Install and Configure MetroCluster Tiebreaker

ONTAP MetroCluster

NetApp
April 25, 2024

Table of Contents

Install and Configure MetroCluster Tiebreaker

What's new

Enhancements to the MetroCluster Tiebreaker software are provided with each release. Here's what's new in recent releases of MetroCluster Tiebreaker.

Enhancements

ONTAP Tiebreaker version	Enhancements
1.6	• Improved ease of installation • Supporting libraries update • Security enhancements
1.5	• Supporting libraries update • Security enhancements
1.4	• Supporting libraries update

OS support matrix

Tiebreaker version	CentOS 7 - 7.9	Red Hat 7 - 7.9	Red Hat 8.1 - 8.7	Red Hat 8.8 -9.2	Rocky Linux 9.0
1.6	No	No	Yes	Yes	Yes
1.5	No	No	Yes	No	No
1.4	Yes	Yes	Yes	No	No

Overview of the Tiebreaker software

It is helpful to understand what the NetApp MetroCluster Tiebreaker software is and how it distinguishes between types of failures so that you can monitor your MetroCluster configurations efficiently. You use the Tiebreaker CLI to manage settings and monitor the status and operations of MetroCluster configurations.

Detecting failures with NetApp MetroCluster Tiebreaker software

You need the Tiebreaker software only if you want to monitor two clusters and the connectivity status between them from a third site. The Tiebreaker software resides on a Linux host on the third site and enables each partner in a cluster to distinguish between an ISL failure, when inter-site links are down, from a site failure.

After you install the Tiebreaker software on a Linux host, you can configure the clusters in a MetroCluster configuration to monitor for disaster conditions.

The Tiebreaker software can monitor up to 15 MetroCluster configurations simultaneously. It supports a combination of MetroCluster IP, MetroCluster FC, and stretch MetroCluster configurations.

How the Tiebreaker software detects site failures

The NetApp MetroCluster Tiebreaker software checks the reachability of the nodes in a MetroCluster configuration and the cluster to determine whether a site failure has occurred. The Tiebreaker software also triggers an alert under certain conditions.

Components monitored by the Tiebreaker software

The Tiebreaker software monitors each controller in the MetroCluster configuration by establishing redundant connections through multiple paths to a node management LIF and to the cluster management LIF, both hosted on the IP network.

The Tiebreaker software monitors the following components in the MetroCluster configuration:

- Nodes through local node interfaces
- Cluster through the cluster-designated interfaces
- Surviving cluster to evaluate whether it has connectivity to the disaster site (NV interconnect, storage, and intercluster peering)

When there is a loss of connection between the Tiebreaker software and all of the nodes in the cluster and to the cluster itself, the cluster will be declared as “not reachable” by the Tiebreaker software. It takes around three to five seconds to detect a connection failure. If a cluster is unreachable from the Tiebreaker software, the surviving cluster (the cluster that is still reachable) must indicate that all of the links to the partner cluster are severed before the Tiebreaker software triggers an alert.

All of the links are severed if the surviving cluster can no longer communicate with the cluster at the disaster site through FC (NV interconnect and storage) and intercluster peering.

Failure scenarios during which Tiebreaker software triggers an alert

The Tiebreaker software triggers an alert when the cluster (all of the nodes) at the disaster site is down or unreachable and the cluster at the surviving site indicates the “AllLinksSevered” status.

The Tiebreaker software does not trigger an alert (or the alert is vetoed) in the following scenarios:

- In an eight-node MetroCluster configuration, if one HA pair at the disaster site is down
- In a cluster with all of the nodes at the disaster site down, one HA pair at the surviving site down, and the cluster at the surviving site indicates the “AllLinksSevered” status

  The Tiebreaker software triggers an alert, but ONTAP vetoes that alert. In this situation, a manual switchover is also vetoed

- Any scenario in which the Tiebreaker software can either reach at least one node or the cluster interface at the disaster site, or the surviving site still can reach either node at the disaster site through either FC (NV interconnect and storage) or intercluster peering

Related information

Risks and limitations of using MetroCluster Tiebreaker in active mode

How the Tiebreaker software detects intersite connectivity failures

The MetroCluster Tiebreaker software alerts you if all connectivity between the sites is lost.

Types of network paths

Depending on the configuration, there are three types of network paths between the two clusters in a MetroCluster configuration:

- **FC network (present in fabric-attached MetroCluster configurations)**

  This type of network is composed of two redundant FC switch fabrics. Each switch fabric has two FC switches, with one switch of each switch fabric co-located with a cluster. Each cluster has two FC switches, one from each switch fabric. All of the nodes have FC (NV interconnect and FCP initiator) connectivity to each of the co-located FC switches. Data is replicated from cluster to cluster over the ISL.

- **Intercluster peering network**

  This type of network is composed of a redundant IP network path between the two clusters. The cluster peering network provides the connectivity that is required to mirror the storage virtual machine (SVM) configuration. The configuration of all of the SVMs on one cluster is mirrored by the partner cluster.

- **IP network (present in MetroCluster IP configurations)**

  This type of network is composed of two redundant IP switch networks. Each network has two IP switches, with one switch of each switch fabric co-located with a cluster. Each cluster has two IP switches, one from each switch fabric. All of the nodes have connectivity to each of the co-located FC switches. Data is replicated from cluster to cluster over the ISL.

Monitoring intersite connectivity

The Tiebreaker software regularly retrieves the status of intersite connectivity from the nodes. If NV interconnect connectivity is lost and the intercluster peering does not respond to pings, then the clusters assume that the sites are isolated and the Tiebreaker software triggers an alert as “AllLinksSevered”. If a cluster identifies the “AllLinksSevered” status and the other cluster is not reachable through the network, then the Tiebreaker software triggers an alert as “disaster”.

How different disaster types affect Tiebreaker software detection time

For better disaster recovery planning, the MetroCluster Tiebreaker software takes some time in detecting a disaster. This time spent is the “disaster detection time”. The MetroCluster Tiebreaker software detects the site disaster within 30 seconds from the time of occurrence of the disaster and triggers the disaster recovery operation to notify you about the disaster.

The detection time also depends on the type of disaster and might exceed 30 seconds in some scenarios, mostly known as “rolling disasters”. The main types of rolling disaster are as follows:

- Power loss
- Panic
- Halt or reboot

- Loss of FC switches at the disaster site

Power loss

The Tiebreaker software immediately triggers an alert when the node stops operating. When there is a power loss, all connections and updates, such as intercluster peering, NV interconnect, and MailBox disk, stop. The time taken between the cluster becoming unreachable, the detection of the disaster, and the trigger, including the default silent time of 5 seconds, should not exceed 30 seconds.

Panic

In MetroCluster FC configurations, the Tiebreaker software triggers an alert when the NV interconnect connection between the sites is down and the surviving site indicates the “AllLinksSevered” status. This only happens after the coredump process is complete. In this scenario, the time taken between the cluster becoming unreachable and the detection of a disaster might be longer or approximately equal to the time taken for the coredump process. In many cases, the detection time is more than 30 seconds.

If a node stops operating but does not generate a file for the coredump process, then the detection time should not be longer than 30 seconds. In MetroCluster IP configurations, the NV stops communicating and the surviving site is not aware of the coredump process.

Halt or reboot

The Tiebreaker software triggers an alert only when the node is down and the surviving site indicates the “AllLinksSevered” status. The time taken between the cluster becoming unreachable and the detection of a disaster might be longer than 30 seconds. In this scenario, the time taken to detect a disaster depends on how long it takes for the nodes at the disaster site to be shut down.

Loss of FC switches at the disaster site (fabric-attached MetroCluster configuration)

The Tiebreaker software triggers an alert when a node stops operating. If FC switches are lost, then the node tries to recover the path to a disk for about 30 seconds. During this time, the node is up and responding on the peering network. When both of the FC switches are down and the path to a disk cannot be recovered, the node produces a MultiDiskFailure error and halts. The time taken between the FC switch failure and the number of times the nodes produced MultiDiskFailure errors is about 30 seconds longer. This additional 30 seconds must be added to the disaster detection time.

About the Tiebreaker CLI and man pages

The Tiebreaker CLI provides commands that enable you to remotely configure the Tiebreaker software and monitor the MetroCluster configurations.

The CLI command prompt is represented as NetApp MetroCluster Tiebreaker::>.

The man pages are available in the CLI by entering the applicable command name at the prompt.

Install the Tiebreaker software

Tiebreaker installation workflow

The Tiebreaker software provides monitoring capabilities for a clustered storage environment. It also sends SNMP notifications in the event of node connectivity issues and site disasters.

About this workflow

You can use this workflow to install or upgrade the Tiebreaker software.

1. **Prepare to install the Tiebreaker software**

Before you install and configure the Tiebreaker software, verify that your system meets certain requirements.

2. **Secure the installation**

For configurations running MetroCluster Tiebreaker 1.5 and later, you can secure and harden the host OS and the database.

3. **Install the Tiebreaker software package**

Perform a new installation or upgrade of the Tiebreaker software. The installation procedure you follow depends on the version of Tiebreaker you want to install.

Prepare to install the Tiebreaker software

Before you install and configure the Tiebreaker software you should verify that your system meets certain requirements.

Software requirements

You must meet the following software requirements depending on the version of Tiebreaker you are installing.

ONTAP Tiebreaker version	Supported ONTAP versions	Supported Linux versions	Java/MariaDB requirements
1.6	ONTAP 9.12.1 and later	Refer to the OS Support Matrix for details.	None. The dependencies are bundled with the installation.
1.5	ONTAP 9.8 to ONTAP 9.14.1	• Red Hat Enterprise Linux 8.1 to 8.7	With Red Hat Enterprise Linux 8.1 to 8.7: • MariaDB 10.x (use the default version that is installed using "yum install mariadb-server.x86_64") • OpenJDK 17, 18, or 19

1.4	ONTAP 9.1 to ONTAP 9.9.1	• Red Hat Enterprise Linux 8.1 to 8.7 • Red Hat Enterprise Linux 7 to 7.9 • CentOS 7 to 7.9 64-bit	With CentOS: • MariaDB 5.5.52.x/MySQL Server 5.6x • 4 GB RAM • Open JRE 8 With Red Hat Enterprise Linux 8.1 to 8.7: • MariaDB 10.x (use the default version that is installed using "yum install mariadb-server.x86_64") • JRE 8

Additional requirements

You must be aware of the following additional requirements:

- The Tiebreaker software is installed on a third site, which allows the software to distinguish between an inter-switch link (ISL) failure (when inter-site links are down) and a site failure. Your host system must meet certain requirements before you can install or upgrade the Tiebreaker software to monitor the MetroCluster configuration.
- You must have "root" privileges to install MetroCluster Tiebreaker software and the dependant packages.
- You can only use one MetroCluster Tiebreaker monitor per MetroCluster configuration to avoid any conflict with multiple Tiebreaker monitors.
- When selecting the Network Time Protocol (NTP) source for the Tiebreaker software, you must use a local NTP source. The Tiebreaker software should not use the same source as the MetroCluster sites that the Tiebreaker software monitors.
- Disk capacity: 8 GB
- Firewall:
  - Direct access for setting up AutoSupport messages
  - SSH (port 22/TCP), HTTPS (port 443/TCP), and ping (ICMP)

Secure the Tiebreaker host and database installation

For configurations running MetroCluster Tiebreaker 1.5 and later, you can secure and harden the host OS and the database.

Secure the host

The following guidelines show you how to secure the host where the Tiebreaker software is installed.

User management recommendations

- Limit access of the "root" user.
  - You can use users that are able to elevate to root access to install and administer the Tiebreaker software.

- You can use users that are not able to elevate to root access to administer Tiebreaker software.
- During installation, you must create a group named "mcctbgrp". The host root user and the user created during the installation must both be members. Only members of this group can fully administer the Tiebreaker software.

> Users who are not members of this group cannot access the Tiebreaker software or CLI. You can create additional users on the host and make them members of the group. These additional members cannot fully administer the Tiebreaker software. They have ReadOnly access and cannot add, change, or delete monitors.

- Do not run Tiebreaker as a root user. Use a dedicated, unprivileged service account to run Tiebreaker.

- Change the default community string in the "/etc/snmp/snmpd.conf" file.
- Allow minimal write privileges. The unprivileged Tiebreaker service account should not have access to overwrite its executable binary or any configuration files. Only directories and files for local Tiebreaker storage (eg., for integrated backend storage) or audit logs should be writable by the Tiebreaker user.
- Do not permit anonymous users.
  - Set AllowTcpForwarding to "no" or use the Match directive to restrict anonymous users.

Related information

- Red Hat Enterprise Linux 8 product documentation
- Red Hat Enterprise Linux 9 product documentation

Baseline host security recommendations

- Use disk encryption
  - You can enable disk encryption. This can be FullDiskEncryption (hardware), or encryption provided by the HostOS (software), or by the SVM host.
- Disable unused services that allow incoming connections. You can disable any service that isn't in use. The Tiebreaker software does not require a service for incoming connections because all connections from the Tiebreaker installation are outgoing. The services that might be enabled by default and can be disabled are:
  - HTTP/HTTPS server
  - FTP server
  - Telnet, RSH, rlogin
  - NFS, CIFS, and other protocol access
  - RDP (RemoteDesktopProtocol), X11 Server, VNC or other remote "desktop" service providers.

> You must leave either serial console access (if supported) or at least one protocol enabled to administer the host remotely. If you disable all protocols, then you require physical access to the host for administration.

- Secure the host using FIPS
  - You can install the host OS in FIPS-compliant mode and then install Tiebreaker.

> OpenJDK 19 checks on startup whether the host is installed in FIPS mode. No manual changes should be required.

    - If you secure the host, you must ensure that the host is able to boot without user intervention. If user intervention is required, Tiebreaker functionality might not be available if the host unexpectedly reboots. If this occurs, Tiebreaker functionality is only available after the manual intervention and when the host is fully booted.
- Disable Shell Command History.
- Upgrade frequently. Tiebreaker is actively developed, and updating frequently is important to incorporate security fixes and any changes in default settings such as key lengths or cipher suites.
- Subscribe to the HashiCorp Announcement mailing list to receive announcements of new releases and visit the Tiebreaker CHANGELOG for details on recent updates for new releases.
- Use the correct file permissions. Always ensure appropriate permissions are applied to files before starting the Tiebreaker software, especially those containing sensitive information.
- Multifactor authentication (MFA) enhances your organization's security by requiring administrators to identify themselves by using more than a username and password. While important, usernames and passwords are vulnerable to brute force attacks and can be stolen by third parties.
    - Red Hat Enterprise Linux 8 provides MFA that requires users to provide more than one piece of information to authenticate successfully to an account or Linux host. The additional information might be a one-time password sent to your cell phone via SMS or credentials from an app like Google Authenticator, Twilio Authy, or FreeOTP.

Related information

- Red Hat Enterprise Linux 8 product documentation
- Red Hat Enterprise Linux 9 product documentation

Secure the database installation

The following guidelines show how to secure and harden the MariaDB 10.x database installation.

- Limit the access of the "root" user.
    - Tiebreaker uses a dedicated account. The account and tables for storing (configuration) data is created during the installation of Tiebreaker. The only time elevated access to the database is required is during installation.
- During installation the following access and privileges are required:
    - The ability to create a database and tables
    - The ability to create global options
    - The ability to create a database user and set the password
    - The ability to associate the database user with the database and tables and assign access rights

    > The user account that you specify during the Tiebreaker installation must have all these privileges. Using multiple user accounts for the different tasks is not supported.

- Use encryption of the database
    - Data-at-rest encryption is supported. Learn more about data-at-rest encryption
    - Data in flight is not encrypted. Data in flight uses a local "socks" file connection.
    - FIPS compliancy for MariaDB — you do not need to enable FIPS compliancy on the database. Installation of the host in FIPS-compliant mode is sufficient.

Learn about MySQL Enterprise Transparent Data Encryption (TDE)

The encryption settings must be enabled before installation of the Tiebreaker software.

Related information

- Database user management

  Access Control and Account Management

- Secure the database

  Making MySQL Secure Against Attackers

  Securing MariaDB

- Secure the Vault installation

  Production hardening

Install the Tiebreaker software package

Choose your installation procedure

The Tiebreaker installation procedure you follow depends on the version of Tiebreaker you are installing.

Tiebreaker version	Go to…
Tiebreaker 1.6	Install Tiebreaker 1.6
Tiebreaker 1.5	Install Tiebreaker 1.5
Tiebreaker 1.4	Install Tiebreaker 1.4

Install Tiebreaker 1.6

Perform a new installation or upgrade to Tiebreaker 1.6 on your host Linux operating system to monitor MetroCluster configurations.

About this task

- Your storage system must be running ONTAP 9.12.1 or later.
- You can install MetroCluster Tiebreaker as a non-root user with sufficient administrative privileges to perform the Tiebreaker installation, create tables and users, and set the user password.

