



Upgrade your NetApp SolidFire all-flash storage system for Element software 12.5 or later

Element Software

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Upgrade your NetApp SolidFire all-flash storage system for Element software 12.5 or later

Upgrade sequence overview

You can keep your SolidFire Element storage system up-to-date after deployment by sequentially upgrading all NetApp storage components.

These components include management services, NetApp Hybrid Cloud Control, Element software, management node, and (depending on your installation) the Element Plug-in for vCenter Server.



- Beginning with Element 12.7, the SF2405 and SF9608 storage nodes and FC0025 and SF-FCN-01 FC nodes are not supported. If you attempt to upgrade one of these nodes to Element 12.7, you will see an error stating that this node is not supported by Element 12.7.
- Beginning with Element 12.5, NetApp HealthTools is no longer supported for Element software upgrades. If you are running Element 11.0 or 11.1, you must first [upgrade to Element 12.3 using HealthTools](#) and then upgrade to Element 12.5 or later using NetApp Hybrid Cloud Control.

The [system upgrade sequence](#) content describes the tasks that are needed to complete a SolidFire all-flash storage system upgrade. Ideally these procedures are performed as part of the larger upgrade sequence and not in isolation. If a component-based upgrade or update is needed, see the procedure prerequisites to ensure additional complexities are addressed.

The [vSphere upgrade sequence](#) including Element Plug-in for vCenter Server content describes additional pre- and post-upgrade steps required to re-install the Element Plug-in for vCenter Server.

What you'll need

- You are running management node 11.3 or later. Newer versions of the management node have a modular architecture that provides individual services.



To check the version, log in to your management node and view the Element version number in the login banner. If you do not have 11.3, see [Upgrade your management node](#).

- You have upgraded your management services to at least version 2.1.326.

Upgrades using NetApp Hybrid Cloud Control are not available in earlier service bundle versions.

- You have ensured that the system time on all nodes is synced and that NTP is correctly configured for the storage cluster and nodes. Each node must be configured with a DNS nameserver in the per-node web UI ([https://\[IP address\]:442](https://[IP address]:442)) with no unresolved cluster faults related to time skew.
- You have scheduled sufficient time for your [Element software](#) and [storage firmware](#) upgrades. When you upgrade to Element software 12.5 or later, the upgrade process time varies depending on the Element software version and firmware updates.

System upgrade sequence

You can use the following sequence to upgrade your NetApp SolidFire all-flash storage system for Element 12.5 or later.

Steps

1. [Update management services from Hybrid Cloud Control.](#)



If you are updating management services to version 2.16 or later and you are running a management node 11.3 to 11.8, you will need to increase your management node VM's RAM prior to updating management services.



You must update to the latest management services bundle before upgrading your Element software.

2. [Run Element storage health checks prior to upgrading storage.](#)

3. [Upgrade your Element software and storage firmware.](#)

4. [\(Optional\) Upgrade your Element storage firmware only.](#)



You might perform this task when a new storage firmware upgrade becomes available outside of a major release.

5. [\(Optional\) Upgrade your management node.](#)



Upgrading the management node operating system is no longer required to upgrade Element software on the storage cluster. If the management node is version 11.3 or higher, you can simply upgrade the management services to the latest version to perform Element upgrades using NetApp Hybrid Cloud Control. Follow the management node upgrade procedure for your scenario if you would like to upgrade the management node operating system for other reasons, such as security remediation.

6. [Upgrade your Element Plug-in for vCenter Server.](#)

Find more information

- [NetApp Element Plug-in for vCenter Server](#)
- [SolidFire and Element Resources page](#)

System upgrade procedures

Update management services

You can update your management services to the latest bundle version after you have installed management node 11.3 or later.

Beginning with the Element 11.3 management node release, the management node design has been changed based on a new modular architecture that provides individual services. These modular services provide central and extended management functionality for a SolidFire all-flash storage system. Management services include system telemetry, logging, and update services, the QoSSIOC service for Element Plug-in for vCenter Server, NetApp Hybrid Cloud Control, and more.

About this task

- You must upgrade to the latest management services bundle before upgrading your Element software.



- Management services 2.22.7 includes NetApp Element Plug-in for VMware vCenter Server 5.0 which contains the remote plug-in. If you use the Element plug-in, you should upgrade to version 5.0 to comply with the VMware directive that removes support for local plug-ins. [Learn more](#). If you do not use the plug-in, this is an optional upgrade.
- For the latest management services release notes describing major services, new features, bug fixes, and workarounds for each service bundle, see [the management services release notes](#)

What you'll need

Beginning with management services 2.20.69, you must accept and save the End User License Agreement (EULA) before using the NetApp Hybrid Cloud Control UI or API to upgrade management services:

1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. The EULA pops up. Scroll down, select **I accept for current and all future updates**, and select **Save**.



When you accept the EULA, it is recorded for all future updates and the automatic download feature is enabled. You will receive updates on NetApp software updates and upgrades, which you can install at your discretion and convenience. You can disable the automatic download feature by disabling network connectivity to the NetApp online software repository.

Update options

You can update management services using the NetApp Hybrid Cloud Control UI or the management node REST API:

- [Update management services using Hybrid Cloud Control](#) (Recommended method)
- [Update management services using the management node API](#)
- [Update management services using the management node API for dark sites](#)

Update management services using Hybrid Cloud Control

You can update your NetApp management services using NetApp Hybrid Cloud Control.

Management service bundles provide enhanced functionality and fixes to your installation outside of major releases.

Before you begin

- You are running management node 11.3 or later.
- If you are updating management services to version 2.16 or later and you are running a management node 11.3 to 11.8, you will need to increase your management node VM's RAM prior to updating management services:
 - a. Power off the management node VM.
 - b. Change the RAM of the management node VM from 12GB to 24GB RAM.

- c. Power on the management node VM.
- Your cluster version is running NetApp Element software 11.3 or later.
- You have upgraded your management services to at least version 2.1.326. NetApp Hybrid Cloud Control upgrades are not available in earlier service bundles.



For a list of available services for each service bundle version, see the [Management Services Release Notes](#).

Steps

1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. On the Upgrades page, select the **Management Services** tab.

The Management Services tab shows the current and available versions of management services software.



If your installation cannot access the internet, only the current software version is shown. If your installation has external connectivity, but cannot access the NetApp online repository, check your [proxy configuration](#).

5. If your installation can access the internet and if a management services upgrade is available, select **Begin Upgrade**.
6. If your installation cannot access the internet, do the following:
 - a. Follow the instructions on the page to download and save a management services upgrade package to your computer.
 - b. Select **Browse** to locate the package you saved and upload it.

After you upload the package, the upgrade starts automatically.

After the upgrade begins, you can see the upgrade status on this page. During the upgrade, you might lose connection with NetApp Hybrid Cloud Control and have to log back in to see the results of the upgrade.

Update management services using the management node API

Users should ideally perform management services updates from NetApp Hybrid Cloud Control. You can however manually update management services using the REST API UI from the management node.

Before you begin

- You are running management node 11.3 or later.
- If you are updating management services to version 2.16 or later and you are running a management node 11.3 to 11.8, you will need to increase your management node VM's RAM prior to updating management services:

- a. Power off the management node VM.
- b. Change the RAM of the management node VM from 12GB to 24GB RAM.
- c. Power on the management node VM.
- Your cluster version is running NetApp Element software 11.3 or later.
- You have upgraded your management services to at least version 2.1.326. NetApp Hybrid Cloud Control upgrades are not available in earlier service bundles.



For a list of available services for each service bundle version, see the [Management Services Release Notes](#).

Steps

1. Open the REST API UI on the management node: <https://<ManagementNodeIP>/mnode>
2. Select **Authorize** and complete the following:
 - a. Enter the cluster user name and password.
 - b. Enter the client ID as `mnode-client` if the value is not already populated.
 - c. Select **Authorize** to begin a session.
 - d. Close the window.
3. (Optional) Confirm available versions of management node services: `GET /services/versions`
4. (Optional) Get detailed information about the latest version: `GET /services/versions/latest`
5. (Optional) Get detailed information about a specific version: `GET /services/versions/{version}/info`
6. Perform one of the following management services update options:
 - a. Run this command to update to the most recent version of management node services: `PUT /services/update/latest`
 - b. Run this command to update to a specific version of management node services: `PUT /services/update/{version}`
7. Run `GET/services/update/status` to monitor the status of the update.

A successful update returns a result similar to the following example:

```
{
  "current_version": "2.10.29",
  "details": "Updated to version 2.14.60",
  "status": "success"
}
```

Update management services using the management node API for dark sites

Users should ideally perform management services updates from NetApp Hybrid Cloud Control. You can however manually upload, extract, and deploy a service bundle update for management services to the management node using the REST API. You can run each command from the REST API UI for the management node.

Before you begin

- You have deployed a NetApp Element software management node 11.3 or later.
- If you are updating management services to version 2.16 or later and you are running a management node 11.3 to 11.8, you will need to increase your management node VM's RAM prior to updating management services:
 - a. Power off the management node VM.
 - b. Change the RAM of the management node VM from 12GB to 24GB RAM.
 - c. Power on the management node VM.
- Your cluster version is running NetApp Element software 11.3 or later.
- You have downloaded the service bundle update from the [NetApp Support Site](#) to a device that can be used in the dark site.

Steps

1. Open the REST API UI on the management node: <https://<ManagementNodeIP>/mnode>
2. Select **Authorize** and complete the following:
 - a. Enter the cluster user name and password.
 - b. Enter the client ID as `mnode-client` if the value is not already populated.
 - c. Select **Authorize** to begin a session.
 - d. Close the window.
3. Upload and extract the service bundle on the management node using this command: `PUT /services/upload`
4. Deploy the management services on the management node: `PUT /services/deploy`
5. Monitor the status of the update: `GET /services/update/status`

A successful update returns a result similar to the following example:

```
{
  "current_version": "2.10.29",
  "details": "Updated to version 2.17.52",
  "status": "success"
}
```

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

Run Element storage health checks prior to upgrading storage

You must run health checks prior to upgrading Element storage to ensure all storage nodes in your cluster are ready for the next Element storage upgrade.

