HP StorageWorks Cluster Extension XP installation guide

XP48
XP128
XP512
XP1024
XP10000
XP12000

Product Version: 2.06.00

seventh edition (October 2005)

part number T1609-96005

This guide explains how to install the HP StorageWorks Cluster Extension XP software.

Printed in the U.S.A.

HP StorageWorks Cluster Extension XP Installation Guide

product version: 2.06.00

seventh edition (October 2005)

part number: T1609-96005

Contents

About this guide 9
Intended audience 10
Supported arrays 10
Related documentation 11
Other resources 11
Getting help 12
HP technical support 12
HP storage website 13
HP authorized reseller 13
Document conventions 14
Terminology conventions 15
Revision history 16
Warranty statement 18

1 Introduction 21
Introducing Cluster Extension XP 22
Cluster Extension XP configurations 22
One-to-one configurations 23
Consolidated disaster recovery site configuration 25
Supported Continuous Access XP configurations and fence levels 26
Installation prerequisites 27
Software versions and supported Cluster Extension XP features 29
Disk array firmware and software dependencies 29
Pair/resync monitor 30
Fast failback feature of Continuous Access XP (Extension) 30
Quorum service *(Microsoft Cluster Service only) 31*
Rolling disaster protection 31

2 Cluster Extension XP licensing 33
Product licensing 34
About your Entitlement Certificate 34
Overview of retrieving license keys 35
Getting an evaluation license extension 35
Using AutoPass to retrieve permanent license keys 35
Retrieving license keys over the Internet 37
Requesting license keys by e-mail or fax 46
Importing a license key into AutoPass 53
Getting a 60-day trial extension 59
License options 60
Report license key 60
Backup license file 61
Remove license key 64
Recover license key 66
clxautopass command line utility 67
Installing the Instant-on license 67
Importing a license key from a file 67

3 Installing Cluster Extension XP in IBM HACMP environments 69
Prerequisites 70
Supported versions 70
HP StorageWorks Auto Path XP for AIX 70
RAID Manager XP instances 71
RAID Manager XP device groups 71
RAID Manager XP startup 71
RAID Manager XP configuration 72
LVM configuration 74
HACMP 74
Installing Cluster Extension XP 75
Pair/resync monitor configuration 77
Remote access hosts file 77
Configuring the port for the pair/resync monitor remote communications 77
Configuring Cluster Extension XP resources 78
Removing Cluster Extension XP 79
Upgrading Cluster Extension XP 80

4 Installing Cluster Extension XP in Microsoft Cluster Service environments 81

Installation Overview 83
- The Cluster Extension XP quorum service 83
- Disk configuration for Microsoft Cluster Service with quorum service 84
- Partitioning RAID Manager XP command devices and quorum service control disks 86
- Pairing all disks in the cluster environment 87

Prerequisites 88
- Supported versions 89
- Custom Volume Size (CVS) Configuration on XP disk arrays 89
- Secure Path/MPIO 89
- RAID Manager XP instances 90
- RAID Manager XP device groups 90
- RAID Manager XP command devices 91

Installation Roadmap 92

Preparing data centers for quorum service installation 93
- Create CVS volumes in the disk arrays and map them to servers 93
- Partition physical disks on the first server 94
- Create RAID Manager configuration file and pair disk pairs 96
- Reboot and check for GUIDs on all nodes 97
- Install Microsoft Cluster Service on all nodes in the second data center 99

Install Cluster Extension XP 100

Installing the quorum service 102

Installing Cluster Extension XP Command Line Interface 107

Installing the Cluster Extension XP external arbitrator 108
- Procedure 108
- Problems during Cluster Extension XP external arbitrator installation 110
- Identifying the external arbitrator in the Active Directory 111

Troubleshooting 112
- Log files 112

Resolving quorum service problems 114

Installing Cluster Extension XP resource types 116

Configuring Cluster Extension XP resources 118

RAID Manager XP startup at system boot 119

Pair/resync monitor configuration 120
Remote access hosts file 120
Configuring the port for the pair/resync monitor remote communications 120
Registering the Cluster Extension XP resource manually 121
Maintenance and repair of Cluster Extension XP 122
Modify function 122
Repair function 122
Remove function 123
Removing your Cluster Extension XP installation 124
Removing the Cluster Extension XP resource type 124
Disabling the Cluster Extension XP resource DLL 124
Removing the quorum service 125
Removing the Cluster Extension XP external arbitrator 127
Upgrading Cluster Extension XP 128
Upgrading Cluster Extension XP: offline upgrade 128
Upgrading from Cluster Extension XP version 2.03.00 and later only: online upgrade 129

5 Installing Cluster Extension XP in VCS environments 135
Prerequisites 136
Supported versions 136
RAID Manager XP instances 136
RAID Manager XP device groups 137
RAID Manager XP startup 138
VERITAS Volume Manager configuration 138
Installing Cluster Extension XP 139
Pair/resync monitor configuration 140
Remote access hosts file 140
Configuring the port for the pair/resync monitor remote communications 140
Log level reporting 141
Including the Cluster Extension resource type 142
Changing the default agent configuration 144
Disabling the Cluster Extension XP agent 145
Removing Cluster Extension XP 146
Removing the HP AutoPass License Components 146
Upgrading Cluster Extension XP 147

6 Installing Cluster Extension XP in Serviceguard for Linux environments 149
Prerequisites 150
Supported versions 150
HP StorageWorks Secure Path 150
RAID Manager XP instances 151
RAID Manager XP device groups 151
RAID Manager XP startup 152
Logical Volume Manager configuration 152
Installing Cluster Extension XP 154
Pair/resync monitor configuration 155
Remote access hosts file 155
Configuring the port for the pair/resync monitor remote communications 155
Including Cluster Extension XP in a Serviceguard package 156
Removing Cluster Extension XP 157
Upgrading Cluster Extension XP for Serviceguard for Linux 158

Glossary 159

Index 163

About this guide

Cluster Extension XP software is used to create a disaster-tolerant environment using two or more data centers. Cluster Extension XP enables cluster software to provide automatic failover for applications whose data is continuously mirrored from a local XP disk array to a remote XP disk array.

This guide explains how to install Cluster Extension XP. It assumes clustered systems are connected to a disaster recovery, array-based mirroring system where mirroring is provided by HP StorageWorks Continuous Access XP.

This guide applies to the following versions of Cluster Extension XP:

- Microsoft Windows: Cluster Extension XP version 2.06.00
- Linux Red Hat: Cluster Extension XP version 2.06.00
- SuSE Linux: Cluster Extension XP version 2.06.00
- Solaris: Cluster Extension XP version 2.05.01
- IBM AIX: Cluster Extension XP version 2.02.00

Please contact your HP representative for the latest information on supported configurations and versions.

Intended audience

This guide is written for those responsible for maintaining the cluster environment and managing the storage subsystems.

This guide is intended for system administrators who have an understanding of:

- disk arrays and RAID technology
- cluster software configuration
- operating systems, including commands and utilities
- related software: HP StorageWorks Continuous Access XP, HP StorageWorks Business Copy XP and HP StorageWorks RAID Manager XP

Supported arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

- HP StorageWorks Disk Array XP48
- HP StorageWorks Disk Array XP128
- HP StorageWorks Disk Array XP512
- HP StorageWorks Disk Array XP1024
- HP StorageWorks XP10000 Disk Array
- HP StorageWorks XP12000 Disk Array

Related documentation

For information about disk arrays, please refer to the owner's manuals.

For related product documentation, see the HP web site www.hp.com):

- *HP StorageWorks Cluster Extension XP: User's Guide*
- *HP StorageWorks RAID Manager: User's Guide*
- *HP StorageWorks Continuous Access XP: User's Guide*
- *HP StorageWorks Business Copy XP: User's Guide*
- *HP StorageWorks Command View XP: User's Guide*
- *HP StorageWorks Command View XP Advanced Edition Device Manager Web Client User's Guide*
- *HP StorageWorks XP Remote Web Console User Guide*
- *HP StorageWorks Disk Array XP Operating System Configuration Guide: AIX*
- *HP StorageWorks Disk Array XP Operating System Configuration Guide: Sun Solaris*
- *HP StorageWorks Disk Array XP Operating System Configuration Guide: Windows 2000/2003*
- *HP StorageWorks Disk Array XP Operating System Configuration Guide: Linux*

Other resources

The following websites contain related information:

- **Serviceguard for Linux.** See the HP High Availability web site: http://docs.hp.com/en/ha.html
- **RS/6000 and HACMP.** See the IBM web site: www-1.ibm.com/servers/aix/library
- **VERITAS Cluster Server.** See the VERITAS web site: support.veritas.com
- **Microsoft Cluster Service.** See these Microsoft web sites: www.microsoft.com/windows2000/technologies/clustering www.microsoft.com/windowsserver2003/technologies/clustering

Getting help

If you still have a question after reading this guide, contact an HP authorized service provider or access our web site:

www.hp.com

For the most current information about this product, visit the following support web site:

www.hp.com/support/clxxp

HP technical support

In North America, call technical support at 1-800-633-3600, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the location nearest you. The HP web site lists telephone numbers for worldwide technical support at: http://www.hp.com/support. From this web site, select your country.

Be sure to have the following information available before calling:

- technical support registration number (if applicable)
- product serial numbers
- product model names and numbers
- applicable error messages
- operating system type and revision level
- detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP storage website

For the most current information about HP StorageWorks XP products, visit: http://h18006.www1.hp.com/storage/arraysystems.html.

For information about product availability, configuration, and connectivity, contact your HP support representative.

HP authorized reseller

To reach HP sales or find a local authorized reseller of HP products, call 1-800-282-6672 or visit the HP How To Buy web site:

http://welcome.hp.com/country/us/en/howtobuy.html

You can also find HP sales and resellers at http://www.hp.com. Click **Contact HP**.

Document conventions

Convention	Element
Blue text (Figure 1)	Blue text represents a cross-reference. In the online version of this guide, the reference is linked to the target.
Bold	Bold text represents application names, file names, menu items, dialog box titles, buttons, key names, field names, and literal values that you type exactly as shown.
Italics	Italic type indicates that you must supply a value. Italic type is also used for manual titles.
Blue underlined sans serif font (www.hp.com)	Underlined, blue text represents a website on the Internet. In the online version of this guide, the reference is linked to the target.
`monospace font`	Monospace font denotes user input and system responses, such as output and messages.
Example	The word “example” in italics denotes an example of input or output.
[ ]	Square brackets indicate an optional parameter.
{ }	Braces indicate that you must specify at least one of the listed options.
|	A vertical bar separates alternatives in a list of options.

Terminology conventions

Cluster software vendors use different terms for clustering and disaster recovery processes and for their cluster software components. Because of these variations in terminology, it is important to clarify the terms used in this guide. This guide uses the following terminology conventions:

application service
: This is the unit of granularity for a failover or failback operation. It includes all necessary resources that must be present for the application.

  For example, a file share must have a disk, a mount point (or drive letter) and an IP address to be considered an application service. A disk is a necessary resource for the application service. Depending on the cluster software, application services can depend on each other and run in parallel on the same system or on different systems.

  Vendor equivalent terms:
  HACMP: resource group
  Microsoft Cluster Service: resource group
  SG-LX (Serviceguard): package
  VCS: service group

resource
: The smallest unit in an application service. It describes the necessary parts to build an application service. The implementation of such resources in cluster software is vendor-specific. Some vendors (such as IBM or HP) do not allow accessing the chains between dependent resources.

  Vendor equivalent terms
  HACMP: resource
  Microsoft Cluster Service: resource
  SG-LX (Serviceguard): package
  VCS: resource

startup/shutdown
: This refers to starting and stopping application services or resources. Only Microsoft and Veritas allow the starting and stopping of a single resource.

Revision history

February 2001	First release.
March 2001	General corrections.
July 2001	Added MSCS support.
November 2001	Added quorum filter-service for MSCS on XP512/XP48.
May 2002	Updated content for version 1.03 of all Cluster Extension products. Updated content for version 1.04.00 of Cluster Extension for MSCS. Added support for Serviceguard on Linux. Updated content for version 1.1 of Cluster Extension XP quorum service with external arbitrator.
September 2002	Updated content for version 2.00. Changed product terminology from *MSCS* to *Microsoft Cluster Service*. Revised the quorum service installation procedure for Microsoft Cluster Service.
December 2002	Updated content for version 2.01 for VCS and Serviceguard. Added graphical user interface installation procedure.
January 2003	Updated content for version 2.01 for Windows GUI.
April 2003	Updated content for version 2.02.
November 2003	Updated content for versions 2.02 and 2.03. Added support for SUSE Linux and Windows 2003. Removed support for XP256.
March 2004	Modified document for version 2.04.

August 2004	Updated for version 2.05.00 and AutoPass.
October 2005	Updated for version 2.06.00.

Warranty statement

HP warrants that for a period of ninety calendar days from the date of purchase, as evidenced by a copy of the invoice, the media on which the Software is furnished (if any) will be free of defects in materials and workmanship under normal use.

DISCLAIMER. EXCEPT FOR THE FOREGOING AND TO THE EXTENT ALLOWED BY LOCAL LAW, THIS SOFTWARE IS PROVIDED TO YOU "AS IS" WITHOUT WARRANTIES OF ANY KIND, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. HP SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, NON-INFRINGEMENT, TITLE, ACCURACY OF INFORMATIONAL CONTENT, AND FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow exclusions of implied warranties or conditions, so the above exclusion may not apply to you to the extent prohibited by such local laws. You may have other rights that vary from country to country, state to state, or province to province.

WARNING! **YOU EXPRESSLY ACKNOWLEDGE AND AGREE THAT USE OF THE SOFTWARE IS AT YOUR SOLE RISK.** HP DOES NOT WARRANT THAT THE FUNCTIONS CONTAINED IN THE SOFTWARE WILL MEET YOUR REQUIREMENTS, OR THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED, VIRUS-FREE OR ERROR-FREE, OR THAT DEFECTS IN THE SOFTWARE WILL BE CORRECTED. THE ENTIRE RISK AS TO THE RESULTS AND PERFORMANCE OF THE SOFTWARE IS ASSUMED BY YOU. HP DOES NOT WARRANT OR MAKE ANY REPRESENTATIONS REGARDING THE USE OR THE RESULTS OF THE USE OF THE SOFTWARE OR RELATED DOCUMENTATION IN TERMS OF THEIR CORRECTNESS, ACCURACY, RELIABILITY, CURRENTNESS, OR OTHERWISE. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY HP OR HP'S AUTHORIZED REPRESENTATIVES SHALL CREATE A WARRANTY.

LIMITATION OF LIABILITY. EXCEPT TO THE EXTENT PROHIBITED BY LOCAL LAW, IN NO EVENT INCLUDING NEGLIGENCE WILL HP OR ITS SUBSIDIARIES, AFFILIATES, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS OR SUPPLIERS BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR OTHER DAMAGES (INCLUDING LOST PROFIT, LOST DATA, OR DOWNTIME COSTS), ARISING OUT OF THE USE, INABILITY TO USE, OR THE RESULTS OF USE OF THE SOFTWARE, WHETHER BASED IN WARRANTY, CONTRACT, TORT OR OTHER LEGAL THEORY, AND WHETHER OR NOT ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Your use of the Software is entirely at your own risk. Should the Software prove defective, you assume the entire cost of all service, repair or correction. Some jurisdictions do not allow the exclusion or limitation of liability for incidental or consequential damages, so the above limitation may not apply to you to the extent prohibited by such local laws.

NOTE. EXCEPT TO THE EXTENT ALLOWED BY LOCAL LAW, THESE WARRANTY TERMS DO NOT EXCLUDE, RESTRICT OR MODIFY, AND ARE IN ADDITION TO, THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE LICENSE OF THE SOFTWARE TO YOU; PROVIDED, HOWEVER, THAT THE CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS SPECIFICALLY DISCLAIMED AND SHALL NOT GOVERN OR APPLY TO THE SOFTWARE PROVIDED IN CONNECTION WITH THIS WARRANTY STATEMENT.

1

Introduction

This chapter provides instructions for installing HP StorageWorks Cluster Extension XP for Linux, Microsoft Windows 2000 and Windows 2003, Sun Solaris, or IBM AIX servers connected to XP disk arrays in a Continuous Access XP configuration.

Introducing Cluster Extension XP

Cluster Extension XP improves the performance and safety of your disk array by:

- enabling write-protected XP disk array disk sets
- checking disk status information in case of a server or complete site failure, which allows application service recovery even in the worst disaster.

Cluster Extension XP is fully integrated with Serviceguard for Linux, Microsoft Cluster Service, VERITAS Cluster Server (VCS) and IBM HACMP, allowing the cluster administrator to easily integrate XP storage subsystems.

The guide will explain the options available to make your disaster tolerant environment as robust as possible and to keep your data always available.

Cluster Extension XP configurations

Cluster configurations typically consist of two or more server systems connected to a shared storage subsystem.

Cluster Extension XP allows dispersion of data center resources by enabling cluster systems to take advantage of XP disk arrays configured for Continuous Access XP operations. Cluster Extension XP connects the XP software to control XP disk arrays (and Continuous Access XP) with the cluster software and uses the ability of cluster software to react to system hardware and application failures.

Cluster Extension XP's behavior is based on four major considerations:

- Cluster software failover behaviors
- Cluster Extension XP user settings
- The fence level configuration (in Continuous Access XP)
- XP disk status information

Therefore, and because of consistency and concurrency considerations, Cluster Extension XP supports the configurations described below. The fence level of Continuous Access XP is used to configure the remote replication feature of an XP disk array environment based on your needs regarding application service availability, data concurrency and replication performance.

One-to-one configurations

Cluster host nodes are split between two geographically separate data center sites and use redundant, diversely routed network connections for intracluster communications. Those links must be as reliable as possible to prevent false failover operations or “split-brain” situations.

Each cluster host node connected to an XP disk array should have redundant I/O paths (FC or SCSI) to the XP disk array. Connections to both the primary (P-VOL) and the secondary (S-VOL) copy of the application disk set are not allowed from the same host.

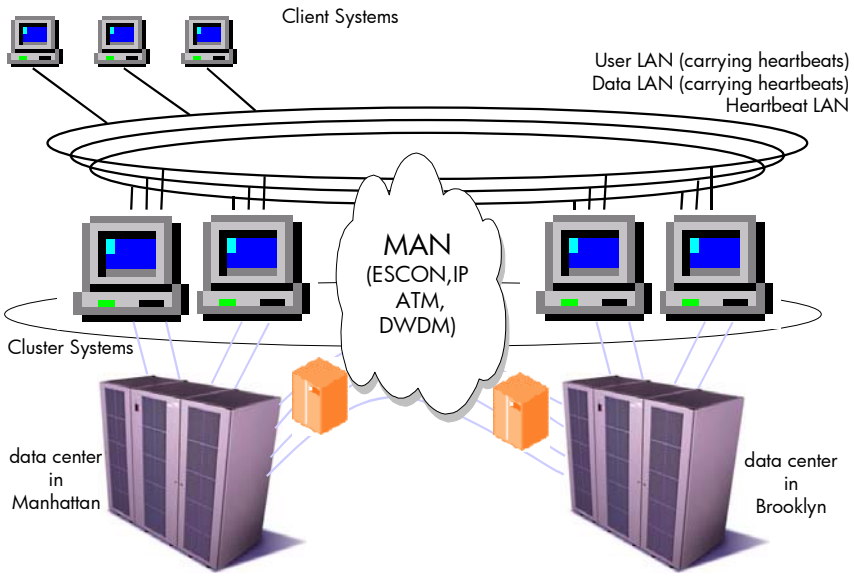
HP recommends a minimum of two cluster host nodes per site. This allows for a preferred local failover in case of a system failure. Local failover operations are faster than a remote failover between XP disk arrays because the mirroring direction of the XP disks does not need to be changed.

Cluster Extension XP can be deployed in environments where several clusters use the same XP disk array pair.

Currently, Cluster Extension XP works with Continuous Access XP in the following configurations:

- Fibre Channel direct connections, using either short wave (550 meters) or long wave (10 km) transceivers.
- Fibre Channel with switches, short wave, long wave, or extra long wave transceivers can be used up to 200 km, depending on the transceiver type.
- Fibre Channel over WDM (wave division multiplexing) can be used up to 200 km, depending on the WDM vendor specifications. This includes DWDM (Dense wave division multiplexing) and CWDM (coarse wave division multiplexing) technologies.

- Fibre Channel over IP networks using FC to IP converters. This includes ATM networks using an FC to ATM converter. The IP/ATM network can be public or private, such as T3/E3 lines. The distance supported by FC over IP/ATM implementation is limited only by the acceptable latency (time delay) of the link.
- ESCON direct connections or extended connections using extender/director hardware for distances up to 43 km. (ESCON is not supported on all array types.)
- ESCON over WDM is only supported up to 50 km. (This is an ESCON limitation and not a WDM limitation.)
- ESCON or IP/ATM using ESCON to IP/ATM converters. The distance supported is limited only by the acceptable latency of the link.

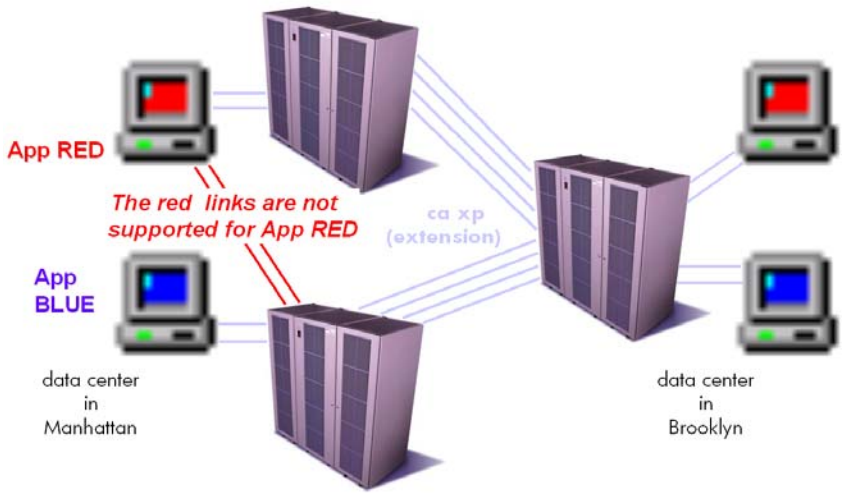


One-to-one configuration

Consolidated disaster recovery site configuration

Configurations that have a single XP disk array in the disaster recovery (DR) data center and up to four other primary XP disk arrays are supported with Cluster Extension XP (the logical configuration must be a one-to-one configuration). The restrictions outlined earlier apply also to consolidated configurations.

Cluster Extension XP does not support NxM configurations, where the application service's data disk set is spread over two or more XP disk arrays.



Consolidated Disaster Recovery site configuration

Supported Continuous Access XP configurations and fence levels

One-to-one and consolidated configurations support all Continuous Access XP fence levels: NEVER, DATA, and ASYNC. Fence levels DATA and NEVER implement synchronous replication and are therefore directly impacted by the distance of the link. HP recommends not implementing these fences on links exceeding 100 km. However, each customer should determine the acceptable impact to their host application I/O.

Fence level ASYNC can be implemented on any configuration, but is typically implemented for longer distances.

Notes:

- The Continuous Access XP links must be configured for bidirectional mirroring and must have redundant, separately routed links for each direction.
- Heartbeat network over DWDM or IP: The cluster heartbeat communications could be routed over the same DWDM or IP links as the Continuous Access XP data traffic. However, the network links should be diversely routed to minimize link congestion and reduce the potential of “split-brain” syndrome attributed to network component failures or link failures.
- Dynamic routing in the wide area network must be transparent to the Continuous Access XP links. Otherwise, dynamic switched network connections could lead to suspended XP disk pairs.

Installation prerequisites

Ensure that the following conditions are met before installing your Cluster Extension XP software:

- Internal LDEVs are mapped to redundant XP Client Host Interface Ports (CHIPs) and host modes and Fibre Channel port settings have been customized.
- Continuous Access XP links (including all extender hardware) are set up in a redundant, bidirectional configuration.
- Alternate I/O paths between server system and the XP disk array are set up.
- The cluster and client networks are set up in a redundant configuration.
- The cluster software is installed on all systems (not required for Windows 2000 and Windows 2003).
- The cluster is set up and cluster systems can communicate with each other (not required for Windows 2000 and Windows 2003).
- HP StorageWorks RAID Manager XP command devices are configured.
- HP StorageWorks RAID Manager XP **horcmX.conf** files have been created and tested.
- HP StorageWorks RAID Manager XP instances can communicate using the most reliable network (heartbeat network) and at least one alternate network.
- RAID Manager versions are the same on all nodes in a cluster.
- The pair/resync monitor port is set up in the **/etc/services** file (not required for Windows 2000 and Windows 2003). See the *HP StorageWorks Cluster Extension XP: User's Guide*.
- A failover test proved bidirectional communications in the CA XP setup for all configured XP Control Units (CUs).

