Module 5
MetroCluster software

Business continuity solution

About this module

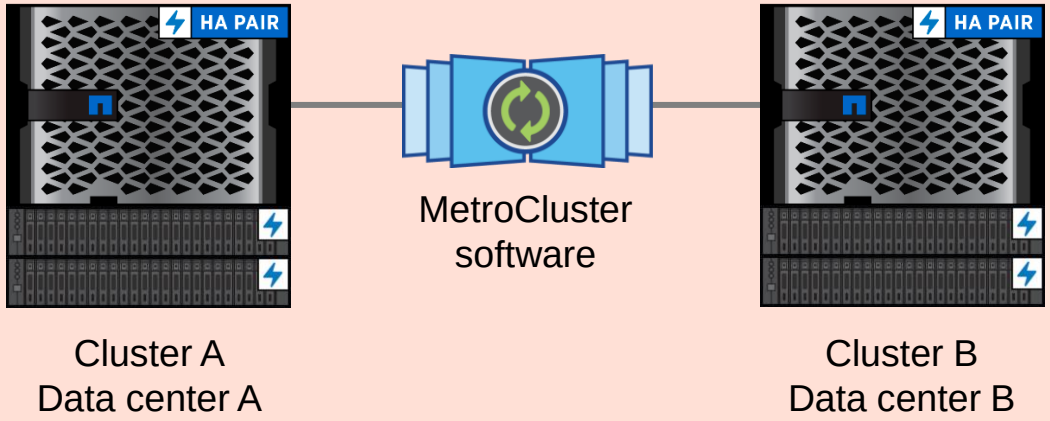
This module focuses on enabling you to do the following:

- Describe the basic operation of MetroCluster software
- Explain how MetroCluster software protects data during typical operations
- Describe MetroCluster switchover, healing, and switchback processes

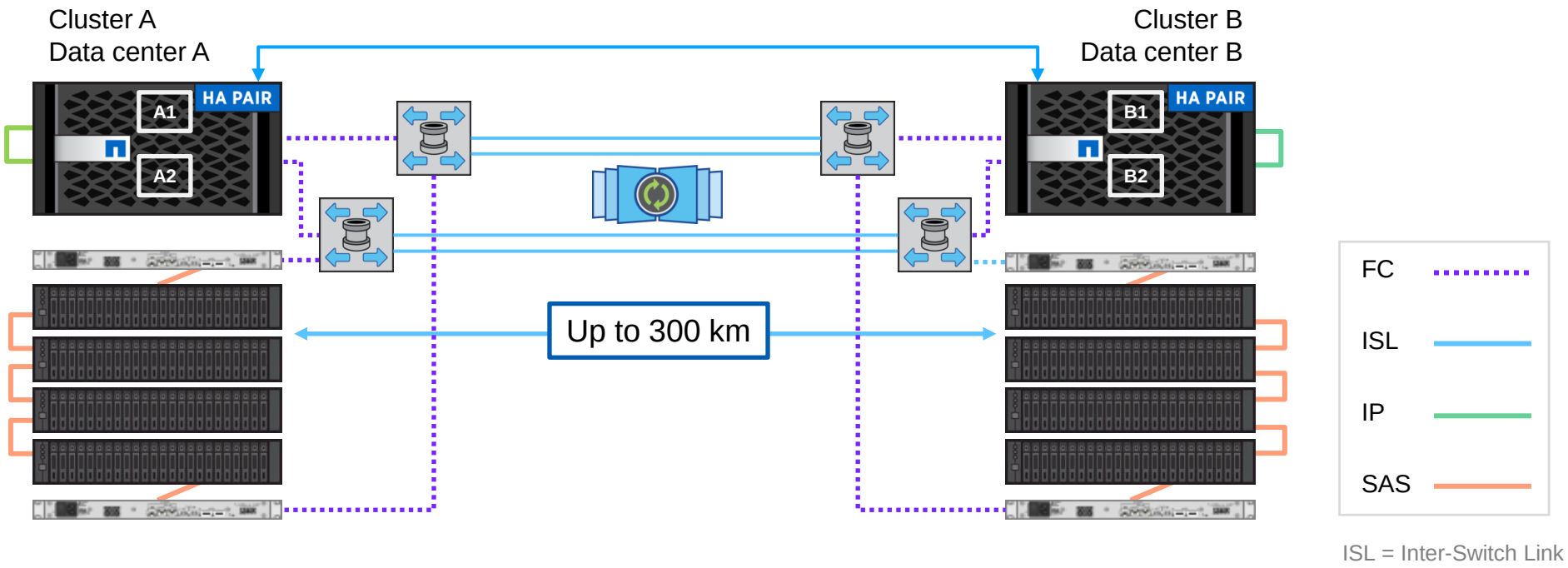
Lesson 1
MetroCluster fundamentals

MetroCluster overview

- Provides continuous data availability across data centers, with zero data loss
- Provides multiprotocol support for SAN and NAS systems
- Is available in two configurations:
  - MetroCluster FC
  - MetroCluster IP
- Requires additional hardware but no additional licensing costs
- Supports NetApp ONTAP FlexGroup volumes, FabricPool technology, FlexCache volumes, and SVM DR (as a source only)



