ONTAP System Manager docs

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NetApp
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Documentation for the SnapMirror Business Continuity solution

This site contains the documentation for the NetApp SM-BC solution available with ONTAP 9.8.

Planning

Prerequisites

There are several prerequisites that you should consider as part of planning a SnapMirror Business Continuity solution deployment.

Hardware

- Only two-node HA clusters are supported
- Both clusters must be either AFF or ASA (no mixing)

Software

- ONTAP 9.8 or later
- ONTAP Mediator 1.2 or later
- A Linux server or virtual machine for the ONTAP Mediator running one of the following:
  - RedHat Enterprise Linux 7.6 or 7. 7
  - CentOS 8.0 or 8.1

Licensing

- SnapMirror synchronous (SM-S) license must be applied on both clusters

If your ONTAP storage systems were purchased before June 2019, click NetApp ONTAP Master License Keys to get the required SM-S license.

Networking environment

- Inter-cluster latency must be less than 10 milliseconds

Supported protocols

- Only SAN protocols are supported (not NFS/CIFS)
- Only Fibre Channel and iSCSI protocols are supported

ONTAP Mediator

- Must be provisioned externally and attached to ONTAP for transparent application failover

AppDM Application volumes

Volumes associated with an AppDM Application are not supported with SM-BC. Before creating an SM-BC relationship for a set of volumes, make sure that none of the volumes are associated with an AppDM Application.

In ONTAP 9.8 RC releases, SM-BC does not automatically check before creating a relationship with a set of AppDM Application volumes.

Additional restrictions and limitations

There are several additional restrictions and limitations when using the SnapMirror Business Continuity solution.

Consistency groups

The maximum number of SnapMirror Synchronous Consistency Group relationships in a cluster is five, a limit which is platform-independent. If you reach or attempt to exceed this limit, the following message is displayed:

```
The number of SnapMirror Synchronous Consistency Group relationships in a cluster cannot
exceed 5
```

Volumes per consistency group

The maximum number of volumes supported per SnapMirror Synchronous Consistency Group relationship is twelve, a limit which is platform-independent. If you reach or attempt to exceed this limit, the following message is displayed:

```
The number of volumes in a SnapMirror Synchronous Consistency Group cannot exceed 12
```

Volumes

The limit is on the number of endpoints and not the number of relationships. A consistency group with 12 volumes contributes 12 endpoints on both the source and destination.A SnapMirror Synchronous relationship with both source and destination volumes on the same HA pair contributes 2 endpoints.

The maximum endpoints per platform are included in the following table.

S. No	Platform	Endpoints per HA for SM-BC	Overall sync and SM-BC endpoints per HA
1	AFF	60	80
2	ASA	60	80

SAN object limits

The following SAN object limits are included in the following table and apply regardless of the platform.

Limits of objects in an SM-BC relationship	Count
LUNs per volume	256
LUN maps per node	2048
LUN maps per cluster	4096
LIFs per VServer (with at least one volume in an SM-BC relationship)	256
Inter-cluster LIFs per node	4
Inter-cluster LIFs per cluster	8

ONTAP access options

You have several access options available when configuring the ONTAP nodes participating in an SM- BC deployment. You should select the option that best matches your specific environment and deployment goals.

In all cases, you must sign in using the administrator account with a valid password.

Command line interface

The text-based command line interface is available through the ONTAP management shell. You can access the CLI using secure shell (SSH).

System Manager

You can connect to the ONTAP System Manager using a modern web browser. The web GUI provides an intuitive and easy-to-use interface when accessing the SnapMirror Business Continuity functionality. For more information about using System Manager, see ONTAP System Manager documentation.

REST API

The ONTAP REST API exposed to external clients provides another option when connecting to the ONTAP. You can access the API using any mainstream programming language or tool that supports

REST web services. Popular choices include:

- Python (including the ONTAP Python client library)
- Java
- Curl

Using a programming or scripting language provides an opportunity to automate the deployment and management of a SnapMirror Business Continuity deployment. For more information, see the ONTAP online documentation page at your ONTAP storage system or click NetApp DevNet ONTAP REST API.

Preparing to use the ONTAP CLI

You should be familiar with the following commands when deploying the SnapMirror Business Continuity solution using the ONTAP command line interface.

For more information, see NetApp Documentation: ONTAP 9.

