Set up an ONTAP cluster

ONTAP 9

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ONTAP cluster setup workflow summary

To set up your cluster, you should gather the information you need to complete the setup, create a cluster and join nodes, convert management LIFs from IPv4 to IPv6, check your cluster with Active IQ Config Advisor, and synchronize the system time across the cluster.

This procedure applies to FAS, AFF and ASA systems.

- If you have an AFX system, follow these steps to set up an ONTAP cluster.
- If you have an ASA r2 system (ASA A1K, ASA A90, ASA A70, ASA A50, ASA A30, ASA A20, or ASA C30), follow these steps to set up an ONTAP cluster. ASA r2 systems provide a simplified ONTAP experience specific to SAN-only customers.

1 Gather information

Before you begin your cluster setup, gather the information you need to complete the set up process.

2 Create an ONTAP cluster and join nodes

NetApp recommends that you use System Manager to set up new clusters. System Manager provides a simple and easy workflow for cluster setup including assigning a node management IP address and initializing the cluster.

3 Convert management LIFs from IPv4 to IPv6

Beginning with ONTAP 9.13.1, you can assign IPv6 addresses to management LIFs on AFF A800 and FAS 8700 platforms during the initial cluster setup using the ONTAP command line interface (CLI). 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.

4 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.

5 Synchronize the system time across the cluster

Synchronize the system time across your cluster to ensure that every node in the cluster has the same time and to prevent CIFS and Kerberos failures.

Gather information to set up an ONTAP cluster

Before you begin cluster setup, you should gather the information you need to complete the cluster setup, such as your cluster management interface port and IP address. 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.

About this task

This procedure applies to FAS, AFF, and ASA systems. If you have an ASA r2 system (ASA A1K, ASA A90, ASA A70, ASA A50, ASA A30, ASA A20, or ASA C30), follow these steps to set up an ONTAP cluster. ASA r2 systems provide a simplified ONTAP experience specific to SAN-only customers.

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
Cluster administrator password The password for the admin account that the cluster requires before granting cluster administrator access to the console or through a secure protocol. For security purposes, recording passwords in this worksheet is not recommended. The default rules for passwords are as follows: • A password must be at least eight characters long. • A password must contain at least one letter and one number.	
Cluster management interface port The physical port that is connected to the data network and enables the cluster administrator to manage the cluster.	
Cluster management interface IP address 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. You can obtain this IP address from the administrator responsible for assigning IP addresses in your organization. Example: 192.0.2.66	
Cluster management interface netmask (IPv4) The subnet mask that defines the range of valid IPv4 addresses on the cluster management network. Example: 255.255.255.0	

Types of information	Your values
Cluster management interface netmask length (IPv6) 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. Example: 64	
Cluster management interface default gateway The IP address for the router on the cluster management network.	
DNS domain name The name of your network's DNS domain. The domain name must consist of alphanumeric characters. To enter multiple DNS domain names, separate each name with either a comma or a space.	
Name server IP addresses The IP addresses of the DNS name servers. Separate each address with either a comma or a space.	

Node information (for each node in the cluster)

Types of information	Your values
Physical location of the controller (optional) 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").	
Node management interface port The physical port that is connected to the node management network and enables the cluster administrator to manage the node.	

Types of information	Your values
Node management interface IP address 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. You can obtain this IP address from the administrator responsible for assigning IP addresses in your organization. Example: 192.0.2.66	
Node management interface netmask (IPv4) The subnet mask that defines the range of valid IP addresses on the node management network. 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. Example: 255.255.255.0	
Node management interface netmask length (IPv6) 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. Example: 64	
Node management interface default gateway The IP address for the router on the node management network.	

NTP server information

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

Create an ONTAP cluster and join nodes

NetApp recommends that you use System Manager to create new clusters. System Manager provides a simple and easy workflow for cluster setup. It is only necessary to use the ONTAP command line interface (CLI) if you are running ONTAP 9.7 or earlier in a MetroCluster configuration or if you need to configure an IPv6-only cluster on certain platforms.

About this task

This procedure applies to AFF, ASA FAS and AFX systems. If you have an ASA r2 system (ASA A1K, ASA A90, ASA A70, ASA A50, ASA A30, ASA A20, or ASA C30), follow these steps to use System Manger to set up an ONTAP cluster. ASA r2 systems provide a simplified ONTAP experience specific to SAN-only customers.

Beginning with ONTAP 9.13.1, you can assign IPv6 addresses to management LIFs on AFF A800 and FAS8700 platforms during the initial cluster setup using the ONTAP CLI. For ONTAP releases earlier than ONTAP 9.13.1, or for ONTAP 9.13.1 and later on other platforms, you should use System Manager to create your cluster using IPv4 addresses, and then convert to IPv6 addresses after you complete cluster setup.