- The following minimum disk space is available:

Linux/UNIX

2 MB for **/opt/hpclx**

1 MB for **/etc/opt/hpclx**

100 MB for **/var/opt/hpclx**

Windows

100 MB in
%ProgramFiles%\Hewlett-Packard\Cluster Extension XP

- At least 25 MB of system memory is available for Cluster Extension XP installation.

  50 MB in
  %SYSTEMROOT%\
  (typically c:\WINNT or c:\WINDOWS) for the Cluster Extension XP quorum service log file and components.

Software versions and supported Cluster Extension XP features

Failover operations depend on the XP firmware and HP StorageWorks RAID Manager XP versions.

Cluster Extension XP supports Continuous Access XP (Extension) configurations between XP512/XP48/XP128/XP1024/XP12000/XP10000 disk arrays.

Host mode and Fibre Channel port settings for XP CHIPs vary depending on the operating system and XP firmware version.

Disk array firmware and software dependencies

Use the most recently available combination of Cluster Extension XP and RAID Manager XP firmware.

XP48, XP512
Firmware revision: 01.19.86.00/00 or later

XP128, XP1024
Firmware revision: 21.13.02.00/00 or later

XP10000
Firmware revision: 50.04.28.00/00 or later

XP12000
Firmware revision: 50.04.28.00/00 or later

HP StorageWorks RAID Manager XP
version 1.17.04 or later

Pair/resync monitor

The pair/resync monitor is used to monitor the XP disk pair status of the local and remote volume based on the HP StorageWorks RAID Manager XP device group configured for the application service.

The automatic resynchronization feature will reinstate suspended mirroring activities for RAID Manager device groups if the disk pair status is maintained. That is, the primary disk reports P-VOL state and the secondary disk reports S-VOL state.

Linux
UNIX

The pair/resync monitor will report any different state from the above-mentioned to the system by using the **syslog()** call only.

Windows

The pair/resync monitor will report any different state from the above-mentioned to the system by using the Event Log facility.

Fast failback feature of Continuous Access XP (Extension)

Cluster Extension XP is optimized to support the Fast Failback feature of RAID Manager. This feature allows Continuous Access XP (Extension) to automatically redirect the mirroring direction of the XP disk pair even if the remote RAID Manager XP instance is not available (fence level DATA and ASYNC). This ensures the fastest possible recovery to the original site in case of an application service failover to the alternate site.

To ensure this, the disk arrays keep track of changed disk cylinders/tracks. Updates are based on changed cylinders/tracks if the link between the XP disk pair cannot be maintained (for example, in the case of Continuous Access XP link failures).

Once activated, the secondary site becomes the dominant site and the former primary site acts as the secondary copy site.

Quorum service *(Microsoft Cluster Service only)*

For XP disk arrays, the quorum service provides the disaster recovery solution for Microsoft Cluster Service quorum disk resources to allow creation of a true dispersed Microsoft Cluster Service environment. The quorum service control mechanism uses three additional noncluster XP disks for each cluster and utilizes the Continuous Access XP pair control feature. You can also deploy an external arbitrator that guards against split-brain situations. The quorum service is fully integrated with the external arbitrator. The quorum service operates independently from the Cluster Extension XP resource type DLL in Microsoft Cluster Service environments.

Rolling disaster protection

Rolling disaster protection features are automatically installed with Cluster Extension XP. You must preconfigure features that are dependent on Business Copy XP in order to use these features. Additional disk space is also required.

Related information See *HP StorageWorks Cluster Extension XP: User's Guide* for information about how to implement rolling disaster protection.

2

Cluster Extension XP licensing

This chapter explains how to obtain and install HP StorageWorks Cluster Extension XP product license keys.

Product licensing

When you first install a Cluster Extension XP product, you receive a 60-day Instant On license which allows you to use the product for 60 days without entering a permanent license key. The product logs messages to the product log file and the system log every 24 hours to notify you of how many days remain on the 60-day license.

Cluster Extension XP requires a permanent license key to use the product for more than 60 days. Sometime during the initial 60 day period, you must obtain a license key from HP and enter the key. This chapter gives you instructions for getting and entering a license key.

About your Entitlement Certificate

When you purchase a Cluster Extension XP product, you receive an Entitlement Certificate. You will need information from this certificate in order to retrieve and enter your license keys.

An example of the information included in an Entitlement Certificate is shown below:

HP Order Number: XXXXXXXXX

Product Name	Product Number	Quantity
HP Cluster Extension XP for Windows/Linux LTU	T1607A	1
HP Cluster Extension XP for AIX/Solaris LTU	T1608A	1

The Entitlement Certificate also includes instructions for using AutoPass in Cluster Extension XP to retrieve and enter license keys and explains how to contact the Hewlett-Packard Password Center in your region for help. If you need more licenses than the License to Use (LTU) quantity you have purchased, please contact your HP Sales Representative.

Overview of retrieving license keys

There are two different types of license keys:

- Permanent license keys
- One time 60-day trial (evaluation) license key extension

Getting an evaluation license extension

Only one 60-day trial license extension will be issued for a total of 120 days of evaluation use. If you want to request an extension to your 60-day trial license key, contact the Hewlett-Packard Password Center. When you receive your license key, use AutoPass to import it. See “Importing a license key into AutoPass” on page 53.

Using AutoPass to retrieve permanent license keys

Have the information from your Entitlement Certificate available. You will need it to retrieve permanent license keys.

1. Start the AutoPass licensing GUI (**clxautopass)** located in the Cluster Extension XP product **bin** directory:

   clxautopass -ovlicensemgr

   AutoPass requires JAVA:

   - 32-bit JRE (Java Runtime Environment) version 1.3.1 or later for 32-bit and 64-bit extended system (x64) platforms.
   - IA64 JAVA SDK 1.4.2-04 or later for 64-bit Itanium (IA64) platforms.

2. If you have an Internet connection, go to “Retrieving license keys over the Internet” on page 37.

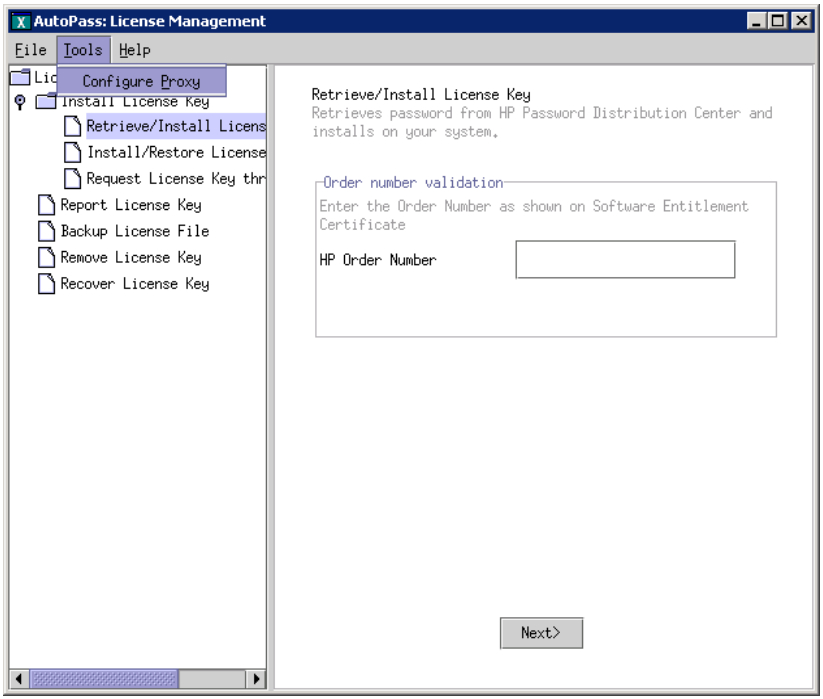
3. If you do not have an Internet connection, go to “Requesting license keys by e-mail or fax” on page 46 for instructions about retrieving license keys by e-mail or fax.

4. After installing the permanent license keys, restart Cluster Extension XP so the license will be recognized. You can restart Cluster Extension XP by restarting the Microsoft Cluster Service (MSCS environment) or the Cluster Extension XP agent (VCS environment).

Retrieving license keys over the Internet

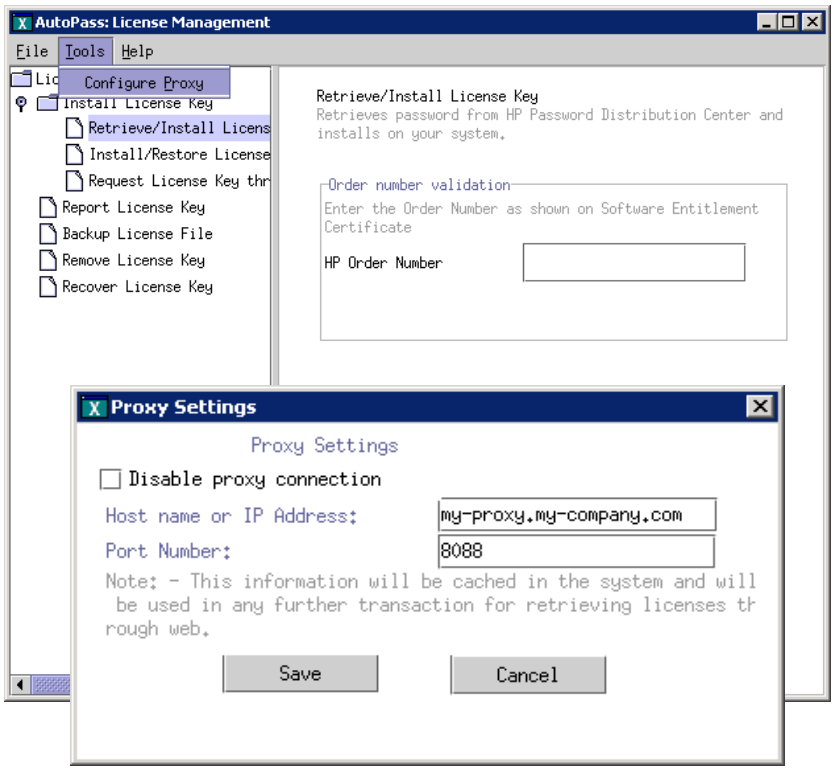
After starting **clxautopass** in the Cluster Extension XP product **bin** directory, use AutoPass to retrieve a permanent license key through the Internet as explained in the following steps:

1. The AutoPass Retrieve/Install License Key window opens when the application starts.



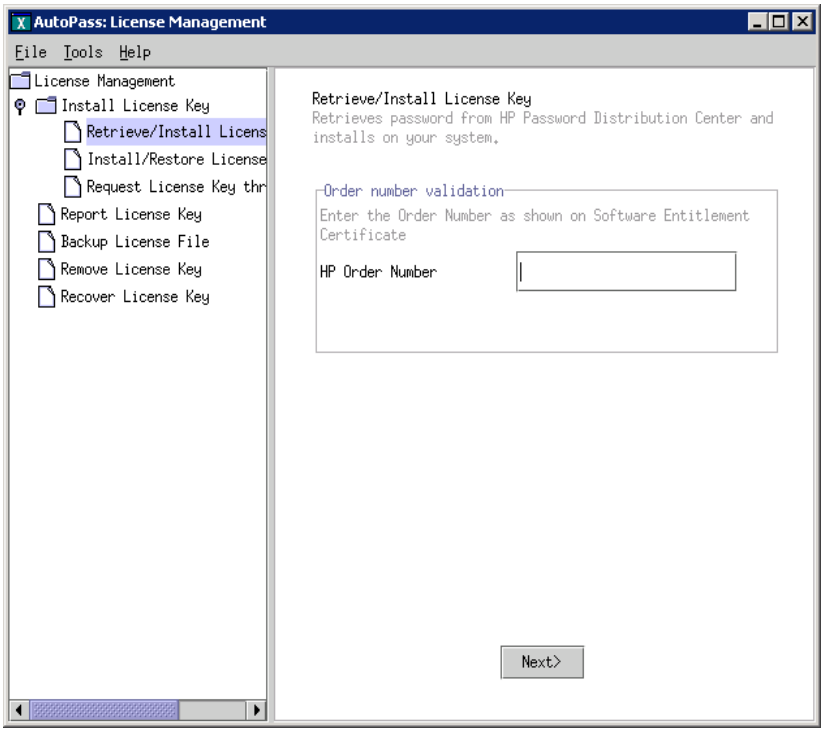
If you require a web proxy to access the Internet, click the Tools menu and click Configure Proxy.

The Proxy Settings window opens.

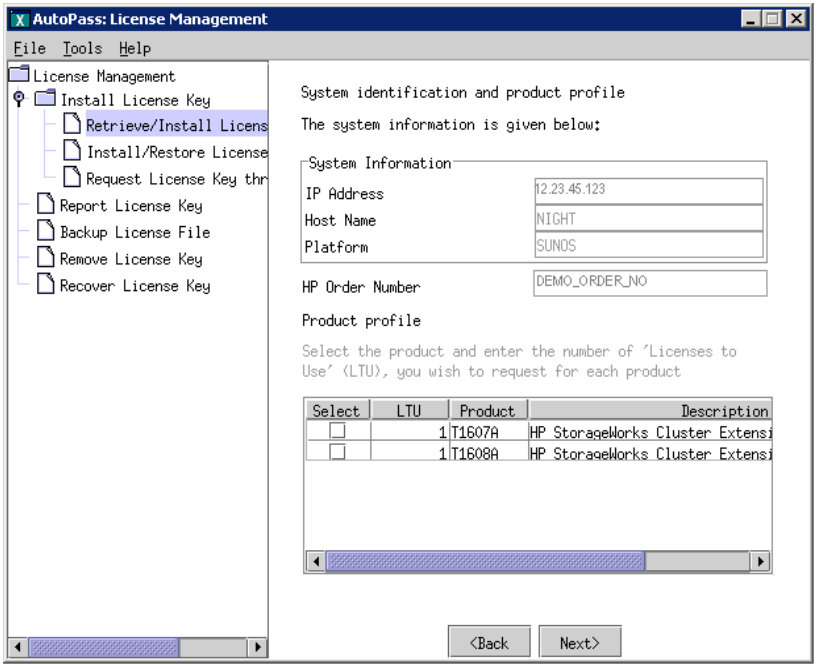


2. In the Proxy Settings window, either disable proxy or enter the host name (or IP address) and port number for your proxy server and click **Save**.

3. Enter the HP order number from your Entitlement Certificate, and click **Next** to continue.



4. The System Identification and Product Profile window opens. Confirm the information that you supplied or the system captured automatically.



The information in the right pane is divided into three areas:

System Information: Displays information about the computer system on which you are installing the product.

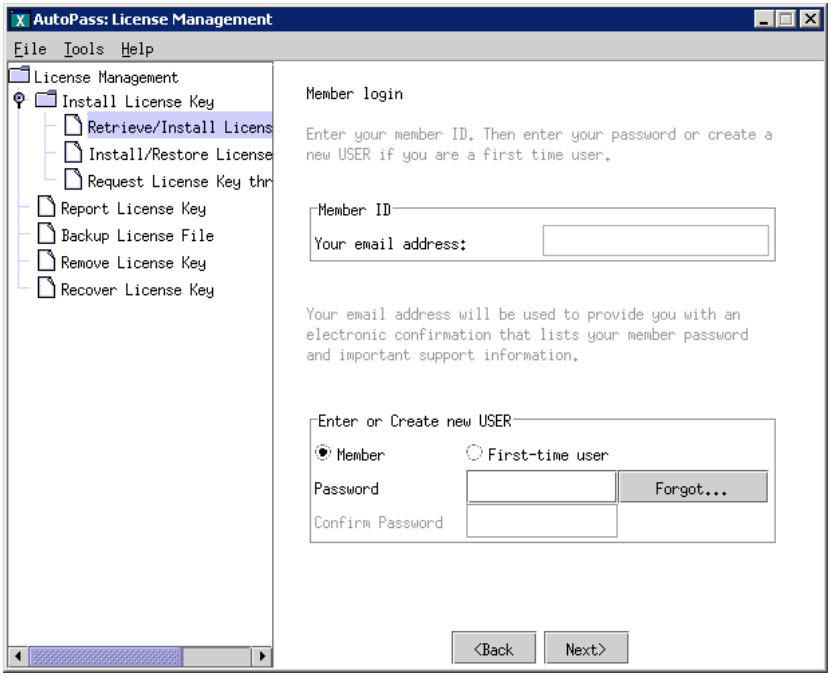
HP Order Number: Determines what information displays in the Product Profile area.

Product Profile: Lists the products you are installing and the number of Licenses to Use (LTUs) you have purchased. The scroll bars allow you to scroll to see all products and their complete descriptions.

5. Click the check boxes for the product LTUs you have purchased, as shown on your Entitlement Certificate.
6. For each selected product enter the number of LTUs you are installing. This must be a number greater than 0. Fixed LTU products have a default value of 1 and you cannot change the number.

7. Click **Next**. AutoPass uses an online database to verify the number of LTUs requested. If you have not purchased enough LTUs to fulfill your request, AutoPass lists the products with insufficient LTUs. Change the number of LTUs requested and continue.

   The Member Login window opens.



8. Enter your e-mail address. This will be your Member ID for AutoPass licensing.
9. Select “Member” or “First-time user.”
10. Enter your AutoPass password.

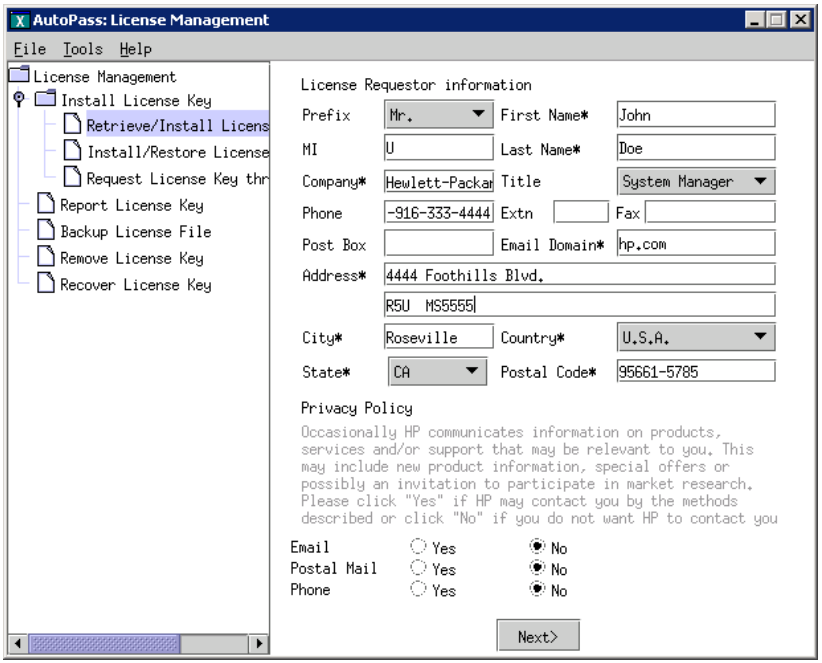
    If you don’t have a password, create one: Verify you selected “First-time user” and then enter a new password in the Password and Confirm Password fields. The two entries must match and must contain between 4 and 15 characters.

    If you are an existing AutoPass user, verify you selected “Member” and then enter your existing password. If you can’t remember your password, click **Forgot.** HP will e-mail you your password.

If you are an existing AutoPass user, but have selected “First-time user,” AutoPass will check to see if the password you entered is already valid for your Member ID (e-mail address). If so, a message displays telling you that you are already registered and you should select “Member” or create a new password.

11. Click **Next**.

    The License Requestor Information window opens. If you are an existing user and you have an active Internet connection, the window displays your current information. If you are a first-time user, or there is no Internet connection, the fields are blank.



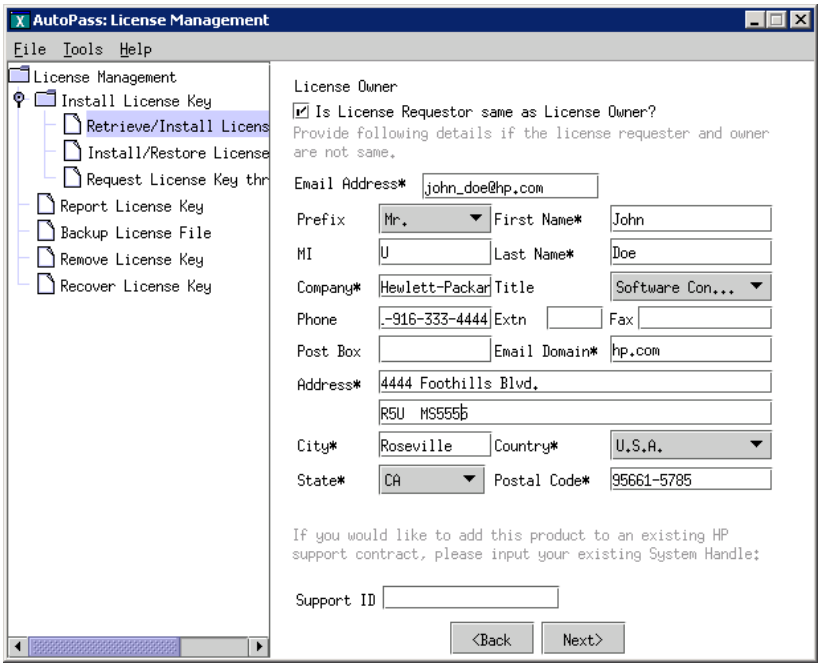
12. Enter any new or changed information.

    Required fields are marked with an asterisk (*).

    You must enter a state only if you select USA as the country. Select a state from the drop-down list. For other countries, type in the state.

13. Under “Privacy Policy,” select how HP may contact you.

14. Click **Next**. The License Owner window opens.

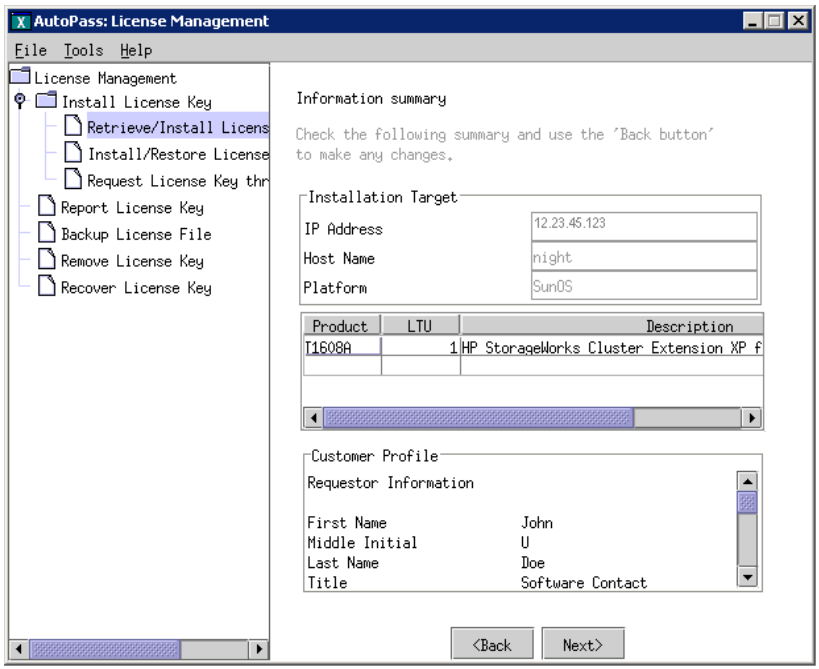


15. Click or unclick “Is License Requestor same as License Owner?”

    When you select this checkbox, the information entered for the License Requestor populates the fields in the License Owner window.

    If the License Owner is not the same as the License Requestor, enter the requested information for the License Owner.