Command	Description
lun igroup create	Create an igroup on a cluster
lun map	Map a LUN to an igroup
lun show	Display a list of LUNs
snapmirror create	Create a new SnapMirror relationship
snapmirror initialize	Initialize an SM-BC consistency group
snapmirror update	Initiates a common snapshot creation operation
snapmirror show	Display a list of SnapMirror relationships
snapmirror failover	Start a planned failover operation
snapmirror resync	Start a resynchronization operation
snapmirror delete	Delete a SnapMirror relationship
snapmirror release	Remove source information for a SnapMirror relationship

Preparing to use the ONTAP Mediator

The ONTAP Mediator establishes a quorum for the ONTAP clusters in an SM-BC relationship. It coordinates automated failover when a failure is detected and helps to avoids split-brain scenarios when each cluster simultaneously tries to establish control as the primary cluster.

Prerequisites for the ONTAP Mediator

The ONTAP Mediator includes its own set of prerequisites. You must meet these prerequisites before installing the mediator. For more information, see Installing or upgrading the ONTAP Mediator service.

Network configuration

By default, the ONTAP Mediator provides service through TCP port 31784. You should make sure that port 31784 is open and available between the ONTAP clusters and the mediator.

Summary of deployment best practices

There are several best practices that you should consider as part of planning an SnapMirror Business Continuity deployment.

SAN

The SnapMirror Business Continuity solution supports only SAN workloads. You should follow the SAN best practices in all cases.

In addition:

- Replicated LUNs in the secondary cluster must be mapped to the host and the I/O paths to the LUNs from both the primary and secondary cluster must be discovered at the time of host configuration.
- After an out of sync (OOS) event exceeds 80 seconds, or after an automatic unplanned failover, it is important to rescan the host LUN I/O path to ensure that there is no I/O path loss. For more information, see the respective host OS vendor's documentation on rescan of LUN I/O paths.

Mediator

To be fully functional and to enable automatic unplanned failover, the external ONTAP mediator should be provisioned and configured with ONTAP clusters.

When installing the mediator, you should replace the self-signed certificate with a valid certificate signed by a mainstream reliable CA.

SnapMirror

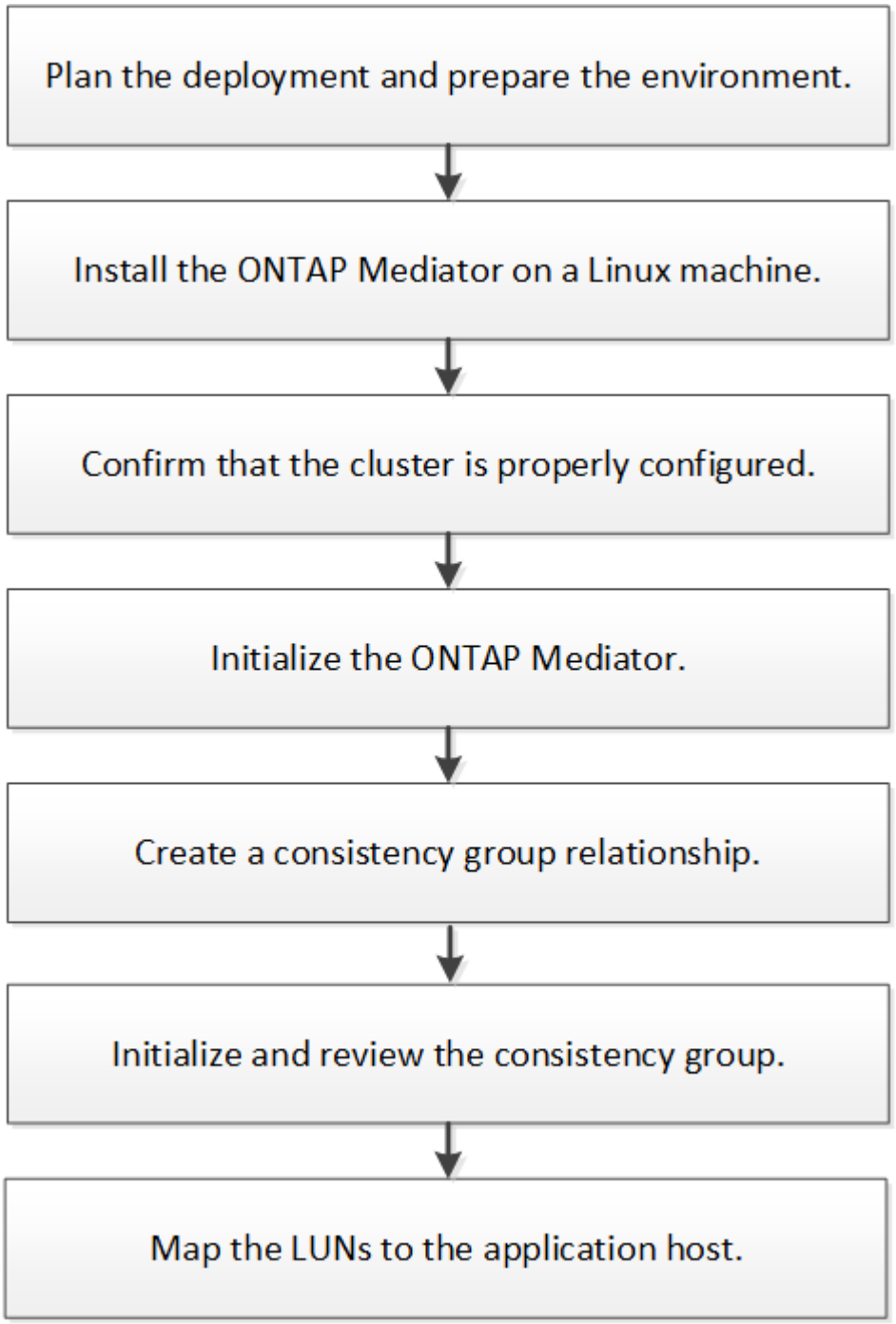
You should terminate an SnapMirror relationship in the following order:

