

# HP StorageWorks Cluster Extension XP user guide

XP48  
XP128  
XP512  
XP1024  
XP10000  
XP12000

product version: 2.06.00

seventh edition (October 2005)

part number T1609-96006

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



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*HP StorageWorks Cluster Extension XP User Guide*

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## About this guide

This guide provides information about configuring and using HP StorageWorks Cluster Extension XP in an environment where clustered systems are connected to a disaster recovery array-based mirroring solution. Cluster Extension XP allows creation of dispersed multiplatform cluster configurations with the XP disk array. Cluster Extension XP enables cluster software to automatically failover applications where data is stored and continuously mirrored from a local to a remote disk array using HP StorageWorks Continuous Access XP. This guide describes the options you have to make your disaster tolerant environment as robust as possible to keep your data available at all times.

Because the XP family of disk arrays supports a broad range of operating systems and cluster software, Cluster Extension XP can be integrated with almost any disk array-supported cluster software. This guide provides you with the necessary information to create a disaster tolerant environment of two or more data centers utilizing the XP disk array and its Continuous Access XP remote mirroring feature.

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# Cluster Extension XP features

HP StorageWorks Cluster Extension XP enables monitoring of HP StorageWorks Continuous Access XP-mirrored disk pairs and allows access to the remote data copy if an application becomes unavailable on the local site. If the application service is restarted on the remote site, after the local (primary) application service has been shut down, Cluster Extension XP uses its internal database to check whether the current disk states allow automatic access to your data, based on consistency and concurrency considerations. Integrated in the cluster software or available as command line interface for your own integration, Cluster Extension XP ensures that the data can be accessed if necessary.

Cluster Extension XP software provides these key features:

- integration into cluster software
- disaster tolerance through geographical dispersion
- automated redirection and monitoring of mirrored Continuous Access XP pairs
- command line interface for easy integration

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## Integration into cluster software

Cluster Extension XP provides tight integration with the cluster software wherever possible. Cluster Extension XP is a resource of the clustered application service (like the disk or volume group) and must be managed as such. The architecture of Cluster Extension XP allows integration with many cluster software products:

- VERITAS Cluster Server (VCS)
- IBM HACMP
- Windows 2000 Advanced Server and Datacenter Server Cluster service
- Windows Server 2003 Enterprise Edition and Datacenter Edition
- Serviceguard for Linux (SG-LX)

For the current list of supported cluster software, contact your HP representative.

---

# Cluster Extension XP processes and components

Cluster Extension XP is shipped in the appropriate format for each platform:

<b>Platform</b>	<b>Implementation</b>
VCS	agent
IBM HACMP	pre-event executable
Microsoft Cluster Service	resource DLL, quorum service, and external arbitrator
SG-LX	function call/executable

Customized solutions to failover application services must implement Cluster Extension XP through its command line interface prior to the disk activation procedure.

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## Cluster Extension XP environments

The ideal environment for a Cluster Extension XP configuration consists of at least four servers (two at each site) and separated redundant communications links for cluster heartbeats, client access and Continuous Access XP (Extension). All communications interfaces must be installed in pairs to serve as failover components, preventing single points of failure (SPOFs).

*Recommendation* Use load balancing and alternative pathing software for host-to-storage connections, such as HP StorageWorks Auto Path for IBM AIX or Secure Path for Linux and Windows operating systems. For Sun Solaris operating systems, VERITAS offers such software. These software products enable you to upgrade XP firmware while the application service is running.

Network communications links between the dispersed data centers must be redundant and physically routed differently. This prevents the “backhoe issue,” that is, where all links between data centers are cut together. This is especially important, since the cluster is more vulnerable to “split brain” syndromes. A split brain syndrome is where both data centers’ systems form new clusters which could allow access to both copies of the data. This can be prevented with physically separated network links and redundant network components. Cluster Extension XP allows you to configure the failover behavior in such a way that the application service startup procedure will be stopped if none of the remote cluster members can be reached. The default configuration of Cluster Extension XP expects the cluster software to deal with the “split brain” syndrome.

Since the disk array stores your most valuable data, this data must get across to the remote disk array. At least four Continuous Access XP links must be available when the disk arrays are connected directly and are configured for bidirectional takeover. For extended distances, extender components must be purchased. These components are able to bundle Continuous Access XP links. At least two links are necessary to provide redundancy and protection against single points of failure. Although communications links can cover considerable distances, each network segment must be extended to the dispersed data center in order to maintain a heartbeat among all servers.

*Recommendation* Use four systems to give local application service failover among local cluster systems priority over remote, more time-consuming failover procedures. When failing over, Cluster Extension XP must reconfigure the disk arrays to change the mirroring direction. This takes more time than just checking for the correct disk array disk states. On the remote site, two systems should be available in the case the failover system experiences a hardware or power failure.

