



**NetApp Element 12.0**

# **Setup Guide**

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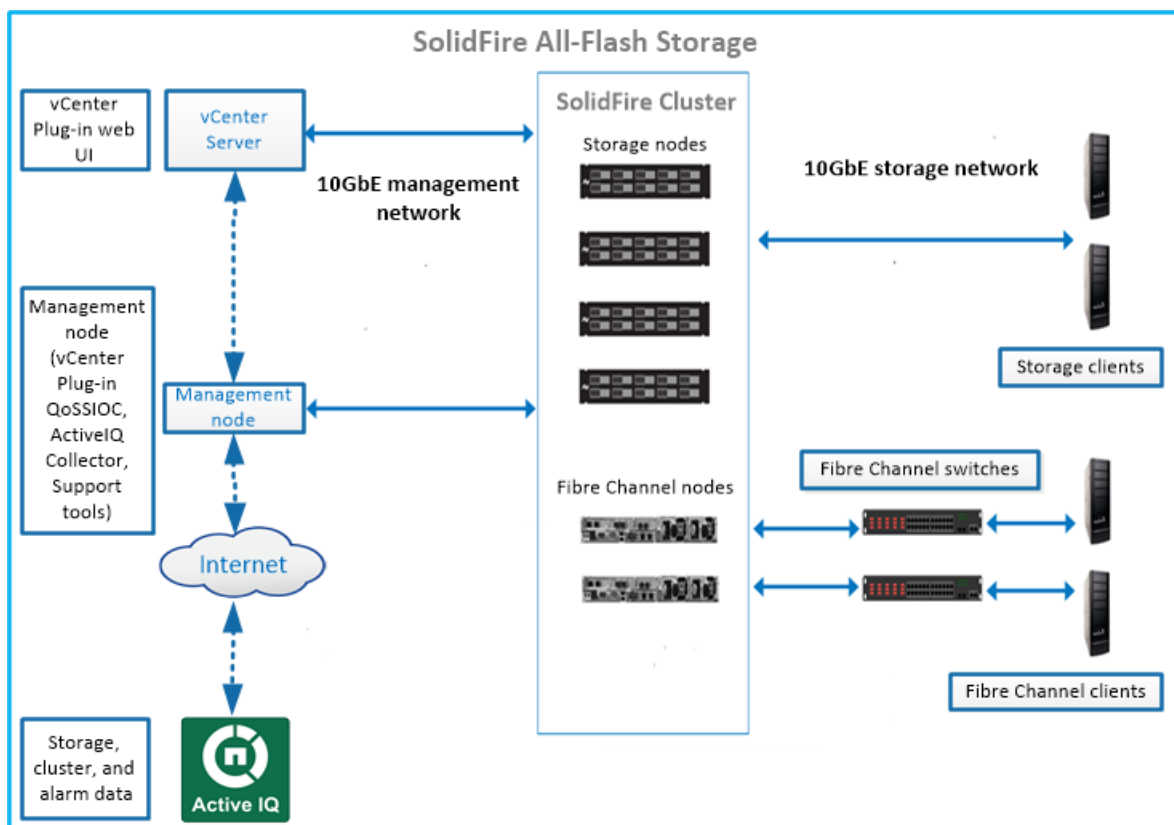
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## SolidFire storage system

A SolidFire all-flash storage system is comprised of discrete hardware components (drive and nodes) that are combined into a single pool of storage resources through NetApp Element software running independently on each node. This unified cluster presents as a single storage system for use by external clients and is managed as a single entity through the Element software UI, API and other management tools.

Using the NetApp Element software user interface, you can set up and monitor SolidFire cluster storage capacity and performance, and manage storage activity across a multi-tenant infrastructure.



A SolidFire all-flash storage system includes the following components:

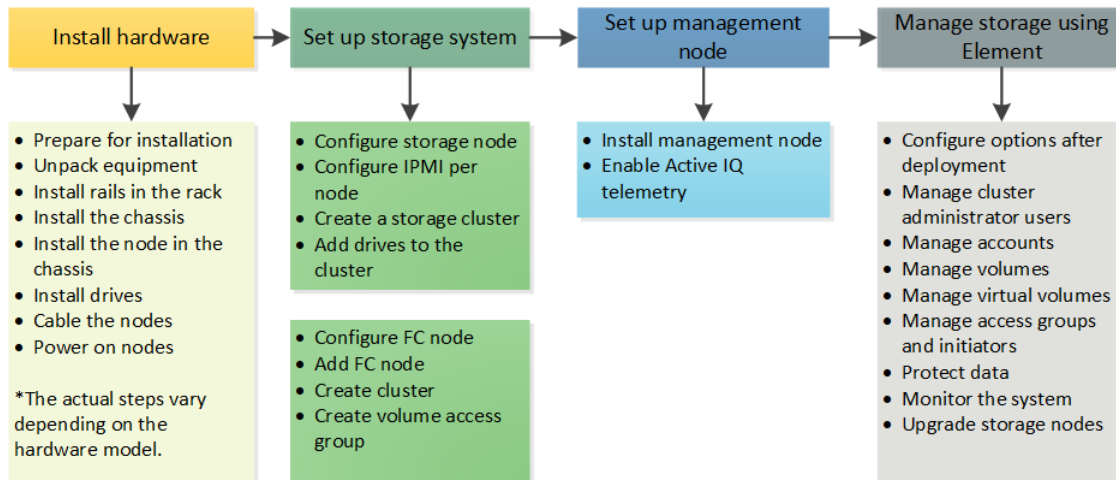
- Nodes: Physical hardware that provides the storage resources for a cluster. There are two types of nodes:
  - Storage nodes: Servers containing a collection of drives.
  - Fibre Channel (FC) nodes: Used to connect FC clients via a Fibre Channel switch.
- Cluster: The hub of the SolidFire storage system comprised of a least four nodes.
- Management node: Enables you to upgrade and provide system services including monitoring and telemetry, manage cluster assets and settings, run system tests and utilities, and provide NetApp Support access for troubleshooting. The management node (mNode) is a virtual machine that runs in tandem with an Element software-based storage cluster.
- Active IQ: A web-based tool that provides continually updated historical views of cluster-wide data. You can set up alerts for specific events, thresholds, or metrics. Active IQ enables you to monitor system performance and capacity, as well as stay informed about cluster health.

