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Enterprise

HPE 3PAR StoreServ Cluster Extension Software 5.00.00 Installation Guide

Abstract

This guide contains detailed instructions for installing, upgrading, and removing HPE 3PAR StoreServ Cluster Extension Software. The intended audience has independent knowledge of related software and of the HPE 3PAR StoreServ Storage and its software.

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Preparing to install HPE 3PAR StoreServ Cluster Extension

This chapter provides information about general environment considerations and pre-installation requirements.

Ideal environment

The ideal configuration environment consists of at least five servers (two at each data center site and one as an arbitrator at a third site) with separate, redundant communication links for cluster heartbeats, client access, and a pair of HPE 3PAR StoreServ Storage with Remote Copy configuration. All communications interfaces must be installed in pairs to serve as failover components, in order to prevent single points of failure.

Network communication requirements

When using HPE 3PAR StoreServ Cluster Extension, note the following:

- Network communication links and components between the dispersed data centers must be redundant and physically routed differently to prevent the “backhoe” issue that is created when all links between data centers are cut together. This redundancy and routing is especially important to prevent the split-brain syndrome that occurs when systems in both data centers form new clusters and allow access to both copies of the data. Using redundant and separately routed communication links and components, you can configure the failover behavior so that the application service startup procedure stops if none of the remote cluster members can be reached.
- Multi-pathing software must be used for host-to-storage connections.

Storage replication link requirements

To ensure reliable data backup between the local (primary) and remote (secondary) storage systems, at least two HPE 3PAR Remote Copy links must be available when the storage systems are connected to provide redundancy and protection against single points of failure. Although communications links can cover considerable distances, each network segment must be extended to the dispersed data center to maintain a heartbeat among all servers. For extended distances, you must purchase extender components to bundle the HPE 3PAR Remote Copy links.

Server cluster infrastructure requirements

Use two cluster nodes at each site to give local application service failover procedures among local cluster systems priority over remote, more time-consuming failover procedures. When failing over, the software must reconfigure the storage systems to change the mirroring direction. At the remote site, two systems should be available in case the primary failover system experiences a hardware or power failure.

For windows, using a Node Majority quorum requires an odd number of cluster nodes, with at least one system in a third location. Where as, using a Node Majority with file share witness requires even number of cluster nodes at each site with file share witness server at the third location.

△ CAUTION:

HPE 3PAR StoreServ Cluster Extension works with one server at each location, with a single I/O path between the server and storage system, and a single link between storage systems. However, any configuration with a single point of failure is not considered highly available or disaster tolerant. Hewlett Packard Enterprise does not support configurations with single points of failure; configurations with one system at each location are supported only if there are no single points of failure.

How HPE 3PAR StoreServ Cluster Extension Software interacts with its environment

This section describes the ways in which HPE 3PAR StoreServ Cluster Extension interacts with its environment.

Failover function

HPE 3PAR StoreServ Cluster Extension Software requires cluster software to automatically fail over among systems on a local site or between sites. Because the software manipulates the application startup process before storage system virtual volumes are accessed, it must be integrated as the first resource (in the order of resources). The software must be installed on all servers in the cluster that can run the application service.

How HPE 3PAR StoreServ Cluster Extension utilizes virtual volumes

To write to HPE 3PAR Remote Copy paired virtual volumes, you must ensure that the paired virtual volumes are in read/write mode. Volume group members (paired virtual volumes) are in read/write mode on the source (primary) virtual volume only. The destination (secondary) virtual volume is in read-only mode.

- In case of a failover, HPE 3PAR StoreServ Cluster Extension Software automatically changes the direction of the mirrored pair. A reboot of the server is not necessary.
- In case of a disaster, the storage system can have several different states for volume group members. HPE 3PAR StoreServ Cluster Extension Software determines whether those virtual volumes can be accessed and made available to the application service.

How HPE 3PAR StoreServ Cluster Extension stores information

HPE 3PAR StoreServ Cluster Extension stores information about the application environment internally and uses HPE 3PAR Web Service Interface (WSAPI) to gather information about the state of associated volume group members. Information about the configured storage system environment and failover behavior is transferred either directly by the cluster software or by gathering it from the user configuration file.

The existing HPE 3PAR WSAPI is enhanced to have new web service interface, which simplifies the entire disaster recovery management for both planned migration and disaster scenarios. CLX uses this WSAPI interface to provide the automatic and automated disaster recovery solution.

As part of the automatic or automated disaster recovery operation, CLX invokes this new WSAPI interface. The WSAPI interface performs the disaster recovery operation orchestrating the storage failover operations in the multiple data center configurations with Remote Copy feature. The WSAPI interface hides all the complexities by dynamically building the DR workflow and executing the sequence of DR workflow operations, catering to all planned migration and disaster scenarios.

For more information, see the *HPE 3PAR Web Services API Developer's Guide*

General installation prerequisites

Ensure that the following conditions are met before installing HPE 3PAR StoreServ Cluster Extension Software:

- HPE Remote Copy links (including extender hardware) are redundant and bidirectional.
- Alternate I/O paths (network and storage links) between servers and the HPE 3PAR StoreServ Storage are set up.
- Cluster and client networks are redundant.
- Cluster nodes communicate with each other.
- The latest supported software and firmware versions, fixes, FC adapter firmware, and driver versions for your HPE 3PAR StoreServ Storage and servers are installed.
- The cluster nodes in your zoning configuration each recognize their respective (local) HPE 3PAR StoreServ Storage, but not the remote HPE 3PAR StoreServ Storage.
- HPE 3PAR WSAPI service is running on the 3PAR arrays. For more information, see the *HPE 3PAR Web Services API Developer's Guide* at <http://www.hpe.com/support/hpesc>.

Disk space and system memory requirements

- 100 MB for the HPE 3PAR StoreServ Cluster Extension installation directory (%ProgramFiles%\HPE\Cluster Extension 3PAR)
- At least 256 MB of system memory

Required firmware and software

For specific firmware and software versions, see the *HPE 3PAR Cluster Extension (CLX) for Windows Spock* document at [HPE SPOCK website](#).

Installing HPE 3PAR StoreServ Cluster Extension Software

This chapter describes the installation of HPE 3PAR StoreServ Cluster Extension Software in Microsoft clustering environments with HPE 3PAR StoreServ Storage.

NOTE:

- You can install, uninstall, modify, and repair HPE 3PAR StoreServ Cluster Extension on all of the nodes in a cluster by running the installer from one node in the cluster.
 - For information on configuring HPE 3PAR StoreServ Cluster Extension in a Microsoft clustering environment, see the *HPE 3PAR StoreServ Cluster Extension Software Administrator Guide*.
-

Prerequisites

Before installing HPE 3PAR StoreServ Cluster Extension, perform the following tasks:

1. Check **General installation prerequisites** on page 6 to ensure that your setup meets the general pre-installation requirements.
2. Perform the required Windows pre-installation procedures. For instructions, see **Pre-installation procedures** on page 8.
3. Download the HPE 3PAR StoreServ Cluster Extension Software installer.
 - a. Browse to <https://h20392.www2.hpe.com/portal/swdepot/index.do>.
 - b. Click **Storage > 3PAR StoreServ > HPE 3PAR StoreServ Cluster Extension Software** in the product category list.
 - c. Follow the on-screen instructions to download the installer.

Pre-installation procedures

This section describes the procedures you must perform to prepare the data centers for HPE 3PAR StoreServ Cluster Extension installation and configuration. Perform these procedures before you install HPE 3PAR StoreServ Cluster Extension.

1. **Checking the IP network setup and SAN configuration** on page 8
2. **Installing the multipath software** on page 9
3. **Installing and configuring the JRE** on page 9
4. **Configuring the HPE 3PAR StoreServ Storage** on page 9
5. **Creating hosts and setting host persona** on page 9
6. **Creating virtual volumes and adding a LUN presentation** on page 10
7. **Creating Remote Copy volume groups** on page 10
8. **Installing Microsoft Failover Cluster (MSFC) on all nodes** on page 10

Checking the IP network setup and SAN configuration

Verify that your IP network setup and SAN configuration meet the following requirements:

- HPE 3PAR StoreServ Cluster Extension requires a cluster environment in which one location failure will not cause the entire cluster to shut down.
- In a Node Majority quorum cluster, all nodes must be distributed so that an equal number of nodes are located in the local and remote data centers and an additional node in a third location functions as a tiebreaker or arbitrator. The third location can be a separate room in a separate fire protection zone with separate power connections. The arbitrator node can act as a regular cluster node and can be connected

to one of the storage systems. However, a connection to either storage system is not necessary for the node to act as a tiebreaker.

- SAN fabrics can be extended to allow array-based data replication. See the *HPE StorageWorks SAN Design Reference Guide* and the *HPE 3PAR Remote Copy Users Guide* for supported SAN extension configuration and instructions on setting up your HPE 3PAR Remote Copy environment.

Installing the multipath software

You must use supported multipath software to take advantage of the I/O path failover feature. Install the multipath software on the cluster system before connecting the system to the second I/O path. For more information on installing the multipath software, see the *HPE 3PAR Windows Implementation Guide* located at <http://www.hpe.com/support/hpesc>.

Installing and configuring the JRE

To install the Autopass based product license through the HPE Autopass GUI, you must first install the JRE. See the HPE 3PAR Cluster Extension (CLX) for Windows Spock document at [HPE SPOCK website](#) for the supported JRE versions.

NOTE: This step is required only if you want to use the AutoPass GUI to manage license keys. If you do not install the JRE, then you can use the HPE 3PAR StoreServ Cluster Extension registration tool to install license keys. For more information about using the registration tool, see [Using the HPE 3PARStoreServ Cluster Extension registration tool](#) on page 29.

Configuring the HPE 3PAR StoreServ Storage

For detailed information on configuring the HPE 3PAR StoreServ Storage, see the *3PAR Management Console User Guide* or the *3PAR CLI Administrator's Manual*. You can also consult your Hewlett Packard Enterprise service representative for further assistance, including help with creating a geographically dispersed cluster environment.

Creating hosts and setting host persona

Before you can assign disk storage to a cluster node, you must create a host entry for the locally connected server/node on each HPE 3PAR StoreServ Storage. Each HPE 3PAR StoreServ Storage port connecting to a host HBA port through a fabric or direct connection must be set to the correct host persona. Host personas are a set of behaviors that permit hosts connected to FC ports on the HPE 3PAR StoreServ Storage to deviate from the default host behavior. Host personas are tied to the host name and identified by the host persona number. Use the HPE 3PAR CLI commands or the HPE 3PAR Management Console to display, create, modify, and remove host personas. For more information, see the *HPE 3PAR CLI Administrator's Manual* or the *HPE 3PAR Management Console Online Help*.

Hewlett Packard Enterprise recommends that you run HPE 3PAR Host Explorer software on hosts connected to HPE 3PAR StoreServ Storage. When a host is created on a HPE 3PAR StoreServ Storage, unassigned WWNs are presented to the storage system. If the Host Explorer agents are not running on the attached hosts, the storage system cannot determine the WWNs assigned to the hosts, and you must manually assign each WWN to a host. If Host Explorer agents are running, the HPE 3PAR StoreServ Storage automatically groups WWNs for the host together, assisting with creating the host. The Host Explorer agent runs as a service.

To configure the host port for iSCSI:

1. Select iSCSI as storage protocol in CNA card configuration.
2. Create the iSCSI host with initiator name on the 3PAR array and export the volumes to the iSCSI host.
3. To discover the exported volumes, perform the iSCSI discovery in the settings of the iSCSI initiator software of the host.