The preferred Cluster Extension XP configuration is depicted on [page 29](#).

---

**Caution** *Cluster Extension XP works with only one system at each location, with a single I/O path between the server system and the disk array and a single link in each direction between disk arrays.*

*However, those configurations are not considered highly available, nor are they disaster tolerant. Therefore, Cluster Extension XP configurations with single points of failure are not supported by HP.*

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## Cluster Extension XP execution

Cluster Extension XP requires cluster software to automatically fail over and fail back among systems on a local site or between sites. Cluster Extension XP must manipulate the application startup process before disk array disks are activated. Cluster Extension XP, therefore, must be integrated as first resource (in the order of resources). To activate Continuous Access XP paired disk devices, the paired disk devices must be in read/write mode. Continuous Access XP disks are usually in read/write mode on the primary disk only; the secondary disk is in read-only mode. In case of a failover, the direction of the mirrored pair is changed by Cluster Extension XP automatically. In case of a disaster, the disk array can have several different states for disks in a RAID Manager XP device group. Cluster Extension XP decides whether those disks can be activated.

Cluster Extension XP must be installed on any server in the cluster that can run the application service in the cluster.

Cluster Extension XP stores information about the application environment in an internal object database and uses RAID Manager XP to gather information about the state of the associated disk pairs. The information about the configured disk array environment and failover behavior is transferred either directly by the cluster software or by gathering from the user configuration file.

The internal object database provides Cluster Extension XP with knowledge about supported parameters, their formats, and default values.

Disk array disk states are stored in an internal object database and a rule engine is used to process those disk states. The rule engine matches current disk states and configuration parameters with a defined rule, stores it in the database, and invokes predefined actions. Those actions prepare the disk array disks to be activated, or it stops the application service startup process if the matching rule requires it to do so.

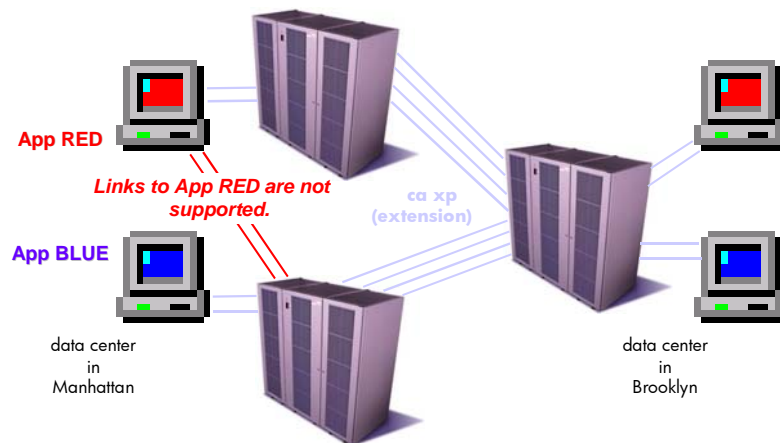
---

## Continuous Access XP and RAID Manager XP

Continuous Access XP provides remote copy functionality for the disk arrays. Disk arrays can be mirrored to many different remote disk arrays.

Cluster Extension XP does not support two disk arrays as either primary or secondary disk arrays. Cluster Extension XP supports configurations where two (or more) disk arrays use one remote disk array as the failover site. In those cases, the disk array configuration can be considered as a logical one-to-one configuration.

An example of a supported configuration is depicted on [page 43](#).



*Supported XP disk array configuration*

To control Continuous Access XP-mirrored disks from a server, RAID Manager XP must be installed on the server. A special disk, called a *command device*, must be configured to control the paired disks. The special disk must not be part of Microsoft Cluster Service resources and cannot be paired. The command device, which is identified by a “CM” appended to the emulation type, can be assigned to a 36-Mbyte or greater CVS volume. RAID Manager XP uses the command device to communicate with the disk array controller (DKC).

Using Continuous Access XP Extension, consistency groups can be configured. Consistency groups are units in which the disk array keeps data consistent among paired disks.

Continuous Access XP links are unidirectional links. For disaster tolerant configurations, two links must be provided in each direction. Both sender (RCP) and receiver (LCP) ports must be configured on each redundant I/O board used for Continuous Access XP.

Continuous Access XP offers two modes of replication:

- synchronous replication
- asynchronous replication

## Synchronous replication

Using synchronous mode, all write requests from the server are first transferred to the remote disk array. After each I/O has been mirrored in the cache area of the remote array, it is acknowledged to the local disk array. The write request is then acknowledged to the server.

