COBALT StaQware™ Cluster Software

User Manual

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Important Safeguards

For your protection, please read and understand all of the safety and operating instructions in the Cobalt RaQ user manual and retain for future reference.

Browsers

Both Netscape Navigator® and Microsoft® Internet Explorer have bugs that can cause intermittent, unexplained failures. When using a Web browser to interact with your Cobalt RaQ, you may occasionally experience a browser failure. Released product versions of the browsers are usually more reliable than beta versions and later versions typically work the most reliably. A browser program failure, although annoying, does not adversely affect your Cobalt RaQ's data.

To use the RaQ, you need a personal computer (attached to the network) that uses a Web browser (for example, Netscape Navigator, version 4.7 or later, or Microsoft Internet Explorer, version 5.0 or later). To manage the RaQ from the Server Desktop, you must enable cookies, cascading style sheets and Javascript on your browser (these features are normally enabled by default).

Contents

Introduction

The Cobalt StaQware™ High Availability Cluster Software for RaQ servers is a software package that provides a high-availability failover solution and real-time data replication for a pair of Cobalt RaQ servers. The software enables a RaQ that is providing services (for example Web, email, file transfer protocol [FTP] and Domain Name System [DNS] service) to fail over to a second RaQ in the event that the first RaQ is detected as being offline.

Cobalt's StaQware Cluster solution, implemented on a pair of identical RaQ servers, is designed to protect customers against hardware failure. There is an active RaQ and a standby RaQ in the pair. The active RaQ is the live machine that services incoming requests; the standby RaQ monitors the active RaQ and is prepared to take over all services for the active RaQ in the event of failure.

Through the primary network interface, both RaQ servers monitor the health of their pair partner and verify connectivity to the Internet (by accessing the gateway). Data synchronization and peer-to-peer communication take place over a second ethernet channel.

The two RaQ servers must have the same SKU number because the hard drives in the two RaQ servers must be the same size.

This product works only with the following Cobalt servers:

- RaQ 3i
- RaQ 4i

Features

The StaQware Cluster offers

- automatic failover between a pair of RaQ servers
- real-time data replication
- reduced downtime of services
- maintenance through planned failovers and service intervals

Automatic failover

The active RaQ and the standby RaQ constantly monitor each other through both the Network 1 and Network 2 interfaces.

1. If the standby RaQ detects that the active RaQ is inaccessible, the standby RaQ tells the active RaQ to shut down. The standby RaQ attempts to become the new active RaQ. The new active RaQ sends an email to the RaQ Administrator stating that a failover occurred.
2. If the active RaQ detects that the standby RaQ is inaccessible, the active RaQ sends an email to the RaQ Administrator stating that the standby RaQ is inaccessible. The active RaQ drops into non-High Availability state (non-HA state), but it still services requests.

Note: The term **HA state** means that the StaQware Cluster software is functioning normally on the cluster. The automatic failover and the data synchronization features are available. The term **non-HA state** means that the automatic failover feature is not available, and the data synchronization feature may or may not be available, depending on the source of failure.

Whenever the active RaQ drops into non-HA state, the standby RaQ has to perform a full data synchronization which can take from one to three hours, depending on the size of the hard disk drive. During this time, the active RaQ can service requests, but the automatic failover feature is not available until the process of data synchronization is complete.

For more information on possible failure scenarios and the results, see Chapter 4, “Failover Scenarios.

For more information on how the failure detection works on the StaQware Cluster, see “Failure detection” on page 47.

Failover time

The following list explains the failover times:

a. If the hard drive or public network interface on the active RaQ fails, the standby RaQ takes over the services in one to five minutes.

b. If the active RaQ suffers a catastrophic failure (for example, a sudden power outage or a hard drive failure), the standby RaQ checks the disk for errors to verify that the state of the file system is stable. This process can take from five to ten minutes, depending on the system.

Real-time data replication

Information written to the hard drive of an active RaQ is simultaneously written to the hard drive of the standby RaQ.

Overview of setting up a StaQware Cluster

To set up a StaQware Cluster, the RaQ Administrator performs the following steps. For more detailed procedures, see Chapter 2, "Setting Up the Cluster.

1. Connect the two RaQ servers according to one of the two wiring diagrams.
2. Install the software package file (.pkg) on the active RaQ through the standard Cobalt browser-based user interface (UI).
3. Configure a standby RaQ through the Configuration Wizard on the active RaQ.

Note: The process of synchronizing a standby RaQ takes approximately 1.5 hours, depending on the size of the hard disk drive. During this time, the active RaQ can service requests but the automatic failover feature is not available until the process of data synchronization is complete.

General information

Before using the StaQware Cluster software, users should be aware of the following items.

1. Before you load the StaQware Cluster software package file (.pkg), ensure that you have installed OS Update 2.0 or later for the RaQ on the active RaQ. For more information, see "System setup" on page 18.
2. The process of converting a normal RaQ into a standby RaQ destroys all the data on the standby RaQ. Ensure that you back up all data on the RaQ before you convert it into a standby RaQ.

   The StaQware Cluster software does not affect the data on the active RaQ.
3. The two RaQ servers must have the same SKU number because the hard drives in the two RaQ servers must be the same size. Verify the SKU number on the rear label of each server.

4. The StaQware Cluster software mirrors only the first internal IDE disk to the standby RaQ. External storage devices or additional internal hard disk drives cannot be used in conjunction with the StaQware Cluster software. If necessary, a link to the **Maintenance** screen of the Server Management section is provided so that the RaQ Administrator can disable an external storage device.

5. To restore a standby RaQ to the normal RaQ server functionality, you need to rebuild the standby RaQ with an OS Restore CD. An OS Restore CD is included with the purchase of the StaQware Cluster software.

Note: Rebuilding the RaQ server with the OS Restore CD is a destructive process. All data is lost on the rebuilt RaQ.

6. Do not interrupt the process of synchronizing the standby RaQ. The process of synchronizing a standby RaQ takes approximately 1.5 hours, depending on the size of the hard disk drive.

   Interrupting the acquisition process can leave the standby RaQ in an unbootable condition for which you will need to use the OS Restore CD to rebuild the RaQ.

7. The StaQware Cluster software uses the Network 2 interface to synchronize the data from the active RaQ to the standby RaQ. If you perform scheduled backups of the RaQ through the Network 2 interface, the IP address assigned to the Network 2 interface for data synchronization (in the StaQware Cluster Configuration Wizard) must be different from the IP address assigned to the Network 2 interface for the backup function (in the **Server Management > Maintenance > Backup** screen).

   Also, in this case, use the wiring solution as displayed in Figure 2.

Requirements

To use the StaQware Cluster software, you need the following:

- A pair of RaQ servers, each with dual ethernet interfaces; **the RaQ servers must have the same SKU number** (the hard drives must be the same size). Verify the SKU number on the rear label on the RaQ servers.
- Two dedicated IP addresses for the Availability Monitoring function (one for the active RaQ and one for the standby RaQ). The dedicated IP address on the active RaQ cannot be used by any virtual sites on the RaQ.
- Two private IP addresses for the Data Synchronization function (one for the active RaQ and one for the standby RaQ).
- A 10BaseT, 10/100BaseTX or 100BaseTX Transmission Control Protocol/ Internet Protocol (TCP/IP)-based local area network (LAN).

Note: A 10BaseT connection is not recommended for the Data Synchronization (Network 2) interface. Cobalt recommends using a crossover ethernet cable for connecting the Data Synchronization interfaces.

- Apersonal computer (attached to the network) that uses a Web browser (for example, Netscape Navigator, version 4.7 or later, or Microsoft Internet Explorer, version 5.0 or later).

  To manage the RaQ from the user interface (UI), you must enable cookies, cascading style sheets and Javascript on your browser (these features are normally enabled by default).
- Network parameters, which you can obtain from your network administrator; these include the two IP addresses assigned to the RaQ servers, the subnet mask of your network and a gateway or router address.