For more information on creating hosts and setting host persona, see https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=SSMC_CONSOLE.

Creating virtual volumes and adding a LUN presentation

Create the storage (virtual volume) on a primary 3PAR StoreServ Storage for your application data using the HPE 3PAR Management Console GUI or CLI and then export the virtual volumes (thin provisioned or fully provisioned) to the cluster nodes connected to that 3PAR StoreServ Storage. You must create a replica of the created virtual volume on a back up storage system. The size of the replica should match with the primary virtual volume, but they can have different RAID levels and availability levels (for example, Cage versus Magazine).

For more information, see the *3PAR Management Console User Guide* or the *3PAR CLI Administrator's Manual*.

Creating Remote Copy volume groups

Before you can use HPE 3PAR StoreServ Cluster Extension, you must create a Remote Copy volume group that includes your previously created virtual volumes. When you create a Remote Copy volume group, the size of virtual volume(s) on the primary 3PAR StoreServ Storage should match with the virtual volume(s) on the secondary 3PAR StoreServ Storage.

For detailed steps on creating a Remote Copy volume group, see the *3PAR Remote Copy User's Guide*.

LUN presentation to the secondary virtual volume(s)

Export the virtual volumes to the cluster nodes connected to the secondary 3PAR StoreServ Storage. When a Remote Copy volume group is started and virtual volumes are in "syncd" state, the secondary virtual volumes will be in read-only mode and data replication direction will be from primary volume group to the secondary volume group.

Installing Microsoft Failover Cluster (MSFC) on all nodes

This section describes the steps for installing MSFC on the cluster nodes.

1. Before installing MSFC, create your disk configuration through the Disk Manager. If the disks are not visible, re-scan your disks in the Disk Manager.

NOTE: You may need to shut down all but one server on the source storage system to successfully configure your disks in the Disk Manager. Errors may occur during partitioning and formatting because all servers that you present the same disk to on the local storage will compete for access to the disk. This will not happen after the cluster software is installed and you have formatted or partitioned the disk(s).

In rare cases, certain FC drivers will show disk access errors in the event log (event ID 51) when the disk access is set to read-only. This can be ignored for read-only destination disks and should not occur after HPE 3PAR StoreServ Cluster Extension is installed.

You must reboot the server(s) on the destination storage system or re-scan the disks in the Disk Manager before and after installing the cluster software, and when you add storage in read-only mode on the destination side.

2. Enable Microsoft Failover Cluster feature on all nodes and create the failover cluster using the nodes.

NOTE: For Windows Server 2012/2012 R2/2016, Failover Cluster Command Interface feature (`cluster.exe`) is not installed by default when Failover Cluster feature is enabled. You need to enable Failover Cluster Command Interface feature for `cluster.exe` to function. However, `cluster.exe` is not required for CLX to function in Windows Server 2012/2012 R2/2016.

In Server Core Cluster environment, enable RSAT-Clustering-PowerShell, [Display name Failover Cluster Module for Windows PowerShell] for CLX installer to function.

3. Select the CLX supported Microsoft Failover Cluster Quorum model. Quorum configuration which includes disk witness is not supported by HPE 3PAR StoreServ Cluster Extension.
4. Run the Microsoft Cluster Validation Tool to validate your cluster. If the Failover Cluster Validation Report lists a failed storage test, you can ignore this disk error. For more information, see the Microsoft TechNet document at <https://technet.microsoft.com/en-US/library>.

After the cluster software is installed, you can install HPE 3PAR StoreServ Cluster Extension Software on all cluster nodes that have an FC/iSCSI connection to the local or remote 3PAR StoreServ Storage and are used to access storage resources on the 3PAR StoreServ Storage. For installation instructions, follow the procedure in **Installing HPE 3PAR StoreServ Cluster Extension Software** on page 12.

If the system that acts as an arbitrator or tiebreaker is not connected to either 3PAR StoreServ Storage, you do not need to install the software on that cluster node.

Installing HPE 3PAR StoreServ Cluster Extension Software for the first time

This section provides prerequisites for installing the HPE 3PAR StoreServ Cluster Extension Software for the first time.

NOTE:

If you already have HPE 3PAR StoreServ Cluster Extension Software installed and want to upgrade to latest version, see **Upgrading HPE 3PAR StoreServ Cluster Extension Software to v5.00.00** on page 20.

Prerequisites for first time installation

- Ensure that the HPE 3PAR OS on all the identified arrays are on 3PAR OS v3.3.1 or later.
- Ensure that the HPE 3PAR WSAPI service is running on all the 3PAR array nodes on both the datacenter arrays.

Once the prerequisites are met, you can install CLX on all the failover cluster nodes. For detailed installation instructions, see **Installing HPE 3PAR StoreServ Cluster Extension Software** on page 12.

You need to configure CLX after completing the CLX installation on all the failover cluster nodes. For information on how to configure CLX for the first time, see the *HPE 3PAR StoreServ Cluster Extension Software Administrator Guide*.

In the following figure, Application A is running on Datacenter A node and data is getting replicated from DC-A array to DC-B array. After the CLX installation is complete, the CLX environment appears as shown in the following figure.

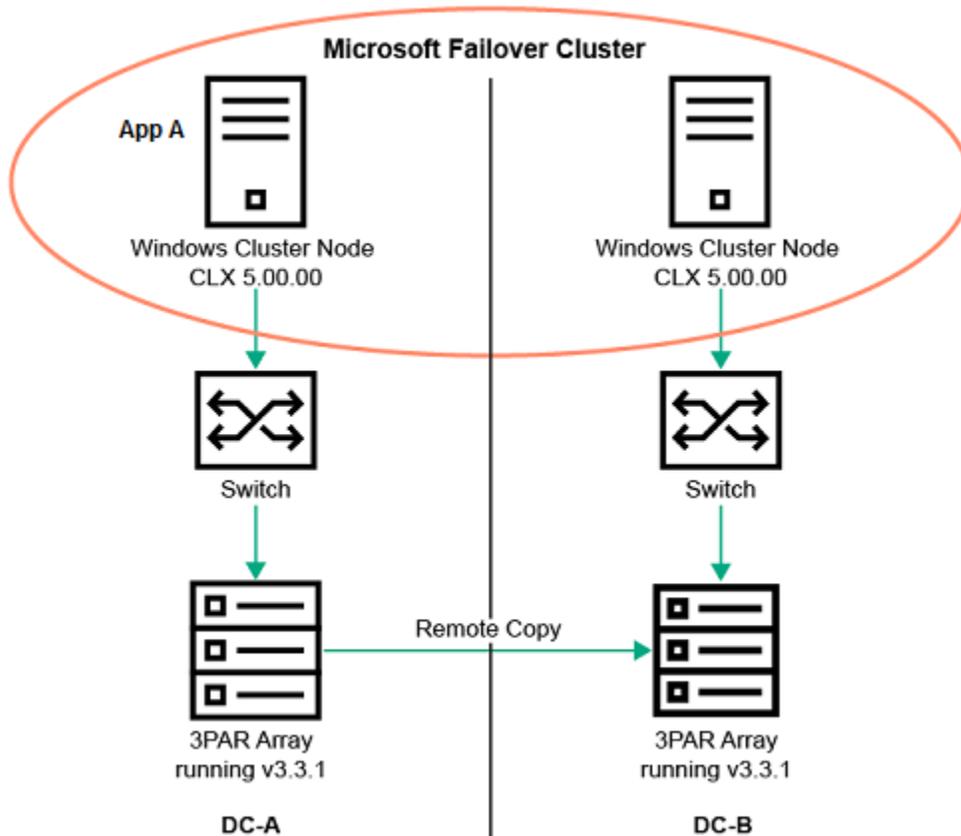


Figure 1: CLX environment with latest software

Installing HPE 3PAR StoreServ Cluster Extension Software

HPE 3PAR StoreServ Cluster Extension Software provides a standard InstallShield wizard. The setup program includes integration with Microsoft clustering and the generic software interface. The installer includes the following features:

- Cluster resource type
 - Cluster Extension 3PAR resource type, (For Windows Server 2008/2008 R2/2012/2012 R2/2016).
 - Cluster Extension 3PAR for VM Management resource type, (For Windows Server 2012/2012 R2/2016 only).
 - PowerShell Cmdlets for creation of CLX resources for VM and CSV disk (For Windows Server 2012/2012 R2/2016 only).
- Command Line Interface (`clx3parrun.exe`)
- HPE 3PAR StoreServ Cluster Extension documentation

To install HPE 3PAR StoreServ Cluster Extension Software v5.00.00:

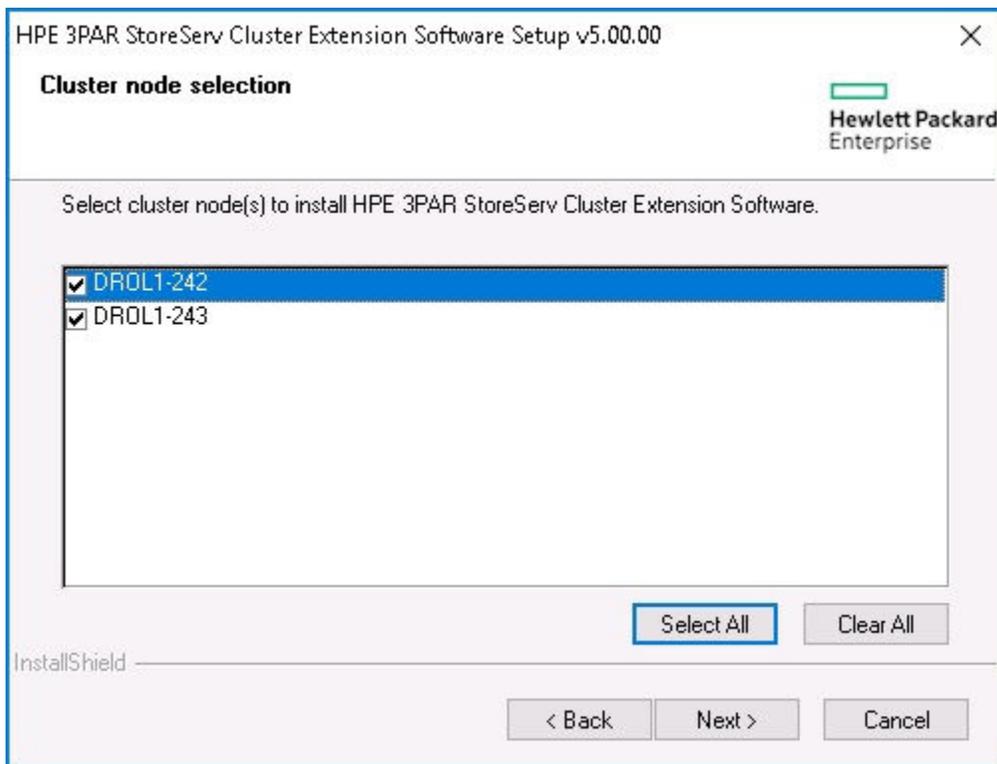
1. Ensure that the cluster service is running on all cluster nodes.
2. Ensure that the cluster management application is not running on the cluster nodes where you plan to install HPE 3PAR StoreServ Cluster Extension.

NOTE: Failover Cluster Management is used on Windows Server 2008/2008 R2/2012/2012 R2/2016.

