

High Availability Cluster/iX User's Manual

HP e3000 MPE/iX Computer Systems

Edition 1



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Introduction

This guide documents the High Availability Cluster/iX utility for the HP e3000 systems.

The Cluster/iX product allows multiple computers to physically connect to a single set of disks, which are configured using the Cluster/iX utility to control cluster volume sets. In the event that the owner computer encounters a failure, another computer in the cluster can take over ownership of the cluster volume set.

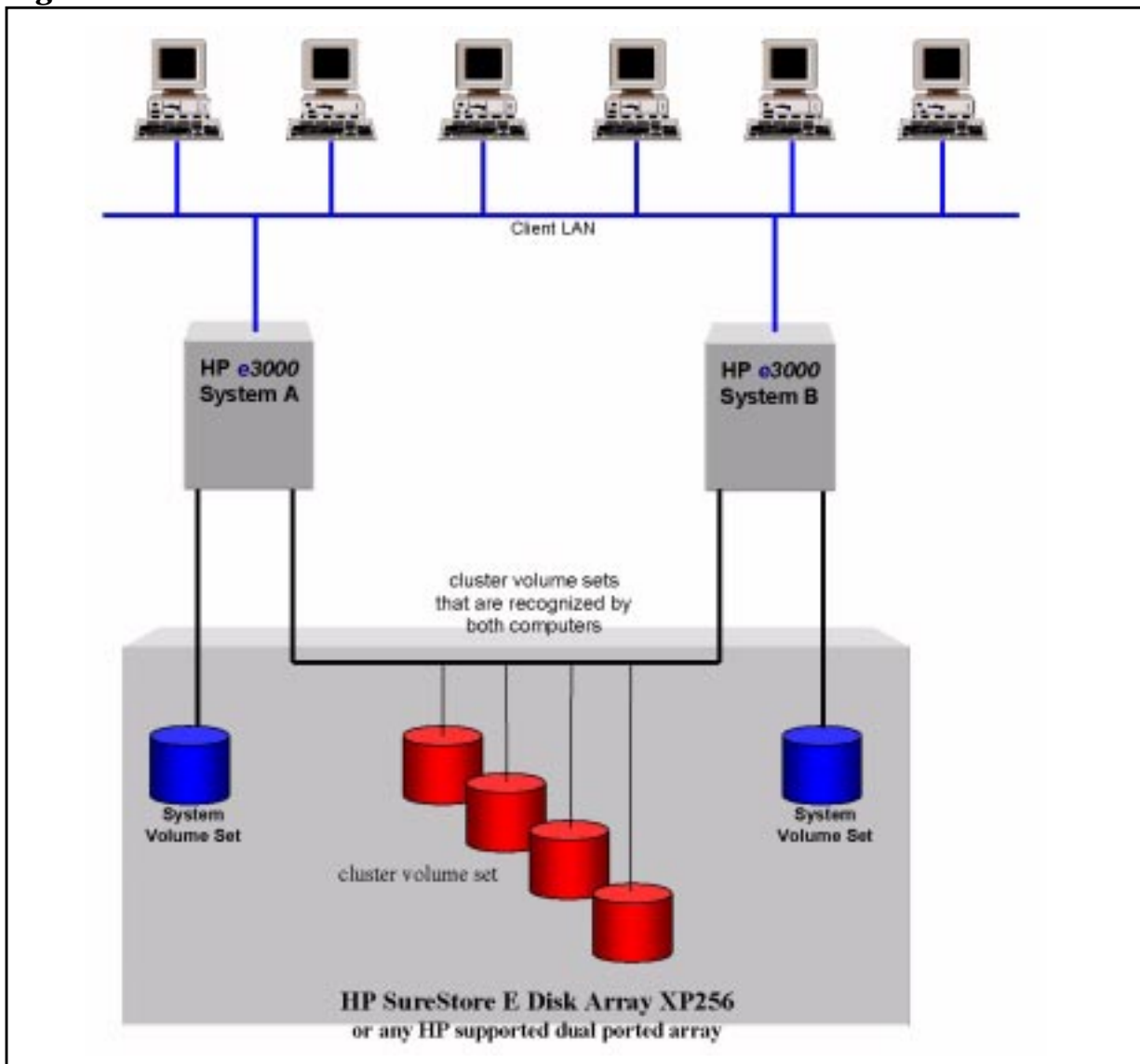
Once installed, the Cluster/iX utility provides continued access to data on high availability disk array products like the SureStore E Disk Array XP256, XP512, 12H, Model-20 and other supported dual-ported arrays.

Product Description

The configuration consists of multiported arrays connected to multiple computers as shown in Figure 1-1, where each port has access to the drives on the other port. Any single computer in this topology has direct access to the cluster volume set but all the computers in the topology agree on a single owner. All access to the data goes through the computer that owns the volume set.