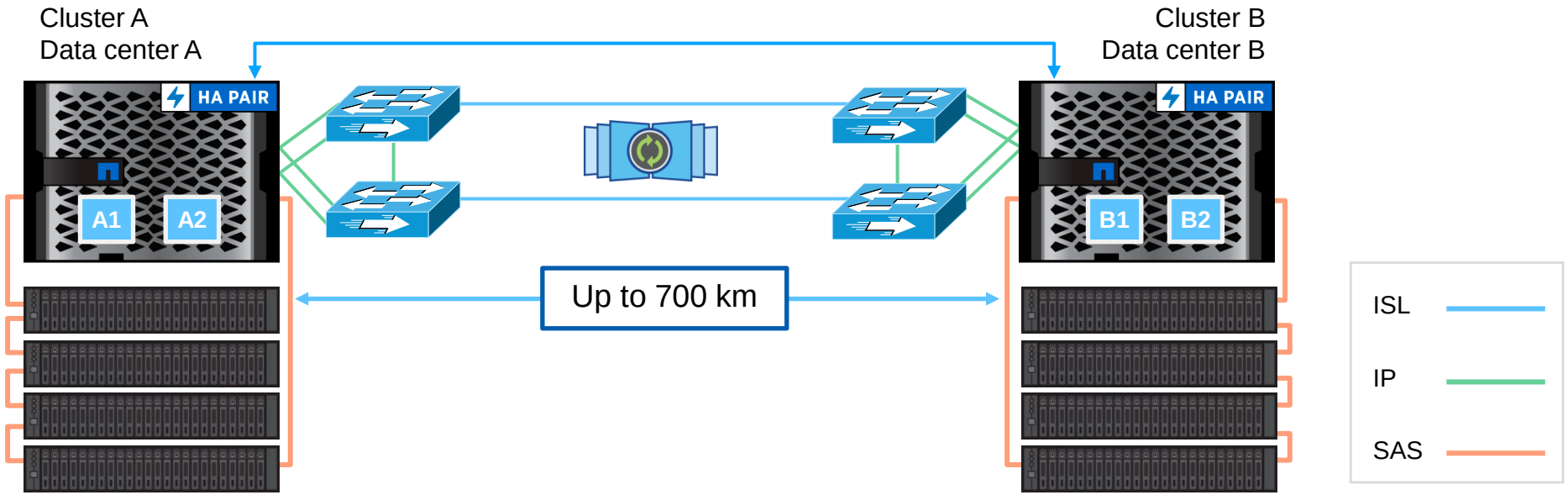
MetroCluster FC



ISL = Inter-Switch Link

- MetroCluster FC has an independent cluster at each site up to 300km (FC switches) or 200km (FCIP switches) apart.
- Switchover and switchback transfer the entire cluster workload between sites.
- High-availability (HA) failover manages nearly all planned and unplanned operations locally (4-node and 8-node configurations).

MetroCluster IP

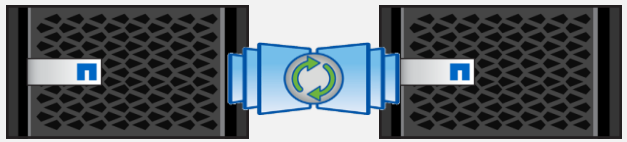


- Connects clusters over Ethernet, which enables customers to standardize on IP
- Eliminates FC-to-SAS bridges and replaces FC switches with IP switches
- Provides higher storage efficiency with Advanced Disk Partitioning (ADP)
- Supports only 4-node configurations

MetroCluster configurations

2-node configuration

- Single-node cluster at each site
- Protects data on a cluster level
- Stretch configurations with an optical SAS or bridge attached at up to 500 m
- Fabric configurations at up to 300 km

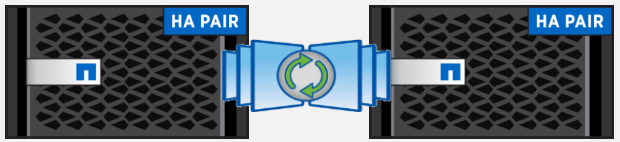


Cluster A
Data Center A

Cluster B
Data Center B

4-node configuration

- 2-node (HA pair) cluster at each site
- Data protection on a local level and a cluster level
- Fabric configurations at up to 300 km
- IP configurations at up to 700 km

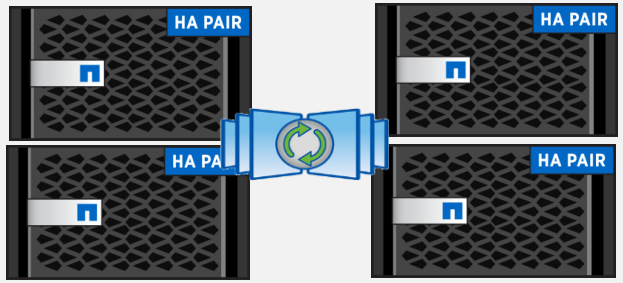


Cluster A
Data Center A

Cluster B
Data Center B

8-node configuration

- 4-node cluster (two HA pairs) at each site
- Data protection on a local level and a cluster level
- Exclusively for fabric configurations at up to 300 km for FC or up to 200 km for FCIP