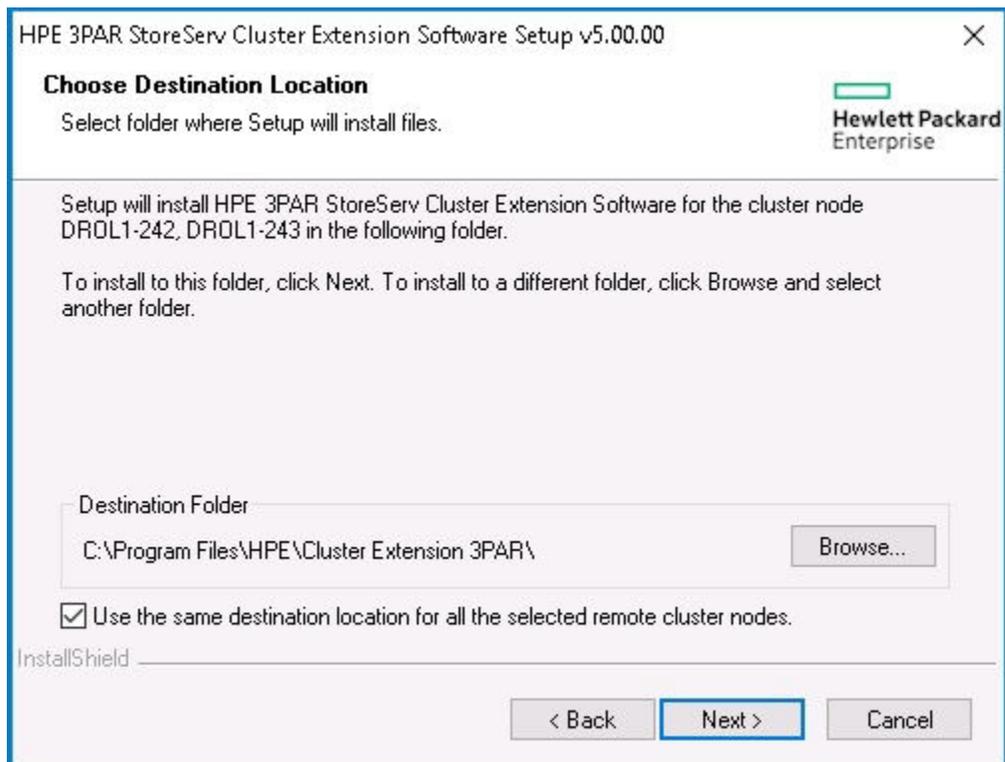
3. Run the installer by doing one of the following:

- Double-click the HPE 3PAR StoreServ Cluster Extension installation package.
 - Run the HPE 3PAR StoreServ Cluster Extension installation package from the command prompt. This option is used for Server Core or Hyper-V Server installation. See Microsoft documentation for more information on installing applications in a Server Core or Hyper-V Server environment.
4. Follow the on screen instructions to accept the license agreement and enter your identification. The Setup Type dialog box appears.
 5. In the Setup Type dialog box, select one of the following options, and then click **Next**:
 - Select **Typical** to install the resource DLLs, resource extension DLL, PowerShell Cmdlet DLL, CLX command line interface (`clx3parrun.exe`) and documentation.
 - Select **Compact** to install only the resource DLLs, resource extension DLL, PowerShell Cmdlet DLL, and CLX command line interface (`clx3parrun.exe`).
 - Select **Custom** to select specific components to install

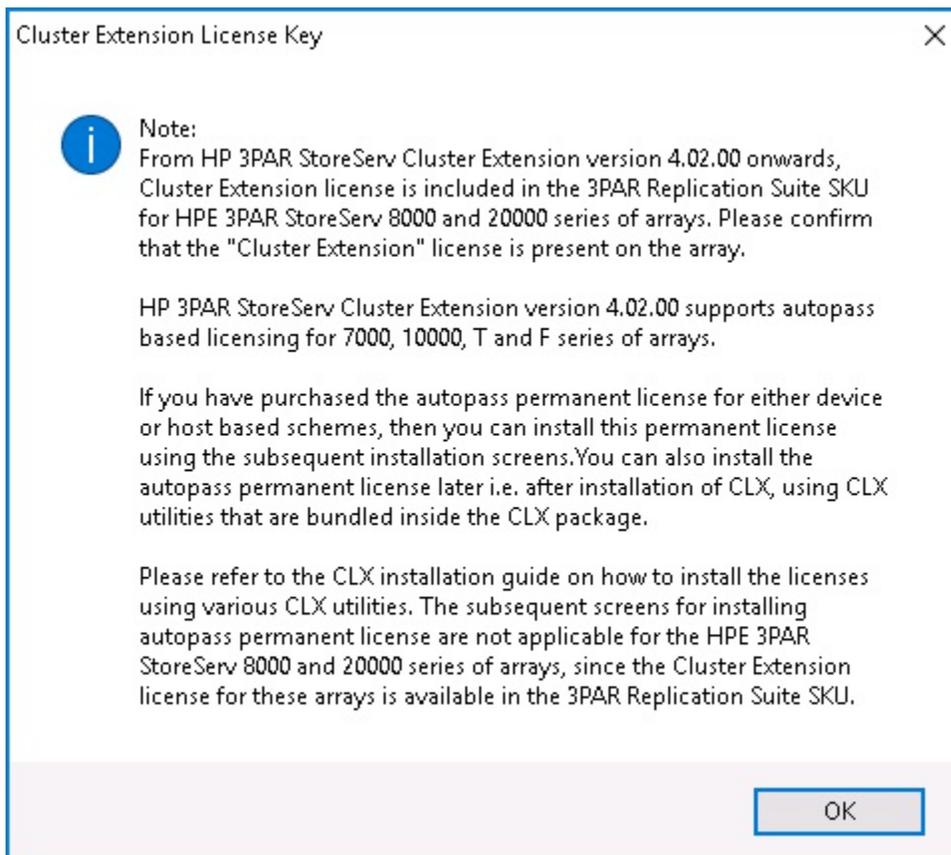
The Cluster node selection dialog box appears.



6. Select the cluster nodes for 3PAR StoreServ Cluster Extension installation, and then click **Next**. The Choose Destination Location dialog box appears.



7. Accept the default location, or click **Browse** and specify a new destination.
 8. Specify whether the installation directory applies to all the nodes, selected for installation:
 - If you want to use the same destination location for all nodes selected in the previous step, select the **Use the same destination location for all the selected remote cluster nodes** check box, and then click **Next**.
 - If you do not want to use the same destination for all nodes selected in the previous step, do not select the **Use the same destination location for all the selected remote cluster nodes** check box, and click **Next** to continue.
 9. For all remote cluster nodes: Accept the default location or enter a new location, and then click **Next**.
-
-  **TIP:** To start the configuration tool at the end of the installation, select the **Launch Configuration Tool** check box before you click **Finish**.
-
10. The below screen appears with information about the Cluster Extension license in HPE 3PAR Replication Software suite introduced for HPE 3PAR StoreServ 8000 and 20000 series of arrays. Click **OK** to proceed.



NOTE:

CLX v4.02.00, v4.03.00 and v4.03.01 supports Autopass based licensing for HPE 3PAR StoreServ 7000, 10000, T, and F series of arrays.

CLX v4.02.00 and above supports Cluster Extension license in HPE 3PAR Replication Software suite for HPE 3PAR StoreServ 8000 and 20000 series of arrays.

-
11. The installer asks if you want to install a Hewlett Packard Enterprise Autopass permanent license. Click **Yes** to install a permanent license. Follow the instructions to retrieve and install the license, and then click **Finish**.

⚠ CAUTION:

You must perform the permanent license installation procedure separately on each cluster node. Cluster-wide installation does not install a permanent license on remote cluster nodes.

-
12. If you have procured Cluster Extension license in Replication software suite for HPE 3PAR StoreServ 8000 or 20000 series of arrays. To install the above license see **Applying HPE 3PAR Cluster Extension array based license** on page 31 once the installation is complete.
 13. To perform the required configuration steps, follow the instructions in *HPE 3PAR StoreServ Cluster Extension Software Administrator Guide*.

Registering the resource type and resource extension DLL manually

If a problem occurs during installation, execute the following commands from the command line to register the resource type from any one of the cluster nodes:

1. Confirm that the resource type is registered with Windows cluster by entering the following cluster command:
`cluster resourcetype`

OR

Using PowerShell Cmdlet

```
Get-ClusterResourceType
```

If the resource type is registered, the output includes the following information:

```
Display Name: Resource Type Name
```

```
Cluster Extension 3PAR: Cluster Extension 3PAR
```

If the resource type is not registered using cluster command:

- a. Enter cluster resource type `"Cluster Extension 3PAR" /CREATE /DLLNAME:clx3parmscs.dll /TYPE:"Cluster Extension 3PAR"`.
- b. Run the `cluster resourcetype` command again to verify that the resource type is now registered.

Using PowerShell Cmdlet:
`Add-ClusterResourceType -Name "Cluster Extension 3PAR" -Dll "c:\windows\system32\clx3parmscs.dll" -DisplayName "Cluster Extension 3PAR"`

2. Registration of resource extension DLL should not be performed on server core environments. Check whether the cluster administrator extension DLL is registered with Windows cluster to provide the Cluster Administrator GUI functionality by entering:
`cluster resourcetype "Cluster Extension 3PAR" /PROPERTIES`
If the resource extension DLL is registered, the output is displayed as shown below:

```
M Cluster Extension 3PAR AdminExtensions {C977EFB9-B640-4E6C-9473-ECE586EC2074}
```

This command should be executed on all cluster nodes.

If the resource extension DLL is not registered:

- a. Enter `cluster/REGADMINEXT:clx3parmscsex.dll`.
- b. Run the `cluster resourcetype` command again to verify that the DLL is now registered.

PowerShell Cmdlets can also be used to perform the above steps.

To check if the resource extension DLL is registered, run the following command:

```
(Get-ClusterResourceType "Cluster Extension 3PAR").AdminExtensions
```

If the resource extension DLL is registered, the output will show the **GUID** of the admin extension as shown

```
{C977EFB9-B640-4E6C-9473-ECE586EC2074}
```

If resource extension DLL is not registered

1. Run the command `regsvr32 c:\windows\system32\clx3parmscsex.dll`. Run this command on all the cluster nodes.
2. Run the command on the PowerShell environment:
`(Get-ClusterResourceType "Cluster Extension 3PAR").AdminExtensions = "{C977EFB9-B640-4E6C-9473-ECE586EC2074}"`
This command should be executed only, from one of the cluster nodes.

Unregistering the resource type and resource extension DLL manually

Enter the following command to unregister the resource extension DLL:

```
cluster /UNREGADMINEXT:clx3PARmscsex.dll
```

Enter the following command to unregister the resource type:

```
cluster resourcetype "Cluster Extension 3PAR" /delete
```

Using the PowerShell

Enter the following command to unregister the resource extension DLL:

1. Run the command `regsvr32 /u c:\windows\system32\clx3parmscsex.dll`. This should be executed on all the cluster nodes.
2. Run the command on the PowerShell Environment `(Get-ClusterResourceType "Cluster Extension 3PAR").AdminExtensions = ""` This should be executed only from one of the cluster nodes.

Enter the command to unregister the resource type from one of the cluster nodes. `Remove-ClusterResourceType -Name "Cluster Extension 3PAR"`

NOTE: On Windows Server 2012/2012 R2/2016, another cluster resource of type "Cluster Extension 3PAR for VM Management" is also created. If you experience issues in registration and unregistration of this resource type, follow the steps mentioned in [Registering the resource type and resource extension DLL manually](#) on page 15 and [Unregistering the resource type and resource extension DLL manually](#) on page 16 to overcome the issues.

Registering the CLX PowerShell Cmdlet DLL manually [Windows Server 2012/2012 R2/2016 only]

If a problem occurs during installation, execute the following commands from the command line on all the cluster nodes to register the PowerShell Cmdlets DLL.