1. Perform `snapmirror delete` at the destination cluster
2. Perform `snapmirror release` at the source cluster

Installation and setup

High level deployment workflow

You can use the following workflow to install and implement the SnapMirror Business Continuity solution.



Installing the ONTAP Mediator

You must install the ONTAP Mediator, which includes accepting the licensing agreement, before you can configure and use the SnapMirror Business Continuity solution.

Before you begin

The following software is required:

- ONTAP Mediator 1.2 or later
- One of the following Linux distributions:
  - RHEL 7.6 or 7.7
  - CentOS 8.0 or 8.1

About this task

You should install the ONTAP Mediator at an external site that is physically separated from the two ONTAP clusters.

For complete installation instructions, see Installing or upgrading the ONTAP Mediator service

Steps

1. Sign into the Linux system that will host the ONTAP Mediator.
2. Download the mediator installation package from the ONTAP Mediator page.

   NetApp Downloads: ONTAP Mediator

3. Install the ONTAP Mediator and respond to all prompts as required:

   ```
   ./ontap-mediator_1.2
   ```

4. Optionally replace the self-signed SSL and certificate authority (CA) with the third party validated SSL Certificate and CA. Copy the contents of the ca.crt file from the ONTAP Mediator directory:

   ```
   /opt/netapp/lib/ontap_mediator/ontap_mediator/server_config
   ```

5. At the ONTAP CLI, install the certificate on both the local and peer cluster:

   ```
   security certificate install -type server-ca -vserver cserverName
   ```

Confirm the ONTAP cluster configuration

You should make sure that your source and destination clusters are configured properly.

About this task

Proceed through each of the following steps. For each step, you should confirm that the specific configuration has been performed. Use the link included after each step to get more information as needed.

Steps

1. Confirm that a cluster peering relationship exists between the clusters.

   Configure peer relationships

2. Confirm that the Storage VMs are created on each cluster.

   Creating an SVM

3. Confirm that a peer relationship exists between the Storage VMs on each cluster.

   Creating an SVM peering relationship

4. Confirm that the volumes exist for your LUNs.

   Creating and managing volumes

5. Confirm that at least one SAN LIF is created on each node in the cluster.

   Considerations for LIFs in a cluster SAN environment

   Creating a LIF

6. Confirm that the necessary LUNs are created and mapped to igroup, which is used to map LUNs to the initiator on the application host.

   Create LUNs and map igroups

7. Rescan the application host to discover any new LUNs.

Initialize the ONTAP Mediator

You must initialize Mediator on one of your cluster peers before SM-BC can perform planned and automatic unplanned failover operations.

About this task

You can initialize Mediator from either cluster. When you issue the `mediator add` command on one cluster, Mediator is automatically added on the other cluster.