Synchronous replication modes can be configured in the following fence levels:

<b>NEVER</b>	Allows write requests even if the request cannot be replicated to the remote disk array. If a write request cannot be replicated to the remote disk array, the area on the disk is marked in a bitmap table and transferred after a resynchronization request has been ordered.
<b>STATUS</b>	This fence level is not supported by Cluster Extension XP.
<b>DATA</b>	Prohibits write requests immediately if a link failure or disk failure occurs. The local disk array cannot replicate data to the remote disk array. Fence level <b>DATA</b> provides data concurrency at any time.

The preceding fence levels provide data integrity on a per disk basis, so a failure affecting a single disk pair does not lead to a halt of the replication activities of non-affected disk pairs.

Synchronous replication can affect the performance of the system if the distance between the disk arrays is significant.

## **Asynchronous replication**

Continuous Access XP Extension offers a unique feature to replicate data asynchronously.

To keep replicated data consistent among two disk arrays, any incoming write request is ordered and numbered. The write request is then acknowledged to the server, offering the fastest response time for remote mirroring. Each write request is transferred to the remote disk array asynchronously. The remote array orders all write requests before they are destaged to the disk, keeping data consistent.

Asynchronous replication offers excellent performance for remote mirroring and provides data consistency on a group of disks (consistency groups) level.

## **RAID Manager XP instances**

A RAID Manager instance is necessary to control pair operations and to gather disk array status information.

The RAID Manager XP instance numbers used for the **RaidManagerInstances** object must be the same among all systems using Cluster Extension XP.

Several RAID Manager XP instances can be configured to provide additional redundancy. Cluster Extension XP switches to the next available 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 scripts to include the RAID Manager XP startup procedure in the system startup file

(for example, **/etc/inittab**). However, Cluster Extension XP starts the configured RAID Manager XP instances if it cannot find any running instance.

### **Quorum service**

The Cluster Extension XP quorum service employs static RAID Manager API calls and therefore is not dependent on a RAID Manager instance.

## **RAID Manager XP device groups**

A single device group must be configured for a service group (VCS), a resource group (HACMP), a cluster group (Microsoft Cluster Service), or a package (SG-LX). This device group must include all disks being used for the application service.

The device group is the unit in which the failover/failback operation is being carried out. A device group can contain several volume groups.

---

## User configuration file and Cluster Extension XP objects

Objects define the disk array environment and failover/failback behavior. Objects can be customized in the user configuration file or directly in the cluster software.

---

# The user configuration file

Cluster Extension XP uses the user configuration file to gather application service-specific information. This file describes the dependencies between application services and RAID Manager XP device groups in one file for all application services in the cluster. This file must be copied to all nodes that use Cluster Extension XP.

The user configuration file must be placed in the configuration directory:

*Linux*     **/etc/opt/hpclx/conf**  
*UNIX*

*Windows*   By default, this location is defined as this value:  
**%ProgramFiles%\Hewlett-Packard\Cluster Extension XP\conf**

*Related information*   “Basic configuration example” ([page 89](#))  
“Creating and configuring the user configuration file” ([page 197](#))

## HACMP

The **UCF.cfg** file is required for IBM HACMP. A single **UCF.cfg** file must be maintained and copied to all systems using Cluster Extension XP. The **UCF.cfg** includes a “common” section to configure the Cluster Extension XP environment and an “application” section to configure the application service-dependent failover/failback behavior. The application section is a multitag component; the **APPLICATION** tag and application-related objects can appear numerous times in the **UCF.cfg**.

*Related information*   “User configuration file for HACMP” ([page 103](#))

## Microsoft Cluster Service

Cluster Extension XP integration with Microsoft Cluster Service does not require a user configuration file when the standard environment for Cluster Extension XP is used. The Cluster Extension XP objects that are integrated with Microsoft Cluster Service are configurable as resource private properties in the cluster software.

*Related information* “Configuring Cluster Extension XP resources” ([page 119](#))

## VCS

Cluster Extension XP integration with VERITAS Cluster Server does not require a user configuration file when the standard environment for Cluster Extension XP is used. The Cluster Extension XP objects that are integrated with VERITAS Cluster Server are configurable as resource attributes in the cluster software.

*Related information* “Configuring the Cluster Extension XP resource” ([page 156](#))

## SG-LX

An environment configuration file is required for Serviceguard. The file must reside in the same directory as the package control file and is identified by the package name:

*package\_name***\_clx.env**

The **APPLICATION** tag is required, although no value is required.

