

HP 3PAR Cluster Extension Software Installation Guide

Abstract

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

HP Part Number: 5697-2264
Published: November 2012
Edition: 3



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1 Preparing to install HP 3PAR 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 communications links for cluster heartbeats, client access, and a pair of HP 3PAR storage system 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 HP 3PAR Cluster Extension, note the following:

- Network communications 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 HP 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 HP 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.

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- △ CAUTION:** HP 3PAR 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. HP 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.
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How HP 3PAR Cluster Extension Software interacts with its environment

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

Failover function

HP 3PAR 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 HP 3PAR Cluster Extension utilizes virtual volumes

To write to HP 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, HP 3PAR 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. HP 3PAR Cluster Extension Software determines whether those virtual volumes can be accessed and made available to the application service.

How HP 3PAR Cluster Extension stores information

HP 3PAR Cluster Extension stores information about the application environment in an internal object database and uses HP 3PAR InForm CLI to gather information about the state of the 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. An internal object database provides the software with the format and default value of supported parameters.

Virtual volume states are stored in the internal object database, which uses a rule engine to process those states. The rule engine matches current volume group member states and configuration parameters with a defined rule, stores it in the database, and invokes predefined actions. Those actions prepare the volume group member virtual volumes to be enabled for access or stop the application service startup process if the matching rule requires a stop.

General installation prerequisites

This section describes general installation prerequisites for HP 3PAR Cluster Extension.

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

- HP Remote Copy links (including extender hardware) are redundant and bidirectional.
- Alternate I/O paths (network and storage links) between servers and the HP 3PAR storage system are set up.
- Cluster and client networks are redundant.
- Cluster nodes can communicate with each other.
- The latest supported software and firmware versions, fixes, FC adapter firmware, and driver versions for your servers and HP 3PAR storage systems are installed.
- The cluster nodes in your zoning configuration each recognize their respective (local) HP 3PAR storage system, but not the remote HP 3PAR storage system.

Disk space and system memory requirements

- 50 MB for the HP 3PAR Cluster Extension installation directory (%ProgramFiles%\Hewlett-Packard\Cluster Extension 3PAR)
- At least 25 MB of system memory

Required firmware and software

For specific firmware and software versions, see the HP SPOCK website: <http://www.hp.com/storage/spock>.

2 Installing HP 3PAR Cluster Extension Software

This chapter describes the installation of HP 3PAR Cluster Extension Software in Microsoft clustering environments with HP 3PAR storage systems.

NOTE:

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

Prerequisites

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

1. Check “[General installation prerequisites](#)” (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](#)” (page 8).
3. Download the HP 3PAR Cluster Extension Software installer.
 - a. Browse to <https://h20392.www2.hp.com/portal/swdepot/displayProductInfo.do?productNumber=CLX>.
 - b. Click **HP Storage > Storage 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 HP 3PAR Cluster Extension installation and configuration. Perform these procedures before you install HP 3PAR Cluster Extension.

1. “[Checking the IP network setup and SAN configuration](#)” (page 8)
2. “[Installing the multipath software](#)” (page 9)
3. “[Installing and configuring the JRE](#)” (page 9)
4. “[Installing HP 3PAR Command Line Interface \(CLI\)](#)” (page 9)
5. “[Configuring the HP 3PAR storage system](#)” (page 9)
6. “[Creating hosts and setting host persona](#)” (page 9)
7. “[Creating virtual volumes and adding a LUN presentation](#)” (page 10)
8. “[Creating Remote Copy volume groups](#)” (page 10)
9. “[Installing Microsoft Failover Cluster \(MSFC\) on all nodes](#)” (page 10)

Checking the IP network setup and SAN configuration

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

- HP 3PAR 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 *HP StorageWorks SAN Design Reference Guide* and the *HP 3PAR Remote Copy Users Guide* for supported SAN extension configuration and instructions on setting up your HP 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 *3PAR Windows Implementation Guide* located at: www.hp.com/go/saw.