Check if Cmdlet is registered or not. Launch PowerShell Window. Run the Command `Get-PSSnapin -Registered`

If the Cmdlet is registered, then the following output displays:

Example

```
Name : CLX3PARCmdletsSnapin
```

```
PSVersion : 3.0
```

```
Description : This PowerShell SnapIn provides cmdlets for helping the user manage CLX 3PAR with Microsoft Windows PowerShell.
```

If the Cmdlet is not registered, then you have to manually register the Cmdlet DLL using the following command from the CLX product **bin** directory:

```
C:\Windows\Microsoft.NET\Framework64\v4.0.30319\InstallUtil.exe  
CLX3PARCmdlets.dll
```

NOTE:

Hewlett Packard Enterprise recommends you to use Microsoft .NET framework v4.0 or above.

Unregistering the CLX PowerShell Cmdlet DLL manually [Windows Server 2012/2012 R2/2016 only]

If a problem occurs during uninstallation, execute the following commands from the command line on all the cluster nodes to unregister the PowerShell Cmdlets DLL.

Check if Cmdlet is registered or not. Launch PowerShell Window. Run the command `Get-PSSnapin -Registered`

If the Cmdlet is registered, then the following output displays:

Example

Name : CLX3PARCmdletsSnapin

PSVersion : 3.0

Description : This PowerShell SnapIn provides cmdlets for helping the user manage CLX 3PAR with Microsoft Windows PowerShell

If you want to manually unregister the Cmdlet DLL, use the following command from the CLX product **bin** directory:

```
C:\Windows\Microsoft.NET\Framework64\v4.0.30319\InstallUtil.exe /u  
CLX3PARCmdlets.dll
```

Preparing for upgrade of CLX to v5.00.00

Following section describes the recommended way of performing the upgrade of CLX to v5.00.00:

If you have a configuration, where the CLX version is prior to v5.00.00 and the 3PAR OS version on all the arrays is prior to v3.3.1, then use the following recommended procedure to upgrade the existing version of CLX to v5.00.00. This upgrade procedure is combination of CLX upgrade on the failover cluster nodes and the 3PAR OS upgrade on the arrays.

Prerequisites

- Ensure that the Remote Copy links between the DC-A and DC-B arrays are working throughout the upgrade.
- As CLX v5.00.00 uses WSAPI to communicate with the array, ensure that the port 8080 (default WSAPI server port ID) is open for communication.

In the following figure, the environment is running existing version of CLX v4.02.00 or v4.03.00, the 3PAR OS version is v3.2.2 or v3.2.1, and the failover cluster node is referred to as node.

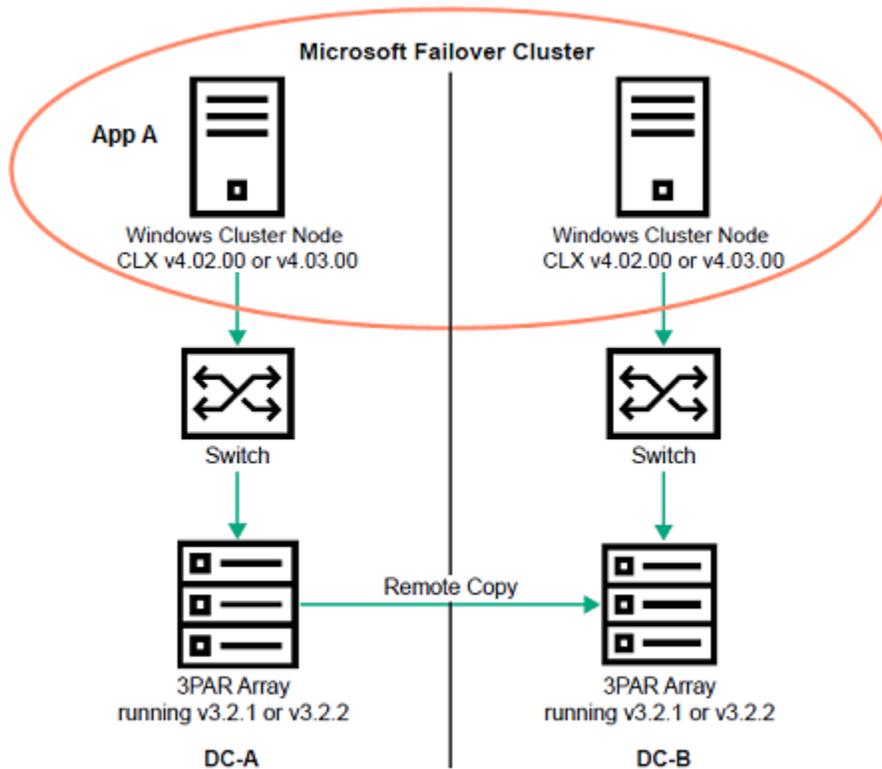


Figure 2: CLX environment before performing the upgrade

In the following upgrade scenario, Application A is running on Datacenter A node and data is getting replicated from DC-A array to DC-B array.

Procedure

1. Move all applications from the DC-A site node to DC-B site node.
2. Upgrade the 3PAR OS of the DC-A 3PAR array to v3.3.1.
3. Now, move all applications from DC-B to DC-A site node.

NOTE: As the current environment have different versions of 3PAR OS, you can perform the planned migration test to move application from DC-A site to DC-B site and again move the application from DC-B site to DC-A site. This ensures that CLX works as expected.

4. Upgrade the 3PAR OS of the DC-B 3PAR array to v3.3.1.

NOTE: You can perform the planned migration test to move application from DC-A site to DC-B site and again move the application from DC-B site to DC-A site. This ensures that CLX works as expected.

5. Ensure that the WSAPI service is running on both the arrays after 3PAR OS upgrade is completed successfully.

To verify whether the WSAPI service is running or not, connect to the array using SSH. Run the `showwsapi` command and if the WSAPI service is not running, then start the WSAPI service using `startwsapi` command.

6. Launch the CLX installer to upgrade the CLX to v5.00.00 in DC-B for one of the failover cluster node and complete the upgrade.

For details, see [Upgrading HPE 3PAR StoreServ Cluster Extension Software to v5.00.00](#) on page 20.

7. Modify the CLX array configuration using the CLX 3PAR Configuration tool.
For details, see **Configuring CLX after upgrading to HPE 3PAR StoreServ Cluster Extension v5.00.00** on page 21
8. Restart the failover cluster service on the node, where the CLX upgrade is completed successfully.
9. (Optional) CLX v5.00.00 and later uses WSAPI interface to perform all its operations on the array. You can remove the existing version of 3PAR CLI on this cluster node, if it is not used by any other application on that node.
10. Repeat the steps 6 to 8 for all the remaining cluster nodes in DC-B. Now, all the cluster nodes on DC-B are upgraded to CLX v5.00.00 successfully.
11. Start the CLX upgrade procedure for the cluster nodes in DC-A site.
12. Move all the applications from DC-A to DC-B. The application comes online successfully on the DC-B nodes.
13. Repeat the steps 6 to 8 for all the cluster nodes in DC-A site.

Upgrade scenario - Mixed mode

As described in **Preparing for upgrade of CLX to v5.00.00** on page 18 section, there is a possibility of mixed version of CLX or 3PAR OS during the CLX upgrade process. Following are the details of what is supported and not supported in this mixed mode environment.

Note the following during CLX upgrade for mixed mode support:

- If the 3PAR OS version on both the arrays is not upgraded to v3.3.1, then do not upgrade the existing CLX version to v5.00.00.
- If the 3PAR OS version is v3.3.1 on one of the array and on the other array 3PAR OS version is prior to v3.3.1, then the CLX version on all the failover cluster nodes must be prior to CLX v5.00.00.
- Once you start the upgrade process, CLX does not support modifying the existing CLX resource configuration or adding new CLX resource during upgrade. Complete the upgrade process to do any CLX resource modifications or to add new CLX resources into the environment.
- Mixed version of CLX is possible in this entire upgrade procedure. For example, one site running CLX v5.00.00 and other site is on CLX v4.03.0.00. But the 3PAR OS must be v3.3.1 on both the sites.
- During the upgrade of CLX to v5.00.00, there is a possibility of Microsoft failover cluster nodes having mixed versions of CLX (some Microsoft failover cluster nodes having CLX versions prior to v5.00.00, such as, v4.xx.xx and some nodes having CLX v5.00.00). In this configuration, where you have mixed versions of CLX due to upgrade, Live Migration of Virtual Machines among the cluster nodes is not supported and only quick migration/normal move of VMs is supported.

IMPORTANT:

CLX does not recommend to have this mixed environment, even though the functionality might work. Hewlett Packard Enterprise strictly recommends the customer to upgrade CLX to v5.00.00 on all the failover cluster nodes and 3PAR OS to v3.3.1 on both the data center arrays as described in the section **Preparing for upgrade of CLX to v5.00.00** on page 18.

Upgrading HPE 3PAR StoreServ Cluster Extension Software to v5.00.00

Following are the instructions to upgrade HPE 3PAR StoreServ Cluster Extension Software from v4.02.00, v4.03.00, or v4.03.01 to v5.00.00 (Windows Server 2008/2008 R2/2012/2012 R2/2016).

Important: If you have applied HPE 3PAR StoreServ Cluster Extension array based license on the arrays and want to upgrade from v4.02.00 or 4.03.00 to v5.00.00, then you must first upgrade the CLX to HPE 3PAR StoreServ Cluster Extension software v4.03.01 on every node of the cluster.

For more information about upgrade from v4.02.00 or v4.03.00 to v4.03.01, see *HPE 3PAR StoreServ Cluster Extension Software 4.03.01 Installation Guide* at <http://www.hpe.com/support/hpesc>.

Prerequisites: Ensure to perform the following:

- Before upgrading CLX to v5.00.00, ensure that the HPE 3PAR OS on all the identified arrays are on 3PAR OS version 3.3.1 or later.
- Perform the CLX upgrade on each failover cluster node locally. HPE 3PAR StoreServ Cluster Extension Software does not support cluster wide upgrades.
- Ensure that the HPE 3PAR WSAPI service is running on the configured arrays. For more information, see the *HPE 3PAR Web Services API Developer's Guide* at <http://www.hpe.com/support/hpesc>.

NOTE:

Before upgrading, save the HPE 3PAR StoreServ Cluster Extension Configuration file using the `Export` feature in the HPE 3PAR StoreServ Cluster Extension Configuration tool. For instructions on saving the file, see the *HPE 3PAR StoreServ Cluster Extension Software Administrator Guide*. Close the Microsoft Failover Cluster Management Console and any of the HPE 3PAR StoreServ Cluster Extension utilities, if open.

Procedure

1. Download HPE 3PAR StoreServ Cluster Extension Software v5.00.00 from <https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=CLX>
2. Move all applications from the current node to another node.
3. Double click the HPE 3PAR StoreServ Cluster Extension installation package, and follow the onscreen instructions.
4. Once, the upgrade is complete, configure the CLX as described in the **Configuring CLX after upgrading to HPE 3PAR StoreServ Cluster Extension v5.00.00** on page 21 section.
5. Restart the cluster service on the failover cluster node.
6. Repeat this procedure for all other remaining cluster nodes.

