

Testing the MetroCluster configuration

ONTAP MetroCluster

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Testing the MetroCluster configuration

You can test failure scenarios to confirm the correct operation of the MetroCluster configuration.

Verifying negotiated switchover

You can test the negotiated (planned) switchover operation to confirm uninterrupted data availability.

This test validates that data availability is not affected (except for Microsoft Server Message Block (SMB) and Solaris Fibre Channel protocols) by switching the cluster over to the second data center.

This test should take about 30 minutes.

This procedure has the following expected results:

• The metrocluster switchover command will present a warning prompt.

If you respond yes to the prompt, the site the command is issued from will switch over the partner site.

For MetroCluster IP configurations:

- For ONTAP 9.4 and earlier:
 - Mirrored aggregates will become degraded after the negotiated switchover.
- For ONTAP 9.5 and later:
 - Mirrored aggregates will remain in normal state if the remote storage is accessible.
 - Mirrored aggregates will become degraded after the negotiated switchover if access to the remote storage is lost.
- For ONTAP 9.8 and later:
 - Unmirrored aggregates that are located at the disaster site will become unavailable if access to the remote storage is lost. This might lead to a controller outage.
 - 1. Confirm that all nodes are in the configured state and normal mode:

metrocluster node show

2. Begin the switchover operation:

metrocluster switchover

```
cluster_A::> metrocluster switchover
Warning: negotiated switchover is about to start. It will stop all
the data Vservers on cluster "cluster_B" and
automatically re-start them on cluster "cluster_A". It will
finally gracefully shutdown cluster "cluster_B".
```

3. Confirm that the local cluster is in the configured state and switchover mode:

metrocluster node show

4. Confirm that the switchover operation was successful:

metrocluster operation show

```
cluster_A::> metrocluster operation show

cluster_A::> metrocluster operation show
   Operation: switchover
        State: successful
Start Time: 2/6/2016 13:28:50
   End Time: 2/6/2016 13:29:41
   Errors: -
```

5. Use the vserver show and network interface show commands to verify that DR SVMs and LIFs have come online.

Verifying healing and manual switchback

You can test the healing and manual switchback operations to verify that data availability is not affected (except for SMB and Solaris FC configurations) by switching back the cluster to the original data center after a negotiated switchover.

This test should take about 30 minutes.

The expected result of this procedure is that services should be switched back to their home nodes.

1. Verify that healing is completed: metrocluster node show

The following example shows the successful completion of the command:

2. Verify that all aggregates are mirrored: storage aggregate show

The following example shows that all aggregates have a RAID Status of mirrored:

```
cluster A::> storage aggregate show
cluster Aggregates:
Aggregate Size Available Used% State #Vols Nodes RAID
______ _____
_____
data cluster
       4.19TB 4.13TB 2% online 8 node_A_1 raid_dp,
                                            mirrored,
                                            normal
root cluster
       715.5GB 212.7GB 70% online 1 node A 1 raid4,
                                            mirrored,
                                            normal
cluster B Switched Over Aggregates:
Aggregate Size Available Used% State #Vols Nodes RAID
_____ ______
data cluster B
        4.19TB 4.11TB 2% online 5 node_A_1 raid_dp,
                                           mirrored,
                                           normal
root_cluster_B - - - unknown - node_A_1 -
```

- 3. Boot nodes from the disaster site.
- 4. Check the status of switchback recovery: metrocluster node show

5. Perform the switchback: metrocluster switchback

```
cluster_A::> metrocluster switchback
[Job 938] Job succeeded: Switchback is successful.Verify switchback
```

6. Confirm status of the nodes: metrocluster node show

7. Confirm status of the metrocluster operation: metrocluster operation show

The output should show a successful state.

```
cluster_A::> metrocluster operation show
  Operation: switchback
     State: successful
Start Time: 2/6/2016 13:54:25
  End Time: 2/6/2016 13:56:15
     Errors: -
```

Loss of a single FC-to-SAS bridge

You can test the failure of a single FC-to-SAS bridge to make sure there is no single point of failure.