Steps

1. Download the MetroCluster Tiebreaker 1.6 software.

   MetroCluster Tiebreaker (Downloads) - NetApp Support Site

2. Log in to the host as the root user.
3. If you are performing an upgrade, verify the version of Tiebreaker that you are running:

   The following example shows Tiebreaker 1.5.

   ```
   [root@mcctb ~] # netapp-metrocluster-tiebreaker-software-cli
   NetApp MetroCluster Tiebreaker :> version show
   NetApp MetroCluster Tiebreaker 1.5: Sun Mar 13 09:59:02 IST 2022
   NetApp MetroCluster Tiebreaker :> exit
   ```

4. Install or upgrade the Tiebreaker software.

Install Tiebreaker 1.6

Use the following steps for a new installation of Tiebreaker 1.6.

Steps

1. Run the following command at the `[root@mcctb ~] #` prompt to begin the installation:

```
sh MetroClusterTiebreakerInstall-1.6
```

The system displays the following output for a successful installation:

```
Extracting the MetroCluster Tiebreaker installation/upgrade
archive
Install digest hash is Ok
Performing the MetroCluster Tiebreaker code signature check
Install code signature is Ok
Enter unix user account to use for the installation:
mcctbadminuser
Unix user account "mcctbadminuser" doesn't exist. Do you wish to
create "mcctbadminuser" user account? [Y/N]: y
useradd: warning: the home directory already exists.
Not copying any file from skel directory into it.
Creating mailbox file: File exists
Unix account "mcctbadminuser" created.
Changing password for user mcctbadminuser.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
MetroCluster Tiebreaker requires unix user account
"mcctbadminuser" to be added to the group "mcctbgrp" for admin
access.
Do you wish to add ? [Y/N]: y
Unix user account "mcctbadminuser" added to "mcctbgrp".
Do you wish to generate your own public-private key pair for
encrypting audit log? [Y/N]: y
Generating public-private key pair...
Configuring Vault...
Starting vault server...
==> Vault server configuration:

             Api Address: <api_address>
                     Cgo: disabled
         Cluster Address: <cluster_address>
   Environment Variables: BASH_FUNC_which%%,
DBUS_SESSION_BUS_ADDRESS, GODEBUG, HISTCONTROL, HISTSIZE, HOME,
```

```
HOSTNAME, HOST_ACCOUNT, LANG, LESSOPEN, LOGNAME, LS_COLORS, MAIL,
PATH, PWD, SHELL, SHLVL, SSH_CLIENT, SSH_CONNECTION, SSH_TTY,
STAF_TEMP_DIR, TERM, USER, VAULT_ADDR, VAULT_TOKEN,
XDG_RUNTIME_DIR, XDG_SESSION_ID, _, vault_Addr, which_declare
              Go Version: go1.20.5
              Listener 1: tcp (addr: "0.0.0.0:8200", cluster
address: "0.0.0.0:8201", max_request_duration: "1m30s",
max_request_size: "33554432", tls: "enabled")
               Log Level:
                   Mlock: supported: true, enabled: true
           Recovery Mode: false
                 Storage: file
                 Version: Vault v1.14.0, built 2023-06-
19T11:40:23Z
             Version Sha:
13a649f860186dffe3f3a4459814d87191efc321

==> Vault server started! Log data will stream in below:

2023-11-23T15:14:28.532+0530 [INFO]  proxy environment:
http_proxy="" https_proxy="" no_proxy=""
2023-11-23T15:14:28.577+0530 [INFO]  core: Initializing version
history cache for core
2023-11-23T15:14:38.552+0530 [INFO]  core: security barrier not
initialized
2023-11-23T15:14:38.552+0530 [INFO]  core: seal configuration
missing, not initialized
2023-11-23T15:14:38.554+0530 [INFO]  core: security barrier not
initialized
2023-11-23T15:14:38.555+0530 [INFO]  core: security barrier
initialized: stored=1 shares=5 threshold=3
2023-11-23T15:14:38.556+0530 [INFO]  core: post-unseal setup
starting
2023-11-23T15:14:38.577+0530 [INFO]  core: loaded wrapping token
key
2023-11-23T15:14:38.577+0530 [INFO]  core: successfully setup
plugin catalog: plugin-directory=""
2023-11-23T15:14:38.577+0530 [INFO]  core: no mounts; adding
default mount table
2023-11-23T15:14:38.578+0530 [INFO]  core: successfully mounted:
type=cubbyhole version="v1.14.0+builtin.vault" path=cubbyhole/
namespace="ID: root. Path: "
2023-11-23T15:14:38.578+0530 [INFO]  core: successfully mounted:
type=system version="v1.14.0+builtin.vault" path=sys/
namespace="ID: root. Path: "
2023-11-23T15:14:38.578+0530 [INFO]  core: successfully mounted:
```

```
type=identity version="v1.14.0+builtin.vault" path=identity/
namespace="ID: root. Path: "
2023-11-23T15:14:38.581+0530 [INFO]  core: successfully mounted:
type=token version="v1.14.0+builtin.vault" path=token/
namespace="ID: root. Path: "
2023-11-23T15:14:38.581+0530 [INFO]  rollback: starting rollback
manager
2023-11-23T15:14:38.581+0530 [INFO]  core: restoring leases
2023-11-23T15:14:38.582+0530 [INFO]  expiration: lease restore
complete
2023-11-23T15:14:38.582+0530 [INFO]  identity: entities restored
2023-11-23T15:14:38.582+0530 [INFO]  identity: groups restored
2023-11-23T15:14:38.583+0530 [INFO]  core: Recorded vault
version: vault version=1.14.0 upgrade time="2023-11-23
09:44:38.582881162 +0000 UTC" build date=2023-06-19T11:40:23Z
2023-11-23T15:14:38.583+0530 [INFO]  core: usage gauge collection
is disabled
2023-11-23T15:14:38.998+0530 [INFO]  core: post-unseal setup
complete
2023-11-23T15:14:38.999+0530 [INFO]  core: root token generated
2023-11-23T15:14:38.999+0530 [INFO]  core: pre-seal teardown
starting
2023-11-23T15:14:38.999+0530 [INFO]  rollback: stopping rollback
manager
2023-11-23T15:14:38.999+0530 [INFO]  core: pre-seal teardown
complete
2023-11-23T15:14:39.311+0530 [INFO]  core.cluster-listener.tcp:
starting listener: listener_address=0.0.0.0:8201
2023-11-23T15:14:39.311+0530 [INFO]  core.cluster-listener:
serving cluster requests: cluster_listen_address=[::]:8201
2023-11-23T15:14:39.312+0530 [INFO]  core: post-unseal setup
starting
2023-11-23T15:14:39.312+0530 [INFO]  core: loaded wrapping token
key
2023-11-23T15:14:39.312+0530 [INFO]  core: successfully setup
plugin catalog: plugin-directory=""
2023-11-23T15:14:39.313+0530 [INFO]  core: successfully mounted:
type=system version="v1.14.0+builtin.vault" path=sys/
namespace="ID: root. Path: "
2023-11-23T15:14:39.313+0530 [INFO]  core: successfully mounted:
type=identity version="v1.14.0+builtin.vault" path=identity/
namespace="ID: root. Path: "
2023-11-23T15:14:39.313+0530 [INFO]  core: successfully mounted:
type=cubbyhole version="v1.14.0+builtin.vault" path=cubbyhole/
namespace="ID: root. Path: "
2023-11-23T15:14:39.314+0530 [INFO]  core: successfully mounted:
```

```
type=token version="v1.14.0+builtin.vault" path=token/
namespace="ID: root. Path: "
2023-11-23T15:14:39.314+0530 [INFO]  rollback: starting rollback
manager
2023-11-23T15:14:39.314+0530 [INFO]  core: restoring leases
2023-11-23T15:14:39.314+0530 [INFO]  identity: entities restored
2023-11-23T15:14:39.314+0530 [INFO]  expiration: lease restore
complete
2023-11-23T15:14:39.314+0530 [INFO]  identity: groups restored
2023-11-23T15:14:39.315+0530 [INFO]  core: usage gauge collection
is disabled
2023-11-23T15:14:39.316+0530 [INFO]  core: post-unseal setup
complete
2023-11-23T15:14:39.316+0530 [INFO]  core: vault is unsealed
Success! Uploaded policy: mcctb-policy
2023-11-23T15:14:39.795+0530 [INFO]  core: enabled credential
backend: path=approle/ type=approle version=""
Success! Enabled approle auth method at: approle/
2023-11-23T15:14:39.885+0530 [INFO]  core: successful mount:
namespace="" path=mcctb/ type=kv version=""
Success! Enabled the kv secrets engine at: mcctb/
Success! Data written to: auth/approle/role/mcctb-app
Installing the NetApp-MetroCluster-Tiebreaker-Software-1.6-
1.x86_64.rpm
Preparing...                          #
################################# # [100%]

Updating / installing...

1:NetApp-MetroCluster-Tiebreaker-So#
################################# # [100%]
Performing file integrity check
etc/cron.weekly/metrocluster-tiebreaker-support is Ok
etc/cron.weekly/metrocluster-tiebreaker-support-cov is Ok
etc/init.d/netapp-metrocluster-tiebreaker-software is Ok
etc/init.d/netapp-metrocluster-tiebreaker-software-cov is Ok
etc/logrotate.d/mcctb is Ok
opt/netapp/mcctb/lib/common/activation-1.1.1.jar is Ok
opt/netapp/mcctb/lib/common/aopalliance.jar is Ok
opt/netapp/mcctb/lib/common/args4j.jar is Ok
opt/netapp/mcctb/lib/common/aspectjrt.jar is Ok
opt/netapp/mcctb/lib/common/aspectjweaver.jar is Ok
opt/netapp/mcctb/lib/common/asup.jar is Ok
opt/netapp/mcctb/lib/common/bcpkix-jdk15on.jar is Ok
opt/netapp/mcctb/lib/common/bcprov-jdk15on.jar is Ok
opt/netapp/mcctb/lib/common/bcprov-jdk18on.jar is Ok
```

```
opt/netapp/mcctb/lib/common/bctls-fips-1.0.13.jar is Ok
opt/netapp/mcctb/lib/common/bctls-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/bcutil-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/cglib.jar is Ok
opt/netapp/mcctb/lib/common/commons-codec.jar is Ok
opt/netapp/mcctb/lib/common/commons-collections4.jar is Ok
opt/netapp/mcctb/lib/common/commons-compress.jar is Ok
opt/netapp/mcctb/lib/common/commons-daemon.jar is Ok
opt/netapp/mcctb/lib/common/commons-daemon.src.jar is Ok
opt/netapp/mcctb/lib/common/commons-dbcp2.jar is Ok
opt/netapp/mcctb/lib/common/commons-io.jar is Ok
opt/netapp/mcctb/lib/common/commons-lang3.jar is Ok
opt/netapp/mcctb/lib/common/commons-logging.jar is Ok
opt/netapp/mcctb/lib/common/commons-pool2.jar is Ok
opt/netapp/mcctb/lib/common/guava.jar is Ok
opt/netapp/mcctb/lib/common/httpclient.jar is Ok
opt/netapp/mcctb/lib/common/httpcore.jar is Ok
opt/netapp/mcctb/lib/common/jakarta.activation.jar is Ok
opt/netapp/mcctb/lib/common/jakarta.xml.bind-api.jar is Ok
opt/netapp/mcctb/lib/common/java-xmlbuilder.jar is Ok
opt/netapp/mcctb/lib/common/javax.inject.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-api-2.3.1.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-core.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-impl.jar is Ok
opt/netapp/mcctb/lib/common/jline.jar is Ok
opt/netapp/mcctb/lib/common/jna.jar is Ok
opt/netapp/mcctb/lib/common/joda-time.jar is Ok
opt/netapp/mcctb/lib/common/jsch.jar is Ok
opt/netapp/mcctb/lib/common/json.jar is Ok
opt/netapp/mcctb/lib/common/jsvc.zip is Ok
opt/netapp/mcctb/lib/common/junixsocket-common.jar is Ok
opt/netapp/mcctb/lib/common/junixsocket-native-common.jar is Ok
opt/netapp/mcctb/lib/common/logback-classic.jar is Ok
opt/netapp/mcctb/lib/common/logback-core.jar is Ok
opt/netapp/mcctb/lib/common/mail-1.6.2.jar is Ok
opt/netapp/mcctb/lib/common/mariadb-java-client.jar is Ok
opt/netapp/mcctb/lib/common/mcctb-mib.jar is Ok
opt/netapp/mcctb/lib/common/mcctb.jar is Ok
opt/netapp/mcctb/lib/common/mockito-core.jar is Ok
opt/netapp/mcctb/lib/common/slf4j-api.jar is Ok
opt/netapp/mcctb/lib/common/snmp4j.jar is Ok
opt/netapp/mcctb/lib/common/spring-aop.jar is Ok
opt/netapp/mcctb/lib/common/spring-beans.jar is Ok
opt/netapp/mcctb/lib/common/spring-context-support.jar is Ok
opt/netapp/mcctb/lib/common/spring-context.jar is Ok
opt/netapp/mcctb/lib/common/spring-core.jar is Ok
```

```
opt/netapp/mcctb/lib/common/spring-expression.jar is Ok
opt/netapp/mcctb/lib/common/spring-web.jar is Ok
opt/netapp/mcctb/lib/common/vault-java-driver.jar is Ok
opt/netapp/mcctb/lib/common/xz.jar is Ok
opt/netapp/mcctb/lib/org.jacoco.agent-0.8.8-runtime.jar is Ok
opt/netapp/mcctb/bin/mcctb-asup-invoke is Ok
opt/netapp/mcctb/bin/mcctb_postrotate is Ok
opt/netapp/mcctb/bin/netapp-metrocluster-tiebreaker-software-cli
is Ok
/

Synchronizing state of netapp-metrocluster-tiebreaker-
software.service with SysV service script with
/usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable netapp-
metrocluster-tiebreaker-software
Created symlink /etc/systemd/system/multi-
user.target.wants/netapp-metrocluster-tiebreaker-software.service
→ /etc/systemd/system/netapp-metrocluster-tiebreaker-
software.service.

Attempting to start NetApp MetroCluster Tiebreaker software
services
Started NetApp MetroCluster Tiebreaker software services
Successfully installed NetApp MetroCluster Tiebreaker software
version 1.6.
```

Upgrade from Tiebreaker 1.5 to 1.6

Use the following steps to upgrade the Tiebreaker 1.5 software version to Tiebreaker 1.6.

