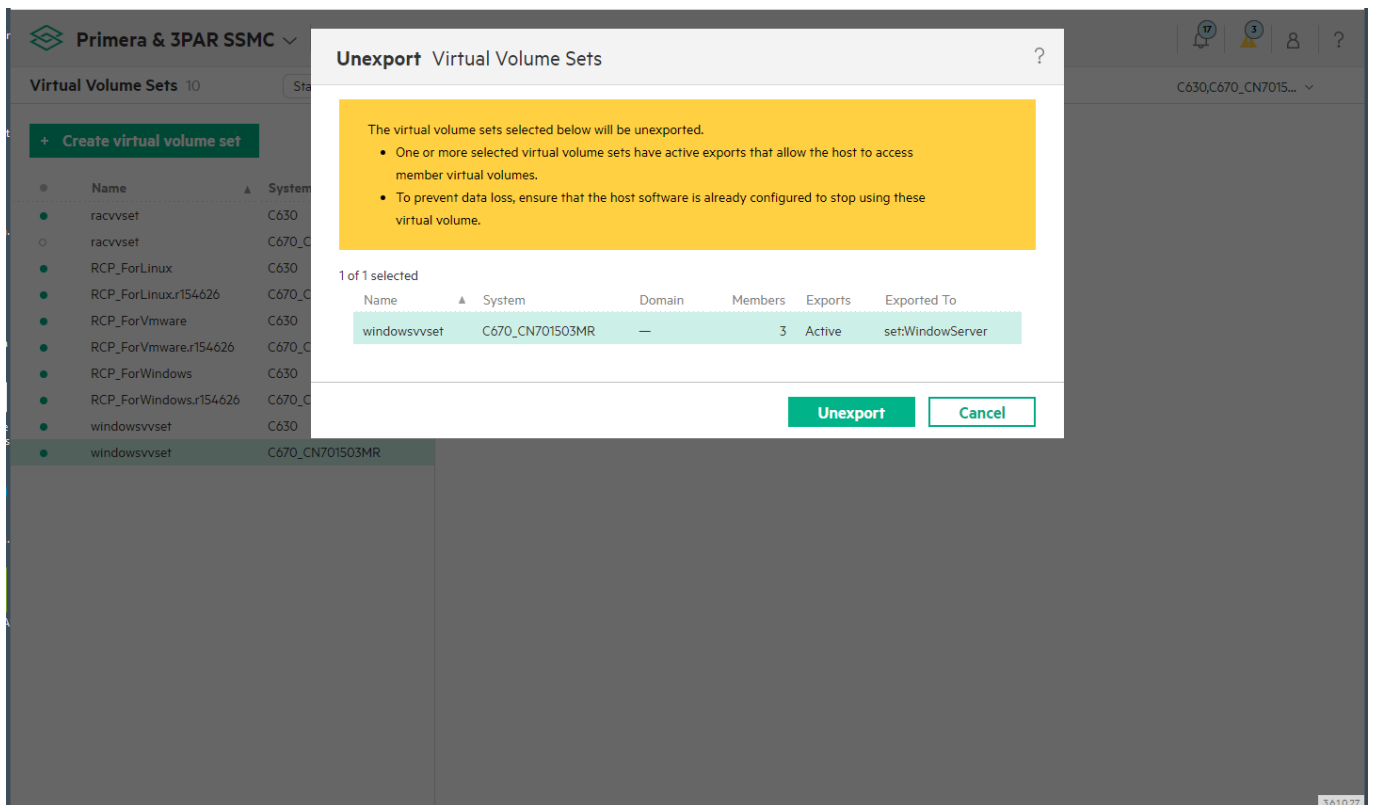
The screenshot shows the 'Volume Pairs' tab for the 'ForWindows' group. It displays a table of source and target volumes, all of which are in a 'Synced' state with no backlog.

Source Volume	Sync State	Target Volume	Sync Percent	Last Synced	Backlog (GiB)
hyper-v	Synced	hyper-vr	—	—	—
sql-server	Synced	sql-serverr	—	—	—
stdc	Synced	stdcr	—	—	—

