



# **Set up a cluster with the CLI**

## **ONTAP 9**

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# Set up a cluster with the CLI

## Gather cluster information for cluster set up

Setting up the cluster involves gathering the information needed to configure setting up each node, creating the cluster on the first node, and joining any remaining nodes to the cluster.

Get started by gathering all the relevant information in the cluster setup worksheets.

The cluster setup worksheet enables you to record the values that you need during the cluster setup process. If a default value is provided, you can use that value or else enter your own.

### System defaults

The system defaults are the default values for the private cluster network. It is best to use these default values. However, if they do not meet your requirements, you can use the table to record your own values.



For clusters configured to use network switches, each cluster switch must use the 9000 MTU size.

Types of information	Your values
Private cluster network ports	
Cluster network netmask	
Cluster interface IP addresses (for each cluster network port on each node)	
The IP addresses for each node must be on the same subnet.	

### Cluster information

Types of information	Your values
Cluster name	
The name must begin with a letter, and it must be fewer than 44 characters. The name can include the following special characters:  · - _	

### Feature license keys

You can find license keys for your initial or add-on software orders at the NetApp Support Site under **My Support > Software Licenses**.

Types of information	Your values
Feature license keys	

## Admin storage virtual machine (SVM)

Types of information	Your values
<p>Cluster administrator password</p> <p>The password for the admin account that the cluster requires before granting cluster administrator access to the console or through a secure protocol.</p> <div>  <p>For security purposes, recording passwords in this worksheet is not recommended.</p> </div> <p>The default rules for passwords are as follows:</p> <ul style="list-style-type: none"> <li>• A password must be at least eight characters long.</li> <li>• A password must contain at least one letter and one number.</li> </ul>	
<p>Cluster management interface port</p> <p>The physical port that is connected to the data network and enables the cluster administrator to manage the cluster.</p>	
<p>Cluster management interface IP address</p> <p>A unique IPv4 or IPv6 address for the cluster management interface. The cluster administrator uses this address to access the admin SVM and manage the cluster. Typically, this address should be on the data network.</p> <p>You can obtain this IP address from the administrator responsible for assigning IP addresses in your organization.</p> <p>Example: 192.0.2.66</p>	
<p>Cluster management interface netmask (IPv4)</p> <p>The subnet mask that defines the range of valid IPv4 addresses on the cluster management network.</p> <p>Example: 255.255.255.0</p>	

Types of information	Your values
<p>Cluster management interface netmask length (IPv6)</p> <p>If the cluster management interface uses an IPv6 address, then this value represents the prefix length that defines the range of valid IPv6 addresses on the cluster management network.</p> <p>Example: 64</p>	
<p>Cluster management interface default gateway</p> <p>The IP address for the router on the cluster management network.</p>	
<p>DNS domain name</p> <p>The name of your network's DNS domain.</p> <p>The domain name must consist of alphanumeric characters. To enter multiple DNS domain names, separate each name with either a comma or a space.</p>	
<p>Name server IP addresses</p> <p>The IP addresses of the DNS name servers. Separate each address with either a comma or a space.</p>	

### Node information (for each node in the cluster)

Types of information	Your values
<p>Physical location of the controller (optional)</p> <p>A description of the physical location of the controller. Use a description that identifies where to find this node in the cluster (for example, "Lab 5, Row 7, Rack B").</p>	
<p>Node management interface port</p> <p>The physical port that is connected to the node management network and enables the cluster administrator to manage the node.</p>	

