Perform switchover for tests or maintenance
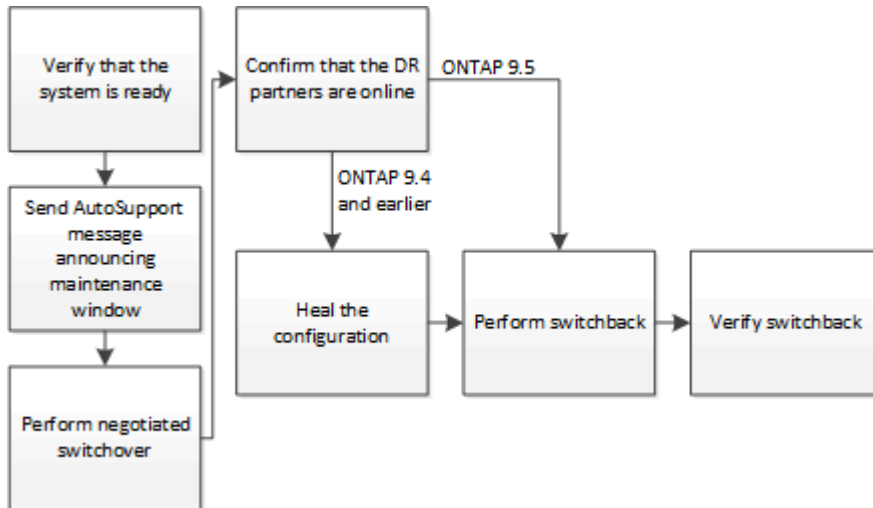
ONTAP MetroCluster

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If you want to test the MetroCluster functionality or to perform planned maintenance, you can perform a negotiated switchover in which one cluster is cleanly switched over to the partner cluster. You can then heal and switch back the configuration.

ⓘ   Beginning with ONTAP 9.6, switchover and switchback operations can be performed on MetroCluster IP configurations with ONTAP System Manager.

Limitations when the MetroCluster configuration is in switchover

When the system is in switchover, certain operations should not be performed. Learn about restricted operations when the system is in switchover.

Restricted operations in switchover

The following operations are not supported when the system is in switchover:

- Creating or deleting aggregates and volumes
- Creating or deleting SVMs
- Creating or deleting LIFs
- Adding or removing disks (only if you are replacing them as part of a recovery procedure)
- Performing configuration changes to SnapMirror SVM DR
- Modifying existing broadcast domains or creating new broadcast domains
- Modifying network subnets

Hardware replacement in switchover

Use the following procedures to replace controller hardware when the system is in switchover:

- If you need to replace a controller of the same type, at the site not in switchover, follow the procedure to Recover from a multi-controller or storage failure.

  - If you need to replace the controller modules and chassis while the nodes are switched over at the surviving site, shut down both controllers and then perform the procedure to Recover from a multi-controller or storage failure.

- If you need to replace a controller with a different type of controller, follow the procedure for your configuration in Choose a controller upgrade procedure.

  - If your system is in switchover because of a controller failure or if you experience a controller failure while in switchover, you must first replace the controller hardware, perform a switchback, and then perform a controller upgrade:

    1. To replace the controller hardware and perform the switchback, follow Recover from a multi-controller or storage failure.

    2. After you have replaced the hardware, perform a controller upgrade using the procedures in Choose a controller upgrade procedure.

Verifying that your system is ready for a switchover

You can use the `-simulate` option to preview the results of a switchover operation. A verification check gives you a way to verify that most of the preconditions for a successful run are met before you start the operation. Issue these commands from the site that will remain up and operational:

1. Set the privilege level to advanced: `set -privilege advanced`

2. From the site that will remain up and operational, simulate a switchover operation: `metrocluster switchover -simulate`

3. Review the output that is returned.

   The output shows whether any vetoes would prevent a switchover operation. Every time you perform a MetroCluster operation, you must verify a set of criteria for the success of the operation. A "veto" is a mechanism to prohibit the operation if one or more of the criteria are not fulfilled. There are two types of veto: a "soft" veto and a "hard" veto. You can override a soft veto, but not a hard veto. For example, to perform a negotiated switchover in a four-node MetroCluster configuration, one criterion is that all of the nodes are up and healthy. Suppose one node is down and was taken over by its HA partner. The switchover operation will be hard vetoed because it is a hard criterion that all of the nodes must be up and healthy. Because this is a hard veto, you cannot override the veto.