Configuring CLX after upgrading to HPE 3PAR StoreServ Cluster Extension v5.00.00

Prerequisites

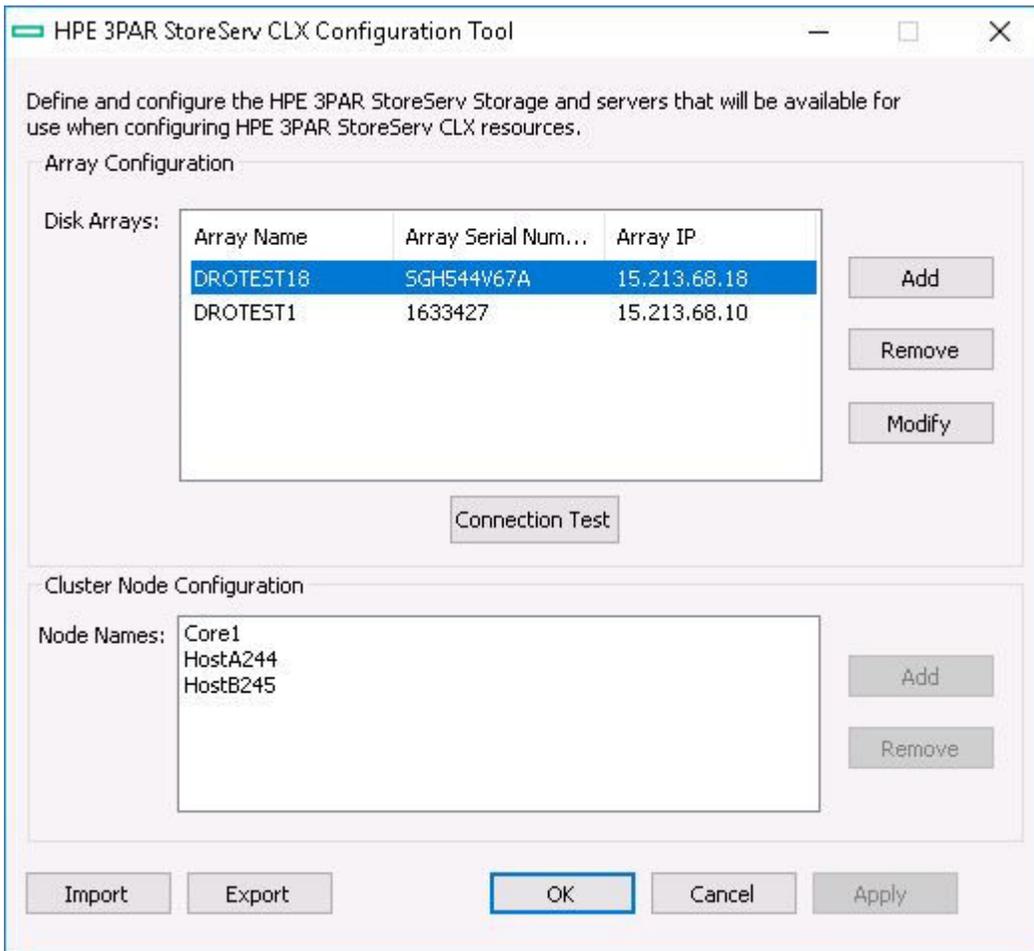
If you are upgrading HPE 3PAR StoreServ Cluster Extension Software from previous versions 4.02.00, 4.03.00, or 4.03.01 to v5.00.00, it is mandatory to reconfigure the array information in the CLX environment. The reconfiguration of array information is required as HPE 3PAR StoreServ Cluster Extension v5.0.00 and later uses HPE 3PAR WSAPI to communicate with the 3PAR array. CLX does not use 3PAR CLI as in the prior versions of CLX.

Currently, the user information to communicate with the array is available as a password file. But, WSAPI interface does not support password file way of authentication. Hence, it is required to provide the user information for every array that is being already configured in CLX. To reconfigure the arrays, the installer launches CLX configuration tool after the CLX upgrade is complete.

To perform the reconfiguration of array information:

Procedure

1. From the CLX configuration tool, select an array.



2. Click **Modify** in the Array Configuration section to open the modify array dialog box.
3. Enter the Array Credentials: Array Username and Array Password.

Modify HPE 3PAR StoreServ Storage Connection Settings

Add HPE 3PAR StoreServ Storage . Only arrays which present disks to cluster nodes need to be configured.

Array Credentials

Array Network Name (or IP address)

Array Username:

Array Password:

Array Details

Array Name:

Array Serial Number:

Array Model:

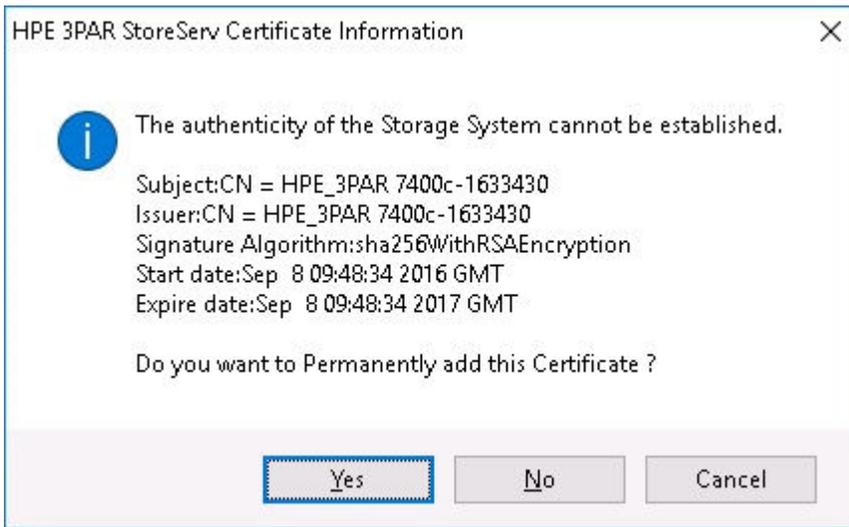
Array ID:

Array Target Information

Target Name	Target Array ID

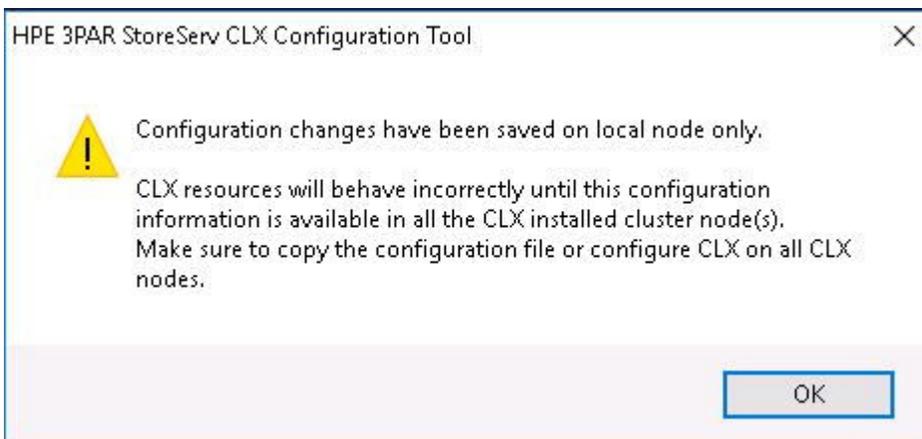
4. Click **Connect**.

Then, you are prompted to save the certificate.



5. Click **Yes** to save the certificate.
6. Repeat the steps from step 1-5 for all the configured arrays.
7. Click **Apply** on the CLX configuration tool.

The following warning appears prompting that the user configuration changes are saved only on the local node.



8. Click **OK** to save the configuration information locally.

Maintaining HPE 3PAR StoreServ Cluster Extension

This chapter provides information about modifying, repairing, and removing the 3PAR StoreServ Cluster Extension software.

- **Modifying HPE 3PAR StoreServ Cluster Extension installation** on page 25
- **Repairing HPE 3PAR StoreServ Cluster Extension installation** on page 25
- **Removing HPE 3PAR StoreServ Cluster Extension** on page 26

Modifying HPE 3PAR StoreServ Cluster Extension installation

Once 3PAR StoreServ Cluster Extension is installed, you can modify the installation by adding or removing components.

1. Start the 3PAR StoreServ Cluster Extension InstallShield wizard:
 - a. Depending on your version of Windows, do one of the following:
 - Select **Start > Control Panel > Programs and Features**
 - For Server Core or Hyper-V Server: Run the 3PAR StoreServ Cluster Extension installation package from the command line. Continue to **Step 2**.
 - b. Select **HPE 3PAR StoreServ Cluster Extension**. Click **Uninstall/Change**.

The InstallShield maintenance window appears.

2. Select **Modify**, and then click **Next**. The Select Features window appears.
3. Select the check boxes next to the features you want to install, clear the check boxes next to the features you want to remove, and then click **Next**.

The Cluster node selection window appears.

4. Select the cluster nodes to modify, and then click **Next**.

The InstallShield wizard notifies you that remote maintenance is in progress. For each selected cluster node, the wizard notifies you that maintenance was successful or unsuccessful.

5. For each remote maintenance confirmation window, click **OK**.

The Maintenance Complete window appears.

6. Click **Finish** to close the InstallShield wizard.

Repairing HPE 3PAR StoreServ Cluster Extension installation

Once 3PAR StoreServ Cluster Extension is installed, you can repair the installation.

1. Start the 3PAR StoreServ Cluster Extension InstallShield wizard:
 - a. Depending on your version of Windows, do one of the following:
 - Select **Start > Control Panel > Programs and Features**
 - For Server Core or Hyper-V Server: Run the 3PAR StoreServ Cluster Extension installation package from the command line. Continue to **Step 2**.
 - b. Select **HPE 3PAR StoreServ Cluster Extension**. Click **Uninstall/Change**. The InstallShield maintenance window appears.
2. Select **Repair**, and then click **Next**. The Cluster node selection window appears.

3. Select the cluster nodes to repair, and then click **Next**. The InstallShield wizard notifies you that remote maintenance is in progress.
4. For each remote maintenance confirmation window, click **OK**. The Maintenance Complete window appears.
5. Click **Finish** to close the InstallShield wizard.

Removing HPE 3PAR StoreServ Cluster Extension

1. Make sure that the Microsoft failover cluster GUI is not running.
2. Start the 3PAR StoreServ Cluster Extension InstallShield wizard:
 - a. Depending on your version of Windows, do one of the following:
 - Select **Start > Control Panel > Programs and Features**
 - For Server Core or Hyper-V Server: Run the 3PAR StoreServ Cluster Extension installation package from the command line. Continue to **Step 3**.
 - b. Select **HPE 3PAR StoreServ Cluster Extension**. Click **Uninstall/Change**. The InstallShield maintenance window appears.
3. Select **Remove**, and then click **Next**.

The InstallShield wizard prompts you to confirm the uninstall request.

4. Click **Yes** to confirm the request.

The Cluster node selection window appears.

5. Select the cluster nodes for 3PAR StoreServ Cluster Extension removal, and then click **Next**.
6. Do one of the following:
 - Click **Yes** if you want to save the Cluster Extension configuration file. Enter a file name, and then click **Save**.
 - Click **No**.
7. Click **OK**.

The install wizard asks if you want to unregister the cluster resource type from all nodes in the cluster. Hewlett Packard Enterprise recommends that you do not unregister the cluster resource type until you are uninstalling HPE 3PAR StoreServ Cluster Extension Software from the last node in the cluster.

Do one of the following:

- If you have not unregistered the cluster resource type, and this is the last node in the cluster, click **Yes**.
- If you have unregistered the cluster resource type from one of the other cluster nodes, click **No**.

The Uninstall Complete window appears.

8. Click **Finish**

NOTE: On Server Core Failover cluster nodes, if you want to back up the CLX configuration data before CLX uninstallation, you must manually copy the `ClxConfigRepository.xml` file present at the location `<CLX Installation Path>\bin`. CLX uninstallation process will not be able to back up the configuration data during the uninstallation.