What you'll need

- **Management services:** You have updated to the latest management services bundle (2.10.27 or later).



You must upgrade to the latest management services bundle before upgrading your Element software.

- **Management node:** You are running management node 11.3 or later.
- **Element software:** Your cluster version is running NetApp Element software 11.3 or later.
- **End User License Agreement (EULA):** Beginning with management services 2.20.69, you must accept and save the EULA before using the NetApp Hybrid Cloud Control UI or API to run Element storage health checks:
 1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. The EULA pops up. Scroll down, select **I accept for current and all future updates**, and select **Save**.



When you accept the EULA, it is recorded for all future updates and the automatic download feature is enabled. You will receive updates on NetApp software updates and upgrades, which you can install at your discretion and convenience. You can disable the automatic download feature by disabling network connectivity to the NetApp online software repository.

Health check options

You can run health checks using the NetApp Hybrid Cloud Control UI or the NetApp Hybrid Cloud Control API:

- [Use NetApp Hybrid Cloud Control to run Element storage health checks prior to upgrading storage](#) (Preferred method)

You can also find out more about storage health checks that are run by the service:

- [Storage health checks made by the service](#)

Use NetApp Hybrid Cloud Control to run Element storage health checks prior to upgrading storage

Using NetApp Hybrid Cloud Control, you can verify that a storage cluster is ready to be upgraded.

Steps

1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. On the **Upgrades** page, select the **Storage** tab.

5.  Select the health check  for the cluster you want to check for upgrade readiness.
6. On the **Storage Health Check** page, select **Run Health Check**.
7. If there are issues, do the following:
 - a. Go to the specific KB article listed for each issue or perform the specified remedy.
 - b. If a KB is specified, complete the process described in the relevant KB article.
 - c. After you have resolved cluster issues, select **Re-Run Health Check**.

After the health check completes without errors, the storage cluster is ready to upgrade. See storage node upgrade [instructions](#) to proceed.

Use API to run Element storage health checks prior to upgrading storage

You can use REST API to verify that a storage cluster is ready to be upgraded. The health check verifies that there are no obstacles to upgrading, such as pending nodes, disk space issues, and cluster faults.

Steps

1. Locate the storage cluster ID:
 - a. Open the management node REST API UI on the management node:

```
https://<ManagementNodeIP>/mnode
```

- b. Select **Authorize** and complete the following:
 - i. Enter the cluster user name and password.
 - ii. Enter the client ID as `mnode-client` if the value is not already populated.
 - iii. Select **Authorize** to begin a session.
 - iv. Close the authorization window.
 - c. From the REST API UI, select `GET /assets`.
 - d. Select **Try it out**.
 - e. Select **Execute**.
 - f. From the response, copy the "id" from the "storage" section of the cluster you intend to check for upgrade readiness.



Do not use the "parent" value in this section because this is the management node's ID, not the storage cluster's ID.

```
"config": {},
"credentialid": "12bbb2b2-f1be-123b-1234-12c3d4bc123e",
"host_name": "SF_DEMO",
"iid": "12cc3a45-e6e7-8d91-a2bb-0bdb3456b789",
"ip": "10.123.12.12",
"parent": "d123ec42-456e-8912-ad3e-4bd56f4a789a",
"sshcredentialid": null,
"ssl_certificate": null
```

2. Run health checks on the storage cluster:

- a. Open the storage REST API UI on the management node:

```
https://<ManagementNodeIP>/storage/1/
```

- b. Select **Authorize** and complete the following:

- i. Enter the cluster user name and password.
- ii. Enter the client ID as `mnode-client` if the value is not already populated.
- iii. Select **Authorize** to begin a session.
- iv. Close the authorization window.

- c. Select **POST /health-checks**.

- d. Select **Try it out**.

- e. In the parameter field, enter the storage cluster ID obtained in Step 1.

```
{
  "config": {},
  "storageId": "123a45b6-1a2b-12a3-1234-1a2b34c567d8"
}
```

- f. Select **Execute** to run a health check on the specified storage cluster.

The response should indicate state as `initializing`:

```

{
  "_links": {
    "collection": "https://10.117.149.231/storage/1/health-checks",
    "log": "https://10.117.149.231/storage/1/health-checks/358f073f-896e-4751-ab7b-ccb5f61f9fc/log",
    "self": "https://10.117.149.231/storage/1/health-checks/358f073f-896e-4751-ab7b-ccb5f61f9fc"
  },
  "config": {},
  "dateCompleted": null,
  "dateCreated": "2020-02-21T22:11:15.476937+00:00",
  "healthCheckId": "358f073f-896e-4751-ab7b-ccb5f61f9fc",
  "state": "initializing",
  "status": null,
  "storageId": "c6d124b2-396a-4417-8a47-df10d647f4ab",
  "taskId": "73f4df64-bda5-42c1-9074-b4e7843dbb77"
}

```

g. Copy the `healthCheckID` that is part of response.

3. Verify the results of the health checks:
 - a. Select **GET /health-checks/{healthCheckId}**.
 - b. Select **Try it out**.
 - c. Enter the health check ID in the parameter field.
 - d. Select **Execute**.
 - e. Scroll to the bottom of the response body.

If all health checks are successful, the return is similar to the following example:

```

"message": "All checks completed successfully.",
"percent": 100,
"timestamp": "2020-03-06T00:03:16.321621Z"

```

4. If the `message` return indicates that there were problems regarding cluster health, do the following:
 - a. Select **GET /health-checks/{healthCheckId}/log**
 - b. Select **Try it out**.
 - c. Enter the health check ID in the parameter field.
 - d. Select **Execute**.
 - e. Review any specific errors and obtain their associated KB article links.
 - f. Go to the specific KB article listed for each issue or perform the specified remedy.
 - g. If a KB is specified, complete the process described in the relevant KB article.
 - h. After you have resolved cluster issues, run **GET /health-checks/{healthCheckId}/log** again.

Storage health checks made by the service

Storage health checks make the following checks per cluster.

Check Name	Node/Cluster	Description
check_async_results	Cluster	Verifies that the number of asynchronous results in the database is below a threshold number.
check_cluster_faults	Cluster	Verifies that there are no upgrade blocking cluster faults (as defined in Element source).
check_upload_speed	Node	Measures the upload speed between the storage node and the management node.
connection_speed_check	Node	Verifies that nodes have connectivity to the management node serving upgrade packages and estimates connection speed.
check_cores	Node	Checks for kernel crash dump and core files on the node. The check fails for any crashes in a recent time period (threshold 7 days).
check_root_disk_space	Node	Verifies the root file system has sufficient free space to perform an upgrade.
check_var_log_disk_space	Node	Verifies that <code>/var/log</code> free space meets some percentage free threshold. If it does not, the check will rotate and purge older logs in order to fall under threshold. The check fails if it is unsuccessful at creating sufficient free space.
check_pending_nodes	Cluster	Verifies that there are no pending nodes on the cluster.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

Upgrade Element software

To upgrade NetApp Element software, you can use the NetApp Hybrid Cloud Control UI or REST API. Certain operations are suppressed during an Element software upgrade, such as adding and removing nodes, adding and removing drives, and commands associated with initiators, volume access groups, and virtual networks, among others.



Beginning with Element 12.5, NetApp HealthTools is no longer supported for Element software upgrades. If you are running Element 11.0 or 11.1, you must first [upgrade to Element 12.3.x using HealthTools](#) and then upgrade to Element 12.5 or later using NetApp Hybrid Cloud Control.

What you'll need

- **Admin privileges:** You have storage cluster administrator permissions to perform the upgrade.
- **Valid upgrade path:** You have checked upgrade path information for the Element version you are upgrading to and verified that the upgrade path is valid.
[NetApp KB: Upgrade matrix for storage clusters running NetApp Element Software](#)
- **System time sync:** You have ensured that the system time on all nodes is synced and that NTP is correctly configured for the storage cluster and nodes. Each node must be configured with a DNS nameserver in the per-node web UI ([https://\[IP address\]:442](https://[IP address]:442)) with no unresolved cluster faults related to time skew.
- **System ports:** If you are using NetApp Hybrid Cloud Control for upgrades, you have ensured that the necessary ports are open. See [Network ports](#) for more information.
- **Management node:** For NetApp Hybrid Cloud Control UI and API, the management node in your environment is running version 11.3.
- **Management services:** You have updated your management services bundle to the latest version.



You must upgrade to the latest management services bundle before upgrading your Element software to version 12.5 or later. If you are updating your Element software to version 12.5 or later, you need management services 2.21.61 or later to proceed.

- **Cluster health:** You have verified that the cluster is ready to be upgraded. See [Run Element storage health checks prior to upgrading storage](#).
- **Updated baseboard management controller (BMC) for H610S storage nodes:** You have upgraded the BMC version for your H610S nodes. See the [release notes and upgrade instructions](#).
- **Upgrade process time:** You have scheduled sufficient time to perform your upgrade. When you upgrade to Element software 12.5 or later, the upgrade process time varies depending on your current Element software version and firmware updates.

Storage Node	Current Element software version	Approximate software and firmware install time per node ¹	Approximate data synchronization time per node ²	Approximate total upgrade time per node
All SolidFire and NetApp H-series nodes with up-to-date firmware ³	12.x	15 minutes	10 to 15 minutes	20 to 30 minutes
H610S and H410S	12.x and 11.8	60 minutes	30 to 60 minutes	90 to 120 minutes

Storage Node	Current Element software version	Approximate software and firmware install time per node ¹	Approximate data synchronization time per node ²	Approximate total upgrade time per node
H610S	11.7 and earlier	90 minutes	40 to 70 minutes	130 to 160 minutes You must also perform a complete node shutdown and power disconnect for each H610S node.