Steps

1. Run the following command at the `[root@mcctb ~] #` prompt to upgrade the software:

```
sh MetroClusterTiebreakerInstall-1.6
```

The system displays the following output for a successful upgrade:

```
Extracting the MetroCluster Tiebreaker installation/upgrade
archive
Install digest hash is Ok
Performing the MetroCluster Tiebreaker code signature check
Install code signature is Ok

Enter database user name : root
```

```
Please enter database password for root
Enter password:

Password updated successfully in the database.

Do you wish to generate your own public-private key pair for
encrypting audit log? [Y/N]: y
Generating public-private key pair...
Configuring Vault...
==> Vault shutdown triggered
2023-07-21T00:30:22.335+0530 [INFO]  core: marked as sealed
2023-07-21T00:30:22.335+0530 [INFO]  core: pre-seal teardown
starting
2023-07-21T00:30:22.335+0530 [INFO]  rollback: stopping rollback
manager
2023-07-21T00:30:22.335+0530 [INFO]  core: pre-seal teardown
complete
2023-07-21T00:30:22.335+0530 [INFO]  core: stopping cluster
listeners
2023-07-21T00:30:22.335+0530 [INFO]  core.cluster-listener:
forwarding rpc listeners stopped
2023-07-21T00:30:22.375+0530 [INFO]  core.cluster-listener: rpc
listeners successfully shut down
2023-07-21T00:30:22.375+0530 [INFO]  core: cluster listeners
successfully shut down
2023-07-21T00:30:22.376+0530 [INFO]  core: vault is sealed
Starting vault server...
==> Vault server configuration:

             Api Address: <api_address>
                     Cgo: disabled
         Cluster Address: <cluster_address>
   Environment Variables: BASH_FUNC_which%%,
DBUS_SESSION_BUS_ADDRESS, GODEBUG, HISTCONTROL, HISTSIZE, HOME,
HOSTNAME, HOST_ACCOUNT, LANG, LESSOPEN, LOGNAME, LS_COLORS, MAIL,
PATH, PWD, SHELL, SHLVL, SSH_CLIENT, SSH_CONNECTION, SSH_TTY,
STAF_TEMP_DIR, TERM, USER, VAULT_ADDR, VAULT_TOKEN,
XDG_RUNTIME_DIR, XDG_SESSION_ID, _, vault_Addr, which_declare
              Go Version: go1.20.5
              Listener 1: tcp (addr: "0.0.0.0:8200", cluster
address: "0.0.0.0:8201", max_request_duration: "1m30s",
max_request_size: "33554432", tls: "enabled")
               Log Level:
                   Mlock: supported: true, enabled: true
           Recovery Mode: false
```

```
                 Storage: file
                 Version: Vault v1.14.0, built 2023-06-
19T11:40:23Z
             Version Sha:
13a649f860186dffe3f3a4459814d87191efc321

==> Vault server started! Log data will stream in below:

2023-07-21T00:30:33.065+0530 [INFO]  proxy environment:
http_proxy="" https_proxy="" no_proxy=""
2023-07-21T00:30:33.098+0530 [INFO]  core: Initializing version
history cache for core
2023-07-21T00:30:43.092+0530 [INFO]  core: security barrier not
initialized
2023-07-21T00:30:43.092+0530 [INFO]  core: seal configuration
missing, not initialized
2023-07-21T00:30:43.094+0530 [INFO]  core: security barrier not
initialized
2023-07-21T00:30:43.096+0530 [INFO]  core: security barrier
initialized: stored=1 shares=5 threshold=3
2023-07-21T00:30:43.098+0530 [INFO]  core: post-unseal setup
starting
2023-07-21T00:30:43.124+0530 [INFO]  core: loaded wrapping token
key
2023-07-21T00:30:43.124+0530 [INFO]  core: successfully setup
plugin catalog: plugin-directory=""
2023-07-21T00:30:43.124+0530 [INFO]  core: no mounts; adding
default mount table
2023-07-21T00:30:43.125+0530 [INFO]  core: successfully mounted:
type=cubbyhole version="v1.14.0+builtin.vault" path=cubbyhole/
namespace="ID: root. Path: "
2023-07-21T00:30:43.126+0530 [INFO]  core: successfully mounted:
type=system version="v1.14.0+builtin.vault" path=sys/
namespace="ID: root. Path: "
2023-07-21T00:30:43.126+0530 [INFO]  core: successfully mounted:
type=identity version="v1.14.0+builtin.vault" path=identity/
namespace="ID: root. Path: "
2023-07-21T00:30:43.129+0530 [INFO]  core: successfully mounted:
type=token version="v1.14.0+builtin.vault" path=token/
namespace="ID: root. Path: "
2023-07-21T00:30:43.130+0530 [INFO]  rollback: starting rollback
manager
2023-07-21T00:30:43.130+0530 [INFO]  core: restoring leases
2023-07-21T00:30:43.130+0530 [INFO]  identity: entities restored
2023-07-21T00:30:43.130+0530 [INFO]  identity: groups restored
2023-07-21T00:30:43.131+0530 [INFO]  core: usage gauge collection
```

```
is disabled
2023-07-21T00:30:43.131+0530 [INFO]  expiration: lease restore
complete
2023-07-21T00:30:43.131+0530 [INFO]  core: Recorded vault
version: vault version=1.14.0 upgrade time="2023-07-20
19:00:43.131158543 +0000 UTC" build date=2023-06-19T11:40:23Z
2023-07-21T00:30:43.371+0530 [INFO]  core: post-unseal setup
complete
2023-07-21T00:30:43.371+0530 [INFO]  core: root token generated
2023-07-21T00:30:43.371+0530 [INFO]  core: pre-seal teardown
starting
2023-07-21T00:30:43.371+0530 [INFO]  rollback: stopping rollback
manager
2023-07-21T00:30:43.372+0530 [INFO]  core: pre-seal teardown
complete
2023-07-21T00:30:43.694+0530 [INFO]  core.cluster-listener.tcp:
starting listener: listener_address=0.0.0.0:8201
2023-07-21T00:30:43.695+0530 [INFO]  core.cluster-listener:
serving cluster requests: cluster_listen_address=[::]:8201
2023-07-21T00:30:43.695+0530 [INFO]  core: post-unseal setup
starting
2023-07-21T00:30:43.696+0530 [INFO]  core: loaded wrapping token
key
2023-07-21T00:30:43.696+0530 [INFO]  core: successfully setup
plugin catalog: plugin-directory=""
2023-07-21T00:30:43.697+0530 [INFO]  core: successfully mounted:
type=system version="v1.14.0+builtin.vault" path=sys/
namespace="ID: root. Path: "
2023-07-21T00:30:43.698+0530 [INFO]  core: successfully mounted:
type=identity version="v1.14.0+builtin.vault" path=identity/
namespace="ID: root. Path: "
2023-07-21T00:30:43.698+0530 [INFO]  core: successfully mounted:
type=cubbyhole version="v1.14.0+builtin.vault" path=cubbyhole/
namespace="ID: root. Path: "
2023-07-21T00:30:43.701+0530 [INFO]  core: successfully mounted:
type=token version="v1.14.0+builtin.vault" path=token/
namespace="ID: root. Path: "
2023-07-21T00:30:43.701+0530 [INFO]  rollback: starting rollback
manager
2023-07-21T00:30:43.702+0530 [INFO]  core: restoring leases
2023-07-21T00:30:43.702+0530 [INFO]  identity: entities restored
2023-07-21T00:30:43.702+0530 [INFO]  expiration: lease restore
complete
2023-07-21T00:30:43.702+0530 [INFO]  identity: groups restored
2023-07-21T00:30:43.702+0530 [INFO]  core: usage gauge collection
is disabled
```

```
2023-07-21T00:30:43.703+0530 [INFO]  core: post-unseal setup
complete
2023-07-21T00:30:43.703+0530 [INFO]  core: vault is unsealed
Success! Uploaded policy: mcctb-policy
2023-07-21T00:30:44.226+0530 [INFO]  core: enabled credential
backend: path=approle/ type=approle version=""
Success! Enabled approle auth method at: approle/
2023-07-21T00:30:44.315+0530 [INFO]  core: successful mount:
namespace="" path=mcctb/ type=kv version=""
Success! Enabled the kv secrets engine at: mcctb/
Success! Data written to: auth/approle/role/mcctb-app
Upgrading to NetApp-MetroCluster-Tiebreaker-Software-1.6-
1.x86_64.rpm
Preparing...
################################# [100%]
Updating / installing...
   1:NetApp-MetroCluster-Tiebreaker-
So################################# [ 50%]
Performing file integrity check
etc/cron.weekly/metrocluster-tiebreaker-support is Ok
etc/cron.weekly/metrocluster-tiebreaker-support-cov is Ok
etc/init.d/netapp-metrocluster-tiebreaker-software is Ok
etc/init.d/netapp-metrocluster-tiebreaker-software-cov is Ok
etc/logrotate.d/mcctb is Ok
opt/netapp/mcctb/lib/common/activation-1.1.1.jar is Ok
opt/netapp/mcctb/lib/common/aopalliance.jar is Ok
opt/netapp/mcctb/lib/common/args4j.jar is Ok
opt/netapp/mcctb/lib/common/aspectjrt.jar is Ok
opt/netapp/mcctb/lib/common/aspectjweaver.jar is Ok
opt/netapp/mcctb/lib/common/asup.jar is Ok
opt/netapp/mcctb/lib/common/bcpkix-jdk15on.jar is Ok
opt/netapp/mcctb/lib/common/bcprov-jdk15on.jar is Ok
opt/netapp/mcctb/lib/common/bcprov-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/bctls-fips-1.0.13.jar is Ok
opt/netapp/mcctb/lib/common/bctls-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/bcutil-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/cglib.jar is Ok
opt/netapp/mcctb/lib/common/commons-codec.jar is Ok
opt/netapp/mcctb/lib/common/commons-collections4.jar is Ok
opt/netapp/mcctb/lib/common/commons-compress.jar is Ok
opt/netapp/mcctb/lib/common/commons-daemon.jar is Ok
opt/netapp/mcctb/lib/common/commons-daemon.src.jar is Ok
opt/netapp/mcctb/lib/common/commons-dbcp2.jar is Ok
opt/netapp/mcctb/lib/common/commons-io.jar is Ok
opt/netapp/mcctb/lib/common/commons-lang3.jar is Ok
opt/netapp/mcctb/lib/common/commons-logging.jar is Ok
```

```
opt/netapp/mcctb/lib/common/commons-pool2.jar is Ok
opt/netapp/mcctb/lib/common/guava.jar is Ok
opt/netapp/mcctb/lib/common/httpclient.jar is Ok
opt/netapp/mcctb/lib/common/httpcore.jar is Ok
opt/netapp/mcctb/lib/common/jakarta.activation.jar is Ok
opt/netapp/mcctb/lib/common/jakarta.xml.bind-api.jar is Ok
opt/netapp/mcctb/lib/common/java-xmlbuilder.jar is Ok
opt/netapp/mcctb/lib/common/javax.inject.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-api-2.3.1.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-core.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-impl.jar is Ok
opt/netapp/mcctb/lib/common/jline.jar is Ok
opt/netapp/mcctb/lib/common/jna.jar is Ok
opt/netapp/mcctb/lib/common/joda-time.jar is Ok
opt/netapp/mcctb/lib/common/jsch.jar is Ok
opt/netapp/mcctb/lib/common/json.jar is Ok
opt/netapp/mcctb/lib/common/jsvc.zip is Ok
opt/netapp/mcctb/lib/common/junixsocket-common.jar is Ok
opt/netapp/mcctb/lib/common/junixsocket-native-common.jar is Ok
opt/netapp/mcctb/lib/common/logback-classic.jar is Ok
opt/netapp/mcctb/lib/common/logback-core.jar is Ok
opt/netapp/mcctb/lib/common/mail-1.6.2.jar is Ok
opt/netapp/mcctb/lib/common/mariadb-java-client.jar is Ok
opt/netapp/mcctb/lib/common/mcctb-mib.jar is Ok
opt/netapp/mcctb/lib/common/mcctb.jar is Ok
opt/netapp/mcctb/lib/common/mockito-core.jar is Ok
opt/netapp/mcctb/lib/common/slf4j-api.jar is Ok
opt/netapp/mcctb/lib/common/snmp4j.jar is Ok
opt/netapp/mcctb/lib/common/spring-aop.jar is Ok
opt/netapp/mcctb/lib/common/spring-beans.jar is Ok
opt/netapp/mcctb/lib/common/spring-context-support.jar is Ok
opt/netapp/mcctb/lib/common/spring-context.jar is Ok
opt/netapp/mcctb/lib/common/spring-core.jar is Ok
opt/netapp/mcctb/lib/common/spring-expression.jar is Ok
opt/netapp/mcctb/lib/common/spring-web.jar is Ok
opt/netapp/mcctb/lib/common/vault-java-driver.jar is Ok
opt/netapp/mcctb/lib/common/xz.jar is Ok
opt/netapp/mcctb/bin/mcctb_postrotate is Ok
opt/netapp/mcctb/bin/netapp-metrocluster-tiebreaker-software-cli
is Ok
/

Synchronizing state of netapp-metrocluster-tiebreaker-
software.service with SysV service script with
/usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable netapp-
```

```
metrocluster-tiebreaker-software

Attempting to start NetApp MetroCluster Tiebreaker software
services
Started NetApp MetroCluster Tiebreaker software services
Successfully upgraded NetApp MetroCluster Tiebreaker software to
version 1.6.
Cleaning up / removing...
   2:NetApp-MetroCluster-Tiebreaker-
So################################# [100%]
```

Upgrade from Tiebreaker 1.4 to 1.6

Use the following steps to upgrade the Tiebreaker 1.4 software version to Tiebreaker 1.6.

Steps

1. Run the following command at the `[root@mcctb ~] #` prompt to upgrade the software:

   ```
   sh MetroClusterTiebreakerInstall-1.6
   ```

   The system displays the following output for a successful upgrade:

   ```
   Extracting the MetroCluster Tiebreaker installation/upgrade
   archive
   Install digest hash is Ok
   Performing the MetroCluster Tiebreaker code signature check
   Install code signature is Ok
   Enter unix user account to use for the installation:
   mcctbuseradmin1
   Unix user account "mcctbuseradmin1" doesn't exist. Do you wish to
   create "mcctbuseradmin1" user account? [Y/N]: y
   Unix account "mcctbuseradmin1" created.
   Changing password for user mcctbuseradmin1.
   New password:
   Retype new password:
   passwd: all authentication tokens updated successfully.

   Enter database user name : root

   Please enter database password for root
   Enter password:

   Password updated successfully in the database.

   MetroCluster Tiebreaker requires unix user account
   ```

```
"mcctbuseradmin1" to be added to the group "mcctbgrp" for admin
access.
Do you wish to add ? [Y/N]: y
Unix user account "mcctbuseradmin1" added to "mcctbgrp".
Do you wish to generate your own public-private key pair for
encrypting audit log? [Y/N]: y
Generating public-private key pair...
Configuring Vault...
Starting vault server...
==> Vault server configuration:

             Api Address: <api_addess>
                     Cgo: disabled
         Cluster Address: <cluster_address>
   Environment Variables: BASH_FUNC_which%%,
DBUS_SESSION_BUS_ADDRESS, GODEBUG, HISTCONTROL, HISTSIZE, HOME,
HOSTNAME, HOST_ACCOUNT, LANG, LESSOPEN, LOGNAME, LS_COLORS, MAIL,
PATH, PWD, SHELL, SHLVL, SSH_CLIENT, SSH_CONNECTION, SSH_TTY,
STAF_TEMP_DIR, TERM, USER, VAULT_ADDR, VAULT_TOKEN,
XDG_RUNTIME_DIR, XDG_SESSION_ID, _, vault_Addr, which_declare
              Go Version: go1.20.5
              Listener 1: tcp (addr: "0.0.0.0:8200", cluster
address: "0.0.0.0:8201", max_request_duration: "1m30s",
max_request_size: "33554432", tls: "enabled")
               Log Level:
                   Mlock: supported: true, enabled: true
           Recovery Mode: false
                 Storage: file
                 Version: Vault v1.14.0, built 2023-06-
19T11:40:23Z
             Version Sha:
13a649f860186dffe3f3a4459814d87191efc321

==> Vault server started! Log data will stream in below:

2023-11-23T15:58:10.400+0530 [INFO]  proxy environment:
http_proxy="" https_proxy="" no_proxy=""
2023-11-23T15:58:10.432+0530 [INFO]  core: Initializing version
history cache for core
2023-11-23T15:58:20.422+0530 [INFO]  core: security barrier not
initialized
2023-11-23T15:58:20.422+0530 [INFO]  core: seal configuration
missing, not initialized
2023-11-23T15:58:20.424+0530 [INFO]  core: security barrier not
initialized
2023-11-23T15:58:20.425+0530 [INFO]  core: security barrier
```

```
initialized: stored=1 shares=5 threshold=3
2023-11-23T15:58:20.427+0530 [INFO]  core: post-unseal setup
starting
2023-11-23T15:58:20.448+0530 [INFO]  core: loaded wrapping token
key
2023-11-23T15:58:20.448+0530 [INFO]  core: successfully setup
plugin catalog: plugin-directory=""
2023-11-23T15:58:20.448+0530 [INFO]  core: no mounts; adding
default mount table
2023-11-23T15:58:20.449+0530 [INFO]  core: successfully mounted:
type=cubbyhole version="v1.14.0+builtin.vault" path=cubbyhole/
namespace="ID: root. Path: "
2023-11-23T15:58:20.449+0530 [INFO]  core: successfully mounted:
type=system version="v1.14.0+builtin.vault" path=sys/
namespace="ID: root. Path: "
2023-11-23T15:58:20.449+0530 [INFO]  core: successfully mounted:
type=identity version="v1.14.0+builtin.vault" path=identity/
namespace="ID: root. Path: "
2023-11-23T15:58:20.451+0530 [INFO]  core: successfully mounted:
type=token version="v1.14.0+builtin.vault" path=token/
namespace="ID: root. Path: "
2023-11-23T15:58:20.452+0530 [INFO]  rollback: starting rollback
manager
2023-11-23T15:58:20.452+0530 [INFO]  core: restoring leases
2023-11-23T15:58:20.453+0530 [INFO]  identity: entities restored
2023-11-23T15:58:20.453+0530 [INFO]  identity: groups restored
2023-11-23T15:58:20.453+0530 [INFO]  expiration: lease restore
complete
2023-11-23T15:58:20.453+0530 [INFO]  core: usage gauge collection
is disabled
2023-11-23T15:58:20.453+0530 [INFO]  core: Recorded vault
version: vault version=1.14.0 upgrade time="2023-11-23
10:28:20.453481904 +0000 UTC" build date=2023-06-19T11:40:23Z
2023-11-23T15:58:20.818+0530 [INFO]  core: post-unseal setup
complete
2023-11-23T15:58:20.819+0530 [INFO]  core: root token generated
2023-11-23T15:58:20.819+0530 [INFO]  core: pre-seal teardown
starting
2023-11-23T15:58:20.819+0530 [INFO]  rollback: stopping rollback
manager
2023-11-23T15:58:20.819+0530 [INFO]  core: pre-seal teardown
complete
2023-11-23T15:58:21.116+0530 [INFO]  core.cluster-listener.tcp:
starting listener: listener_address=0.0.0.0:8201
2023-11-23T15:58:21.116+0530 [INFO]  core.cluster-listener:
serving cluster requests: cluster_listen_address=[::]:8201
```

```
2023-11-23T15:58:21.117+0530 [INFO]  core: post-unseal setup
starting
2023-11-23T15:58:21.117+0530 [INFO]  core: loaded wrapping token
key
2023-11-23T15:58:21.117+0530 [INFO]  core: successfully setup
plugin catalog: plugin-directory=""
2023-11-23T15:58:21.119+0530 [INFO]  core: successfully mounted:
type=system version="v1.14.0+builtin.vault" path=sys/
namespace="ID: root. Path: "
2023-11-23T15:58:21.120+0530 [INFO]  core: successfully mounted:
type=identity version="v1.14.0+builtin.vault" path=identity/
namespace="ID: root. Path: "
2023-11-23T15:58:21.120+0530 [INFO]  core: successfully mounted:
type=cubbyhole version="v1.14.0+builtin.vault" path=cubbyhole/
namespace="ID: root. Path: "
2023-11-23T15:58:21.123+0530 [INFO]  core: successfully mounted:
type=token version="v1.14.0+builtin.vault" path=token/
namespace="ID: root. Path: "
2023-11-23T15:58:21.123+0530 [INFO]  rollback: starting rollback
manager
2023-11-23T15:58:21.124+0530 [INFO]  core: restoring leases
2023-11-23T15:58:21.124+0530 [INFO]  identity: entities restored
2023-11-23T15:58:21.124+0530 [INFO]  identity: groups restored
2023-11-23T15:58:21.124+0530 [INFO]  expiration: lease restore
complete
2023-11-23T15:58:21.125+0530 [INFO]  core: usage gauge collection
is disabled
2023-11-23T15:58:21.125+0530 [INFO]  core: post-unseal setup
complete
2023-11-23T15:58:21.125+0530 [INFO]  core: vault is unsealed
Success! Uploaded policy: mcctb-policy
2023-11-23T15:58:21.600+0530 [INFO]  core: enabled credential
backend: path=approle/ type=approle version=""
Success! Enabled approle auth method at: approle/
2023-11-23T15:58:21.690+0530 [INFO]  core: successful mount:
namespace="" path=mcctb/ type=kv version=""
Success! Enabled the kv secrets engine at: mcctb/
Success! Data written to: auth/approle/role/mcctb-app
Upgrading to NetApp-MetroCluster-Tiebreaker-Software-1.6-
1.x86_64.rpm
Preparing...
################################## [100%]
Updating / installing...
   1:NetApp-MetroCluster-Tiebreaker-
So################################## [ 50%]
Performing file integrity check
```

```
etc/cron.weekly/metrocluster-tiebreaker-support is Ok
etc/cron.weekly/metrocluster-tiebreaker-support-cov is Ok
etc/init.d/netapp-metrocluster-tiebreaker-software is Ok
etc/init.d/netapp-metrocluster-tiebreaker-software-cov is Ok
etc/logrotate.d/mcctb is Ok
opt/netapp/mcctb/lib/common/activation-1.1.1.jar is Ok
opt/netapp/mcctb/lib/common/aopalliance.jar is Ok
opt/netapp/mcctb/lib/common/args4j.jar is Ok
opt/netapp/mcctb/lib/common/aspectjrt.jar is Ok
opt/netapp/mcctb/lib/common/aspectjweaver.jar is Ok
opt/netapp/mcctb/lib/common/asup.jar is Ok
opt/netapp/mcctb/lib/common/bcpkix-jdk15on.jar is Ok
opt/netapp/mcctb/lib/common/bcprov-jdk15on.jar is Ok
opt/netapp/mcctb/lib/common/bcprov-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/bctls-fips-1.0.13.jar is Ok
opt/netapp/mcctb/lib/common/bctls-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/bcutil-jdk18on.jar is Ok
opt/netapp/mcctb/lib/common/cglib.jar is Ok
opt/netapp/mcctb/lib/common/commons-codec.jar is Ok
opt/netapp/mcctb/lib/common/commons-collections4.jar is Ok
opt/netapp/mcctb/lib/common/commons-compress.jar is Ok
opt/netapp/mcctb/lib/common/commons-daemon.jar is Ok
opt/netapp/mcctb/lib/common/commons-daemon.src.jar is Ok
opt/netapp/mcctb/lib/common/commons-dbcp2.jar is Ok
opt/netapp/mcctb/lib/common/commons-io.jar is Ok
opt/netapp/mcctb/lib/common/commons-lang3.jar is Ok
opt/netapp/mcctb/lib/common/commons-logging.jar is Ok
opt/netapp/mcctb/lib/common/commons-pool2.jar is Ok
opt/netapp/mcctb/lib/common/guava.jar is Ok
opt/netapp/mcctb/lib/common/httpclient.jar is Ok
opt/netapp/mcctb/lib/common/httpcore.jar is Ok
opt/netapp/mcctb/lib/common/jakarta.activation.jar is Ok
opt/netapp/mcctb/lib/common/jakarta.xml.bind-api.jar is Ok
opt/netapp/mcctb/lib/common/java-xmlbuilder.jar is Ok
opt/netapp/mcctb/lib/common/javax.inject.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-api-2.3.1.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-core.jar is Ok
opt/netapp/mcctb/lib/common/jaxb-impl.jar is Ok
opt/netapp/mcctb/lib/common/jline.jar is Ok
opt/netapp/mcctb/lib/common/jna.jar is Ok
opt/netapp/mcctb/lib/common/joda-time.jar is Ok
opt/netapp/mcctb/lib/common/jsch.jar is Ok
opt/netapp/mcctb/lib/common/json.jar is Ok
opt/netapp/mcctb/lib/common/jsvc.zip is Ok
opt/netapp/mcctb/lib/common/junixsocket-common.jar is Ok
opt/netapp/mcctb/lib/common/junixsocket-native-common.jar is Ok
```

```
opt/netapp/mcctb/lib/common/logback-classic.jar is Ok
opt/netapp/mcctb/lib/common/logback-core.jar is Ok
opt/netapp/mcctb/lib/common/mail-1.6.2.jar is Ok
opt/netapp/mcctb/lib/common/mariadb-java-client.jar is Ok
opt/netapp/mcctb/lib/common/mcctb-mib.jar is Ok
opt/netapp/mcctb/lib/common/mcctb.jar is Ok
opt/netapp/mcctb/lib/common/mockito-core.jar is Ok
opt/netapp/mcctb/lib/common/slf4j-api.jar is Ok
opt/netapp/mcctb/lib/common/snmp4j.jar is Ok
opt/netapp/mcctb/lib/common/spring-aop.jar is Ok
opt/netapp/mcctb/lib/common/spring-beans.jar is Ok
opt/netapp/mcctb/lib/common/spring-context-support.jar is Ok
opt/netapp/mcctb/lib/common/spring-context.jar is Ok
opt/netapp/mcctb/lib/common/spring-core.jar is Ok
opt/netapp/mcctb/lib/common/spring-expression.jar is Ok
opt/netapp/mcctb/lib/common/spring-web.jar is Ok
opt/netapp/mcctb/lib/common/vault-java-driver.jar is Ok
opt/netapp/mcctb/lib/common/xz.jar is Ok
opt/netapp/mcctb/lib/org.jacoco.agent-0.8.8-runtime.jar is Ok
opt/netapp/mcctb/bin/mcctb-asup-invoke is Ok
opt/netapp/mcctb/bin/mcctb_postrotate is Ok
opt/netapp/mcctb/bin/netapp-metrocluster-tiebreaker-software-cli
is Ok
/

Synchronizing state of netapp-metrocluster-tiebreaker-
software.service with SysV service script with
/usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable netapp-
metrocluster-tiebreaker-software

Attempting to start NetApp MetroCluster Tiebreaker software
services
Started NetApp MetroCluster Tiebreaker software services
Successfully upgraded NetApp MetroCluster Tiebreaker software to
version 1.6.
Cleaning up / removing...
   2:NetApp-MetroCluster-Tiebreaker-
So################################## [100%]
```

Install Tiebreaker 1.5

Configure admin access to ONTAP API and SSH

You can configure admin access to ONTAP API and SSH.

Steps

1. Create an admin user with ONTAP API access: `security login create -user-or-group-name mcctb -application ontapi -authentication-method password`
2. Create an admin user with SSH access: `security login create -user-or-group-name mcctb -application ssh -authentication-method password`
3. Verify that the new admin users are created: `security login show`
4. Repeat these steps on the partner cluster.

Administrator authentication and RBAC is implemented.

Install MetroCluster Tiebreaker 1.5 dependencies

Related information

Depending on your host Linux operating system, you must install a MySQL or MariaDB server before installing or upgrading the Tiebreaker software.

Steps

1. Install JDK
2. Install and configure Vault
3. Install MySQL or MariaDB server:

If the Linux host is	Then…
Red Hat Enterprise Linux 7/CentOS 7	Install MySQL Server 5.5.30 or later and 5.6.x versions on Red Hat Enterprise Linux 7 or CentOS 7
Red Hat Enterprise Linux 8	Install MariaDB server on Red Hat Enterprise Linux 8

Install JDK

You must install JDK on your host system before installing or upgrading the Tiebreaker software. Tiebreaker 1.5 and later supports OpenJDK 17, 18, or 19.

Steps

1. Log in as a "root" user or a sudo user that can change to advanced privilege mode.

```
login as: root
root@mcctb's password:
Last login: Fri Jan  8 21:33:00 2017 from host.domain.com
```

2. Check for available JDK versions:

```
yum search openjdk
```

3. Install JDK 17,18, or 19.

   The following command installs JDK 17:

   ```
   yum install java-17-openjdk
   ```

4. Verify the installation:

   ```
   java -version
   ```

   A successful installation displays the following output:

   ```
   openjdk version "17.0.2" 2022-01-18 LTS
   OpenJDK Runtime Environment 21.9 (build 17.0.2+8-LTS)
   OpenJDK 64-Bit Server VM 21.9 (build 17.0.2+8-LTS, mixed mode, sharing)
   ```

Install and configure Vault

If you do not have or want to use the local Vault server, you must install Vault. You can refer to this standard procedure for installing Vault, or refer to the Hashicorp installation instructions for alternative guidelines.

> If you have a Vault server in your network, you can configure the MetroCluster Tiebreaker host to use that Vault installation. If you do this, you do not need to install Vault on the host.

Steps

1. Navigate to the `/bin` directory:

   ```
   [root@mcctb] cd /bin
   ```

2. Download the Vault zip file.

   ```
   [root@mcctb /bin]#  curl -sO
   https://releases.hashicorp.com/vault/1.12.2/vault_1.12.2_linux_amd64.zip
   ```

3. Unzip the Vault file.

   ```
   [root@mcctb /bin]# unzip vault_1.12.2_linux_amd64.zip
   Archive:  vault_1.12.2_linux_amd64.zip
     inflating: vault
   ```

4. Verify the installation.

```
[root@mcctb /bin]# vault -version
Vault v1.12.2 (415e1fe3118eebd5df6cb60d13defdc01aa17b03), built 2022-11-
23T12:53:46Z
```

5. Navigate to the `/root` directory:

```
[root@mcctb /bin] cd /root
```

6. Create a Vault configuration file under the `/root` directory.

   At the `[root@mcctb ~]` prompt, copy and run the following command to create the `config.hcl` file:

```
# cat > config.hcl << EOF
 storage "file" {
  address = "127.0.0.1:8500"
  path    = "/mcctb_vdata/data"
 }
 listener "tcp" {
   address     = "127.0.0.1:8200"
   tls_disable = 1
 }
EOF
```

7. Start the Vault server:

```
[root@mcctb ~] vault server -config config.hcl &
```

8. Export the Vault address.

```
[root@mcctb ~]# export VAULT_ADDR="http://127.0.0.1:8200"
```

9. Initialize Vault.

```
[root@mcctb ~]# vault operator init
2022-12-15T14:57:22.113+0530 [INFO]  core: security barrier not
initialized
2022-12-15T14:57:22.113+0530 [INFO]  core: seal configuration missing,
not initialized
2022-12-15T14:57:22.114+0530 [INFO]  core: security barrier not
initialized
2022-12-15T14:57:22.116+0530 [INFO]  core: security barrier initialized:
```

```
stored=1 shares=5 threshold=3
2022-12-15T14:57:22.118+0530 [INFO]  core: post-unseal setup starting
2022-12-15T14:57:22.137+0530 [INFO]  core: loaded wrapping token key
2022-12-15T14:57:22.137+0530 [INFO]  core: Recorded vault version: vault
version=1.12.2 upgrade time="2022-12-15 09:27:22.137200412 +0000 UTC"
build date=2022-11-23T12:53:46Z
2022-12-15T14:57:22.137+0530 [INFO]  core: successfully setup plugin
catalog: plugin-directory=""
2022-12-15T14:57:22.137+0530 [INFO]  core: no mounts; adding default
mount table
2022-12-15T14:57:22.143+0530 [INFO]  core: successfully mounted backend:
type=cubbyhole version="" path=cubbyhole/
2022-12-15T14:57:22.144+0530 [INFO]  core: successfully mounted backend:
type=system version="" path=sys/
2022-12-15T14:57:22.144+0530 [INFO]  core: successfully mounted backend:
type=identity version="" path=identity/
2022-12-15T14:57:22.148+0530 [INFO]  core: successfully enabled
credential backend: type=token version="" path=token/ namespace="ID:
root. Path: "
2022-12-15T14:57:22.149+0530 [INFO]  rollback: starting rollback manager
2022-12-15T14:57:22.149+0530 [INFO]  core: restoring leases
2022-12-15T14:57:22.150+0530 [INFO]  expiration: lease restore complete
2022-12-15T14:57:22.150+0530 [INFO]  identity: entities restored
2022-12-15T14:57:22.150+0530 [INFO]  identity: groups restored
2022-12-15T14:57:22.151+0530 [INFO]  core: usage gauge collection is
disabled
2022-12-15T14:57:23.385+0530 [INFO]  core: post-unseal setup complete
2022-12-15T14:57:23.387+0530 [INFO]  core: root token generated
2022-12-15T14:57:23.387+0530 [INFO]  core: pre-seal teardown starting
2022-12-15T14:57:23.387+0530 [INFO]  rollback: stopping rollback manager
2022-12-15T14:57:23.387+0530 [INFO]  core: pre-seal teardown complete
Unseal Key 1: <unseal_key_1_id>
Unseal Key 2: <unseal_key_2_id>
Unseal Key 3: <unseal_key_3_id>
Unseal Key 4: <unseal_key_4_id>
Unseal Key 5: <unseal_key_5_id>

Initial Root Token: <initial_root_token_id>


Vault initialized with 5 key shares and a key threshold of 3. Please
securely
distribute the key shares printed above. When the Vault is re-sealed,
restarted, or stopped, you must supply at least 3 of these keys to
unseal it
before it can start servicing requests.
```

```
Vault does not store the generated root key. Without at least 3 keys to
reconstruct the root key, Vault will remain permanently sealed!

It is possible to generate new unseal keys, provided you have a quorum
of
existing unseal keys shares. See "vault operator rekey" for more
information.
```

You must record and store the key IDs and initial root token in a secure location for use later in the procedure.