Types of information	Your values
<p>Node management interface IP address</p> <p>A unique IPv4 or IPv6 address for the node management interface on the management network. If you defined the node management interface port to be a data port, then this IP address should be a unique IP address on the data network.</p> <p>You can obtain this IP address from the administrator responsible for assigning IP addresses in your organization.</p> <p>Example: 192.0.2.66</p>	
<p>Node management interface netmask (IPv4)</p> <p>The subnet mask that defines the range of valid IP addresses on the node management network.</p> <p>If you defined the node management interface port to be a data port, then the netmask should be the subnet mask for the data network.</p> <p>Example: 255.255.255.0</p>	
<p>Node management interface netmask length (IPv6)</p> <p>If the node management interface uses an IPv6 address, then this value represents the prefix length that defines the range of valid IPv6 addresses on the node management network.</p> <p>Example: 64</p>	
<p>Node management interface default gateway</p> <p>The IP address for the router on the node management network.</p>	

## NTP server information

Types of information	Your values
<p>NTP server addresses</p> <p>The IP addresses of the Network Time Protocol (NTP) servers at your site. These servers are used to synchronize the time across the cluster.</p>	

# Create the cluster on the first node

You use the Cluster Setup wizard to create the cluster on the first node. The wizard helps you to configure the cluster network that connects the nodes, create the cluster admin storage virtual machine (SVM), add feature license keys, and create the node management interface for the first node.

## Before you begin

- You should have installed, cabled and powered on your new storage system according to the installation and setup instructions for your platform model. See the [AFF and FAS documentation](#).
- Cluster network interfaces should be configured on each node of the cluster for intra-cluster communication.

## Steps

1. Power on all the nodes you are adding to the cluster. This is required to enable discovery for your cluster setup.
2. Connect to the console of the first node.

The node boots, and then the Cluster Setup wizard starts on the console.

```
Welcome to the cluster setup wizard....
```

3. Acknowledge the AutoSupport statement.

```
Type yes to confirm and continue {yes}: yes
```



AutoSupport is enabled by default.

4. Follow the instructions on the screen to assign an IP address to the node.

Beginning in ONTAP 9.13.1, you can assign IPv6 addresses for management LIFs on A800 and FAS8700 platforms. For ONTAP releases earlier than 9.13.1, or for 9.13.1 and later on other platforms, you must assign IPv4 addresses for management LIFs, then convert to IPv6 after you complete cluster setup.

5. Press **Enter** to continue.

```
Do you want to create a new cluster or join an existing cluster?
{create, join}:
```

6. Create a new cluster: `create`
7. Accept the system defaults or enter your own values.
8. After setup is completed, log in to the cluster and verify that the cluster is active and the first node is healthy by entering the ONTAP CLI command: `cluster show`

The following example shows a cluster in which the first node (cluster1-01) is healthy and eligible to

participate:

```
cluster1::> cluster show
Node                      Health  Eligibility
-----
cluster1-01              true    true
```

You can access the Cluster Setup wizard to change any of the values you entered for the admin SVM or node SVM by using the `cluster setup` command.

### After you finish

If needed, [convert from IPv4 to IPv6](#).

## Join remaining nodes to the cluster

After creating a new cluster, you use the Cluster Setup wizard to join each remaining node to the cluster one at a time. The wizard helps you to configure each node's node management interface.

When you join two nodes in a cluster, you are creating a high availability (HA) pair. If you join 4 nodes, you create two HA pairs. To learn more about HA, see [Learn about HA](#).

You can only join one node to the cluster at a time. When you start to join a node to the cluster, you must complete the join operation for that node, and the node must be part of the cluster before you can start to join the next node.

**Best Practice:** If you have a FAS2720 with 24 or fewer NL-SAS drives, you should verify that the storage configuration default is set to active/passive to optimize performance. For more information, see [Setting up an active-passive configuration on nodes using root-data partitioning](#)

1. Log in to the node you plan to join in the cluster.

Cluster Setup wizard starts on the console.

```
Welcome to the cluster setup wizard....
```

2. Acknowledge the AutoSupport statement.



AutoSupport is enabled by default.

```
Type yes to confirm and continue {yes}: yes
```

3. Follow the instructions on the screen to assign an IP address to the node.

Beginning in ONTAP 9.13.1, you can assign IPv6 addresses for management LIFs on A800 and FAS8700 platforms. For ONTAP releases earlier than 9.13.1, or for 9.13.1 and later on other platforms, you must assign IPv4 addresses for management LIFs, then convert to IPv6 after you complete cluster setup.