Note: The last page of this user manual is a worksheet that you can tear out and use to keep track of the IP addresses necessary for the StaQware Cluster software to run on your RaQ servers.

Target audience for the StaQware Cluster Software

The user manual is for RaQ Administrators who use the StaQware Cluster software to ensure automatic server failover and real-time data replication on a pair of RaQ servers. The RaQ Administrator should be familiar with Microsoft® Windows™, Macintosh® or other operating systems, and Netscape Navigator®, Microsoft® Internet Explorer or other Web browsers.

List of chapters and appendices

The manual has the following chapters and appendices.

Chapter 1, "Introduction", summarizes the StaQware Cluster software.

Chapter 2, "Setting Up the Cluster", explains how to set up the RaQ servers in a StaQware Cluster.

Chapter 3, "Features of the StaQware Cluster software", discusses the features of the StaQware Cluster software.

Chapter 4, "Failover Scenarios", discusses failover scenarios and the effects of a failover on services.

Chapter 5, "Technical Information", explains how the automatic failover feature works and provides a glossary.

Appendix A, "Using the LCD Console", explains the LCD console functions.

Appendix B, "Warranty and Licenses", lists the warranty and licensing information.

"Worksheet" is a worksheet to tear out and use to keep track of the IP addresses necessary for the StaQware Cluster software.

Customer Service and Technical Support

For Cobalt product information, visit the support section of the Cobalt Web site at http://www.cobalt.com/support/. The site includes a Knowledge Base that customers can query; a list of Frequently Asked Questions (FAQs) that provide additional information is also available through the Knowledge Base.

General Cobalt information

In the U.S.A., call (888) 70-COBALT or (888) 702-6225, or send email to info@cobalt.com.

Outside the U.S.A., call +1 650 623-2500, or send email to info@cobalt.com.

In Europe, the Middle East and Africa, call +31 71 565 7000 (The Netherlands), or send email to info-emea@cobalt.com.

In Japan, send email to info-japan@cobalt.com.

Cobalt Technical Support and Service

Email contact

You can contact Cobalt Networks Technical Support by email using the Online Email Support Form. This form provides us all the information we need to service your request in a timely fashion.

Go to the URL http://www.cobalt.com/support/ and click on the **Contact Support** link.

Technical Support telephone numbers

In the United States, call (800) 266-4378.

In Europe, Middle East and Africa, call +31 (71) 565-7070 (The Netherlands).

Customers in Japan can send email to support-japan@cobalt.com.

Further resources and information

Cobalt also offers the following additional resources and information.

Solutions

For business-case information concerning Cobalt products or for solutions that extend the functionality of our products, visit the Online Solutions Directory on Cobalt's Web site at http://www.cobalt.com/solutions/.

Cobalt Developer Network

Cobalt provides a wide range of resources, such as technical notes and white papers, for developers of Linux applications for Cobalt platforms. Premium resources are also available.

To register with the Cobalt Developer Network at no cost, visit the Web site at http://developer.cobalt.com/.

Discussion Groups

Cobalt has made available a number of discussion groups through which users can share information.

You can view the current list of Cobalt discussion groups at http://www.cobalt.com/support/resources/usergroups.html. The names of the discussion groups show up as hypertext links.

To subscribe to or unsubscribe from a discussion group, or to view previous postings to a group, click on the group name. A new browser window opens, displaying information about the discussion group.

New discussion groups are added periodically. The current groups include:

- an announcement list concerning Cobalt products
- an information list for developers working on Cobalt products
- a user list for sharing information between users of Cobalt products
- a security list for users to address network security issues on Cobalt products

The Knowledge Base

Cobalt offers access to its online database of common installation and configuration problems and solutions. You can access the site at http://www.cobalt.com/support/kb/.

Online technical papers

For in-depth technical information, there are a number of technical papers available on Cobalt Networks' Web site at http://www.cobalt.com/support/.

Education

For those who desire a premium level of technical expertise with Cobalt Networks, Inc.'s products, we offer a number of training courses. The intended audience includes end users, Cobalt resellers, system and network administrators, systems engineers, product developers, support technicians, consultants and trainers. You can access the site at http://www.cobalt.com/support/education/index.html/.

Before contacting Cobalt Networks Technical Support

Note: To receive Technical Support, you must first register your Cobalt product.

First, make an effort to resolve the problem on your own. Take note of all actions you perform and any error messages so that, if necessary, you can describe them to a member of the Technical Support team.

Refer to the user manual and to the Web-based resources such as Cobalt's Knowledge Base, the online technical papers and the Solutions page, as described above.

To speed up your support call

When contacting Cobalt Networks Technical Support, the more information you can provide, the better. Before you call or email, have the following information ready.

- the serial number (located on the back panel) or the MAC address of the primary network interface (accessible through the user interface) of your RaQ server
- any additional software installed on your system
- any peripherals connected to your system
- any error messages you have received and the time when they occurred
- the process you were running or the changes you had made when the error occurred
- the steps you have taken to resolve the problem

Support tools feature

The Support Tools feature is a Web page that assists Technical Support in diagnosing problems on a RaQ server.

On the **Server Diagnostics** screen, the RaQ Administrator can create and download a data dump of the configuration files on the RaQ. This data dump can then be emailed to **diagnostics@cobalt.com**. A member of the Technical Support team can evaluate the condition of your RaQ before providing you with corrective action, either by telephone or email.

If the RaQ Administrator is familiar with Linux, he or she can look through this file in an effort to determine the problem with the RaQ. The file is a standard gzip file.

For more information on the Support Tools feature, refer to Chapter 3 of the RaQ user manual.

Cobalt logo badge

For more information on the RaQ server, click on the Cobalt Networks logo badge in the top left corner.

- the amount of RAM
- the size of the hard disk drive
- the version of the Cobalt OS
- Cobalt Networks trademark information

The table also contains four hypertext links:

- **About The Product** displays the services available on the RaQ server, links to Cobalt Networks Technical Support and a link to the Solutions guide.
- **Cobalt Networks, Inc. Web site** takes you to the URL http://www.cobalt.com/.
- **Credits and Acknowledgements** acknowledges the software used on the RaQ.
- **Diagnostic Information** contains a form used generate and download a diagnostics file which can assist Cobalt Technical Support in diagnosing problems with a RaQ server.

Active Assist

For help with a particular field on a screen, move the pointer over the Active Assist icon adjacent to that field. Help text appears in a window at the bottom of the screen.

Setting Up the Cluster

This chapter explains how to connect the two RaQ servers and how to install the StaQware Cluster software .pkg file.

Note: Before you can configure the standby RaQ in the Configuration Wizard, you have to connect the two RaQ servers correctly over the network. See Figure 1 or Figure 2. If the Network 2 connector on the active RaQ is being used for server maintenance, use the wiring solution as displayed in Figure 2.

Note: The two RaQ servers must be on the same physical subnet.

Setting up the active RaQ

You can use an existing RaQ on your network or a new RaQ as the active RaQ.

If you are using a new RaQ as the active RaQ, follow the setup procedure in the RaQ user manual prior to installing the StaQware Cluster software.

Setting up the standby RaQ

You can use an existing RaQ on your network or a new RaQ as the standby RaQ.

If you are using a new RaQ as the standby RaQ, follow the LCD setup procedure in the RaQ user manual. You only need to enter the IP address for the RaQ server.

Note: You do not have to go through the browser-based Setup Wizard for the standby RaQ. You only need to enter the IP address for the standby RaQ through the LCD console.

Connecting the two RaQ servers

For the StaQware Cluster software to function, you must correctly connect the network interfaces of the two RaQ servers.

There are two methods for connecting the two RaQ servers.

a. The Network 2 interfaces are connected directly by a crossover ethernet cable; see Figure 1.

b. The Network 2 interfaces are connected indirectly through an additional switch or hub; Figure 2.