10. Export the Vault root token.

```
[root@mcctb ~]#  export VAULT_TOKEN="<initial_root_token_id>"
```

11. Unseal Vault by using any three of the five keys that were created.

    You must run the `vault operator unseal` command for each of the three keys:

    a. Unseal vault by using the first key:

```
[root@mcctb ~]# vault operator unseal
Unseal Key (will be hidden):
Key                Value
---                -----
Seal Type          shamir
Initialized        true
Sealed             true
Total Shares       5
Threshold          3
Unseal Progress    1/3
Unseal Nonce       <unseal_key_1_id>
Version            1.12.2
Build Date         2022-11-23T12:53:46Z
Storage Type       file
HA Enabled         false
```

    b. Unseal vault by using the second key:

```
[root@mcctb ~]# vault operator unseal
Unseal Key (will be hidden):
Key                Value
---                -----
Seal Type          shamir
Initialized        true
Sealed             true
Total Shares       5
Threshold          3
Unseal Progress    2/3
Unseal Nonce       <unseal_key_2_id>
Version            1.12.2
Build Date         2022-11-23T12:53:46Z
Storage Type       file
HA Enabled         false
```

c. Unseal vault by using the third key:

```
[root@mcctb ~]# vault operator unseal
Unseal Key (will be hidden):
2022-12-15T15:15:00.980+0530 [INFO]  core.cluster-listener.tcp:
starting listener: listener_address=127.0.0.1:8201
2022-12-15T15:15:00.980+0530 [INFO]  core.cluster-listener: serving
cluster requests: cluster_listen_address=127.0.0.1:8201
2022-12-15T15:15:00.981+0530 [INFO]  core: post-unseal setup starting
2022-12-15T15:15:00.981+0530 [INFO]  core: loaded wrapping token key
2022-12-15T15:15:00.982+0530 [INFO]  core: successfully setup plugin
catalog: plugin-directory=""
2022-12-15T15:15:00.983+0530 [INFO]  core: successfully mounted
backend: type=system version="" path=sys/
2022-12-15T15:15:00.984+0530 [INFO]  core: successfully mounted
backend: type=identity version="" path=identity/
2022-12-15T15:15:00.984+0530 [INFO]  core: successfully mounted
backend: type=cubbyhole version="" path=cubbyhole/
2022-12-15T15:15:00.986+0530 [INFO]  core: successfully enabled
credential backend: type=token version="" path=token/ namespace="ID:
root. Path: "
2022-12-15T15:15:00.986+0530 [INFO]  rollback: starting rollback
manager
2022-12-15T15:15:00.987+0530 [INFO]  core: restoring leases
2022-12-15T15:15:00.987+0530 [INFO]  expiration: lease restore
complete
2022-12-15T15:15:00.987+0530 [INFO]  identity: entities restored
2022-12-15T15:15:00.987+0530 [INFO]  identity: groups restored
2022-12-15T15:15:00.988+0530 [INFO]  core: usage gauge collection is
disabled
2022-12-15T15:15:00.989+0530 [INFO]  core: post-unseal setup complete
2022-12-15T15:15:00.989+0530 [INFO]  core: vault is unsealed
Key             Value
---             -----
Seal Type       shamir
Initialized     true
Sealed          false
Total Shares    5
Threshold       3
Version         1.12.2
Build Date      2022-11-23T12:53:46Z
Storage Type    file
Cluster Name    vault-cluster
Cluster ID      <cluster_id>
HA Enabled      false
```

12. Verify that the Vault sealed status is false.

```
[root@mcctb ~]# vault status
Key             Value
---             -----
Seal Type       shamir
Initialized     true
Sealed          false
Total Shares    5
Threshold       3
Version         1.12.2
Build Date      2022-11-23T12:53:46Z
Storage Type    file
Cluster Name    vault-cluster
Cluster ID      <cluster_id>
HA Enabled      false
```

13. Configure the Vault service to start on boot.
    a. Run the following command: `cd /etc/systemd/system`

    ```
    [root@mcctb ~]#  cd /etc/systemd/system
    ```

    b. At the `[root@mcctb system]` prompt, copy and run the following command to create the Vault service file.

    ```
    # cat > vault.service << EOF
    [Unit]
    Description=Vault Service
    After=mariadb.service

    [Service]
    Type=forking
    ExecStart=/usr/bin/vault server -config /root/config.hcl &
    Restart=on-failure

    [Install]
    WantedBy=multi-user.target
    EOF
    ```

    c. Run the following command: `systemctl daemon-reload`

    ```
    [root@mcctb system]#  systemctl daemon-reload
    ```

    d. Run the following command: `systemctl enable vault.service`

```
[root@mcctb system]#  systemctl enable vault.service
Created symlink /etc/systemd/system/multi-
user.target.wants/vault.service → /etc/systemd/system/vault.service.
```

You are prompted to use this feature during the installation of MetroCluster Tiebreaker. If you want to change the method to unseal Vault, then you need to uninstall and reinstall the MetroCluster Tiebreaker software.

Install MySQL Server 5.5.30 or later and 5.6.x versions on Red Hat Enterprise Linux 7 or CentOS 7

You must install MySQL Server 5.5.30 or later and 5.6.x version on your host system before installing or upgrading the Tiebreaker software. For Red Hat Enterprise Linux 8, Install MariaDB server.

Steps

1. Log in as a root user or a sudo user that can change to advanced privilege mode.

```
login as: root
root@mcctb's password:
Last login: Fri Jan  8 21:33:00 2016 from host.domain.com
```

2. Add the MySQL repository to your host system:

```
[root@mcctb ~]# yum localinstall https://dev.mysql.com/get/mysql57-community-
release-el6-11.noarch.rpm
```

```
Loaded plugins: product-id, refresh-packagekit, security, subscription-
manager
Setting up Local Package Process
Examining /var/tmp/yum-root-LLUw0r/mysql-community-release-el6-
5.noarch.rpm: mysql-community-release-el6-5.noarch
Marking /var/tmp/yum-root-LLUw0r/mysql-community-release-el6-
5.noarch.rpm to be installed
Resolving Dependencies
--> Running transaction check
---> Package mysql-community-release.noarch 0:el6-5 will be installed
--> Finished Dependency Resolution
Dependencies Resolved
================================================================================
========
Package               Arch   Version
                                    Repository
Size
================================================================================
========
Installing:
mysql-community-release
                       noarch el6-5 /mysql-community-release-el6-
5.noarch 4.3 k
Transaction Summary
================================================================================
========
Install       1 Package(s)
Total size: 4.3 k
Installed size: 4.3 k
Is this ok [y/N]: y
Downloading Packages:
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : mysql-community-release-el6-5.noarch
1/1
  Verifying  : mysql-community-release-el6-5.noarch
1/1
Installed:
  mysql-community-release.noarch 0:el6-5
Complete!
```

3. Disable the MySQL 57 repository:

```
[root@mcctb ~]# yum-config-manager --disable mysql57-community
```

4. Enable the MySQL 56 repository:

```
[root@mcctb ~]# yum-config-manager --enable mysql56-community
```

5. Enable the repository:

```
[root@mcctb ~]# yum repolist enabled | grep "mysql.-community."
```

```
mysql-connectors-community           MySQL Connectors Community
21
mysql-tools-community                MySQL Tools Community
35
mysql56-community                    MySQL 5.6 Community Server
231
```

6. Install the MySQL Community server:

```
[root@mcctb ~]# yum install mysql-community-server
```

```
Loaded plugins: product-id, refresh-packagekit, security, subscription-
manager
This system is not registered to Red Hat Subscription Management. You
can use subscription-manager
to register.
Setting up Install Process
Resolving Dependencies
--> Running transaction check
 .....Output truncated.....
---> Package mysql-community-libs-compat.x86_64 0:5.6.29-2.el6 will be
obsoleting
--> Finished Dependency Resolution
Dependencies Resolved
================================================================================
======
Package                          Arch   Version       Repository
Size
================================================================================
======
Installing:
 mysql-community-client         x86_64  5.6.29-2.el6  mysql56-community
18  M
     replacing  mysql.x86_64 5.1.71-1.el6
 mysql-community-libs           x86_64  5.6.29-2.el6  mysql56-community
1.9 M
```

```
     replacing  mysql-libs.x86_64 5.1.71-1.el6
 mysql-community-libs-compat    x86_64  5.6.29-2.el6  mysql56-community
1.6 M
     replacing  mysql-libs.x86_64 5.1.71-1.el6
 mysql-community-server         x86_64  5.6.29-2.el6  mysql56-community
53  M
     replacing  mysql-server.x86_64 5.1.71-1.el6
Installing for dependencies:
mysql-community-common          x86_64  5.6.29-2.el6  mysql56-community
308 k

Transaction Summary
================================================================================
=======
Install       5 Package(s)
Total download size: 74 M
Is this ok [y/N]: y
Downloading Packages:
(1/5): mysql-community-client-5.6.29-2.el6.x86_64.rpm       |  18 MB
00:28
(2/5): mysql-community-common-5.6.29-2.el6.x86_64.rpm       | 308 kB
00:01
(3/5): mysql-community-libs-5.6.29-2.el6.x86_64.rpm         | 1.9 MB
00:05
(4/5): mysql-community-libs-compat-5.6.29-2.el6.x86_64.rpm  | 1.6 MB
00:05
(5/5): mysql-community-server-5.6.29-2.el6.x86_64.rpm       |  53 MB
03:42
 --------------------------------------------------------------------------
--------
Total                                              289 kB/s |  74 MB
04:24
warning: rpmts_HdrFromFdno: Header V3 DSA/SHA1 Signature, key ID
<key_id> NOKEY
Retrieving key from file:/etc/pki/rpm-gpg/RPM-GPG-KEY-mysql
Importing GPG key 0x5072E1F5:
 Userid : MySQL Release Engineering <mysql-build@oss.oracle.com>
Package: mysql-community-release-el6-5.noarch
         (@/mysql-community-release-el6-5.noarch)
 From   : file:/etc/pki/rpm-gpg/RPM-GPG-KEY-mysql
Is this ok [y/N]: y
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : mysql-community-common-5.6.29-2.el6.x86_64
```

```
....Output truncated....
1.el6.x86_64
7/8
  Verifying  : mysql-5.1.71-1.el6.x86_64
8/8
Installed:
  mysql-community-client.x86_64 0:5.6.29-2.el6
  mysql-community-libs.x86_64 0:5.6.29-2.el6
  mysql-community-libs-compat.x86_64 0:5.6.29-2.el6
  mysql-community-server.x86_64 0:5.6.29-2.el6

Dependency Installed:
  mysql-community-common.x86_64 0:5.6.29-2.el6

Replaced:
  mysql.x86_64 0:5.1.71-1.el6 mysql-libs.x86_64 0:5.1.71-1.el6
  mysql-server.x86_64 0:5.1.71-1.el6
Complete!
```

7. Start MySQL server:

```
[root@mcctb ~]# service mysqld start
```

```
Initializing MySQL database:  2016-04-05 19:44:38 0 [Warning] TIMESTAMP
with implicit DEFAULT value is deprecated. Please use
--explicit_defaults_for_timestamp server option (see documentation
for more details).
2016-04-05 19:44:38 0 [Note] /usr/sbin/mysqld (mysqld 5.6.29)
        starting as process 2487 ...
2016-04-05 19:44:38 2487 [Note] InnoDB: Using atomics to ref count
        buffer pool pages
2016-04-05 19:44:38 2487 [Note] InnoDB: The InnoDB memory heap is
disabled
....Output truncated....
2016-04-05 19:44:42 2509 [Note] InnoDB: Shutdown completed; log sequence
       number 1625987

PLEASE REMEMBER TO SET A PASSWORD FOR THE MySQL root USER!
To do so, start the server, then issue the following commands:

  /usr/bin/mysqladmin -u root password 'new-password'
  /usr/bin/mysqladmin -u root -h mcctb password 'new-password'

Alternatively, you can run:
  /usr/bin/mysql_secure_installation

which will also give you the option of removing the test
databases and anonymous user created by default.  This is
strongly recommended for production servers.
.....Output truncated.....
WARNING: Default config file /etc/my.cnf exists on the system
This file will be read by default by the MySQL server
If you do not want to use this, either remove it, or use the
--defaults-file argument to mysqld_safe when starting the server

                                                           [  OK  ]
Starting mysqld:                                           [  OK  ]
```

8. Confirm that MySQL server is running:

```
[root@mcctb ~]# service mysqld status
```

```
mysqld (pid  2739) is running...
```

9. Configure security and password settings:

```
[root@mcctb ~]# mysql_secure_installation
```

```
NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MySQL
      SERVERS IN PRODUCTION USE!  PLEASE READ EACH STEP CAREFULLY!

 In order to log into MySQL to secure it, we'll need the current
 password for the root user.  If you've just installed MySQL, and
 you haven't set the root password yet, the password will be blank,
 so you should just press enter here.

 Enter current password for root (enter for none):   <== on default
install
                                                        hit enter here
 OK, successfully used password, moving on...

 Setting the root password ensures that nobody can log into the MySQL
 root user without the proper authorization.

 Set root password? [Y/n] y
 New password:
 Re-enter new password:
 Password updated successfully!
 Reloading privilege tables..
  ... Success!

 By default, a MySQL installation has an anonymous user, allowing anyone
 to log into MySQL without having to have a user account created for
 them.  This is intended only for testing, and to make the installation
 go a bit smoother.  You should remove them before moving into a
 production environment.

 Remove anonymous users? [Y/n] y
  ... Success!

 Normally, root should only be allowed to connect from 'localhost'.
This
 ensures that someone cannot guess at the root password from the
network.

 Disallow root login remotely? [Y/n] y
  ... Success!

 By default, MySQL comes with a database named 'test' that anyone can
 access.  This is also intended only for testing, and should be removed
 before moving into a production environment.

 Remove test database and access to it? [Y/n] y
  - Dropping test database...
 ERROR 1008 (HY000) at line 1: Can't drop database 'test';
```

```
database doesn't exist
 ... Failed!  Not critical, keep moving...
 - Removing privileges on test database...
 ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n] y
 ... Success!

All done!  If you've completed all of the above steps, your MySQL
installation should now be secure.

Thanks for using MySQL!

Cleaning up...
```

10. Verify that the MySQL login is working:

```
[root@mcctb ~]# mysql -u root -p
```

```
Enter password: <configured_password>
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 17
Server version: 5.6.29 MySQL Community Server (GPL)

Copyright (c) 2000, 2016, Oracle and/or its affiliates. All rights
reserved.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.
mysql>
```

If the MySQL login is working, the output will end at the `mysql>` prompt.

Enable the MySQL autostart setting

You should verify that the autostart feature is turned on for the MySQL daemon. Turning on the MySQL daemon automatically restarts MySQL if the system on which the MetroCluster Tiebreaker software resides reboots. If the MySQL daemon is not running, the Tiebreaker software continues running, but it cannot be restarted and configuration changes cannot be made.

Step

1. Verify that MySQL is enabled to autostart when booted:

```
[root@mcctb ~]# systemctl list-unit-files mysqld.service
```

```
UNIT FILE          State
------------------ ----------
mysqld.service     enabled
```

If MySQL is not enabled to autostart when booted, see the MySQL documentation to enable the autostart feature for your installation.

Install MariaDB server on Red Hat Enterprise Linux 8

You must install MariaDB server on your host system before installing or upgrading the Tiebreaker software. For Red Hat Enterprise Linux 7 or CentOS 7, Install MySQL Server.

Before you begin

Your host system must be running on Red Hat Enterprise Linux (RHEL) 8.

Steps

1. Log in as a `root` user or a user that can sudo to advanced privilege mode.

```
login as: root
root@mcctb's password:
Last login: Fri Jan  8 21:33:00 2017 from host.domain.com
```

2. Install the MariaDB server:

```
[root@mcctb ~]# yum install mariadb-server.x86_64
```

```
[root@mcctb ~]# yum install mariadb-server.x86_64
Loaded plugins: fastestmirror, langpacks
 ...
 ...

================================================================================
===
 Package                       Arch    Version         Repository
Size
================================================================================
===
Installing:
mariadb-server                x86_64   1:5.5.56-2.el7   base
11 M
```

```
Installing for dependencies:

Transaction Summary
================================================================================
===
Install  1 Package  (+8 Dependent packages)
Upgrade             ( 1 Dependent package)

Total download size: 22 M
Is this ok [y/d/N]: y

Downloading packages:
No Presto metadata available for base warning:
/var/cache/yum/x86_64/7/base/packages/mariadb-libs-5.5.56-
2.el7.x86_64.rpm:
Header V3 RSA/SHA256 Signature,
key ID f4a80eb5: NOKEY] 1.4 MB/s | 3.3 MB  00:00:13 ETA
Public key for mariadb-libs-5.5.56-2.el7.x86_64.rpm is not installed
(1/10): mariadb-libs-5.5.56-2.el7.x86_64.rpm  | 757 kB  00:00:01
..
..
(10/10): perl-Net-Daemon-0.48-5.el7.noarch.rpm|  51 kB  00:00:01
--------------------------------------------------------------------------------
-----------------
Installed:
  mariadb-server.x86_64 1:5.5.56-2.el7

Dependency Installed:
mariadb.x86_64 1:5.5.56-2.el7
perl-Compress-Raw-Bzip2.x86_64 0:2.061-3.el7
perl-Compress-Raw-Zlib.x86_64 1:2.061-4.el7
perl-DBD-MySQL.x86_64 0:4.023-5.el7
perl-DBI.x86_64 0:1.627-4.el7
perl-IO-Compress.noarch 0:2.061-2.el7
perl-Net-Daemon.noarch 0:0.48-5.el7
perl-PlRPC.noarch 0:0.2020-14.el7

Dependency Updated:
  mariadb-libs.x86_64 1:5.5.56-2.el7
Complete!
```

3. Start MariaDB server:

```
[root@mcctb ~]# systemctl start mariadb
```

4. Verify that the MariaDB server has started:

```
[root@mcctb ~]# systemctl status mariadb
```

```
[root@mcctb ~]# systemctl status mariadb
mariadb.service - MariaDB database server
...
Nov 08 21:28:59 mcctb systemd[1]: Starting MariaDB database server...
...
Nov 08 21:29:01 mcctb systemd[1]: Started MariaDB database server.
```

5. Configure the security and password settings:

> When you are prompted for the root password, leave it empty and press enter to continue to configure the security and password settings.

```
[root@mcctb ~]# mysql_secure_installation
```

```
root@localhost systemd]# mysql_secure_installation

 NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MariaDB
      SERVERS IN PRODUCTION USE!  PLEASE READ EACH STEP CAREFULLY!

In order to log into MariaDB to secure it, we'll need the current
password for the root user.  If you've just installed MariaDB, and
you haven't set the root password yet, the password will be blank,
so you should just press enter here.

Enter current password for root (enter for none):
OK, successfully used password, moving on...

Setting the root password ensures that nobody can log into the MariaDB
root user without the proper authorisation.

Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
Reloading privilege tables..
 ... Success!


By default, a MariaDB installation has an anonymous user, allowing
anyone
to log into MariaDB without having to have a user account created for
them.  This is intended only for testing, and to make the installation
go a bit smoother.  You should remove them before moving into a
```

```
production environment.

Remove anonymous users? [Y/n] y
 ... Success!

Normally, root should only be allowed to connect from 'localhost'.  This
ensures that someone cannot guess at the root password from the network.

Disallow root login remotely? [Y/n] y
 ... Success!

By default, MariaDB comes with a database named 'test' that anyone can
access.  This is also intended only for testing, and should be removed
before moving into a production environment.

Remove test database and access to it? [Y/n] y
 - Dropping test database...
  ... Success!
 - Removing privileges on test database...
   ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n]

 ... Success!

Cleaning up...

All done!  If you've completed all of the above steps, your MariaDB
installation should now be secure.

Thanks for using MariaDB!
```

Enable the autostart setting for the MariaDB server

You should verify that the autostart feature is turned on for the MariaDB server. If you do not enable the autostart feature, and the system on which the MetroCluster Tiebreaker software resides has to reboot, then the Tiebreaker software continues running, but the MariaDB service cannot be restarted and configuration changes cannot be made.