16. Click **Next**. The Information Summary window opens.



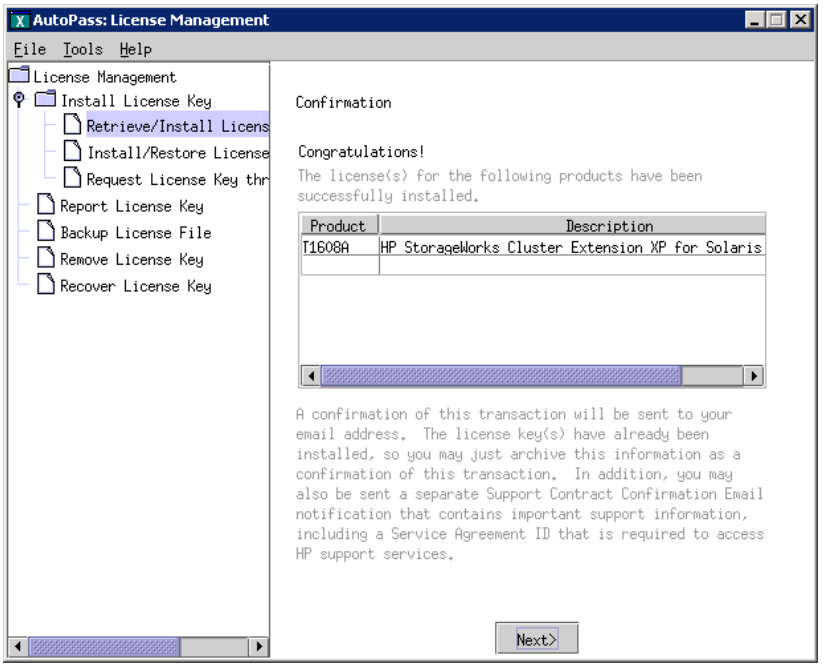
17. Check the Information Summary carefully, and use the **Back** button to go to the previous window to change incorrect details.

    AutoPass displays a message for each product for which there is an insufficient number of LTUs. If an “insufficient LTU” message appears, you must go back to the System Identification and Product Profile window and change the number of LTUs requested.

18. Click **Next**. AutoPass generates passwords for the selected products.

    If the passwords are successfully installed, the Password Delivery System updates your member profile and machine information.

19. The Confirmation window displays a table showing the products that have had license keys/passwords successfully installed.



20. Click **Next** if you want to retrieve and install the license key for another order number, or click **Close** in the **File** menu to close the application.

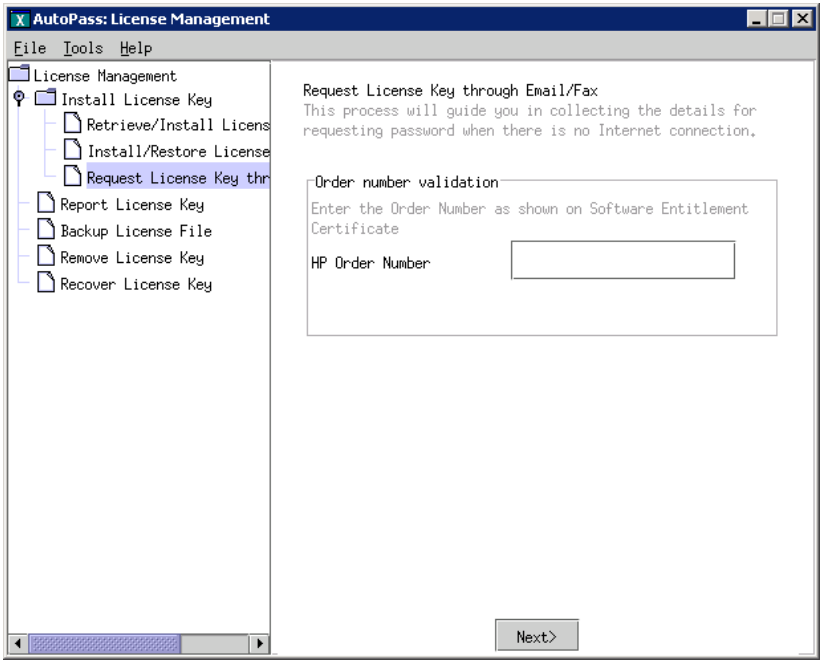
Requesting license keys by e-mail or fax

If you install Cluster Extension XP on a system that does not have an Internet connection, you can request a license key by e-mail or fax. Use AutoPass as explained below to send your request to the HP Password Center. When you receive the license key in your e-mail, use AutoPass to import it. See “Importing a license key into AutoPass” on page 53.

1. Open AutoPass by running the **clxautopass** utility:

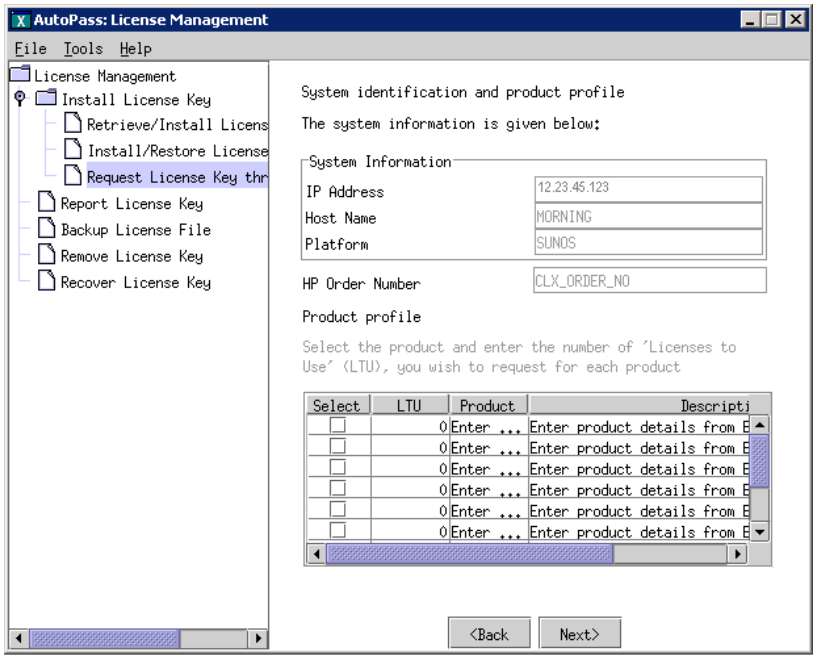
   clxautopass -ovlicensemgr

2. Click **Request License Key through Email/Fax** in the left panel.



3. Enter the HP Order Number for your product.
4. Click **Next**.

5. The System Identification and Product Profile window opens. Confirm the information you have supplied or that the system has gathered automatically.



The information is divided into three areas:

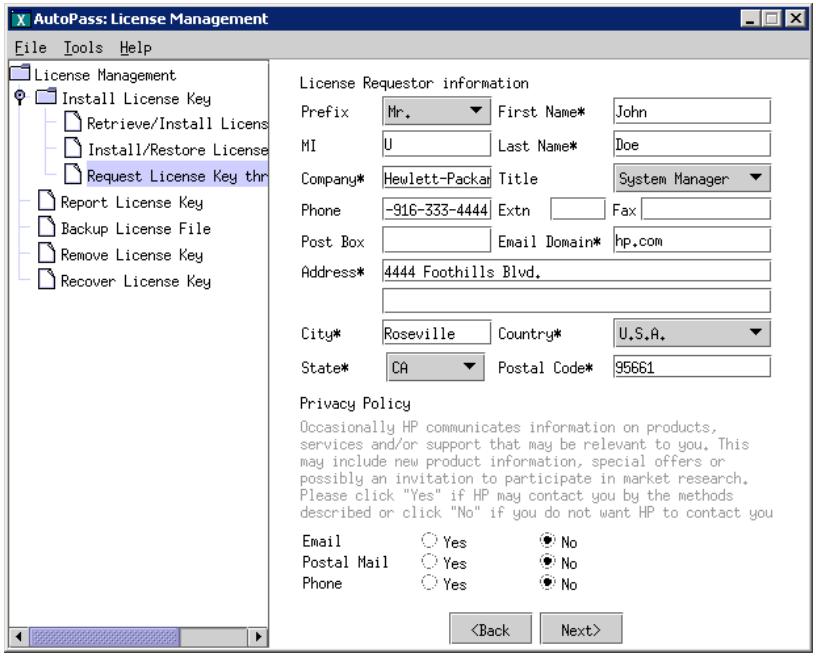
System Information: Displays information about the computer system on which you are installing the product.

HP Order Number: Determines what information displays in the Product Profile area.

Product Profile: Lists the products you are installing and the number of Licenses to Use (LTUs) you have purchased. The scroll bars allow you to scroll to see all products and their complete descriptions.

6. Enter the Product and Description for each product you are installing.
7. Click the check boxes for your Product and Description entries.
8. Enter the number of Licenses to Use (LTU) for each product, as shown on your Entitlement Certificate.

9. Click **Next**. The License Requestor Information window opens.



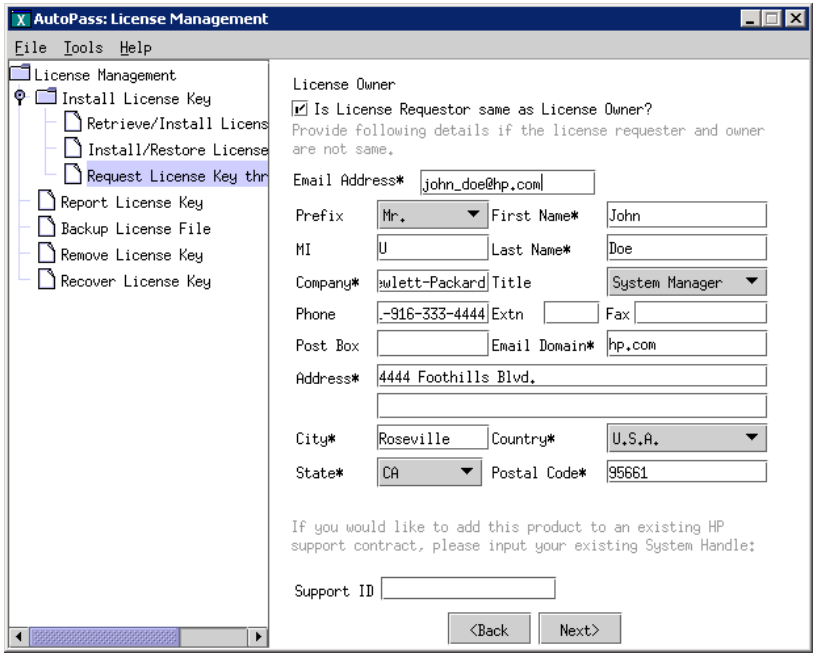
10. Enter the requested information in the blanks.

    Required fields are marked with an asterisk (*).

    You must enter a state only if you choose USA as the country. Select a state from the drop-down list. For other countries, type in the state.

11. Under “Privacy Policy,” select how HP may contact you.
12. Click **Next**.

13. The License Owner window opens.

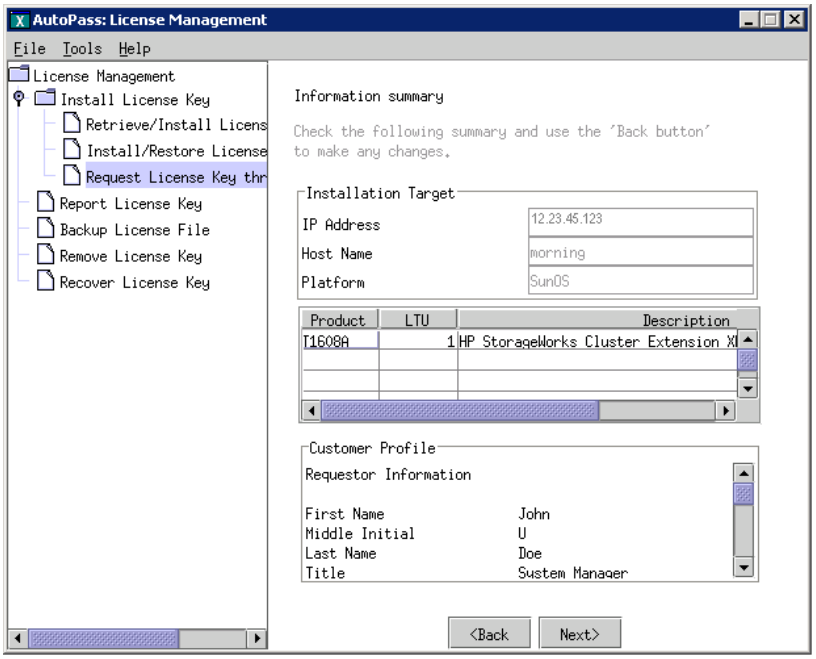


14. Click or unclick “Is License Requestor same as License Owner?”

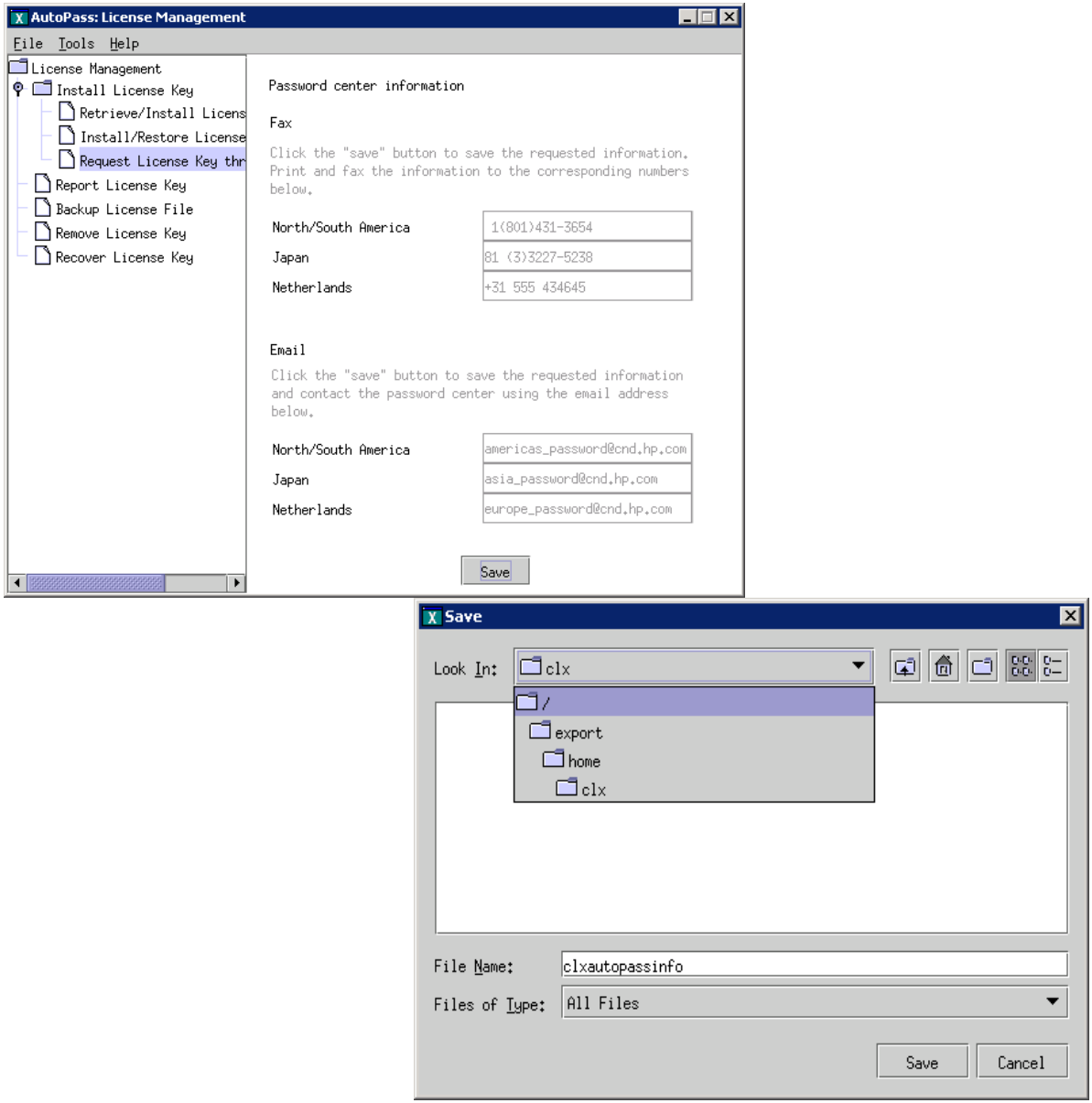
    When you select this check box, the information entered for the License Requestor populates the fields in the License Owner window.

15. If the License Owner is not the same as the License Requestor, enter the requested information for the License Owner.

16. Click **Next**. The Information Summary window opens.



17. Check the Information Summary carefully, and use the **Back** button to go to the previous window to change incorrect details.
18. Click **Next**. The Password center information window opens.


AutoPass: License Management
File Tools Help
License Management
Install License Key
Retrieve/Install Licens
Install/Restore License
Request License Key thr
Report License Key
Backup License File
Remove License Key
Recover License Key
Password center information
Fax
Click the "save" button to save the requested information. Print and fax the information to the corresponding numbers below.
North/South America
1(801)431-3654
Japan
81 (3)3227-5238
Netherlands
+31 555 434645
Email
Click the "save" button to save the requested information and contact the password center using the email address below.
North/South America
americas_password@cnd.hp.com
Japan
asia_password@cnd.hp.com
Netherlands
europe_password@cnd.hp.com
Save
Save
Look In:
clx
/
export
home
clx
File Name:
clxautopassinfo
Files of Type:
All Files
Save
Cancel

19. Follow the instructions in the Password center information window for faxing or e-mailing your license key request to the HP Password Center. Click **Save** and use the window that opens to save the information you have entered.

Importing a license key into AutoPass

You may request license keys by contacting the HP Password Center by phone, email, or fax, or from the web at www.webware.hp.com. When you receive a license key by e-mail, use the AutoPass program as describe below to import the license key from a saved file into Cluster Extension XP.

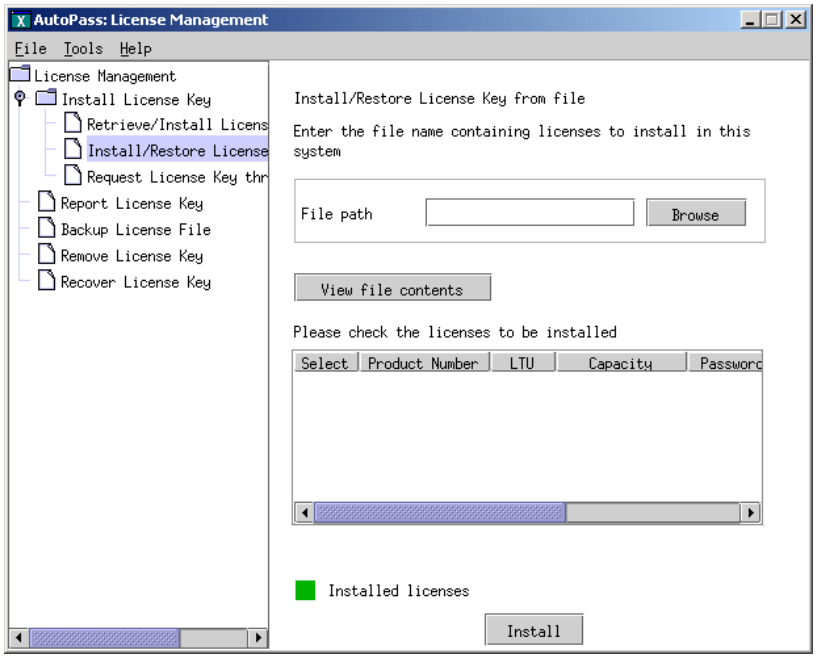
1. To request a license key by phone, fax, or email, contact the nearest Password Center using the contact information in the table below. You will need your Entitlement Certificate information, such as HP order number, and product LTUs, and quantities you purchased.

Location	Phone Number	Fax Number	Email
USA	(801) 431-1597 or (800) 326-0411	(801) 431-3654	americas_password@cnd.hp.com
Europe/ Africa	(+31-55-543-4642)	(+31-55-543-4645)	europe_password@cnd.hp.com
Asia Pacific	Outside Japan (+81-3-3227-5672) In Japan (03-3227-5264)	(+81-3-3227-5238)	asia_password@cnd.hp.com

2. The Password Center e-mails a License Key Password Certificate to you as an attachment.
3. Save the attachment file in a location accessible by the system where you run AutoPass. When saving the file, do not use the file name LicFile.txt because that name is used by AutoPass as the destination file name for installed license keys.
4. Open the saved license key file using a text editor. Follow the instructions in the license key file to perform required editing of the license password.
5. Open AutoPass by running the **clxautopass** utility:

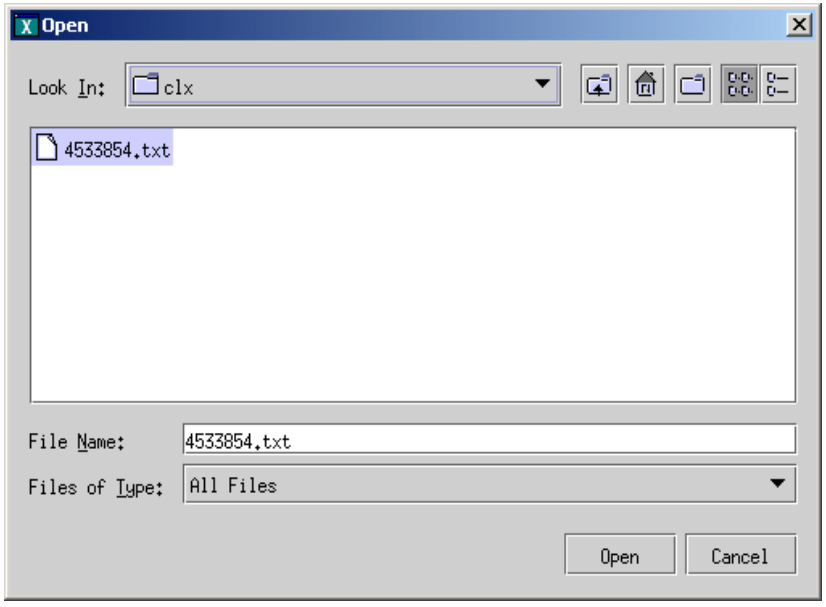
   clxautopass -ovlicensemgr

6. Click **Install/Restore License Key** in the left panel.



7. Click **Browse**.

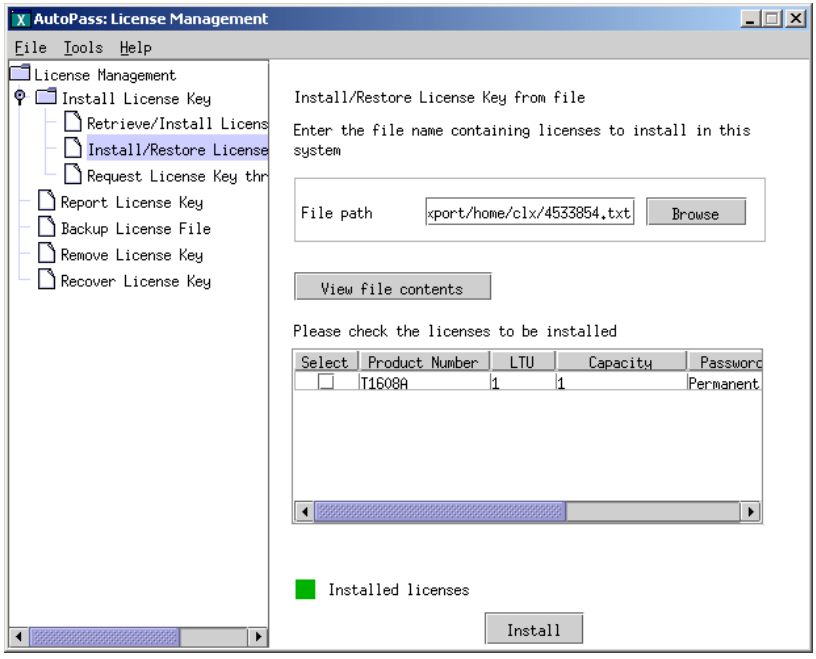
8. The Open window displays.



9. Browse to the license key file. Find the file, highlight it, and click **Open**.

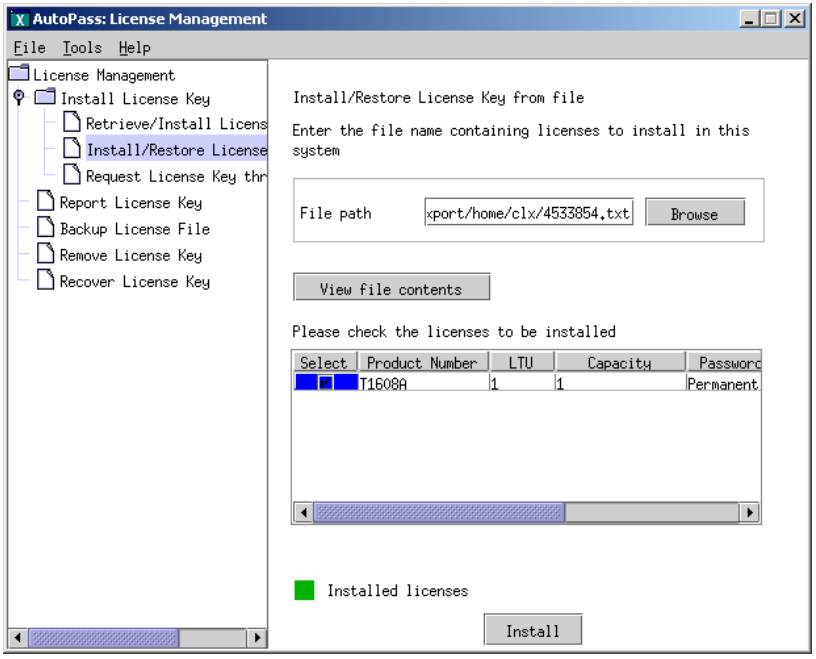
   You return to the Install/Restore License Key from file window.