*Related information* “Configuration of the Cluster Extension XP environment” ([page 176](#))

## File structure

The configuration file comprises a common section and application sections. These sections are distinguished by control tags. Cluster Extension XP uses the following objects as control tags:

- **COMMON**
- **APPLICATION**

Objects have one of the following formats:

tag	a definition of an object, for example, <b>COMMON</b> or <b>APPLICATION</b> .
integer	a number, for example, a timeout value.
string	a name, which can include alphabetic and numeric characters and underscores, for example, an application startup value.
list	a list of space-separated strings, for example, a list of host names (lists of numbers are stored as lists of strings).

Text that is a comment starts with the pound (#) character and continues until the end of the line. Comments can start on a new line or be part of a line specifying an object.

## Specifying object values

When using the default configuration, you must provide values for these five objects:

- DeviceGroup** ([page 84](#))
- DC\_A\_Hosts** ([page 84](#))
- DC\_B\_Hosts** ([page 84](#))
- RaidManagerInstances** ([page 86](#))
- XPSerialNumbers** ([page 88](#))

You do not need to change the default settings unless you want to change the degree of protection for your paired disks. If you change an object, you may need to change additional objects as well. For example, if you change the **FenceLevel** object to **DATA**, you might need to change the **DataLoseMirror** object also.

Objects are supported according to the requirements or capabilities of the cluster software, as listed in table 1 ([page 71](#)).

Table 1. Cluster Extension XP supported objects

<b>Name</b>	<b>Page</b>	<b>CLI</b>	<b>HACMP</b>	<b>MS Cluster service</b>	<b>VCS</b>	<b>SG-LX</b>
<b>COMMON</b>	73	•	•	•	•	•
<b>LogDir</b>	73	•	•	•	•	•
<b>LogLevel</b>	73	•	•	•	•	•
<b>SearchObject</b>	74		•			
<b>VcsBinPath</b>	74				•	
<b>APPLICATION</b>	76	•	•	•	•	•
<b>ApplicationDir</b>	76	•	•	•	•	
<b>ApplicationStartup</b>	77	•	•	•	•	•
<b>AsyncTakeoverTimeout</b>	79	•	•	•	•	•
<b>AutoRecover</b>	80	•	•	•	•	•
<b>BCEnabledA</b>	81	•	•	•	•	•
<b>BCEnabledB</b>	81	•	•	•	•	•
<b>BCM uLocalA</b>	81	•	•	•	•	•
<b>BCM uLocalB</b>	81	•	•	•	•	•
<b>BCResyncEnabledA</b>	81	•	•	•	•	•
<b>BCResyncEnabledB</b>	82	•	•	•	•	•
<b>BCResyncMuLocalA</b>	82	•	•	•	•	•
<b>BCResyncMuLocalB</b>	82	•	•	•	•	•
<b>DataLoseDataCenter</b>	82	•	•	•	•	•
<b>DataLoseMirror</b>	83	•	•	•	•	•
<b>* DC_A_Hosts</b>	84	•	•	•	•	•
<b>* DC_B_Hosts</b>	84	•	•	•	•	•

Table 1. Cluster Extension XP supported objects (Continued)

Name	Page	CLI	HACMP	MS Cluster service	VCS	SG-LX
<i>(continued)</i>						
* DeviceGroup	84	•	•	•	•	•
FastFailbackEnabled	85				•	
FenceLevel	85	•	•	•	•	•
Filesystems	85	•	•			
PostExecCheck	86	•	•	•	•	•
PostExecScript	86	•	•	•	•	•
PreExecScript	86	•	•	•	•	•
* RaidManagerInstances	86	•	•	•	•	•
ResyncMonitor	87		•	•	•	•
ResyncMonitorAutoRecover	87		•	•	•	•
ResyncMonitorInterval	87		•	•	•	•
ResyncWaitTimeout	88	•	•	•	•	•
Vgs	88	•	•	•	•	•
* XPSerialNumbers	88	•	•	•	•	•

**LEGEND**

\* Required

• Supported

---

## COMMON section objects

The common part is used to set the environment of Cluster Extension XP.

The **COMMON** tag is a single-tag; it can appear in the configuration file only once. The common object does not require any value.

Objects of the type common can only appear once. Those objects must be placed after the **COMMON** tag in the configuration file.

If the default values fit your environment, there is no need to specify them in the file.

---

### COMMON

*Format* tag

*Description* Distinguishes between general (common) and application-specific objects.

---

### LogDir

*Format* string

*Description* (*Optional*) Defines the path to the Cluster Extension XP log file.

*Default value* *Linux/UNIX*  
**/var/opt/hpclx/log**

*Windows*  
**%ProgramFiles%\Hewlett-Packard\Cluster Extension XP\log**

---

### LogLevel

*Format* string

*Description* (*Optional*) Defines the logging level used by Cluster Extension XP.