Steps

1. Enable the autostart service:

```
[root@mcctb ~]# systemctl enable mariadb.service
```

2. Verify that MariaDB is enabled to autostart when booted:

```
[root@mcctb ~]# systemctl list-unit-files mariadb.service
```

```
UNIT FILE          State
------------------ ----------
mariadb.service    enabled
```

Install or upgrade to Tiebreaker 1.5

Perform a new installation or upgrade to Tiebreaker 1.5 on your host Linux operating system to monitor MetroCluster configurations.

About this task

- Your storage system must be running a supported version of ONTAP. See the Software requirements table for more details.
- You must have installed OpenJDK by using the `yum install java-x.x.x-openjdk` command. Tiebreaker 1.5 and later supports OpenJDK 17, 18, or 19.
- You can install MetroCluster Tiebreaker as a non-root user with sufficient administrative privileges to perform the Tiebreaker installation, create tables and users, and set the user password.

Steps

1. Download the MetroCluster Tiebreaker software and the MetroCluster_Tiebreaker_RPM_GPG key.

   The MetroCluster_Tiebreaker_RPM_GPG key is available to download from the same page that you download the software package for Tiebreaker 1.5 on the NetApp Support Site.

   MetroCluster Tiebreaker (Downloads) - NetApp Support Site

2. Log in to the host as the root user.
3. Create a non-root user and the `mcctbgrp` group.
   a. Create a non-root user and set the password.

      The following example commands create a non-root user named `mcctbuser1`:

      ```
      [root@mcctb ~]# useradd mcctbuser1
      [root@mcctb ~]# passwd mcctbuser1
      Changing password for user mcctbuser1.
      New password:
      Retype new password:
      passwd: all authentication tokens updated successfully.
      ```

   b. Create a group named `mcctbgrp`:

      ```
      [root@mcctb ~~]# groupadd mcctbgrp
      ```

c. Add the non-root user you created to the `mcctbgrp` group.

   The following command adds `mcctbuser1` to the `mcctbgrp` group:

   ```
   [root@mcctb ~]# usermod -a -G mcctbgrp mcctbuser1
   ```

4. Verify the RPM file.

   Run the following substeps from the directory containing the RPM key.

   a. Download and import the RPM key file:

   ```
   [root@mcctb ~]# rpm --import MetroCluster_Tiebreaker_RPM_GPG.key
   ```

   b. Verify the that the correct key was imported by checking the fingerprint.

      The following example shows a correct key fingerprint:

   ```
   root@mcctb:~/signing/mcctb-rpms# gpg --show-keys --with-fingerprint
   MetroCluster_Tiebreaker_RPM_GPG.key
   pub   rsa3072 2022-11-17 [SCEA] [expires: 2025-11-16]
         65AC 1562 E28A 1497 7BBD  7251 2855 EB02 3E77 FAE5
   uid                      MCCTB-RPM (mcctb RPM production signing)
   <mcctb-rpm@netapp.com>
   ```

   c. Verify the signature: `rpm --checksig NetApp-MetroCluster-Tiebreaker-Software-1.5-1.x86_64.rpm`

   ```
   NetApp-MetroCluster-Tiebreaker-Software-1.5-1.x86_64.rpm: digests OK
   ```

   ⓘ You must only proceed with installation after you have successfully verified the signature.

5. Install or upgrade the Tiebreaker software:

   ⓘ You can only upgrade to Tiebreaker version 1.5 when you are upgrading from Tiebreaker version 1.4. Upgrading from earlier versions to Tiebreaker 1.5 is not supported.

   Select the correct procedure depending on whether you're performing a new installation or upgrading an existing installation.

Perform a new installation

a. Retrieve and record the absolute path for Java:

```
[root@mcctb ~]# readlink -f /usr/bin/java
/usr/lib/jvm/java-19-openjdk-19.0.0.0.36-
2.rolling.el8.x86_64/bin/java
```

b. Run the following command: `rpm -ivh NetApp-MetroCluster-Tiebreaker-Software-1.5-1.x86_64.rpm`

The system displays the following output for a successful installation:

> When prompted during the installation, provide the non-root user that you previously created and assigned to the `mcctbgrp` group.

```
Verifying...
################################# [100%]
Preparing...
################################# [100%]
Updating / installing...
   1:NetApp-MetroCluster-Tiebreaker-
So################################# [100%]
Enter the absolute path for Java : /usr/lib/jvm/java-19-openjdk-
19.0.0.0.36-2.rolling.el8.x86_64/bin/java
Verifying if Java exists...
Found Java. Proceeding with the installation.
Enter host user account to use for the installation:
mcctbuser1
User account mcctbuser1 found. Proceeding with the installation
Enter database user name:
root
Please enter database password for root
Enter password:
Sealed          false
Do you wish to auto unseal vault(y/n)?y
Enter the key1:
Enter the key2:
Enter the key3:
Success! Uploaded policy: mcctb-policy
Error enabling approle auth: Error making API request.
URL: POST http://127.0.0.1:8200/v1/sys/auth/approle
Code: 400. Errors:
* path is already in use at approle/
Success! Enabled the kv secrets engine at: mcctb/
Success! Data written to: auth/approle/role/mcctb-app
Password updated successfully in the vault.
Synchronizing state of netapp-metrocluster-tiebreaker-
software.service with SysV service script with
/usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable netapp-
metrocluster-tiebreaker-software
Created symlink /etc/systemd/system/multi-
user.target.wants/netapp-metrocluster-tiebreaker-software.service
→ /etc/systemd/system/netapp-metrocluster-tiebreaker-
software.service.
Attempting to start NetApp MetroCluster Tiebreaker software
services
Started NetApp MetroCluster Tiebreaker software services
Successfully installed NetApp MetroCluster Tiebreaker software
version 1.5.
```

Upgrading an existing installation

a. Verify that a supported version of OpenJDK is installed and is the current Java version located on the host.

> For upgrades to Tiebreaker 1.5, you must install either OpenJDK version 17, 18, or 19.

```
[root@mcctb ~]# readlink -f /usr/bin/java
/usr/lib/jvm/java-19-openjdk-19.0.0.0.36-
2.rolling.el8.x86_64/bin/java
```

b. Verify the Vault service is unsealed and running: `vault status`

```
[root@mcctb ~]# vault status
Key             Value
---             -----
Seal Type       shamir
Initialized     true
Sealed          false
Total Shares    5
Threshold       3
Version         1.12.2
Build Date      2022-11-23T12:53:46Z
Storage Type    file
Cluster Name    vault
Cluster ID      <cluster_id>
HA Enabled      false
```

c. Upgrade the Tiebreaker software.

```
[root@mcctb ~]# rpm -Uvh NetApp-MetroCluster-Tiebreaker-Software-
1.5-1.x86_64.rpm
```

The system displays the following output for a successful upgrade:

```
Verifying...
################################# [100%]
Preparing...
################################# [100%]
Updating / installing...
   1:NetApp-MetroCluster-Tiebreaker-
So################################# [ 50%]

Enter the absolute path for Java : /usr/lib/jvm/java-19-openjdk-
19.0.0.0.36-2.rolling.el8.x86_64/bin/java
Verifying if Java exists...
Found Java. Proceeding with the installation.
Enter host user account to use for the installation:
mcctbuser1
User account mcctbuser1 found. Proceeding with the installation
Sealed          false
Do you wish to auto unseal vault(y/n)?y
Enter the key1:
Enter the key2:
Enter the key3:
Success! Uploaded policy: mcctb-policy
Error enabling approle auth: Error making API request.
URL: POST http://127.0.0.1:8200/v1/sys/auth/approle
Code: 400. Errors:
* path is already in use at approle/
Success! Enabled the kv secrets engine at: mcctb/
Success! Data written to: auth/approle/role/mcctb-app
Enter database user name : root
Please enter database password for root
Enter password:
Password updated successfully in the database.
Password updated successfully in the vault.
Synchronizing state of netapp-metrocluster-tiebreaker-
software.service with SysV service script with
/usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable netapp-
metrocluster-tiebreaker-software
Attempting to start NetApp MetroCluster Tiebreaker software
services
Started NetApp MetroCluster Tiebreaker software services
Successfully upgraded NetApp MetroCluster Tiebreaker software to
version 1.5.
Cleaning up / removing...
   2:NetApp-MetroCluster-Tiebreaker-
So################################# [100%]
```

If you enter the wrong MySQL root password, the Tiebreaker software indicates that it was installed successfully, but displays "Access denied" messages. To resolve the issue, you must uninstall the Tiebreaker software by using the `rpm -e` command, and then reinstall the software by using the correct MySQL root password.

6. Check the Tiebreaker connectivity to the MetroCluster software by opening an SSH connection from the Tiebreaker host to each of the node management LIFs and cluster management LIFs.

Related information

NetApp Support

Install Tiebreaker 1.4

Install MetroCluster Tiebreaker 1.4 dependencies

Depending on your host Linux operating system, install a MySQL or MariaDB server before installing or upgrading the Tiebreaker software.

Steps

1. Install JDK.
2. Install MySQL or MariaDB server:

If the Linux host is	Then…
Red Hat Enterprise Linux 7/CentOS 7	Install MySQL Server 5.5.30 or later and 5.6.x versions on Red Hat Enterprise Linux 7 or CentOS 7
Red Hat Enterprise Linux 8	Install MariaDB server on Red Hat Enterprise Linux 8

Install JDK

You must install JDK on your host system before installing or upgrading the Tiebreaker software. Tiebreaker 1.4 and earlier supports JDK 1.8.0. (JRE 8).

Steps

1. Log in as a "root" user.

```
login as: root
root@mcctb's password:
Last login: Fri Jan  8 21:33:00 2017 from host.domain.com
```

2. Install JDK 1.8.0:

```
yum install java-1.8.0-openjdk.x86_64
```

```
[root@mcctb ~]# yum install java-1.8.0-openjdk.x86_64
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
... shortened....
Dependencies Resolved

================================================================================
Package               Arch   Version                 Repository    Size
================================================================================
Installing:
 java-1.8.0-openjdk  x86_64  1:1.8.0.144-0.b01.el7_4 updates      238 k
 ..
 ..
Transaction Summary
================================================================================
Install  1 Package  (+ 4 Dependent packages)

Total download size: 34 M
Is this ok [y/d/N]: y

Installed:
java-1.8.0-openjdk.x86_64 1:1.8.0.144-0.b01.el7_4
Complete!
```

Install MySQL Server 5.5.30 or later and 5.6.x versions on Red Hat Enterprise Linux 7 or CentOS 7

You must install MySQL Server 5.5.30 or later and 5.6.x version on your host system before installing or upgrading the Tiebreaker software. For Red Hat Enterprise Linux 8, Install the MariaDB server.

Steps

1. Log in as a root user.

```
login as: root
root@mcctb's password:
Last login: Fri Jan  8 21:33:00 2016 from host.domain.com
```

2. Add the MySQL repository to your host system:

```
[root@mcctb ~]# yum localinstall https://dev.mysql.com/get/mysql57-community-
release-el6-11.noarch.rpm
```

```
Loaded plugins: product-id, refresh-packagekit, security, subscription-
manager
Setting up Local Package Process
Examining /var/tmp/yum-root-LLUw0r/mysql-community-release-el6-
5.noarch.rpm: mysql-community-release-el6-5.noarch
Marking /var/tmp/yum-root-LLUw0r/mysql-community-release-el6-
5.noarch.rpm to be installed
Resolving Dependencies
--> Running transaction check
---> Package mysql-community-release.noarch 0:el6-5 will be installed
--> Finished Dependency Resolution
Dependencies Resolved
================================================================================
========
Package               Arch   Version
                                    Repository
Size
================================================================================
========
Installing:
mysql-community-release
                       noarch el6-5 /mysql-community-release-el6-
5.noarch 4.3 k
Transaction Summary
================================================================================
========
Install       1 Package(s)
Total size: 4.3 k
Installed size: 4.3 k
Is this ok [y/N]: y
Downloading Packages:
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : mysql-community-release-el6-5.noarch
1/1
  Verifying  : mysql-community-release-el6-5.noarch
1/1
Installed:
  mysql-community-release.noarch 0:el6-5
Complete!
```

3. Disable the MySQL 57 repository:

```
[root@mcctb ~]# yum-config-manager --disable mysql57-community
```

4. Enable the MySQL 56 repository:

```
[root@mcctb ~]# yum-config-manager --enable mysql56-community
```

5. Enable the repository:

```
[root@mcctb ~]# yum repolist enabled | grep "mysql.-community."
```

```
mysql-connectors-community           MySQL Connectors Community
21
mysql-tools-community                MySQL Tools Community
35
mysql56-community                    MySQL 5.6 Community Server
231
```

6. Install the MySQL Community server:

```
[root@mcctb ~]# yum install mysql-community-server
```

```
Loaded plugins: product-id, refresh-packagekit, security, subscription-
manager
This system is not registered to Red Hat Subscription Management. You
can use subscription-manager
to register.
Setting up Install Process
Resolving Dependencies
--> Running transaction check
 .....Output truncated.....
---> Package mysql-community-libs-compat.x86_64 0:5.6.29-2.el6 will be
obsoleting
--> Finished Dependency Resolution
Dependencies Resolved
================================================================================
======
Package                          Arch   Version       Repository
Size
================================================================================
======
Installing:
 mysql-community-client         x86_64  5.6.29-2.el6  mysql56-community
18  M
     replacing  mysql.x86_64 5.1.71-1.el6
 mysql-community-libs           x86_64  5.6.29-2.el6  mysql56-community
1.9 M
```

```
     replacing  mysql-libs.x86_64 5.1.71-1.el6
 mysql-community-libs-compat    x86_64  5.6.29-2.el6  mysql56-community
1.6 M
     replacing  mysql-libs.x86_64 5.1.71-1.el6
 mysql-community-server         x86_64  5.6.29-2.el6  mysql56-community
53  M
     replacing  mysql-server.x86_64 5.1.71-1.el6
Installing for dependencies:
mysql-community-common          x86_64  5.6.29-2.el6  mysql56-community
308 k

Transaction Summary
================================================================================
=======
Install       5 Package(s)
Total download size: 74 M
Is this ok [y/N]: y
Downloading Packages:
(1/5): mysql-community-client-5.6.29-2.el6.x86_64.rpm       |  18 MB
00:28
(2/5): mysql-community-common-5.6.29-2.el6.x86_64.rpm       | 308 kB
00:01
(3/5): mysql-community-libs-5.6.29-2.el6.x86_64.rpm         | 1.9 MB
00:05
(4/5): mysql-community-libs-compat-5.6.29-2.el6.x86_64.rpm  | 1.6 MB
00:05
(5/5): mysql-community-server-5.6.29-2.el6.x86_64.rpm       |  53 MB
03:42
 --------------------------------------------------------------------------
--------
Total                                                289 kB/s |  74 MB
04:24
warning: rpmts_HdrFromFdno: Header V3 DSA/SHA1 Signature, key ID
<key_id> NOKEY
Retrieving key from file:/etc/pki/rpm-gpg/RPM-GPG-KEY-mysql
Importing GPG key 0x5072E1F5:
 Userid : MySQL Release Engineering <mysql-build@oss.oracle.com>
Package: mysql-community-release-el6-5.noarch
         (@/mysql-community-release-el6-5.noarch)
 From   : file:/etc/pki/rpm-gpg/RPM-GPG-KEY-mysql
Is this ok [y/N]: y
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : mysql-community-common-5.6.29-2.el6.x86_64
```

```
....Output truncated....
1.el6.x86_64
7/8
  Verifying  : mysql-5.1.71-1.el6.x86_64
8/8
Installed:
  mysql-community-client.x86_64 0:5.6.29-2.el6
  mysql-community-libs.x86_64 0:5.6.29-2.el6
  mysql-community-libs-compat.x86_64 0:5.6.29-2.el6
  mysql-community-server.x86_64 0:5.6.29-2.el6

Dependency Installed:
  mysql-community-common.x86_64 0:5.6.29-2.el6

Replaced:
  mysql.x86_64 0:5.1.71-1.el6 mysql-libs.x86_64 0:5.1.71-1.el6
  mysql-server.x86_64 0:5.1.71-1.el6
Complete!
```