Installing and configuring the JRE

To install the product license using the HP AutoPass GUI, you must first install the JRE. See the CLX 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, you can use the HP 3PAR Cluster Extension registration tool to install license keys. For more information about using the registration tool, see “Using the HP 3PAR Cluster Extension registration tool ” (page 23).

Installing HP 3PAR Command Line Interface (CLI)

HP 3PAR Cluster Extension communicates with the HP 3PAR storage system using the HP 3PAR Command Line Interface (CLI). Ensure that you install and test the supported version of HP 3PAR Command Line Interface (CLI) on all cluster nodes where Cluster Extension software will be installed. For more information, see *3PAR CLI Administrator's Manual* located at www.hp.com/go/saw.

NOTE: While installing or upgrading HP 3PAR Command Line Interface (CLI) on Windows, the environment variable `Path` will be updated with the CLI install directory. Occasionally, this change does not take effect and you may have to re-login to Windows. HP recommends that you test the CLI commands after you install or upgrade HP 3PAR CLI and try to re-login, if the commands fail due to the binary not found error.

Configuring the HP 3PAR storage system

For detailed information on configuring the HP 3PAR storage system, see the *3PAR Management Console User Guide* or the *3PAR CLI Administrator's Manual*. You can also consult your HP 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 HP 3PAR storage system. Each HP 3PAR storage system 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 HP 3PAR storage systems to deviate from the default host behavior. Host personas are tied to the host name and identified by the host persona number. Use the HP 3PAR CLI commands or the HP 3PAR Management Console to display, create, modify, and remove host personas. For more information, see the *HP 3PAR CLI Administrator's Manual* or the *HP 3PAR Management Console Online Help*.

HP recommends that you run HP 3PAR Host Explorer software on hosts connected to HP 3PAR storage systems. When a host is created on a HP 3PAR storage system, 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 HP 3PAR storage system automatically groups WWNs for the host together, assisting with creating the host. The Host Explorer agent runs as a service.

For more information on creating hosts and setting host persona, see the *3PAR Windows Implementation Guide* located at: www.hp.com/go/saw.

Creating virtual volumes and adding a LUN presentation

Create the storage (virtual volume) on a primary 3PAR storage system for your application data using the HP 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 storage system. 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 HP 3PAR 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 storage system should match with the virtual volume(s) on the secondary 3PAR storage system.

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 storage system. When a Remote Copy volume group is started and virtual volumes are in "synced" 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 HP 3PAR 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, 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.

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 HP 3PAR 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 error.

For more information, see the following Microsoft TechNet document: <http://technet.microsoft.com/en-US/library/b153c638-ff53-4470-8b72-010046b8dcc6.aspx>.

After the cluster software is installed, you can install HP 3PAR Cluster Extension Software on all cluster nodes that have an FC connection to the local or remote 3PAR storage system and are used to access storage resources on the 3PAR storage system. For installation instructions, follow the procedure in “Installing HP 3PAR Cluster Extension Software ” (page 11).

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

Installing HP 3PAR Cluster Extension Software

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

To install HP 3PAR Cluster Extension:

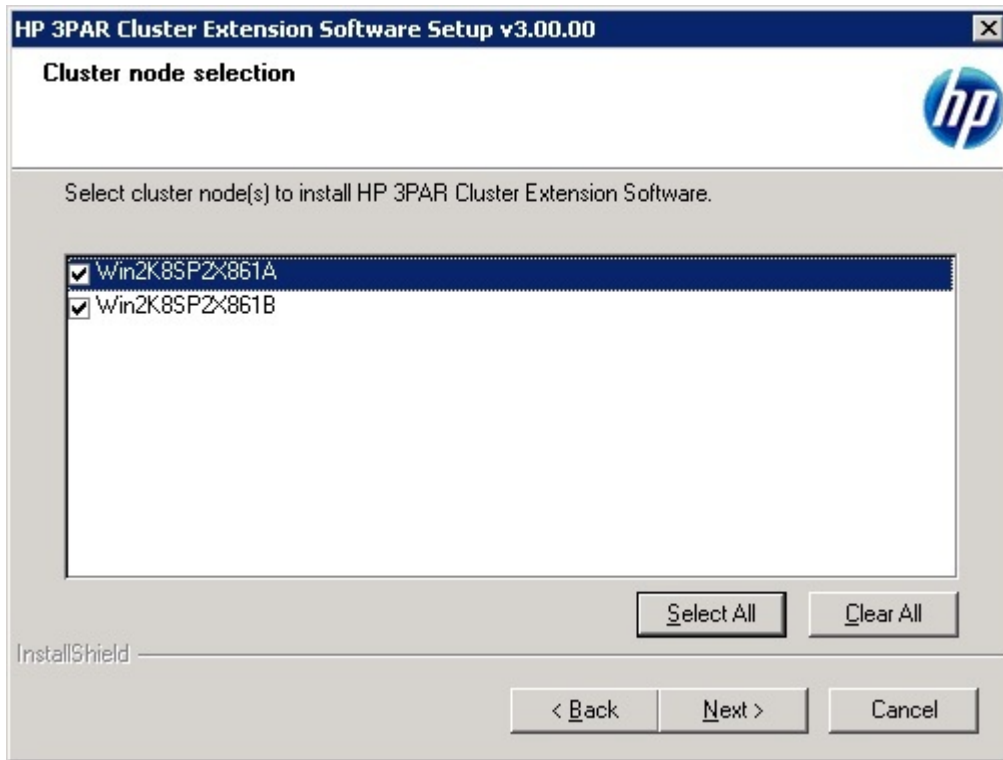
1. Ensure that the cluster service is running on all cluster nodes.
2. Ensure that the cluster management application is not running on the cluster nodes where you plan to install HP 3PAR Cluster Extension.

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

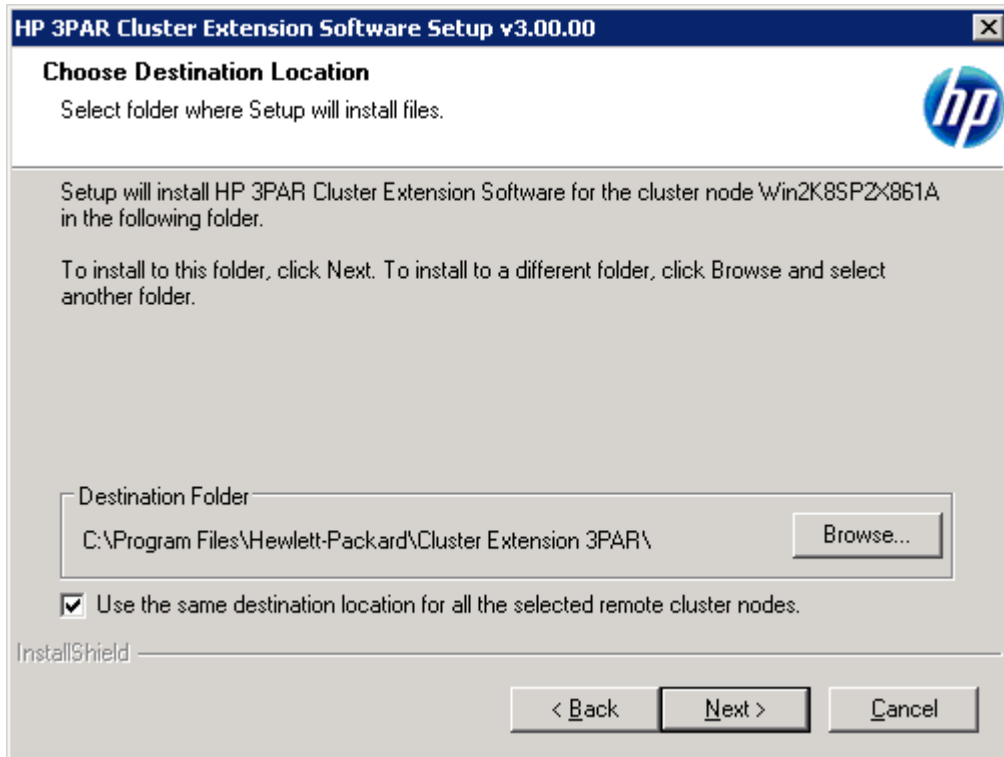
3. Run the installer by doing one of the following:

- Double-click the HP 3PAR Cluster Extension installation package.
- Run the HP 3PAR 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 (c1x3parrun.exe) and documentation.
 - Select **Compact** to install only the resource DLLs, resource extension DLL, PowerShell Cmdlet DLL, and CLX command line interface (c1x3parrun.exe).
 - Select **Custom** to select specific components to install.The Cluster node selection dialog box appears.



6. Select the cluster nodes for 3PAR 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 will apply to all 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**.
10. The installer asks if you want to install a permanent license. Click **Yes** to install a permanent license. Follow the instructions in 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.

TIP: To start the configuration tool at the end of the installation, select the **Launch Configuration Tool** check box before you click **Finish**.

11. To perform the required configuration steps, follow the instructions in the *HP 3PAR Cluster Extension Software Administrator Guide*.

HP 3PAR Cluster Extension maintenance

Modifying the 3PAR Cluster Extension installation

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

1. Start the 3PAR 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 Cluster Extension installation package from the command line. Continue to [Step 2](#).
 - b. Select **HP 3PAR 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 the 3PAR Cluster Extension installation

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

1. Start the 3PAR 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 Cluster Extension installation package from the command line. Continue to [Step 2](#).
 - b. Select **HP 3PAR 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 3PAR Cluster Extension

1. Make sure that the Microsoft failover cluster GUI is not running.

2. Start the 3PAR 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 Cluster Extension installation package from the command line. Continue to [Step 3](#).
 - b. Select **HP 3PAR 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 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. HP recommends that you do not unregister the cluster resource type until you are uninstalling HP 3PAR 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 user wants to back up the CLX configuration data before CLX uninstallation, user needs to manually copy the file `clx3PARcfg` present at the location `<CLX Installation Path>\bin`. CLX uninstallation process will not be able to back up the configuration data during the uninstallation.

Troubleshooting installation and maintenance problems

This section helps you locate and identify installation and maintenance problems. The cluster-wide installation feature allows you to install HP 3PAR 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.

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 [Table 1](#) (page 16).

In addition to showing the results of the installation process, the `.result` file helps you identify the status of remote maintenance if cluster level maintenance (modify, repair, remove) fails.

NOTE: If the `.result` file is not found on the remote cluster node, run the HP 3PAR Cluster Extension setup by logging on to the remote cluster node locally.

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 and rerun the HP 3PAR Cluster Extension setup locally.

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 [Table 1 \(page 16\)](#).

NOTE: If cluster 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...`, confirm that the WMI service is running using the Microsoft Management Console. To use the HP 3PAR Cluster Extension cluster-wide installation feature, the WMI service must be running.

On Windows Server 2012, installation of the CLX product would register the CLX resource type and registration of resource type copies the CLX resource DLL files `clxs3parmscs.dll` and `clx3parvmmcs.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 should be manually removed.

After the user has completed the uninstallation of the CLX product on all the cluster nodes, if any CLX resources (Cluster Extension 3PAR or Cluster Extension 3PAR for VM Management) exist in the cluster, then, next time when the user completes 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 Server Core, apart from failover cluster, the feature `RSAT-Clustering-PowerShell` should be installed whose display name is `Failover Cluster Module for Windows PowerShell`. This feature is required by the CLX installer for registration and un-registration of CLX resources 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.

Table 1 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	HP 3PAR Cluster Extension was successfully removed from the local cluster node.	N/A
ERROR_REPAIR_SUCCESS	HP 3PAR Cluster Extension was successfully repaired on the local cluster node.	N/A
ERROR_MODIFY_SUCCESS	HP 3PAR Cluster Extension was successfully modified on the local cluster node.	N/A
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.