<i>Valid values</i>	<b>error</b> ( <i>default</i> )	Logs only error messages for events that are nonrecoverable.
	<b>warning</b>	Logs <b>error</b> messages and <b>warning</b> messages for events that are recoverable.
	<b>info</b>	Logs <b>error</b> messages, <b>warning</b> messages, and additional information, such as disk status.
	<b>debug</b>	Logs <b>error</b> messages, <b>warning</b> messages, <b>info</b> messages, and messages that report on execution status, useful for troubleshooting.

---

**SearchObject** *HACMP only*

*Format* string

*Description* (*Optional*) Searches for the application service if the user configuration file specifies multiple applications. This object is not used for VCS, Microsoft Cluster Service, or SG-LX.

*Default value* **Vgs**

---

**VcsBinPath** *VCS only*

*Format* string

*Description* (*Optional*) Defines the path to the VCS binaries. This object is not used for Microsoft Cluster Service, SG-LX, or HACMP.

*Default value* **/opt/VRTSvcs/bin**

---

---

## APPLICATION section objects

The application part defines the failover and failback behavior of Cluster Extension XP for each application service. **APPLICATION** is a multitag that can appear in the configuration file for each application service using Cluster Extension XP.

The **APPLICATION** object requires the name of the application service as its value. The objects specified after an **APPLICATION** tag must appear only once per application. As with the common part objects, the application part objects have predefined default values.

Cluster Extension XP also uses the following rules to define objects:

- If you use the default value, you do not have to specify the object.
- Cluster Extension XP uses objects depending on the setting of other objects. For example, if you set the **FenceLevel** object to **DATA**, Cluster Extension XP uses the values specified for the **DataLoseMirror** or **DataLoseDataCenter** object. However, these objects are ignored if the **FenceLevel** object is set to **NEVER**.
- The pre-execution and post-execution functions in Cluster Extension XP will not be processed if the associated object values are empty. (This is the default setting.)

**CLI**  
**HACMP**  
**SG-LX**

To set **APPLICATION** object values, use the user configuration file.

**VCS**

Use the VCS GUI to set **APPLICATION** object values.

**Microsoft Cluster Service**

To set **APPLICATION** object values, use the Microsoft Cluster Service Cluster Administrator GUI.

---

## APPLICATION

*Format* tag

*Description* Distinguishes between general and application-specific objects. Specify the name of the application service. The format of its value is equivalent to a string value.

### SG-LX

For Serviceguard, the tag is required; however, specifying a value is not necessary.

---

## ApplicationDir

*Format* string

*Description* Specifies the directory where Cluster Extension XP searches for application-specific files, such as the force flag or online file.

If **ApplicationDir** is set to a nonexistent drive and **PairResyncMonitor** is not enabled, Cluster Extension is unable to create the online file and cannot put the resource online.

### SG-LX

The value of **ApplicationDir** is derived from the package control file location.

Windows

If **ApplicationDir** is not set, Cluster Extension uses the local **%HPCLX\_PATH%** values as defined in the registry.

*Default values*

*Linux*

*UNIX*

**/etc/opt/hpclx**

*Windows*

**%HPCLX\_PATH%**

*Files*     *resource\_name.createplitbrain*  
*resource\_name.forceflag*  
*resource\_name.online*

If specified in a user configuration file, *resource\_name* is the value of the **APPLICATION** tag; otherwise, *resource\_name* is the value of the Cluster Extension XP resource name.

---

## ApplicationStartup

*Format*     string

*Description*     (*Optional*) Specifies where a cluster group should be brought online.

The **ApplicationStartup** object can be customized to determine whether an application service starts locally or is transferred back to the remote data center (if possible) to start directly without waiting for resynchronization. This object is used only if an application service has already been transferred to the secondary site and no recovery procedure has been applied to the disk set (the disk pair has not been recovered and is not in **PAIR** state). This process is considered a failback attempt without prior disk pair recovery.

Cluster Extension XP can detect the most current copy of your data based on the disk state information. If Cluster Extension XP detects that the remote XP disk array has the most current data, it orders a resynchronization of the local disk from the remote disk, or it stops the startup process to enable the cluster software to fail back to the remote XP disk array.

If a resynchronization is ordered, Cluster Extension XP monitors the progress of the copy process. If the application service was running on a secondary XP disk array without replication link, a large number of records may need to be copied. If the copy process takes more time than the configured application startup timeout, the application startup will fail.

## Microsoft Cluster Service

If the **ApplicationStartup** resource property is set to **FASTFAILBACK** and the **FailoverThreshold** value is set to a number higher than the current number of clustered systems for the resource group, the resource group will restart on configured nodes until one of the following conditions is met:

- The resource is brought online in the remote data center.
- The resource failed because the **FailoverThreshold** value has been reached.
- The resource failed because the **FailoverPeriod** timeout value has been reached.

