



# **Cluster management basics (cluster administrators only)**

**ONTAP 9**

NetApp  
November 30, 2022

# Table of Contents

- Cluster management basics (cluster administrators only) . . . . . 1
  - Display information about the nodes in a cluster . . . . . 1
  - Display cluster attributes . . . . . 2
  - Modify cluster attributes . . . . . 2
  - Display the status of cluster replication rings . . . . . 2
  - About quorum and epsilon . . . . . 3
  - What system volumes are . . . . . 4

# Cluster management basics (cluster administrators only)

## Display information about the nodes in a cluster

You can display node names, whether the nodes are healthy, and whether they are eligible to participate in the cluster. At the advanced privilege level, you can also display whether a node holds epsilon.

### Steps

1. To display information about the nodes in a cluster, use the `cluster show` command.

If you want the output to show whether a node holds epsilon, run the command at the advanced privilege level.

### Examples of displaying the nodes in a cluster

The following example displays information about all nodes in a four-node cluster:

```
cluster1::> cluster show
Node                Health  Eligibility
-----
node1                true   true
node2                true   true
node3                true   true
node4                true   true
```

The following example displays detailed information about the node named “node1” at the advanced privilege level:

```
cluster1::> set -privilege advanced
Warning: These advanced commands are potentially dangerous; use them only
when directed to do so by support personnel.
Do you want to continue? {y|n}: y

cluster1::*> cluster show -node node1

      Node: node1
Node UUID: a67f9f34-9d8f-11da-b484-000423b6f094
  Epsilon: false
Eligibility: true
    Health: true
```

## Display cluster attributes

You can display a cluster's unique identifier (UUID), name, serial number, location, and contact information.

### Steps

1. To display a cluster's attributes, use the `cluster identity show` command.

### Example of displaying cluster attributes

The following example displays the name, serial number, location, and contact information of a cluster.

```
cluster1::> cluster identity show

Cluster UUID: 1cd8a442-86d1-11e0-ae1c-123478563412
Cluster Name: cluster1
Cluster Serial Number: 1-80-123456
Cluster Location: Sunnyvale
Cluster Contact: jsmith@example.com
```

## Modify cluster attributes

You can modify a cluster's attributes, such as the cluster name, location, and contact information as needed.

### About this task

You cannot change a cluster's UUID, which is set when the cluster is created.

### Steps

1. To modify cluster attributes, use the `cluster identity modify` command.

The `-name` parameter specifies the name of the cluster. The `cluster identity modify` man page describes the rules for specifying the cluster's name.

The `-location` parameter specifies the location for the cluster.

The `-contact` parameter specifies the contact information such as a name or e-mail address.

### Example of renaming a cluster

The following command renames the current cluster ("cluster1") to "cluster2":

```
cluster1::> cluster identity modify -name cluster2
```

## Display the status of cluster replication rings

You can display the status of cluster replication rings to help you diagnose cluster-wide

problems. If your cluster is experiencing problems, support personnel might ask you to perform this task to assist with troubleshooting efforts.

### Steps

1. To display the status of cluster replication rings, use the `cluster ring show` command at the advanced privilege level.

### Example of displaying cluster ring-replication status

The following example displays the status of the VLDB replication ring on a node named node0:

```
cluster1::> set -privilege advanced
Warning: These advanced commands are potentially dangerous; use them only
when directed to do so by support personnel.
Do you wish to continue? (y or n): y

cluster1::*> cluster ring show -node node0 -unitname vldb
      Node: node0
    Unit Name: vldb
      Status: master
      Epoch: 5
Master Node: node0
  Local Node: node0
      DB Epoch: 5
DB Transaction: 56
  Number Online: 4
      RDB UUID: e492d2c1-fc50-11e1-bae3-123478563412
```

## About quorum and epsilon

Quorum and epsilon are important measures of cluster health and function that together indicate how clusters address potential communications and connectivity challenges.

*Quorum* is a precondition for a fully functioning cluster. When a cluster is in quorum, a simple majority of nodes are healthy and can communicate with each other. When quorum is lost, the cluster loses the ability to accomplish normal cluster operations. Only one collection of nodes can have quorum at any one time because all of the nodes collectively share a single view of the data. Therefore, if two non-communicating nodes are permitted to modify the data in divergent ways, it is no longer possible to reconcile the data into a single data view.

