Install and Configure MetroCluster Tiebreaker

ONTAP MetroCluster

NetApp
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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

The Tiebreaker software resides on a Linux host. You need the Tiebreaker software only if you want to monitor two clusters and the connectivity status between them from a third site. Doing so 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.

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

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.

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.

Installing the Tiebreaker software

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.

The MetroCluster software must be installed and configured.

System requirements for installing or upgrading Tiebreaker software

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 on your local computer to monitor the MetroCluster configuration.

The MetroCluster Tiebreaker software has the following monitoring capabilities and requirements:

- No requirement for a special configuration for the different MetroCluster configurations.
- Monitoring capabilities for up to 15 MetroCluster configurations simultaneously.

  You should have only one MetroCluster Tiebreaker monitor per MetroCluster configuration to avoid any conflict with multiple Tiebreaker monitors.

- Support for a combination of MetroCluster IP, MetroCluster FC, and stretch MetroCluster configurations.
- Hardware and software:
  - ONTAP 8.3.x, 9.0, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9.1, 9.10.1, or 9.11.1.
- Red Hat Enterprise Linux 7 to 7.9 or 8 to 8.5, or CentOS 7 to 7.9 64-bit (physical installation or virtual machine)
  - MariaDB 5.5.52.x/MySQL Server 5.6x
  - 4 GB RAM
  - Open Java Runtime Environment 8
- Disk capacity: 8 GB
- User: Root access
- Firewall:
  - Direct access for setting up AutoSupport messages
  - SSH (port 22/TCP), HTTPS (port 443/TCP), and ping (ICMP)
- Installation on FIPS-enabled hosts is not supported.

Installing MetroCluster Tiebreaker dependencies

You must install a MySQL or MariaDB server depending on the Linux operating system that is your host before installing or upgrading the Tiebreaker software.

Steps

1. Install Java Runtime Environment.

   Installing Java Runtime Environment 1.8

2. Install MySQL or MariaDB server:

If the Linux host is	Then…
Red Hat Enterprise Linux 7/CentOS 7	Install MySQL Installing 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 Installing MariaDB server on Red Hat Enterprise Linux 8

Installing Java Runtime Environment 1.8

You must install Java Runtime Environment 1.8 on your host system before installing or upgrading the Tiebreaker software.

Steps

1. Log in as `root` to the host system.

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

2. Install Java Runtime Environment 1.8:

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

Installing 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.

Steps

1. Log in as `root` to the host system.

```
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
5072e1f5: 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)

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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.

Enabling the MySQL autostart setting

You should ensure that the autostart feature is turned on for the MySQL deamon. 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.

Installing MariaDB server on Red Hat Enterprise Linux 8

You must install MariaDB server on your host system before installing or upgrading the Tiebreaker software.

Before you begin

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

Steps

1. Log in as `root` to the host system.

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

2. Install 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 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 scspr0523972001 systemd[1]: Started MariaDB database
server.
```

Ensure that the "enable autostart" setting is turned on for MariaDB. See Enabling the autostart setting for the MariaDB.

5. Configure the security and password settings:

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

```
[root@mcctb ~]# mysql_secure_installation
NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MariaDB
SERVERS IN PRODUCTION USE! PLEASE READ EACH STEP CAREFULLY!
Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
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!
Remove test database and access to it? [Y/n] y
- Dropping test database...
... Success!
- Removing privileges on test database...
... Success!
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!
```

Enabling the autostart setting for the MariaDB

You should ensure that the autostart feature is turned on for the MariaDB. 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
```

Installing or upgrading the software package

You must install or upgrade the MetroCluster Tiebreaker software on your local computer to monitor MetroCluster configurations.

- Your storage system must be running ONTAP 8.3.x or later.
- You must have installed OpenJDK by using the `yum install java-1.8.0-openjdk` command.

Steps

1. Download the latest version of the MetroCluster Tiebreaker software. This example uses version 1.21P3-1.

   NetApp Support

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

If you are…	Issue this command…

Performing a new installation	`rpm -ivh NetApp-MetroCluster-Tiebreaker-Software-1.21P3-1x86_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 Wed Oct 20 09:59:19 EDT 2021`
	`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 Wed Oct 20 09:59:28 EDT 2021`
	`Successfully installed NetApp MetroCluster Tiebreaker software version 1.21P3.`

Upgrading an existing installation	`rpm -Uvh NetApp-MetroCluster-Tiebreaker-Software-1.21P3-1.x86_64.rpm`
	
	The system displays the following output for a successful upgrade:
	
	`MetroCluster-Tiebreaker-Software-1.21P3-1.x86_64.rpm`
	`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 Wed Oct 20 09:57:49 EDT 2021`
	`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`
	`Starting NetApp MetroCluster Tiebreaker software services. Retry: 1`
	`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 Wed Oct 20 09:57:52 EDT 2021`
	`Successfully upgraded NetApp MetroCluster Tiebreaker software to version 1.21P3.`
	`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. Verify 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

Upgrading the host where the Tiebreaker monitor is running

You can upgrade the host on which the Tiebreaker monitor is running with minimal disruption if you place the monitors in observer mode before the upgrade.

Steps

1. Verify that the monitors are in observer mode:

```
monitor show –status
```

```
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
```

2. Change all of the monitors to observer mode.

```
NetApp MetroCluster Tiebreaker :> monitor modify -monitor-name
_monitor_name_ -observer-mode true
```

3. To upgrade the Tiebreaker host, follow all of the steps in the following procedure:

   Installing or upgrading the software package

4. Disable observer mode to move all of the monitors back to online mode.

```
NetApp MetroCluster Tiebreaker :> monitor modify -monitor-name
_monitor_name_ -observer-mode false
```

Selecting the NTP source for the Tiebreaker software

You should use a local Network Time Protocol (NTP) source for the Tiebreaker software. It should not use the same source as the MetroCluster sites that the Tiebreaker software monitors.

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
   ```

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

The Tiebreaker CLI `update-mcctb-password` command can be used to update the user password.

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 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 V1 with an IP address of 10.222.210.234, port number 162 for trap messages, and the community string set to public:

```
NetApp MetroCluster Tiebreaker :> snmp config wizard
Enter SNMP Version [V1/V3]: V1
Enter SNMP Host: 10.222.210.234
Enter SNMP Port: 162
Enter SNMP V1 Community: public
Successfully added SNMP properties to NetApp MetroCluster Tiebreaker
software.
NetApp MetroCluster Tiebreaker :>
```

The Tiebreaker software is ready to send traps to the SNMP receiver that you specified.

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

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