Cluster A
Data Center A

Cluster B
Data Center B

Lesson 2
MetroCluster operations

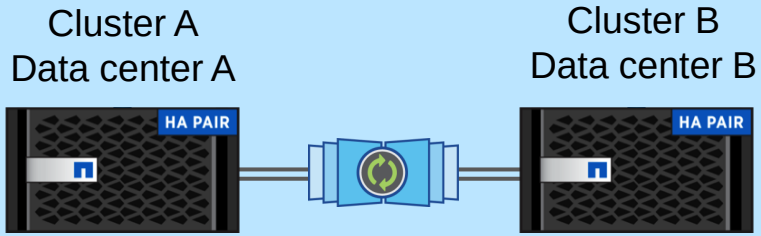
MetroCluster nondisruptive operations

ONTAP software provides nondisruptive operations (NDO) in the data center:

- Withstand component, node, or network failures
- Perform maintenance operations without disruption or downtime
- Refresh technology without disruption or downtime

ONTAP cluster

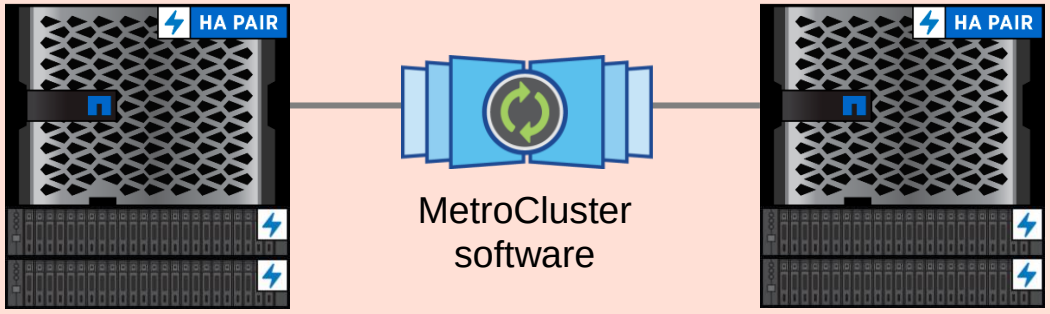
MetroCluster enables business continuity and continuous availability beyond the data center.



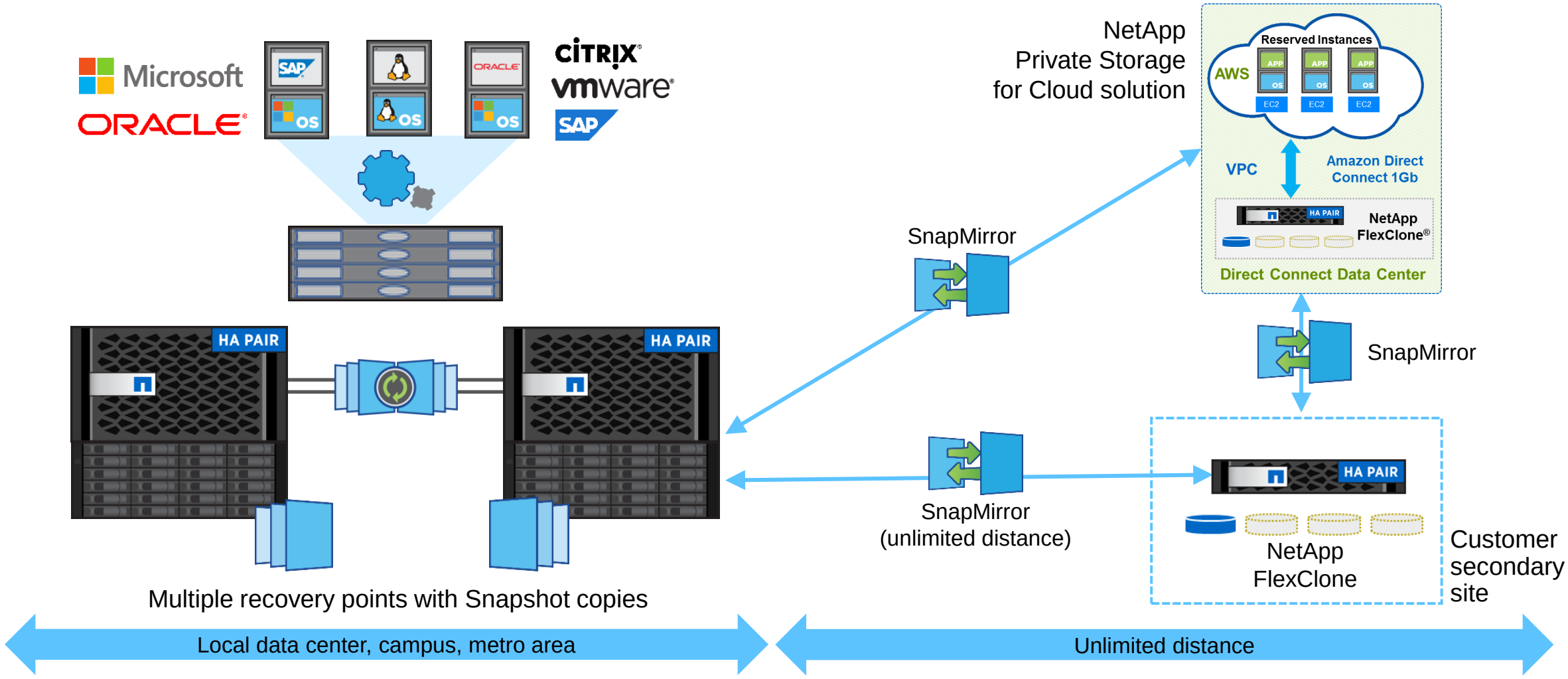
ONTAP software
with MetroCluster feature

MetroCluster and local HA failover

- Operations are nondisruptive. An ONTAP upgrade or system refresh does not require an outage.
- Site switchover is required only for disasters and sitewide events:
  - All local component failures are managed locally.
  - Most workflows do not require site-level switchover.
- All nodes actively serve data to applications.