¹For a complete matrix of firmware and driver firmware for your hardware, see [supported storage firmware versions for SolidFire storage nodes](#).

²If you combine a cluster with a heavy write IOPS load with a longer firmware update time, the data synchronization time will increase.

³Beginning with Element 12.7, the SF2405 and SF9608 storage nodes and FC0025 and SF-FCN-01 FC nodes are not supported. If you attempt to upgrade one of these nodes to Element 12.7, you will see an error stating that this node is not supported by Element 12.7.

- **End User License Agreement (EULA):** Beginning with management services 2.20.69, you must accept and save the EULA before using the NetApp Hybrid Cloud Control UI or API to upgrade Element software:

1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. The EULA pops up. Scroll down, select **I accept for current and all future updates**, and select **Save**.



When you accept the EULA, it is recorded for all future updates and the automatic download feature is enabled. You will receive updates on NetApp software updates and upgrades, which you can install at your discretion and convenience. You can disable the automatic download feature by disabling network connectivity to the NetApp online software repository.

Upgrade options

Choose one of the following Element software upgrade options:

- [Use NetApp Hybrid Cloud Control UI to upgrade Element storage](#)
- [Use NetApp Hybrid Cloud Control API to upgrade Element storage](#)



If you are upgrading an H610S series node to Element 12.5 or later and the node is running a version of Element earlier than 11.8, you will need to perform the additional upgrade steps in this [KB article](#) for each storage node. If you are running Element 11.8 or later, the additional upgrade steps are not required.

Use NetApp Hybrid Cloud Control UI to upgrade Element storage

Using the NetApp Hybrid Cloud Control UI, you can upgrade a storage cluster.

What you'll need

- If your management node is not connected to the internet, you have downloaded the [Element software upgrade package \(.tar.gz\) for SolidFire storage clusters](#).



For potential issues while upgrading storage clusters using NetApp Hybrid Cloud Control and their workarounds, see this [KB article](#).

Steps

1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. On the **Upgrades** page, select **Storage**.

The **Storage** tab lists the storage clusters that are part of your installation. If a cluster is inaccessible by NetApp Hybrid Cloud Control, it will not be displayed on the **Upgrades** page.

5. Choose from the following options and perform the set of steps that are applicable to your cluster:

Option	Steps
Your management node has external connectivity.	<ol style="list-style-type: none"> <li data-bbox="857 159 1484 260">1. Select the drop-down arrow next to the cluster you are upgrading, and select from the upgrade versions available under the Element tab. <li data-bbox="857 277 1182 310">2. Select Begin Upgrade. <div data-bbox="873 445 928 499" style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;">  <p>The Upgrade Status changes during the upgrade to reflect the status of the process. It also changes in response to actions you take, such as pausing the upgrade, or if the upgrade returns an error. See Upgrade status changes.</p> </div> <div data-bbox="873 772 928 827" style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;">  <p>While the upgrade is in progress, you can leave the page and come back to it later to continue monitoring the progress. The page does not dynamically update status and current version if the cluster row is collapsed. The cluster row must be expanded to update the table or you can refresh the page.</p> </div> <p data-bbox="841 999 1377 1062">You can download logs after the upgrade is complete.</p>
Your management node is within a dark site without external connectivity.	<ol style="list-style-type: none"> <li data-bbox="857 1121 1471 1184">1. Select Browse to upload the upgrade package that you downloaded. <li data-bbox="857 1201 1471 1264">2. Wait for the upload to complete. A progress bar shows the status of the upload. <div data-bbox="873 1335 928 1390" style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;">  <p>The file upload will be lost if you navigate away from the browser window.</p> </div> <p data-bbox="841 1457 1468 1625">An on-screen message is displayed after the file is successfully uploaded and validated. Validation might take several minutes. If you navigate away from the browser window at this stage, the file upload is preserved.</p>

Option	Steps
<p>You are upgrading an H610S cluster running Element version earlier than 11.8.</p>	<ol style="list-style-type: none"> 1. Select the drop-down arrow next to the cluster you are upgrading, and select from the upgrade versions available. 2. Select Begin Upgrade. After the upgrade is complete, the UI prompts you to perform additional upgrade steps. 3. Complete the additional steps required in the KB article, and acknowledge in the UI that you have completed phase 2. <p>You can download logs after the upgrade is complete. For information about the various upgrade status changes, see Upgrade status changes.</p>

Upgrade status changes

Here are the different states that the **Upgrade Status** column in the UI shows before, during, and after the upgrade process:

Upgrade state	Description
Up to Date	The cluster was upgraded to the latest Element version available.
Versions Available	Newer versions of Element and/or storage firmware are available for upgrade.
In Progress	The upgrade is in progress. A progress bar shows the upgrade status. On-screen messages also show node-level faults and display the node ID of each node in the cluster as the upgrade progresses. You can monitor the status of each node using the Element UI or the NetApp Element plug-in for vCenter Server UI.
Upgrade Pausing	You can choose to pause the upgrade. Depending on the state of the upgrade process, the pause operation can succeed or fail. You will see a UI prompt asking you to confirm the pause operation. To ensure that the cluster is in a safe spot before pausing an upgrade, it can take up to two hours for the upgrade operation to be completely paused. To resume the upgrade, select Resume .
Paused	You paused the upgrade. Select Resume to resume the process.

Upgrade state	Description
Error	An error has occurred during the upgrade. You can download the error log and send it to NetApp Support. After you resolve the error, you can return to the page, and select Resume . When you resume the upgrade, the progress bar goes backwards for a few minutes while the system runs the health check and checks the current state of the upgrade.
Unable to Detect	NetApp Hybrid Cloud Control shows this status instead of Versions Available when it does not have external connectivity to reach the online software repository. If you have external connectivity but still see this message, check your proxy configuration .
Complete with Follow-up	Only for H610S nodes upgrading from Element version earlier than 11.8. After phase 1 of the upgrade process is complete, this state prompts you to perform additional upgrade steps (see the KB article). After you complete phase 2 and acknowledge that you have completed it, the status changes to Up to Date .

Use NetApp Hybrid Cloud Control API to upgrade Element storage

You can use APIs to upgrade storage nodes in a cluster to the latest Element software version. You can use an automation tool of your choice to run the APIs. The API workflow documented here uses the REST API UI available on the management node as an example.

Steps

1. Do one of the following depending on your connection:

Option	Steps
Your management node has external connectivity.	<ol style="list-style-type: none">1. Verify the repository connection:<ol style="list-style-type: none">a. Open the management node REST API UI on the management node:<div data-bbox="938 310 1485 447" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"><pre>https://<ManagementNodeIP>/package-repository/1/</pre></div>b. Select Authorize and complete the following:<ol style="list-style-type: none">i. Enter the cluster user name and password.ii. Enter the client ID as <code>mnode-client</code>.iii. Select Authorize to begin a session.iv. Close the authorization window.c. From the REST API UI, select GET /packages/remote-repository/connection.d. Select Try it out.e. Select Execute.f. If code 200 is returned, go to the next step. If there is no connection to the remote repository, establish the connection or use the dark site option.2. Find the upgrade package ID:<ol style="list-style-type: none">a. From the REST API UI, select GET /packages.b. Select Try it out.c. Select Execute.d. From the response, copy and save the package ID for use in a later step.

Option	Steps
<p>Your management node is within a dark site without external connectivity.</p>	<ol style="list-style-type: none"> 1. Download the storage upgrade package to a device that is accessible to the management node. <p>Go to the Element software downloads page and download the latest storage node image.</p> 2. Upload the storage upgrade package to the management node: <ol style="list-style-type: none"> a. Open the management node REST API UI on the management node: <div data-bbox="938 577 1485 716" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre>https://<ManagementNodeIP>/package-repository/1/</pre> </div> b. Select Authorize and complete the following: <ol style="list-style-type: none"> i. Enter the cluster user name and password. ii. Enter the client ID as <code>mnode-client</code>. iii. Select Authorize to begin a session. iv. Close the authorization window. c. From the REST API UI, select POST /packages. d. Select Try it out. e. Select Browse and select the upgrade package. f. Select Execute to initiate the upload. g. From the response, copy and save the package ID ("<code>id</code>") for use in a later step. 3. Verify the status of the upload. <ol style="list-style-type: none"> a. From the REST API UI, select GET /packages/{id}/status. b. Select Try it out. c. Enter the package ID you copied in the previous step in <code>id</code>. d. Select Execute to initiate the status request. <p>The response indicates <code>state</code> as <code>SUCCESS</code> when complete.</p>

2. Locate the storage cluster ID:

- a. Open the management node REST API UI on the management node:

```
https://<ManagementNodeIP>/inventory/1/
```

- b. Select **Authorize** and complete the following:
 - i. Enter the cluster user name and password.
 - ii. Enter the client ID as `mnode-client`.
 - iii. Select **Authorize** to begin a session.
 - iv. Close the authorization window.
- c. From the REST API UI, select **GET /installations**.
- d. Select **Try it out**.
- e. Select **Execute**.
- f. From the response, copy the installation asset ID ("`id`").
- g. From the REST API UI, select **GET /installations/{id}**.
- h. Select **Try it out**.
- i. Paste the installation asset ID into the `id` field.
- j. Select **Execute**.
- k. From the response, copy and save the storage cluster ID ("`id`") of the cluster you intend to upgrade for use in a later step.

3. Run the storage upgrade:

- a. Open the storage REST API UI on the management node:

```
https://<ManagementNodeIP>/storage/1/
```

- b. Select **Authorize** and complete the following:
 - i. Enter the cluster user name and password.
 - ii. Enter the client ID as `mnode-client`.
 - iii. Select **Authorize** to begin a session.
 - iv. Close the authorization window.
- c. Select **POST /upgrades**.
- d. Select **Try it out**.
- e. Enter the upgrade package ID in the parameter field.
- f. Enter the storage cluster ID in the parameter field.