This test should take about 15 minutes.

This procedure has the following expected results:

- Errors should be generated as the bridge is switched off.
- · No failover or loss of service should occur.
- Only one path from the controller module to the drives behind the bridge is available.



Starting with ONTAP 9.8, the storage bridge command is replaced with system bridge. The following steps show the storage bridge command, but if you are running ONTAP 9.8 or later, the system bridge command is preferred.

- 1. Turn off the power supplies of the bridge.
- 2. Confirm that the bridge monitoring indicates an error: storage bridge show

```
cluster_A::> storage bridge show

Is

Monitor

Bridge Symbolic Name Vendor Model Bridge WWN Monitored

Status

-----

ATTO_10.65.57.145

bridge_A_1 Atto FibreBridge 6500N

200000108662d46c true

error
```

3. Confirm that drives behind the bridge are available with a single path: storage disk error show

```
cluster A::> storage disk error show
             Error Type Error Text
-----
             onedomain 1.0.0 (5000cca057729118): All paths
1.0.0
to this array LUN are connected to the same fault domain. This is a
single point of failure.
       onedomain 1.0.1 (5000cca057727364): All paths
1.0.1
to this array LUN are connected to the same fault domain. This is a
single point of failure.
        onedomain 1.0.2 (5000cca05772e9d4): All paths
1.0.2
to this array LUN are connected to the same fault domain. This is a
single point of failure.
1.0.23 onedomain 1.0.23 (5000cca05772e9d4): All paths
to this array LUN are connected to the same fault domain. This is a
single point of failure.
```

Verifying operation after power line disruption

You can test the MetroCluster configuration's response to the failure of a PDU.

The best practice is for each power supply unit (PSU) in a component to be connected to separate power supplies. If both PSUs are connected to the same power distribution unit (PDU) and an electrical disruption occurs, the site could down or a complete shelf might become unavailable. Failure of one power line is tested to confirm that there is no cabling mismatch that could cause a service disruption.

This test should take about 15 minutes.

This test requires turning off power to all left-hand PDUs and then all right-hand PDUs on all of the racks containing the MetroCluster components.

This procedure has the following expected results:

- Errors should be generated as the PDUs are disconnected.
- · No failover or loss of service should occur.
 - 1. Turn off the power of the PDUs on the left-hand side of the rack containing the MetroCluster components.
 - 2. Monitor the result on the console by using the system environment sensors show -state fault and storage shelf show -errors commands.

```
cluster A::> system environment sensors show -state fault
Node Sensor State Value/Units Crit-Low Warn-Low Warn-Hi
Crit-Hi
node A 1
      PSU1
                     fault
                         PSU OFF
       PSU1 Pwr In OK fault
                          FAULT
node A 2
       PSU1
                     fault
                          PSU OFF
       PSU1 Pwr In OK fault
                          FAULT
4 entries were displayed.
cluster A::> storage shelf show -errors
   Shelf Name: 1.1
    Shelf UID: 50:0a:09:80:03:6c:44:d5
Serial Number: SHFHU1443000059
Error Type Description
                  Critical condition is detected in storage shelf
power supply unit "1". The unit might fail. Reconnect PSU1
```

- 3. Turn the power back on to the left-hand PDUs.
- 4. Make sure that ONTAP clears the error condition.
- 5. Repeat the previous steps with the right-hand PDUs.

Verifying operation after a switch fabric failure

You can disable a switch fabric to show that data availability is not affected by the loss.

This test should take about 15 minutes.

The expected result of this procedure is that disabling a fabric results in all cluster interconnect and disk traffic flowing to the other fabric.