Cobalt recommends that you use the crossover cable method.

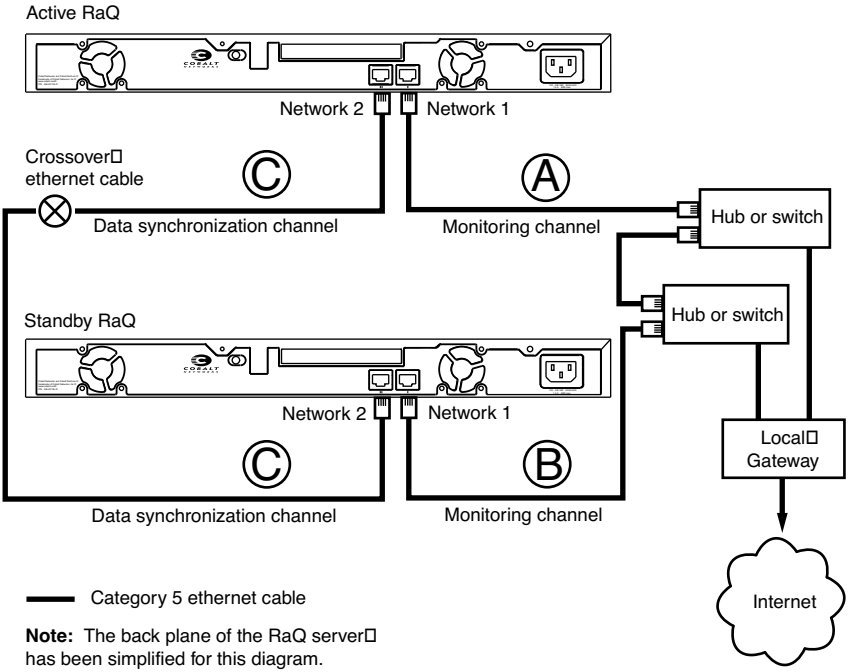
Connecting with a crossover ethernet cable

To connect the RaQ servers with a crossover ethernet cable:

1. With a Category 5 ethernet cable, connect the Network 1 interface on the active RaQ to an ethernet hub or switch. See (A) in Figure 1.
2. With a Category 5 ethernet cable, connect the Network 1 interface on the standby RaQ to a different ethernet hub or switch. See (B) in Figure 1.
3. With a crossover ethernet cable, connect the Network 2 interfaces on the active RaQ and standby RaQ directly to each other. See (C) in Figure 1.

Figure 1 shows the wiring configuration the Network 2 interfaces connected directly by means of a crossover cable.

Figure 1. Connecting the RaQ servers with a crossover ethernet cable



Note: The back plane of the RaQ server has been simplified for this diagram.

Connecting through an additional hub or switch

If you use the Network 2 connector on the active RaQ for server maintenance, you can use an additional switch or hub to connect the Network 2 interfaces to a local area network (LAN).

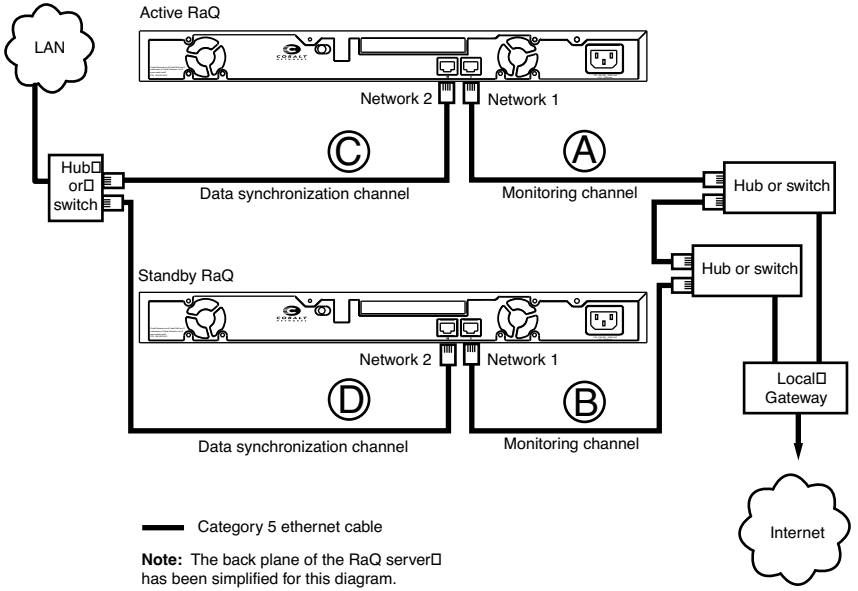
1. With a Category 5 ethernet cable, connect the Network 1 interface on the active RaQ to an ethernet hub or switch. See (A) in Figure 2.
2. With a Category 5 ethernet cable, connect the Network 1 interface on the standby RaQ to a different ethernet hub or switch. See (B) in Figure 2.
3. With a Category 5 ethernet cable, connect the Network 2 interface on the active RaQ to an ethernet switch or hub. See (C) in Figure 2.

   Cobalt recommends using a 100BaseT (fast) ethernet switch for best performance. Using a slower hub or switch can have a negative effect on the performance of the StaQware Cluster. The following list shows the types of connection, descending from fastest to slowest.

   a. a crossover cable
   b. a 100 Mb/s switch
   c. a 100 Mb/s hub
   d. a 10 Mb/s switch
   e. a 10 Mb/s hub
4. With a Category 5 ethernet cable, connect the Network 2 interface of the standby RaQ to the same ethernet switch or hub as in Step 3. See (D) in Figure 2.

Figure 2 shows the wiring configuration the Network 2 interfaces connected indirectly by means of an additional hub or switch.

Figure 2. Connecting the RaQ servers through an additional hub or switch



System setup

Note: If you are installing the StaQware Cluster software package file on a pair of RaQ 3i servers, you must first install the OS Update 2.0 package or later on the active RaQ. OS Update 2.0 is included on the StaQware Cluster CD-ROM; refer to the following paragraphs.

If you are installing the software package on a pair of RaQ 4i servers, this update is already included in the RaQ 4 OS. You can proceed to "Installing the StaQware Cluster software" on page 21.

Verifying OS Update 2.0 on the active RaQ

To verify whether you have OS Update 2.0 on the active RaQ:

1. On the **Server Management** screen of the active RaQ, click **Maintenance** on the left. The File Backup table appears.
2. Click **Install Software** at the top. The Install Software and Software on the Cobalt Server tables appear.
3. If you have installed OS Update 2.0 on the active RaQ, it appears in the Software on the Cobalt Server table as "RaQ3E-Update-OS Release 2.0". You can continue with setting up the StaQware Cluster software.

   If you have not installed OS Update 2.0 on the active RaQ, you need to do so before installing the StaQware Cluster software.

Downloading OS Update 2.0

OS Update 2.0 is included on the StaQware Cluster CD-ROM.

You can also download OS Update 2.0 from either Cobalt Networks' Web site or by file transfer protocol (FTP) site.

Download the file from the CD-ROM

To download OS Update 2.0 from the StaQware Cluster CD-ROM:

1. Insert the CD-ROM into your personal computer.
2. Open the CD-ROM. In the RaQ 3 folder, you will see the StaQware Cluster software package and the OS Update 2.0 file.
3. Copy the OS Update 2.0 file to your personal computer.

Download from the Web site

To download OS Update 2.0 from Cobalt Networks' Web site:

1. From your Web browser, go to http://www.cobalt.com/support/download/. The **Software Downloads** screen appears.
2. On the right is a pull-down menu to select a Cobalt product. Click on the menu and select "Cobalt RaQ 3 - English". The **Cobalt RaQ 3 English Downloads** screen appears.
3. Locate the "Cobalt RaQ 3 Update 2.0" entry on the screen.
4. Click on the hypertext link to download the package to your personal computer.