Protecting data with MetroCluster software

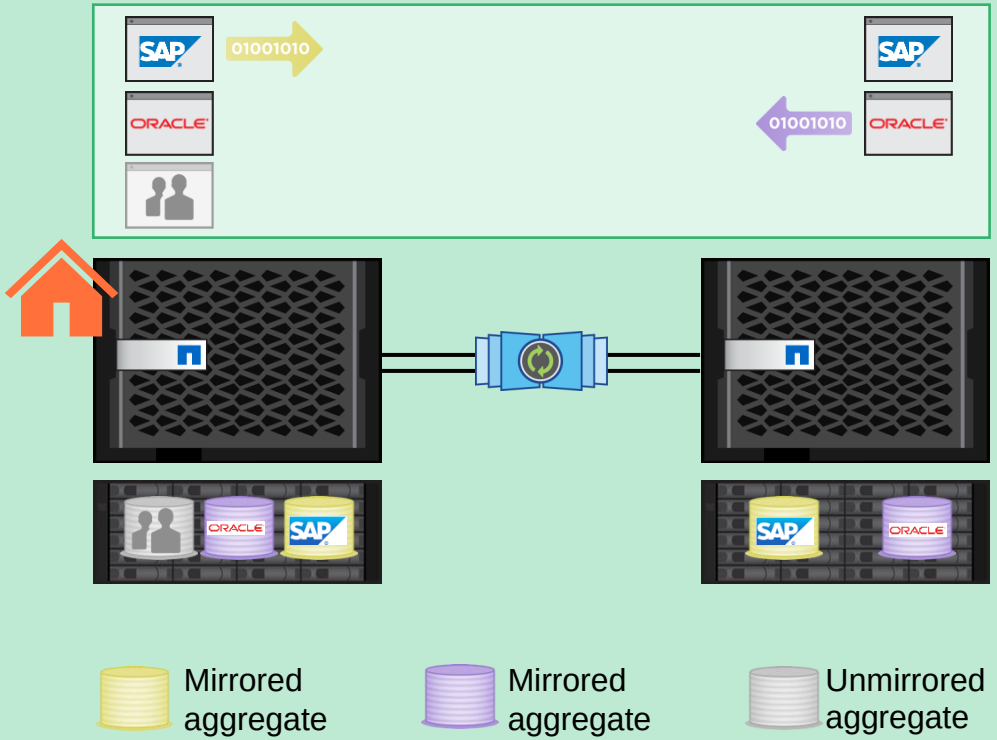


ISL sharing

- ISL sharing can be used in the following cases:
  - Two separate 4-node MetroCluster configurations
  - Two separate 2-node MetroCluster configurations
  - Two disaster-recovery groups within one 8-node MetroCluster configuration
- For the ISL in MetroCluster over P configurations, a shared Layer 2 network is supported on specific Cisco switches.
- Consult the Interoperability Matrix Tool (IMT) for supported switches.
- ISL requirements are system-specific.