   (i) It is best not to override any veto.

Example: Verification results

The following example shows the errors that are encountered in a simulation of a switchover operation:

```
cluster4::*> metrocluster switchover -simulate

[Job 126] Preparing the cluster for the switchover operation...
[Job 126] Job failed: Failed to prepare the cluster for the switchover
operation. Use the "metrocluster operation show" command to view detailed
error
information. Resolve the errors, then try the command again.
```

> ℹ️ Negotiated switchover and switchback will fail until you replace all of the failed disks. You can perform disaster recovery after you replace the failed disks. If you want to ignore the warning for failed disks, you can add a soft veto for the negotiated switchover and switchback.

Sending a custom AutoSupport message prior to negotiated switchover

Before performing a negotiated switchover, you should issue an AutoSupport message to notify NetApp technical support that maintenance is underway. The negotiated switchover might result in plex or MetroCluster operation failures that trigger AutoSupport messages. Informing technical support that maintenance is underway prevents them from opening a case on the assumption that a disruption has occurred.

This task must be performed on each MetroCluster site.

Steps

1. Log in to the cluster at Site_A.

2. Invoke an AutoSupport message indicating the start of the maintenance: `system node autosupport invoke -node * -type all -message MAINT=maintenance-window-in-hours`

   maintenance-window-in-hours specifies the length of the maintenance window and can be a maximum of 72 hours. If the maintenance is completed before the time has elapsed, you can issue a command to indicating that the maintenance period has ended:`system node autosupport invoke -node * -type all -message MAINT=end`

3. Repeat this step on the partner site.

Performing a negotiated switchover

A negotiated switchover cleanly shuts down processes on the partner site, and then switches over operations from the partner site. You can use a negotiated switchover to perform maintenance on a MetroCluster site or to test the switchover functionality.

- All previous configuration changes must be completed before performing a switchback operation.

  This is to avoid competition with the negotiated switchover or switchback operation.

- Any nodes that were previously down must be booted and in cluster quorum.

The *System Administration Reference* has more information about cluster quorum in the "Understanding quorum and epsilon" section.

- The cluster peering network must be available from both sites.
- All of the nodes in the MetroCluster configuration must be running the same version of ONTAP software.
- The option replication.create_data_protection_rels.enable must be set to ON on both of the sites in a MetroCluster configuration before creating a new SnapMirror relationship.
- For a two-node MetroCluster configuration, a new SnapMirror relationship should not be created during an upgrade when there are mismatched versions of ONTAP between the sites.
- For a four-node MetroCluster configuration, the mismatched versions of ONTAP between the sites are not supported.

The recovering site can take a few hours to be able to perform the switchback operation.

The metrocluster switchover command switches over the nodes in all DR groups in the MetroCluster configuration. For example, in an eight-node MetroCluster configuration, it switches over the nodes in both DR groups.

While preparing for and executing a negotiated switchover, you must not make configuration changes to either cluster or perform any takeover or giveback operations.

For MetroCluster FC configurations:

- 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.
- 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.

For MetroCluster IP configurations:

> ℹ️ Before performing maintenance tasks, you must remove monitoring if the MetroCluster configuration is monitored with the Tiebreaker or Mediator utility. Remove ONTAP Mediator or Tiebreaker monitoring before performing maintenance tasks

- 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. Use the metrocluster check run, metrocluster check show and metrocluster check config-replication show commands to make sure no configuration updates are in progress or pending. Issue these commands from the site that will remain up and operational.

2. From the site that will remain up and operational, implement the switchover: `metrocluster switchover`

   The operation can take several minutes to complete.

3. Monitor the completion of the switchover: `metrocluster operation show`

```
cluster_A::*> metrocluster operation show
  Operation: Switchover
 Start time: 10/4/2012 19:04:13
      State: in-progress
   End time: -
     Errors:

cluster_A::*> metrocluster operation show
  Operation: Switchover
 Start time: 10/4/2012 19:04:13
      State: successful
   End time: 10/4/2012 19:04:22
     Errors: -
```

4. Reestablish any SnapMirror or SnapVault configurations.

Verify that the SVMs are running and the aggregates are online

After the switchover is complete, you should verify that the DR partners have taken ownership of the disks and the partner SVMs have come online.