---

### Caution

*Disable subsequent automated failover procedures for recovery failback operations.*

---

### Valid values

#### **FASTFAILBACK** (default)

The cluster group will be brought online in the remote data center (if possible) without waiting for resynchronization. The application startup process will be stopped locally and Cluster Extension XP reports a data center error. Depending on the cluster software, the application service cannot start on any system in the local data center and the cluster software will transfer the application service back to the remote data center. Use this value to provide the highest application service uptime. Depending on the value configured for the **AutoRecover** object, Cluster Extension XP will attempt to update the former primary disk based on the secondary disk and swap the personalities of the disk pair so that the local disk will become the primary disk.

In a two-node cluster, this process will not work because the target failback system would not be available. In this case, the application service must be started manually, or the **ApplicationStartup** object should be set to **RESYNCWAIT**.

In a CLX for Microsoft Cluster Service (MSCS) integration, Cluster Extension XP can detect when there is no target failback system available in the remote data center. In this case, Cluster Extension XP will behave as if the **ApplicationStartup** resource property is set to **RESYNCWAIT**.

**RESYNCWAIT** Online local, cluster group must wait until the disk status is **PAIR**. Cluster Extension XP will initiate a resynchronization of the local disk based on the remote disk. The copy process will be monitored. If no copy progress was made after a monitoring interval expired, the copy process is considered failed and Cluster Extension XP returns a global error. If **RESYNCWAIT** has been specified for the **ApplicationStartup** object, the **ResyncWaitTimeout** object must be specified, in case Cluster Extension XP should wait for resynchronization changes for more or less than 90 seconds, which is the default.

---

### **AsyncTakeoverTimeout**

*Format* integer

*Description* (*Optional*) Specifies the **horctakeover** command timeout in seconds. Must be adjusted based on disk mirroring link speed.

This object is used only if the **FenceLevel** object value is **ASYNC**.

The takeover operation for fence level **ASYNC** (Continuous Access XP Extension) offers the option to stop the data transfer process after a specified time value. This is used to allow access to the remote copy if the data transfer process has been stopped due to a Continuous Access XP-link failure. All data that has been copied up to the moment the timeout value has been reached is consistent and available to access at the secondary site.

**Caution**

---

Measure or calculate the full XP disk array cache copy time to use the gathered information for the **AsyncTakeoverTimeout** object. After a takeover command has been invoked, Continuous Access XP Extension copies the side file area residing in the XP disk array cache to the site where the takeover command has been issued (the secondary disks). The side file area cannot exceed the installed cache size. The maximum time for the **AsyncTakeoverTimeout** object is the time to fully copy the amount of cache size data. The takeover timeout value is used to terminate the copy process to provide access to the secondary disks, for example, if all links or the primary XP disk array are unavailable to copy the side file area. The copy time depends on the performance of the Continuous Access XP link between your sites. The takeover or resynchronization operation could take longer than the timeout value for application service startup in the cluster software. The application service startup might fail in this case. However, the takeover or resynchronization command will continue in the background.

---

*Default value*      **1800** (default)

---

**AutoRecover**

*Format*      string

*Description*      (Optional) Recovers a suspended or deleted disk pair when the resource is brought online at application service startup time.

If the **AutoRecover** object is set to **YES**, Cluster Extension XP will try to resynchronize the remote disk at application startup time. Cluster Extension XP will ignore the return code of the resynchronization command and allow access to the disk ensuring highest application availability.

If the resynchronization attempt fails, Cluster Extension XP will not fail. The internal logic will first apply the concurrency and consistency rules to allow access to the disk set.

If you configure fence level **DATA** for the device group and set the **FenceLevel** object to **DATA**, the **AutoRecover** object will change Cluster Extension XP's behavior. Cluster Extension XP will attempt to reestablish the **PAIR** state and wait for the **PAIR** state before it allows access to the disk. If the resynchronization or takeover process fails, Cluster Extension XP returns a global error.

*Valid values*    **YES** (*default*)  
**NO**

---

**BCEnabledA**

*Format*        string  
*Description*    (*Optional*) Enables rolling disaster protection for data center A.  
*Valid values*    **YES**  
**NO** (*default*)

---

**BCEnabledB**

*Format*        string  
*Description*    (*Optional*) Enables rolling disaster protection for data center B.  
*Valid values*    **YES**  
**NO** (*default*)

---

**BCMuListA**

*Format*        list  
*Description*    (*Optional*) Space-separated list defines the MU number of the Business Copy XP disk pairs in data center A.