Download from the FTP site

To download OS Update 2.0 from Cobalt Networks' FTP site:

1. Point your FTP client using an anonymous login to ftp.cobalt.com .
2. Navigate through the following folders:
   a. pub
   b. packages
   c. raq3
   d. <language of your product>
3. Locate the "RaQ3E-Update-OS-2.0.pkg" file.
4. Transfer the file to your personal computer.

Installing OS Update 2.0

To install the OS Update 2.0 on the active RaQ through the standard Cobalt browser-based user interface (UI):

1. Launch your browser software.
2. Type in the URL for the RaQ Admin Server (http://<IP address>/admin/). In the confirmation dialog, enter the user name and password for the RaQ Administrator. The **Server Management** screen of the active RaQ appears.
3. On the **Server Management** screen, click **Maintenance** on the left. The File Backup table appears.
4. Click **Install Software** at the top. The Install Software and Software on the Cobalt Server tables appear.
5. Click **Browse** to locate the OS Update 2.0 .pkg file on your personal computer.
6. Click **Open** to select the .pkg file.
7. Click **Install a .pkg file** to load the OS Update 2.0 .pkg file on the active RaQ. The mouse pointer changes to a spinning watch to indicate that the .pkg file is installing. The installation can take several minutes, depending on the bandwidth of your connection to the RaQ.
8. When the installation is finished, you see a message that the software installed successfully. You are prompted to reboot the RaQ in order to enable OS Update 2.0.

   Click **OK** to reboot the RaQ.

Installing the StaQware Cluster software

The StaQware Cluster software package file (.pkg) is installed initially on the active RaQ through the browser-based UI. The Configuration Wizard then walks you through the process of acquiring a standby RaQ.

To install the StaQware Cluster software on the active RaQ:

1. Launch your browser software.
2. Type in the URL for the RaQ Admin Server (http://<IP address>/admin/). In the confirmation dialog, enter the user name and password for the RaQ Administrator. The **Server Management** screen of the active RaQ appears.
3. On the **Server Management** screen, click **Maintenance** on the left. The File Backup table appears.
4. Click **Install Software** at the top. The Install Software table appears.
5. Click **Browse** to locate the StaQware Cluster CD-ROM on your personal computer.
6. Select the folder that corresponds to the type of RaQ server on which you are installing the StaQware Cluster software: RaQ 3i or RaQ 4i.
7. Click **Open** to select the .pkg file.
8. Click **Install a .pkg file** to load the StaQware Cluster .pkg file on the active RaQ. The mouse pointer changes to a spinning watch to indicate that the .pkg file is installing. The installation should take about five minutes.
9. When the installation is finished, you see a message that the software installed successfully. You are prompted to reboot the RaQ in order to enable the StaQware Cluster.

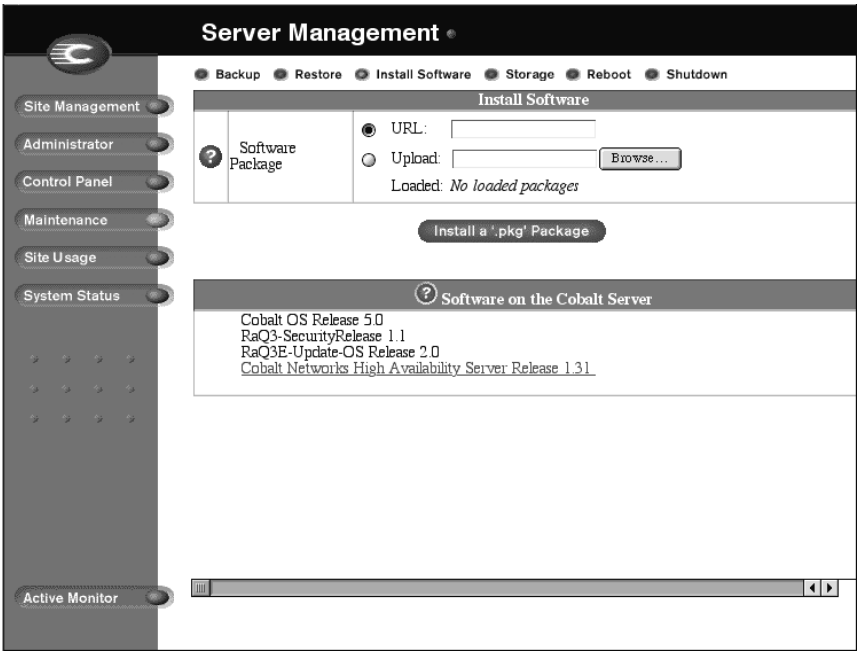
   Click **OK** to reboot the RaQ.

When the RaQ has rebooted, a hypertext link appears on the Install Software screen; Figure 3 shows a sample shot of the Install Software screen with the StaQware Cluster loaded.

This link takes you to the High Availability Cluster Status screen that is protected by the standard RaQ Administrator password.

The RaQ Administrator configures the StaQware Cluster through the browser-based UI.

Figure 3. Sample of the Install Software screen



UI-based setup on the active RaQ

Caution: The process of converting a RaQ into a standby RaQ destroys all the data on the RaQ. Ensure that you back up all data on the RaQ before you convert it into a standby RaQ.

Caution: Do not interrupt the process of synchronizing a standby RaQ; this process approximately 1.5 hours, depending on the size of the hard disk drive.

Interrupting the synchronization process can leave the standby RaQ in an unbootable condition for which you will need to use the OS Restore CD to rebuild the RaQ.

Through the browser-based user interface (UI), the RaQ Administrator can now configure the active RaQ with a standby RaQ. The last page of this user manual is a worksheet that you can tear out and use to keep track of the IP addresses necessary for the StaQware Cluster software to run on your RaQ servers.

Note: Two dedicated IP addresses are required for the Availability Monitoring function (one for the active RaQ and one for the standby RaQ). This IP address cannot be used by any virtual sites on the RaQ server.

Note: Two private IP addresses are required for the Data Synchronization function (one for the active RaQ and one for the standby RaQ).

To access the Configuration Wizard for the StaQware Cluster:

1. Launch your browser software.
2. Type in the URL for the RaQ Admin Server (http://<IP address>/admin/). In the confirmation dialog, enter the user name and password for the RaQ Administrator. The **Server Management** screen of the active RaQ appears.

Note: If you have not closed your browser session since going through "System setup" on page 18, your user name and password have been cached and you will not receive a prompt to enter them.

3. On the **Server Management** screen, click **Maintenance** on the left. The File Backup table appears.
4. Click **Install Software** at the top. The Install Software and Software on the Cobalt Server tables appears. The Software on the Cobalt Server table lists the software and updates installed on the active RaQ.
5. Click the hypertext link for Cobalt StaQware Cluster.
6. The **Cluster Status** screen appears; this screen is protected by the standard RaQ Administrator password.
7. Enter the admin user name and password in the dialog box.

When the StaQware Cluster software is loaded on the active RaQ, there is also an alias added to the Web server configuration; this allows the RaQ Administrator to access the **Cluster Status** screen by pointing the browser at the URL http://<IP address>/ha/.

Configuration Wizard

When you first enter the StaQware Cluster, the **Cluster Status** screen appears; see Figure 4.