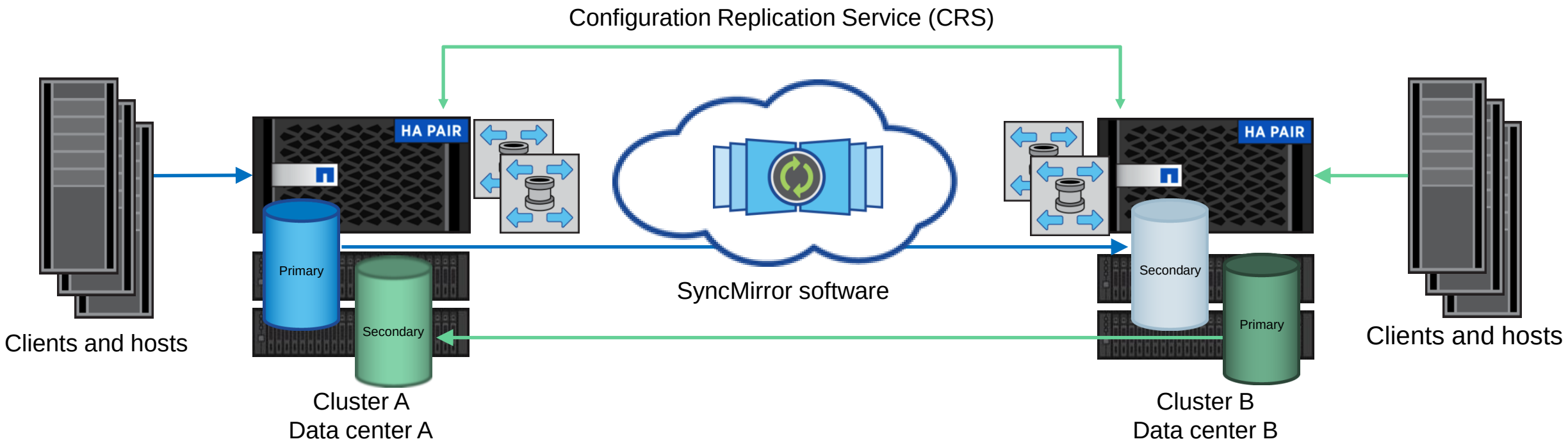
Unmirrored aggregates

- Mirroring is enabled or disabled at the aggregate level.
- You select aggregates to mirror or not to mirror.
- You can mix critical workloads (workloads that require a recovery point objective of 0) and noncritical workloads in one MetroCluster configuration.
- Unmirrored aggregates are supported on both MetroCluster FC and MetroCluster IP configurations (ONTAP 9.8 and later software).



Example: Oracle and SAP data are synchronously replicated; home directory data is not replicated.

HA configuration



- Each site serves data to local clients and hosts and acts as a secondary to the other site.
- Identity is preserved during switchover.
- The client and host network must span both sites.
- Writes are mirrored synchronously to both plexes.
- Root aggregates must be mirrored, but data aggregates can be mirrored or unmirrored.
- Configuration replication service replicates the cluster configuration through the cluster peering network.

Planned switchover

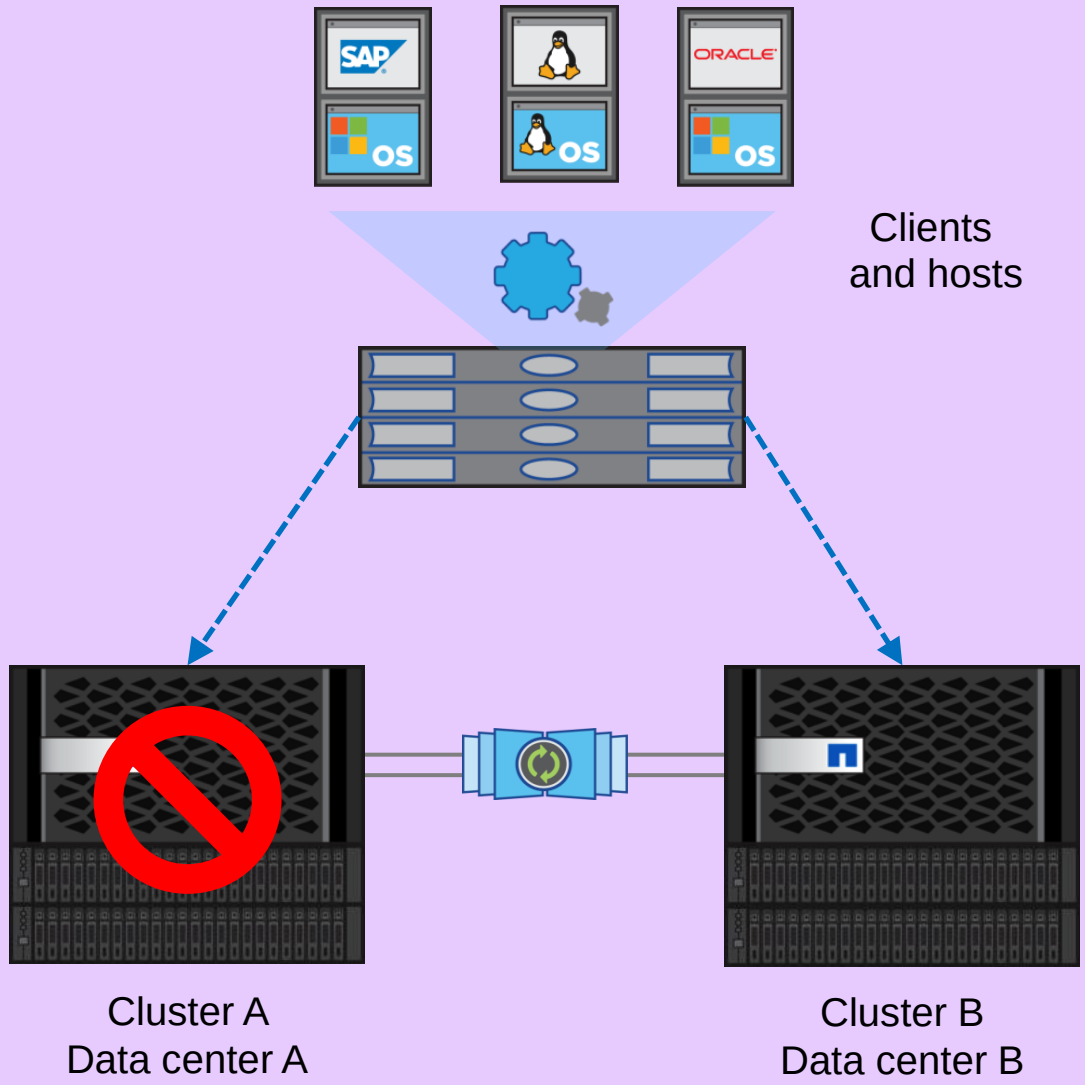
- Clients transparently fail over to the remote site, which enables the following activities:
  - Disaster-recovery testing
  - Technology refreshes
  - Scheduled maintenance
  - Disaster avoidance
- Verify the MetroCluster configuration before switchover:

  ```
  metrocluster check, switchover -simulate
  ```