4. Press **Enter** to continue.

```
Do you want to create a new cluster or join an existing cluster?
{create, join}:
```

5. Join the node to the cluster: `join`
6. Follow the instructions on the screen to set up the node and join it to the cluster.
7. After setup is completed, verify that the node is healthy and eligible to participate in the cluster: `cluster show`

The following example shows a cluster after the second node (cluster1-02) has been joined to the cluster:

```
cluster1::> cluster show
Node                               Health  Eligibility
-----
cluster1-01                       true    true
cluster1-02                       true    true
```

You can access the Cluster Setup wizard to change any of the values you entered for the admin SVM or node SVM by using the cluster setup command.

8. Repeat this task for each remaining node.

#### After you finish

If needed, [convert from IPv4 to IPv6](#).

## Convert management LIFs from IPv4 to IPv6

Beginning in ONTAP 9.13.1, you can assign IPv6 addresses to management LIFs on A800 and FAS8700 platforms during the initial cluster setup. For ONTAP releases earlier than 9.13.1, or for 9.13.1 and later on other platforms, you must first assign IPv4 addresses to management LIFs, and then convert to IPv6 addresses after you complete cluster setup.

#### Steps

1. Enable IPv6 for the cluster:

```
network options ipv6 modify -enable true
```

2. Set privilege to advanced:

```
set priv advanced
```

3. View the list of RA prefixes learned on various interfaces:

```
network ndp prefix show
```

4. Create an IPv6 management LIF:

Use the format `prefix::id` in the address parameter to construct the IPv6 address manually.

```
network interface create -vserver <svm_name> -lif <LIF> -home-node  
<home_node> -home-port <home_port> -address <IPv6prefix::id> -netmask  
-length <netmask_length> -failover-policy <policy> -service-policy  
<service_policy> -auto-revert true
```

5. Verify that the LIF was created:

```
network interface show
```

6. Verify that the configured IP address is reachable:

```
network ping6
```

7. Mark the IPv4 LIF as administratively down:

```
network interface modify -vserver <svm_name> -lif <lif_name> -status  
-admin down
```

8. Delete the IPv4 management LIF:

```
network interface delete -vserver <svm_name> -lif <lif_name>
```

9. Confirm that the IPv4 management LIF is deleted:

```
network interface show
```

## Check your cluster with Active IQ Config Advisor

After you have joined all the nodes to your new cluster, you should run Active IQ Config Advisor to validate your configuration and check for common configuration errors.

Config Advisor is a web-based application that you install on your laptop, virtual machine or a server, and

works across Windows, Linux, and Mac platforms.

Config Advisor runs a series of commands to validate your installation and check the overall health of the configuration, including the cluster and storage switches.

1. Download and install Active IQ Config Advisor.

#### [Active IQ Config Advisor](#)

2. Launch Active IQ, and set up a passphrase when prompted.
3. Review your settings and click **Save**.
4. On the **Objectives** page, click **ONTAP Post-Deployment Validation**.
5. Choose either Guided or Expert mode.

If you choose Guided mode, connected switches are discovered automatically.

6. Enter the cluster credentials.
7. (Optional) Click **Form Validate**.
8. To begin collecting data, click **Save & Evaluate**.
9. After data collection is complete, under **Job Monitor > Actions**, view the data collected by clicking **Data View** icon, and view the results by clicking the **Results** icon.
10. Resolve the issues identified by Config Advisor.

## Synchronize the system time across the cluster

Synchronizing the time ensures that every node in the cluster has the same time, and prevents CIFS and Kerberos failures.

A Network Time Protocol (NTP) server should be set up at your site. Beginning with ONTAP 9.5, you can set up your NTP server with symmetric authentication. For more information, see [Managing the cluster time \(cluster administrators only\)](#).

You synchronize the time across the cluster by associating the cluster with one or more NTP servers.