10. Click **View file contents** to display the details for the selected license key file.

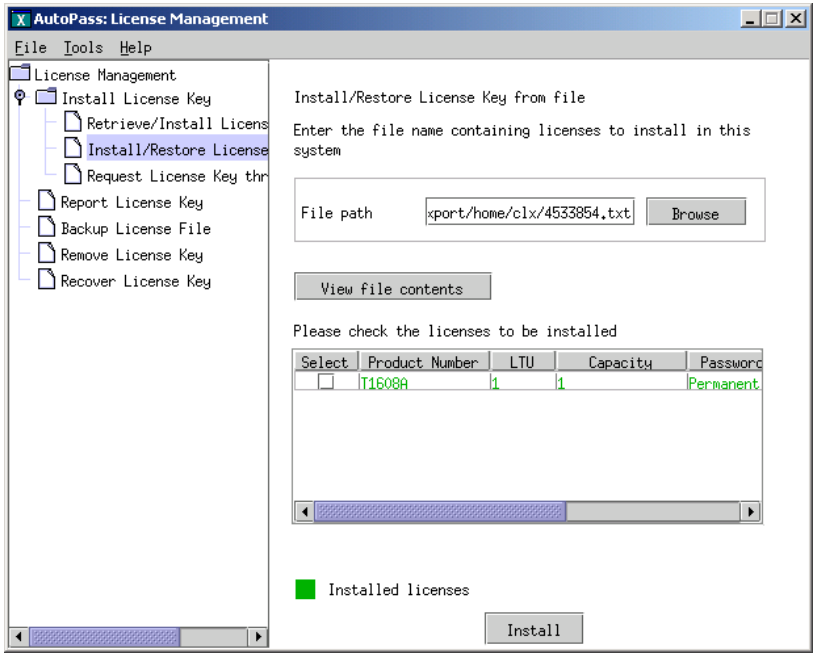


11. Click the check boxes for passwords (license keys) you want to import into AutoPass, then click **Install**.

Passwords for the selected products are imported into the AutoPass License file (LicFile.txt) on your local system.



Those products that had licenses successfully installed are indicated by a different color font as designated by the “Installed licenses” legend at the bottom of the screen.


AutoPass: License Management
File Tools Help
License Management
Install License Key
Retrieve/Install Licens
Install/Restore License
Request License Key thr
Report License Key
Backup License File
Remove License Key
Recover License Key
Install/Restore License Key from file
Enter the file name containing licenses to install in this system
File path
xport/home/clx/4533854.txt
Browse
View file contents
Please check the licenses to be installed
Select
Product Number
LTU
Capacity
Passworc
T1608A
1
1
Permanent
Installed licenses
Install

Getting a 60-day trial extension

If you want to request a 60-day trial (evaluation) license key extension, you can do so directly with the Hewlett-Packard Password Center. Go to the web site www.webware.hp.com for contact information for evaluation software passwords. Contact the Password Center to request a Trial (evaluation) License Extension. The trial license code for your HP StorageWorks Cluster Extension XP product trial software is TRIAL-CLX_XP. The trial license extension will give you a one-time 60-day extension.

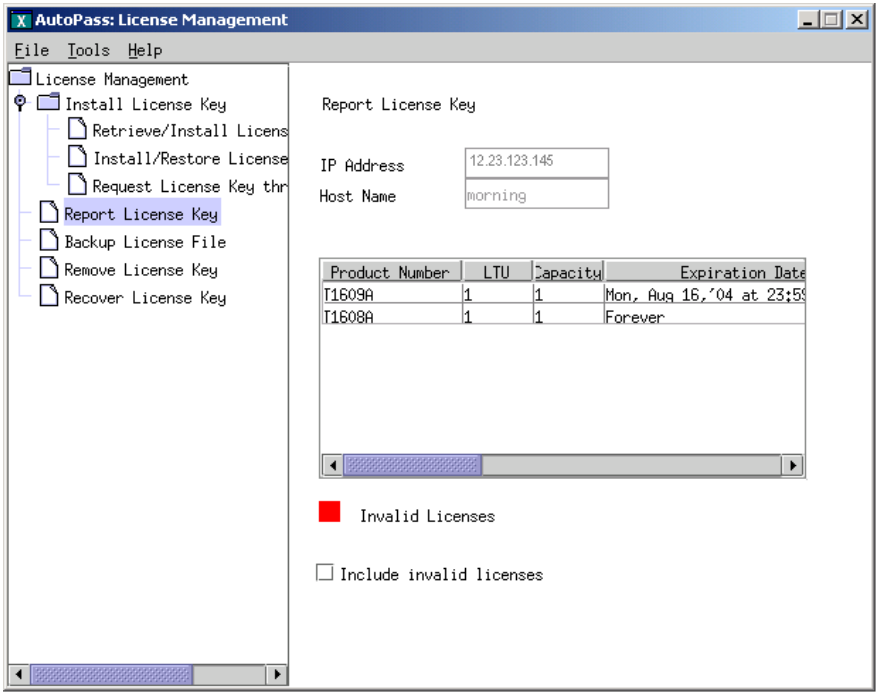
You will receive your trial license key by email. Import the license key using the process described in “Importing a license key into AutoPass” on page 53.

License options

Report license key

To view a report of the license keys installed on the system:

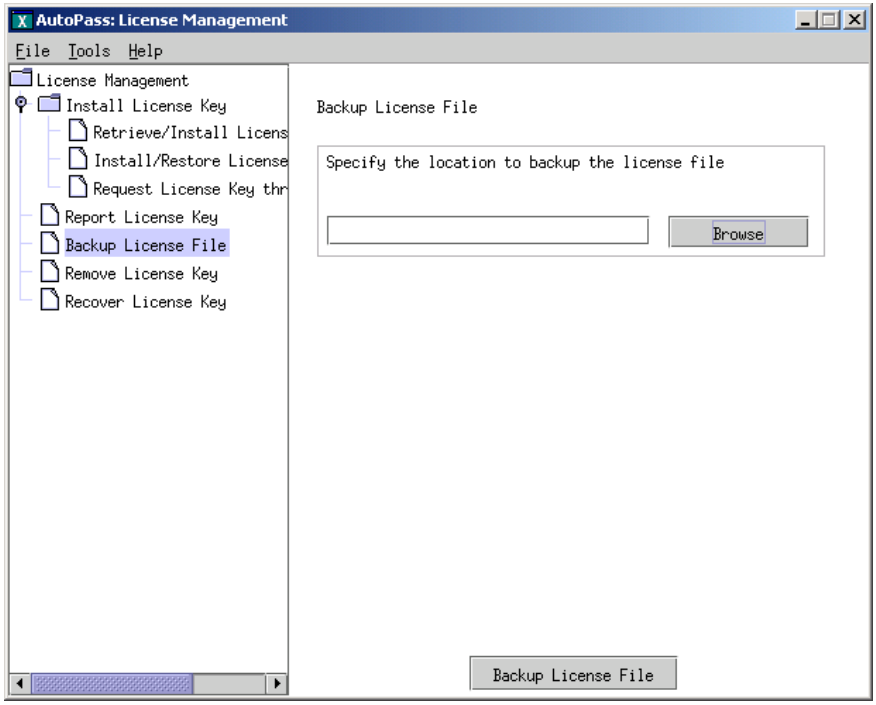
1. Run **clxautopass -ovlicensemgr**.
2. When AutoPass opens, click **Report License Key** in the left panel.



Backup license file

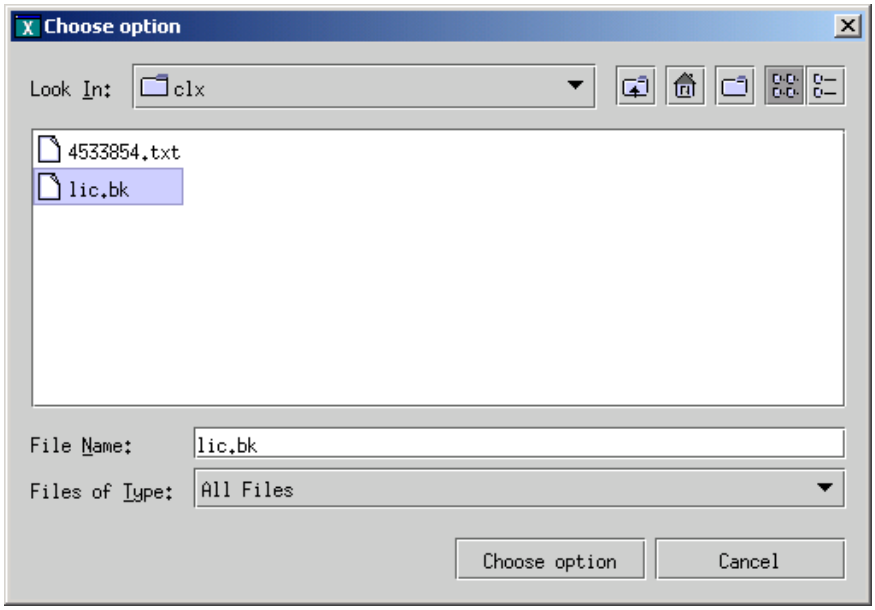
To back up the AutoPass license file (LicFile.txt):

1. Run **clxautopass -ovlicensemgr**.
2. When AutoPass opens, click **Backup License File** in the left panel.



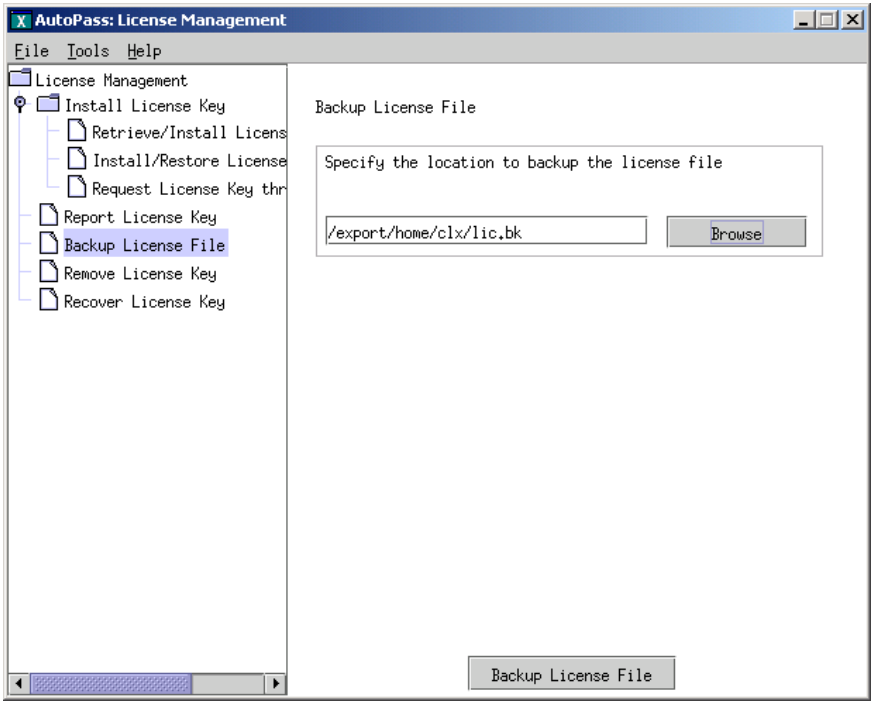
3. In the Backup License File window, click **Browse** to specify the location and file name where you want to save the backup copy of the AutoPass license file.

4. The Choose option window opens.



5. Browse to the directory you want to use. Enter a file name in the “File Name” field.
6. Click **Choose option** to return to the Backup License File window.

7. The Backup License File window opens.

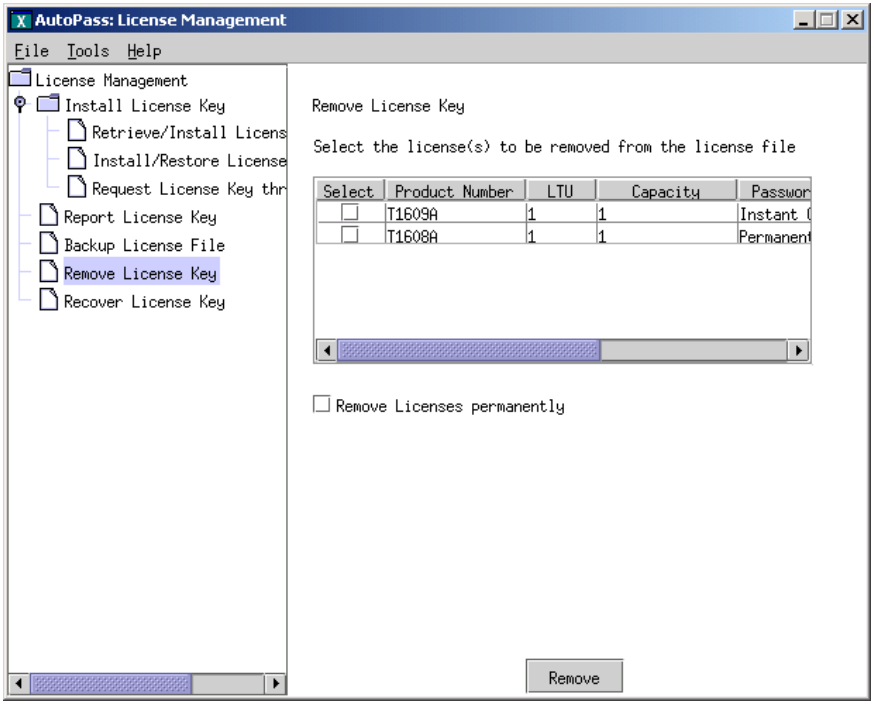


8. Click **Backup License File** to save the AutoPass license file to the specified backup file location.

Remove license key

To remove license keys from your system for products that are no longer being used or have been uninstalled:

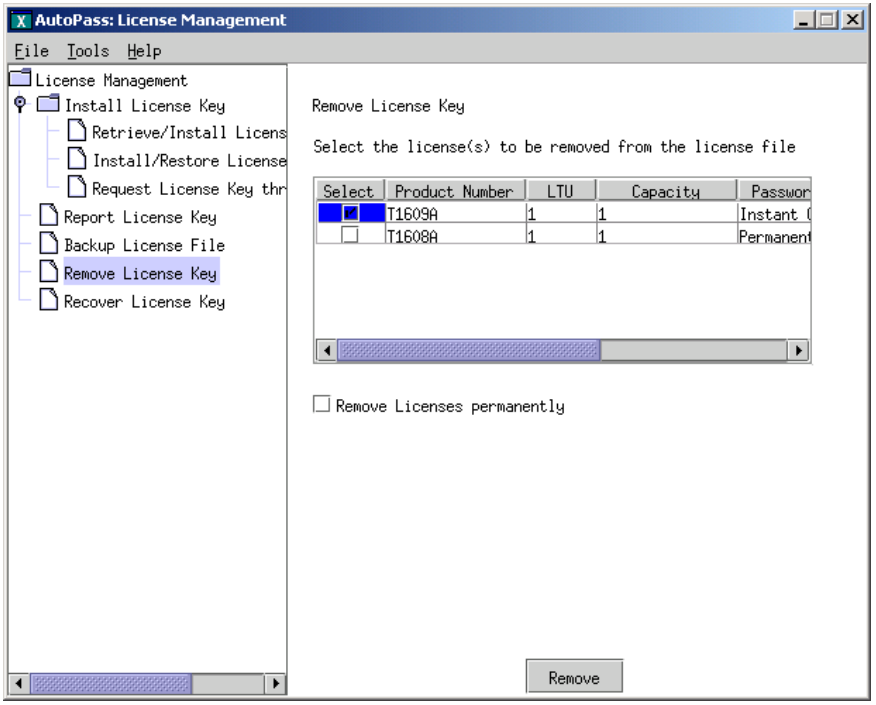
1. Run **clxautopass -ovlicensemgr**.
2. When AutoPass opens, click **Remove License Key** in the left panel.



3. In the Remove License Key window, select the license keys you want to remove.

   You can permanently remove licenses by selecting the **Remove Licenses permanently** check box.

   Note: Licenses that are permanently removed cannot be recovered using the Recover License Key option. They must be reinstalled.

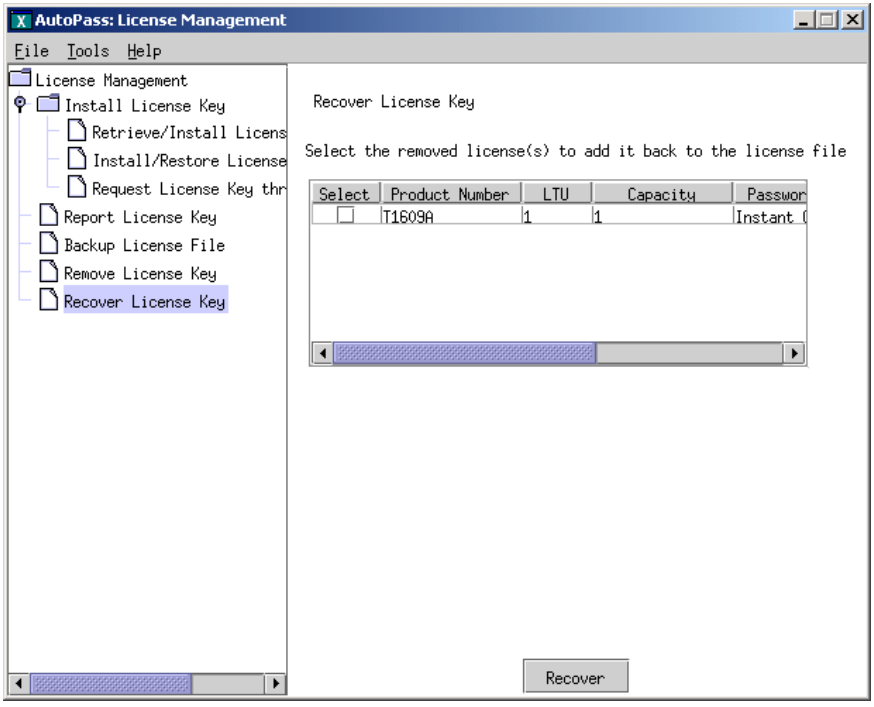


4. Click **Remove** to remove the license from the AutoPass license file. The list of installed licenses updates after you click **Remove**.

Recover license key

To recover a license key that was previously removed:

1. Run **clxautopass -ovlicensemgr**.
2. When AutoPass opens, click **Recover License Key** in the left panel.



3. Select the licenses you want to add back to the AutoPass license file and click **Recover**.

   The list of removed licenses updates after you select **Recover**.

clxautopass command line utility

In addition to using **clxautopass** to start the AutoPass GUI, you can use **clxautopass** to install the Instant-on license and import a password from the license key file.

Installing the Instant-on license

In cases where the Cluster Extension XP installation process failed to install the 60-day Instant-on license, use **clxautopass** to install it. Repair any conditions that may have caused the Instant-on license installation to fail. Then run the following command to install the Instant-on license:

clxautopass -installinstanton

Importing a license key from a file

Once you receive the license key file by e-mail, you can import the license key using the command line instead of using the AutoPass GUI. To import the license key, run the following command:

clxautopass -addpasswords <license file path>

where **<license file path>** is the full (absolute) path name to the license key file.

The **clxautopass -addpasswords** command is equivalent to using the **Install/Restore License Key from file** option in the AutoPass GUI.

3

Installing Cluster Extension XP in IBM HACMP environments

Cluster Extension XP provides a standard installation package for IBM AIX. This package can be installed with the System Manager Information Tool (SMIT) or the **installp** command line utility.

Prerequisites

The following tasks must be done prior to the installation and configuration of your Cluster Extension XP for the HACMP environment:

- Check “Installation prerequisites” on page 27.
- Check supported software versions, fixes, Fibre Channel adapter firmware and driver versions.

Optional

- Install and configure Auto Path XP for AIX to enable Alternative Pathing and Load balancing for AIX.
- Install and configure RAID Manager XP.
- Configure LVM.
- Install and configure HACMP.

Supported versions

Cluster Extension XP supports HACMP 4.4.1 and 4.5 with AIX 5.1, and HACMP 5.1 and 5.2 with AIX 5.1, AIX 5.2, and AIX 5.3.

Related information Please see the latest documentation and release notes for these products.

HP StorageWorks Auto Path XP for AIX

Auto Path XP is available for IBM AIX with HACMP and can be installed using SMIT or **installp**.

Auto Path XP creates virtual device files for redundant hdisk devices.

Auto Path XP provides utility programs to convert hdisk devices into Auto Path devices.

Auto Path XP must be installed on all cluster systems.

RAID Manager XP instances

RAID Manager XP is available as a **cpio** archive and must be installed on each clustered system.

Application services using Cluster Extension XP must use the same RAID Manager XP instances among all configured systems.

Several RAID Manager XP instances can be configured. If specified, Cluster Extension XP will use the alternative instance when an instance becomes unavailable.

The RAID Manager XP instances should be running at all times to provide the fastest failover capability. Refer to the paragraph "RAID Manager XP startup" on page 71 for an example on how to integrate automatic RAID Manager XP startup at boot time.

Recommendation For rolling disaster protection, use the same RAID Manager XP instances to manage the BC pairs.

RAID Manager XP device groups

One device group must be configured for each resource group's disk set. This disk set must include all disks of the volume groups used for the entire highly available application. A device group can contain several volume groups.

Rolling disaster protection

For rolling disaster protection, create the BC disk pair with the **no_read** option to hide it from the disk management layer.

RAID Manager XP startup

To enable RAID Manager XP instances (for example, instance 11 and 22) to be started at system boot time, the following changes must be applied to the system configuration:

1. Add a **local** entry to the **/etc/inittab** file.

Example

```
logsymp:2:once:/usr/lib/ras/logsymptom # for system dumps
httpdlite:2:once:/usr/IMNSearch/httpdlite/httpdlite -r
/etc/IMNSearch/httpdlite/
httpdlite.conf & >/dev/console 2>&1
local:2:wait:/etc/rc.local > /dev/console 2>&1 # Start raid
manager
cons:0123456789:respawn:/usr/sbin/getty /dev/console
```

2. Edit the **/etc/rc.local** file and add the following entries:

Example

```
echo "Starting local application"
HORCMBIN=/opt/HORCM/usr/bin
PATH=/bin:/usr/bin:$HORCMBIN
export PATH
# Start RAID Manager XP instances
RAIDMGR_INSTANCES="11 22"
if [ ! -z "$RAIDMGR_INSTANCES" ]
then
        echo "Starting RAID Manager XP instances:    $RAIDMGR_INSTANCES"
        $HORCMBIN/horcmstart.sh $RAIDMGR_INSTANCES
fi
echo "Completed local application"
```

RAID Manager XP configuration

In a disaster tolerant environment, it is highly recommended to have redundant networks available between the two data center sites. This will protect the environment against a total network failure, and protect against a "split-brain" syndrome since it is not possible to implement a serial heartbeat connection (RS232) between the two geographically dispersed sites. You can use this additional network as a dedicated heartbeat network.

Each clustered system needs at least one RAID Manager XP instance running in order to control the shared disks. The shared disks are mirrored between both sites using Continuous Access XP. The following rules must be considered when configuring the RAID Manager XP instances:

- Local binding (**HORCM_MON**) must be set to **NONE**. This enables RAID Manager XP to listen on all possible HACMP IP addresses: boot, service and standby. In addition to this, the RAID Manager XP instance can communicate over the heartbeat network mentioned above.

- The RAID Manager XP instances should communicate over both networks. The Remote binding (**HORCM_INST**) must be set to "heartbeat-address," service, standby, and boot IP addresses of the public network. Review *HP StorageWorks Cluster Extension XP: User's Guide* for more information on timing constraints when setting up several alternative remote instances.
- The service ports of each RAID Manager XP instance, configurable in the **/etc/services** file, must be different. This prevents the RAID Manager XP instance from communicating with itself in case of a takeover situation. If the service ports of the local and remote system were the same and the service IP address of the remote system had been taken over by the local system, the RAID Manager XP instance running on the local system would communicate with itself instead of the RAID Manager XP instance on the remote system. This would lead to wrong XP disk pair status information being processed by Cluster Extension XP.