- Use one command to switch over from site A to site B:

  ```
  metrocluster switchover
  ```

- Use three commands for switchback:
  - `metrocluster heal –phase aggregates`
  - `metrocluster heal –phase root-aggregates`
  - `metrocluster switchback`



Unplanned switchover

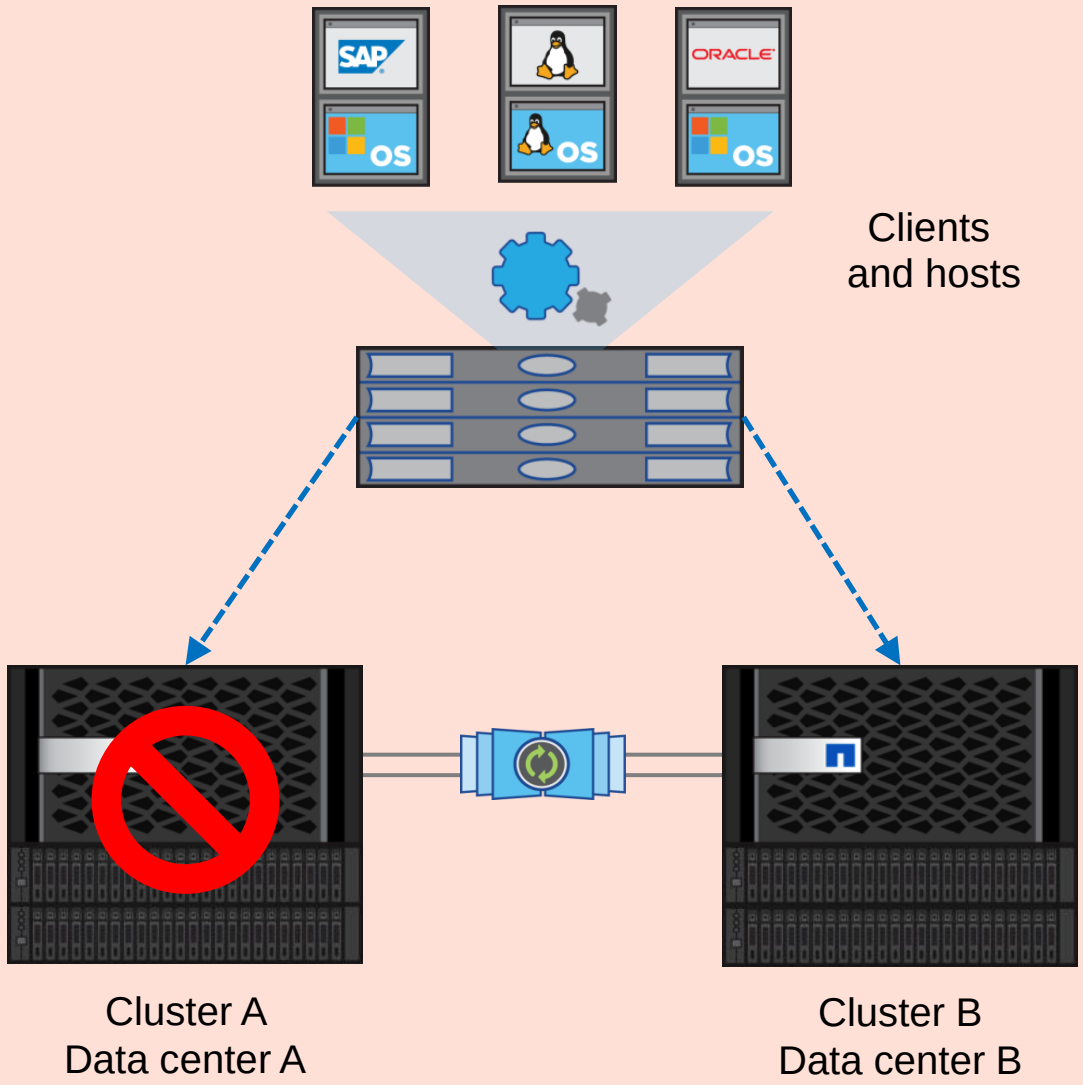
Power failure

Hardware or software error

Flood

Earthquake

- Synchronous replication preserves data.
- Clients transparently fail over to the remote site.
- You do not need to re-create SnapMirror relationships after switchover or switchback.
- MetroCluster TieBreaker software monitors, detects, and sends alerts about disasters.