Table 1 Windows remote installation error codes *(continued)*

ERROR code	Description	Corrective action
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: cluster restype "Cluster Extension 3PAR" /create /dll:clx3parmscs.dll /type:"Cluster Extension 3PAR". For more information, see "Registering the resource type and resource extension DLL manually" (page 19)
ERROR_CLXMSCSEX_REGISTER_FAILED	Installation completed on the local cluster node. Setup was unable to register the HP 3PAR Cluster Extension DLL.	Register the resource extension DLL by running the following cluster command: Cluster / regadminext:clx3parmscsex.dll. For more information, see "Registering the resource type and resource extension DLL manually" (page 19)
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 HP 3PAR Cluster Extension setup.
ERROR_PCF_CREATION_FAILED	Installation failed on the local cluster node. The PCF file could not be created.	Run the setup on the local cluster node.
ERROR_AUTOPASS_INSTALL_FAILED	Setup completed on the local cluster node. The AutoPass package was not installed properly. HP 3PAR Cluster Extension will not function correctly until the AutoPass package is properly installed.	Check the eventlog for more information, and then run the HP 3PAR Cluster Extension setup with the repair option.
ERROR_CLXAUTOPASS_INSTANTON_FAILED	Installation completed on the local cluster node. Setup was unable to run clxautopass.exe -installinstanton on the local cluster node.	Install the instant-on license on the local node by running the following command: clxautopass.exe -installinstanton

Table 1 Windows remote installation error codes (continued)

ERROR code	Description	Corrective action
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 HP 3PAR 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 HP 3PAR 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 HP 3PAR Cluster Extension resource type. HP 3PAR 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 HP 3PAR Cluster Extension setup.
ERROR_RESOURCE_STATE_ONLINE	Uninstall failed on the local cluster node. A HP 3PAR Cluster Extension resource is still online.	Remove all Cluster Extension 3PAR -type resource(s) from this cluster, and then run the HP 3PAR Cluster Extension setup.
ERROR_CLXMSCSEX_UNREGISTER_FAILED	Uninstall failed on the local cluster node. Setup was unable to unregister the HP 3PAR Cluster Extension DLL.	Unregister the resource extension DLL by running the following cluster command: <code>Cluster /unregadminext:clx3parmscsex.dll</code> . For more information, see “Unregistering the resource type and resource extension DLL manually” (page 20)
ERROR_PCF_REMOVAL_FAILED	Uninstall completed on the local cluster node. Setup was unable to delete the PCF file.	Delete the file <code>clxpcf</code> from <code>INSTALL_DIR\bin</code> .
CLXUNSETPATH_FAILED	Uninstall completed on the local cluster node. Could not unset the path variables.	Remove the environment variable <code>HPCLX_3PAR_PATH</code> from the local cluster node.
ERROR_DELETE_EVENTLOG_DLL_FAILED	Uninstall completed on the local cluster node. Could not delete <code>clxeventlog.dll</code> from the following registry entry: <code>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</code>	Delete the <code>clxeventlog.dll</code> from the following registry entry: <code>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</code>
ERROR_UNINSTALL_DRS_FILES_FAILED	Uninstall completed on the local cluster node. Could not delete <code>clx3parmscs.dll</code> and <code>clx3parmscsex.dll</code> from the following registry entry: <code>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</code>	Delete <code>clx3parmscs.dll</code> and <code>clx3parmscsex.dll</code> from the following registry entry: <code>HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\SharedDlls</code>
ERROR_CLXMSCS_3PAR_VMMGMT_REGISTER_FAILED	Installation completed on cluster node. Setup was unable to register resource	Register the Resource type “Cluster Extension 3PAR for VM Management”. For more information, see “Registering

Table 1 Windows remote installation error codes (continued)