Example

```
#/************************ For HORCM_MON ************************/
HORCM_MON
#ip_address        service              poll(10ms)      timeout(10ms)
NONE               horcm0_aix1          1000            1000

#/************************ For HORCM_CMD ************************/
HORCM_CMD
#dev_name               dev_name               dev_name
/dev/rhdisk2            /dev/rhdisk15

#/************************ For HORCM_DEV ************************/
HORCM_DEV
#dev_group        dev_name        port#          TargetID        LU#
oracle            dev01           CL1-C          0               8
oracle            dev02           CL1-C          0               9

sap               dev05           CL1-C          0               12
sap               dev06           CL1-C          0               13

#/************************ For HORCM_INST ***********************/
HORCM_INST
#dev_group        ip_address    service
oracle            aix2h         horcm0_aix2
oracle            aix2s         horcm0_aix2
oracle            aix2b         horcm0_aix2
oracle            aix2          horcm0_aix2
sap               aix2h         horcm0_aix2
sap               aix2s         horcm0_aix2
sap               aix2b         horcm0_aix2
sap               aix2          horcm0_aix2
```

LVM configuration

The shared data disks reside on the XP disk array, which are mirrored to the remote data center using Continuous Access XP. In order to be able to access the mirrored disks in read/write mode, the primary disk (P-VOL) of the mirrored disk pair must be in the local data center. To make the disk (S-VOL) accessible to the remote system, you must switch the personalities of the disks:

- Create volume groups, logical volumes, and file systems on the first system for all resource groups.
- Use the RAID Manager XP **horctakeover** command to switch the RAID Manager XP device groups from site A to site B to make the shared disks accessible.
- Import volume groups, logical volumes, and file systems on the system on the remote site.
- Make sure that the volume groups are not automatically activated at system boot time.

HACMP

Set up the HACMP cluster configuration as described in IBM's HACMP documentation.

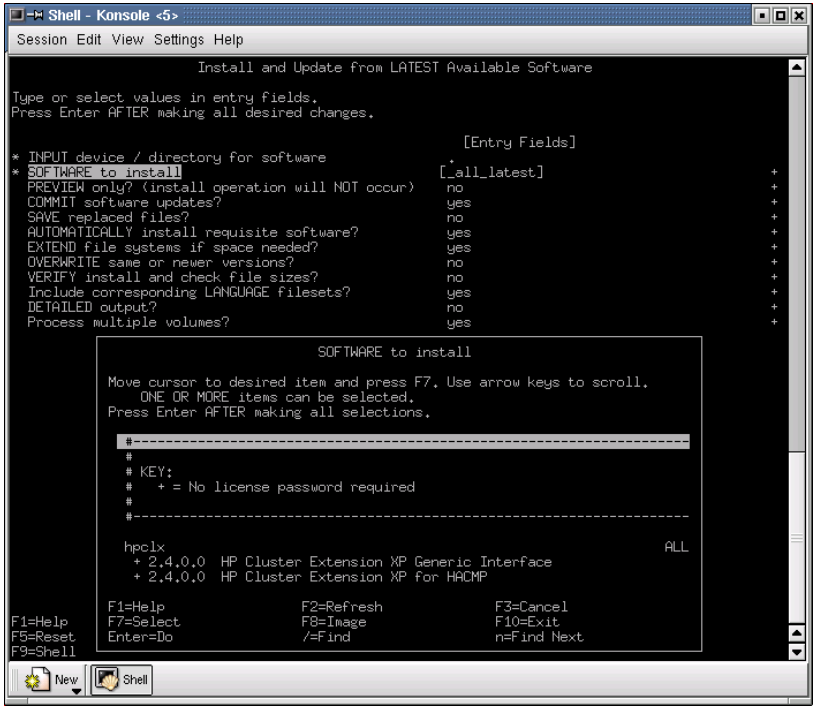
The cluster system of the primary data center must have access to the XP disk array of the local data center, while the cluster system of the remote data center must have access to the remote XP disk array.

Installing Cluster Extension XP

1. Log in as **root**.
2. Download the installation package to a temporary directory on your system.
3. Uncompress and extract the install package into the **hpclxxp** sub-directory (created during extraction).
4. Use SMIT or the **installp** utility to install Cluster Extension XP.

   ```
   #smitty install_update
   ```

5. Select “Install and Update from LATEST Available Software.”
6. Specify the path to **hcclxxp** as the target directory for the update.
7. Press **Enter** to start installation right away, or press **F4** to list the contents of the installation package.



8. Select either “HP Cluster Extension XP For HACMP” or “HP Cluster Extension XP Generic Interface” to install the command line interface for AIX.
9. When the installation is finished, press F10 to exit from SMIT. Remove the CD-ROM.

   The Cluster Extension XP software is installed into three directory locations:

   /etc/opt/hpclx

   /var/opt/hpclx

   /opt/hpclx

Repeat these steps on each system that will run Cluster Extension XP in the cluster.

Samples of user configuration files (**UCF.cfg**) can be found in **/opt/hpclx/sample**.

Pair/resync monitor configuration

The pair/resync monitor checks whether the requesting server is allowed to have access to the pair/resync monitor.

Remote access hosts file

The names of the remote systems must be configured in a remote access hosts file:

clxhosts

By default this file is located in the following directory:

/etc/opt/hpclx/conf

The access file is formatted with one host name per line. Blank or empty lines are ignored. Comments in the file are not supported.

Configuring the port for the pair/resync monitor remote communications

The **services** file must contain the port entries for the pair/resync monitor.

The **services** file is located in the following directory:

/etc/services

The user must choose a port and add the following entry:

clxmonitor *nnnnn*/**tcp**

where *nnnnn* is the chosen port number.

Configuring Cluster Extension XP resources

The default configuration can be modified to fit your HACMP and disk array environment. Before configuring the Cluster Extension XP resource, review the Cluster Extension XP objects in the **UCF.cfg** file.

Related information

For information about how to configure Cluster Extension XP for integration with HACMP, see *HP StorageWorks Cluster Extension XP: User's Guide*.

Removing Cluster Extension XP

Caution *Before you can remove Cluster Extension XP from the system, you must first stop the resource group or switch the resource group to another system. Then remove the pre-event entry for Cluster Extension XP from the* ***get_disk_vg_fs*** *event and from the* ***release_vg_fs*** *event.*

The following command removes Cluster Extension XP for HACMP from the system.

```
#smitty deinstall
```

1. Select software.
2. Press **F4**.
3. Select the Cluster Extension XP component you want to deinstall from the system, then press Enter.
4. When the deinstallation process is complete, press **F10** to exit from SMIT.

Upgrading Cluster Extension XP

The Cluster Extension XP software for HACMP can be upgraded while the cluster is running.

If you are installing Cluster Extension XP for the first time, this section is not applicable.

Recommendation Stop the cluster on the node to be upgraded before starting the upgrade process.

To upgrade Cluster Extension XP:

1. Move the resource groups that use Cluster Extension XP to another cluster system, or stop the resource groups, including Cluster Extension XP.
2. Deinstall Cluster Extension XP and install the new version of Cluster Extension XP.

If the Cluster Extension XP command line interface (**clxrun**) is used, make sure that all associated resources that were previously online are offline after **clxrun** has run.

Then, deinstall Cluster Extension XP Generic Interface and install the new version of Cluster Extension XP.

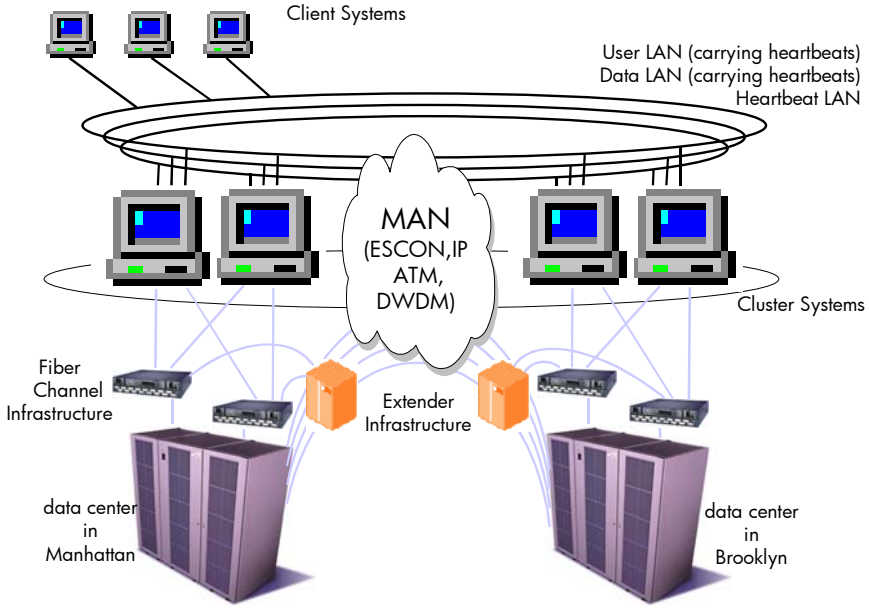
4

Installing Cluster Extension XP in Microsoft Cluster Service environments

This chapter describes additional requirements and provides installation procedures for installing Cluster Extension in a Microsoft Cluster Service environment.

Cluster Extension XP provides a standard InstallShield wizard for Windows. The setup program includes the Cluster Extension XP integration with Microsoft Cluster Service and the generic interface of Cluster Extension XP.

The Cluster Extension XP Arbitrator service can be installed from a separate setup program. For your convenience, the installation CD includes an autostart feature that permits you to choose the operating system and other options before you start the installation.



Supported Cluster Extension XP configuration with Microsoft Cluster Service

Installation Overview

This section describes features and requirements for using Cluster Extension XP in Microsoft Cluster Service environments with the XP512/XP48/XP128/XP1024/XP10000/XP12000 disk arrays.

The XP256 is not supported in Cluster Extension XP environments.

The Cluster Extension XP quorum service

The quorum service removes the limitation of Microsoft Cluster Service that requires each clustered server to access a single, shared quorum disk to maintain a persistent log of cluster events and provide a “tie-breaker” for events that could otherwise lead to a split-brain condition. Cluster nodes connected to the quorum disk pair behave as if they were connected to a single, shared quorum disk. As with any cluster disk resource, only the server node that owns the quorum disk resource can access that drive. The quorum disk resource is synchronously mirrored over Continuous Access XP, allowing the cluster to remain online even when a site experiences a disruption.

When the quorum disk resource is moved (failed over) to a new server, the quorum service handles any necessary swapping of the secondary-to-primary disk of the mirror set. This ensures that the proper low-level SCSI drive reserve/release semantics are preserved. The quorum service detects the disruption of service via Microsoft Cluster Service and assigns the quorum resource to either the local or the remote site. The decision is based on the challenger/defender protocol built into Microsoft Cluster Service.

The quorum service enables a cluster to recover after most types of site failures, for example:

- server unable to access the local quorum disk
- failure of one or all servers in either data center
- failure of a disk array
- total communication failure between data centers (if the arbitrator service is deployed)

In rare circumstances, communications failures between the cluster nodes in the dispersed data centers and the arbitrator can prevent the quorum service from ascertaining the correct failover behavior. If this occurs, the cluster stops completely to prevent data from being corrupted by a split-brain condition. It can be quickly restarted from any host node using a documented procedure, once the system administrator has confirmed that a split-brain situation has not occurred and will not occur when the system is restarted.

As long as one site can communicate with the arbitrator service, the cluster will restart or continue to operate. The Continuous Access XP link failure could leave the PVOL site of the quorum disk pair and the status disk pair in a failure state (PSUE or PDUB). It may be necessary to manually recover after site service has been restored. The required pair split and pair creation operations can be performed while the cluster is running.

Disk configuration for Microsoft Cluster Service with quorum service

To configure the quorum service, you must provide a quorum disk sized as required by Microsoft, usually 100 Mbytes or larger. User data must not be stored on this volume.

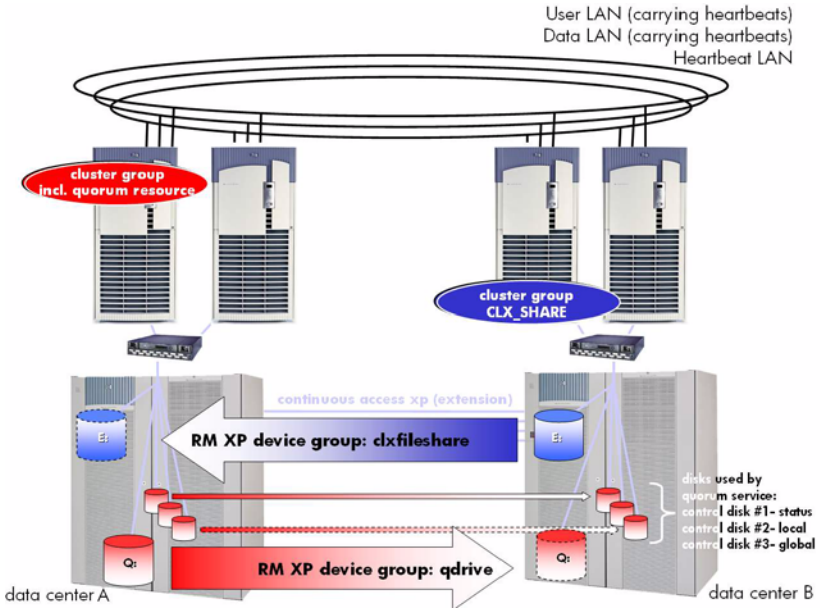
In addition, two RAID Manager XP command devices per cluster node must be configured, as well as three small XP disks (LDEVs) per cluster on each array for quorum service metadata. These control disks must be CVS volumes made as small as possible (36-50 Mbytes).

The control disks must be mapped to all local cluster nodes. The control disks are shared raw devices.

The command device and control disks must be partitioned, but must not be assigned Windows drive letters; nor must they have file systems created on them. They must be accessed only by RAID Manager XP software and Cluster Extension XP quorum service software.

The application/data disks can be any size supported by the XP disk array. However, for replication and recovery performance reasons, you should configure several smaller disks or create LUSE disks to take advantage of parallel processing in the XP disk array.

The quorum disk, application/data disk(s) and the control disks will be paired with disks in the remote disk array.



Disk configuration for the quorum service (RAID Manager XP Command device not shown)

Partitioning RAID Manager XP command devices and quorum service control disks

Cluster Extension XP quorum service uses the GUID to resolve the physical drive number. In order to use GUIDs to access the command devices and the control devices, each disk used by the Cluster Extension XP quorum service must have a partition created, in order to create a GUID for the disk.

Do not assign drive letters for disks used by the Cluster Extension XP quorum service.

Do not format partitions.

GUIDs are much more reliable disk identifiers in a SAN than physical drive numbers or drive letters. The Cluster Extension XP quorum service fully supports GUIDs and discovers them automatically if they were created before the Cluster Extension XP installation.

In order to acquire the GUID for a disk, the drive must be accessible by the host system. To check this, open Disk Management and check the property values for the target disk.

There are two different, but complementary, property sheets for a given disk. In the lower, right pane of Disk Management, the graphical table of disks shows a text description of each disk (stating whether it is in Basic or Dynamic mode). It also shows a graphical representation of partition information (partition display). The property sheet for the text description provides Port-Target ID-LUN data, in addition to the capacity of the disk (should be non-zero). The property sheet for the partition display breaks down the partition capacity into used and free space. Again, capacity should be a nonzero value, confirming that a disk or partition displays the correct capacity. This indicates that the host system has access to the volume, and the installation program would therefore be able to retrieve its assigned GUID.

If you have version 1.09.04 (or later) of RAID Manager XP installed, you can optionally use a RAID Manager XP utility to verify that a disk's GUID is visible to the local system.

Close the Computer Management window and run the **inqraid.exe** program from a command prompt.

Example (Windows2000)

C:\>**inqraid $Volume -fv -fx**

Caution *Windows 2000: GUIDs are generated on the local node when creating a new partition. This means that whenever you create a new partition, you change the GUID of the disk. If the disk is shared between several nodes you must open Disk Management and close it in order to update the other systems GUID information. This is also true if you create a new partition while disks in a Continuous Access XP disk pair are suspended or split.*

Caution *Windows 2003: GUIDs are not automatically created for partitions that have been created on another node. In order to create a GUID for a shared partition you must delete and re-create the partition on the node that doesn't show a GUID.*

Pairing all disks in the cluster environment

Microsoft Cluster Service uses the disk signature to recognize a shared disk as a common resource in the cluster. In order to allow geographically dispersed cluster environments, Continuous Access XP needs to replicate the disk signature to the remote disk. This means all disk resources in the Cluster Extension XP cluster must be copied to the remote side prior to failover operations in the cluster.

To initialize the quorum service control disks correctly, they must be replicated to the remote disk array as well.

After the disks have been paired, the servers on the remote disk array (S-VOL side) must be rebooted. This will allow them to recognize the correct disk signature.

Once the servers are rebooted, the disk pairs can be suspended until Cluster Extension XP is installed.

Prerequisites

Prior to installing Cluster Extension XP, perform the following tasks:

1. Check "Installation prerequisites" on page 27.
2. Check for the latest supported software versions, fixes, Fibre Channel adapter firmware and driver versions.

Optional

3. Install and configure HP StorageWorks Secure Path XP or HP MPIO DSM for Windows for XP Disk Arrays to enable alternative pathing for Windows.
4. Install and configure HP StorageWorks RAID Manager XP.

Optional

5. Install the applicable JAVA package for your system:
   - 32-bit JRE (Java Runtime Environment) version 1.3.1 or later for 32-bit and 64-bit extended system (x64) platforms
   - IA64 JAVA SDK 1.4.2-04 or later for 64-bit Itanium (IA64) platforms.
6. Install and configure Microsoft Cluster Service on all nodes.
7. Install Microsoft hotfixes:

(Windows 2000 only)

   - Install Service Pack 4 to obtain the latest hotfixes.
   - If you cannot install Service Pack 4, install Service Pack 3, which includes:

     Q297219
     Q307939
     Q321793

     These hotfixes include the minimum supported version of the Cluster Service **clusdisk.sys** driver.

Supported versions

Cluster Extension XP supports

- Windows 2000 Advanced Server and Datacenter Server with the hotfixes mentioned above plus Service Pack 3 or later.
- Windows 2003 Enterprise Edition and Datacenter Edition plus Sevice Pack 1.

HP supports XP disk arrays connected to a broad range of Intel-based servers with FC HBAs (direct connected or switched) running Windows 2000 and Windows 2003.

Secure Path for Windows 2000 and Windows 2003 are available from Hewlett-Packard.

Related information See the documentation and release notes for each of the above products.

Custom Volume Size (CVS) Configuration on XP disk arrays

The volume size configuration feature allows you to create custom size volumes (CVS) that are smaller than a single LDEV (logical device). CVS volumes as small as 36 Mbytes are suitable for supporting the required quorum service control functions. The quorum disk pair must be sized as required by Microsoft. The sizes of the quorum disk and the control disks affect the recovery time required for the quorum disk pair.

Related information For information about custom size volumes, see *HP StorageWorks LUN Configuration Manager XP: User's Guide.*

Secure Path/MPIO

HP StorageWorks Secure Path XP and HP MPIO DSM for XP Disk Arrays are available for Windows 2000 and Windows 2003. Secure Path or MPIO DSM must be used to take advantage of I/O-path failover, a feature not available with Windows operating systems.

Secure Path or MPIO DSM must be installed on the cluster systems prior to connecting the system to the second I/O path.

RAID Manager XP instances

HP StorageWorks RAID Manager XP must be installed on each clustered system.

The RAID Manager XP instance numbers used for the Cluster Extension XP resource must be identical among all systems on which the resource is configured to run.

Multiple RAID Manager XP instances can be configured. If specified, the Cluster Extension XP resource uses an alternative instance when an instance becomes unavailable.

The RAID Manager XP instances must be running at all times to provide the fastest failover capability. Cluster Extension XP provides a RAID Manager XP Service to include the RAID Manager XP instance startup in the system boot process.

Recommendation For rolling disaster protection, use the same RAID Manager XP instances to manage the BC pairs.

RAID Manager XP device groups

One RAID Manager device group must be configured for each resource group's disk set. This disk set must include all physical disks associated with the resource group. A RAID Manager XP device group can contain multiple physical disks.

The quorum disk pair and quorum service control disk pairs must be configured as a separate device group. This group is for maintenance purposes only.

Rolling disaster protection

For rolling disaster protection, create the BC disk pair with the **no_read** option to hide it from the disk management layer.

RAID Manager XP command devices

Recommendation Configure a minimum of two command devices per cluster node.

One of the command devices must be dedicated to the quorum service and not be used for any other purpose. The second command device should be used for the above-mentioned RAID Manager XP instance(s). You can set up additional command devices to provide for additional redundancy or other HP integration products such as HP Open View Data Protector Zero Downtime Backup Integration.

Installation Roadmap

The installation roadmap below shows the steps for installing Cluster Extension XP in a Microsoft Cluster Service environment. The steps are described in detail on the pages that follow.

1. Prepare the installation:
   - Create CVS volumes in the disk arrays and map them to servers.
   - Partition physical disks on the first server
   - Create Raid Manager configuration file and pair disk pairs
   - Install Microsoft Cluster Service on all nodes in the first data center
   - Reboot and check for GUIDs on all nodes for the command device and the control disks.
   - Install Microsoft Cluster Service on all nodes in the second data center
2. Install Cluster Extension XP:
   - Install the Cluster Extension XP resource type DLL
   - Install the quorum service
   - Install the arbitrator service on the arbitrator system
3. Troubleshoot your Cluster Extension XP installation
4. Repair your Cluster Extension XP installation
5. Remove your Cluster Extension XP installation
6. Upgrade Cluster Extension XP

Preparing data centers for quorum service installation

This section describes disk array configuration procedures for the local, primary site and the remote, secondary site prior to installation of the quorum service for environments with XP512/XP48/XP128/XP1024/ XP10000/XP12000 disk arrays.

Consult your HP service representative for assistance in configuring the disk array.

Create CVS volumes in the disk arrays and map them to servers

At the local, primary site:

HP service representative only

1. Configure the disk array with the following disk drives (LDEVs):
   - 4 x CVS volumes per cluster:
     - — 1 x 100 Mbyte volume for the quorum disk
     - — 3 x 36 Mbyte volumes for the three quorum service control disks. These disks must be visible to all nodes on the local site.
   - 2 additional CVS volumes per node in the cluster:
     - — 1 x 36 Mbyte volume as command device for the RAID Manager XP instance used by the Cluster Extension XP resource in the resource group.
     - — 1 x 36 Mbyte volume as command device for the quorum service

   These volumes can usually be created from available free space on a disk parity group.

   Any additional application/data disks can be of any size supported in the disk array.

HP service representative only

2. Configure two of the CVS volumes as a command device.

HP service representative only

3. Assign the new CVS volumes to the FC ports to be connected to the local cluster nodes.

HP service representative only

4. Coordinate with remote, secondary site to configure the disk array at that site in the same manner (steps 1 to 3).

HP service representative only

5. Establish bidirectional links between the disk arrays at the two sites.

   For greater fault tolerance, use two or more diversely routed links in each direction between the two data centers.

HP service representative only

6. Identify the array volumes that will be part of the cluster.

   These volumes will be the data disks that will support your applications and shares. Assign the same FC client host interface ports to the servers as were assigned to the CVS volumes.

7. With the array attached to the local cluster node, configure the array volumes so that they are assigned to equivalent physical disks on the respective servers.

Partition physical disks on the first server

1. Open Microsoft Management Console (MMC) on the first server and select **Device Manager**.
2. Scan the Device Manager for new hardware. (Select **Scan for new hardware**.)
3. Select **Disk drives**.

   Look for the six CVS volumes created in step 1. These are designated by an OPEN-*n*-CVS label, where *n* is the emulation type.

4. Select **Disk Management** and ensure that signatures are written to each disk.

5. Verify that each of the OPEN CVS volumes is listed with a disk and that each disk is in Basic mode.

   If the new CVS volumes are marked as RAW devices, partition each one. Do not reformat them.

   If a volume has been partitioned and formatted but is unreadable, you can disable and then enable the volume in Device Manager–Disk drives.

   Of the six CVS volumes, only the intended Microsoft Cluster Service quorum disk should have a drive letter assignment. Record these assignments for future reference.

   Adding drive letters or formatting the control disks and command devices causes unnecessary file system checks and even log entries.

6. Close Disk Management.

Windows 2000 only

If you use Terminal Services, you must reset the Terminal Service session and create a new Terminal Services session in order to update all windows.

7. If applicable, open MMC on all cluster nodes on the local side and confirm that you can see the previously created partitions in the Disk Manager.

