Set up storage

Element Software

NetApp
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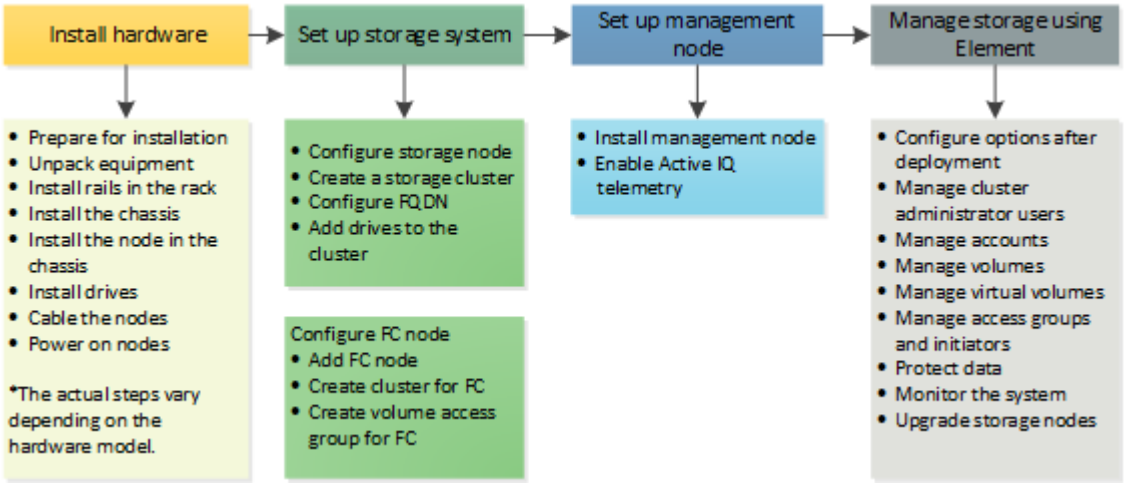
Setup overview

At this point, you should have installed the hardware. The hardware also includes Element software.

Next, you'll need to set up the storage system for your environment. You can set up a cluster with storage nodes or Fibre Channel nodes and manage it using Element software after you install and cable nodes in a rack unit and power them on.



Steps to set up storage

1. Select one of the following:
   - Set up cluster with storage nodes
   - Set up cluster with Fibre Channel nodes
2. Determine which SolidFire components to install
3. Set up a management node and enable Active IQ telemetry
4. Configure Fully Qualified Domain Name web UI access

Find more information

- Discover next steps for using storage
- SolidFire and Element Resources page

Setting up a cluster with Element storage nodes

You can set up a cluster with storage nodes and manage it using Element software after you install and cable nodes in a rack unit and power them on. You can then install and configure additional components in your storage system.

Steps

1. Configure a storage node
2. Create a storage cluster
3. Log in to the Element software user interface

4. Add drives to the cluster
5. Determine which SolidFire components to install
6. Set up a management node
7. Configure Fully Qualified Domain Name web UI access

Find more information

- SolidFire and Element Resources page

Configure a storage node

You must configure individual nodes before you can add them to a cluster. After you install and cable a node in a rack unit and power it on, you can configure the node network settings using the per-node UI or the node terminal user interface (TUI). Ensure that you have the necessary network configuration information for the node before proceeding.

There are two options for configuring storage nodes:

- Per-node UI: Use the per-node UI (https://<node_management_IP>:442) to configure node network settings.
- TUI: Use the node terminal user interface (TUI) to configure the node.

You cannot add a node with DHCP-assigned IP addresses to a cluster. You can use the DHCP IP address to initially configure the node in the per-node UI, TUI, or API. During this initial configuration, you can add static IP address information so that you can add the node to a cluster.

After initial configuration, you can access the node using the node's management IP address. You can then change the node settings, add it to a cluster, or use the node to create a cluster. You can also configure a new node using Element software API methods.

Beginning in Element version 11.0, nodes can be configured with IPv4, IPv6, or both addresses for their management network. This applies to both storage nodes and management nodes, except for management node 11.3 and later which does not support IPv6. When you create a cluster, only a single IPv4 or IPv6 address can be used for the MVIP and the corresponding address type must be configured on all nodes.

Configure a storage node using the per-node UI

You can configure nodes using the per-node user interface.