The payload should look similar to the following example:

```

{
  "config": {},
  "packageId": "884f14a4-5a2a-11e9-9088-6c0b84e211c4",
  "storageId": "884f14a4-5a2a-11e9-9088-6c0b84e211c4"
}

```

g. Select **Execute** to initiate the upgrade.

The response should indicate the state as initializing:

```

{
  "_links": {
    "collection": "https://localhost:442/storage/upgrades",
    "self": "https://localhost:442/storage/upgrades/3fa85f64-1111-4562-b3fc-2c963f66abc1",
    "log": "https://localhost:442/storage/upgrades/3fa85f64-1111-4562-b3fc-2c963f66abc1/log"
  },
  "storageId": "114f14a4-1a1a-11e9-9088-6c0b84e200b4",
  "upgradeId": "334f14a4-1a1a-11e9-1055`-6c0b84e2001b4",
  "packageId": "774f14a4-1a1a-11e9-8888-6c0b84e200b4",
  "config": {},
  "state": "initializing",
  "status": {
    "availableActions": [
      "string"
    ],
    "message": "string",
    "nodeDetails": [
      {
        "message": "string",
        "step": "NodePreStart",
        "nodeID": 0,
        "numAttempt": 0
      }
    ],
    "percent": 0,
    "step": "ClusterPreStart",
    "timestamp": "2020-04-21T22:10:57.057Z",
    "failedHealthChecks": [
      {
        "checkID": 0,
        "name": "string",
        "displayName": "string",
        "passed": true,

```

```

        "kb": "string",
        "description": "string",
        "remedy": "string",
        "severity": "string",
        "data": {},
        "nodeID": 0
    }
]
},
"taskId": "123f14a4-1a1a-11e9-7777-6c0b84e123b2",
"dateCompleted": "2020-04-21T22:10:57.057Z",
"dateCreated": "2020-04-21T22:10:57.057Z"
}

```

- h. Copy the upgrade ID ("upgradeId") that is part of the response.
4. Verify the upgrade progress and results:
- Select **GET /upgrades/{upgradeld}**.
 - Select **Try it out**.
 - Enter the upgrade ID from the previous step in **upgradeld**.
 - Select **Execute**.
 - Do one of the following if there are problems or special requirements during the upgrade:

Option	Steps
<p>You need to correct cluster health issues due to <code>failedHealthChecks</code> message in the response body.</p>	<ol style="list-style-type: none"> Go to the specific KB article listed for each issue or perform the specified remedy. If a KB is specified, complete the process described in the relevant KB article. After you have resolved cluster issues, reauthenticate if needed and select PUT /upgrades/{upgradeld}. Select Try it out. Enter the upgrade ID from the previous step in upgradeld. Enter <code>"action": "resume"</code> in the request body. <div data-bbox="915 1635 1487 1814" data-label="Text" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre> { "action": "resume" } </pre> </div> Select Execute.

Option	Steps
<p>You need to pause the upgrade because the maintenance window is closing or for another reason.</p>	<ol style="list-style-type: none"> 1. Reauthenticate if needed and select PUT /upgrades/{upgradeld}. 2. Select Try it out. 3. Enter the upgrade ID from the previous step in upgradeld. 4. Enter <code>"action": "pause"</code> in the request body. <div data-bbox="915 478 1487 659" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre>{ "action": "pause" }</pre> </div> 5. Select Execute.
<p>If you are upgrading an H610S cluster running an Element version earlier than 11.8, you see the <code>state finishedNeedsAck</code> in the response body. You must perform additional upgrade steps for each H610S storage node.</p>	<ol style="list-style-type: none"> 1. Complete the additional upgrade steps in this KB article for each node. 2. Reauthenticate if needed and select PUT /upgrades/{upgradeld}. 3. Select Try it out. 4. Enter the upgrade ID from the previous step in upgradeld. 5. Enter <code>"action": "acknowledge"</code> in the request body. <div data-bbox="915 1178 1487 1358" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre>{ "action": "acknowledge" }</pre> </div> 6. Select Execute.

- f. Run the **GET /upgrades/{upgradeld}** API multiple times, as needed, until the process is complete.

During the upgrade, the `status` indicates `running` if no errors are encountered. As each node is upgraded, the `step` value changes to `NodeFinished`.

The upgrade has finished successfully when the `percent` value is 100 and the `state` indicates `finished`.

What happens if an upgrade fails using NetApp Hybrid Cloud Control

If a drive or node fails during an upgrade, the Element UI will show cluster faults. The upgrade process does not proceed to the next node, and waits for the cluster faults to resolve. The progress bar in the UI shows that the upgrade is waiting for the cluster faults to resolve. At this stage, selecting **Pause** in the UI will not work,

because the upgrade waits for the cluster to be healthy. You will need to engage NetApp Support to assist with the failure investigation.

NetApp Hybrid Cloud Control has a pre-set three-hour waiting period, during which one of the following scenarios can happen:

- The cluster faults get resolved within the three-hour window, and upgrade resumes. You do not need to take any action in this scenario.
- The problem persists after three hours, and the upgrade status shows **Error** with a red banner. You can resume the upgrade by selecting **Resume** after the problem is resolved.
- NetApp Support has determined that the upgrade needs to be temporarily aborted to take corrective action before the three-hour window. Support will use the API to abort the upgrade.



Aborting the cluster upgrade while a node is being updated might result in the drives being ungracefully removed from the node. If the drives are ungracefully removed, adding the drives back during an upgrade will require manual intervention by NetApp Support. The node might be taking longer to do firmware updates or post update syncing activities. If the upgrade progress seems stalled, contact NetApp Support for assistance.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

Upgrade storage firmware

Starting with Element 12.0 and management services version 2.14, you can perform firmware-only upgrades on your storage nodes using the NetApp Hybrid Cloud Control UI and REST API. This procedure does not upgrade Element software and enables you to upgrade storage firmware outside of a major Element release.

What you'll need

- **Admin privileges:** You have storage cluster administrator permissions to perform the upgrade.
- **System time sync:** You have ensured that the system time on all nodes is synced and that NTP is correctly configured for the storage cluster and nodes. Each node must be configured with a DNS nameserver in the per-node web UI ([https://\[IP address\]:442](https://[IP address]:442)) with no unresolved cluster faults related to time skew.
- **System ports:** If you are using NetApp Hybrid Cloud Control for upgrades, you have ensured that the necessary ports are open. See [Network ports](#) for more information.
- **Management node:** For NetApp Hybrid Cloud Control UI and API, the management node in your environment is running version 11.3.
- **Management services:** You have updated your management services bundle to the latest version.



For H610S storage nodes running Element software version 12.0, you should apply D-patch SUST-909 before you upgrade to storage firmware bundle 2.27. Contact NetApp Support to obtain the D-patch before you upgrade. See [Storage Firmware Bundle 2.27 Release Notes](#).



You must upgrade to the latest management services bundle before upgrading the firmware on your storage nodes. If you are updating your Element software to version 12.2 or later, you need management services 2.14.60 or later to proceed.

- **Cluster health:** You have run health checks. See [Run Element storage health checks prior to upgrading storage](#).
- **Updated baseboard management controller (BMC) for H610S nodes:** You have upgraded the BMC version for your H610S nodes. See [release notes and upgrade instructions](#).



For a complete matrix of firmware and driver firmware for your hardware, see [supported storage firmware versions for SolidFire storage nodes](#).

- **Upgrade process time:** You have scheduled sufficient time to perform your upgrade. When you upgrade to Element software 12.5 or later, the upgrade process time varies depending on your current Element software version and firmware updates.

Storage Node	Current Element software version	Approximate software and firmware install time per node ¹	Approximate data synchronization time per node ²	Approximate total upgrade time per node
All SolidFire and NetApp H-series nodes with up-to-date firmware ³	12.x	15 minutes	10 to 15 minutes	20 to 30 minutes
H610S and H410S	12.x and 11.8	60 minutes	30 to 60 minutes	90 to 120 minutes
H610S	11.7 and earlier	90 minutes	40 to 70 minutes	130 to 160 minutes You must also perform a complete node shutdown and power disconnect for each H610S node.

¹For a complete matrix of firmware and driver firmware for your hardware, see [supported storage firmware versions for SolidFire storage nodes](#).

²If you combine a cluster with a heavy write IOPS load with a longer firmware update time, the data synchronization time will increase.

³Beginning with Element 12.7, the SF2405 and SF9608 storage nodes and FC0025 and SF-FCN-01 FC nodes are not supported. If you attempt to upgrade one of these nodes to Element 12.7, you will see an error stating that this node is not supported by Element 12.7.

- **End User License Agreement (EULA):** Beginning with management services 2.20.69, you must accept and save the EULA before using the NetApp Hybrid Cloud Control UI or API to upgrade storage firmware:

1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. The EULA pops up. Scroll down, select **I accept for current and all future updates**, and select **Save**.



When you accept the EULA, it is recorded for all future updates and the automatic download feature is enabled. You will receive updates on NetApp software updates and upgrades, which you can install at your discretion and convenience. You can disable the automatic download feature by disabling network connectivity to the NetApp online software repository.

Upgrade options

Choose one of the following storage firmware upgrade options:

- [Use NetApp Hybrid Cloud Control UI to upgrade storage firmware](#)
- [Use NetApp Hybrid Cloud Control API to upgrade storage firmware](#)

Use NetApp Hybrid Cloud Control UI to upgrade storage firmware

You can use the NetApp Hybrid Cloud Control UI to upgrade the firmware of the storage nodes in your cluster.

What you'll need

- If your management node is not connected to the internet, you have [downloaded the storage firmware bundle](#).