   The drive letters may vary because you do not have the cluster software installed yet. This can be changed later.

Windows 2003 only

If you see a partition on a command device or control disk as an unknown partition, you can delete and re-create the partition on the server.

If you use Terminal Services, you need to reset the Terminal Service session and create a new Terminal Services session in order to update all windows or to see the latest changes.

At the remote, secondary site:

8. Configure the disk array at the remote, secondary site to match the configuration at the primary site.

   Match the CVS volumes and drive letter assignments.

   Record the volume assignment details for the next step.

Create RAID Manager configuration file and pair disk pairs

On all servers:

1. Make sure that the HP StorageWorks RAID Manager XP software has been installed on all nodes at both sites.

   The RAID Manager XP configuration files describe the array configurations that were created using the data recorded in the previous steps. This includes a description of the volume pair that will make up the Microsoft Cluster Service quorum disk pair, the quorum service control disk pairs, and the application/data disk pairs. Please refer to the "RAID Manager XP dependencies" section in the *HP StorageWorks Cluster Extension XP: User's Guide* and to the *HP StorageWorks RAID Manager: User's Guide*.

At the local, primary site:

2. Use RAID Manager XP to create synchronous mirrored pairs for the quorum disk, the three drives used by the quorum service, and the data disk pairs.

   Syntax **paircreate –g *disk_pair_name* –f never –vl –c 15**

   where *disk_pair_name* is the disk pair used for the quorum disk or any of the control disks as specified in a previously created RAID Manager configuration file.

3. Install Microsoft Cluster Service on all nodes in the first data center.

   Windows 2000 On the first server, install Cluster service in the Add/Remove Windows Components pane of Add/Remove Programs.

Windows 2003

On the first server, open the Cluster Administrator GUI by selecting Start -> Programs -> Administrative Programs -> Cluster Administrator. Create a new cluster in the Cluster Administrator GUI and add the local node.

When designating disk resources, none of the non-quorum CVS volumes should be included. If they do appear in the selection list, go back to Disk Management and remove the drive letter assignment. Only the quorum disk and the application/data disks should be visible to the cluster software.

When designating the quorum disk, select the one CVS volume that was assigned a drive letter.

4. If applicable, after the cluster is running on the first server and has been configured for your application, install cluster service on all cluster nodes in the local data center.

Windows 2000

Install Cluster service in the Add/Remove Windows Components pane of Add/Remove Programs. Make all local cluster nodes join the existing cluster, consecutively.

Windows 2003

Open the Cluster Administrator GUI by selecting Start -> Programs -> Administrative Programs -> Cluster Administrator. Add all local cluster nodes to the existing cluster in the Cluster Administrator GUI.

Reboot and check for GUIDs on all nodes

On all servers:

1. Reboot all local and remote systems.
2. Check the GUIDs for the command devices and the quorum service control disks.

   C:\>inqraid $Volume -fvx

Windows 2000

If you cannot find the GUID for any of the three quorum service control devices, delete and re-create the partition of the specific disk on *one* server at the P-VOL site.

If you use Terminal Services, you must reset the Terminal Service session and create a new Terminal Services session in order to update all windows.

Windows 2003

If you cannot find the GUID for any of the three quorum service control devices, delete and recreate the partition of the specific disk on the server that doesn't have the GUID.

If you use Terminal Services, you must reset the Terminal Service session and create a new Terminal Services session in order to update all windows.

If the GUID of any command device is missing, re-create the partition on the command device on the server where the GUID is missing.

If you use Terminal Services, you must reset the Terminal Service session and create a new Terminal Services session in order to update all windows.

At the remote, secondary site:

3. If there is no user/application data on the application/data disks, suspend all disk pairs.

Syntax

pairsplit -g *disk_pair_name*

where *disk_pair_name* is the disk pair used for the quorum disk or any of the control disks or application/data disks, as specified in a previously created RAID Manager configuration file.

If there already is user/application data on the application/data disks, suspend only the quorum disk pair and all quorum service control disks.

This means your application/data disk might not be shown as an available disk during installation of the remote cluster nodes (below), until Cluster Extension XP is installed and configured.

Install Microsoft Cluster Service on all nodes in the second data center

1. Add all remaining nodes on the remote site to the existing cluster.

Windows 2000 Install Cluster service in the Add/Remove Windows Components pane of Add/Remove Programs. Make all remaining cluster nodes join the existing cluster, consecutively.

Windows 2003 Open the Cluster Administrator GUI by selecting Start -> Programs -> Administrative Programs -> Cluster Administrator. Add all local cluster nodes to the existing cluster in the Cluster Administrator GUI.

Install Cluster Extension XP

The Cluster Extension XP setup program consists of three components:

- the Cluster Extension XP resource type (resource type DLL)
- the quorum service
- the documentation

The installation was separated in this way to allow you to repair the individual components if necessary. However, we recommend that you install all the above-mentioned components at the same time.

The installation requires that the quorum disk (cluster group) be located on the local server.

1. Log in with your administrator account.
2. After both sites have been prepared, open Cluster Administrator and move the cluster group to the first server where Cluster Extension XP will be installed.
3. From Windows Explorer, confirm that the server can detect the quorum disk.

   A Microsoft Cluster Service directory should be visible in the root directory of the drive.

Tip If you are remotely setting up Cluster Extension XP using Microsoft Terminal Services, the quorum disk may not appear properly in Disk Manager after moving the cluster group to that host node. To correct the problem, reset the Terminal Services session and then log on to a new session.

4. Make sure that the cluster service is running and that the RAID Manager instances are configured.
5. Before continuing to install Cluster Extension XP, stop all Cluster Administrator programs.
6. Download the installation package into a temporary folder on the first cluster sytem.

7. Extract the install package to folders **hpclxxp** and **hpclxextarb** (created during extraction).
8. Open the **hpclxxp** folder and run setup.exe.
9. Select the "quorum service" and "Cluster resource type" to install the necessary Cluster Extension XP components.
10. Follow the on-screen instructions to enter your identification and select the program installation location.
11. Select “Yes” when the installation asks if you want to install the permanent license. Follow the instructions in Chapter 2 “Cluster Extension XP licensing” on page 33 to retrieve and install licenses.

Installing the quorum service

This procedure installs the following Cluster Extension XP components:

Windows 2003 only

- quorum disk filter driver **clxqflt.sy**s
- quorum SCSI port/storport filter driver **clxspflt.sys**
- quorum service **clxqsvc.exe**
- additional components

Caution

Cluster Extension XP adds a dependency to the Microsoft Cluster Service that is lost during de-installation or eviction of a cluster node. Every new installation, removal, or reinstallation of the Microsoft Cluster Service requires running Repair for the Cluster Extension XP quorum service installation.

1. Before installing the quorum service, prepare the local and remote sites. See “Preparing data centers for quorum service installation” on page 93.
2. The installation program writes the setup data into a text file for quick reference. The default file name is **%SystemRoot%\clxcfg.txt**.

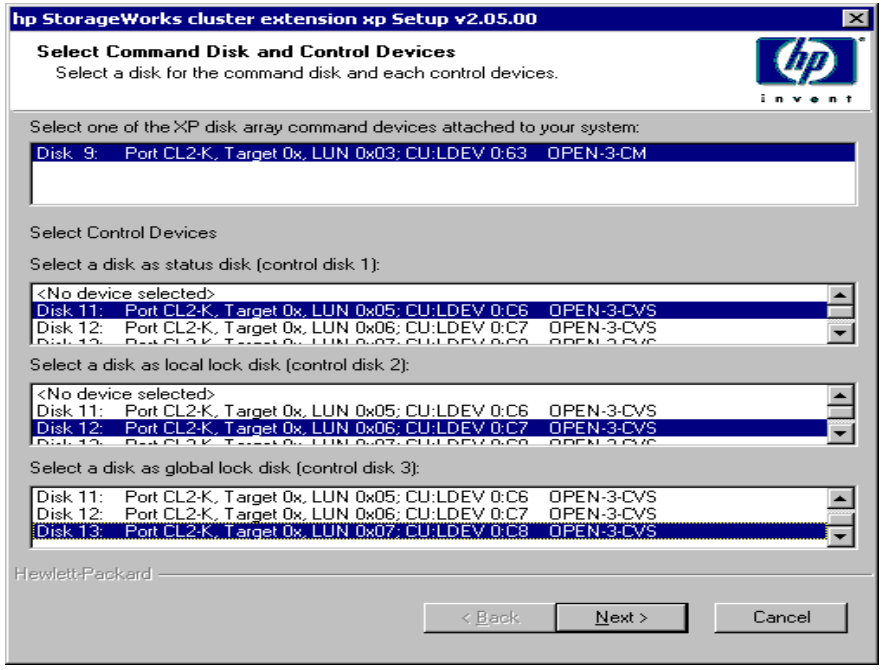
   Document the settings under the registry key at this location:

   HK_LM\SYSTEM\CurrentControlSet\Services\ClxQSvc\Parameters
3. In the next dialog box, select the command device and the three control devices.

   The installation program displays all resources that it determines to be suitable for supporting the quorum service.

   If sufficient resources are not detected, carefully review “Preparing data centers for quorum service installation” on page 93, then restart Setup.

Example Setup detected a number of suitable control devices. A command device is selected by default. A different disk must be selected for each of the three control devices.

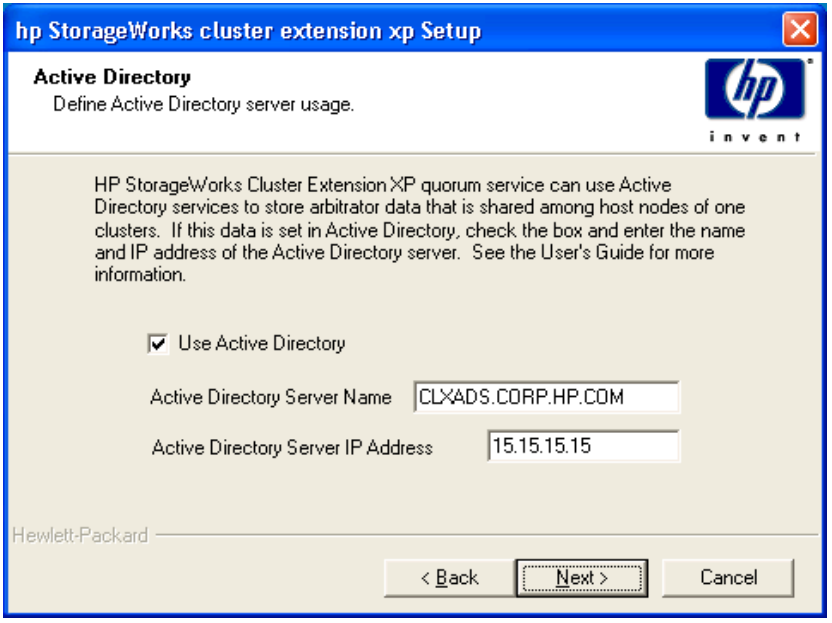


4. After the control devices are selected, decide whether Active Directory will be used to store data about an external arbitrator. External arbitrator is a service that supports the quorum service but resides outside the cluster.

   For more information about the external arbitrator, see “Installing the Cluster Extension XP external arbitrator” (page 108).

Example

5. If Active Directory services are to be used, check the box and complete the information for the fully qualified network name of the Active Directory server and its IP address.



6. If there is more than one cluster member on any site (such as in a 3-node or 4-node cluster), move the cluster group to the next server at the same site and install Cluster Extension XP on that node. (During setup on the second and subsequent servers, it is important that the servers can communicate via the network with the servers that already have Cluster Extension XP installed.)

Caution *When installation is complete, do not reboot the system.*

7. Split the quorum disk pair and the three quorum service control disk pairs, if not already done.

   Use the RAID Manager utilities **pairsplit** command:

Syntax **pairsplit -S -g** *disk_pair_name*

where *disk_pair_name* is the disk pair used for the quorum disk or any of the quorum service control disks, as specified in a previously created RAID Manager configuration file.

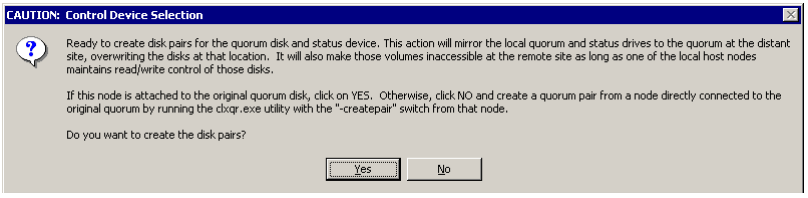
The disk pairs must be placed into simplex mode.

8. If not already done, install the Microsoft Cluster Service software on all servers at the secondary site and make them join the cluster.
9. If there is more than one cluster member at each site, move the cluster group to one of the servers at the secondary site and confirm that the server detects the quorum disk.

   Each server at the second site must be able to own the cluster group and see the simplex (SMPL) copy of the quorum disk in order to complete the Cluster Extension XP installation on the remaining cluster nodes.
10. While the server at the secondary site owns the quorum disk, run the installation as explained above.

    During setup, this server (secondary site) must communicate with the servers at the distant site where Cluster Extension XP has already been installed.

    The pairs for the quorum service control disks can now be created.
11. When prompted to create the disk pair for the quorum service, click Yes.



Caution *When installation is complete, do not reboot the system.*

12. If there is more than one cluster member at each site, move the cluster group to the next server of the cluster and install Cluster Extension XP there. During setup, this server must communicate with the servers at the distant site where Cluster Extension XP was previously installed.

Caution *When installation is complete, do not reboot the system.*

All cluster nodes should now have Cluster Extension XP installed.

13. Reboot each server that does not own the cluster group, one at a time.
14. Move the cluster group to the newly rebooted server node at the same site
15. Reboot the final server.
16. Open Cluster Administrator and verify that the cluster group can be successfully moved to each server node.
17. Verify that the disk pairs for the quorum disk and the first of the three control disks have been created. If not, create the pairs from the Cluster Extension XP directory:

    cd \Program Files\Hewlett-Packard\Cluster Extension XP

    clxqr -createpair
18. Document all configuration data for later upgrades. You can review the configuration data in the **%WINDIR%\clxcfg.txt** file.

Installing Cluster Extension XP Command Line Interface

The Cluster Extension XP Command Line Interface can be used for custom cluster software integration. For example, you could write your own online and offline scripts using the advanced disk pair status checking options of Cluster Extension XP.

It is not necessary to install this component if Cluster Extension XP is used with Microsoft Cluster Service.

Please refer to the *HP StorageWorks Cluster Extension XP: User's Guide* for more information on the command line interface.

Installing the Cluster Extension XP external arbitrator

During communications disruptions, the quorum service on each cluster node uses the external arbitrator to determine the following:

- whether the cluster is operational on other nodes, and
- whether the inquiring node can communicate with the network at large.

It assists in determining whether that node can restart the cluster without the risk of creating a split-brain condition.

Before installing the external arbitrator, you must determine the most suitable host system. The external arbitrator service places little load on the host system, but it does need to be responsive and available to the network at all times. Therefore the server should not be running many other service functions or encumbered with a very heavy workload.

The host system is best located on a server that uses the services provided by the cluster and not co-located with either part of the cluster itself. The cluster nodes that receive arbitration services are not suitable hosts, because disruption of a cluster site that hosts the external arbitrator would defeat its purpose.

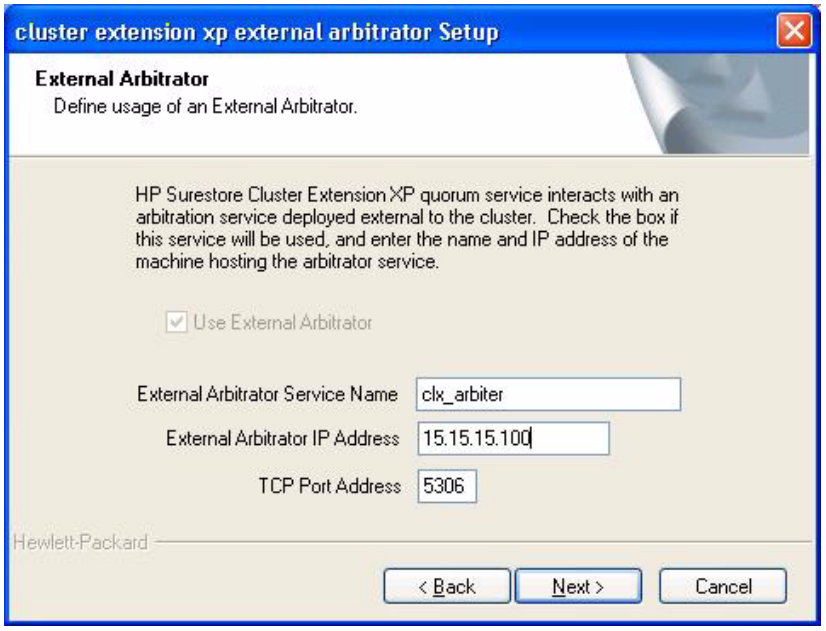
Consequently, installation of the external arbitrator on one of the cluster nodes for which it provides arbitration is not supported.

Procedure

1. Download the installation package into a temporary folder on the system.
2. Extract the install package to folders **hpclxxp** and **hpclxextarb** (created during extraction).
3. Launch **setup.exe** from the **hpclxextarb** folder.
4. Follow the on-screen instructions until the External Arbtitrator dialog box appears.

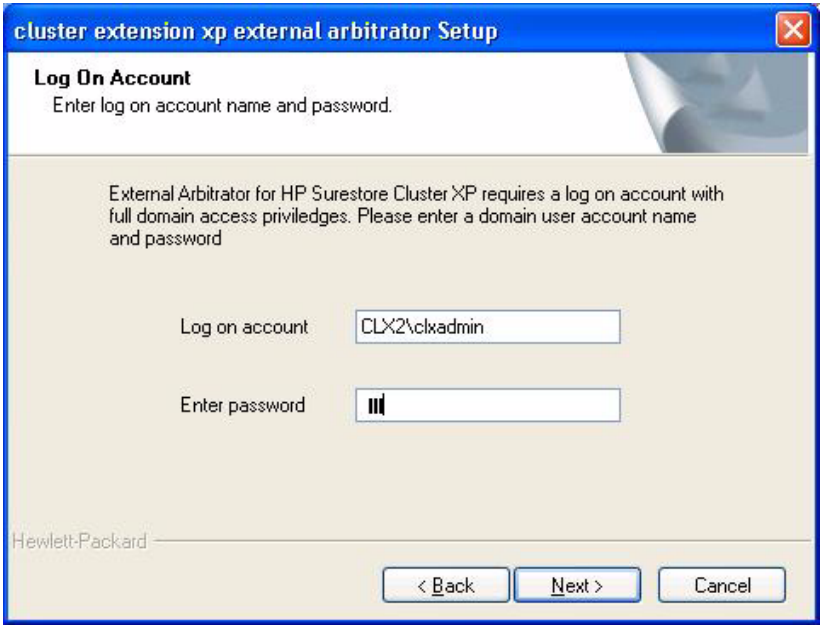
5. In the external arbitrator dialog box, enter the IP address for the external arbitrator. This is usually the node's public IP address.

Example



If you change the default name and port address, you must ensure that all cluster host nodes that use the arbitrator and Active Directory services are updated.

6. Enter a domain user account name and password with sufficient privileges to access the domain that contains the dispersed cluster.



7. Choose Next to start the arbitrator service. When finished, and if Active Directory was selected earlier, proceed to the next section to record information about the external arbitrator with the Active Directory services.
8. Document all configuration data for later upgrades. You can review the configuration data in the **%WINDIR%\system32\clxqarbs.ini** file.

Problems during Cluster Extension XP external arbitrator installation

If you provide an incorrect domain or user for the arbitrator service during installation, the installation procedures will not be able to register the **ClxQArb** service. The installation procedure will instruct you to re-enter the correct domain or user.

Caution *During the deinstallation, do not use the Modify or Repair functions of the Setup program. Select Remove to deinstall the arbitrator.*

Identifying the external arbitrator in the Active Directory

The Active Directory can be used to store information about the external arbitrator. This ensures that the address lookup for the arbitrator is not solely dependent on a local domain controller that may be co-located with one of the data centers. To edit Active Directory services, you must install the Active Directory Service Interfaces (ADSI) Edit snap-in, which is included as part of Windows 2000 or Windows 2003 Administrator Tools.

1. Open an MMC session by launching **mmc.exe**.
2. Click Console in the main menu, and then click Add/Remove Snap-In.
3. In the Add/Remove Snap-In dialog box, click [Add], and then select to add ADSI Edit. Close the dialog box.
4. Right-click the ADSI Edit object and connect to the Active Directory domain controller for your domain using the Domain NC naming.

   Contact your domain administrator for help in obtaining credentials with permissions to make changes to Active Directory.
5. Right-click on the domain, select New, and then Object.
6. Create a container object for external arbitrator.
7. Right-click the new external arbitrator container, select New, and then Object.
8. Create a computer object with the value set to **External_Arbiter**. Enter **ClxqArbiter** for the **sAMAccountName**.
9. Click [More] to set the value of the **location** attribute.
10. Enter the value of the **location** attribute for the computer object to equal the IP address and arbitrator listening port (for example, *www.xxx.yyy.zzz* **5306** where *www.xxx.yyy.zzz* represents the IP address of the system where you installed the external arbitrator and 5306 is the default port).
11. Click [Set] to register the value, then click [OK].
12. Save the change and exit ADSI Edit.
13. Set up the domain trust properties. The account the installer specifies for the external arbitrator must be a domain account, and that domain must be trusted by the Active Directory domain.

Troubleshooting

Log files

Log files are shown below to assist you in locating and identifying problems. Timestamps, component IDs, and message IDs are not shown in the log file examples.

The **%WINDIR%\clxq.log** file shows the correct initialization of the quorum service as follows.

```
[INFO] Current GMT/UTC [Thu Oct 02 21:25:59 2003 ]
[INFO] [DebugLevel=1]
[INFO] [LogFile=L:\WINDOWS\clxq.log]
[INFO] External Arbitration is enabled
[INFO] [CommandDevice=Volume{563a9aac-e945-11d7-bde8-505054503030}]
[INFO] [ControlDevice1(S)=Volume{563a9aae-e945-11d7-bde8-505054503030}]
[INFO] [ControlDevice2(X)=Volume{563a9aaf-e945-11d7-bde8-505054503030}]
[INFO] [ControlDevice3(Y)=Volume{563a9ab0-e945-11d7-bde8-505054503030}]
[INFO] [CommandDevice=PhysicalDrive2]
[INFO] [ControlDevice1(S)=PhysicalDrive30]
[INFO] [ControlDevice2(X)=PhysicalDrive31]
[INFO] [ControlDevice3(Y)=PhysicalDrive32]
[INFO] [QuorumPortTidLunSerialSSIDLDEVNUMLDEV]

[INFO] [LocalCL1-C(2 0x2)15(0xf)46(0x2e)20030(0x4e3e)4(0x4)168(0xa8)1]

[INFO] [RemoteCL2-K(25 0x19)15(0xf)84(0x54)20035(0x4e43)4(0x4)218(0xda)1]

[INFO] [Control1PortTidLunSerialSSIDLDEVNUMLDEV]

[INFO] [LocalCL1-C(2 0x2)15(0xf)47(0x2f)20030(0x4e3e)4(0x4)169(0xa9)1]

[INFO] [RemoteCL2-K(25 0x19)15(0xf)85(0x55)20035(0x4e43)4(0x4)219(0xdb)1]

[INFO] [Control3PortTidLunSerialSSIDLDEVNUMLDEV]

[INFO] [LocalCL1-C(2 0x2)15(0xf)49(0x31)20030(0x4e3e)4(0x4)171(0xab)1]

[INFO] [RemoteCL2-K(25 0x19)15(0xf)87(0x57)20035(0x4e43)4(0x4)221(0xdd)1]

[INFO] Init check succeeded
[INFO] The wait time for cluster service startup is [10] seconds
[INFO] Cluster service attempts to start
[INFO] Detected cluster service status: [SERVICE_START_PENDING]
[INFO] HP CLX Quorum Filter Driver found, version [1.1]
[INFO] Filter Timeout value is set to 8 seconds
[INFO] Set Filter Passthrough value to KLICKITAT_FORWARD_3R_ONCLEANUP succeeded
[INFO] Detected cluster service status: [SERVICE_START_PENDING]
[INFO] Waiting for requests to time out. Retrying ...
[INFO] Detected cluster service status: [SERVICE_START_PENDING]
[INFO] Waiting for requests to time out. Retrying ...
[INFO] Detected cluster service status: [SERVICE_RUNNING]
```

If the **clxq.log** file shows errors referring to ***_RPort initialization** error or a convert GUID error, then the initialization was not successful.

```
[ERR] Function DeviceIoControl() to device
[\\?\Volume{6735536f-da7f-11d7-8e14-806e6f6e6963}] failed.
Error code [1167]
```

```
[ERR] Failed to convert GUID
[6735536f-da7f-11d7-8e14-806e6f6e6963] to physical drive number
```

These errors can occur when using Terminal Service sessions during the installation of Cluster Extension XP.