About this task

- You can configure the node to have either an IPv4 or IPv6 address.
- You need the DHCP address displayed in the TUI to access a node. You cannot use DHCP addresses to add a node to a cluster.

You should configure the management (Bond1G) and storage (Bond10G) interfaces for separate subnets. Bond1G and Bond10G interfaces configured for the same subnet cause routing problems when storage traffic is sent via the Bond1G interface. If you must use the same subnet for management and storage traffic, manually configure management traffic to use the Bond10G interface. You can do this for each node using the **Cluster Settings** page of the per-node UI.

Steps

1. In a browser window, enter the DHCP IP address of a node.

   You must add the extension `:442` to access the node; for example, https://172.25.103.6:442.

   The **Network Settings** tab opens with the **Bond1G** section.

2. Enter the 1G management network settings.
3. Click **Apply Changes**.
4. Click **Bond10G** to display the 10G storage network settings.
5. Enter the 10G storage network settings.
6. Click **Apply Changes**.
7. Click **Cluster Settings**.
8. Enter the hostname for the 10G network.
9. Enter the cluster name.

   This name must be added to the configuration for all nodes before a cluster can be created. All the nodes in a cluster must have identical cluster names. Cluster names are case-sensitive.

10. Click **Apply Changes**.

Configure a storage node using the TUI

You can use the terminal user interface (TUI) to perform initial configuration for new nodes.

You should configure the Bond1G (Management) and Bond10G (Storage) interfaces for separate subnets. Bond1G and Bond10G interfaces configured for the same subnet causes routing problems when storage traffic is sent via the Bond1G interface. If you must use the same subnet for management and storage traffic, manually configure management traffic to use the Bond10G interface. You can do this for each node using the **Cluster** > **Nodes** page of the Element UI.

Steps

1. Attach a keyboard and monitor to the node and then power on the node.

   The NetApp Storage Main menu of the TUI appears on the tty1 terminal.

   If the node cannot reach your configuration server, the TUI displays an error message. Check your configuration server connection or the networking connection to resolve the error.

2. Select **Network** > **Network Config**.

To navigate through the menu, press the Up or Down arrow keys. To move to another button or to the fields from the buttons, press **Tab**. To navigate between fields, use the Up or Down arrow keys.

3. Select **Bond1G (Management)** or **Bond10G (Storage)** to configure the 1G and 10G network settings for the node.
4. For the Bond mode and Status fields, press **Tab** to select the Help button and identify the available options.

   All the nodes in a cluster must have identical cluster names. Cluster names are case-sensitive. If a DHCP server is running on the network with available IP addresses, the 1GbE address appears in the Address field.

5. Press **Tab** to select the **OK** button and save the changes.

   The node is put in a pending state and can be added to an existing cluster or a new cluster.

Find more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Create a storage cluster

You can create a storage cluster after you have configured all of the individual nodes. When you create a cluster, a cluster administrator user account is automatically created for you. The cluster administrator has permission to manage all cluster attributes and can create other cluster administrator accounts.

What you'll need

- You have installed the management node.
- You have configured all of the individual nodes.

About this task

During new node configuration, 1G or 10G Management IP (MIP) addresses are assigned to each node. You must use one of the node IP addresses created during configuration to open the Create a New Cluster page. The IP address you use depends on the network you have chosen for cluster management.

If you want to enable cluster-wide software encryption at rest, you must create the cluster using the CreateCluster API method instead and change the enableSoftwareEncryptionAtRest parameter to `true`. After software encryption at rest is enabled, it cannot be disabled on the cluster. Software encryption at rest is enabled by default for SolidFire eSDS clusters. Hardware-based encryption at rest can be enabled and disabled after cluster creation.

When creating a new cluster, consider the following:

- If you are using storage nodes that reside in a shared chassis, you might want to consider designing for chassis-level failure protection using the protection domains feature.
- If a shared chassis in not in use, you can define a custom protection domain layout.

Steps

1. In a browser window, enter a node MIP address.
2. In Create a New Cluster, enter the following information:
   - Management VIP: Routable virtual IP on the 1GbE or 10GbE network for network management tasks.

     You can create a new cluster using IPv4 or IPv6 addressing.

   - iSCSI (storage) VIP: Virtual IP on the 10GbE network for storage and iSCSI discovery.

     You cannot change the MVIP, SVIP, or cluster name after you create the cluster.