---

**BCMuListB**

*Format*        list  
*Description*    (*Optional*) Space-separated list defines the MU number of the Business Copy XP disk pairs in data center B.

---

**BCResyncEnabledA**

*Format*        string  
*Description*    (*Optional*) Enables automatic resynchronization of Business Copy XP disk pairs in data center A. The automatic resynchronization function is supported only when the split BC pair is located in the same data center where Cluster Extension XP is started.  
*Valid values*    **YES**  
**NO** (*default*)

---

---

## BCResyncEnabledB

<i>Format</i>	string
<i>Description</i>	(Optional) Enables automatic resynchronization of Business Copy XP disk pairs in data center B. The automatic resynchronization function is supported only when the split BC pair is located in the same data center where Cluster Extension XP is started.
<i>Valid values</i>	<b>YES</b> <b>NO</b> (default)

---

## BCResyncMuListA

<i>Format</i>	list
<i>Description</i>	(Optional) Space-separated list defines the MU number of the Business Copy XP disk pairs in data center A.

---

## BCResyncMuListB

<i>Format</i>	list
<i>Description</i>	(Optional) Space-separated list defines the MU number of the Business Copy XP disk pairs in data center B.

---

## DataLoseDataCenter

<i>Format</i>	string
<i>Description</i>	(Optional) Specifies whether a resource should be brought online while the disk pair is (or will be) suspended or deleted and there is no connection (CA XP and IP network) to the remote data center.

Used only if the **FenceLevel** object value is **DATA**.

RAID Manager XP is able to access its remote peer to invoke takeover actions for Continuous Access XP device groups. It is also able to invoke a swap-takeover operation of the device group from the secondary site. If no configured remote RAID Manager XP instance replies to a request of the local RAID Manager XP instance (remote status EX\_ENORMT), all network connections between the local and the remote data center are considered *DOWN*. If the swap-takeover operation leads into a suspended state for the device group, the Continuous Access XP links are considered *DOWN*.

Because redundant networks and Continuous Access XP links are necessary to build a disaster tolerant environment, this situation can be considered as a data center failure. The **DataLoseDataCenter** object is used to allow/prohibit automatic application service startup in this particular case.

The combination of setting the **DataLoseMirror** object to **YES** and the **DataLoseDataCenter** object to **NO** are contradictory.

*Valid values*    **YES** (*default*)  
**NO**

---

### **DataLoseMirror**

*Format*    string

*Description*    (*Optional*) Specifies whether a resource should be brought online while the disk pair is suspended or deleted.

Used only if the **FenceLevel** object value is **DATA** and local and remote XP disk status information can be gathered. If the remote XP disk state information is not available (remote state **EX\_ENORMT**), the setting of the **DataLoseDataCenter** object will be used.

Depending on the value configured for the **AutoRecover** object, Cluster Extension XP will attempt to recover the **PAIR** state for the device group. Cluster Extension XP waits until the **PAIR** state has been established. If this operation fails, Cluster Extension XP returns a global error. Because the **DATA** fence level ensures no loss of concurrency, manual intervention is required to recover the **PAIR** state. The **PAIR** state must be reestablished for all disks in the device group before you can start the application service.

The combination of setting the **DataLoseMirror** object to **YES** and the **DataLoseDataCenter** object to **NO** are contradictory.

*Valid values*    **YES**  
**NO** (*default*)

---

**DC\_A\_Hosts** *Required*

*Format* list

*Description* Space-separated list defines the cluster nodes in data center A.

**VCS**

This object is a string-vector element. Add a new element to the list for each system name.

---

**DC\_B\_Hosts** *Required*

*Format* list

*Description* Space-separated list defines the cluster nodes in data center B.

**VCS**

This object is a string-vector element. Add a new element to the list for each system name.

---

**DeviceGroup** *Required*

*Format* string

*Description* RAID Manager XP device group, containing the application service disk set.

*Files* *Linux*

*UNIX*  
**/etc/horcmX.conf**

*Windows*

**drive:\winnt\horcmX.conf**  
**%system\_root%\horcmX.conf**

where X is the RAID Manager XP instance number.

---

---

**FastFailbackEnabled***VCS only**Format* string*Description* (*Optional*) Disables VCS service groups for the data center. This allows transferring the service group back to the remote data center immediately. To allow this operation, the VCS configuration file (**main.cf**) will be write enabled and saved later.

The service group will be disabled for all systems contained in either the **DC\_A\_Hosts** object or **DC\_B\_Hosts** object. Then, the VCS configuration file will be saved (dumped).