For potential issues while upgrading storage clusters using NetApp Hybrid Cloud Control and their workarounds, see the [KB article](#).



The upgrade process takes approximately 30 minutes per storage node. If you are upgrading an Element storage cluster to storage firmware newer than version 2.76, individual storage nodes will only reboot during the upgrade if new firmware was written to the node.

Steps

1. Open the IP address of the management node in a web browser:

```
https://<ManagementNodeIP>
```

2. Log in to NetApp Hybrid Cloud Control by providing the storage cluster administrator credentials.
3. Select **Upgrade** near the top right of the interface.
4. On the **Upgrades** page, select **Storage**.



The **Storage** tab lists the storage clusters that are part of your installation. If a cluster is inaccessible by NetApp Hybrid Cloud Control, it will not be displayed on the **Upgrades** page. If you have clusters running Element 12.0 or later, you will see the current firmware bundle version listed for these clusters. If the nodes in a single cluster have different firmware versions on them or as the upgrade progresses, you will see **Multiple** in the **Current Firmware Bundle Version** column. You can select **Multiple** to navigate to the **Nodes** page to compare firmware versions. If all your clusters are running Element versions earlier than 12.0, you will not see any information about firmware bundle version numbers. If the cluster is up to date and/or no upgrade packages are available, the **Element** and **Firmware Only** tabs are not displayed. These tabs are also not displayed when an upgrade is in progress. If the **Element** tab is displayed, but not the **Firmware Only** tab, no firmware packages are available.

5. Choose from the following options and perform the set of steps that are applicable to your cluster:

Option	Steps
Your management node has external connectivity.	<ol style="list-style-type: none"> 1. Select the drop-down arrow next to the cluster you are upgrading. 2. Select Firmware Only, and select from the upgrade versions available. 3. Select Begin Upgrade. <div style="margin-top: 10px;">  <p>The Upgrade Status changes during the upgrade to reflect the status of the process. It also changes in response to actions you take, such as pausing the upgrade, or if the upgrade returns an error. See Upgrade status changes.</p> </div> <div style="margin-top: 10px;">  <p>While the upgrade is in progress, you can leave the page and come back to it later to continue monitoring the progress. The page does not dynamically update status and current version if the cluster row is collapsed. The cluster row must be expanded to update the table or you can refresh the page.</p> </div> <p>You can download logs after the upgrade is complete.</p>

Option	Steps
Your management node is within a dark site without external connectivity.	<ol style="list-style-type: none"> 1. Select the drop-down arrow next to the cluster you are upgrading. 2. Select Browse to upload the upgrade package that you downloaded. 3. Wait for the upload to complete. A progress bar shows the status of the upload. <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;">  <p>The file upload will be lost if you navigate away from the browser window.</p> </div> <p>An on-screen message is displayed after the file is successfully uploaded and validated. Validation might take several minutes. If you navigate away from the browser window at this stage, the file upload is preserved.</p> <p>You can download logs after the upgrade is complete. For information about the various upgrade status changes, see Upgrade status changes.</p>

Upgrade status changes

Here are the different states that the **Upgrade Status** column in the UI shows before, during, and after the upgrade process:

Upgrade state	Description
Up to Date	The cluster was upgraded to the latest Element version available or the firmware was upgraded to the latest version.
Unable to Detect	NetApp Hybrid Cloud Control shows this status instead of Versions Available when it does not have external connectivity to reach the online software repository. This status is also displayed when the storage service API returns an upgrade status that is not in the enumerated list of possible upgrade statuses.
Versions Available	Newer versions of Element and/or storage firmware are available for upgrade.
In Progress	The upgrade is in progress. A progress bar shows the upgrade status. On-screen messages also show node-level faults and display the node ID of each node in the cluster as the upgrade progresses. You can monitor the status of each node using the Element UI or the NetApp Element plug-in for vCenter Server UI.

Upgrade state	Description
Upgrade Pausing	You can choose to pause the upgrade. Depending on the state of the upgrade process, the pause operation can succeed or fail. You will see a UI prompt asking you to confirm the pause operation. To ensure that the cluster is in a safe spot before pausing an upgrade, it can take up to two hours for the upgrade operation to be completely paused. To resume the upgrade, select Resume .
Paused	You paused the upgrade. Select Resume to resume the process.
Error	An error has occurred during the upgrade. You can download the error log and send it to NetApp Support. After you resolve the error, you can return to the page, and select Resume . When you resume the upgrade, the progress bar goes backwards for a few minutes while the system runs the health check and checks the current state of the upgrade.

What happens if an upgrade fails using NetApp Hybrid Cloud Control

If a drive or node fails during an upgrade, the Element UI will show cluster faults. The upgrade process does not proceed to the next node, and waits for the cluster faults to resolve. The progress bar in the UI shows that the upgrade is waiting for the cluster faults to resolve. At this stage, selecting **Pause** in the UI will not work, because the upgrade waits for the cluster to be healthy. You will need to engage NetApp Support to assist with the failure investigation.

NetApp Hybrid Cloud Control has a pre-set three-hour waiting period, during which one of the following scenarios can happen:

- The cluster faults get resolved within the three-hour window, and upgrade resumes. You do not need to take any action in this scenario.
- The problem persists after three hours, and the upgrade status shows **Error** with a red banner. You can resume the upgrade by selecting **Resume** after the problem is resolved.
- NetApp Support has determined that the upgrade needs to be temporarily aborted to take corrective action before the three-hour window. Support will use the API to abort the upgrade.



Aborting the cluster upgrade while a node is being updated might result in the drives being ungracefully removed from the node. If the drives are ungracefully removed, adding the drives back during an upgrade will require manual intervention by NetApp Support. The node might be taking longer to do firmware updates or post update syncing activities. If the upgrade progress seems stalled, contact NetApp Support for assistance.

Use NetApp Hybrid Cloud Control API to upgrade storage firmware

You can use APIs to upgrade storage nodes in a cluster to the latest Element software version. You can use an automation tool of your choice to run the APIs. The API workflow documented here uses the REST API UI available on the management node as an example.

Steps

1. Do one of the following depending on your connection:

Option	Steps
Your management node has external connectivity.	<ol style="list-style-type: none">1. Verify the repository connection:<ol style="list-style-type: none">a. Open the management node REST API UI on the management node:<div data-bbox="938 373 1487 512" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"><pre>https://<ManagementNodeIP>/package-repository/1/</pre></div>b. Select Authorize and complete the following:<ol style="list-style-type: none">i. Enter the cluster user name and password.ii. Enter the client ID as <code>mnode-client</code>.iii. Select Authorize to begin a session.iv. Close the authorization window.c. From the REST API UI, select GET /packages/remote-repository/connection.d. Select Try it out.e. Select Execute.f. If code 200 is returned, go to the next step. If there is no connection to the remote repository, establish the connection or use the dark site option.2. Find the upgrade package ID:<ol style="list-style-type: none">a. From the REST API UI, select GET /packages.b. Select Try it out.c. Select Execute.d. From the response, copy and save the firmware package ID for use in a later step.

Option	Steps
<p>Your management node is within a dark site without external connectivity.</p>	<ol style="list-style-type: none"> 1. Download the storage firmware upgrade package to a device that is accessible to the management node; go to the Element software downloads page and download the latest storage firmware image. 2. Upload the storage firmware upgrade package to the management node: <ol style="list-style-type: none"> a. Open the management node REST API UI on the management node: <div data-bbox="938 527 1485 667" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre>https://<ManagementNodeIP>/package-repository/1/</pre> </div> b. Select Authorize and complete the following: <ol style="list-style-type: none"> i. Enter the cluster user name and password. ii. Enter the client ID as <code>mnode-client</code>. iii. Select Authorize to begin a session. iv. Close the authorization window. c. From the REST API UI, select POST /packages. d. Select Try it out. e. Select Browse and select the upgrade package. f. Select Execute to initiate the upload. g. From the response, copy and save the package ID ("<code>id</code>") for use in a later step. 3. Verify the status of the upload. <ol style="list-style-type: none"> a. From the REST API UI, select GET /packages/{id}/status. b. Select Try it out. c. Enter the firmware package ID you copied in the previous step in <code>id</code>. d. Select Execute to initiate the status request. <p>The response indicates <code>state</code> as <code>SUCCESS</code> when complete.</p>

2. Locate the installation asset ID:

- a. Open the management node REST API UI on the management node:

```
https://<ManagementNodeIP>/inventory/1/
```

- b. Select **Authorize** and complete the following:
 - i. Enter the cluster user name and password.
 - ii. Enter the client ID as `mnode-client`.
 - iii. Select **Authorize** to begin a session.
 - iv. Close the authorization window.
- c. From the REST API UI, select **GET /installations**.
- d. Select **Try it out**.
- e. Select **Execute**.
- f. From the response, copy the installation asset ID (`id`).

```
"id": "abcd01e2-xx00-4ccf-11ee-11f111xx9a0b",
"management": {
  "errors": [],
  "inventory": {
    "authoritativeClusterMvip": "10.111.111.111",
    "bundleVersion": "2.14.19",
    "managementIp": "10.111.111.111",
    "version": "1.4.12"
```

- g. From the REST API UI, select **GET /installations/{id}**.
- h. Select **Try it out**.
 - i. Paste the installation asset ID into the `id` field.
 - j. Select **Execute**.
- k. From the response, copy and save the storage cluster ID ("`id`") of the cluster you intend to upgrade for use in a later step.

```
"storage": {
  "errors": [],
  "inventory": {
    "clusters": [
      {
        "clusterUuid": "a1bd1111-4f1e-46zz-ab6f-0a1111b1111x",
        "id": "a1bd1111-4f1e-46zz-ab6f-a1a1a111b012",
```

3. Run the storage firmware upgrade:
 - a. Open the storage REST API UI on the management node:

```
https://<ManagementNodeIP>/storage/1/
```

- b. Select **Authorize** and complete the following:
 - i. Enter the cluster user name and password.
 - ii. Enter the client ID as `mnode-client`.
 - iii. Select **Authorize** to begin a session.
 - iv. Close the window.
- c. Select **POST /upgrades**.
- d. Select **Try it out**.
- e. Enter the upgrade package ID in the parameter field.
- f. Enter the storage cluster ID in the parameter field.
- g. Select **Execute** to initiate the upgrade.