- Drives are used in storage nodes and store data for the cluster. A storage node contains two types of drives:
  - Volume metadata drives store information that defines the volumes and other objects within a cluster.
  - Block drives store data blocks for application volumes.

# Setup overview

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Before you get started, you might want to understand the sequence of installing and setting up NetApp Element software.



## Determining which SolidFire components to install

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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.

### About this task

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.

**Note:** 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 deployment information.

[NetApp HCI Documentation Center](#)

## Setting up an Element storage system

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Setting up a NetApp Element software storage system involves configuring a storage node, creating a storage cluster, and adding drives to the cluster. If you use a Fibre Channel network, you can configure a Fibre Channel node.

### Steps

**1. [Configuring a storage node](#)** on page 7

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.

**2. [Creating a storage cluster](#)** on page 10

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.

**3. [Accessing the Element software user interface](#)** on page 11

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

**4. [Adding drives to a cluster](#)** on page 11

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.

**5. [Configuring a Fibre Channel node](#)** on page 12

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.

**6. [Setting up a management node](#)** on page 15

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.

## Configuring 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.

**Note:** Use the DHCP 1G management IP address displayed in the menu bar at the top of the TUI to access the per-node UI.

### 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.

**Note:** 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.

#### Related tasks

[Configuring the node using the TUI](#) on page 9

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

[Configuring the storage node using the per-node UI](#) on page 8

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

[Creating a storage cluster](#) on page 10

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.

#### Related reference

[Node states](#) on page 10

A node can be in one of several states depending on the level of configuration.

## Configuring the 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.



**Attention:** 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.

**Important:** 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**.

#### Related tasks

[Configuring the node using the TUI](#) on page 9

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

## Configuring the node using the TUI

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

### About this task

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.

**Note:** 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**.

**Tip:** 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.

#### Related tasks

[Creating a storage cluster](#) on page 10

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.

## Node states

A node can be in one of several states depending on the level of configuration.

### Available

The node has no associated cluster name and is not yet part of a cluster.

### Pending

The node is configured and can be added to a designated cluster.

Authentication is not required to access the node.

### Pending Active

The system is in the process of installing compatible Element software on the node. When complete, the node will move to the `Active` state.

### Active

The node is participating in a cluster.

Authentication is required to modify the node.

In each of these states, some fields are read only.

## Creating 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.

### Before you begin

- 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.

**Note:** When creating a new cluster:

- 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 is 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.

**Note:** 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.

**Note:** 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.

**Note:** 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.

#### Related information

[Managing storage with the Element API](#)

## Accessing the Element software user interface

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

### Before you begin

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

### About this task

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.

## Adding 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.

### About this task

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**.

## Configuring 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.

### Related tasks

[Adding Fibre Channel nodes to a cluster](#) on page 13

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.

[Creating a new cluster with Fibre Channel nodes](#) on page 13

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.

## Adding 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.

### About this task

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**.

#### Note:

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.

## Creating 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.

### Before you begin

You have configured the individual Fibre Channel 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.

### 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.

**Note:** 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.

**Note:** 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.

## Zoning 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.

## Creating 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.

### About this task

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.

**Note:** 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**.

## Setting 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.

### Step

See the [install the management node](#) documentation.

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

## Contacting NetApp Support

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If you need help with or have questions or comments about NetApp products, contact NetApp Support.

- Web:  
[mysupport.netapp.com](https://mysupport.netapp.com)
- Phone:
  - 888.4.NETAPP (888.463.8277) (US and Canada)
  - 00.800.44.638277 (EMEA/Europe)
  - +800.800.80.800 (Asia/Pacific)



## **Where to find product documentation and other information**

You can learn more about using and managing NetApp HCI and SolidFire all-flash storage from the resources available in the Documentation Centers and Resources pages for both products.

In the Documentation Centers, you can also find information about hardware installation and maintenance, additional content resources available, links to known issues and resolved issues, and the latest release notes. On the Resources pages, you can find links to data sheets, technical reports, white papers, and videos.

- [\*NetApp HCI Documentation\*](#)
- [\*NetApp HCI Documentation Center\*](#)
- [\*NetApp HCI Resources page\*](#)
- [\*SolidFire and Element 12.0 Documentation Center\*](#)
- [\*SolidFire and Element 11.8 Documentation Center\*](#)
- [\*SolidFire and Element 11.7 Documentation Center\*](#)
- [\*SolidFire and Element 11.5 Documentation Center\*](#)
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- [\*SolidFire Resources page\*](#)

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