



Installing the Tiebreaker software

ONTAP MetroCluster

aherbin, Amanda Stroman, netapp-ivanad, ntap-bmegan, zachary wambold
April 21, 2021

Table of Contents

- Installing the Tiebreaker software 1
 - System requirements for installing or upgrading Tiebreaker software 1
 - Installing MetroCluster Tiebreaker dependencies 2
 - Installing or upgrading the software package 13
 - Upgrading the host where the Tiebreaker monitor is running 17
 - Selecting the NTP source for the Tiebreaker software 19

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 and 9.8
- Red Hat Enterprise Linux 7 to 7.6 or CentOS 7 to 7.6 64-bit (physical installation or virtual machine)
 - MariaDB 5.5.52.x
 - 4 GB RAM
 - Open Java Runtime Environment 8
- Red Hat Enterprise Linux 6.4 to 6.10 or CentOS 6.4 to 6.10 64-bit (physical installation or virtual machine)
 - MySQL Server 5.6.x
 - 2 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 6/CentOS 6	<ol style="list-style-type: none">a. Install MySQL Installing MySQL Server 5.5.30 or later and 5.6.x versions on Red Hat Enterprise Linux 6 or CentOS 6
Red Hat Enterprise Linux 7/CentOS 7	<ol style="list-style-type: none">a. Install MariaDB Installing MariaDB server on Red Hat Enterprise Linux 7 or CentOS 7

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 6 or CentOS 6

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
5072elf5: 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

```
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 authorisation.

```
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.

Enabling the MySQL autostart setting

You should ensure 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.

See the MySQL documentation to enable autostart on your installation.

Installing MariaDB server on Red Hat Enterprise Linux 7 or CentOS 7

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

Your host system must be running on Red Hat Enterprise Linux (RHEL) 7 or CentOS 7.

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`

```
[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.

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!
```

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 NetApp-MetroCluster-Tiebreaker-Software-1.21P3-1.x86_64.rpm file.

[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	<p data-bbox="842 153 1484 226">rpm -ivh NetApp-MetroCluster-Tiebreaker-Software-1.21P3-1.x86_64.rpm</p> <p data-bbox="842 258 1484 321">The system displays the following output for a successful installation:</p> <pre data-bbox="867 384 1468 1948"> [root@scspr0523972001 mcctb]# rpm -ivh NetApp-MetroCluster- Tiebreaker-Software-1.21P3- 1.x86_64.rpm Preparing... ##### [100%] Updating / installing... 1:NetApp-MetroCluster- Tiebreaker- So##### ## [100%] Post installation start Wed Sep 5 05:56:18 EDT 2018 Enter MetroCluster Tiebreaker user password: Please enter mysql root password when prompted Enter password: Created symlink from /etc/systemd/system/multi- user.target.wants/netapp- metrocluster-tiebreaker- software.service to /etc/systemd/system/netapp- metrocluster-tiebreaker- software.service. Enabled autostart of NetApp MetroCluster Tiebreaker software daemon during boot Created symbolic link for NetApp MetroCluster Tiebreaker software CLI Post installation end Wed Sep 5 05:56:24 EDT 2018 Successfully installed NetApp MetroCluster Tiebreaker software version 1.21P3 </pre>

If you are...	Issue this command...
Upgrading an existing installation	<p data-bbox="842 153 1484 226"><code>rpm -Uvh NetApp-MetroCluster-Tiebreaker-Software-1.21P3-1.x86_64.rpm</code></p> <p data-bbox="842 258 1484 321">The system displays the following output for a successful upgrade:</p> <pre data-bbox="867 384 1468 1917"> [root@scspr0523972001 mcctb]# rpm -Uvh NetApp-MetroCluster- Tiebreaker-Software-1.21P3- 1.x86_64.rpm Preparing... ##### [100%] Upgrading NetApp MetroCluster Tiebreaker software.... Stopping NetApp MetroCluster Tiebreaker software services before upgrade. Stopping NetApp MetroCluster Tiebreaker software daemon [OK] Updating / installing... 1:NetApp-MetroCluster- Tiebreaker- So##### ## [50%] Post installation start Wed Sep 5 05:59:13 EDT 2018 Enabled autostart of NetApp MetroCluster Tiebreaker software daemon during boot Created symbolic link for NetApp MetroCluster Tiebreaker software CLI Post installation end Wed Sep 5 05:59:13 EDT 2018 Successfully installed NetApp MetroCluster Tiebreaker software version 1.21P3 Cleaning up / removing... 2:NetApp-MetroCluster- Tiebreaker- So##### ## [100%] </pre>

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.

Steps

1. 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 where the Tiebreaker monitor is running with minimal disruption if you place the monitors in observer mode before the upgrade.

Steps

1. Verify 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 the 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.

Copyright Information

Copyright © 2021 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system- without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.