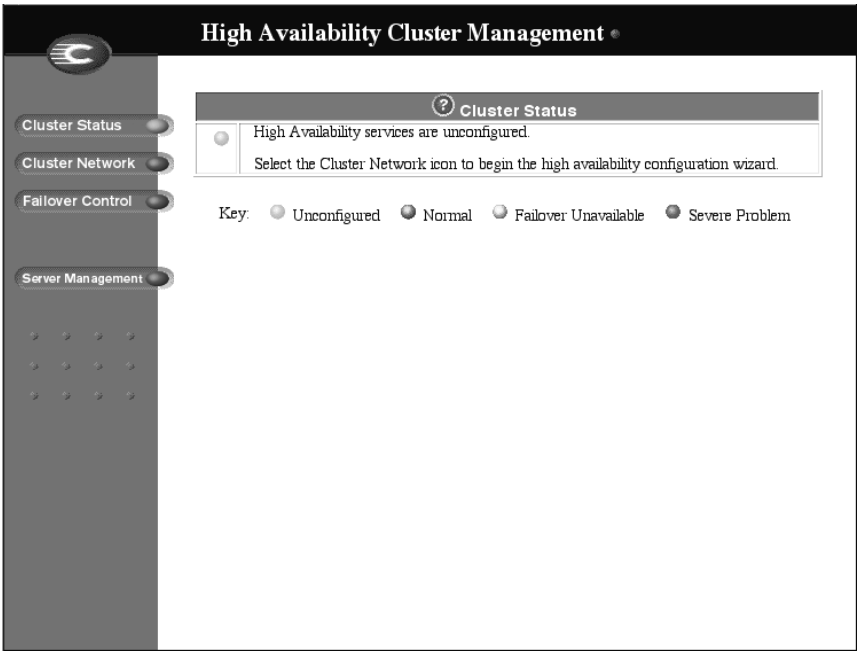
The **Cluster Status** screen displays a colored circle to indicate the status of the StaQware Cluster. Table 1 indicates the colors and the associated states of the StaQware Cluster.

When you first access the **Cluster Status** screen, the circle is gray as the StaQware Cluster software has not been configured yet. See "Glossary" on page 52 for an explanation of HA state and non-HA state.

Table 1. Status colors

Color	Status
Gray	Unconfigured; non-HA state
Green	Normal functioning; HA state
Yellow	Failover is unavailable; non-HA state
Red	Severe problem; non-HA state

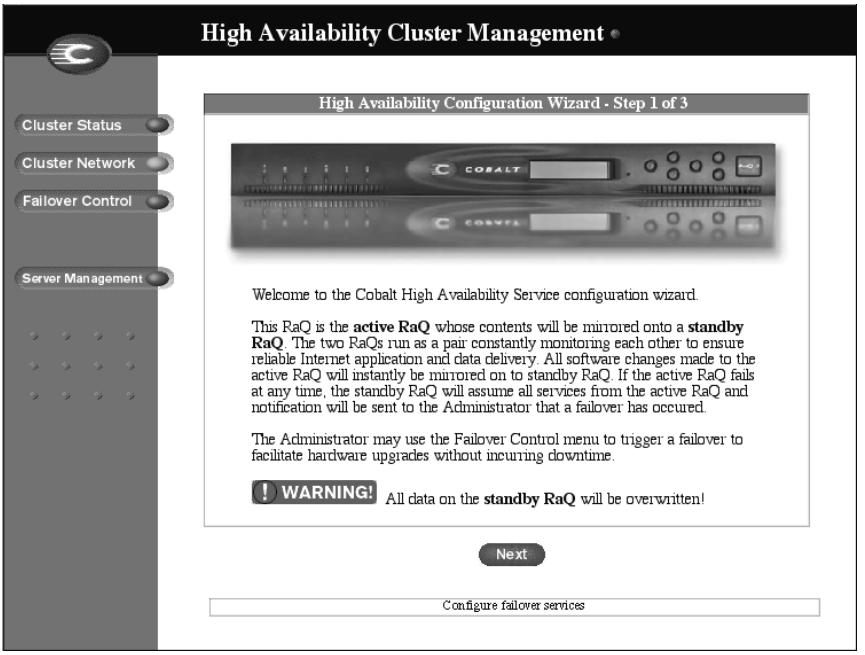
Figure 4. Cluster Status screen



To launch the Configuration Wizard, click on **Cluster Network** on the left side of the screen. The UI then presents a Configuration Wizard on the screen. The Configuration Wizard has three screens.

1. Screen 1 of the Configuration Wizard provides general information about the StaQware Cluster software. It warns the user that all data on the RaQ selected to be the standby RaQ will be overwritten while it is acquired as a standby RaQ. See Figure 5.
2. Click **Next** at the bottom of the screen to proceed to Screen 2.

Figure 5. Configuration Wizard —Screen 1



3. Screen 2 shows the recommended wiring connections between the two RaQ servers. Refer back to Figure 1 and Figure 2.

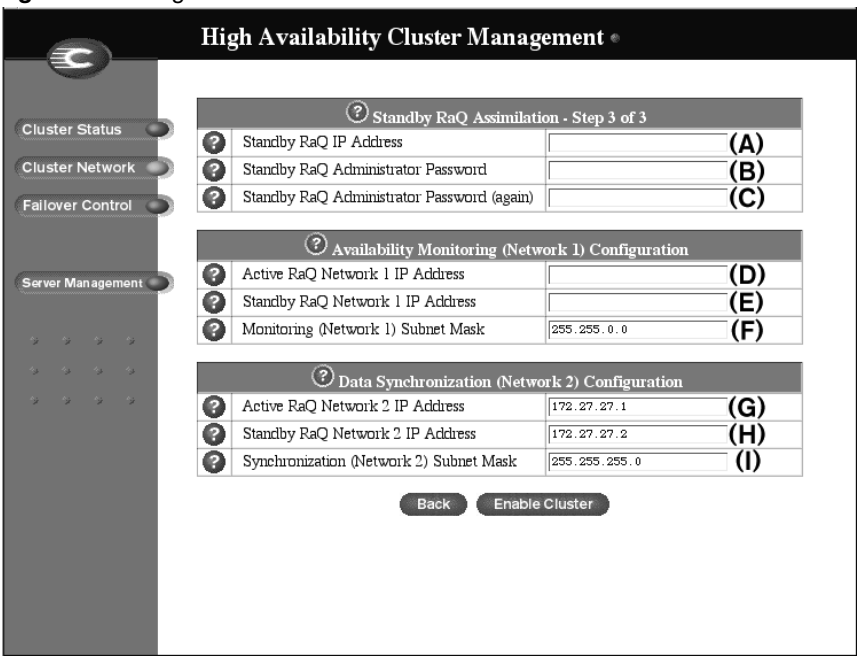
Note: Only the first internal IDE disk is mirrored to the standby RaQ by the StaQware Cluster software. External storage devices or additional internal hard disk drives cannot be used in conjunction with the StaQware Cluster software. If necessary, a link to the Maintenance screen of the **Server Management** section is provided so that the user can disable an external storage device.

4. If you want to return to Screen 1, click **Back** at the bottom of the screen.

   Click **Next** at the bottom of the screen to proceed to Screen 3.

5. Screen 3 asks the user for several network settings; see Figure 6.

Figure 6. Configuration Wizard —Screen 3



Screen 3 of the Configuration Wizard contains the following fields.

The last page of this user manual is a worksheet that you can tear out and use to keep track of the IP addresses necessary for the StaQware Cluster software to run on your RaQ servers; the worksheet includes a copy of Figure 6.

Standby RaQ Acquisition

The active RaQ uses this IP address to acquire the standby RaQ.

1. **Standby RaQ IP address** Enter the main IP address for the Network 1 interface of the standby RaQ (the IP address that is displayed on the LCD screen). Before the active RaQ configures the standby RaQ, the standby RaQ must have an IP address on the same subnet as the active RaQ and its gateway. See **(A)** in Figure 6.
2. **Standby RaQ Administrator password (twice)** Enter the RaQ Administrator password twice for confirmation. See **(B)** and **(C)** in Figure 6.

Note: If you are using a new RaQ server as the standby RaQ and did not go through the browser-based Setup Wizard on the RaQ server, you can leave the "Standby RaQ Administrator password" field blank.

Availability Monitoring (Network 1) Configuration

The active RaQ and the standby RaQ monitor the state of each other using the Network 1 interface.