In the examples shown, switch fabric 1 is disabled. This fabric consists of two switches, one at each MetroCluster site:

- FC_switch_A_1 on cluster_A
- FC switch B 1 on cluster B
 - 1. Disable connectivity to one of the two switch fabrics in the MetroCluster configuration:
 - a. Disable the first switch in the fabric: switchdisable

```
FC_switch_A_1::> switchdisable
```

b. Disable the second switch in the fabric: switchdisable

```
FC_switch_B_1::> switchdisable
```

2. Monitor the result on the console of the controller modules.

You can use the following commands to check the cluster nodes to make sure that all data is still being served. The command output shows missing paths to disks. This is expected.

- vserver show
- network interface show
- aggr show
- system node runnodename-command storage show disk -p
- storage disk error show
- 3. Reenable connectivity to one of the two switch fabrics in the MetroCluster configuration:
 - a. Reenable the first switch in the fabric: switchenable

```
FC_switch_A_1::> switchenable
```

b. Reenable the second switch in the fabric: switchenable

```
FC_switch_B_1::> switchenable
```

4. Wait at least 10 minutes and then repeat the above steps on the other switch fabric.

Verifying operation after loss of a single storage shelf

You can test the failure of a single storage shelf to verify that there is no single point of failure.

This procedure has the following expected results:

- An error message should be reported by the monitoring software.
- · No failover or loss of service should occur.
- Mirror resynchronization starts automatically after the hardware failure is restored.
 - 1. Check the storage failover status: storage failover show

```
Cluster_A::> storage failover show

Node Partner Possible State Description

node_A_1 node_A_2 true Connected to node_A_2 node_A_2 node_A_1 true Connected to node_A_1 true Connected to node_A_1 entries were displayed.
```

2. Check the aggregate status: storage aggregate show

```
cluster A::> storage aggregate show
cluster Aggregates:
Aggregate Size Available Used% State #Vols Nodes
RAID Status
_____ ____
-----
node A 1data01 mirrored
       raid dp,
mirrored,
normal
node A 1root
  707.7GB 34.29GB 95% online 1 node A 1
raid dp,
mirrored,
normal
node A 2 data01 mirrored
       4.15TB 4.12TB 1% online 2 node_A_2
raid_dp,
mirrored,
normal
node_A_2_data02_unmirrored
       raid_dp,
normal
node A 2 root
       707.7GB 34.27GB 95% online 1 node_A_2
raid dp,
mirrored,
normal
```

3. Verify that all data SVMs and data volumes are online and serving data: vserver show -type datanetwork interface show -fields is-home falsevolume show !vol0,!MDV*

```
cluster A::> vserver show -type data
cluster A::> vserver show -type data
                      Admin Operational Root
Vserver Type Subtype State
                             State Volume
Aggregate
SVM1 data sync-source running SVM1_root
node A 1 data01 mirrored
SVM2 data sync-source running SVM2_root
node A 2 data01 mirrored
cluster A::> network interface show -fields is-home false
There are no entries matching your query.
cluster A::> volume show !vol0,!MDV*
Vserver Volume Aggregate State Type Size
Available Used%
______ _____
_____
SVM1
       SVM1 root
                node A 1data01 mirrored
                          online RW 10GB
9.50GB
       5%
SVM1
       SVM1 data vol
                 node A 1data01 mirrored
                         online RW
                                         10GB
9.49GB
       5%
SVM2
       SVM2 root
                node A 2 data01 mirrored
                          online RW
                                         10GB
9.49GB 5%
SVM2
       SVM2 data vol
                 node A 2 data02 unmirrored
                          online RW
                                           1GB
972.6MB 5%
```

4. Identify a shelf in Pool 1 for node node_A_2 to power off to simulate a sudden hardware failure: storage aggregate show -r -node node-name !*root