Licensing

This chapter describes various licensing models supported by CLX. The following section also explains how to obtain and install the product license keys.

Licensing models supported by CLX

There are three types of licensing model supported by CLX.

- 1. HPE Host-based permanent license:** In this licensing model, HPE 3PAR StoreServ CLX license needs to be procured for each node that uses HPE 3PAR StoreServ Cluster Extension (CLX). If Microsoft failover Cluster has [Nh] number of nodes that have CLX software installed connected to [Na] number of storage arrays, you need to procure [Nh] number of host based permanent licenses to make CLX work. For example, if you have 5 cluster nodes having CLX installed, you must have 5 host based CLX licenses – one for each node. Applying Host based permanent license is a node specific operation. For more information, see [Applying HPE Autopass host-based permanent license](#) on page 29. This licensing model is supported since previous releases.
- 2. HPE Autopass device-based permanent license:** In this licensing model, you must procure licenses for each storage device connected to the failover cluster independent of the number of hosts to which the storage devices are connected. For example, if the failover Cluster has [Nh] number of nodes that have CLX software installed and connected to [Na] number of storage devices, you must procure only [Na] number of HPE Autopass device-based permanent licenses – one for each storage device. Using a particular CLX utility, you can import these licenses in all the nodes of the cluster at once. See [Applying HPE Autopass device-based permanent license](#) on page 30 to know how to apply the HPE Autopass device-based licenses in the CLX setup. You must choose one of the CLX licensing models in the CLX setup and make a decision based on the price set for each node or device based CLX license and the number of host cluster nodes and storage arrays that you have in the CLX setup.

NOTE:

HPE Autopass license model [instant-on , Host based permanent license, and device based permanent license] is not supported for HPE 3PAR StoreServ 8xx0, 20xx0, and later array models.

- 3. HPE 3PAR Cluster Extension array based license in HPE 3PAR Replication Software suite :** In this newly introduced licensing model, you must procure licenses for each storage device connected to the failover cluster independent of the number of hosts to which the storage devices are connected. For example, if the failover Cluster has [Nh] number of nodes that have CLX software installed and connected to [Na] number of storage devices, you must procure only [Na] number of HPE 3PAR Cluster Extension license in HPE 3PAR Replication Software suite – one for each storage device. CLX is enhanced to support this licensing model from v4.02.00 and later. For information on how to apply the HPE 3PAR Cluster Extension array based license in HPE 3PAR Replication Software suite, see [Applying HPE 3PAR Cluster Extension array based license](#) on page 31 .This license model is part of the following HPE 3PAR Cluster Extension license suites:

- **HPE 3PAR Replication Software suite**

This suite has licenses for HPE 3PAR StoreServ array features Virtual Copy, Remote Copy, Peer Persistence, and Cluster Extension. When you purchase this suite, HPE 3PAR StoreServ Cluster Extension array based license is also present.

- **Replication Extension Suite license**

This suite has licenses for HPE 3PAR StoreServ array features Peer Persistence, and Cluster Extension. License for Remote Copy feature is not part of this suite, you have to purchase license for Remote Copy separately.

It is mandatory to purchase any one of the mentioned license suites for HPE 3PAR StoreServ 8xx0, 20xx0, and later models.

NOTE:

Any of the Autopass based licensing model is not supported on 3PAR array models 8xx0, 20xx0, and later hardware models.

AutoPass based license key information

A license key is required to use all of the product features. The License Entitlement Certificate provides instructions on how to obtain a license key. In the meantime, a temporary, instant-on license key is available so that you can immediately start using all of the features. The instant-on key is valid for 60 days from the first use. Upon expiration of the instant-on license key, the features will be disabled. You must obtain a permanent license key to continue using the features.

Retrieving a license key

When you purchase this product, you receive a License Entitlement Certificate. You will need information from this certificate to retrieve and enter your license keys.

You can use any of the following methods to request a license key:

- Obtain a license key from the HPE licensing software website at www.hpe.com/software/license.
- Use AutoPass to retrieve permanent license keys. See [Using AutoPass to retrieve permanent license keys](#) on page 28.
- Fax the Password Request Form that came with your License Entitlement Certificate. See the certificate for fax numbers in your area.
- Call or email the Hewlett Packard Enterprise Password Center. See the certificate for telephone numbers in your area or email addresses.

Using AutoPass to retrieve permanent license keys

To retrieve permanent license keys:

Procedure

1. Start AutoPass, located in the CLX product's `bin` directory:

For host based licenses

```
clxautopass -ovlicensemgr
```

For device based licenses

```
clxautopass -ovlicensemgr -d
```

AutoPass requires that a JRE or SDK, or both be installed on the cluster node. See the HPE 3PAR Cluster Extension (CLX) for Windows Spock document at [HPE SPOCK website](#) for the supported JRE version.

2. Once you receive the license key in email, start the AutoPass GUI and click **Install/Restore License Key**.
3. For MSFC environments only: After installing the permanent license keys, restart the cluster service to validate the license.

Using the clxautopass command-line utility

In addition to using the `clxautopass` command to start Autopass, you can also use the command at the CLI to install the instant-on license and import a password from the license key file.

Installing instanton license keys

If the installation process failed to install the license, you can use the command line to install it. First repair any conditions that may have caused the license installation to fail, and then run the following command to install the license:

```
clxautopass -installinstanton
```

Applying HPE Autopass host-based permanent license

If you have procured host based permanent license, you can use one of the following options to apply the host based permanent license to individual hosts.

Importing a license key from a file

When you receive the license key file by email, import the license key by running the following command:

```
clxautopass -addpasswords <license file path>
```

Where *license file path* is the full (absolute) path name to the license key file.

This command is equivalent to using the Install/Restore License Key from file option in AutoPass.

Using the HPE 3PARStoreServ Cluster Extension registration tool

NOTE:

This registration tool is applicable only for installing HPE Autopass host-based permanent license. Do not use this tool for installing HPE Autopass device-based license or HPE 3PAR Cluster Extension Array based license.

To install a license key:

Procedure

1. For Windows Server 2008/2008 R2: Select **Start > All Programs > HPE > HPE 3PAR StoreServ Cluster Extension Software > HPE 3PAR StoreServ Cluster Extension Registration Tool**.
2. For Windows Server 2012/2012 R2/2016: Double-click the HPE 3PAR StoreServ CLX Configuration Tool icon on the desktop, or go to the Start menu, search for HPE, and select **HPE 3PAR StoreServ Cluster Extension Configuration Tool**.
3. Click **Browse**.
4. Browse to your license key file, and then click **Install License**.
5. Click **Close** when you are done installing the license keys.

Support for Mixed device-based license models in CLX environment

1. **HPE 3PAR Cluster Extension array based license:** Supports only HPE 3PAR StoreServ 8xx0, 20xx0, and later models.
2. **HPE Autopass device-based permanent license:** Supports only HPE 3PAR StoreServ 7xx0 and 10xx0.

Consider a setup where, two different sites have two different array models. Array on one site has Autopass device-based permanent license model and array on the other site has HPE 3PAR Cluster Extension array based license model. This type of configuration is supported by CLX.

Installation of HPE Autopass device-based permanent license in Mixed device-based license environments

Procedure

1. Procure the HPE Autopass device-based permanent license for HPE 3PAR StoreServ Cluster Extension.
2. Identify all nodes part of Microsoft Failover cluster connected to the array where the HPE Autopass device-based permanent license will be installed.
3. On each Failover Cluster node identified in the previous step, you need to install the HPE Autopass device-based permanent license as described in the following steps:
 - a. Launch the **CLXRegistration** tool and click **Autopass** GUI. This will launch the **Autopass license management** GUI.
 - b. Under the license management column, select **Install License** key.
 - c. Select the file where Autopass device-based permanent license is present.
 - d. Select **View file contents** and select the license file to be installed.
 - e. Click Install.
4. After the HPE Autopass device-based license is installed on all the identified failover cluster nodes, restart the failover cluster service on all the nodes that are connected to the array.

Applying HPE Autopass device-based permanent license

Applying HPE Autopass device-based permanent license keys in clustered environment

If you have procured the HPE Autopass device-based license for HPE 3PAR StoreServ Cluster Extension, then you can use this tool to apply license to all the cluster nodes automatically running from one of the cluster nodes. This means that, if you run this tool from any one of the cluster nodes with the following option, permanent license in all other cluster nodes will be imported automatically.

Usage:

```
ClxDeviceLicenseRegistration[.exe] {[-f <License File 1> <License File 2>>] | [-s <License File 1>]} [. . .<License File n>]
```

Options:

- -f : Import the HPE Autopass device-based permanent licenses using multiple license files. This option has to be used to apply the licenses for the first time or can be used later, but minimum two HPE Autopass device-based permanent license files should be provided.
- -s : Import the HPE Autopass device-based permanent license using single license file. This option has to be used subsequently to import the license for a device purchased only if you have already applied HPE Autopass device-based permanent licenses earlier for different devices in the same Microsoft failover cluster.

[License File] : HPE Autopass device-based permanent license file name with path.

Examples:

```
ClxDeviceLicenseRegistration.exe -f <License File 1> <License File 2>  
[ . . .<License File n>]
```

```
ClxDeviceLicenseRegistration.exe -s <License File 1> > [ . . . <License File n>]
```

Where `License File` is a HPE Autopass device-based license file name with path. At least two or more valid HPE Autopass device-based permanent license files should be provided.

This command is equivalent to manually importing the HPE 3PAR CLX Autopass device-based permanent license in each individual cluster node one by one using either `clxautopass` utility or the HPE 3PAR StoreServ Cluster Extension registration tool.

NOTE:

This tool is applicable only for installing HPE Autopass device-based permanent licenses. Do not use this tool for installing node based permanent license or HPE 3PAR Cluster Extension array based license.

Applying HPE Autopass device-based permanent license keys in non-clustered environment

If `CLX3PARrun.exe` is used for failover operation in a non-clustered environment and if you have purchased HPE Autopass device based permanent licenses, follow the procedure for permanent license installation. Once you procure the HPE Autopass device based license file, import the license key by running the following command:

```
clxautopass -addpasswords <Device based license File path>
```

Where `license File path` is the full (absolute) path name to the license key file.

Applying HPE 3PAR Cluster Extension array based license

If you have procured this license for HPE 3PAR Cluster Extension, then license installation can be done using HPE 3PAR SSMC.

Applying HPE 3PAR Cluster Extension array based license using HPE 3PAR SSMC

To apply HPE 3PAR Cluster Extension array based license using HPE 3PAR SSMC:

Procedure

1. Login to HPE 3PAR SSMC.
2. In the right pane, click **View** and select **Licenses**.

The screenshot shows the 3PAR StoreServ interface. On the left, a table lists systems:

Name	Model	Serial Number
DRO3PAR03	HPE_3PAR AR 740 Oc	1633430
DRO3PAR04	HPE_3PAR AR 740 Oc	1633439

The main area shows the 'View' menu for system DRO3PAR03. The 'Licenses' option is selected. Other menu items include Overview, Configuration, Capacity, Capacity Savings, Capacity Forecasting, Encryption, System Reporter, Settings, Services, Software, Layout, Performance, and Activity. The background displays system details and resource usage bars for Data cache (49%), Control cache (44%), and CPU usage (1%).

3. Click the **Actions** drop-down and select **Add License**.

The screenshot shows the 3PAR StoreServ interface with the 'Licenses' page for system DRO3PAR03. The 'Actions' drop-down menu is open, and 'Add license' is selected. The page displays the License Key and a list of enabled features with their expiration dates.