The response should indicate state as `initializing`:

```
{
  "_links": {
    "collection": "https://localhost:442/storage/upgrades",
    "self": "https://localhost:442/storage/upgrades/3fa85f64-1111-4562-b3fc-2c963f66abc1",
    "log": "https://localhost:442/storage/upgrades/3fa85f64-1111-4562-b3fc-2c963f66abc1/log"
  },
  "storageId": "114f14a4-1a1a-11e9-9088-6c0b84e200b4",
  "upgradeId": "334f14a4-1a1a-11e9-1055-6c0b84e2001b4",
  "packageId": "774f14a4-1a1a-11e9-8888-6c0b84e200b4",
  "config": {},
  "state": "initializing",
  "status": {
    "availableActions": [
      "string"
    ],
    "message": "string",
    "nodeDetails": [
      {
        "message": "string",
        "step": "NodePreStart",
        "nodeID": 0,
        "numAttempt": 0
      }
    ],
    "percent": 0,

```

```

"step": "ClusterPreStart",
"timestamp": "2020-04-21T22:10:57.057Z",
"failedHealthChecks": [
  {
    "checkID": 0,
    "name": "string",
    "displayName": "string",
    "passed": true,
    "kb": "string",
    "description": "string",
    "remedy": "string",
    "severity": "string",
    "data": {},
    "nodeID": 0
  }
],
"taskId": "123f14a4-1a1a-11e9-7777-6c0b84e123b2",
"dateCompleted": "2020-04-21T22:10:57.057Z",
"dateCreated": "2020-04-21T22:10:57.057Z"
}

```

- h. Copy the upgrade ID ("upgradeId") that is part of the response.
4. Verify the upgrade progress and results:
 - a. Select **GET /upgrades/{upgradeld}**.
 - b. Select **Try it out**.
 - c. Enter the upgrade ID from the previous step in **upgradeld**.
 - d. Select **Execute**.
 - e. Do one of the following if there are problems or special requirements during the upgrade:

Option	Steps
<p>You need to correct cluster health issues due to <code>failedHealthChecks</code> message in the response body.</p>	<ol style="list-style-type: none"> 1. Go to the specific KB article listed for each issue or perform the specified remedy. 2. If a KB is specified, complete the process described in the relevant KB article. 3. After you have resolved cluster issues, reauthenticate if needed and select PUT /upgrades/{upgradeld}. 4. Select Try it out. 5. Enter the upgrade ID from the previous step in upgradeld. 6. Enter <code>"action": "resume"</code> in the request body. <div data-bbox="915 682 1485 863" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre>{ "action": "resume" }</pre> </div> 7. Select Execute.
<p>You need to pause the upgrade because the maintenance window is closing or for another reason.</p>	<ol style="list-style-type: none"> 1. Reauthenticate if needed and select PUT /upgrades/{upgradeld}. 2. Select Try it out. 3. Enter the upgrade ID from the previous step in upgradeld. 4. Enter <code>"action": "pause"</code> in the request body. <div data-bbox="915 1297 1485 1478" style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <pre>{ "action": "pause" }</pre> </div> 5. Select Execute.

f. Run the **GET /upgrades/{upgradeld}** API multiple times, as needed, until the process is complete.

During the upgrade, the `status` indicates `running` if no errors are encountered. As each node is upgraded, the `step` value changes to `NodeFinished`.

The upgrade has finished successfully when the `percent` value is 100 and the `state` indicates `finished`.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

Upgrade a management node

You can upgrade your management node to management node 12.5 or later from version 12.3.x or later.

Upgrading the management node operating system is no longer required to upgrade Element software on the storage cluster. You can simply upgrade the management services to the latest version to perform Element upgrades using NetApp Hybrid Cloud Control. Follow the management node upgrade procedure for your scenario if you would like to upgrade the management node operating system for other reasons, such as security remediation.



If you require information on upgrading management nodes 12.2 or earlier, see the [Element 12.3.x management node upgrade documentation](#).

Upgrade options

Choose one of the following options:

- [Upgrade a management node to version 12.5 or later from version 12.3.x or later](#)
- [Reconfigure authentication using the management node REST API](#)

Choose this option if you have **sequentially** updated (1) your management services version and (2) your Element storage version and you want to **keep** your existing management node:



If you do not sequentially update your management services followed by Element storage, you cannot reconfigure reauthentication using this procedure. Follow the appropriate upgrade procedure instead.

Upgrade a management node to version 12.5 or later from version 12.3.x or later

You can perform an in-place upgrade of the management node from version 12.3.x or later to version 12.5 or later without needing to provision a new management node virtual machine.



The Element 12.5 or later management node is an optional upgrade. It is not required for existing deployments.

What you'll need

- The RAM of the management node VM is 24GB.
- The management node you are intending to upgrade is version 12.0 and uses IPv4 networking. The management node version 12.5 or later does not support IPv6.



To check the version of your management node, log in to your management node and view the Element version number in the login banner.

- You have updated your management services bundle to the latest version using NetApp Hybrid Cloud Control. You can access NetApp Hybrid Cloud Control from the following IP:
`https://<ManagementNodeIP>`

- If you are updating your management node to version 12.5 or later, you need management services 2.21.61 or later to proceed.
- You have configured an additional network adapter (if required) using the instructions for [configuring an additional storage NIC](#).



Persistent volumes might require an additional network adapter if eth0 is not able to be routed to the SVIP. Configure a new network adapter on the iSCSI storage network to allow the configuration of persistent volumes.

- Storage nodes are running Element 12.3.x or later.

Steps

1. Log in to the management node virtual machine using SSH or console access.
2. Download the [management node ISO](#) for Element software from the NetApp Support Site to the management node virtual machine.



The name of the ISO is similar to `solidfire-fdva-<Element release>-patchX-XX.X.X.XXXX.iso`

3. Check the integrity of the download by running `md5sum` on the downloaded file and compare the output to what is available on the NetApp Support Site for Element software, as in the following example:

```
sudo md5sum -b <path to iso>/solidfire-fdva-<Element release>-patchX-XX.X.X.XXXX.iso
```

4. Mount the management node ISO image and copy the contents to the file system using the following commands:

```
sudo mkdir -p /upgrade
```

```
sudo mount <solidfire-fdva-<Element release>-patchX-XX.X.X.XXXX.iso>/mnt
```

```
sudo cp -r /mnt/* /upgrade
```

5. Change to the home directory, and unmount the ISO file from `/mnt`:

```
sudo umount /mnt
```

6. Delete the ISO to conserve space on the management node:

```
sudo rm <path to iso>/solidfire-fdva-<Element release>-patchX-XX.X.X.XXXX.iso
```

7. On the management node that you are upgrading, run the following command to upgrade your management node OS version. The script retains all necessary configuration files after the upgrade, such as Active IQ collector and proxy settings.

```
sudo /sf/rtfi/bin/sfrtfi_inplace
file:///upgrade/casper/filesystem.squashfs sf_upgrade=1
```

The management node reboots with a new OS after the upgrade process completes.



After you run the sudo command described in this step, the SSH session is killed. Console access is required for continued monitoring. If no console access is available to you when performing the upgrade, retry the SSH login and verify connectivity after 15 to 30 minutes. Once you log in, you can confirm the new OS version in the SSH banner that indicates that the upgrade was successful.

8. On the management node, run the `redeploy-mnode` script to retain previous management services configuration settings:



The script retains previous management services configuration, including configuration from the Active IQ collector service, controllers (vCenters), or proxy, depending on your settings.

```
sudo /sf/packages/mnode/redeploy-mnode -mu <mnode user>
```



If you had previously disabled SSH functionality on the management node, you need to [disable SSH again](#) on the recovered management node. SSH capability that provides [NetApp Support remote support tunnel \(RST\) session access](#) is enabled on the management node by default.

Reconfigure authentication using the management node REST API

You can keep your existing management node if you have sequentially upgraded (1) management services and (2) Element storage. If you have followed a different upgrade order, see the procedures for in-place management node upgrades.

Before you begin

- You have updated your management services to version 2.20.69 or later.
- Your storage cluster is running Element 12.3 or later.
- You have sequentially updated your management services followed by upgrading your Element storage. You cannot reconfigure authentication using this procedure unless you have completed upgrades in the sequence described.

Steps

1. Open the management node REST API UI on the management node:

```
https://<ManagementNodeIP>/mnode
```

2. Select **Authorize** and complete the following:
 - a. Enter the cluster user name and password.
 - b. Enter the client ID as `mnode-client` if the value is not already populated.
 - c. Select **Authorize** to begin a session.
3. From the REST API UI, select **POST /services/reconfigure-auth**.
4. Select **Try it out**.
5. For the **load_images** parameter, select `true`.
6. Select **Execute**.

The response body indicates that reconfiguration was successful.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

Upgrade the Element Plug-in for vCenter Server

For existing vSphere environments with a registered NetApp Element Plug-in for VMware vCenter Server, you can update your plug-in registration after you first update the management services package that contains the plug-in service.

You can update the plug-in registration on vCenter Server Virtual Appliance (vCSA) or Windows using the registration utility. You must change your registration for the vCenter Plug-in on every vCenter Server where you need to use the plug-in.

This upgrade procedure covers the following upgrade scenarios.