- The IP address assigned to the function of availability monitoring is paired to the media access control (MAC) address of the server.
- This IP address must be able to "ping" the gateway.
- In case of a failover, the IP address for availability monitoring does NOT migrate to the new active RaQ.

  For example, let us say that the IP address assigned on the active RaQ to the function of availability monitoring is 192.168.25.77 and that on the standby RaQ is 192.168.25.50.

  If a failover occurs, the configuration settings on the **Cluster Network** screen now show that the active RaQ Monitoring IP Address is now 192.168.25.50 and that on the standby RaQ is now 192.168.25.77.

3. **Active RaQ Monitoring IP address** Enter a dedicated IP address for the Network 1 interface of the active RaQ. This address CANNOT be the IP address displayed on the LCD screen. See **(D)** in Figure 6.

Caution: This IP address CANNOT be used by any virtual sites on the active RaQ.

4. **Standby RaQ Monitoring IP address** This field is automatically filled in with the IP address entered in Step 1, but you can change this value if you want. This IP address is assigned to the Network 1 interface on the standby RaQ, through which the standby RaQ monitors the Network 1 interface on the active RaQ. See **(E)** in Figure 6.
5. **Monitoring Network Subnet Mask** The IP addresses used for monitoring the availability of the other RaQ and the gateway IP address must all share the same subnet mask. See **(F)** in Figure 6.

Data Synchronization (Network 2) Configuration

The active RaQ and the standby RaQ synchronize their data using the Network 2 interface.

- The IP address assigned to the function of data synchronization is paired to the MAC address of the server.
- In case of a failover, these IP addresses do NOT migrate to the new active RaQ.

  For example, let us say that the IP address assigned on the active RaQ to the function of data synchronization is 172.27.27.1 and that on the standby RaQ is 172.27.27.2.

  If a failover occurs, the configuration settings on the **Cluster Network** screen now show that the active RaQ Synchronization IP Address is now 172.27.27.2 and that on the standby RaQ is now 172.27.27.1.

The Configuration Wizard automatically enters default private IP addresses (172.27.27.x) in these fields. You can change these private IP addresses if necessary. Consult your Network Administrator.

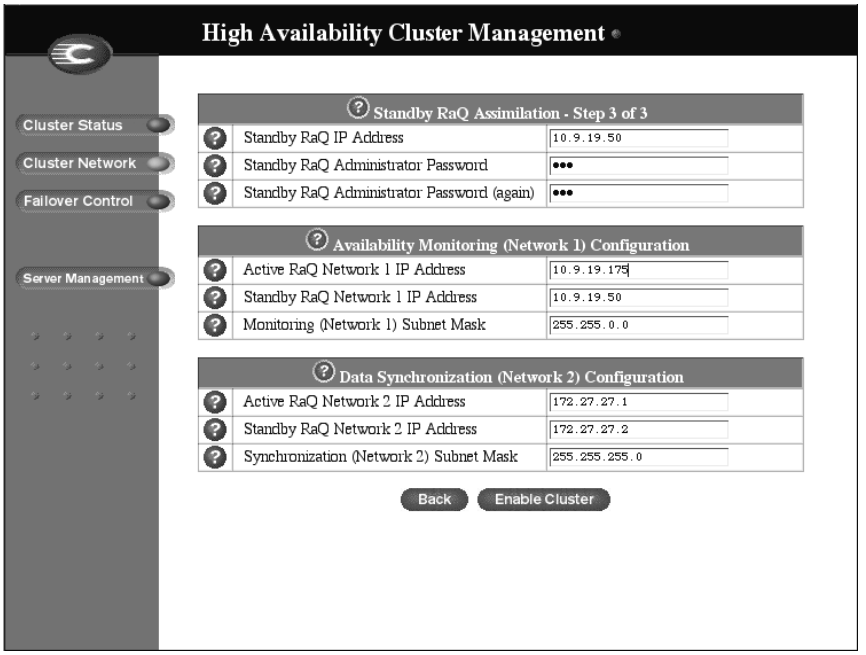
Note: If you are using an ethernet crossover cable to connect the Network 2 interfaces on the active RaQ and standby RaQ, use the default values in the Data Synchronization IP address fields. If you are connecting the Network 2 interfaces through a hub or switch, consult your Network Administrator for a pair of private IP addresses to enter here.

6. **Active RaQ Synchronization IP address** Use the default value or enter a private IP address for the Network 2 interface of the active RaQ. See **(G)** in Figure 6.
7. **Standby RaQ Synchronization IP address** Use the default value or enter a private IP address for the Network 2 interface of the standby RaQ. See **(H)** in Figure 6.
8. **Synchronization Network Subnet Mask** The IP addresses used for synchronizing the data between the RaQ servers must share the same subnet mask. See **(I)** in Figure 6.
9. If you want to return to Screen 2, click **Back** at the bottom of the screen.

   Click **Enable Cluster** at the bottom of the screen to complete the configuration and set up the StaQware Cluster.

Figure 7 shows a sample of a completed Configuration Wizard.

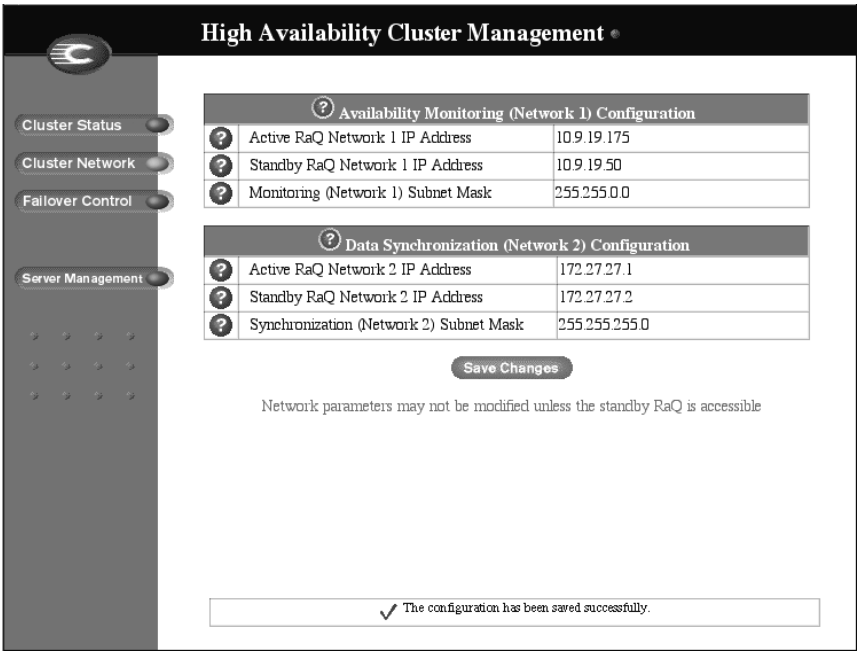
Figure 7. Sample of a completed Configuration Wizard



The StaQware Cluster software saves the configuration information; this may take a few minutes. The cursor changes to a spinning watch. Once completed, a message is displayed stating that the configuration settings were saved successfully. See Figure 8.

The active RaQ then goes through the process of acquiring the standby RaQ. The acquisition of the standby RaQ takes about five minutes.