*Valid values* **YES** (*default*)  
**NO**

---

**FenceLevel***Format* string*Description* (*Optional*) The **FenceLevel** object specifies the fence level configured for the device group. Cluster Extension XP checks whether the current fence level reported by the XP disk array is the same as the configured (expected) fence level. This object is also used to make sure your configurations are supported based on consistency considerations. Different failover and recovery procedures are used for different fence levels.

If you change the **FenceLevel** object value, also review the values of these objects:

**DataLoseMirror** ([page 83](#))**DataLoseDataCenter** ([page 82](#))**AsyncTakeoverTimeout** ([page 79](#))*Valid values* **DATA**  
**NEVER** (*default*)  
**ASYNC**

---

**Filesystems***CLI and HACMP only**Format* list*Description* Space-separated list of file systems.

---

## PostExecCheck

<i>Format</i>	string
<i>Description</i>	(Optional) The <b>PostExecCheck</b> object is used to configure Cluster Extension XP to gather XP disk pair status information after the takeover procedure. That information will be passed to the post-executable. In case of a remote data center failure, it could be time consuming to gather that information, especially if your post-executable does not need any XP status information. The arguments passed to the post-executable will include only the local disk status if the <b>PostExecCheck</b> object is set to <b>NO</b> . See “RAID Manager XP configuration” ( <a href="#">page 92</a> ).
<i>Valid values</i>	<b>YES</b> <b>NO (default)</b>

---

## PostExecScript

<i>Format</i>	string
<i>Description</i>	(Optional) Specifies an executable with its full path name to be invoked after the takeover action or failover procedure.

---

## PreExecScript

<i>Format</i>	string
<i>Description</i>	(Optional) Specifies an executable with its full path name to be invoked before the takeover action or failover procedure.

---

## RaidManagerInstances

*Required*

<i>Format</i>	list
<i>Description</i>	A space-separated list of RAID Manager XP instances Cluster Extension XP can use to communicate with the disk array. The instance numbers must be the same among all cluster systems. Cluster Extension XP can alternate between the specified instances.

## VCS

This object is a string-vector element. Add a new element to the list for each system name.

*Files*     *Linux*  
              *UNIX*  
              **/etc/horcmX.conf**

*Windows*  
**%systemroot%\horcmX.conf**

where *X* is the RAID Manager XP instance number.

---

### ResyncMonitor

*Format*     string

*Description*     (*Optional*) Starts the pair/resync monitor to monitor the disk pair status and resynchronize disk pairs if the **ResyncMonitorAutoRecover** attribute is set to **YES**.

*Valid values*     **YES** (*default: Microsoft Cluster Service*)  
                      **NO** (*default: HACMP; SG-LX; VCS*)

---

### ResyncMonitorAutoRecover

*Format*     string

*Description*     (*Optional*) Automatically recovers disk pairs states if the disk pairs are monitored by the pair/resync monitor.

*Valid values*     **YES**  
                      **NO** (*default*)

---

### ResyncMonitorInterval

*Format*     integer

*Description*     (*Optional*) Specifies the monitor interval (in seconds) that the pair/resync monitor checks the disk pair status.

*Default value*     **60**

---

**ResyncWaitTimeout**

*Format* integer

*Description* (*Optional*) Specifies the timeout value (in seconds) for a disk pair resynchronization. It may take some time to resynchronize disks. The timer times out if there is no change in the percentage value of the copy status for the device group in the specified time interval. The timeout value is used if the **ApplicationStartup** object is set to **RESYNCWAIT**.

*Default value* **90**

---

**Vgs**

*CLI and HACMP only*

*Format* list

*Description* List of volume groups

---

**XPSerialNumbers**

*Required*

*Format* list

*Description* A space-separated list of at least two serial numbers must be specified: the serial numbers of the primary and secondary XP disk arrays. Cluster Extension XP checks whether the local disk array is contained in this list. Serial numbers of the disk arrays of the connected cluster nodes (at least two).

**VCS**

This object is a string-vector element. Add a new element to the list for each system name.

---

---

## Basic configuration example

The following is an example of a basic **UCF.cfg** file.

```
#/etc/opt/hpclx/conf/UCF.cfg
#This is the Cluster Extension XP User Configuration File (UCF.cfg).
#The COMMON tag specifies the configuration for the
#Cluster Extension XP core environment
COMMON
LogLevel          info                #default (not necessary)
APPLICATION        sap                 #the application service
Vgs                sapdatavg saptmpvg  #the volume groups (not necessary)
Filesystems        /sapdata /saptmp    #the filesystems
DeviceGroup        sapdg               #RM dev group for the app service
RaidManagerInstances 22                #RM instance number for dev group
DC_A_Hosts         host1a host2a       #Data center A
DC_B_Hosts         host3b host4b       #Data center B
```