Steps

1. Initialize Mediator on one of the clusters:

`snapmirror mediator add -mediator-address IP_Address -peer-cluster cluster_name -username user_name`

Example

```
cluster1::> snapmirror mediator add -mediator-address 192.168.10.1 -peer-cluster
cluster2 -username mediatoradmin
Notice: Enter the mediator password.

Enter the password: ******
Enter the password again: ******
```

2. Check the status of the Mediator configuration:

   `snapmirror mediator show`

   ```
   Mediator Address Peer Cluster     Connection Status Quorum Status
   ---------------- ---------------- ----------------- -------------
   192.168.10.1     cluster-2        connected         true
   ```

   `-quorum-status` indicates whether the SnapMirror consistency group relationships are synchronized with Mediator.

Creating a consistency group relationship

You must create a SnapMirror consistency group which also establishes the synchronous consistency group relationship.

Before you begin

The following prerequisites and restrictions apply:

- You must be a cluster or storage VM administrator
- You must have a SnapMirror Synchronous license
- The destination volumes must be type DP
- The primary and the secondary storage VM must be in a peered relationship
- All constituent volumes in a consistency group must be in a single Storage VM

About this task

You must create the consistency group relationship from the destination cluster. You can map up to 12 constituents using the `cg-item-mappings` parameter on the `snapmirror create` command.

Steps

1. Create a consistency group and constituent relationship. This example creates two consistency groups: srccg with constituent volumes vol1 and vol2, and dstcg with constituent volumes vol1_dr and vol2_dr.

   ```
   destination::>  snapmirror  create  -source-path  vs1_src:/cg/cg_src  -destination-path vs1_dst:/cg/cg_dst  -cg-item-mappings  vol_src1:@vol_dst1,vol_src2:@vol_dst2  -policy AutomatedFailover
   ```

Initializing a consistency group

After creating a consistency group, you must initialize it.

Before you begin

You must be a cluster or storage VM administrator.

About this task

You initialize the consistency group from the destination cluster.

Steps

1. Sign in to the ONTAP CLI at the destination cluster and initialize the consistency group:

   ```
   destination::>snapmirror initialize -destination-path vs1_dst:/cg/cg_dst
   ```

2. Confirm that the initialization operation completed successfully. The status should be `InSync`.

   ```
   snapmirror show
   ```

Mapping LUNs to the application hosts

You must create an igroup so you can map LUNs to the initiator on the application host.

About this task

You should perform this configuration at the source cluster.

Steps

1. Create an igroup on each cluster:

   ```
   lun igroup create -igroup name -protocol fcp|iscsi -ostype os -initiator initiator_name
   ```

   Example

   ```
   lun igroup create -igroup ig1 -protocol iscsi -ostype linux -initiator -initiator iqn.2001-04.com.example:abc123
   ```

2. Map LUNs to the igroup:

   `lun map -path path_name -igroup igroup_name`

   Example:

   ```
   lun map -path /vol/src1/11 -group ig1
   ```

3. Verify the LUNs are mapped:

   `lun show`

4. On the application host, discover the new LUNs.

Administration

Creating a common Snapshot copy

In addition to the regularly scheduled Snapshot copy operations, you can manually create a common Snapshot copy between the volumes in the primary SnapMirror consistency group and the volumes in the secondary SnapMirror consistency group.

Before you begin

The SnapMirror group relationship must be in sync.

Steps

1. Create a common Snapshot copy:

   ```
   destination::>snapmirror update -destination-path vs1_dst:/cg/cg_dst
   ```

2. Monitor the progress of the update:

   ```
   destination::>snapmirror show -fields -newest-snapshot
   ```

Performing a planned failover

You can perform a planned failover to test your disaster recovery configuration or to perform maintenance on the primary cluster.

Before you begin

- The relationship must be in sync
- Nondisruptive operations must not be running
- The ONTAP Mediator must be configured, connected, and in quorum

About this task

A planned failover is initiated by the administrator of the secondary cluster. The operation requires switching the primary and secondary roles so that the secondary cluster takes over from the primary. The new primary cluster can then begin processing input and output requests locally without disrupting client operations.

Steps

1. Start the failover operation:

   ```
   destination::>snapmirror failover start -destination-path vs1_dst:/cg/cg_dst
   ```

2. Monitor the progress of the failover:

```
destination::>snapmirror failover show
```

3. When the failover operation is complete, you can monitor the Synchronous SnapMirror protection relationship status from the destination:

```
destination::>snapmirror show
```

What happens during an automatic unplanned failover

An automatic unplanned failover (AUFO) operation occurs when the primary cluster is down or isolated. When this occurs, the secondary cluster is converted to the primary and begins serving clients. This operation is performed only with assistance from the ONTAP Mediator.