In such a case, the installation on a node that shows these or similar symptoms must be repaired. Use the **Repair** option of Cluster Extension XP in **Add/Remove Programs** and reboot the node afterwards.

In rare cases where the GUIDs were not available during installation of Cluster Extension XP, a rerun of the above installation procedure is necessary.

- In those cases you must re-create the GUIDs while all quorum service control disk pairs are paired (in PAIR state) and then split all quorum service control disk pairs.
- After this, reboot all nodes and repair the Cluster Extension XP installation using the Repair feature on each node in the cluster.
- If the **clxq.log** shows a “mismatch error.” You can use the **clxqr** utility to repair and reinitialize the quorum service disk pairs. See “Quorum service recovery” in *HP StorageWorks Cluster Extension XP: User’s Guide*.

Resolving quorum service problems

Problem **During setup, the installation program is unable to detect the quorum disk and fails.**

Solution Verify that the quorum disk is accessible from Windows Explorer, and then try again.

If the quorum is not visible in Windows Explorer, make sure that the cluster service is running. Move the cluster group to the node where the installation is being done and refresh Windows Explorer before starting Setup again. (Disable and re-enable the quorum disk in Disk Manager; then, if using Remote Desktop in Windows 2000, reset the Terminal Services session from the Terminal Service Manager. Upon the next connection, the disk should be visible.)

Problem **The Setup command cannot find the Command Device, sufficient control devices, or other resources, and is terminated.**

Solution The installation program examines your system to look for the requisite disk resources. If resources are not found, it terminates installation after identifying the type of resource it could not find. If Setup fails a second time for the same reason, contact your HP service representative to ensure that the storage array is properly configured for Continuous Access operation, to include designation of a Command Device.

The service representative must check the array for three CVS or single LDEV volumes configured to the Fibre Channel port for the local host node. The CVS or single LDEV volumes must not be included as part of the cluster disk resources. Additionally, the volumes must not be assigned drive letters. If the installation program reports it is unable to locate a supported Fibre Channel host bus adapter or disk array, ensure that those required devices are properly installed, and drivers are loaded and visible to the Windows device manager. Then restart the installation process.

Problem **The server cannot detect the quorum disk, although the cluster node owns the cluster group.**

Solution If the server is accessed from Terminal Services, Windows Explorer is not always properly refreshed. From Disk Management in MMC, the disk is visible and includes the volume label and drive letter; however, the disk Properties indicates a disk capacity of 0 bytes. Resetting the Terminal Services session and re-establishing the connection sometimes resolves this problem. If not, use the primary console to continue administration of the node.

Problem **The installation program reports that it is unable to locate a supported Fibre Channel host bus adapter or disk array.**

Solution (HP service representative only) Check the disk array for three CVS or single LDEV volumes configured to the Fibre Channel port for the local host node. The CVS or single LDEV volumes must not be included as part of the cluster disk resources. Additionally, the volumes must not be assigned drive letters. Ensure that these required devices are properly installed and that drivers are loaded and visible to the Windows device manager. Then restart the installation process.

Installing Cluster Extension XP resource types

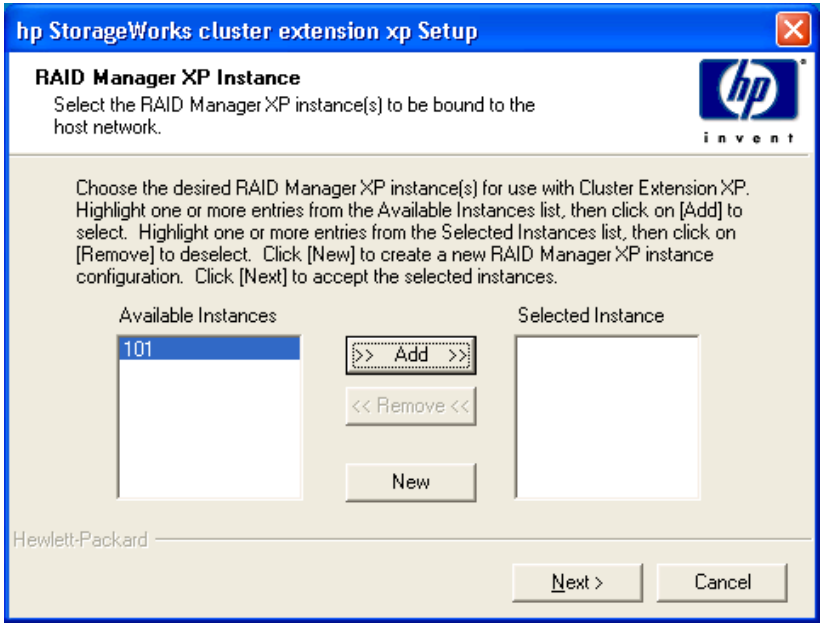
This procedure installs the following Cluster Extension XP components:

- resource DLL **clxmscs.dll**
- cluster administrator extension DLL **clxmscsex.dll**
- pair/resync monitor components **clxchkd** and **clxchkmon**
- RAID Manager XP service **clxraidmgr**
- **clxrun** command line interface
- additional components

Caution *Cluster Extension XP adds a resource type DLL to the Microsoft Cluster Service. The association with this resource type DLL is lost during deinstallation of the cluster software. Every new installation, removal, or reinstallation of the Microsoft Cluster Service requires running Repair for the Cluster Extension XP "Cluster resource type" setup program.*

1. Specify the RAID Manager XP instances used for Cluster Extension XP resources that will be started and monitored by the RAID Manager XP Service.

Example



2. Enter the password for the user name used to run this service. Use the same password as for the Cluster administrator user.
3. Verify that the RAID Manager XP instances are started. If there is a problem starting the RAID Manager service, you will be instructed to manually start it from the Services panel in the MMC.

   If problems persist, examine the **horcmX.conf** file in the system root directory, or reconfigure existing instances by selecting New in the RAID Manager XP Instance dialog box (see step 1 above) and enter an existing instance number.
4. Check whether your Microsoft cluster offers the new resource type “Cluster Extension XP.”

   You can register the resource DLL and cluster extension (GUI) DLL manually if the resource type “Cluster Extension XP” is not available. For instructions, see “Registering the Cluster Extension XP resource manually” (page 121).

Configuring Cluster Extension XP resources

The default configuration can be modified to fit your Microsoft Cluster Service and disk array environment. Before configuring the Cluster Extension XP resource, review the Microsoft Cluster Service resource properties of the Cluster Extension XP resource type.

Related information

For information about resources and to change the default settings, see *HP StorageWorks Cluster Extension XP: User's Guide*.

RAID Manager XP startup at system boot

To enable RAID Manager XP instances to be started at system boot, specify the instance numbers during the Cluster Extension XP installation process.

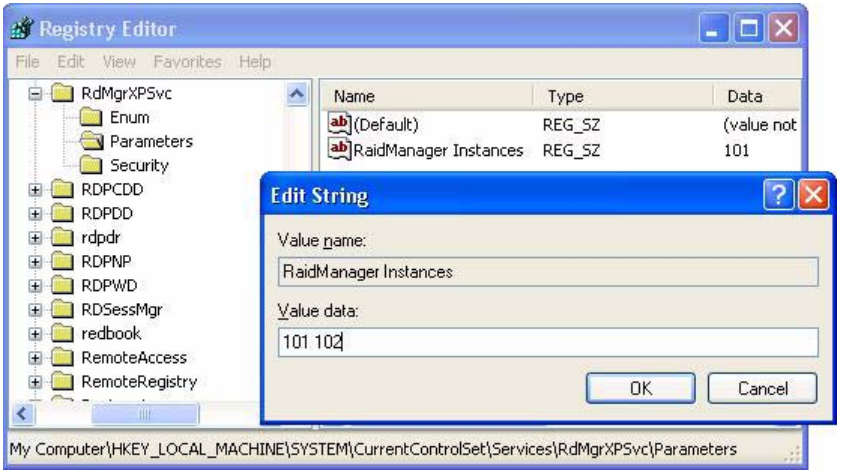
If you need to change the instance number later, run Repair from the setup Maintenance window, or edit the **RaidManager Instances** value in the Windows Registry:

1. Click **Start**.
2. Click **Run**.
3. Enter **regedit** in the “Open:” box.
4. Open the Parameter folder in the following path:

   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\RdMgrXPSvc
5. Click on the **RaidManager Instances** parameter and select “Modify” from the Edit menu.
6. Enter/change the instance numbers in the “Value data” box.

   Several instances can be entered, separated by spaces.

Example



7. Click **OK**.
8. Restart the RAID Manager XP Service.

Pair/resync monitor configuration

The pair/resync monitor verifies whether the requesting server is allowed to access information in the pair/resync monitor.

Remote access hosts file

The names of the remote systems must be configured in a remote access hosts file:

clxhosts.txt

By default this file is located in the following directory:

C:\Program Files\Hewlett-Packard\Cluster Extension XP\conf

This file is automatically generated. The access file is formatted with one host name per line. Blank or empty lines are ignored. Comments in the file are not supported.

Configuring the port for the pair/resync monitor remote communications

The **services** file must contain the port entries for the pair/resync monitor.

The **services** file is located in the following directory:

%SystemRoot%\system32\drivers\etc

The user must choose a port and add the following entry:

clxmonitor *nnnnn*/**tcp**

where *nnnnn* is the chosen port number.

Registering the Cluster Extension XP resource manually

The following commands can be executed from the Microsoft Cluster Service command line to register the Cluster Extension XP resource manually when a problem has occurred during installation.

1. Check whether the Cluster Extension XP resource type is registered with Microsoft Cluster Service:

   \cd %SystemRoot%\system32
   cluster resourcetype

2. Register the Cluster Extension XP resource type with Microsoft Cluster Service:

   cluster resourcetype "Cluster Extension XP" /CREATE /DLLNAME:clxmscs.dll /TYPE:"Cluster Extension XP"

3. Check whether the Cluster Extension XP cluster extension DLL is registered with Microsoft Cluster Service to provide the Microsoft Cluster Service Cluster Administrator GUI functionality:

   cluster resourcetype "Cluster Extension XP" /PROPERTIES

4. Register the Cluster Extension XP cluster extension DLL with Microsoft Cluster Service:

   cluster /REGADMINEXT: "clxmscsex.dll"

Maintenance and repair of Cluster Extension XP

Any time the installation program is run after one or more product components are installed, it starts up in a Maintenance mode. In this mode, the user can optionally add or remove individual components, repair or update installed components, or remove all components of Cluster Extension XP. Use the Setup Maintenance screen to make installation changes.

Modify function

Selecting Modify from the Maintenance dialog box allows you to add or remove Cluster Extension XP components by checking or clearing the check box associated with each component. Only those components with a checked box will be installed; all other components will be removed.

If Cluster Extension XP resource type is already installed and there are no changes to the list of selected components, the Modify mode provides the opportunity to change the RAID Manager XP settings. However, the preferred method of updating RAID Manager XP is to use the Repair function. The Repair function is more complete and ensures that all requisite files and registry settings are in place.

Repair function

Selecting Repair from the Maintenance dialog box initiates a search for installed components, and then reinstalls them without having to uninstall them first. The Repair function enables changes to component configurations to be made easily, in most instances, without disrupting the cluster service.

For the Cluster Extension XP resource type, Repair allows the user to select instances of RAID Manager XP from a list of detected configurations. The user can also create new instance configurations and then add the newly created instances to the list of instances to be installed. This feature also allows the user to overwrite an existing configuration by choosing to create

a new instance and then entering the instance number of the configuration to be replaced.

For the Cluster Extension XP quorum service, Repair allows the user to select a different command device and different control devices. Selecting the same devices used in a previous installation or repair refreshes the configuration settings on the local system and on the dispersed data center. Repair also provides the opportunity to add, modify, or remove Active Directory features for the quorum service.

Recommendation When making changes to the quorum or moving the quorum to a new disk, uninstall the quorum service, assign the quorum to a new disk, and then reinstall the quorum service.

After user-definable options are set, component files are recopied and the registry is refreshed with the new data. When making changes to the quorum service (especially when changing the quorum disk), the server must be rebooted afterwards. Otherwise, key components started at boot time will not be able to register or invoke the new configuration.

Tip Although you can change the logon password for Cluster Extension XP services during a Repair, it will not update the password for other services that use that same logon account, such as the cluster service. The preferred method is to change the password in the Logon Properties tab of the target service in the Services pane where all services affected by a password change can be easily accessed.

Remove function

Selecting Remove from the Maintenance dialog box will remove all Cluster Extension XP components. Before proceeding with any deinstallation, see “Removing the Cluster Extension XP resource type” (page 124) and “Removing the quorum service” (page 125).

Removing your Cluster Extension XP installation

Removing the Cluster Extension XP resource type

To remove the Cluster Extension XP resource type from the system, you must first remove the individual Cluster Extension XP resources. Refer to the Microsoft Cluster documentation for instructions about how to remove resources.

1. Before you can remove the Cluster Extension XP resource type from the system, first either stop the application groups or switch the applications groups that contain a Cluster Extension XP resource to another system.
2. Remove the node from the list of possible owners and from the node name list of the Cluster Extension XP resource.
3. Open the Add/Remove Programs utility from the Control Panel. Select HP StorageWorks Cluster Extension XP in the Change or Remove Programs pane. In the setup maintenance Welcome dialog, select Modify to remove only the resource type while leaving other components installed
4. Ensure that Cluster Resource Type is not checked, then click [Next]. Select Remove to remove all Cluster Extension XP components. For more information, see “Maintenance and repair of Cluster Extension XP” (page 122).

Disabling the Cluster Extension XP resource DLL

Before you can disable the resource DLL, you must first stop the resource group or switch the resource group to another system.

To remove the Cluster Extension XP resource from the cluster group:

1. Confirm whether the resource group is online or offline.

2. If the resource group has been taken offline, you can remove the Cluster Extension XP resource from the resource group.

   If the resource group is online, take the resource group offline or switch the resource group with the following command from the Microsoft Cluster Service command line:

   cluster group *resource_group*

   cluster group *resource_group* **/moveto:** *system_name*

   cluster group *resource_group*

   or:

   cluster group *resource_group* **/offline**

   cluster group *resource_group*

Related information For information about how to remove a resource, see *HP StorageWorks Cluster Extension XP: User's Guide*.

Removing the quorum service

To remove the quorum service on one or more host nodes, first move the cluster group to another host node. If deactivating the cluster at one site, begin the uninstall on servers at that site.

1. Open the Add/Remove Programs utility from the Control Panel.
2. Select HP StorageWorks Cluster Extension XP in the Change or Remove Programs panel.
3. In the setup maintenance Welcome dialog, select Modify to remove only the quorum service while leaving other components installed
4. Ensure that Quorum Service is not checked, then click [Next].
5. Select Remove to remove all Cluster Extension XP components.

   For more information, see "Maintenance and repair of Cluster Extension XP" (page 122).

Recommendation Remove the Cluster service or set the Cluster service's Startup type to Manual in the Services panel of the MMC. If this is not done and

Cluster service attempts to restart before the uninstall is completed, the Cluster service will fail with unpredictable results.

6. Reboot the server.
7. If removing the quorum service on all four host nodes, be sure that the site where you want to maintain the cluster is the same site that is the last to own the cluster group.

Removing the Cluster Extension XP external arbitrator

Before removing the Cluster Extension XP external arbitrator from the system, you must

1. Stop the **ClxQArb** service in the Services window on the system hosting the arbitrator.
2. Open the Add/Remove Programs utility from the Control Panel. Select **cluster extension xp external arbitrator** in the Change or Remove Programs pane.
3. Select Remove to remove the external arbitrator.
4. For more information, see "Maintenance and repair of Cluster Extension XP" (page 122).

Caution *During deinstallation, do not use the Modify or Repair functions of the Setup program. Always use Remove to deinstall the arbitrator.*

Upgrading Cluster Extension XP

Upgrading Cluster Extension XP: offline upgrade

This is the recommended procedure for upgrading Cluster Extension XP. However, this procedure requires application downtime as it involves a complete uninstall and re-install of Cluster Extension XP. If this downtime is not acceptable, perform the procedure outlined in "Upgrading from Cluster Extension XP version 2.03.00 and later only: online upgrade" on page 129.

Note *When upgrading from versions 2.02.00 and earlier, use only this procedure (offline upgrade).*

Upgrading from Version 2.01.00 only

1. Cluster Extension XP 2.01.00 did not create a service dependency between **ClxQSvc** and Microsoft Cluster Service **ClusSvc** during installation. The dependency had to be added manually. When de-installing CLX 2.01.00, this dependency must be removed manually; otherwise the Cluster service will not start and the latest version of CLX will not be able to be installed. Additionally, the following error message displays:

   ```
   Could not start the Cluster service on Local
   Computer. Error 1075: The dependency service does
   not exist or has been marked for deletion.
   ```

   To manually remove the service dependency use the following command:

```
sc.exe config ClusSvc depend= ClusNet/RpcSs/W32Time/netman/WMI
```

   The **sc.exe** program is provided with the Windows 2000/2003 Server Resource Kit.

2. Completely uninstall the previous version of Cluster Extension XP on all nodes. Refer to "Removing your Cluster Extension XP installation" on page 124 (or follow the uninstall procedures for your current Cluster Extension XP version.)

Upgrading from version 2.02.00 and earlier only

3. Using Disk Management, delete the partitions on the three Cluster Extension XP quorum service control devices and the RAID Manager Command devices. Do this on every node.
4. Install the new Cluster Extension XP version on all nodes. Refer to “Install Cluster Extension XP” on page 100.

Upgrading from Cluster Extension XP version 2.03.00 and later only: online upgrade

Use this upgrade procedure when minimal application downtime is necessary. If you are installing Cluster Extension XP for the first time, do not use this procedure. Refer to “Install Cluster Extension XP” on page 100.

The following steps assume that the quorum disk resource (Cluster Group) is online on the first node in the primary data center DC_A, which is the primary volume (PVOL) of the quorum disk pair. These steps also assume that the cluster group containing the quorum disk resource is called “Cluster Group”.

These assumptions simplify the upgrade procedure. However, the quorum disk resource can be online in either of the two data centers.

1. Open the Services window on all nodes in the cluster and pause the **ClxQSvc** service by right-clicking on the service name and selecting **Pause**.
2. Split the quorum disk pair and the S disk (status disk or control disk 1) pair using the **pairsplit –S** command.
3. Move the Cluster Group to the first node in DC_B.

   This makes the Cluster Group temporarily unavailable.

   Note: If the quorum disk resource (Cluster Group) is online on any node in the secondary data center (DC_B), ignore this step.

The next step may require application downtime.

4. Move all applications to any node(s) in DC_A. **If applications are already running on node(s) in DC_A proceed to the next step**.

5. Remove Cluster Extension XP's cluster service resource type and quorum service from the first node in DC_B (the node that currently owns the Cluster Group) using the **Change/Remove** button of the Cluster Extension XP installation in the **Add/Remove Programs** window.

   You do not need to remove the Cluster Extension XP resources from the cluster configuration in the Cluster Administrator window. Removing them may cause error messages when moving groups between the nodes later.

   For any additional nodes in DC_B:

   a. Move the Cluster Group to the current node.

   b. Uninstall Cluster Extension XP's cluster service resource type and quorum service.

   This makes the cluster group temporarily unavailable.

6. Move the Cluster Group to the first node in DC_A.

   This makes the Cluster Group temporarily unavailable.

7. Reboot the first node in DC_B.

   If there are additional nodes in DC_B, reboot each node.

Note: At this point Cluster Extension XP has been uninstalled on all nodes in DC_B and each node in DC_B has been rebooted.

8. Move the Cluster Group to the first node in DC_B.

   This makes the Cluster Group temporarily unavailable.

9. Install Cluster Extension XP's cluster service resource type and quorum service.

   For any additional nodes in DC_B:

   a. Move the Cluster Group to the current node.

   b. Install Cluster Extension XP's cluster service resource type and quorum service.

(Windows 2000 only) If you use Terminal Services, in order to update all windows you must reset the Terminal Service session and create a new Terminal Services session before you can install Cluster Extension XP.

Caution *Do not create disk pairs during the installation of Cluster Extension XP. If disk pairs have been created, split the quorum disk and control disk 1 again with the* **pairsplit -S** *command.*

10. Move the Cluster Group to the first node in DC_A.

    This makes the Cluster Group temporarily unavailable.

11. Open the Services window on the first node in DC_A and resume the **ClxQSvc** service by right-clicking the service name and selecting **Resume**.

    Cluster Extension XP quorum service recognizes that the quorum disk pair and the status disk pair are split and recovers the PAIR state.

    Check the **%WINDIR%\clxq.log** file for quorum service self-recovery completion. You can also use the **pairdisplay –fc** command to check resynchronization progress.

12. Reboot the first node in DC_B.

    If there are additional nodes in DC_B, reboot each node.

Note: At this point the latest version of Cluster Extension XP has been installed on all nodes in DC_B and each node in DC_B has been rebooted.

The next step requires application downtime.

13. Move all applications to any node in DC_B.
14. Remove Cluster Extension XP's cluster service resource type and quorum service from the first node (node that owns the Cluster Group) in DC_A using the **Change/Remove** button of the Cluster Extension XP installation in the **Add/Remove Programs** window.

    You do not need to remove the Cluster Extension XP resources from the cluster configuration in the Cluster Administrator window. Removing them may cause error messages when moving groups between the nodes later.

    For any additional nodes in DC_A:

    a. Move the Cluster Group to the current node.

    b. Remove Cluster Extension XP's cluster service resource type and quorum service.

15. Move the Cluster Group to the first node in DC_B.

    This makes the Cluster Group temporarily unavailable

16. Reboot the first node in DC_A.

    If there are additional nodes in DC_A, reboot each node.

Note: At this point Cluster Extension XP has been uninstalled on all of the nodes in DC_A and each node in DC_A has been rebooted.

17. Open the Services window on all nodes in DC_B and pause the **ClxQSvc** service by right-clicking the service name and selecting **Pause**.
18. Split the quorum disk pair and the S (status disk or control disk 1) pair using the **pairsplit -S** command.
19. Move the Cluster Group to the first node in DC_A.

    This makes the Cluster Group temporarily unavailable.

20. Install Cluster Extension XP's cluster service resource type and quorum service.

    For any additional nodes in DC_A:

    a. Move the Cluster Group to the current node.

    b. Install Cluster Extension XP's cluster service resource type and quorum service.

(Windows 2000 only) If you use Terminal Services, in order to update all windows you must reset the Terminal Service session and create a new Terminal Services session before you can install Cluster Extension XP.

Caution *Do not create disk pairs during the installation of Cluster Extension XP. If disk pairs have been created, split the quorum disk and control disk 1 again with the* **pairsplit -S** *command.*

21. Move the Cluster Group to the first node in DC_B.

    This makes the Cluster Group temporarily unavailable

22. Resume the **ClxQSvc** service on each node in DC_B by opening the Services window and right-clicking the service name and selecting **Resume**.

    Cluster Extension XP quorum service recognizes that the quorum disk pair and the status disk pair are split and recovers the PAIR state.

    Check the **%WINDIR%\clxq.log** file for quorum service self-recovery completion. You can also use the **pairdisplay –fc** command to check resynchronization progress.

23. Reboot the first node in DC_A.

    If there are additional nodes in DC_A, reboot each node.

Note: At this point the latest version Cluster Extension XP has been installed on all nodes in DC_A and DC_B and each node has been rebooted.

24. Check the status of the disk pairs.

    The quorum disk pair and the first Cluster Extension XP quorum service control disk pair (status) should be the primary volume (PVOL) in the data center where the Cluster Group is online.

    The second and third quorum service control disk pairs should be in SMPL state.

25. To take advantage of the continuous availability provided by Cluster Extension XP, install the external arbitrator component on a system that is external to both data centers.

    To test the quorum service, move the cluster group from one cluster node to the next. The data center where the cluster group is online should show the quorum disk pair and the first quorum service control disk pair as the primary volume (PVOL). If not, contact your HP representative for assistance.

5

Installing Cluster Extension XP in VCS environments

Cluster Extension XP provides three standard installation packages for Sun Solaris. The **HWPclxvcs** package includes the Cluster Extension XP integration with VERITAS Cluster Server (VCS). The **HWPclxgen** package includes the Cluster Extension XP generic interface. The **HPOvLic** package includes the HP AutoPass licensing components. All three packages are bundled into a single data stream format package named **HWPclxXP.pkg**.