7. Start MySQL server:

```
[root@mcctb ~]# service mysqld start
```

```
Initializing MySQL database:  2016-04-05 19:44:38 0 [Warning] TIMESTAMP
with implicit DEFAULT value is deprecated. Please use
--explicit_defaults_for_timestamp server option (see documentation
for more details).
2016-04-05 19:44:38 0 [Note] /usr/sbin/mysqld (mysqld 5.6.29)
        starting as process 2487 ...
2016-04-05 19:44:38 2487 [Note] InnoDB: Using atomics to ref count
        buffer pool pages
2016-04-05 19:44:38 2487 [Note] InnoDB: The InnoDB memory heap is
disabled
....Output truncated....
2016-04-05 19:44:42 2509 [Note] InnoDB: Shutdown completed; log sequence
       number 1625987

PLEASE REMEMBER TO SET A PASSWORD FOR THE MySQL root USER!
To do so, start the server, then issue the following commands:

  /usr/bin/mysqladmin -u root password 'new-password'
  /usr/bin/mysqladmin -u root -h mcctb password 'new-password'

Alternatively, you can run:
  /usr/bin/mysql_secure_installation

which will also give you the option of removing the test
databases and anonymous user created by default.  This is
strongly recommended for production servers.
.....Output truncated.....
WARNING: Default config file /etc/my.cnf exists on the system
This file will be read by default by the MySQL server
If you do not want to use this, either remove it, or use the
--defaults-file argument to mysqld_safe when starting the server

                                                           [  OK  ]
Starting mysqld:                                           [  OK  ]
```

8. Confirm that MySQL server is running:

```
[root@mcctb ~]# service mysqld status
```

```
mysqld (pid  2739) is running...
```

9. Configure security and password settings:

```
[root@mcctb ~]# mysql_secure_installation
```

```
NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MySQL
      SERVERS IN PRODUCTION USE!  PLEASE READ EACH STEP CAREFULLY!

 In order to log into MySQL to secure it, we'll need the current
 password for the root user.  If you've just installed MySQL, and
 you haven't set the root password yet, the password will be blank,
 so you should just press enter here.

 Enter current password for root (enter for none):   <== on default
install
                                                        hit enter here
 OK, successfully used password, moving on...

 Setting the root password ensures that nobody can log into the MySQL
 root user without the proper authorization.

 Set root password? [Y/n] y
 New password:
 Re-enter new password:
 Password updated successfully!
 Reloading privilege tables..
  ... Success!

 By default, a MySQL installation has an anonymous user, allowing anyone
 to log into MySQL without having to have a user account created for
 them.  This is intended only for testing, and to make the installation
 go a bit smoother.  You should remove them before moving into a
 production environment.

 Remove anonymous users? [Y/n] y
  ... Success!

 Normally, root should only be allowed to connect from 'localhost'.
This
 ensures that someone cannot guess at the root password from the
network.

 Disallow root login remotely? [Y/n] y
  ... Success!

 By default, MySQL comes with a database named 'test' that anyone can
 access.  This is also intended only for testing, and should be removed
 before moving into a production environment.

 Remove test database and access to it? [Y/n] y
  - Dropping test database...
 ERROR 1008 (HY000) at line 1: Can't drop database 'test';
```

```
database doesn't exist
 ... Failed!  Not critical, keep moving...
 - Removing privileges on test database...
 ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n] y
 ... Success!

All done!  If you've completed all of the above steps, your MySQL
installation should now be secure.

Thanks for using MySQL!

Cleaning up...
```

10. Verify that the MySQL login is working:

```
[root@mcctb ~]# mysql -u root -p
```

```
Enter password: <configured_password>
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 17
Server version: 5.6.29 MySQL Community Server (GPL)

Copyright (c) 2000, 2016, Oracle and/or its affiliates. All rights
reserved.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.
mysql>
```

When the MySQL login is working as expected, the output ends at the `mysql>` prompt.

Enable the MySQL autostart setting

You should verify that the autostart feature is turned on for the MySQL daemon. Turning on the MySQL daemon automatically restarts MySQL if the system on which the MetroCluster Tiebreaker software resides reboots. If the MySQL daemon is not running, the Tiebreaker software continues running, but it cannot be restarted and configuration changes cannot be made.

Step

1. Verify that MySQL is enabled to autostart when booted:

```
[root@mcctb ~]# systemctl list-unit-files mysqld.service
```

```
UNIT FILE          State
------------------ ----------
mysqld.service     enabled
```

If MySQL is not enabled to autostart when booted, see the MySQL documentation to enable the autostart feature for your installation.

Install MariaDB server on Red Hat Enterprise Linux 8

You must install MariaDB server on your host system before installing or upgrading the Tiebreaker software. For Red Hat Enterprise Linux 7 or CentOS 7, Install MySQL Server.

Before you begin

Your host system must be running on Red Hat Enterprise Linux (RHEL) 8.

Steps

1. Log in as a `root` user.

```
login as: root
root@mcctb's password:
Last login: Fri Jan  8 21:33:00 2017 from host.domain.com
```

2. Install the MariaDB server:

```
[root@mcctb ~]# yum install mariadb-server.x86_64
```

```
[root@mcctb ~]# yum install mariadb-server.x86_64
Loaded plugins: fastestmirror, langpacks
 ...
 ...

================================================================================
===
 Package                       Arch    Version         Repository
Size
================================================================================
===
Installing:
mariadb-server                x86_64   1:5.5.56-2.el7   base
11 M
```

```
Installing for dependencies:

Transaction Summary
================================================================================
===
Install  1 Package  (+8 Dependent packages)
Upgrade             ( 1 Dependent package)

Total download size: 22 M
Is this ok [y/d/N]: y

Downloading packages:
No Presto metadata available for base warning:
/var/cache/yum/x86_64/7/base/packages/mariadb-libs-5.5.56-
2.el7.x86_64.rpm:
Header V3 RSA/SHA256 Signature,
key ID f4a80eb5: NOKEY] 1.4 MB/s | 3.3 MB  00:00:13 ETA
Public key for mariadb-libs-5.5.56-2.el7.x86_64.rpm is not installed
(1/10): mariadb-libs-5.5.56-2.el7.x86_64.rpm  | 757 kB  00:00:01
..
..
(10/10): perl-Net-Daemon-0.48-5.el7.noarch.rpm|  51 kB  00:00:01
--------------------------------------------------------------------------------
-----------------
Installed:
  mariadb-server.x86_64 1:5.5.56-2.el7

Dependency Installed:
mariadb.x86_64 1:5.5.56-2.el7
perl-Compress-Raw-Bzip2.x86_64 0:2.061-3.el7
perl-Compress-Raw-Zlib.x86_64 1:2.061-4.el7
perl-DBD-MySQL.x86_64 0:4.023-5.el7
perl-DBI.x86_64 0:1.627-4.el7
perl-IO-Compress.noarch 0:2.061-2.el7
perl-Net-Daemon.noarch 0:0.48-5.el7
perl-PlRPC.noarch 0:0.2020-14.el7

Dependency Updated:
  mariadb-libs.x86_64 1:5.5.56-2.el7
Complete!
```

3. Start MariaDB server:

```
[root@mcctb ~]# systemctl start mariadb
```

4. Verify that the MariaDB server has started:

```
[root@mcctb ~]# systemctl status mariadb
```

```
[root@mcctb ~]# systemctl status mariadb
mariadb.service - MariaDB database server
...
Nov 08 21:28:59 mcctb systemd[1]: Starting MariaDB database server...
...
Nov 08 21:29:01 mcctb systemd[1]: Started MariaDB database server.
```

5. Configure the security and password settings:

> When you are prompted for the root password, leave it empty and press enter to continue to configure the security and password settings.

```
[root@mcctb ~]# mysql_secure_installation
```

```
root@localhost systemd]# mysql_secure_installation

 NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MariaDB
      SERVERS IN PRODUCTION USE!  PLEASE READ EACH STEP CAREFULLY!

In order to log into MariaDB to secure it, we'll need the current
password for the root user.  If you've just installed MariaDB, and
you haven't set the root password yet, the password will be blank,
so you should just press enter here.

Enter current password for root (enter for none):
OK, successfully used password, moving on...

Setting the root password ensures that nobody can log into the MariaDB
root user without the proper authorisation.

Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
Reloading privilege tables..
 ... Success!


By default, a MariaDB installation has an anonymous user, allowing
anyone
to log into MariaDB without having to have a user account created for
them.  This is intended only for testing, and to make the installation
go a bit smoother.  You should remove them before moving into a
```

```
production environment.

Remove anonymous users? [Y/n] y
 ... Success!

Normally, root should only be allowed to connect from 'localhost'.  This
ensures that someone cannot guess at the root password from the network.

Disallow root login remotely? [Y/n] y
 ... Success!

By default, MariaDB comes with a database named 'test' that anyone can
access.  This is also intended only for testing, and should be removed
before moving into a production environment.

Remove test database and access to it? [Y/n] y
 - Dropping test database...
  ... Success!
 - Removing privileges on test database...
   ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n]

  ... Success!

Cleaning up...

All done!  If you've completed all of the above steps, your MariaDB
installation should now be secure.

Thanks for using MariaDB!
```

Enable the autostart setting for the MariaDB server

You should verify that the autostart feature is turned on for the MariaDB server. If you do not enable the autostart feature, and the system on which the MetroCluster Tiebreaker software resides has to reboot, then the Tiebreaker software continues running, but the MariaDB service cannot be restarted and configuration changes cannot be made.

Steps

1. Enable the autostart service:

```
[root@mcctb ~]# systemctl enable mariadb.service
```

2. Verify that MariaDB is enabled to autostart when booted:

```
[root@mcctb ~]# systemctl list-unit-files mariadb.service
```

```
UNIT FILE          State
------------------ ----------
mariadb.service    enabled
```

Install or upgrade to Tiebreaker 1.4

Perform a new installation or upgrade to Tiebreaker 1.4 on your host Linux operating system to monitor MetroCluster configurations.

About this task

- Your storage system must be running a supported version of ONTAP. See the Software requirements table for more details.
- You must have installed OpenJDK by using the `yum install java-x.x.x-openjdk` command. Tiebreaker 1.4 and earlier supports JDK 1.8.0 (JRE 8).

Steps

1. Download the MetroCluster Tiebreaker software.

   MetroCluster Tiebreaker (Downloads) - NetApp Support Site

2. Log in to the host as the root user.
3. Install or upgrade the Tiebreaker software:

   Select the correct procedure depending on whether you're performing a new installation or upgrading an existing installation.

Perform a new installation

a. Install the Tiebreaker software by running the :

```
rpm -ivh NetApp-MetroCluster-Tiebreaker-Software-1.4-1.x86_64.rpm
```

The system displays the following output for a successful installation:

```
Verifying...
################################# [100%]
Preparing...
################################# [100%]
Updating / installing...
   1:NetApp-MetroCluster-Tiebreaker-
So################################# [100%]
Post installation start Fri Apr  5 02:28:09 EDT 2024
Enter MetroCluster Tiebreaker user password:

Please enter mysql root password when prompted
Enter password:
Synchronizing state of netapp-metrocluster-tiebreaker-
software.service with SysV service script with
/usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable netapp-
metrocluster-tiebreaker-software
Created symlink /etc/systemd/system/multi-
user.target.wants/netapp-metrocluster-tiebreaker-software.service
→ /etc/systemd/system/netapp-metrocluster-tiebreaker-
software.service.
Attempting to start NetApp MetroCluster Tiebreaker software
services
Started NetApp MetroCluster Tiebreaker software services
Enabled autostart of NetApp MetroCluster Tiebreaker software
daemon during boot
Created symbolic link for NetApp MetroCluster Tiebreaker software
CLI
Post installation end Fri Apr  5 02:28:22 EDT 2024
Successfully installed NetApp MetroCluster Tiebreaker software
version 1.4.
```

Upgrade an existing installation

a. Upgrade the Tiebreaker software.

```
[root@mcctb ~]# rpm -Uvh NetApp-MetroCluster-Tiebreaker-Software-
1.4-1.x86_64.rpm
```

The system displays the following output for a successful upgrade:

```
Verifying...
################################# [100%]
Preparing...
################################# [100%]
Upgrading NetApp MetroCluster Tiebreaker software....
Stopping NetApp MetroCluster Tiebreaker software services before
upgrade.
Updating / installing...
   1:NetApp-MetroCluster-Tiebreaker-
So################################# [ 50%]
Post installation start Mon Apr  8 06:29:51 EDT 2024
Synchronizing state of netapp-metrocluster-tiebreaker-
software.service with SysV service script with
/usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable netapp-
metrocluster-tiebreaker-software
Attempting to start NetApp MetroCluster Tiebreaker software
services
Started NetApp MetroCluster Tiebreaker software services
Enabled autostart of NetApp MetroCluster Tiebreaker software
daemon during boot
Created symbolic link for NetApp MetroCluster Tiebreaker software
CLI
Post upgrade end Mon Apr  8 06:29:51 EDT 2024
Successfully upgraded NetApp MetroCluster Tiebreaker software to
version 1.4.
Cleaning up / removing...
   2:NetApp-MetroCluster-Tiebreaker-
So################################# [100%]
```

If you enter the wrong MySQL root password, the Tiebreaker software indicates that it was installed successfully, but displays "Access denied" messages. To resolve the issue, you must uninstall the Tiebreaker software by using the `rpm -e` command, and then reinstall the software by using the correct MySQL root password.

4. Check the Tiebreaker connectivity to the MetroCluster software by opening an SSH connection from the Tiebreaker host to each of the node management LIFs and cluster management LIFs.

Related information

Upgrade the host where the Tiebreaker monitor is running

You might need to upgrade the host that the Tiebreaker monitor is running on.

Steps

1. Uninstall the Tiebreaker software:

   ```
   rpm -e NetApp-MetroCluster-Tiebreaker-Software
   ```

2. Upgrade the host. Refer to your host OS documentation for details.
3. Reinstall the Tiebreaker software.

   Perform a fresh installation of Tiebreaker by following the steps in Install the Tiebreaker software.

Configuring the Tiebreaker software

After installation of the Tiebreaker software, you can add or modify MetroCluster configurations, or remove them from the Tiebreaker software.

Launching the Tiebreaker software CLI

After installing the Tiebreaker software, you must launch its CLI to configure the software.

1. Launch the CLI from the prompt of the host on which you installed the software:

   ```
   netapp-metrocluster-tiebreaker-software-cli
   ```

2. After installation and during the first startup, enter the password for the Tiebreaker user to access the database. This is the password that you specified for the database user during installation.

Adding MetroCluster configurations

After installing the NetApp MetroCluster Tiebreaker software, you can add more MetroCluster configurations, one at a time.

You must have installed the MetroCluster configuration in an ONTAP environment and enabled the settings in the software.

1. Use the Tiebreaker command-line interface (CLI) monitor add command to add MetroCluster configurations.

   If you are using the host name, it must be the fully qualified domain name (FQDN).