Automatic healing after an unplanned switchover

MetroCluster IP configurations (ONTAP 9.6 and later software)

1. Automatic healing after an unscheduled switchover is supported on MetroCluster over IP configurations.

2. After the unscheduled switchover, the disaster site nodes move to the `Waiting for switchback` state.

3. The healing operations are performed automatically.

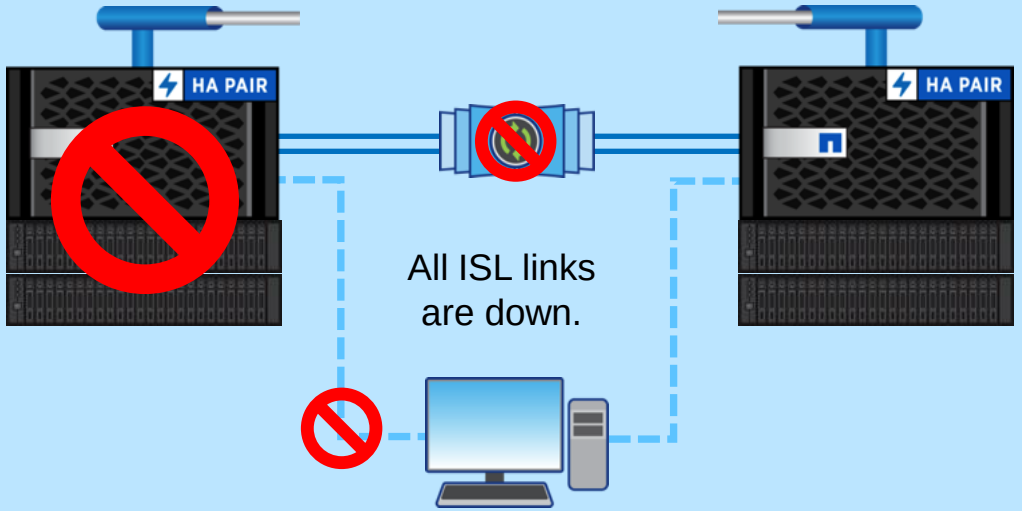
4. Confirm by using the `metrocluster operation show` command.

MetroCluster TieBreaker software

MetroCluster FC and MetroCluster IP

- MetroCluster TieBreaker software:
  - Is in observer mode by default
  - Monitors, detects, and sends alerts about disasters
  - Sends SNMP traps if a disaster occurs
  - Enables switchover within a client or host recovery time objective of 120 seconds
  - Is available for download from the NetApp Support Site
- Switchover that is not automatic:
  - Site disaster or lost connectivity
  - Possible split-brain scenario
  - Need for the command `metrocluster switchover -forced-on-disaster true`

Site disaster?