The shelf you select must contain drives that are part of a mirrored data aggregate.

```
cluster A::> storage aggregate show -r -node node A 2 !*root
Owner Node: node A 2
Aggregate: node A 2 data01 mirrored (online, raid dp, mirrored)
(block checksums)
 Plex: /node A 2 data01 mirrored/plex0 (online, normal, active,
pool0)
  RAID Group /node A 2 data01 mirrored/plex0/rg0 (normal, block
checksums)
                                                 Usable
Physical
   Position Disk
                                Pool Type RPM Size
Size Status
   _____
   dparity 2.30.3
                                  0 BSAS 7200 827.7GB
828.0GB (normal)
                                  0 BSAS 7200 827.7GB
   parity 2.30.4
828.0GB (normal)
   data 2.30.6
                                  0 BSAS 7200 827.7GB
828.0GB (normal)
   data 2.30.8
                                  0 BSAS 7200 827.7GB
828.0GB (normal)
  data 2.30.5
                                  0 BSAS 7200 827.7GB
828.0GB (normal)
 Plex: /node A 2 data01 mirrored/plex4 (online, normal, active,
pool1)
  RAID Group /node A 2 data01 mirrored/plex4/rg0 (normal, block
checksums)
                                                 Usable
Physical
   Position Disk
                                Pool Type RPM Size
Size Status
   _____
   dparity 1.31.7
                                  1 BSAS 7200 827.7GB
828.0GB (normal)
   parity 1.31.6
                                  1 BSAS
                                           7200 827.7GB
828.0GB (normal)
   data 1.31.3
                                  1 BSAS 7200 827.7GB
828.0GB (normal)
   data 1.31.4
                                  1 BSAS
                                           7200 827.7GB
828.0GB (normal)
   data 1.31.5
                                  1 BSAS
                                            7200 827.7GB
```

```
828.0GB (normal)
Aggregate: node A 2 data02 unmirrored (online, raid dp) (block
checksums)
 Plex: /node A 2 data02 unmirrored/plex0 (online, normal, active,
pool0)
  RAID Group /node A 2 data02 unmirrored/plex0/rg0 (normal, block
checksums)
                                                  Usable
Physical
   Position Disk
                             Pool Type RPM
                                                   Size
Size Status
   _____
   dparity 2.30.12
                                   0 BSAS 7200 827.7GB
828.0GB (normal)
   parity 2.30.22
                                   0 BSAS
                                            7200 827.7GB
828.0GB (normal)
   data 2.30.21
                                   0 BSAS
                                            7200 827.7GB
828.0GB (normal)
    data 2.30.20
                                            7200 827.7GB
                                   0 BSAS
828.0GB (normal)
                                   0 BSAS
   data 2.30.14
                                            7200 827.7GB
828.0GB (normal)
```

15 entries were displayed.

- 5. Physically power off the shelf that you selected.
- 6. Check the aggregate status again: storage aggregate show``storage aggregate show`-r -node node A 2 !*root

The aggregate with drives on the powered-off shelf should have a degraded RAID status, and drives on the affected plex should have a failed status, as shown in the following example:

```
node A 1root
       707.7GB 34.29GB 95% online 1 node_A_1
raid dp,
mirrored,
normal
node A 2 data01 mirrored
         4.15TB 4.12TB 1% online 2 node_A_2
raid dp,
mirror
degraded
node A 2 data02 unmirrored
         2.18TB 2.18TB 0% online 1 node A 2
raid dp,
normal
node A 2 root
       707.7GB 34.27GB 95% online 1 node A 2
raid_dp,
mirror
degraded
cluster A::> storage aggregate show -r -node node A 2 !*root
Owner Node: node A 2
Aggregate: node A 2 data01 mirrored (online, raid dp, mirror
degraded) (block checksums)
Plex: /node A 2 data01 mirrored/plex0 (online, normal, active,
pool0)
  RAID Group /node A 2 data01 mirrored/plex0/rg0 (normal, block
checksums)
                                                    Usable
Physical
  Position Disk
                                  Pool Type RPM Size
Size Status
   _____
   dparity 2.30.3
                                    0 BSAS 7200 827.7GB
828.0GB (normal)
    parity 2.30.4
                                    0 BSAS 7200 827.7GB
828.0GB (normal)
   data 2.30.6
                                    0 BSAS 7200 827.7GB
828.0GB (normal)
```