Each node in the cluster participates in a voting protocol that elects one node *master*; each remaining node is a *secondary*. The master node is responsible for synchronizing information across the cluster. When quorum is formed, it is maintained by continual voting. If the master node goes offline and the cluster is still in quorum, a new master is elected by the nodes that remain online.

Because there is the possibility of a tie in a cluster that has an even number of nodes, one node has an extra fractional voting weight called *epsilon*. If the connectivity between two equal portions of a large cluster fails, the group of nodes containing epsilon maintains quorum, assuming that all of the nodes are healthy. For example, the following illustration shows a four-node cluster in which two of the nodes have failed. However, because

one of the surviving nodes holds epsilon, the cluster remains in quorum even though there is not a simple majority of healthy nodes.



Epsilon is automatically assigned to the first node when the cluster is created. If the node that holds epsilon becomes unhealthy, takes over its high-availability partner, or is taken over by its high-availability partner, then epsilon is automatically reassigned to a healthy node in a different HA pair.

Taking a node offline can affect the ability of the cluster to remain in quorum. Therefore, ONTAP issues a warning message if you attempt an operation that will either take the cluster out of quorum or else put it one outage away from a loss of quorum. You can disable the quorum warning messages by using the `cluster quorum-service options modify` command at the advanced privilege level.

In general, assuming reliable connectivity among the nodes of the cluster, a larger cluster is more stable than a smaller cluster. The quorum requirement of a simple majority of half the nodes plus epsilon is easier to maintain in a cluster of 24 nodes than in a cluster of two nodes.

A two-node cluster presents some unique challenges for maintaining quorum. Two-node clusters use *cluster HA*, in which neither node holds epsilon; instead, both nodes are continuously polled to ensure that if one node fails, the other has full read-write access to data, as well as access to logical interfaces and management functions.

## What system volumes are

System volumes are FlexVol volumes that contain special metadata, such as metadata for file services audit logs. These volumes are visible in the cluster so that you can fully account for storage use in your cluster.

System volumes are owned by the cluster management server (also called the admin SVM), and they are created automatically when file services auditing is enabled.

You can view system volumes by using the `volume show` command, but most other volume operations are not permitted. For example, you cannot modify a system volume by using the `volume modify` command.

This example shows four system volumes on the admin SVM, which were automatically created when file services auditing was enabled for a data SVM in the cluster:

```
cluster1::> volume show -vserver cluster1
```

Vserver	Volume	Aggregate	State	Type	Size	Available
---------	--------	-----------	-------	------	------	-----------

Used%	-----	-----	-----	-----	-----	-----
-------	-------	-------	-------	-------	-------	-------

cluster1	MDV_aud_1d0131843d4811e296fc123478563412	aggr0	online	RW	2GB	1.90GB
----------	--	-------	--------	----	-----	--------

5%

cluster1	MDV_aud_8be27f813d7311e296fc123478563412	root_vs0	online	RW	2GB	1.90GB
----------	--	----------	--------	----	-----	--------

5%

cluster1	MDV_aud_9dc4ad503d7311e296fc123478563412	aggr1	online	RW	2GB	1.90GB
----------	--	-------	--------	----	-----	--------

5%

cluster1	MDV_aud_a4b887ac3d7311e296fc123478563412	aggr2	online	RW	2GB	1.90GB
----------	--	-------	--------	----	-----	--------

5%

4 entries were displayed.

## Copyright information

Copyright © 2022 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.

LIMITED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (b)(3) of the Rights in Technical Data -Noncommercial Items at DFARS 252.227-7013 (FEB 2014) and FAR 52.227-19 (DEC 2007).

Data contained herein pertains to a commercial product and/or commercial service (as defined in FAR 2.101) and is proprietary to NetApp, Inc. All NetApp technical data and computer software provided under this Agreement is commercial in nature and developed solely at private expense. The U.S. Government has a non-exclusive, non-transferrable, nonsublicensable, worldwide, limited irrevocable license to use the Data only in connection with and in support of the U.S. Government contract under which the Data was delivered. Except as provided herein, the Data may not be used, disclosed, reproduced, modified, performed, or displayed without the prior written approval of NetApp, Inc. United States Government license rights for the Department of Defense are limited to those rights identified in DFARS clause 252.227-7015(b) (FEB 2014).

## 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.