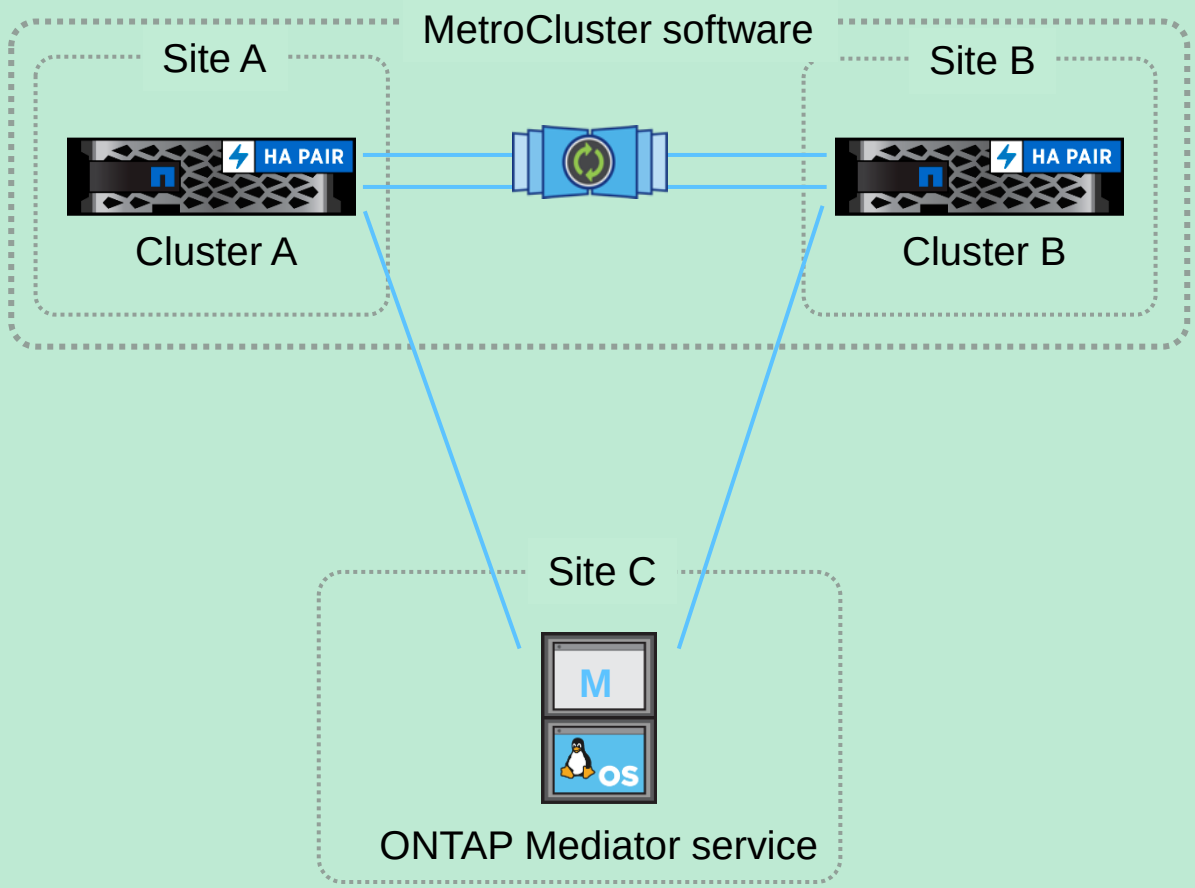


MetroCluster TieBreaker software

ONTAP Mediator service for MetroCluster IP

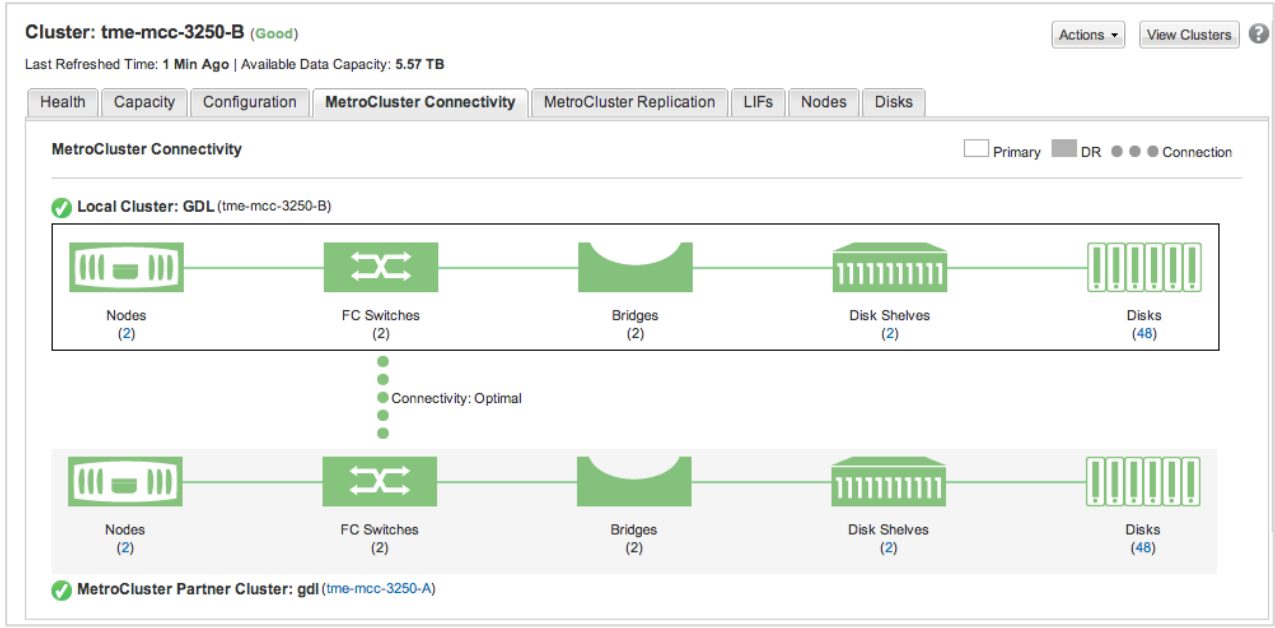
ONTAP 9.7 and later software

- Detects failures and enables an automatic unplanned switchover
- Runs on a physical or virtual Linux server and is configured from the ONTAP CLI
- Provides mailbox LUNs for MetroCluster IP nodes to determine whether switchover is required
- Supports up to five MetroCluster over IP implementations



Monitoring and managing MetroCluster configuration

- NetApp Active IQ Unified Manager (formerly OnCommand Unified Manager) provides detailed monitoring and reporting features.
- NetApp Active IQ Config Advisor verifies configurations.
- Golden configuration files are available for supported network switches.



Additional learning

- *ONTAP MetroCluster Installation* (2-day instructor-led course)

Resources

- ONTAP release notes

  https://library.netapp.com/ecm/ecm_download_file/ECMLP2492508

- *NetApp MetroCluster documentation*

  https://docs.netapp.com/us-en/ontap-metrocluster/index.html

- *NetApp Technical Report TR-4689: MetroCluster IP Solution Architecture and Design*

  https://www.netapp.com/pdf.html?item=/media/13481-tr4689.pdf

- *NetApp Technical Report TR-4705: NetApp MetroCluster Solution Architecture and Design*

  https://www.netapp.com/pdf.html?item=/media/13480-tr4705.pdf

Module summary

This module focused on enabling you to do the following:

- Describe the basic operation of MetroCluster software
- Explain how MetroCluster software protects data during typical operations
- Describe MetroCluster switchover, healing, and switchback processes

Knowledge check

Module 5: MetroCluster software

Knowledge check

You installed MetroCluster TieBreaker Manager in observer mode. A disaster causes site A to fail. What do you do?

a. Nothing. MetroCluster TieBreaker Manager performs an automatic switchover.

b. Turn off the SAN switches to prevent a split-brain scenario.

c. Use the `metrocluster switchover` command to initiate the switchover of storage and client access to site B.

d. Use the `metrocluster check` command and verify that switchover is possible.

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Knowledge check

Which software enables MetroCluster IP to perform automated unplanned switchover?

a. MetroCluster TieBreaker Manager

b. ONTAP Mediator service

c. SyncMirror software

d. SnapMirror software

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