System Manager does not support deployments that require IPv6 networking in ONTAP 9.6 and earlier.

Before you begin

- You should have installed, cabled and powered on your new storage system according to the installation and set up instructions for your platform model.

  See the AFF and FAS documentation.

- Gather the information you need to complete the cluster setup.
- Cluster network interfaces should be configured on each node of the cluster for intra-cluster communication.
- If you are using the CLI to configure IPv6, IPv6 should be configured on the Base Management Controller (BMC) so that you can use SSH to access the system.

Example 1. Steps

System Manager

1. Assign a node-management IP address
   - Windows computer
     a. Connect your Windows computer to the same subnet as the controllers.

        This automatically assigns a node-management IP address to your system.

     b. Open the **Network** drive to discover the nodes.
     c. Select the node to launch the cluster setup wizard.
   - Non-Windows computer
     a. Power on all the nodes you are adding to the cluster.

        This is required to enable discovery for your clusterset up.

     b. 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....
        ```

     c. Acknowledge the AutoSupport statement.

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

        AutoSupport is enabled by default.

     d. Follow the instructions on the screen to assign a management IP address to the node.
     e. In a web browser, enter the node-management IP address that you have configured: "https://node-management-IP".

        System Manager automatically discovers the remaining nodes in the cluster.
2. Under **Initialize storage system**, enter the cluster name and admin password.
3. Under **Networking**, enter the cluster management IP address, subnet mask, and gateway.
4. If you want to use the Domain Name Service to resolve host names, select **Use Domain Name Service (DNS)**; then enter the DNS server information.
5. If you want to use the Network Time Protocol (NTP) to keep times synchronized across your cluster, under **Others**, select **Use time services (NTP)**; then enter the NTP server information.
6. Select **Submit**.

ONTAP CLI

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 a management IP address to the node.

   Beginning with 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:

   a. Enter `create`

   b. Accept the system defaults or enter your own values.

   c. After set up is completed, log in to the cluster and verify that the cluster is active and the first node is healthy: `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
      ```

      If needed, you can use the `cluster setup` command to access the Cluster Setup wizard and change any of the values you entered for the admin or node SVM.

7. Join a node to the cluster:

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

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 documentation for setting up an active-passive configuration on nodes using root-data partitioning.

a. 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....
```

b. Acknowledge the AutoSupport statement.

   AutoSupport is enabled by default.

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

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

   Beginning with 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.

b. Press **Enter** to continue.

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

c. Enter `join`

d. Follow the instructions on the screen to set up the node and join it to the cluster.

e. After set up 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
```

8. Repeat step 7 to join each remaining node.

What's next

- If needed, convert from IPv4 to IPv6.
- Run Active IQ Config Advisor to validate your configuration and check for common configuration errors.

Optionally, convert ONTAP management LIFs from IPv4 to IPv6

Beginning with ONTAP 9.13.1, you can assign IPv6 addresses to management LIFs on AFF A800 and FAS 8700 platforms during the initial cluster setup using the ONTAP command line interface (CLI). 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.

If you launch System Manager after completing your hardware set up using DHCP with an auto assigned IP address and with Windows discovery, System Manager can configure an IPv6 management address.

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
```

Related information

- network interface
- network ndp prefix show
- network options ipv6 modify

Check your ONTAP cluster with Digital Advisor 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 Digital Advisor, 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 an ONTAP 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 documentation for 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:

   ```
   cluster date show
   ```

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

   This example shows the date and time zone for each node in the cluster.

   ```
   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.
   ```

2. Change the date or time zone for all of the nodes:

   ```
   cluster date modify
   ```

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

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

3. 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
   ```

4. Verify that the cluster is associated with an NTP server:

   ```
   cluster time-service ntp server show
   ```

   This example shows that the cluster is associated with the NTP server ntp1.example.com.

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

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	`cluster time-service ntp server create -server server_name`
Configure an NTP server with symmetric authentication	`cluster time-service ntp server create -server server_ip_address -key-id key_id`
Enable symmetric authentication for an existing NTP server An existing NTP server can be modified to enable authentication by adding the required key-id.	`cluster time-service ntp server modify -server server_name -key-id key_id`
Configure a shared NTP key	`cluster time-service ntp key create -id shared_key_id -type shared_key_type -value shared_key_value` **Note:** 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
Configure an NTP server with an unknown key ID	`cluster time-service ntp server create -server server_name -key-id key_id`
Configure a server with a key ID not configured on the NTP server.	`cluster time-service ntp server create -server server_name -key-id key_id` **Note:** The key ID, type, and value must be identical to the key ID, type, and value configured on the NTP server.

To do this…	Use this command…
Disable symmetric authentication	`cluster time-service ntp server modify -server server_name -authentication disabled`

Related information

- System administration
- cluster time-service ntp

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