ERROR code	Description	Corrective action
	type Cluster Extension 3PAR for VM Management.	the resource type and resource extension DLL manually" (page 19)
ERROR_3PAR_VMMGMT_CMDLET_REGISTER_FAILED	Installation completed on cluster node. Setup was unable to register CLX 3PAR Cmdlets DLL.	Register the CLX Cmdlet DLL. For more information, see "Registering the CLX PowerShell Cmdlet DLL manually [Windows Server 2012 only]" (page 20)
ERROR_3PAR_VMMGMT_CMDLET_UNREGISTER_FAILED	Uninstallation completed on cluster node. Setup was unable to unregister CLX 3PAR Cmdlets DLL.	Unregister the CLX Cmdlet DLL. For more information, see "Unregistering the resource type and resource extension DLL manually" (page 20)

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, another cluster resource of type "Cluster Extension 3PAR for VM Management" is also created. If an user experiences issues in registration and unregistration of this resource type, follow the steps mentioned in ["Registering the resource type and resource extension DLL manually" \(page 19\)](#) and ["Unregistering the resource type and resource extension DLL manually" \(page 20\)](#) to overcome the issues.

Registering the CLX PowerShell Cmdlet DLL manually [Windows Server 2012 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 will be displayed:

```
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
```

Unregistering the CLX PowerShell Cmdlet DLL manually [Windows Server 2012 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 will be displayed:

```
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
```

Upgrading from HP 3PAR Cluster Extension 1.00.00 and 2.00.00 (Windows Server 2008/2008 R2)

- ❗ **IMPORTANT:** Before starting the upgrade procedure, save the HP 3PAR Cluster Extension configuration file, if it exists.

You can save the file by using the Export feature in the HP 3PAR Cluster Extension configuration tool. For instructions on saving the file, see the *HP 3PAR Cluster Extension Administrator Guide*. After completing the upgrade procedure in this section, use the Import feature in the HP 3PAR Cluster Extension configuration tool to import the saved configuration file.

Perform the upgrade procedure on each node locally. HP 3PAR Cluster Extension does not support remote upgrades.

To upgrade from HP 3PAR Cluster Extension 1.00.00 and 2.00.00:

1. Download the HP 3PAR Cluster Extension Software from <https://h20392.www2.hp.com/portal/swdepot/displayProductInfo.do?productNumber=CLX>.
2. Move all of the applications from the current node to any other node.
3. Double-click the HP 3PAR Cluster Extension installation package and then follow the onscreen instructions.
4. Restart the cluster service on the node.
5. Repeat this procedure for all other nodes that are running HP 3PAR Cluster Extension 1.00.00 and 2.00.00.

3 Licensing

This chapter explains how to obtain and install the product license keys. 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 <http://www.hp.com/software/licensing>.
- Use AutoPass to retrieve permanent license keys. See “Using AutoPass to retrieve permanent license keys” (page 22).
- 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 HP 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:

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

```
clxautopass -ovlicensemgr
```

AutoPass requires that a JRE and/or SDK be installed on the cluster node. See the CLX SPOCK website for the latest supported JRE versions.
2. Take one of the following actions:
 - If you have an Internet connection, click **Retrieve/Install License Key**.
 - If you installed the product on a system that does not have an Internet connection, click **Retrieve License Key through Email/Fax**. When you receive the license key in email, start AutoPass and click **Install/Restore License Key**.
3. For MSFC environments only: After installing the permanent license keys, restart the product so that the license will be recognized. You can restart the product by restarting the Microsoft cluster service.

Two types of licensing model supported by CLX

There are two types of licensing model supported by CLX.

1. **Host based permanent license:** In this licensing model, HP 3PAR CLX license needs to be procured for each node that uses HP 3PAR Cluster Extension (CLX). If Microsoft Failover Cluster has [Nh] number of nodes which has 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 a user has five cluster nodes having CLX installed, he needs to have five host based CLX licenses – one for each node. Applying Host based permanent license is a node specific operation. For more information, see “Applying host based permanent license” (page 23). This licensing model is supported since previous releases.
2. **Device based permanent license:** In this newly introduced licensing model, user needs to 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 which has CLX software installed and connected to [Na] number of storage devices, user needs to procure only [Na] number of device based permanent licenses – one for each storage device. Using a particular CLX utility, user can import these licenses in all the nodes of the cluster at once. See “[Applying Device based permanent license](#)” (page 23) to know how to apply the device based licenses in the CLX setup. User has to choose one of the CLX licensing models in his CLX setup and he needs to decide based on the price set for each node or device based CLX license and the number of host cluster nodes and storage arrays, user has in his CLX setup.