Figure 8. Configuration information saved successfully



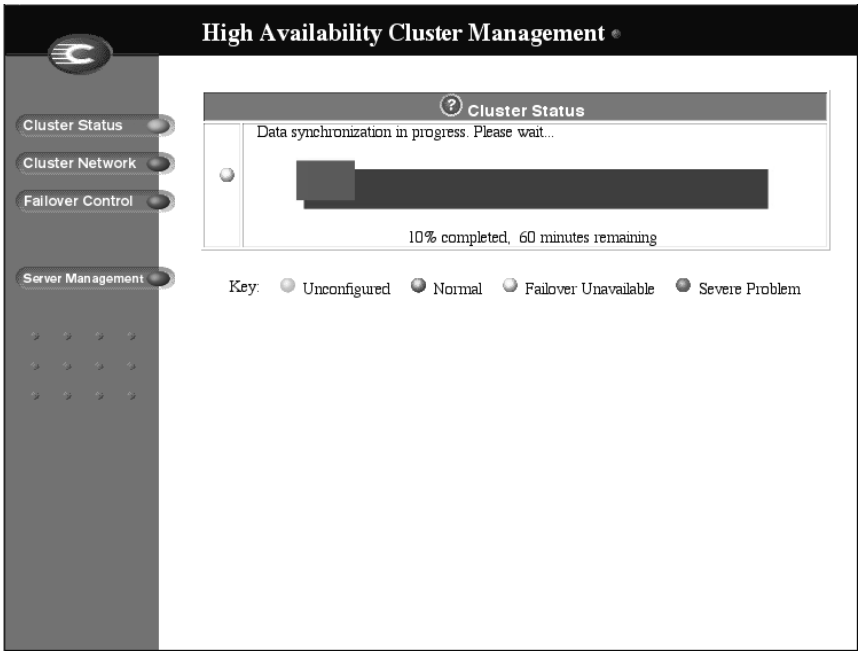
The active RaQ now begins the process of synchronizing its data to the standby RaQ.

Click **Cluster Status** on the left to view the progress of the data synchronization process; a progress bar appears, showing the percentage of the process completed. See Figure 9.

The process of synchronizing a standby RaQ takes approximately 1.5 hours, depending on the size of the hard disk drive. During this time, the active RaQ can service requests but the automatic-failover feature is not available until the process of data synchronization is complete.

Once the data synchronization process is finished, the UI refreshes to show a green ball and that the StaQware Clusters services are active.

Figure 9. Data synchronization with the standby RaQ



Features of the StaQware Cluster software

The RaQ Administrator configures the StaQware Cluster software through the browser-based user interface (UI); this chapter describes the UI. The UI for configuring the StaQware Cluster resides only on the active RaQ.

Note: The term **HA state** means that the StaQware Cluster software is functioning normally on the cluster. The automatic failover and the data synchronization features are available. The term **non-HA state** means that the automatic failover feature is not available, and the data synchronization feature may or may not be available, depending on the source of failure.

The RaQ Administrator can also perform tasks through the LCD console; see Appendix A, "Using the LCD Console".

Access to the StaQware Cluster user interface

You can access the StaQware Cluster UI in two ways:

- through a hypertext link on the **Install Software** screen
- through the URL http://<IP address>/ha/

When the StaQware Cluster software is loaded on the active RaQ, there is an alias added to the Web server configuration; this allows the RaQ Administrator to access the **Cluster Status** screen by pointing the browser at the URL http://<IP address>/ha/.

On the **Install Software** screen, a hypertext link also appears in the Software on the Cobalt Server table. To access the StaQware Cluster UI through this link:

1. On the **Server Management** screen of the active RaQ, click **Maintenance** on the left. The File Backup table appears.
2. Click **Install Software** at the top. The Install Software and Software on the Cobalt Server tables appear.
3. In the Software on the Cobalt Server table, click the hypertext link for **Cobalt StaQware Cluster**.
4. The **Cluster Status** screen appears; this screen is protected by the standard RaQ Administrator password.

   Enter the admin user name and password in the dialog box.

Features on the StaQware Cluster user interface

The StaQware Cluster UI presents the standard Cobalt screen layout with the options displayed on the left. The options are as follows:

1. **Cluster Status** displays the current status of the StaQware Cluster.
2. **Cluster Network** allows the RaQ Administrator to view and adjust the network parameters for the StaQware Cluster.
3. **Failover Control** controls the forced and scheduled failovers, and allows the RaQ Administrator to disband the StaQware Cluster.
4. **Server Management** links back to the **Server Management** screen of the active RaQ.

Cluster Status screen

When you first enter the StaQware Cluster, the **Cluster Status** screen appears. The **Cluster Status** screen displays a colored circle to indicate the status of the StaQware Cluster.

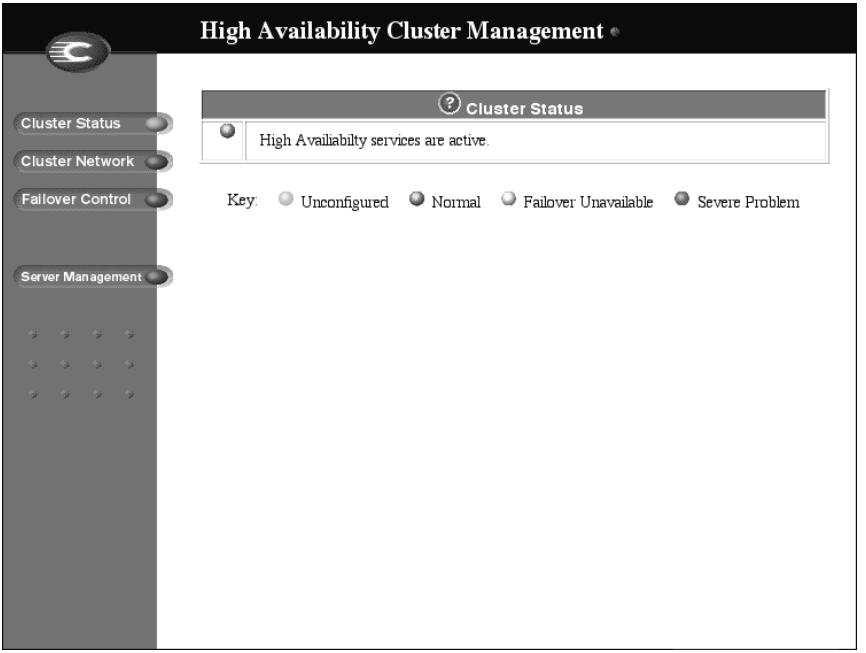
Table 2 provides an explanation of the colors and the associated states of the StaQware Cluster. Green is the only HA-state; all other colors indicate a non-HA state.

Table 2. Status colors

Color	Status
Gray	Unconfigured; non-HA state
Green	Normal functioning; HA state
Yellow	Failover is unavailable; non-HA state
Red	Severe problem; non-HA state

Figure 10 shows the Cluster Status screen.

Figure 10. Cluster Status screen



Cluster Network screen

If you have not yet configured a standby RaQ, see “Configuration Wizard” on page 25.

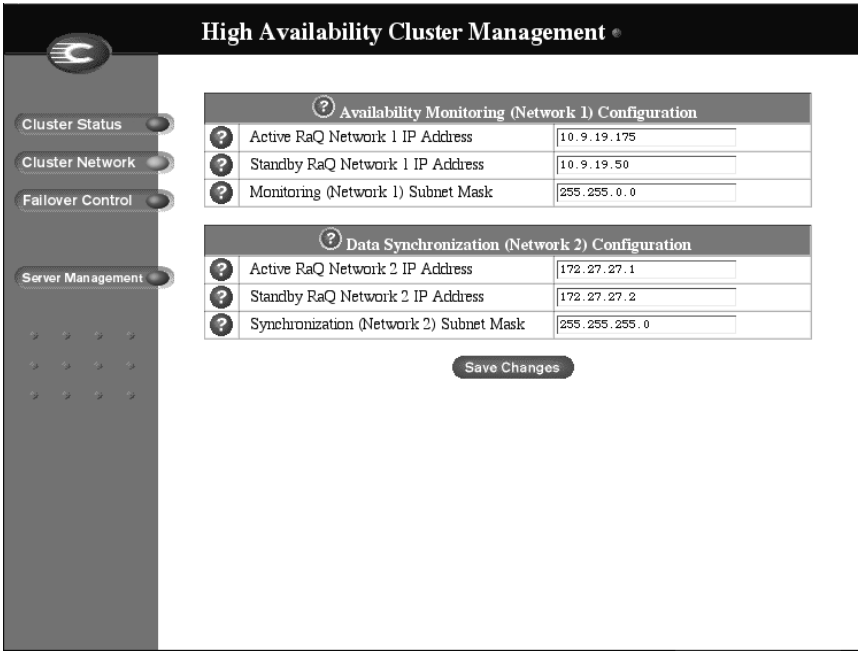
If you have already configured a standby RaQ, a Network Settings table appears; see Figure 11.

a. If the standby RaQ is rebuilding its drive or synchronizing its data to the active RaQ, or is in a failed state, the settings in this table appear as read-only.

b. If the standby RaQ is operating normally, the settings in this table can be changed. Click **Save Changes** when finished.