在做 Restore 前停止业务。



把远程卷取消映射。



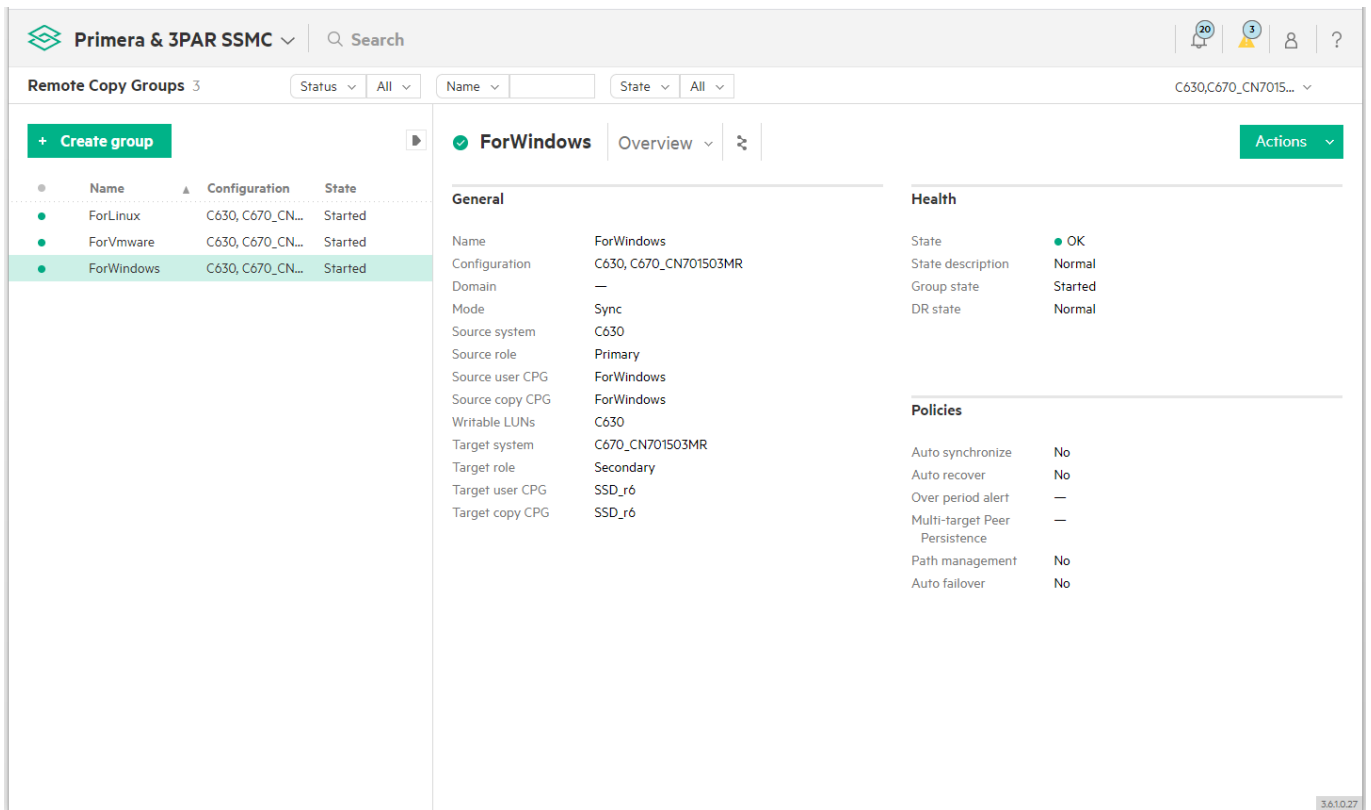
使用 Restore 恢复两端存储原始角色和流向。

The screenshot shows the H3C management console interface. At the top, there is a search bar and navigation icons. Below that, the 'Remote Copy Groups' section is visible, with a table listing three groups: ForLinux, ForVmware, and ForWindows. The 'ForWindows' group is selected, and its configuration details are shown in the main area. The configuration includes fields for Name, Configuration, Domain, Mode, Source system, Source role, Source user CPG, Source copy CPG, Writable LUNs, Target system, Target role, Target user CPG, and Target copy CPG. The 'Health' section shows a warning state with a yellow triangle icon. The 'Policies' section lists various settings like Auto synchronize, Auto recover, Over period alert, Multi-target Peer Persistence, Path management, and Auto failover. An 'Actions' dropdown menu is open, showing options like Create, Edit, Delete, Start, Stop, Sync, Failover, Switch failover, Switchover, Revert failover, Recover, Restore, and Start Peer Motion. The 'Restore' option is highlighted.

点击 Yes, restore。

The screenshot shows a dialog box titled 'Restore ForWindows'. The dialog contains a yellow warning box with the following text: 'A restore will restore replication for the groups to a pre-failover state after a recover operation has been completed. The group role on the source system will become Primary and the target system Secondary. All LUNs associated with volumes in the group will become writable by hosts connected to the source system and non-writable by hosts connected to the target system.' Below this, there is a table with two columns: Name and Configuration. The table lists the 'ForWindows' group with configuration 'C630, C670\_CN701503MR'. There are two checkboxes: 'Do not start groups after role reversal is completed' (unchecked) and 'I have read and understood all the implications.' (checked). At the bottom right, there are two buttons: 'Yes, restore' (highlighted) and 'Cancel'. The background shows the same management console interface as the previous screenshot.

Restore 完成后主存储恢复 Primary 角色，目标存储仍旧为 Secondary 角色。



此时挂载卷确认业务正常并可以看到新写入的数据。