In the event that the owner computer encounters a failure, another computer in the cluster topology can take over ownership of the cluster volume set. The system volume set can not be configured as a cluster volume set.

Figure 1-1 Cluster/iX



Benefits

The purpose of this product is to reduce planned or unplanned downtime caused by having a system outage while that system owns critical business data. The plan is to move or switch the data (user volume set) onto an up-and-working system where the users can then gain access to the critical data through the backup or secondary computer.

The Cluster/iX product will continue using the benefits of MPE's transaction management to rebuild system data structures and database facilities, like IMAGE, to ensure no or minimum loss of data.

Requirements

Hardware Requirements

The hardware consists of multiported arrays, like the XP family and 12H, connected to multiple computers where each port has access to the drives on the other port.

Limitations

- Only **manual control** is available with this release. Manual control is the act of commanding the computer and utilities to take control of disks that have been designated as the cluster volume set over from another computer, which is currently downed. **The decision to verify that the host machine is downed and to activate the switchover is done by an operator, manually.**
- Cluster/iX will not be supported on System Volume Sets.
- Only user volume sets are allowed to be cluster volume sets.
- Cluster/iX is not supported with path failover for the first release.
- Cluster/iX is not supported on Mirrored disks.
- Cluster/iX is not supported on split volume sets.
- Cluster/iX does not support data sharing.

Configuration

Once the Cluster/iX product is installed, perform the following steps to configure the systems and to convert the required user volume set to a cluster volume set:

1. Connect the primary and the secondary systems to a multiported volume set but only configure the ldevs for the primary system, leaving the configuration of the secondary system for later.
2. Verify that the MPE program **SXOutil** and the catalog SXCAT000 are properly installed in the group PUB.SYS for the primary and secondary systems, by using the `LISTF` command.
3. Using the cluster utility **SXOutil**, create (cmd: `SXOMAKELABEL`) the Cluster ID block on the primary system. This will convert your volume set into a cluster volume set. Please refer to the help facility within **SXOutil** for more details about the command.
4. `VSCLOSE` the newly created cluster volume set.
5. `VSOPEN` the cluster volume sets. Every cluster volume set can be owned by only one system belonging to the cluster at any time. The system that initiates creation of the cluster volume set will be the initial owner of the disk and is allowed to perform disk operations on these disks after mounting (`VSOPENing`).
6. Execute the `DSTAT` command to verify that the cluster volume sets are created properly. `DSTAT` will display all cluster volume sets as “MASTER-SX” & “MEMBER-SX”.
7. Configure the ldevs on the secondary system by using `SYSGEN` of `IOCONFIG`. As each of the drives is recognized, the operating system they will mount automatically as “LONER.” Neither `VSOPEN` nor `VSCLOSE` should change the state from the secondary computer.

Secondary System

When the primary/host system experiences an outage, a switchover operation must be initiated. The currently active/secondary system needs to take ownership of all the cluster volume sets that the primary host/system owned. This is termed as “taking control or switchover” of a cluster volume set which is mounted as **loner** on the secondary system.

This is accomplished by the `SXOSETLABEL` command within **SXOutil** and followed by issuing the `VSOPEN` command.

The currently active/secondary system overrides the “Ownership Label” on the disks owned by the primary/host system, and assigns its “Ownership Label” on the disks owned by the primary/host system. Only then can the active/secondary system mount or VSOPEN the cluster volume set. On the completion of the switchover operation, these volumes will be mounted as master and member volumes, respectively, on the currently active/secondary system.

Once the secondary system has taken control of the cluster volume sets, reboot the primary system and *verify* that the cluster volume sets are automatically mounted as **loner** within the primary/host system.

Configuration Restrictions

It is ****IMPORTANT**** to note that since the manual cluster is the only option available currently, when a “Ownership Label” is being created or being reset to the secondary active system, the other system should be shutdown or must have done a VSCLOSE of the volume set.

Recreating a volume set and converting to a cluster volume set should only be done when the primary system can “see” the volumes. Failure to do so will cause the secondary to have stale data on its system data structure, forcing a reboot to refresh the structures.

SXUtil

This phase of the Cluster/iX product consists of a utility program called **SXUtil** that is used to create and initialize a master/member of the cluster volume set. In addition, it provides other commands that grant access to the cluster volume set from any computer within the cluster configuration.

NOTE The user requires CV (create volumes) or SM (system manager) capability to execute the commands within **SXUtil**.

The following commands are currently available in **SXUtil**. For a complete description of the command and its usage please refer to the help facility within **SXUtil**.