   The following example shows the configuration of cluster_A:

```
NetApp MetroCluster Tiebreaker :> monitor add wizard
Enter monitor Name: cluster_A
Enter Cluster IP Address: 10.222.196.130
Enter Cluster Username: admin
Enter Cluster Password:
Enter Peer Cluster IP Address: 10.222.196.40
Enter Peer Cluster Username: admin
Enter Peer Cluster Password:
Successfully added monitor to NetApp MetroCluster Tiebreaker software.
```

2. Confirm that the MetroCluster configuration was added properly by using the Tiebreaker CLI `monitor show -status` command.

```
NetApp MetroCluster Tiebreaker :> monitor show -status
```

3. Disable the observer mode for the Tiebreaker software to automatically initiate a switchover after it detects a site failure:

   `monitor modify -monitor-name monitor_name -observer-mode false`

```
NetApp MetroCluster Tiebreaker :> monitor modify -monitor-name 8pack
-observer-mode false
Warning: If you are turning observer-mode to false, make sure to review
the 'risks and limitations'
as described in the MetroCluster Tiebreaker installation and
configuration.
Are you sure you want to enable automatic switchover capability for
monitor "8pack"? [Y/N]: y
```

Related information

Risks and limitations of using MetroCluster Tiebreaker in active mode

Commands for modifying MetroCluster Tiebreaker configurations

You can modify the MetroCluster configuration whenever you need to change the settings.

The Tiebreaker CLI monitor modify command can be used with any of the following options. You can confirm your changes with the monitor show -status command.

Option	Description
-monitor-name	Name of the MetroCluster configuration
-enable-monitor	Enables and disables monitoring of the MetroCluster configuration

-silent-period	Period in seconds for which the MetroCluster Tiebreaker software waits to confirm a site failure after detection
-observer-mode	Observer mode (true) provides monitoring only, and does not trigger a switchover if a site disaster occurs. Online mode (false) triggers a switchover if a site disaster occurs. • How the Tiebreaker software detects site failure • Risks and limitations of using MetroCluster Tiebreaker in active mode

The following example changes the silent period for the configuration.

```
NetApp MetroCluster Tiebreaker :> monitor modify -monitor-name cluster_A
-silent-period 15
Successfully modified monitor in NetApp MetroCluster Tiebreaker
software.
```

The Tiebreaker CLI `debug` command can be used to change the logging mode.

Command	Description
debug status	Displays the status of the debug mode
debug enable	Enables the debug mode for logging
debug disable	Disables the debug mode for logging

In systems running Tiebreaker 1.4 and earlier, the Tiebreaker CLI `update-mcctb-password` command can be used to update the user password. This command is deprecated in Tiebreaker 1.5 and later.

Command	Description
update-mcctb-password	The user password is successfully updated

Removing MetroCluster configurations

You can remove the MetroCluster configuration that is being monitored by the Tiebreaker software when you no longer want to monitor a MetroCluster configuration.

1. Use the Tiebreaker CLI `monitor remove` command to remove the MetroCluster configuration.

   In the following example, “cluster_A” is removed from the software:

```
NetApp MetroCluster Tiebreaker :> monitor remove -monitor-name cluster_A
Successfully removed monitor from NetApp MetroCluster Tiebreaker
software.
```

2. Confirm that the MetroCluster configuration is removed properly by using the Tiebreaker CLI `monitor show -status` command.

```
NetApp MetroCluster Tiebreaker :> monitor show -status
```

Configuring SNMP settings for Tiebreaker software

To use SNMP with the Tiebreaker software, you must configure the SNMP settings.

1. Use the Tiebreaker CLI `snmp config wizard` command to add MetroCluster configurations.

   Only one SNMP trap host is currently supported.

   The following example shows the configuration of an SNMP receiver that supports SNMP V3 with an IP address of 10.240.45.66 and port number 162 for trap messages. The Tiebreaker software is ready to send traps to the SNMP receiver that you specified.

```
NetApp MetroCluster Tiebreaker :> snmp config wizard
Enter SNMP Version[V1/V3]: v3
Enter SNMP Host: 10.240.45.66
Enter SNMP Port: 162
Enter SNMP V3 Security Name: v3sec
Enter SNMP V3 Authentication password:
Enter SNMP V3 Privacy password:
Engine ID : 8000031504932eff571825192a6f1193b265e24593
Successfully added SNMP properties to NetApp MetroCluster Tiebreaker
software.
```

   You should configure SNMPv3 because SNMPv1 is not secure. Ensure that the default community string is **NOT** set to public.

2. Verify that the SNMP settings are configured:

   `snmp config test`

   The following example shows that the Tiebreaker software can send an SNMP trap for the event TEST_SNMP_CONFIG:

```
NetApp MetroCluster Tiebreaker :> snmp config test
Sending SNMP trap to localhost. Version : V1.
Successfully sent SNMP trap for event TEST_SNMP_CONFIG
NetApp MetroCluster Tiebreaker :>
```

Monitoring the MetroCluster configuration

MetroCluster Tiebreaker software automates the recovery process by enabling you to monitor the MetroCluster configuration status, evaluate SNMP events and traps that are sent to NetApp customer support, and view the status of monitoring operations.

Configuring AutoSupport

By default, AutoSupport messages are sent to NetApp a week after installation of the Tiebreaker software. Events that trigger AutoSupport notification include Tiebreaker software panics, detection of disaster conditions on MetroCluster configurations, or an unknown MetroCluster configuration status.

Before you begin

You must have a direct access for setting up AutoSupport messages.

Steps

1. Use the Tiebreaker CLI autosupport command with any of the following options:

Option	Description
-invoke	Sends an AutoSupport message to customer support
-configure wizard	Wizard to configure proxy server credentials
-delete configuration	Deletes the proxy server credentials
--enable	Enables AutoSupport notification (This is the default.)
-disable	Disables AutoSupport notification
-show	Displays AutoSupport status

The following example shows that AutoSupport is enabled or disabled and the destination to which the AutoSupport content is posted:

```
NetApp MetroCluster Tiebreaker :> autosupport enable
AutoSupport already enabled.

NetApp MetroCluster Tiebreaker :> autosupport disable
AutoSupport status            : disabled
Proxy Server IP Address       : 10.234.168.79
Proxy Server Port Number      : 8090
Proxy Server Username         : admin
AutoSupport destination       :
https://support.netapp.com/asupprod/post/1.0/postAsup

NetApp MetroCluster Tiebreaker :> autosupport enable
AutoSupport status            : enabled
Proxy Server IP Address       : 10.234.168.79
Proxy Server Port Number      : 8090
Proxy Server Username         : admin
AutoSupport destination       :
https://support.netapp.com/asupprod/post/1.0/postAsup

NetApp MetroCluster Tiebreaker :> autosupport invoke
AutoSupport transmission      : success
Proxy Server IP Address       : 10.234.168.79
Proxy Server Port Number      : 8090
Proxy Server Username         : admin
AutoSupport destination       :
https://support.netapp.com/asupprod/post/1.0/postAsup
```

The following example shows AutoSupport configured by means of an authenticated proxy server, using an IP address and port number:

```
NetApp MetroCluster Tiebreaker :> autosupport configure wizard
Enter Proxy Server IP address :  10.234.168.79
Enter Proxy Server port number :  8090
Enter Proxy Server Username :  admin
Enter Proxy Server Password : 123abc
Autosupport configuration updated successfully.
```

The following example shows the deletion of an AutoSupport configuration:

```
NetApp MetroCluster Tiebreaker :> autosupport delete configuration
Autosupport configuration deleted successfully.
```

SNMP events and traps

NetApp MetroCluster Tiebreaker software uses SNMP traps to notify you of significant events. These traps are part of the NetApp MIB file. Each trap contains the following information: trap name, severity, impact level, timestamp, and message.

Event name	Event detail	Trap number
MetroCluster Tie-Breaker is unable to reach the MetroCluster configuration	Warns the administrator that the software cannot detect a disaster. This event occurs when both clusters are not reachable.	25000
MetroCluster Tie-Breaker is unable to reach cluster	Warns the administrator that the software cannot reach one of the clusters.	25001
MetroCluster Tie-Breaker detected disaster at cluster	Notifies the administrator that the software detects a site failure. A notification will be delivered.	25002
All links between partner cluster are severed.	The software detects that both clusters are reachable, but all the network paths between the two clusters are down, and the clusters cannot communicate with each other.	25005
SNMP Test Trap	SNMP configuration can now be tested by running the snmp config test command.	25006

Displaying the status of monitoring operations

You can display the overall status of monitoring operations for a MetroCluster configuration.

Step

1. Use the Tiebreaker CLI monitor show command to display the status of a MetroCluster operation with any of the following options:

Option	Description
-monitor-name	Displays the status for the specified monitor name
-operation-history	Displays up to 10 monitoring operations that were last performed on a cluster
-stats	Displays the statistics related to the specified cluster
-status	Displays the status of the specified cluster **Note:** The MetroCluster Tiebreaker software might take up to 10 minutes to reflect the completion status of operations such as heal aggregates, heal roots, or switchback.

   The following example shows that the clusters cluster_A and cluster_B are connected and healthy:

```
NetApp MetroCluster Tiebreaker:> monitor show -status
MetroCluster: cluster_A
    Disaster: false
    Monitor State: Normal
    Observer Mode: true
    Silent Period: 15
    Override Vetoes: false
    Cluster: cluster_Ba(UUID:4d9ccf24-080f-11e4-9df2-00a098168e7c)
        Reachable: true
        All-Links-Severed: FALSE
            Node: mcc5-a1(UUID:78b44707-0809-11e4-9be1-e50dab9e83e1)
                Reachable: true
                All-Links-Severed: FALSE
                State: normal
            Node: mcc5-a2(UUID:9a8b1059-0809-11e4-9f5e-8d97cdec7102)
                Reachable: true
                All-Links-Severed: FALSE
                State: normal
    Cluster: cluster_B(UUID:70dacd3b-0823-11e4-a7b9-00a0981693c4)
        Reachable: true
        All-Links-Severed: FALSE
            Node: mcc5-b1(UUID:961fce7d-081d-11e4-9ebf-2f295df8fcb3)
                Reachable: true
                All-Links-Severed: FALSE
                State: normal
            Node: mcc5-b2(UUID:9393262d-081d-11e4-80d5-6b30884058dc)
                Reachable: true
                All-Links-Severed: FALSE
                State: normal
```

In the following example, the last seven operations that were run on cluster_B are displayed:

```
NetApp MetroCluster Tiebreaker:> monitor show -operation-history
MetroCluster: cluster_B
 [ 2014-09-15 04:48:32.274 ] MetroCluster Monitor is initialized
 [ 2014-09-15 04:48:32.278 ] Started Discovery and validation of
MetroCluster Setup
 [ 2014-09-15 04:48:35.078 ] Discovery and validation of MetroCluster
Setup succeeded. Started monitoring.
 [ 2014-09-15 04:48:35.246 ] NetApp MetroCluster Tiebreaker software is
able to reach cluster "mcc5a"
 [ 2014-09-15 04:48:35.256 ] NetApp MetroCluster Tiebreaker software is
able to reach cluster "mcc5b"
 [ 2014-09-15 04:48:35.298 ] Link to remote DR cluster is up for cluster
"mcc5a"
 [ 2014-09-15 04:48:35.308 ] Link to remote DR cluster is up for cluster
"mcc5b"
```

Displaying MetroCluster configuration information

You can display the monitor name and IP address of all instances of MetroCluster configurations in the Tiebreaker software.

Step

1. Use the Tiebreaker CLI configuration show command to display the MetroCluster configuration information.

   The following example shows the information for clusters cluster_A and cluster_B:

```
MetroCluster: North America
    Monitor Enabled: true
    ClusterA name: cluster_A
    ClusterA IpAddress: 10.222.196.130
    ClusterB name: cluster_B
    ClusterB IpAddress: 10.222.196.140
```

Creating dump files

You save the overall status the Tiebreaker software to a dump file for debugging purposes.

Step

1. Use the Tiebreaker CLI monitor dump -status command to create a dump file of the overall status of all MetroCluster configurations.

   The following example shows the successful creation of the /var/log/netapp/mcctb/metrocluster-tiebreaker-status.xml dump file:

```
NetApp MetroCluster Tiebreaker :> monitor dump -status
MetroCluster Tiebreaker status successfully dumped in file
/var/log/netapp/mcctb/metrocluster-tiebreaker-status.xml
```

Risks and limitations of using MetroCluster Tiebreaker in active mode

Switchover upon detection of a site failure happens automatically, with MetroCluster Tiebreaker in active mode. This mode can be used to supplement the ONTAP/FAS automatic switchover capability.

When you implement MetroCluster Tiebreaker in active mode, the following known issues might lead to data loss:

- When the inter-site link fails, the controllers on each site continue to serve the clients. However, the controllers will not be mirrored. Failure of a controller in one site is identified as a site failure and the MetroCluster Tiebreaker initiates a switchover. The data which is not mirrored after the inter-site link failure with the remote site will be lost.
- A switchover occurs when the aggregates in remote site are in degraded state. The data will not be replicated if the switchover has occurred before aggregate resync.
- A remote storage failure occurs when switchover is in progress.
- The nonvolatile memory (NVRAM or NVMEM, depending on the platform model) in the storage controllers is not mirrored to the remote disaster recovery (DR) partner on the partner site.
- Metadata is lost if the cluster peering network is down for an extended period and the metadata volumes are not online after a switchover.

You might encounter scenarios that are not mentioned. NetApp is not responsible for any damages that may arise out of use of MetroCluster Tiebreaker in active mode. Do not use MetroCluster Tiebreaker in active mode if the risks and limitations are not acceptable to you.

Firewall requirements for MetroCluster Tiebreaker

MetroCluster Tiebreaker uses a number of ports to communicate with specific services.

The following table lists the ports that you must allow in your firewall:

Port/services	Source	Destination	Purpose
443 / TCP	Tiebreaker	Internet	Sending AutoSupport messages to NetApp
22 / TCP	Management host	Tiebreaker	Tiebreaker Management
443 / TCP	Tiebreaker	Cluster management LIFs	Secure communications to cluster via HTTP (SSL)

22 / TCP	Tiebreaker	Cluster management LIFs	Secure communications to cluster via SSH
443 / TCP	Tiebreaker	Node management LIFs	Secure communications to node via HTTP (SSL)
22 / TCP	Tiebreaker	Node management LIFs	Secure communications to node via SSH
162 / UDP	Tiebreaker	SNMP trap host	Used to send alert notification SNMP traps
ICMP (ping)	Tiebreaker	Cluster management LIFs	Check if cluster IP is reachable
ICMP (ping)	Tiebreaker	Node management LIFs	Check if node IP is reachable

Event log files for MetroCluster Tiebreaker

The event log file contains a log of all the actions performed by the MetroCluster Tiebreaker software.

The Tiebreaker software performs the following actions:

- Detects site disasters
- Detects configuration changes related to the database, other Tiebreaker monitors, or the MetroCluster Tiebreaker software
- Detects SSH connections and disconnections
- Discovers MetroCluster configurations

These actions are logged in the event log file in the following format:

<timestamp> <severity/log level> <thread-id> <module>

Example

```
2022-09-07 06:14:30,797 INFO  [MCCTBCommandServer-16] [SslSupport]
Successfully initiated SSL context. Protocol used is TLSv1.3.
2022-09-07 06:14:34,137 INFO  [MCCTBCommandServer-16] [DataBase]
Successfully read MCCTB database.
2022-09-07 06:14:34,137 INFO  [MCCTBCommandServer-16]
[ConfigurationMonitor] Debug mode disabled.
```

Where to find additional information

You can learn more about MetroCluster configuration and operation.

MetroCluster and miscellaneous information

Information	Subject
MetroCluster Documentation	• All MetroCluster information
NetApp Technical Report 4375: NetApp MetroCluster for ONTAP 9.3	• A technical overview of the MetroCluster configuration and operation. • Best practices for MetroCluster configuration.
Fabric-attached MetroCluster installation and configuration	• Fabric-attached MetroCluster architecture • Cabling the configuration • Configuring the FC-to-SAS bridges • Configuring the FC switches • Configuring the MetroCluster in ONTAP
Stretch MetroCluster installation and configuration	• Stretch MetroCluster architecture • Cabling the configuration • Configuring the FC-to-SAS bridges • Configuring the MetroCluster in ONTAP
MetroCluster IP installation and configuration	• MetroCluster IP architecture • Cabling the MetroCluster IP configuration • Configuring the MetroCluster in ONTAP

Maintain the MetroCluster components	• Guidelines for maintenance in a MetroCluster configuration • Hardware replacement or upgrade and firmware upgrade procedures for FC-to-SAS bridges and FC switches • Hot-adding a disk shelf in a fabric-attached or stretch MetroCluster configuration • Hot-removing a disk shelf in a fabric-attached or stretch MetroCluster configuration • Replacing hardware at a disaster site in a fabric-attached or stretch MetroCluster configuration • Expanding a two-node fabric-attached or stretch MetroCluster configuration to a four-node MetroCluster configuration. • Expanding a four-node fabric-attached or stretch MetroCluster configuration to an eight-node MetroCluster configuration.
Active IQ Unified Manager documentation NetApp Documentation: Product Guides and Resources	• Monitoring the MetroCluster configuration and performance
Copy-based transition	• Transitioning data from 7-Mode storage systems to clustered storage systems

Copyright information

Trademark information