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 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 HP 3PAR Cluster Extension registration tool

To install a license key:

1. For Windows Server 2008/2008 R2: Select **Start**→**All Programs**→**Hewlett-Packard**→**HP 3PAR Cluster Extension Software**→**HP 3PAR Cluster Extension Registration Tool**.
For Windows Server 2012: Select **Start**→**All Apps**→**Hewlett-Packard**→**HP 3PAR Cluster Extension Registration Tool**.
2. Click **Browse**.
3. Browse to your license key file, and then click **Install License**.
4. Click **Close** when you are done installing the license keys.

Applying Device based permanent license

If you have procured device based permanent license, use the following procedures to apply device based permanent license key in clustered and non-clustered environment.

Applying Device based permanent license keys in clustered environment

If you have procured the device based license for HP 3PAR CLX, 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 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 device based permanent license files should be provided.
- `-s` : Import the 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 device based permanent licenses earlier for different devices in the same Microsoft failover cluster.

[License File] : 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 device based license file name with path. At least two or more valid device based permanent license files should be provided.

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

NOTE: This tool is applicable only if you procure device based permanent licenses. This tool should not be used if you procure node based permanent licenses.

Applying 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 device based permanent licenses, follow the procedure for permanent license installation. Once you procure the device based license file, import the license key by running the following command:

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

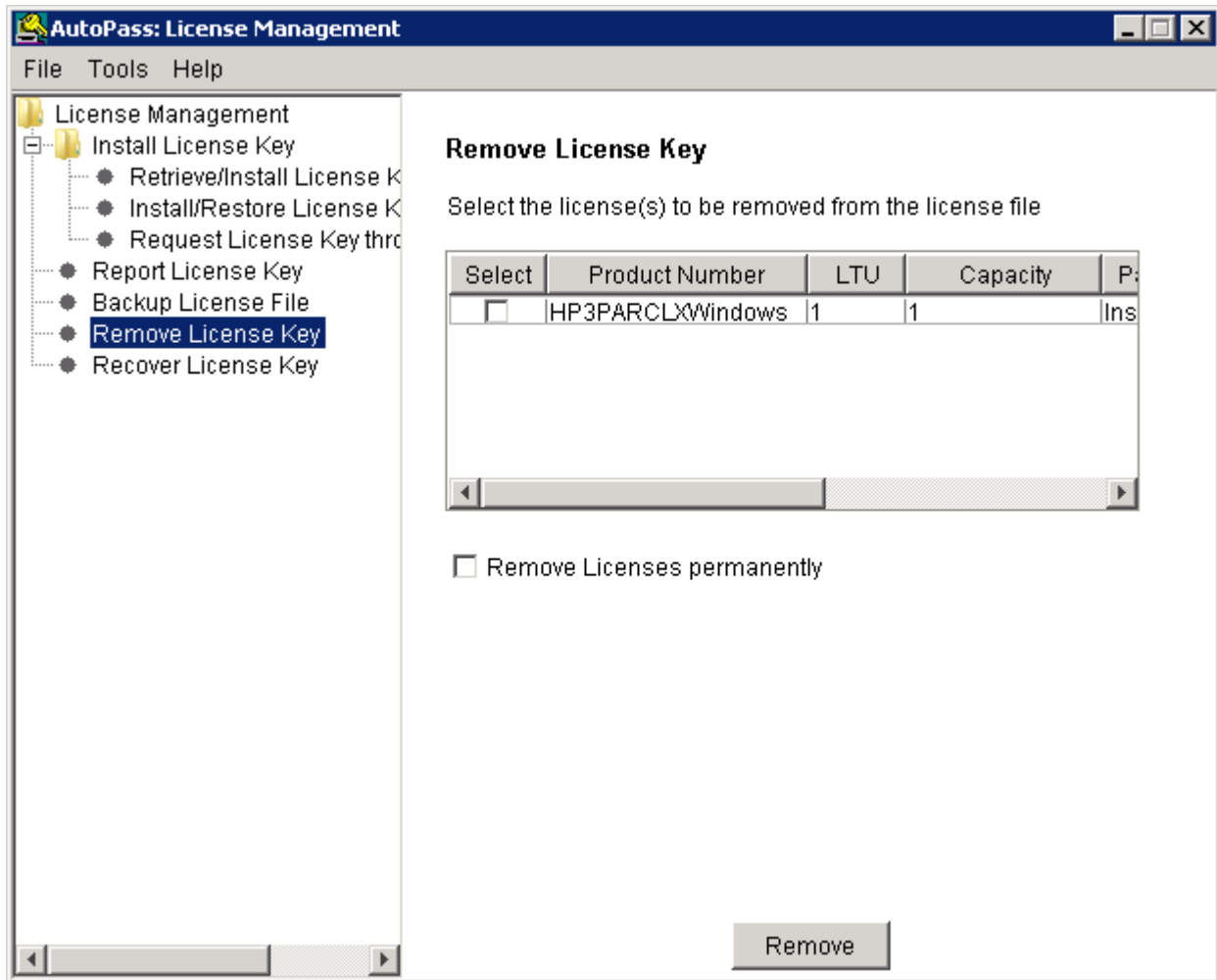
Where `license File path` is the full (absolute) path name to the license key file.