SXOMAKELABEL

The `SXOMAKELABEL` command is used to create the cluster data structure, which include “Ownership label,” associated audit trail information and history records. “Ownership Label” consists of the unique HPSUSAN number of the system and the Root UFID of the System Volume Set. This command will set the “Ownership Label” to that of the computer where the command was issued. The “Ownership Label” is assigned only to the MASTER volume of the volume set created and not the member volumes.

Creation of “Ownership Label” prevents two systems from trying to mount the same volume set simultaneously. Thus, disk operations are allowed only on disk volumes owned by the system.

NOTE The operator is responsible for verifying that this computer is the only one that has access to the volume set until after the volume set has been created and the data structures built using this command. After these structures are built, the system administrator can then configure ldevs on the other computers that will be in the cluster configuration.

SXOSETLABEL

The **SXOSETLABEL** command is used to assign/switch a user defined “Ownership Label” on the master volume of the volume set. The value of the HPSUSAN and Root UFID of the ldev 1 is the default value for the “Ownership Label.”

This command can be initiated from any system belonging to the cluster. The default value of the “Ownership Label” will be assigned only to cluster volumes previously created by any system on this cluster. The MASTER volume should be in LONER state to execute this command. This operation is also known as switchover.

SXOREMOVELABEL

The **SXOREMOVELABEL** command removes the “Ownership Label” from the cluster volume set, thus converting it into non-cluster volume set.

SXUtil also allows the execution of all CI commands and other utilities within this utility.

In addition to the above commands, **SXUtil** provides the following commands:

- Listredo
- Redo
- Help
- Log
- Verify
- Exit

DSTAT

DSTAT has been changed to display cluster volume type as shown here. In this example, SXO_SET1 is a cluster volume set.

```
:dstat all
```

LDEV-TYPE	SATUS	VOLUME	VOLUME SET - GEN
1-C2247M1	MASTER	MEMBER1	MPEXL_SYSTEM_VOLUME_SET-0
2-C3010M1	MEMBER	MEMBER	MPEXL_SYSTEM_VOLUME_SET-0
30-C5447A	MASTER-SX	MASTER1	SXO_SET1-0
31-C5447A	MEMBER-SX	MEMBER1	SXO_SET1-0
32-C5447A	MEMBER-SX	MEMBER2	SXO_SET1-0
33-C5447A	MEMBER-SX	MEMBER3	SXO_SET1-0
34-C5447A	MEMBER-SX	MEMBER4	SXO_SET1-0
35-C5447A	MEMBER-SX	MEMBER5	SXO_SET1-0
36-C5447A	MEMBER-SX	MEMBER6	SXO_SET1-0
37-C5447A	MEMBER-SX	MEMBER7	SXO_SET1-0

Error Handling

In addition to the normal command parsing errors and illegal command errors from the utility **SXUtil**, the following new errors pertaining to the creation and manipulation of the cluster block, are introduced:

MESSAGE: Cluster label exists already, cannot create another one

CAUSE: This error is returned while executing the command `SXOMAKELABEL`. This error indicates that an initial Cluster Ownership ID block has already been created by invoking the command `SXOMAKELABEL`.

ACTION: You only can reset this label to the current system by invoking the command `SXSETLABEL`. If there is a need to re-create the Cluster ID block, then issue the `SXOREMOVELABEL` command first.

MESSAGE: Volume mounted in invalid state for desired operation

CAUSE: The command failed because the volume is mounted in a wrong state.

ACTION: The volume should be in `MASTER` state in order to create (`SXOMAKELABEL`) the Cluster Ownership ID block as well as to purge (`SXOREMOVELABEL`) it. It should be in `LONER` state to reset (`SXOSETLABEL`) to the current system.

MESSAGE: Volume not a member of the set being initialized

CAUSE: There is a mismatch between the setname and the ldev being passed to the `SXOMAKELABEL` or `SXOSETLABEL` command.

ACTION: Cluster Ownership ID block can be created or reset only on the master volume of a volume set.

MESSAGE: Cluster ID is invalid for system volume set

CAUSE: Cluster Ownership ID block is valid only for user volume sets.

MESSAGE: Cannot RESET because no Cluster label is found

CAUSE: Cluster ID block needed to be created before it can be reset to the current system.

ACTION: Issue the command `SXMAKELABEL` before issuing `SXOSETLABEL` command.

MESSAGE: Cannot purge. Cluster label not initialized

CAUSE: Just a warning to indicate that the volume set is not switchable. Issue `SXOMAKELABEL` command to create the Cluster ID block before accessing the block using other commands.

MESSAGE: Insufficient capabilities to execute this command.

CAUSE: User does not have proper capability to execute this command.

ACTION: User requires either CV or SM capability to execute Cluster/iX commands.