License Key

Key generation date: Mar 27, 2017 11:42:15 AM IST

License

Enabled Feature	Expiration Date
3PAR OS Suite	—
Adaptive Flash Cache	—
Adaptive Optimization	—
Autonomic Rebalance	—
Data Encryption	—
Dynamic Optimization	—
File Persona (102400G)	—
File Persona Basic	—
Management Plug-In for VMware vCenter	—
Peer Motion	—
Peer Persistence	—
Peer Persistence (102400G)	—
Priority Optimization	—

4. In the **Add License** window, enter the license key and click **Add**.

Add License DRO3PAR03

License file

Drag and drop a file or select a file to upload.

[Browse](#)

License key

If this software is being provided to you for a limited evaluation period, then your license shall be governed by the current HPE Software License Terms (or as otherwise agreed between us) with the exception that the term of the license shall expire upon the earlier of the evaluation period notified to you or 120 days. Upon expiration of the license, you must cease using the software and HPE reserves the right to disable the software without notice. By using or activating the software you are agreeing to these terms.

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[Cancel](#)

Verification of license installation

Once installation of license is complete you can verify if the license was successfully installed using HPE 3PAR SSMC.

To verify license using HPE 3PAR SSMC

Login to HPE 3PAR SSMC.

In the right pane, click **View** and select **Licenses** and check for presence of `Cluster Extension` as shown below:

The screenshot shows the HPE 3PAR StoreServ management console. At the top, there is a search bar and navigation options for 'Systems' (2) and 'All systems' / 'All statuses'. The main content area is divided into two panels. The left panel displays a table of systems:

Name	Model	Serial Number
DRO3PAR03	HPE_3PAR 740	1633430
DRO3PAR04	HPE_3PAR 740	1633439

The right panel shows details for the selected system 'DRO3PAR03'. It includes a 'License Key' section with the 'Key generation date' as 'Mar 27, 2017 12:25:23 PM IST'. Below this is a 'License' section with a table of enabled features and their expiration dates:

Enabled Feature	Expiration Date
3PAR OS Suite	—
Adaptive Flash Cache	—
Adaptive Optimization	—
Autonomic Rebalance	—
Cluster Extension	—
Cluster Extension (102400G)	—
Data Encryption	—
Dynamic Optimization	—
File Persona (102400G)	—
File Persona Basic	—
Management Plug-In for VMware vCenter	—
Peer Motion	—
Peer Persistence	—

Configuring HPE 3PAR StoreServ Cluster Extension Software for HPE 3PAR Cluster Extension array based license

NOTE:

As a best practice, HPE 3PAR Cluster Extension array based license should be installed first on all the arrays and then HPE 3PAR StoreServ Cluster Extension software should be configured for those arrays.

IMPORTANT:

HPE 3PAR StoreServ Cluster Extension Software is enhanced to provide HPE 3PAR Cluster Extension array based license support from v4.02.00 and later.

If HPE 3PAR StoreServ Cluster Extension Software is configured for the first time after installation of HPE 3PAR Cluster Extension array based license, see *Configuring HPE 3PAR StoreServ Cluster Extension in HPE 3PAR StoreServ Cluster Extension Software Administrator Guide*.

If HPE 3PAR StoreServ Cluster Extension Software was earlier configured and HPE 3PAR Cluster Extension array based license is installed later, you must configure HPE 3PAR StoreServ Cluster Extension Software again.

To configure HPE 3PAR StoreServ Cluster Extension Software:

Procedure

1. Launch the **CLX Configuration tool**. For more information on launching `CLX Configuration tool`, see *Configuring HPE 3PAR StoreServ Cluster Extension Configuration* section in *HPE 3PAR StoreServ Cluster Extension Software Administrator Guide*.
2. Select an array that has HPE 3PAR Cluster Extension array based license installed.
3. Select **Modify** and click **Connect**.
4. Click **OK** after successful connection.

 **IMPORTANT:**

Repeat the above procedure for all arrays configured, that has HPE 3PAR Cluster Extension array based license installed.

Removing HPE Autopass host based or device based license keys

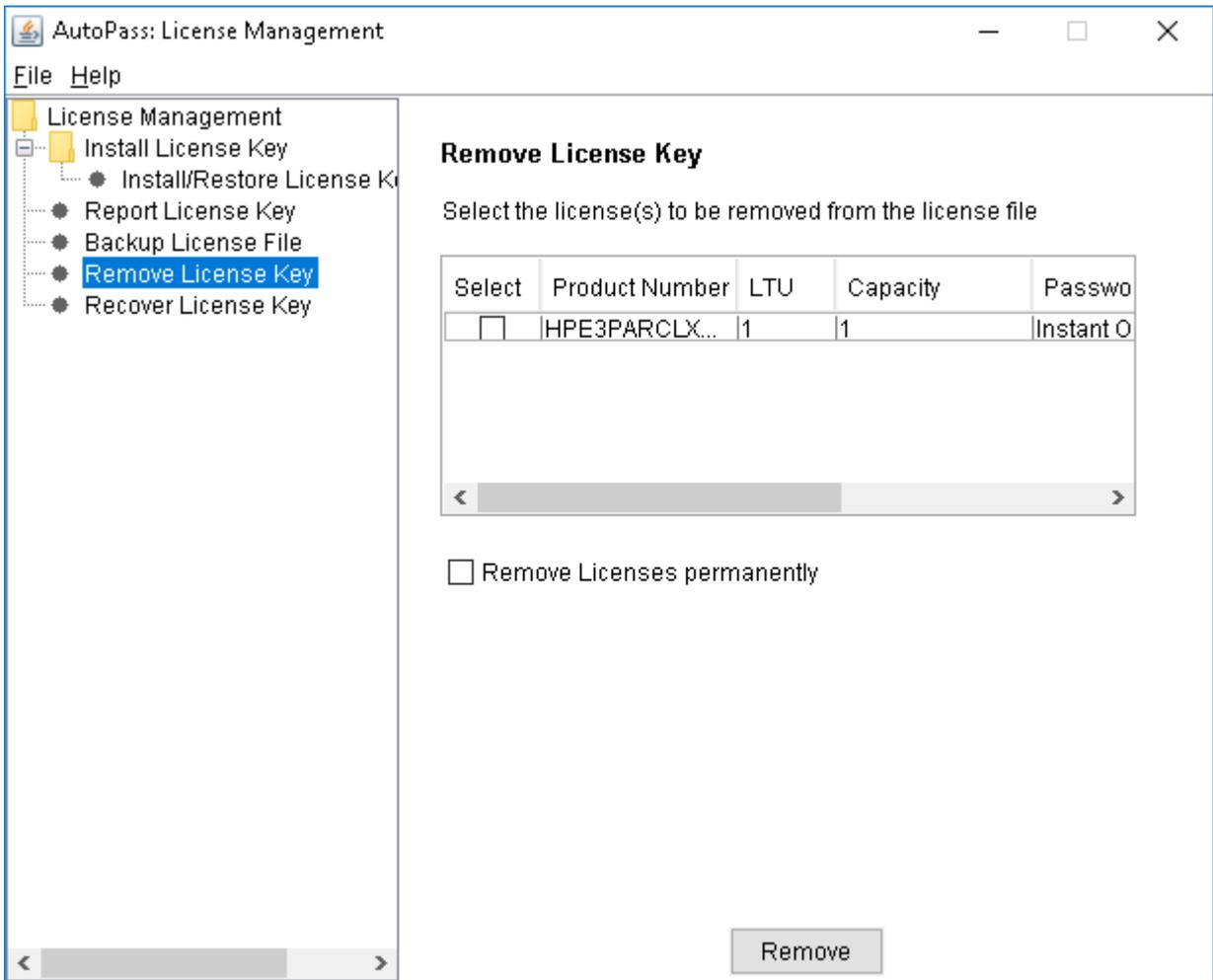
Perform the following steps to remove the host based or device based license keys:

Procedure

1. Start AutoPass located in the product's `bin` directory by running the following command:
2. For host based licenses

```
clxautopass -ovlicensemgr
```
3. For HPE Autopass device-based licenses

```
clxautopass -ovlicensemgr -d
```
4. Click **Remove License Key**.
5. Select the required license key and click **Remove**.



NOTE:

The procedure to remove license keys is applicable for both host based and device based permanent license and also for instanton licenses.

Troubleshooting installation and maintenance problems

Description

This section helps you identify, and troubleshoot installation and maintenance problems. The cluster-wide installation feature allows you to install HPE 3PAR StoreServ Cluster Extension on multiple nodes in a cluster by running the installer from one node in the cluster. Cluster-wide installation is no different than local installation on each individual node.

Result file is not found on the remote cluster node during the cluster-wide installation

Symptom

The .result file is not found on the remote cluster node during the Cluster-wide installation of HPE 3PAR StoreServ Cluster Extension Software.

Cause

The .result file helps in showing the results of the installation process and also helps you identify the status of remote maintenance if cluster level maintenance (modify, repair, remove) fails. The cluster-wide installation feature allows you to install HPE 3PAR StoreServ Cluster Extension on multiple nodes in a cluster by running the installer from one node in the cluster. Cluster-wide installation is similar to local installation on each individual node.

Cluster-wide installation can fail to obtain the remote installation status if a remote node becomes unreachable. This can happen if the network connection or remote cluster node fails. If this type of failure occurs, find the error code in the file `%WINDIR%\CLXSetup_nodename.result`, available on the unreachable node, and then locate the error in Windows remote installation error codes.

Action

Procedure

1. Run the HPE 3PAR StoreServ Cluster Extension setup by logging on to the remote cluster node locally.
2. If you receive an error similar to `Another installation is already in progress...`, then stop the process `IDriver.exe` (and `msiexec.exe`) using task manager, or reboot the node.
3. Rerun the HPE 3PAR StoreServ Cluster Extension setup locally.
For example, If you start a cluster-wide installation on Node1 of a 3-node cluster, with all nodes selected for installation, and the network connection to Node2 and Node3 is lost by Node1, then the cluster-wide installation process cannot get the status of the remote node installation. In this situation, use the `%WINDIR%\CLXSetup_nodename.result` file to obtain the remote node installation status. To check the .result file for the remote nodes, log on to Node2 and Node3, and access the file `%WINDIR%\CLXSetup_nodename.result` on each node. Compare the errors in the file to the information in **Windows remote installation error codes**.

CLX installation fails with the message could not get the system drive for the cluster node

Symptom

CLX installation fails with the message `could not get the system drive for the cluster node... or setup was unable to run the installation in remote machine.`

Cause

On Windows Server 2012/2012R2/2016, installation of the CLX product would register the CLX resource type and registration of resource type copies the CLX resource DLL files `clx3parmcs.dll` and `clx3parvmmscs.dll` to `%SystemDrive%\Windows\Cluster` folder on all the cluster nodes.

Uninstallation of CLX will not remove these files but will be renamed. Once the uninstallation is complete, the files must be manually removed.

Action

Procedure

- Confirm that the WMI service is running using the Microsoft Management Console. To use the HPE 3PAR StoreServ Cluster Extension cluster-wide installation feature, the WMI service must be running. Once uninstallation of the CLX product is completed on all the cluster nodes then next time when you complete the installation of the CLX product on all the cluster nodes, the Cluster service must be restarted on all the cluster nodes.

On Windows Server 2012/2012 R2/2016 Server Core, apart from failover cluster, the feature `RSATClustering-PowerShell` should be installed whose display name is `Failover Cluster Module for WindowsPowerShell`. This feature is required by the CLX installer for registration and un-registration of CLXresources during the installation.