Management services 2.22.7 includes NetApp Element Plug-in for VMware vCenter Server 5.0 which contains the remote plug-in. If you use the Element plug-in, you should upgrade to version 5.0 to comply with the VMware directive that removes support for local plug-ins. [Learn more](#). If you do not use the plug-in, this is an optional upgrade.

Element vCenter Plug-in 5.0 or later

Beginning with Element Plug-in for VMware vCenter Server 5.0, this upgrade procedure covers the following upgrade scenarios:

- You are upgrading to Element Plug-in for vCenter Server 5.0.
- You are upgrading to a 8.0 or 7.0 HTML5 vSphere Web Client.



Element Plug-in for vCenter 5.0 and later is not compatible with vCenter Server 6.7 and 6.5.



When you upgrade from Element Plug-in for vCenter Server 4.x to 5.0, the clusters already configured with the plug-in are lost because the data cannot be copied from a vCenter instance to a remote plug-in. You must re-add the clusters to the remote plug-in. This is a one-time activity when upgrading from a local plug-in to a remote plug-in.

Element vCenter Plug-in 4.10 or earlier

For Element Plug-in for vCenter Server 4.10 or earlier, this upgrade procedure covers the following upgrade scenarios:

- You are upgrading to Element Plug-in for vCenter Server 4.10, 4.9, 4.8, 4.7, 4.6, 4.5, or 4.4.
- You are upgrading to a 7.0, 6.7, or 6.5 HTML5 vSphere Web Client.



- The plug-in is not compatible with VMware vCenter Server 8.0 for Element Plug-in for VMware vCenter Server 4.x.
- The plug-in is not compatible with VMware vCenter Server 6.5 for Element Plug-in for VMware vCenter Server 4.6, 4.7, and 4.8.

- You are upgrading to a 6.7 Flash vSphere Web Client.



The plug-in is compatible with vSphere Web Client version 6.7 U2 for Flash, 6.7 U3 (Flash and HTML5), and 7.0 U1. The plug-in is not compatible with version 6.7 U2 build 13007421 of the HTML5 vSphere Web Client and other 6.7 U2 builds released prior to update 2a (build 13643870). For more information about supported vSphere versions, see the release notes for [your version of the plug-in](#).

What you'll need

- **Admin privileges:** You have vCenter Administrator role privileges to install a plug-in.
- **vSphere upgrades:** You have performed any required vCenter upgrades before upgrading the NetApp Element Plug-in for vCenter Server. This procedure assumes that vCenter upgrades have already been completed.
- **vCenter Server:** Your vCenter Plug-in version 4.x or 5.x is registered with a vCenter Server. From the registration utility (<https://<ManagementNodeIP>:9443>), select **Registration Status**, complete the necessary fields, and select **Check Status** to verify that the vCenter Plug-in is already registered and the version number of the current installation.
- **Management services updates:** You have updated your [management services bundle](#) to the latest version. Updates to the vCenter plug-in are distributed using management services updates that are

released outside of major product releases for NetApp SolidFire all-flash storage.

- **Management node upgrades:**

- Beginning with Element vCenter plug-in 5.0, you are running a management node that has been **upgraded** to version 12.3.x or later.
- For Element vCenter plug-in 4.4 to 4.10, you are running a management node that has been **upgraded** to version 11.3 or later. vCenter Plug-in 4.4 or later requires an 11.3 or later management node with a modular architecture that provides individual services. Your management node must be powered on with its IP address or DHCP address configured.

- **Element storage upgrades:**

- Beginning with Element vCenter plug-in 5.0, you have a cluster running NetApp Element software 12.3.x or later.
- For Element vCenter plug-in 4.10 or earlier, you have a cluster running NetApp Element software 11.3 or later.

- **vSphere Web Client:** You have logged out of the vSphere Web Client before beginning any plug-in upgrade. The web client will not recognize updates made during this process to your plug-in if you do not log out.

Steps

1. Enter the IP address for your management node in a browser, including the TCP port for registration:
<https://<ManagementNodeIP>:9443>
The registration utility UI opens to the **Manage QoSSIOC Service Credentials** page for the plug-in.

NetApp Element Plug-in for vCenter Server Management Node

QoSSIOC Service Management vCenter Plug-in Registration

QoSSIOC Management

Manage Credentials

Restart QoSSIOC Service

Manage QoSSIOC Service Credentials

Old Password Current password
Current password is required

New Password New password
Must contain at least 8 characters with at least one lower-case and upper-case alphabet, a number and a special character like # \$ % & ' () - / * + @ ^ ~ _

Confirm Password Confirm New Password
New and confirm passwords must match

SUBMIT CHANGES

Contact NetApp Support at <http://mysupport.netapp.com>

2. Select **vCenter Plug-in Registration**.

- The vCenter Plug-in Registration page for Element Plug-in for vCenter Server 5.0:

NetApp Element Plug-in for vCenter Server Management Node

GoSSIOC Service Management > vCenter Plug-in Registration

Manage vCenter Plug-in

- Register Plug-in
- Update Plug-in
- Unregister Plug-in
- Registration Status

vCenter Plug-in - Registration

Register version 5.0.0 of the NetApp Element Plug-in for vCenter Server with your vCenter server. The Plug-in will not be deployed until a fresh vCenter login after registration.

vCenter Address vCenter Server Address
Enter the IPV4, IPV6 or DNS name of the vCenter server to register plug-in on.

vCenter User Name vCenter Admin User Name
Ensure this user is a vCenter user that has administrative privileges for registration.

vCenter Password vCenter Admin Password
The password for the vCenter user name entered.

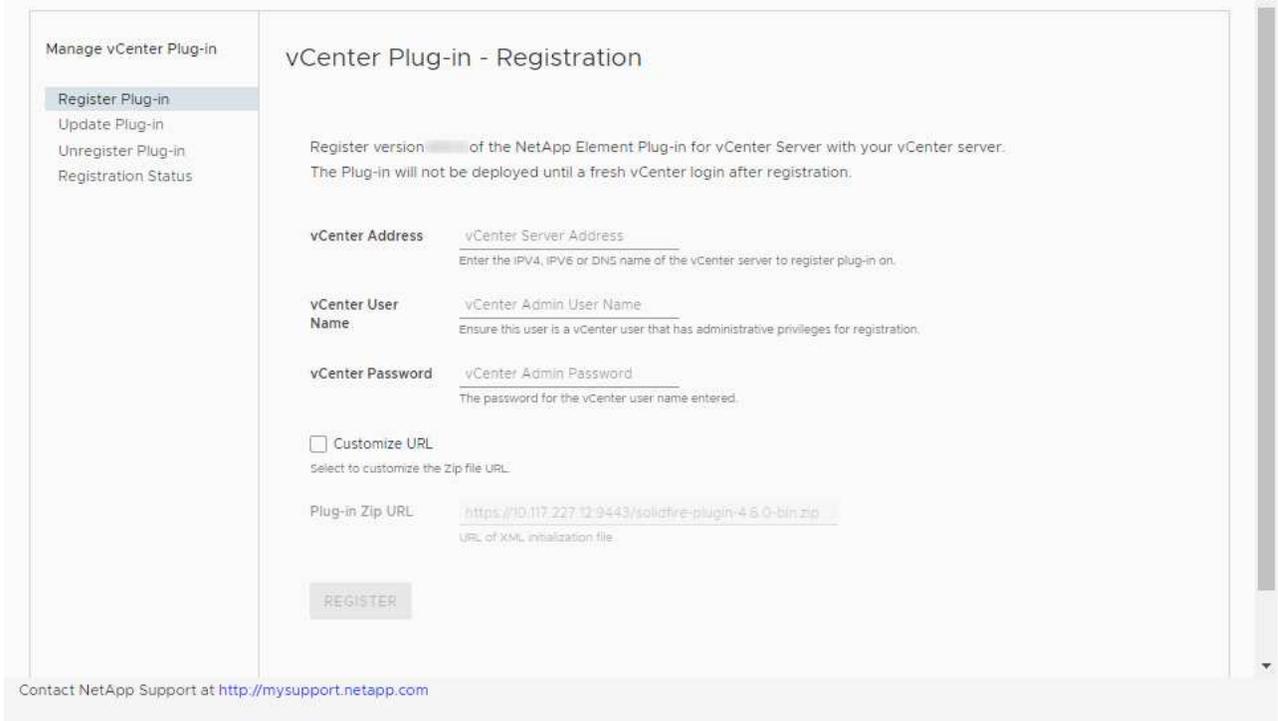
Customize URL
Select to customize the Zip file URL.

Plug-in Zip URL URL of XML initialization file
`https://10.117.227.44:8333/vcp-ui/plugin.json`

REGISTER

Contact NetApp Support at <http://mysupport.netapp.com>

- The vCenter Plug-in Registration page for Element Plug-in for vCenter Server 4.10 or earlier:



3. Within **Manage vCenter Plug-in**, select **Update Plug-in**.

4. Confirm or update the following information:

- a. The IPv4 address or the FQDN of the vCenter service on which you will register your plug-in.
- b. The vCenter Administrator user name.



The user name and password credentials you enter must be for a user with vCenter Administrator role privileges.

- c. The vCenter Administrator password.
- d. (For in-house servers/dark sites) Depending on your Element Plug-in for vCenter version, a custom URL for the plug-in JSON file or plug-in ZIP:
 - i. Beginning with Element Plug-in for vCenter Server 5.0, a custom URL for the plug-in JSON file.



You can select **Custom URL** to customize the URL if you are using an HTTP or HTTPS server (dark site) or have modified the JSON file name or network settings. For additional configuration steps if you intend to customize a URL, see Element Plug-in for vCenter Server documentation about modifying vCenter properties for an in-house (dark site) HTTP server.

- ii. For Element Plug-in for vCenter Server 4.10 or earlier, a custom URL for the plug-in ZIP.