When you run the storage aggregate plex show command after a MetroCluster switchover, the status of plex0 of the switched over root aggregate is indeterminate and is displayed as failed. During this time, the switched over root is not updated. The actual status of this plex can only be determined after the MetroCluster healing phase.

Steps

1. Check that the aggregates were switched over by using the storage aggregate show command.

   In this example, the aggregates were switched over. The root aggregate (aggr0_b2) is in a degraded state. The data aggregate (b2_aggr2) is in a mirrored, normal state:

```
cluster_A::*> storage aggregate show


.

.

.

mcc1-b Switched Over Aggregates:
Aggregate     Size Available Used% State   #Vols  Nodes            RAID
Status
--------- -------- --------- ----- ------- ------ ----------------
------------
aggr0_b2     227.1GB    45.1GB    80% online       0 node_A_1
raid_dp,

mirror

degraded
b2_aggr1     227.1GB    200.3GB    20% online       0 node_A_1
raid_dp,

mirrored

normal
```

2. Confirm that the secondary SVMs have come online by using the vserver show command.

   In this example, the previously dormant sync-destination SVMs on the secondary site have been activated
   and have an Admin State of running:

```
cluster_A::*> vserver show
                                          Admin      Operational  Root
Name    Name
Vserver              Type   Subtype             State      State          Volume
Aggregate   Service Mapping
-----------        ----- ----------        ---------- -----------
--------- ---------- ------- -------
...
cluster_B-vs1b-mc data    sync-destination   running    running
vs1b_vol    aggr_b1    file     file
```

Heal the configuration

Heal the configuration in a MetroCluster FC configuration

Healing the configuration in a MetroCluster FC configuration

Following a switchover, you must perform the healing operations in specific order to restore MetroCluster functionality.

- Switchover must have been performed and the surviving site must be serving data.
- Nodes on the disaster site must be halted or remain powered off.

  They must not be fully booted during the healing process.

- Storage at the disaster site must be accessible (shelves are powered up, functional, and accessible).
- In fabric-attached MetroCluster configurations, inter-switch links (ISLs) must be up and operating.
- In four-node MetroCluster configurations, nodes in the surviving site must not be in HA failover state (all nodes must be up and running for each HA pair).

The healing operation must first be performed on the data aggregates, and then on the root aggregates.

Healing the data aggregates after negotiated switchover

You must heal the data aggregates after completing any maintenance or testing. This process resynchronizes the data aggregates and prepares the disaster site for normal operation. You must heal the data aggregates prior to healing the root aggregates.

All configuration updates in the remote cluster successfully replicate to the local cluster. You power up the storage on the disaster site as part of this procedure, but you do not and must not power up the controller modules on the disaster site.

Steps

1. Ensure that switchover has been completed by running the metrocluster operation show command.

   ```
   controller_A_1::> metrocluster operation show
     Operation: switchover
         State: successful
    Start Time: 7/25/2014 20:01:48
      End Time: 7/25/2014 20:02:14
        Errors: -
   ```

2. Resynchronize the data aggregates by running the metrocluster heal -phase aggregates command from the surviving cluster.

   ```
   controller_A_1::> metrocluster heal -phase aggregates
   [Job 130] Job succeeded: Heal Aggregates is successful.
   ```

   If the healing is vetoed, you have the option of reissuing the metrocluster heal command with the --override -vetoes parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

3. Verify that the operation has been completed by running the metrocluster operation show command.

```
controller_A_1::> metrocluster operation show
    Operation: heal-aggregates
       State: successful
  Start Time: 7/25/2014 18:45:55
    End Time: 7/25/2014 18:45:56
      Errors: -
```

4. Check the state of the aggregates by running the storage aggregate show command.

```
controller_A_1::> storage aggregate show
Aggregate      Size Available Used% State   #Vols  Nodes            RAID
Status
--------- -------- --------- ----- ------- ------ ---------------- 
-----------
...
aggr_b2    227.1GB   227.1GB    0% online       0 mcc1-a2
raid_dp, mirrored, normal...
```

5. If storage has been replaced at the disaster site, you might need to remirror the aggregates.

Healing the root aggregates after negotiated switchover

After the data aggregates have been healed, you must heal the root aggregates in preparation for the switchback operation.

The data aggregates phase of the MetroCluster healing process must have been completed successfully.