If you are installing CLX product on a cluster whose nodes contain both Server Core and Non-Server Core, then you should install the CLX product from the Non-Server Core cluster node.

Windows remote installation error codes

ERROR code	Description	Corrective action
ERROR_INSTALLATION_SUCCESS	Installation was successful on the local cluster node.	N/A
ERROR_REMOVAL_SUCCESS	HPE 3PAR StoreServ Cluster Extension was successfully removed from the local cluster node.	N/A
ERROR_REPAIR_SUCCESS	HPE 3PAR StoreServ Cluster Extension was successfully repaired on the local cluster node.	N/A
ERROR_MODIFY_SUCCESS	HPE 3PAR StoreServ Cluster Extension was successfully modified on the local cluster node.	N/A

Table Continued

ERROR code	Description	Corrective action
ERROR_READ_INPUT_FILE_FAILED	Setup failed on the local cluster node. The silent input file is corrupt.	Run the setup on the local cluster node.
ERROR_INVALID_HANDLE	Setup failed on the local cluster node. Internal Error. Could not invoke the DLL.	Run the setup on the local cluster node.
SILENT_INPUT_FILE_CORRUPTED	Setup failed on the local cluster node. The silent input file is corrupted or could not be found.	Run the setup on the local cluster node.
LOCAL_NODE_NAME_NOT_FOUND	Setup failed on the local cluster node. Could not find the local node name.	Run the setup on the local cluster node.
ERROR_CLXMSCS_REGISTER_FAILED	Installation completed on the local cluster node. Setup was unable to register the resource type Cluster Extension 3PAR.	Register the resource type by running the following cluster command: <code>cluster restype "Cluster Extension 3PAR" / create / dll:clx3parmscs.dll / type:"Cluster Extension 3PAR"</code> . For more information, see <u>Registering the resource type and resource extension DLL manually</u> on page 15
ERROR_CLXMSCSEX_REGISTR_FAILED	Installation completed on the local cluster node. Setup was unable to register the HPE 3PAR StoreServ Cluster Extension DLL.	Register the resource extension DLL by running the following cluster command: <code>Cluster / regadminext:clx3parmscsex.dll</code> . For more information, see <u>Registering the resource type and resource extension DLL manually</u> on page 15
ERROR_INSTALLDIR_NOT_FOUND	Setup failed on the local cluster node. Setup was not able to get the INSTALLDIR value.	Run the setup on the local cluster node.
ERROR_CLUS_SERVICE_UNKNOWN	Setup failed on the local cluster node. Setup is not able to determine whether the cluster service is running.	Run the setup on the local cluster node.
ERROR_CLUS_SERVICE_NOT_RUNNING	Setup failed on the local cluster node. The cluster service is not running. Please start the cluster service.	Start the cluster service on the local node and run the HPE 3PAR StoreServ Cluster Extension setup.

Table Continued

ERROR code	Description	Corrective action
ERROR_AUTOPASS_INSTALL_FAILED	Setup completed on the local cluster node. The AutoPass package was not installed properly. HPE 3PAR StoreServ Cluster Extension will not function correctly until the AutoPass package is properly installed.	Check the <code>eventlog</code> for more information, and then run the HPE 3PAR StoreServ Cluster Extension setup with the repair option.
ERROR_CLXAUTOPASS_INSTANTON_FAILED	Installation completed on the local cluster node. Setup was unable to run <code>clxautopass.exe - installinstanton</code> on the local cluster node.	Install the instant-on license on the local node by running the following command: <code>clxautopass.exe - installinstanton</code>
ERROR_AUTOPASS_REMOVAL_FAILED	Uninstall completed on the local cluster node. Setup was unable to run the <code>msiexec.exe</code> command.	Make sure <code>msiexec.exe</code> can be executed, and then run the HPE 3PAR StoreServ Cluster Extension setup on the local cluster node.
ERROR_RESOURCE_STATE_UNKNOWN	Uninstall failed on the local cluster node. Setup is not able to determine whether a HPE 3PAR StoreServ Cluster Extension resource is still running.	Run the setup on the local cluster node.
ERROR_RESOURCE_EXISTS	Uninstall failed on the local cluster node. Setup is unable to remove the HPE 3PAR StoreServ Cluster Extension resource type. HPE 3PAR StoreServ Cluster Extension resource(s) are still configured in this cluster.	Remove all Cluster Extension 3PAR -type resource(s) from this cluster, and then run the HPE 3PAR StoreServ Cluster Extension setup.
ERROR_RESOURCE_STATE_ONLINE	Uninstall failed on the local cluster node. A HPE 3PAR StoreServ Cluster Extension resource is still online.	Remove all Cluster Extension 3PAR -type resource(s) from this cluster, and then run the HPE 3PAR StoreServ Cluster Extension setup.
ERROR_CLXMSCSEX_UNREGISTER_FAILED	Uninstall failed on the local cluster node. Setup was unable to unregister the HPE 3PAR StoreServ Cluster Extension DLL.	Unregister the resource extension DLL by running the following cluster command: <code>Cluster / unregadminext:clx3parmscsex.dll</code> . For more information, see <u>Unregistering the resource type and resource extension DLL manually</u> on page 16
CLXUNSETPATH_FAILED	Uninstall completed on the local cluster node. Could not unset the path variables.	Remove the environment variable <code>HPECLX_3PAR_PATH</code> from the local cluster node.

Table Continued

ERROR code	Description	Corrective action
ERROR_DELETE_EVENTLOG_DLL_FAILED	<p>Uninstall completed on the local cluster node. Could not delete clxeventlog.dll from the following registry entry:</p> <p>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</p>	<p>Delete the clxeventlog.dll from the following registry entry:</p> <p>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</p>
ERROR_UNINSTALL_DRS_FILE_S_FAILED	<p>Uninstall completed on the local cluster node. Could not delete clx3parmscs.dll and clx3parmscsex.dll from the following registry entry:</p> <p>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</p>	<p>Delete clx3parmscs.dll and clx3parmscsex.dll from the following registry entry:</p> <p>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</p>
ERROR_CLXMSCS_3PAR_VMMGMT_REGISTER_FAILED	<p>Installation completed on cluster node. Setup was unable to register resource type Cluster Extension 3PAR for VM Management.</p>	<p>Register the Resource type "Cluster Extension 3PAR for VM Management". For more information, see Registering the resource type and resource extension DLL manually on page 15</p>
ERROR_3PAR_VMMGMT_CMDLET_REGISTER_FAILED	<p>Installation completed on cluster node. Setup was unable to register CLX 3PAR Cmdlets DLL.</p>	<p>Register the CLX Cmdlet DLL. For more information, see Registering the CLX PowerShell Cmdlet DLL manually [Windows Server 2012/2012 R2/2016 only] on page 17</p>
ERROR_3PAR_VMMGMT_CMDLET_UNREGISTER_FAILED	<p>Uninstallation completed on cluster node. Setup was unable to unregister CLX 3PAR Cmdlets DLL.</p>	<p>Unregister the CLX Cmdlet DLL. For more information, see Unregistering the resource type and resource extension DLL manually on page 16</p>

Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:
<http://www.hpe.com/assistance>
- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:
<http://www.hpe.com/support/hpesc>

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.
- To download product updates:

Hewlett Packard Enterprise Support Center

www.hpe.com/support/hpesc

Hewlett Packard Enterprise Support Center: Software downloads

www.hpe.com/support/downloads

Software Depot

www.hpe.com/support/softwaredepot

- To subscribe to eNewsletters and alerts:
www.hpe.com/support/e-updates
- To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:
www.hpe.com/support/AccessToSupportMaterials

ⓘ IMPORTANT:

Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HPE Passport set up with relevant entitlements.

Customer self repair

Hewlett Packard Enterprise customer self repair (CSR) programs allow you to repair your product. If a CSR part needs to be replaced, it will be shipped directly to you so that you can install it at your convenience.

Some parts do not qualify for CSR. Your Hewlett Packard Enterprise authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider or go to the CSR website:

<http://www.hpe.com/support/selfrepair>

Remote support

Remote support is available with supported devices as part of your warranty or contractual support agreement. It provides intelligent event diagnosis, and automatic, secure submission of hardware event notifications to Hewlett Packard Enterprise, which will initiate a fast and accurate resolution based on your product's service level. Hewlett Packard Enterprise strongly recommends that you register your device for remote support.

If your product includes additional remote support details, use search to locate that information.

Remote support and Proactive Care information

HPE Get Connected

www.hpe.com/services/getconnected

HPE Proactive Care services

www.hpe.com/services/proactivecare

HPE Proactive Care service: Supported products list

www.hpe.com/services/proactivecaresupportedproducts

HPE Proactive Care advanced service: Supported products list

www.hpe.com/services/proactivecareadvancedsupportedproducts

Proactive Care customer information

Proactive Care central

www.hpe.com/services/proactivecarecentral

Proactive Care service activation

www.hpe.com/services/proactivecarecentralgetstarted

Related information

The following documents [and websites] provide related information:

- *HPE 3PAR StoreServ Cluster Extension Software Administrator Guide*
- *HPE 3PAR StoreServ Cluster Extension Software Release Notes*

You can find these documents on the Manuals page of the HPE Support Center website:

www.hpe.com/support/hpesc

In the **Manuals** section, navigate to **All HPE products > Storage > Storage Software > Storage Replication Software**, and then select **HPE Cluster Extension Software** under **HPE Cluster Software**.

White papers

The following white paper are available at www.hpe.com/storage/whitepapers:

- *Implementing HPE 3PAR Cluster Extension for Windows in a VMware Virtual Machine*
- *Live Migration of Virtual Machines across data centers with HP 3PAR Cluster Extension and Microsoft Hyper-V*

Documentation feedback

Hewlett Packard Enterprise is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (docsfeedback@hpe.com). When submitting your feedback, include the document title, part number, edition, and publication date located on the front cover of the document. For online help content, include the product name, product version, help edition, and publication date located on the legal notices page.

Glossary

CLI

Command-line interface. An interface comprised of various commands which are used to control operating system responses.

DLL

Dynamic-link library.

failover

A role-reversal process where the backup Remote Copy volume group is converted to the primary Remote Copy volume group.

FC

Fibre Channel. A network technology primarily used for storage networks.

GUI

Graphical User Interface.

heartbeat

A periodic synchronization signal issued by cluster software or hardware to indicate that a node is an active member of the cluster.

host

A computer that runs user applications and uses (or potentially uses) one or more virtual disks that are created and presented by the array controller.

JRE

Java Runtime Environment.

LUN

Logical unit number.

MSFC

Microsoft Failover Cluster

quorum

In Windows clustering: A cluster resource that has been configured to control the cluster, maintaining essential cluster data and recovery information. In the event of a node failure, the quorum acts as a tiebreaker and is transferred to a surviving node to ensure that data remains consistent within the cluster.

SAN

Storage area network. A network of storage devices available to one or more servers.

split-brain syndrome

A state of data corruption that can occur if a cluster is re-formed as subclusters of nodes at each site, and each subcluster assumes authority, starting the same set of applications and modifying the same data.

SPOCK

Single Point of Connectivity Knowledge website. SPOCK is the primary portal used to obtain detailed information about supported HPE StorageWorks product configurations.

storage system

A synonym of storage array and virtual array. A group of disks in one or more disk enclosures combined with controller software that presents disk storage capacity as one or more virtual disks.

virtual volume

A virtual storage unit created by mapping data from one or more logical disks.

volume group

A group of virtual volumes that are logically related and for which there is a cross-volume ordering of writes.

WWN

A 64- or 128-bit identifier that uniquely identifies the address of a component on the fabric.