1. Verify that the system time and time zone is set correctly for each node.

All nodes in the cluster should be set to the same time zone.

- a. Use the cluster date show command to display the current date, time, and time zone for each node.

```
cluster1::> cluster date show
Node           Date           Time zone
-----
cluster1-01    01/06/2015 09:35:15 America/New_York
cluster1-02    01/06/2015 09:35:15 America/New_York
cluster1-03    01/06/2015 09:35:15 America/New_York
cluster1-04    01/06/2015 09:35:15 America/New_York
4 entries were displayed.
```

- b. Use the cluster date modify command to change the date or time zone for all of the nodes.

This example changes the time zone for the cluster to be GMT:

```
cluster1::> cluster date modify -timezone GMT
```

2. Use the cluster time-service ntp server create command to associate the cluster with your NTP server.

- To set up your NTP server without symmetric authentication enter the following command: `cluster time-service ntp server create -server server_name`
- To set up your NTP server with symmetric authentication, enter the following command: `cluster time-service ntp server create -server server_ip_address -key-id key_id`



Symmetric authentication is available Beginning with ONTAP 9.5. It is not available in ONTAP 9.4 or earlier.

This example assumes that DNS has been configured for the cluster. If you have not configured DNS, you must specify the IP address of the NTP server:

```
cluster1::> cluster time-service ntp server create -server  
ntp1.example.com
```

3. Verify that the cluster is associated with an NTP server: `cluster time-service ntp server show`

```
cluster1::> cluster time-service ntp server show  
Server                Version  
-----  
ntp1.example.com      auto
```

#### Related information

[System administration](#)

## Commands for managing symmetric authentication on NTP servers

Beginning with ONTAP 9.5, Network Time Protocol (NTP) version 3 is supported. NTPv3 includes symmetric authentication using SHA-1 keys which increases network security.

To do this...	Use this command...
Configure an NTP server without symmetric authentication	<code>cluster time-service ntp server create -server server_name</code>

To do this...	Use this command...
Configure an NTP server with symmetric authentication	<pre>cluster time-service ntp server create -server server_ip_address -key-id key_id</pre>
<p>Enable symmetric authentication for an existing NTP server</p> <p>An existing NTP server can be modified to enable authentication by adding the required key-id.</p>	<pre>cluster time-service ntp server modify -server server_name -key-id key_id</pre>
Configure a shared NTP key	<pre>cluster time-service ntp key create -id shared_key_id -type shared_key_type -value shared_key_value</pre> <p><b>Note:</b> Shared keys are referred to by an ID. The ID, its type, and value must be identical on both the node and the NTP server</p>
Configure an NTP server with an unknown key ID	<pre>cluster time-service ntp server create -server server_name -key-id key_id</pre>
Configure a server with a key ID not configured on the NTP server.	<pre>cluster time-service ntp server create -server server_name -key-id key_id</pre> <p><b>Note:</b> The key ID, type, and value must be identical to the key ID, type, and value configured on the NTP server.</p>
Disable symmetric authentication	<pre>cluster time-service ntp server modify -server server_name -authentication disabled</pre>

## Additional system configuration tasks to complete

After setting up a cluster, you can use either System Manager or the ONTAP command-line interface (CLI) to continue configuring the cluster.

System configuration task	Resource
<p>Configure networking:</p> <ul style="list-style-type: none"> <li>• Create broadcast domains</li> <li>• Create subnets</li> <li>• Create IP spaces</li> </ul>	<a href="#">Setting up the network</a>

<b>System configuration task</b>	<b>Resource</b>
Set up the Service Processor	<a href="#">System administration</a>
Lay out your aggregates	<a href="#">Disk and aggregate management</a>
Create and configure data storage virtual machines (SVMs)	<a href="#">NFS configuration</a> <a href="#">SMB configuration</a> <a href="#">SAN administration</a>
Configure event notifications	<a href="#">EMS configuration</a>

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