You can select **Custom URL** to customize the URL if you are using an HTTP or HTTPS server (dark site) or have modified the ZIP file name or network settings. For additional configuration steps if you intend to customize a URL, see Element Plug-in for vCenter Server documentation about modifying vCenter properties for an in-house (dark site) HTTP server.

5. Select **Update**.

A banner appears in the registration utility UI when the registration is successful.

6. Log in to the vSphere Web Client as a vCenter Administrator. If you are already logged in to the vSphere Web Client, you must first log out, wait two to three minutes, and then log in again.

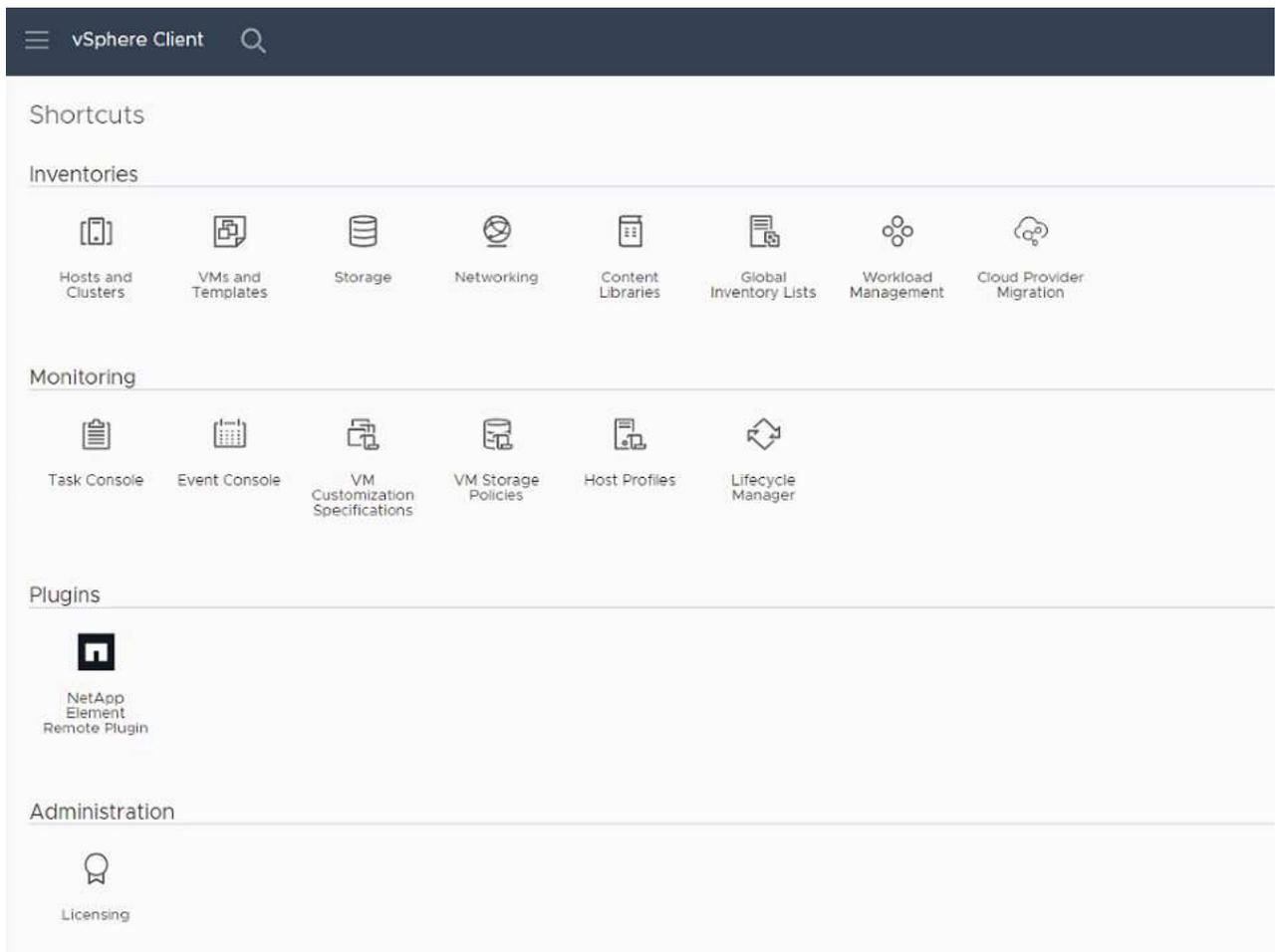


This action creates a new database and completes the installation in the vSphere Web Client.

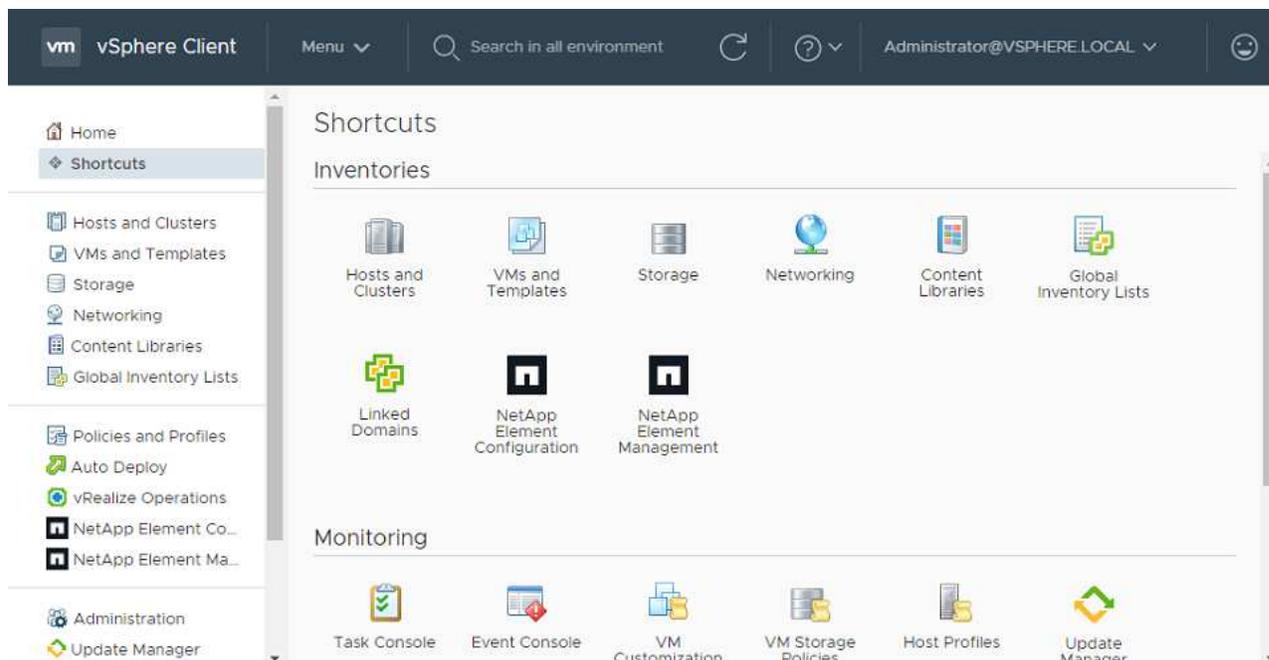
7. In the vSphere Web Client, look for the following completed tasks in the task monitor to ensure installation has completed: **Download plug-in** and **Deploy plug-in**.

8. Verify that the plug-in extension points appear in the **Shortcuts** tab of the vSphere Web Client and in the side panel.

- Beginning with Element Plug-in for vCenter Server 5.0, the NetApp Element Remote Plugin extension point appears:



- For Element Plug-in for vCenter Server 4.10 or earlier, the NetApp Element Configuration and Management extension points appear:



If the vCenter Plug-in icons are not visible, see [Element Plug-in for vCenter Server](#) documentation about troubleshooting the plug-in.



After upgrading to NetApp Element Plug-in for vCenter Server 4.8 or later with VMware vCenter Server 6.7U1, if the storage clusters are not listed or a server error appears in the **Clusters** and **QoSSIOC Settings** sections of the NetApp Element Configuration, see [Element Plug-in for vCenter Server](#) documentation about troubleshooting these errors.

9. Verify the version change in the **About** tab in the **NetApp Element Configuration** extension point of the plug-in.

You should see the following version details or details of a more recent version:

```
NetApp Element Plug-in Version: 5.0
NetApp Element Plug-in Build Number: 37
```



The vCenter Plug-in contains online Help content. To ensure that your Help contains the latest content, clear your browser cache after upgrading your plug-in.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

Upgrade your vSphere components for a NetApp SolidFire storage system with the Element Plug-in for vCenter Server

When you upgrade the VMware vSphere components of your SolidFire Element storage installation, there are some additional steps you will need to take for systems with Element Plug-in for vCenter Server.

Steps

1. For vCSA upgrades, [clear](#) QoSSIOC settings in the plug-in (**NetApp Element Configuration > QoSSIOC Settings**). The **QoSSIOC Status** field displays `Not Configured` after the process is complete.
2. For vCSA and Windows upgrades, [unregister](#) the plug-in from the vCenter Server with which it is associated using the registration utility.
3. [Upgrade vSphere, including vCenter Server, ESXi, VMs, and other VMware components.](#)



You should upgrade to NetApp Element Plug-in for vCenter Server 5.0 to give you the capability to deploy the plug-in with VMware vCenter 7.0 Update 3 without having to apply a workaround.

With Element Plug-in for vCenter Server 4.x, when you upgrade to VMware vCenter Server 7.0 Update 3, the plug-in fails to deploy. To resolve this issue using Spring Framework 4, see [this KB article](#).

4. [Register](#) the Element Plug-in for vCenter Server again with vCenter.
5. [Add clusters](#) using the plug-in.
6. [Configure QoSSIOC settings](#) using the plug-in.
7. [Enable QoSSIOC](#) for all datastores controlled by the plug-in.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

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