After the automatic unplanned failover, it is important to rescan the host LUN I/O paths so that there is no loss of I/O paths.

You can monitor the status of the automatic unplanned failover by using the `snapmirror failover show` command.

Basic monitoring

There are several SM-BC components and operations you can monitor.

ONTAP mediator

During normal operation, the Mediator state should be connected. If it is in any other state, this might indicate an error condition. You can review the EMS messages to determine the error and appropriate corrective actions.

EMS Name	Description
sm.mediator.added	Mediator is added successfully
sm.mediator.removed	Mediator is removed successfully
sm.mediator.unusable	Mediator is unusable due to a corrupted mediator server
sm.mediator.misconfigured	Mediator is repurposed or the Mediator package is no longer installed on the Mediator server
sm.mediator.unreachable	Mediator is unreachable
sm.mediator.removed.force	Mediator is removed from the cluster using the "force" option

EMS Name	Description
sm.mediator.cacert.expiring	Mediator certificate authority (CA) certificate is due to expire in 30 days or less
sm.mediator.serverc.expiring	Mediator server certificate is due to expire in 30 days or less
sm.mediator.clientc.expiring	Mediator client certificate is due to expire in 30 days or less
sm.mediator.cacert.expired	Mediator certificate authority (CA) certificate has expired
sm.mediator.serverc.expired	Mediator server certificate has expired
sm.mediator.clientc.expired	Mediator client certificate has expired
sm.mediator.in.quorum	All the SM-BC records are resynchronized with Mediator

Planned failover operations

You can monitor status and progress of a planned failover operation using the `snapmirror failover show` command. For example:

```
ClusterB::> snapmirror failover start -destination-path vs1:/cg/dcg1
```

Once the failover operation is complete, you can monitor the Synchronous SnapMirror protection status from the new destination cluster. For example:

```
ClusterA::> snapmirror show
```

Automatic unplanned failover operations

During an unplanned automatic failover, you can monitor the status of the operation using the `snapmirror failover show` command. For example:

```
ClusterB::> snapmirror failover show -instance
Start Time: 9/23/2020 22:03:29
         Source Path: vs1:/cg/scg3
    Destination Path: vs3:/cg/dcg3
     Failover Status: completed
        Error Reason:
            End Time: 9/23/2020 22:03:30
Primary Data Cluster: cluster-2
Last Progress Update: -
       Failover Type: unplanned
  Error Reason codes: -
```

SM-BC availability

You can check the availability of the SM-BC relationship using a series of commands, either on the primary cluster, the secondary cluster, or both.

Commands you use include the `snapmirror mediator show` command on both the primary and secondary cluster to check the connection and quorum status, the `snapmirror show` command, and the `volume show` command. For example:

```
SMBC_A::*> snapmirror mediator show
Mediator Address Peer Cluster     Connection Status Quorum Status
---------------- ---------------- ----------------- -------------
10.236.172.86    SMBC_B           connected         true

SMBC_B::*> snapmirror mediator show
Mediator Address Peer Cluster     Connection Status Quorum Status
---------------- ---------------- ----------------- -------------
10.236.172.86    SMBC_A           connected         true

SMBC_B::*> snapmirror show -expand
                                                                        Progress
Source            Destination Mirror  Relationship   Total             Last
Path        Type  Path        State   Status         Progress  Healthy Updated
----------- ---- ------------ ------- -------------- --------- ------- --------
vs0:/cg/cg1 XDP  vs1:/cg/cg1_dp Snapmirrored InSync  -         true    -
vs0:vol1    XDP  vs1:vol1_dp  Snapmirrored InSync    -         true    -
2 entries were displayed.

SMBC_A::*> volume show -fields is-smbc-master,smbc-consensus,is-smbc-failover-capable
-volume vol1
vserver volume is-smbc-master is-smbc-failover-capable smbc-consensus
------- ------ -------------- ------------------------ --------------
vs0     vol1   true           false                     Consensus

SMBC_B::*> volume show -fields is-smbc-master,smbc-consensus,is-smbc-failover-capable
-volume vol1_dp
vserver volume  is-smbc-master is-smbc-failover-capable smbc-consensus
------- ------- -------------- ------------------------ --------------
vs1     vol1_dp false          true                      No-consensus
```