   - User name: The primary cluster administrator user name for authenticated access to the cluster. You must save the user name for future reference.

     You can use uppercase and lowercase letters, special characters, and numbers for the user name and password.

   - Password: Password for authenticated access to the cluster. You must save the password for future reference. Two-way data protection is enabled by default. You cannot change this setting.
3. Read the End User License Agreement, and click **I Agree**.
4. **Optional**: In the Nodes list, ensure that the check boxes for nodes that should not be included in the cluster are not selected.
5. Click **Create Cluster**.

   The system might take several minutes to create the cluster depending on the number of nodes in the cluster. On a properly configured network, a small cluster of five nodes should take less than one minute. After the cluster is created, the Create a New Cluster window is redirected to the MVIP URL address for the cluster and displays the Element UI.

For more information

- Managing storage with the Element API
- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Access the Element software user interface

You can access the Element UI by using the management virtual IP (MVIP) address of the primary cluster node.

You must ensure that popup blockers and NoScript settings are disabled in your browser.

You can access the UI using IPv4 or IPv6 addressing, depending on configuration during cluster creation.

Steps

1. Choose one of the following:
   - IPv6: Enter `https://[IPv6_MVIP_address]`. For example:

     ```
     https://[fd20:8b1e:b256:45a::1234]/
     ```

   - IPv4: Enter `https://[IPv4 MVIP address]`. For example:

     ```
     https://10.123.456.789/
     ```

2. For DNS, enter the host name.
3. Click through any authentication certificate messages.

For more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Add drives to a cluster

When you add a node to the cluster or install new drives in an existing node, the drives automatically register as available. You must add the drives to the cluster by using either the Element UI or API before they can participate in the cluster.

Drives are not displayed in the Available Drives list when the following conditions exist:

- Drives are in Active, Removing, Erasing, or Failed state.
- The node of which the drive is a part of is in Pending state.

Steps

1. From the Element user interface, select **Cluster** > **Drives**.
2. Click **Available** to view the list of available drives.
3. Do one of the following:
   - To add individual drives, click the **Actions** icon for the drive you want to add and click **Add**.
   - To add multiple drives, select the check boxes of the drives to add, click **Bulk Actions**, and click **Add**.

```
== Find more information
* https://www.netapp.com/data-
storage/solidfire/documentation[SolidFire and Element Resources
page^]
* https://docs.netapp.com/us-en/vcp/index.html[NetApp Element Plug-in
for vCenter Server^]
```

Setting up a cluster with Fibre Channel nodes

You can set up a cluster with Fibre Channel nodes and manage it using Element software after you install and cable nodes in a rack unit and power them on. You can then install and configure additional components in your storage system.

Steps

1. Configure a Fibre Channel node
2. Create a new cluster with Fibre Channel nodes
3. Add Fibre Channel nodes to a cluster
4. Set up zones for Fibre Channel nodes
5. Create a volume access group for Fibre Channel clients
6. Determine which SolidFire components to install
7. Set up a management node
8. Configure Fully Qualified Domain Name web UI access

Find more information

- SolidFire and Element Resources page

Configure a Fibre Channel node

Fibre Channel nodes enable you to connect the cluster to a Fibre Channel network fabric. Fibre Channel nodes are added in pairs, and operate in active-active mode (all nodes actively process traffic for the cluster). Clusters running Element software version 9.0 and later support up to four nodes; clusters running previous versions support a maximum of two nodes.

You must ensure that the following conditions are met before you configure a Fibre Channel node:

- At least two Fibre Channel nodes are connected to Fibre Channel switches.
- All SolidFire Fibre Channel ports should be connected to your Fibre Channel fabric. The four SolidFire Bond10G network connections should be connected in one LACP bond group at the switch level. This will enable the best overall performance from the Fibre Channel systems.
- Review and validate all best practices for Fibre Channel clusters included in this NetApp Knowledge Base article.

SolidFire FC cluster best practice

Network and cluster configuration steps are the same for Fibre Channel nodes and storage nodes.

When you create a new cluster with Fibre Channel nodes and SolidFire storage nodes, the worldwide port name (WWPN) addresses for the nodes are available in the Element UI. You can use the WWPN addresses to zone the Fibre Channel switch.

WWPNs are registered in the system when you create a new cluster with nodes. In the Element UI, you can find the WWPN addresses from the WWPN column of the FC Ports tab, which you access from the Cluster tab.