| data 2.30.8 | 0 | BSAS | 7200 | 827.7GB |
|--|---------|---------|---------|---------|
| 828.0GB (normal) data 2.30.5 | 0 | BSAS | 7200 | 827.7GB |
| 828.0GB (normal) | | | | |
| Plex: /node_A_2_data01_mirrored/plex4 | (offli | ne, fai | led, in | active, |
| <pre>pool1) RAID Group /node A 2 data01 mirrored/</pre> | nlev4/ | ran (na | rtial | none |
| checksums) | PICX4/ | 190 (pa | r crar, | none |
| Physical | | | | Usable |
| Position Disk | Pool | Type | RPM | Size |
| Size Status | | | | |
| | | | | |
| dparity FAILED | - | - | - | 827.7GB |
| - (failed) parity FAILED | _ | _ | _ | 827.7GB |
| - (failed) data FAILED | | | | 827.7GB |
| - (failed) | _ | _ | _ | 027.7GD |
| data FAILED | - | - | - | 827.7GB |
| - (failed) data FAILED | _ | _ | _ | 827.7GB |
| - (failed) | | | | |
| Aggregate: node_A_2_data02_unmirrored (| online | , raid_ | dp) (bl | ock |
| checksums) | 0 / 1 | , | , | |
| <pre>Plex: /node_A_2_data02_unmirrored/plex pool0)</pre> | (onl | ine, no | rmal, a | ctive, |
| RAID Group /node_A_2_data02_unmirrore | ed/plex | 0/rg0 (| normal, | block |
| checksums) | | | | Usable |
| Physical | | | | |
| Position Disk Size Status | Pool | Type | RPM | Size |
| | | | | |
| dparity 2.30.12 | 0 | BSAS | 7200 | 827.7GB |
| 828.0GB (normal) | Ü | 20110 | 7200 | 027.702 |
| parity 2.30.22 828.0GB (normal) | 0 | BSAS | 7200 | 827.7GB |
| data 2.30.21 | 0 | BSAS | 7200 | 827.7GB |
| 828.0GB (normal) | 0 | D C A C | 7000 | 007 700 |
| data 2.30.20 828.0GB (normal) | 0 | RSAS | /200 | 827.7GB |
| | | | | |

data 2.30.14 0 BSAS 7200 827.7GB 828.0GB (normal) 15 entries were displayed.

7. Verify that the data is being served and that all volumes are still online: vserver show -type datanetwork interface show -fields is-home falsevolume show !vol0,!MDV*