Prerequisites

The following tasks must be done prior to the installation and configuration of your Cluster Extension XP for VCS environment:

- Check “Installation prerequisites” on page 27
- Check supported software versions, patches, Fibre Channel HBA firmware, and driver versions.
- Install and configure RAID Manager XP for the desired operating system.
- Install and configure VERITAS Volume Manager (VxVM).
- Install and configure VERITAS Cluster Server.
- Install and configure JRE (Java Runtime Environment) 1.3 or later.

Supported versions

Cluster Extension XP supports

- VCS 3.5 on Solaris 7 and Solaris 8 and Solaris 9
- VCS 4.0 on Solaris 9

Recommendation Review the latest documentation and release notes for each of the above products.

RAID Manager XP instances

RAID Manager XP is available as a **cpio** archive and must be installed on each clustered system.

The RAID Manager XP instance numbers used for the Cluster Extension XP resource must be the same among all systems for which the resource is configured.

Several RAID Manager XP instances can be configured. If specified, the Cluster Extension XP resource will use the alternative instance when an instance becomes unavailable.

The RAID Manager XP instances should be running at all times to provide the fastest failover capability. Cluster Extension XP provides a script to include the RAID Manager XP instance startup in the system boot process.

Recommendation For rolling disaster protection, use the same RAID Manager XP instances to manage the BC pairs.

RAID Manager XP device groups

One device group must be configured for each service group's disk set. This disk set must include all disks of the disk groups used for the entire highly available application. A device group can contain several disk groups.

Rolling disaster protection

For rolling disaster protection, create the BC disk pair with the **no_read** option to hide it from the disk management layer.

RAID Manager XP startup

To enable RAID Manager XP instances to be started at system boot time, configure the **/etc/init.d/raidmgr** file.

Example The following example enables instances 11 and 22.

```
#! /usr/bin/ksh
# Copyright 2000 Hewlett-Packard, All Rights Reserved.
# Generic init script for RAID Manager XP provided with Cluster
# Extension XP
#

# Note that there are two methods by which we can start
# RAID Manager XP at boot time.
# The default method is to look for files of the form
# /etc/horcm<instance number>.conf
# and thus determine the instance numbers.
#
# However, we recommend to statically define the instances which need
# to be started, then uncomment and edit the following line:
#
RAIDMGR_INSTANCES="11 22"
```

VERITAS Volume Manager configuration

The shared data disks residing on the XP disk array, are mirrored to the remote data center using Continuous Access XP. To access the mirrored disks in read/write mode, the primary disk (P-VOL) of the mirrored disk pair must be in the local (currently active) data center. To make the disk (S-VOL) accessible to the remote system, switch the personalities of the disks:

- Create disk groups, logical volumes and file systems on the primary system for all service groups.
- Use the RAID Manager XP **horctakeover** command to switch the RAID Manager XP device groups from site A to site B in order to make the shared disks accessible.
- Import disk groups, and logical volumes and file systems on the remote systems after creating the mount points on each system.
- Make sure that the volume groups are not automatically activated at system boot time.
- Do not configure the VxVM **rootdg** on Continuous Access XP disk pairs.
- Configure Dynamic Multi Pathing.

Installing Cluster Extension XP

On a UNIX system:

1. Log in as **root**.
2. Download the installation package to a temporary directory on your system.
3. Uncompress and extract the install package to the **hpclxxp** sub-directory (created during extraction).
4. **Change directory** to the **hpclxxp** directory.
5. Type the following command to install the Cluster Extension XP agent:

Sun Solaris

```
#pkgadd –d HWPclxXP.pkg
```

The pkgadd program displays the packages available in the HWPclxXP.pkg bundle and prompts you to select the package(s) you wish to install. Type “all” to install all packages or select individual packages.

If you choose to install individual packages, the HPOvLic package is a prerequisite for the Cluster Extension XP packages and must be installed before you install the Cluster Extension XP packages.

6. After the installation is complete, follow the instructions in Chapter 2 “Cluster Extension XP licensing” on page 33 to retrieve and install the necessary licenses for Cluster Extension XP packages.

Repeat the preceding steps on each system that will run the Cluster Extension XP resource in the cluster.

Pair/resync monitor configuration

The pair/resync monitor checks whether the requesting server is allowed to have access to the pair/resync monitor.

Remote access hosts file

The names of the remote systems must be configured in a remote access hosts file:

clxhosts

By default this file is located in the following directory:

/etc/opt/hpclx/conf

The access file is formatted with one host name per line. Blank or empty lines are ignored. Comments in the file are not supported.

Configuring the port for the pair/resync monitor remote communications

The **services** file must contain the port entries for the pair/resync monitor.

The **services** file is located in the following directory:

/etc/services

The user must choose a port and add the following entry:

clxmonitor *nnnnn*/**tcp**

where *nnnnn* is the chosen port number.

Log level reporting

The default setting for the pair/resync monitor's log facility is log level **WARNING** in the syslog. Solaris does not log warning messages to syslog by default.

To be able to receive messages from the pair/resync monitor in case of Continuous Access XP link failures, you must add the following line to the **/etc/syslog.conf** file:

user.warning /var/adm/messages

This line ensures that you will be notified of Continuous Access XP link failures if you use the pair/resync monitor.

Including the Cluster Extension resource type

To include the Cluster Extension XP agent in the VCS cluster:

1. Log in to the system as **root**.
2. Copy the Cluster Extension XP types configuration file.

   VCS 1.3.0 and later offers the convenient feature to import resource types from the VCS Cluster Manager GUI.

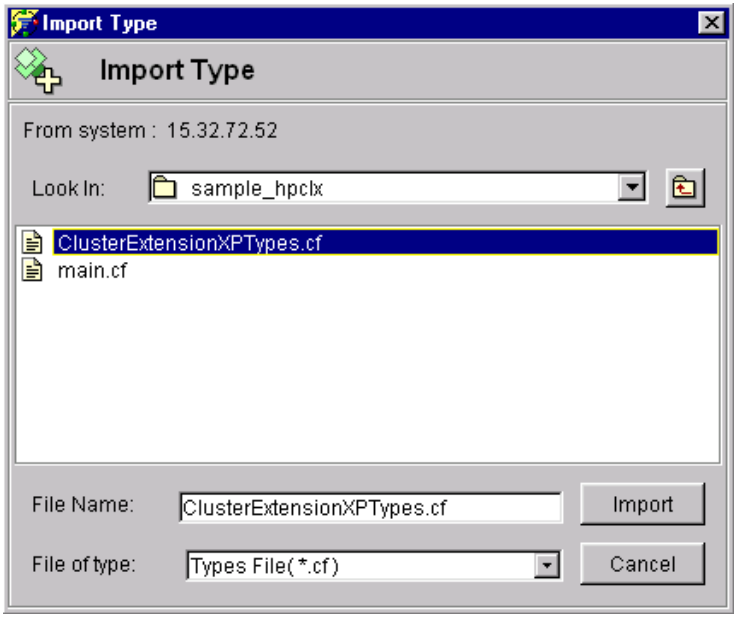
   $VCS_CONF/sample_hpclx/ClusterExtensionXPTypes.cf

   to:

   $VCS_CONF/config/ClusterExtensionXPTypes.cf

To import the Cluster Extension XP types configuration file from the VCS Cluster Manager GUI while the cluster is running:

1. Using Cluster Explorer, choose File from the menu.
2. Choose Import from the File menu.
3. Enter the path to the Cluster Extension XP types configuration file (**/etc/VRTSvcs/conf/sample_hpclx**) in the Look In box.
4. Select **ClusterExtensionXPTypes.cf** and click Import.



5. Edit the configuration file **$VCS_CONF/config/main.cf** to include the following line:

```
include ClusterExtensionXPTypes.cf
```

Changing the default agent configuration

To change Cluster Extension XP resource attributes, take the resource offline. Changing an attribute of the Cluster Extension XP resource while the resource is running is not supported.

Related information

To change the default attribute setting, and to enable the pair/resync monitor, see *HP StorageWorks Cluster Extension XP: User's Guide*.

Disabling the Cluster Extension XP agent

Before you can disable the agent, you must first stop the service group or switch the service group to another system.

To remove the Cluster Extension XP resource from the service group, you must confirm whether the service group is online.

- If the service group is online, take the service group offline or switch the service group with the following command from the VCS command line:

  `#hagrp –state service_group –sys system_name`

  `#hagrp –switch service_group –to system_name`

  or

  `#hagrp –offline service_group –sys system_name`

- If the service group is offline, you can remove the Cluster Extension XP resource from the service group.

Related information

To remove the resource, see *HP StorageWorks Cluster Extension XP: User's Guide*.

Removing Cluster Extension XP

The following command will remove Cluster Extension XP from the system.

Sun Solaris (for VCS)

```
#pkgrm HWPclxvcs
```

(for generic interface)

```
#pkgrm HWPclxgen
```

Removing the HP AutoPass License Components

If there are no other package dependencies on the HPOvLic package, the HPOvLic package can be removed from the system with the following command:

Sun Solaris

```
#pkgrm HPOvLic
```

Upgrading Cluster Extension XP

The ClusterExtensionXP agent for VCS can be upgraded while the cluster is running.

If you are installing Cluster Extension XP for the first time, this section is not applicable.

Recommendation Stop the cluster on the node to be upgraded before starting the upgrade process.

To upgrade Cluster Extension XP:

1. Move the ClusterExtensionXP resources to another cluster system, or stop the ClusterExtensionXP resources.
2. Stop the ClusterExtensionXP agent with the following command:

   haagent –stop ClusterExtensionXP
3. Check the **engine_A.log** for details.
4. Deinstall Cluster Extension XP and install the new version of Cluster Extension XP.

If the Cluster Extension XP command line interface (**clxrun**) is used, make sure that all associated resources that were previously online are offline after **clxrun** has run.

Then, deinstall Cluster Extension XP Generic Interface and install the new version of Cluster Extension XP.

6

Installing Cluster Extension XP in Serviceguard for Linux environments

Cluster Extension XP provides a standard RPM installation package for Linux. The package includes the Cluster Extension XP integration with Serviceguard for Linux (SG-LX) as well as the Cluster Extension XP command line interface (CLI).

Prerequisites

The following tasks must be done prior to the installation and configuration of your Cluster Extension XP for SG-LX environment:

- Check “Installation prerequisites” (page 27)
- Check supported software versions, patches, Fibre Channel HBA firmware, and SCSI/FC HBA driver versions.
- *(Optional)* Install and configure Auto Path XP to enable Alternative Pathing and Load balancing for Linux.
- Install and configure HP StorageWorks RAID Manager XP for the desired operating system.
- Install and configure Logical Volume Manager.
- Install and configure Serviceguard on Linux.

  For the latest version, see the HP software depot:

  www.software.hp.com → High availability

Supported versions

Cluster Extension XP supports these product versions:

- Serviceguard for Linux 11.16A (B9903BA or T1521A) with Linux Disaster Recovery Data Replication Enabler (T1858AA)
- Serviceguard for Linux 11.16A includes the Linux Disaster Recovery Data Replication Enabler by default. (Installation of T1858AA is not required.)
- Cluster Extension XP supports the same Linux distributions supported by Serviceguard.

HP StorageWorks Secure Path

Secure Path is available for Linux.

Secure Path creates virtual device files (**/dev/APx**) for redundant **/dev/sdx** devices. Those **/dev/APx** devices must be used when creating volume groups to take advantage of the load balancing and path failover feature.

Secure Path provides the discovery option to create **/dev/APx** devices. To create volume groups with virtual devices you must install the LVM version provided with Secure Path.

Secure Path must be installed on all cluster systems.

RAID Manager XP instances

HP StorageWorks RAID Manager XP is available as a **cpio** archive and must be installed on each clustered system.

The RAID Manager XP instance numbers used for the Cluster Extension XP resource must be the same among all systems for which the SG-LX package is configured.

Several RAID Manager XP instances can be configured. If specified, the Cluster Extension XP resource uses the alternative instance when an instance becomes unavailable.

The RAID Manager XP instances should be running at all times to provide the fastest failover capability. Cluster Extension XP provides a script to include the RAID Manager XP instance startup in the system boot process.

Recommendation For rolling disaster protection, use the same RAID Manager XP instances to manage the BC pairs.

RAID Manager XP device groups

One device group must be configured for each SG-LX package's disk set. This disk set must include all disks of the volume groups used for the entire highly available application. A device group can contain several volume groups.

Rolling disaster protection

For rolling disaster protection, create the BC disk pair with the **no_read** option to hide it from the disk management layer.

RAID Manager XP startup

To enable RAID Manager XP instances to be started at system boot time, configure the **/etc/init.d/raidmgr** file.

Example The following example enables instances 11 and 22.

```
# Generic init script for RAID Manager XP provided with
Cluster Extension XP
#
# Note that there are two methods by which we can start
# RAID Manager XP at boot time.
# The default method is to look for files of the form
# /etc/horcm<instance number>.conf
# and thus determine the instance numbers.
#
# However, we recommend to statically define the
instances which need to be
# started, then uncomment and edit the following line:
#
RAIDMGR_INSTANCES="11 22"
...
```

Logical Volume Manager configuration

The shared data disks reside on the disk array, which are mirrored to the remote data center using Continuous Access XP. To access the mirrored disks in read/write mode, the primary disk (P-VOL) of the mirrored disk pair must be in the local (currently active) data center. To make the disk

(S-VOL) accessible to the remote system, switch the personalities of the disks:

- Create volume groups, logical volumes and file systems on the primary system for all packages.
- Use the RAID Manager XP **horctakeover** command to switch the RAID Manager XP device groups from site A to site B in order to make the shared disks accessible.
- Import volume groups and logical volumes on the remote systems after creating the mount points on each system. (**vgscan**).
- Make sure that the volume groups are not automatically activated at system boot time.
- Configure Alternative Pathing and Load Balancing for redundant FC HBAs provided with Auto Path XP (requires LVM provided with Auto Path XP).

Installing Cluster Extension XP

On a Linux system:

1. Log in as **root**.
2. Download the installation program to a temporary directory on your system.
3. Uncompress and extract the install program to the **hpclxxp** directory (created during extraction).
4. **Change directory** to the **hpclxxp** directory.
5. If a prior version of Cluster Extension XP for SG-LX is not installed, type:

   #rpm –ivh clx-2.06.00-0.i386.rpm

   If an older version of Cluster Extension for SG-LX is currently present on the system, type:

   #rpm –Uvh clx-2.06.00-0.i386.rpm
6. Add the following line to your root profile:

   PATH=$PATH:/opt/hpclx/bin
7. After installation read the **/opt/hpclx/README** file.

Repeat steps 1 to 7 on each system that will run a SG-LX package with Cluster Extension XP.

Pair/resync monitor configuration

The pair/resync monitor checks whether the requesting server is allowed to have access to the pair/resync monitor.

Remote access hosts file

The names of the remote systems must be configured in a remote access hosts file:

clxhosts

By default this file is located in the following directory:

/etc/opt/hpclx/conf

The access file is formatted with one host name per line. Blank or empty lines are ignored. Comments in the file are not supported.

Configuring the port for the pair/resync monitor remote communications

The **services** file must contain the port entries for the pair/resync monitor.

The **services** file is located in the following directory:

/etc/services

The user must choose a port and add the following entry:

clxmonitor *nnnnn*/**tcp**

where *nnnnn* is the chosen port number.

Including Cluster Extension XP in a Serviceguard package

The default Serviceguard configuration can be modified to fit your cluster and disk array environment. Before configuring the Cluster Extension XP integration, review the Cluster Extension XP objects in the user configuration file *package_name*_**clx.env** file.

Then, set the **DATA_REP** parameter in the package control script from **none** to **clx**.

Related information

For detailed information about how to configure Cluster Extension XP for integration with Serviceguard, see *HP StorageWorks Cluster Extension XP: User's Guide.*

Removing Cluster Extension XP

Before you remove Cluster Extension XP from the system, ensure that no package has the **DATA_REP** set parameter set to **CLX**. Change this parameter to **NONE**. Also ensure that the package is configured to run only on nodes in one data center with the primary volumes (PVOLs).

The following command removes Cluster Extension XP from the system.

#rpm –ev clx

Upgrading Cluster Extension XP for Serviceguard for Linux

The Cluster Extension XP software for Serviceguard can be upgraded while the cluster is running. However, it is recommended that the cluster on the node to be upgraded is stopped before starting the upgrade process.

If you are installing Cluster Extension XP for the first time, this section is not applicable.

In order to upgrade Cluster Extension XP, follow these steps:

1. Move all the Serviceguard packages using Cluster Extension XP to another cluster system or stop the packages that use Cluster Extension XP.
2. Deinstall Cluster Extension XP and install the new version of Cluster Extension XP.

   If the Cluster Extension XP command line interface (**clxrun**) is used, make sure that all associated resources are offline which were previously onlined, after **clxrun** has run.

   Then, deinstall Cluster Extension XP Generic Interface and install the new version of Cluster Extension XP as described in “Installing Cluster Extension XP” (page 154).

Glossary

BC	HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array.
CA	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array.
CLI	Command line interface.
Command View (CVXP)	HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation.
Command View XP Advanced Edition (CVXP AE)	HP StorageWorks Command View XP Advanced Edition, installs on the user-provided Device Manager server and provides a browser-based platform from which you can manage the XP family of disk arrays—even globally distributed arrays.
command device	A volume on the disk array that accepts Continuous Access or Business Copy control operations which are then executed by the disk array.
CU	Control Unit. Contains LDEVs and is approximately equivalent to SCSI Target ID.
CVS	Custom volume size. CVS devices (OPEN-x CVS) are custom volumes configured using array management software to be smaller than normal fixed-size OPEN system volumes. Synonymous with volume size customization (VSC).
DWDM	Dense wavelength division multiplexing.

emulation modes The logical devices (LDEVs) associated with each RAID group are assigned an emulation mode that makes them operate like OPEN system disk drives. The emulation mode determines the size of an LDEV:

OPEN-3: 2.46 GB
OPEN-8: 7.38 GB
OPEN-9: 7.42 GB
OPEN-E: 13.56 GB
OPEN-L: 36 GB
OPEN-V: User-defined custom size

failover Disconnecting a failed unit or path and replacing it with an alternative unit or path in order to continue functioning.

FC Fibre Channel.

fence level A level for selecting rejection of a write I/O request from the host according to the condition of mirroring consistency.

GUID Globally Unique Identifier.

HACMP IBM High Availability Cluster Multi-Processing for AIX software.

HBA Host bus adapter.

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

LDEV Logical device. An LDEV is created when a RAID group is carved into pieces according to the selected host emulation mode (that is, OPEN-3, OPEN-8, OPEN-L). The number of resulting LDEVs depends on the selected emulation mode. The term LDEV is often used synonymously with the term volume.

LUN Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.

LUSE A LUN is normally associated with only a single LDEV. The LUSE feature allows a LUN to be associated with 1 to 36 LDEVs. Essentially, LUSE makes

	it possible for applications to access a single large pool of storage. The LUSE feature is available when the HP StorageWorks LUN Configuration Manager product is installed.
MMC	Microsoft Management Console.
OPEN-*x*	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L).
OV-SAM	HP OpenView Storage Area Manager.
port	A physical connection that allows data to pass between a host and the disk array. The number of ports on an XP disk array depends on the number of supported I/O slots and the number of ports available per I/O adapter. The XP family of disk arrays supports Fibre Channel (FC) ports as well as other port types. Ports are named by port group and port letter, such as CL1-A. CL1 is the group, and A is the port letter.
primary site	Data center location that owns the Cluster Group (quorum resource).
quorum	In Microsoft Cluster Service, 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 tie-breaker and is transferred to a surviving node to ensure that data remains consistent within the cluster.
RAID	Redundant array of independent disks.
Remote Web Console (RWC)	HP StorageWorks XP Remote Web Console. A browser-based program installed on the SVP that allows you to configure and manage the disk array.
RPM	Red Hat package manager.
SCSI	Small computer system interface.
secondary site	Data center location with the mirror copy of the quorum disk pair.
SG-LX	Serviceguard for Linux.
SIM	Service information message.
SMS	System managed storage.
SNMP	Simple Network Management Protocol.

“split-brain” syndrome	A state of data corruption can occur if a cluster is reformed as subclusters of nodes at each site, and each subcluster assumes authority, starting the same set of applications and modifying the same data.
SVP	Service processor. A notebook computer built into the disk array. The SVP provides a direct interface to the disk array and is used only by the HP service representative.
TB	Terabytes.
TID	Target ID.
VCS	VERITAS Cluster Server.
Volume	On the XP array, a volume is a uniquely identified virtual storage device composed of a control unit (CU) component and a logical device (LDEV) component separated by a colon. For example 00:00 and 01:00 are two uniquely identified volumes; one is identified as CU = 00 and LDEV = 00, and the other as CU = 01 and LDEV = 00; they are two unique separate virtual storage devices within the XP array.
VSC	Volume size customization. Synonymous with CVS.
WWN	World Wide Name. A unique identifier assigned to a Fibre Channel device.

Index

A

agent
- default 144
- default configuration 144
- disabling 145

authorized resellers 13

autopass command line utility 67

AutoPass license program 35

B

backup license file 61

C

cautions
- disk pairs 131, 132
- installing quorum service 102
- removing Cluster Extension XP 79

clxautopass command line utility 67

configuration
- consolidated site 25
- one to one 23

D

documentation
- related products 11

E

Entitlement Certificate 34

evaluation license 59

evaluation license extension 35

F

files
- clxhosts 77
- services 77

firmware requirements
- XP disk arrays 29

H

HP
- storage website 13
- technical support 12

HP StorageWorks Auto Path XP
- IBM AIX with HACMP 70
- MC/SG environment 150

HP StorageWorks Cluster Extension XP
- configurations 22
- HACMP environments 75
- installation prerequisites 27
- installing 21
- removing (HACMP) 79
- removing (MC/SG) 157
- removing (VCS) 146
- supported features 29
- UNIX installations 139

HP StorageWorks RAID Manager XP
configuring (HACMP environment) 72
device group configuration (HACMP) 71
device groups (MC/SG environment) 151
device groups (VCS) 137
installing (HACMP environment) 71
instances (MC/SG environment) 151
instances (VCS) 136
Microsoft Cluster Service requirements 90
startup (HACMP) 71
HP StorageWorks Secure Path 89

I

IBM HACMP
installation of Cluster Extension XP 69
setting up 74
installation
HACMP environment 69
MC/SG environment 154
Microsoft Cluster Service environment 81
VCS environment 135
Instant On license 34

L

license
60-day Instant On 34
backup 61
evaluation extension 35, 59
importing a key 53
key recovery 66
key removal 64
keys by e-mail or fax 46
keys over the Internet 37
permanent key 34
report 60
retrieving key 35
licensing 33
Linux environment
Cluster Extension XP for MC/SG 149
LVM
configuration (HACMP) 74
configuration (MC/SG) 152

M

MC/Serviceguard (MC/SG)
integration of Cluster Extension XP 156
integration with Cluster Extension XP 149
Microsoft Cluster Service
integration with Cluster Extension XP 81

P

pair/resync monitor 30
configuration 120
configuring for HACMP 77
configuring for MC/Serviceguard 155
configuring for Microsoft Cluster Service 120
configuring for VCS 140
permanent license key 34
prerequisites
HACMP 70
MC/SG 150
Microsoft Cluster Service 88
VCS 136

Q

quorum disk
Microsoft Cluster Service configuration 83
quorum service
data center preparation 93
MSCS environment 31

R

recommendations
- changing the quorum 123
- rolling disaster protection (HACMP) 71
- rolling disaster protection (MC/SG) 151
- rolling disaster protection (MSCS) 90
- rolling disaster protection (VCS) 137
- stopping the cluster before upgrading 80

recover license key 66
related information 11
remove license key 64
report license key 60
resellers, authorized 13
resource
- configuring Cluster Extension XP 118
- disabling Cluster Extension XP DLL 124

retrieving license keys 35
rolling disaster protection
- BC disk pair creation (HACMP) 71
- BC disk pair creation (MC/SG) 152
- BC disk pair creation (MSCS) 91
- BC disk pair creation (VCS) 137
- installation 31
- recommendation (HACMP) 71
- recommendation (MC/SG) 151
- recommendation (MSCS) 90
- recommendation (VCS) 137

S

system administrator, required knowledge 10

T

technical support 12
terminology
- cluster software 15

tips
- changing the logon password 123

U

upgrading
- HACMP environment 80
- MC/Serviceguard environment 158
- Microsoft Cluster Service environment 128
- VCS environment 147

V

VERITAS Cluster Server (VCS)
- integration of Cluster Extension XP 135

W

warranty 18
websites
- HP storage 13

X

XP disk arrays
- firmware requirements 29