Steps

1. Switch back the mirrored aggregates by running the metrocluster heal -phase root-aggregates command.

```
cluster_A::> metrocluster heal -phase root-aggregates
[Job 137] Job succeeded: Heal Root Aggregates is successful
```

If the healing is vetoed, you have the option of reissuing the metrocluster heal command with the --override
-vetoes parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the
healing operation.

2. Confirm the heal operation is complete by running the metrocluster operation show command on the
healthy cluster:

```
cluster_A::> metrocluster operation show
  Operation: heal-root-aggregates
      State: successful
 Start Time: 7/29/2014 20:54:41
   End Time: 7/29/2014 20:54:42
     Errors: -
```

3. Check for and remove any failed disks belonging to the disaster site by issuing the following command on the healthy site: `disk show -broken`

4. Power up or boot each controller module on the disaster site.

   If the system displays the LOADER prompt, run the `boot_ontap` command.

5. After nodes are booted, verify that the root aggregates are mirrored.

   If both plexes are present, resynchronization will occur automatically if the plexes are not synchronized. If one plex has failed, that plex must be destroyed and the mirror must be recreated using the storage aggregate mirror -aggregateaggregate-name command to reestablish the mirror relationship.

Healing the configuration in a MetroCluster IP configuration (ONTAP 9.4 and earlier)

You must heal the aggregates in preparation for the switchback operation.

> (i) On MetroCluster IP systems running ONTAP 9.5, healing is performed automatically, and you can skip these tasks.

The following conditions must exist before performing the healing procedure:

- Switchover must have been performed and the surviving site must be serving data.
- Storage shelves at the disaster site must be powered up, functional, and accessible.
- ISLs must be up and operating.
- Nodes in the surviving site must not be in HA failover state (both nodes must be up and running).

This task applies to MetroCluster IP configurations running ONTAP versions prior to 9.5 only.

This procedure differs from the healing procedure for MetroCluster FC configurations.

Steps
1. Power up each controller module on the site that was switched over and let them fully boot.

   If the system displays the LOADER prompt, run the `boot_ontap` command.

2. Perform the root aggregate healing phase: `metrocluster heal root-aggregates`

```
cluster_A::> metrocluster heal root-aggregates
[Job 137] Job succeeded: Heal Root-Aggregates is successful
```

If the healing is vetoed, you have the option of reissuing the metrocluster heal root-aggregates command with the --override-vetoes parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

3. Resynchronize the aggregates: `metrocluster heal aggregates`

```
cluster_A::> metrocluster heal aggregates
[Job 137] Job succeeded: Heal Aggregates is successful
```

If the healing is vetoed, you have the option of reissuing the metrocluster heal command with the --override -vetoes parameter. If you use this optional parameter, the system overrides any soft vetoes that prevent the healing operation.

4. Confirm the heal operation is complete by running the metrocluster operation show command on the healthy cluster:

```
cluster_A::> metrocluster operation show
  Operation: heal-aggregates
      State: successful
 Start Time: 7/29/2017 20:54:41
   End Time: 7/29/2017 20:54:42
     Errors: -
```

Performing a switchback

After you heal the MetroCluster configuration, you can perform the MetroCluster switchback operation. The MetroCluster switchback operation returns the configuration to its normal operating state, with the sync-source storage virtual machines (SVMs) on the disaster site active and serving data from the local disk pools.

- The disaster cluster must have successfully switched over to the surviving cluster.
- Healing must have been performed on the data and root aggregates.
- The surviving cluster nodes must not be in the HA failover state (all nodes must be up and running for each HA pair).
- The disaster site controller modules must be completely booted and not in the HA takeover mode.
- The root aggregate must be mirrored.
- The Inter-Switch Links (ISLs) must be online.
- Any required licenses must be installed on the system.
  1. Confirm that all nodes are in the enabled state: `metrocluster node show`

The following example displays the nodes that are in the enabled state:

```
cluster_B::>  metrocluster node show

DR                              Configuration  DR
Group Cluster Node          State           Mirroring Mode
----- ------- ----------- -------------- ---------
--------------------
1     cluster_A
            node_A_1    configured     enabled   heal roots
completed
            node_A_2    configured     enabled   heal roots
completed
      cluster_B
            node_B_1    configured     enabled   waiting for
switchback recovery
            node_B_2    configured     enabled   waiting for
switchback recovery
4 entries were displayed.
```

2. Confirm that resynchronization is complete on all SVMs: `metrocluster vserver show`

3. Verify that any automatic LIF migrations being performed by the healing operations have been successfully completed: `metrocluster check lif show`