Removing license key

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

```
clxautopass -ovlicensemgr
```
2. Click **Remove License Key**.

3. Select any installed license key, and then click **Remove**.



4 Support and other resources

Contacting HP

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

New and changed information in this edition

- HP 3PAR Cluster Extension support for Windows Server 2012.
- HP 3PAR Cluster Extension support for Windows Server 2003 is not available in this release.

Related information

The following documents [and websites] provide related information:

- *HP 3PAR Cluster Extension Software Administrator Guide*
- *HP 3PAR Cluster Extension Software Release Notes*

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

<http://www.hp.com/support/manuals>

In the Storage section, click **Storage software** and then select your product.

Whitepapers

The following white papers are available at www.hp.com/storage/whitepapers:

- *Live Migration across data centers and disaster tolerant virtualization architecture with HP StorageWorks Cluster Extension and Microsoft Hyper-VTM*
- *Implementing HP StorageWorks Cluster Extension for Windows in a VMware Virtual Machine*

NOTE: The above whitepapers are specific to HP P6000 (EVA) and HP P9000 (XP) storage systems, but the functionality is also applicable for HP 3PAR storage systems.

HP websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- http://www.hp.com/service_locator
- <http://www.hp.com/support/manuals>
- [Single Point of Connectivity Knowledge \(SPOCK\)](#)

- <http://www.hp.com/support/downloads>
- <http://www.hp.com/storage/whitepapers>

Typographic conventions

Table 2 Document conventions

Convention	Element
Blue text: Table 2 (page 27)	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Website addresses
Bold text	<ul style="list-style-type: none"> • Keys that are pressed • Text typed into a GUI element, such as a box • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none"> • File and directory names • System output • Code • Commands, their arguments, and argument values
<i>Monospace, italic</i> text	<ul style="list-style-type: none"> • Code variables • Command variables
Monospace, bold text	Emphasized monospace text



WARNING! Indicates that failure to follow directions could result in bodily harm or death.



CAUTION: Indicates that failure to follow directions could result in damage to equipment or data.



IMPORTANT: Provides clarifying information or specific instructions.

NOTE: Provides additional information.



TIP: Provides helpful hints and shortcuts.

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 HP 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.

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