Find more information

Add Fibre Channel nodes to a cluster

Create a new cluster with Fibre Channel nodes

Create a new cluster with Fibre Channel nodes

You can create a new cluster after you have configured the individual Fibre Channel nodes. When you create a cluster, a cluster administrator user account is automatically created for you. The cluster administrator has permission to manage all cluster attributes and can create other cluster administrator accounts.

During new node configuration, 1G or 10G Management IP (MIP) addresses are assigned to each node. You must use one of the node IP addresses created during configuration to open the Create a New Cluster page. The IP address you use depends on the network you have chosen for cluster management.

What you'll need

You have configured the individual Fibre Channel nodes.

Steps

1. In a browser window, enter a node MIP address.
2. In Create a New Cluster, enter the following information:
   - Management VIP: Routable virtual IP on the 1GbE or 10GbE network for network management tasks.
   - iSCSI (storage) VIP: Virtual IP on the 10GbE network for storage and iSCSI discovery.

     You cannot change the SVIP after you create the cluster.

   - User name: The primary Cluster Admin user name for authenticated access to the cluster. You must save the user name for future reference.

     You can use uppercase and lowercase letters, special characters, and numbers for the user name.

   - Password: Password for authenticated access to the cluster. You must save the user name for future reference. Two-way data protection is enabled by default. You cannot change this setting.
3. Read the End User License Agreement, and click **I Agree**.
4. **Optional**: In the Nodes list, ensure that the check boxes for nodes that should not be included in the cluster are not selected.

5. Click **Create Cluster**.

   The system might take several minutes to create the cluster depending on the number of nodes in the cluster. On a properly configured network, a small cluster of five nodes should take less than one minute. After the cluster is created, the Create a New Cluster window is redirected to the MVIP URL address for the cluster and displays the web UI.

Find more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Add Fibre Channel nodes to a cluster

You can add Fibre Channel nodes to a cluster when more storage is needed or during cluster creation. Fibre Channel nodes require initial configuration when they are first powered on. After the node is configured, it appears in the list of pending nodes and you can add it to a cluster.

The software version on each Fibre Channel node in a cluster must be compatible. When you add a Fibre Channel node to a cluster, the cluster installs the cluster version of Element on the new node as needed.

Steps

1. Select **Cluster** > **Nodes**.
2. Click **Pending** to view the list of pending nodes.
3. Do one of the following:
   - To add individual nodes, click the **Actions** icon for the node you want to add.
   - To add multiple nodes, select the check box of the nodes to add, and then **Bulk Actions**.

   If the node you are adding has a different version of Element than the version running on the cluster, the cluster asynchronously updates the node to the version of Element running on the cluster master. After the node is updated, it automatically adds itself to the cluster. During this asynchronous process, the node will be in a pendingActive state.

4. Click **Add**.

   The node appears in the list of active nodes.

Find more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Set up zones for Fibre Channel nodes

When you create a new cluster with Fibre Channel nodes and SolidFire storage nodes, the worldwide port name (WWPN) addresses for the nodes are available in the web UI.

You can use the WWPN addresses to zone the Fibre Channel switch.

WWPNs are registered in the system when you create a new cluster with nodes. In the Element UI, you can find the WWPN addresses from the WWPN column of the FC Ports tab, which you access from the Cluster tab.

Find more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Create a volume access group for Fibre Channel clients

Volume access groups enable communication between Fibre Channel clients and volumes on a SolidFire storage system. Mapping Fibre Channel client initiators (WWPN) to the volumes in a volume access group enables secure data I/O between a Fibre Channel network and a SolidFire volume.

You can also add iSCSI initiators to a volume access group; this gives the initiators access to the same volumes in the volume access group.

Steps

1. Click **Management** > **Access Groups**.
2. Click **Create Access Group**.
3. Enter a name for the volume access group in the **Name** field.
4. Select and add the Fibre Channel initiators from the **Unbound Fibre Channel Initiators** list.

   You can add or delete initiators at a later time.

5. **Optional:** Select and add an iSCSI initiator from the **Initiators** list.
6. To attach volumes to the access group, perform the following steps:
   a. Select a volume from the **Volumes** list.
   b. Click **Attach Volume**.
7. Click **Create Access Group**.

Find more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Determine which SolidFire components to install

You might want to check which SolidFire components, such as the management node, Active IQ and the NetApp Monitoring Agent (NMA), that you should install, depending on configuration and deployment choices.