4. Perform a simulated switchback to verify the system is ready: `metrocluster switchback -simulate`

5. Check the configuration:

   `metrocluster check run`

   The command runs as a background job and might not be completed immediately.

```
cluster_A::> metrocluster check run
The operation has been started and is running in the background. Wait
for
it to complete and run "metrocluster check show" to view the results.
To
check the status of the running metrocluster check operation, use the
command,
"metrocluster operation history show -job-id 2245"
```

```
cluster_A::> metrocluster check show
Last Checked On: 9/13/2018 20:41:37

Component            Result
------------------- ---------
nodes                ok
lifs                 ok
config-replication   ok
aggregates           ok
clusters             ok
connections          ok
6 entries were displayed.
```

6. Perform the switchback by running the metrocluster switchback command from any node in the surviving cluster: `metrocluster switchback`

7. Check the progress of the switchback operation: `metrocluster show`

   The switchback operation is still in progress when the output displays waiting-for-switchback:

```
cluster_B::> metrocluster show
Cluster                     Entry Name           State
-------------------------- ------------------- -----------
 Local: cluster_B           Configuration state configured
                            Mode                switchover
                            AUSO Failure Domain -
 Remote: cluster_A          Configuration state configured
                            Mode                waiting-for-switchback
                            AUSO Failure Domain -
```

   The switchback operation is complete when the output displays normal:

```
cluster_B::> metrocluster show
Cluster                     Entry Name           State
-------------------------- ------------------- -----------
 Local: cluster_B           Configuration state configured
                            Mode                normal
                            AUSO Failure Domain -
 Remote: cluster_A          Configuration state configured
                            Mode                normal
                            AUSO Failure Domain -
```

   If a switchback takes a long time to finish, you can check on the status of in-progress baselines by using the `metrocluster config-replication resync-status show` command. This command is at the advanced privilege level.

8. Reestablish any SnapMirror or SnapVault configurations.

   In ONTAP 8.3, you need to manually reestablish a lost SnapMirror configuration after a MetroCluster switchback operation. In ONTAP 9.0 and later, the relationship is reestablished automatically.

Verifying a successful switchback

After performing the switchback, you want to confirm that all aggregates and storage virtual machines (SVMs) are switched back and online.

1. Verify that the switched-over data aggregates are switched back:

   `storage aggregate show`

   In the following example, aggr_b2 on node B2 has switched back:

   ```
   node_B_1::> storage aggregate show
   Aggregate     Size Available Used% State   #Vols  Nodes           RAID
   Status
   --------- -------- --------- ----- ------- ------ ----------------
   -----------
   ...
   aggr_b2    227.1GB   227.1GB    0% online       0 node_B_2   raid_dp,

   mirrored,

   normal
   ```

2. Verify that all sync-destination SVMs on the surviving cluster are dormant (showing an operational state of "stopped"):

   `vserver show -subtype sync-destination`

   ```
   node_B_1::> vserver show -subtype sync-destination
                                  Admin     Operational  Root
   Vserver        Type    Subtype   State     State        Volume
   Aggregate
   -----------    ------- ---------- -------- ----------    --------
   ----------
   ...
   cluster_A-vs1a-mc data sync-destination
                                  running    stopped    vs1a_vol   aggr_b2
   ```

   Sync-destination aggregates in the MetroCluster configuration have the suffix "-mc" automatically appended to their name to help identify them.

3. Verify the sync-source SVMs on the disaster cluster are up and running:

```
vserver show -subtype sync-source
```

```
node_A_1::> vserver show -subtype sync-source
                                     Admin     Operational  Root
Vserver          Type    Subtype    State     State        Volume
Aggregate
-----------      ------- ---------- -------- ----------    --------
----------
...
vs1a             data    sync-source
                                     running   running      vs1a_vol  aggr_b2
```

4. Confirm that the switchback operations succeeded by using the `metrocluster operation show` command.

If the command output shows…	Then…
That the switchback operation state is successful.	The switchback process is complete and you can proceed with operation of the system.
That the switchback operation or switchback-continuation-agent operation is partially successful.	Perform the suggested fix provided in the output of the `metrocluster operation show` command.

You must repeat the previous sections to perform the switchback in the opposite direction. If site_A did a switchover of site_B, have site_B do a switchover of site_A.