| aluster | A::> vserve | show -tyr | ne data | | | |
|--|-------------------------------|----------------------------|--|-------------------------------|----------------|--------------|
| CIUSCEI_ | vaerve. | r silow cyl | Admin | Operat | ional R | oot |
| Vserver | Туре | Subtype | | _ | | |
| Aggregat | | 11 | | | | |
| | | | | | | |
| | | | | | | 77747 |
| | data | | ce | runnir | ıg S | VMI_root |
| | _data01_mirı data | | 70 | runnir | g 9 | VM2 root |
| | data01 mir | _ | | LUIIIIII | 19 5 | VIIZ_100C |
| | | | | | | |
| cluster_ | A::> networ | c interface | e show -fi | elds is-h | ome fal | se |
| There ar | e no entries | s matching | your quer | У• | | |
| | | | | | | |
| _ | A::> volume | | | | | ~ ! |
| | Volume | Aggrega | ate Sta | te 1 | 'уре | Size |
| Availabl | e Used% | | | | | |
| | | | | | | |
| 77741 | | | | | | |
| 2 AMT | | | | | | |
| SVMI | SVM1_root | | | | | |
| SVM1 | SVM1_root | node A | _1data01_ m | irrored | | |
| SVMI | SVM1_root | node_A_ | | irrored ine F | .W | 10GB |
| | _ | node_A_ | | | W | 10GB |
| 9.50GB | _ | node_A_ | | | W | 10GB |
| 9.50GB SVM1 | _ | _vol | onl | ine F | W | 10GB |
| 9.50GB | 5% | _vol | onl ldata01_m | ine F | W. | |
| 9.50GB SVM1 | 5% SVM1_data_ | _vol | onl | ine F | W. | 10GB 10GB |
| 9.50GB SVM1 9.49GB | 5% | _vol | onl ldata01_m | ine F | | |
| 9.50GB | 5% SVM1_data_ 5% | _vol | onl ldata01_m | ine F | | |
| 9.50GB SVM1 9.49GB | 5% SVM1_data_ | _vol node_A_ | onl onl _ldata01_m onl | ine Firrored | | |
| 9.50GB SVM1 9.49GB | 5% SVM1_data_ 5% | _vol node_A_ | onl _ldata01_m onl _ldata01_m | ine F irrored ine F | ₹W | 10GB |
| 9.50GB SVM1 9.49GB SVM2 | 5% SVM1_data_ 5% SVM2_root | _vol node_A_ | onl onl _ldata01_m onl | ine F irrored ine F | | |
| 9.50GB SVM1 9.49GB SVM2 9.49GB | 5% SVM1_data_ 5% | _vol node_A_ | onl _ldata01_m onl _ldata01_m | ine F irrored ine F | ₹W | 10GB |
| 9.50GB SVM1 9.49GB SVM2 9.49GB | 5% SVM1_data_ 5% SVM2_root | _vol node_A_ node_A_ | onl _ldata01_m onl _ldata01_m | ine F irrored ine F | ₹W | 10GB |
| 9.50GB SVM1 9.49GB SVM2 9.49GB | 5% SVM1_data_ 5% SVM2_root | _vol _node_A_ _vol | onl _ldata01_m onl _ldata01_m onl | ine F irrored ine F | ₹W | 10GB |
| 9.50GB SVM1 9.49GB | 5% SVM1_data_ 5% SVM2_root | _vol _node_A_ _vol | onl _ldata01_m onl _ldata01_m onl _2_data02_ | ine F irrored ine F unmirrore | lW lW ∶d | 10GB 10GB |
| 9.50GB SVM1 9.49GB SVM2 | 5% SVM1_data_ 5% SVM2_root | _vol _node_A_ _vol | onl _ldata01_m onl _ldata01_m onl | ine F irrored ine F unmirrore | ₹W | 10GB |

8. Physically power on the shelf.

Resynchronization starts automatically.

9. Verify that resynchronization has started: storage aggregate show

The affected aggregate should have a resyncing RAID status, as shown in the following example:

```
cluster A::> storage aggregate show
cluster Aggregates:
Aggregate Size Available Used% State #Vols Nodes
RAID Status
______ ______
node A 1 data01_mirrored
       raid dp,
mirrored,
normal
node A 1 root
707.7GB 34.29GB 95% online 1 node_A_1
raid dp,
mirrored,
normal
node A 2 data01 mirrored
4.15TB 4.12TB 1% online 2 node_A_2
raid dp,
resyncing
node A 2 data02 unmirrored
      2.18TB 2.18TB 0% online 1 node_A_2
raid dp,
normal
node_A_2_root
      707.7GB 34.27GB 95% online 1 node A 2
raid dp,
resyncing
```

10. Monitor the aggregate to confirm that resynchronization is complete: storage aggregate show

The affected aggregate should have a normal RAID status, as shown in the following example:

```
cluster A::> storage aggregate show
cluster Aggregates:
Aggregate Size Available Used% State #Vols Nodes
RAID Status
_____
node A 1data01 mirrored
    raid_dp,
mirrored,
normal
node A 1root
    707.7GB 34.29GB 95% online 1 node_A_1
raid dp,
mirrored,
normal
node A_2_data01_mirrored
  4.15TB 4.12TB 1% online 2 node_A_2
raid dp,
normal
node A 2 data02 unmirrored
      raid_dp,
normal
node A 2 root
      707.7GB 34.27GB 95% online 1 node A 2
raid_dp,
resyncing
```

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