The following table lists the additional components and indicates whether you should install them.

Component	Standalone SolidFire storage cluster	NetApp HCI cluster
Management node	Recommended	Installed by default, required
Active IQ	Recommended*	Recommended*
NetApp Monitoring Agent	Not supported	Recommended

*Active IQ is required for capacity-licensed SolidFire storage clusters.

Steps

1. Determine which components should be installed.
2. Complete the installation according to the install the management node procedure.

> To set up Active IQ, use the `--telemetry_active` parameter in the setup script to enable data collection for analytics by Active IQ.

3. For NetApp Monitoring Agent information, see the NetApp HCI documentation.

For more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Set up a management node

You can install the NetApp Element software management node (mNode) to upgrade and provide system services, manage cluster assets and settings, run system tests and utilities, and enable NetApp Support access for troubleshooting.

1. See the install the management node documentation.

> To set up Active IQ, use the `--telemetry_active` parameter in the setup script to enable data collection for analytics by Active IQ.

Find more information

- SolidFire and Element Resources page
- NetApp Element Plug-in for vCenter Server

Configure Fully Qualified Domain Name web UI access

NetApp HCI with NetApp Element software 12.2 or later enables you to access storage cluster web interfaces using the Fully Qualified Domain Name (FQDN). If you want to use the FQDN to access web user interfaces such as the Element web UI, per-node UI, or

management node UI, you must first add a storage cluster setting to identify the FQDN used by the cluster.

This process enables the cluster to properly redirect a login session and improves integration with external services such as key managers and identity providers for multi-factor authentication.

What you'll need

- This feature requires Element 12.2 or later and management services version 2.15 or later.
- To use REST APIs, you must have deployed a management node running version 11.5 or later.

Steps

1. Ensure that the Element storage nodes and the mNode have DNS configured correctly for the network environment so that FQDNs in the environment can be resolved. To set DNS, go to the per-node UI for storage nodes and to the management node, then select **Network Settings** > **Management Network**.
   a. Per-node UI for storage nodes: `https://<storage_node_management_IP>:442`
   b. Per-node UI for the management node: `https://<management_node_IP>:442`
2. Access the Element API and create the following cluster interface preference using the CreateClusterInterfacePreference API method, inserting the cluster MVIP FQDN for the preference value:
   - Name: `mvip_fqdn`
   - Value: `Fully Qualified Domain Name for the Cluster MVIP`

     In this example, FQDN=storagecluster.my.org:

     ```
     https://<Cluster_MVIP>/json-rpc/12.2?
     method=CreateClusterInterfacePreference&name=mvip_fqdn&value=storagec
     luster.my.org
     ```

3. Change the management node settings using the REST API on the management node:
   a. Access the REST API UI for the management node by entering the management node IP address followed by `/mnode/2/`

      For example:

      `https://<management_node_IP>/mnode/2/`

   b. Click **Authorize** or any lock icon and enter the cluster user name and password.
   c. Enter the client ID as `mnode-client`.
   d. Click **Authorize** to begin the session and then close the window.
   e. From the server list, select `mnode2`.
   f. Click **GET /settings**.
   g. Click **Try it out**.
   h. Click **Execute**.
   i. Record any proxy settings reported in the response body.
   j. Click **PUT/setttings**.

k. Click **Try it out**.

l. In the request body area, enter the management node FQDN as the value for the `mnode_fqdn` parameter.

m. Enter any proxy setting values you recorded earlier in the remaining parameters in the request body. If you leave the proxy parameters empty or do not include them in the request body, existing proxy settings will be removed.

n. Click **Execute**.

```
== Find more information
* https://www.netapp.com/data-
storage/solidfire/documentation[SolidFire and Element Resources
page^]
* https://docs.netapp.com/us-en/vcp/index.html[NetApp Element Plug-in
for vCenter Server^]
```

What's next

After you set up Element software, you manage storage by completing some of the following options:

- Access the Element software user interface
- Configure SolidFire system options after deployment
- Manage accounts
- Manage your system
- Manage volumes and virtual volumes
- Protect your data
- Troubleshoot your system

Find more information

- SolidFire and Element Resources page
- Documentation for earlier versions of NetApp SolidFire and Element products
- NetApp Element Plug-in for vCenter Server