If you change any of the settings in the Network Settings table and save the changes, both the active RaQ and standby RaQ reboot and re-establish the StaQware Cluster. The automatic failover and data synchronization features are not available until the cluster is re-established.

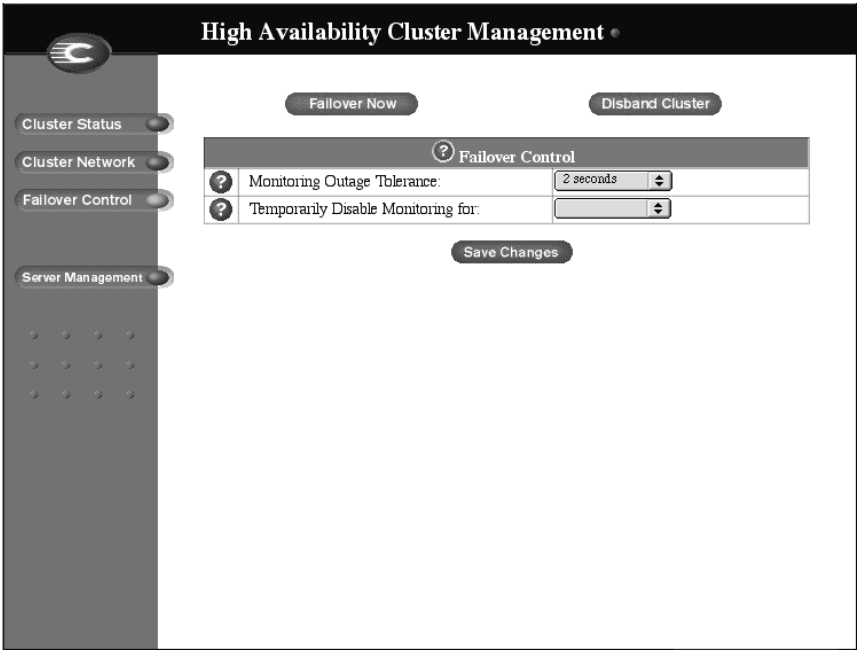
Figure 11. Cluster Network screen



Failover Control screen

Figure 12 shows the **Failover Control** screen.

Figure 12. Failover Control screen



In the Failover Control table, you can set two parameters:

- monitoring outage tolerance
- temporarily disable monitoring

Monitoring Outage Tolerance

You can adjust the sensitivity of the automatic failover (meaning how quickly the failover process begins) to tolerate a short disconnection from the network. For RaQ servers that undergo severe loads, select a longer time period.

The three options are 5 seconds, 90 seconds and 5 minutes. Click **Save Changes**.

If you want to install a software .pkg file that requires the RaQ to reboot after installation, set the Monitoring Outage Tolerance parameter to the maximum amount of time before you install the software.

Once the RaQ has rebooted, reset this parameter to the desired level of sensitivity.

Temporarily Disable Monitoring

You can disable the automatic failover feature for a specific interval. If you plan to disconnect the active RaQ from the network or to interrupt service (for example, perform maintenance on the standby RaQ), disable the automatic failover feature.

The interval options are 15 minutes, 1 hour, 2 hours, 4 hours and 1 day. Click **Save Changes**.

When you temporarily disable the monitoring function, the **Cluster Status** screen shows a yellow circle, indicating that automatic failover is unavailable. The **Cluster Status** screen also reports the time remaining in the service interval.

Note: When you temporarily disable the monitoring feature, an email notification is not sent to the RaQ Administrator.

If you want to install a software .pkg file on the active RaQ, do not use the Temporarily Disable Monitoring feature. Instead, set the Monitoring Outage Tolerance parameter to the maximum amount of time before you install the software. The new software will be synchronized to the standby RaQ. See "Monitoring Outage Tolerance" on page 40.

If you want to perform maintenance on standby RaQ, use the Temporarily Disable Monitoring feature so that you do not cause an email notification to be sent to the RaQ Administrator.

Choose an interval from the pull-down menu, save the changes and then power down the standby RaQ through the LCD console. When you reboot the standby RaQ, it will find its active RaQ.

There are also two buttons on the **Failover Control** screen:

a. Failover Now

b. Disband Cluster

Failover Now

If you want to perform maintenance on an active RaQ (for example, to add memory, or to physically disconnect the RaQ and move it), you can use the Failover Now feature.

To invoke a failover:

1. Click **Failover Now**.

   The feature halts the active RaQ, brings up the standby RaQ as the new active RaQ and powers down the former active RaQ properly.

2. The new active RaQ is now in non-HA state, meaning that the automatic failover feature is not available. The **Cluster Status** screen on the active RaQ displays a red circle, indicating that a failover has occurred.

   The LCD screen on the former active RaQ displays

   ```
   PLEASE POWER DOWN...
   ```

If you subsequently power on the former active RaQ on the same network, it searches for the new active RaQ. If the former active RaQ finds the new active RaQ, the former active RaQ becomes the standby RaQ. If the former active RaQ does not find the new active RaQ after approximately five minutes, it becomes the active RaQ.

To return a standby RaQ to normal RaQ server functionality, you must rebuild the RaQ with the OS Restore CD.

Note: Rebuilding the RaQ server with the OS Restore CD is a destructive process. All data is lost on the rebuilt RaQ.

Disband Cluster

At some point, you may want to disband the StaQware Cluster. To disband a cluster:

1. On the **Failover Control** screen, click **Disband Cluster**. A confirmation dialog appears, asking if you want to disband the StaQware Cluster.
2. Click **OK**. The buttons on the **Failover Control** screen are now disabled (gray). The **Cluster Status** screen shows a gray circle to indicate that the StaQware services are not configured.

   The standby RaQ powers down and the LCD screen displays

   ```
   PLEASE POWER DOWN...
   ```

You can re-enable the StaQware Cluster by proceeding through the steps of the Configuration Wizard again. See "Configuration Wizard" on page 25.

To return a disbanded standby RaQ to normal RaQ server functionality, you must rebuild the RaQ with the OS Restore CD.

Note: Rebuilding the RaQ server with the OS Restore CD is a destructive process. All data is lost on the rebuilt RaQ.

Configuration of a replacement standby RaQ

To configure a replacement standby RaQ for an active RaQ, you must first disband the current StaQware Cluster.

1. On the **Failover Control** screen, click **Disband Cluster**. A confirmation dialog appears, asking if you want to disband the StaQware Cluster.
2. Click **OK**. The **Cluster Status** screen shows a gray circle to indicate that the StaQware services are not configured.
3. Now you can configure a new standby RaQ by proceeding through the Configuration Wizard again. See "Configuration Wizard" on page 25.

To return a former standby RaQ to normal RaQ server functionality, you must rebuild the RaQ with the OS Restore CD.

Note: Rebuilding the RaQ server with the OS Restore CD is a destructive process. All data is lost on the rebuilt RaQ.

Failover Scenarios

Effects on assigned IP addresses

Table 3 explains the effect on the IP addresses when a failover occurs.

Table 3. Effects on IP addresses when failover occurs

IP address	Effect of failover
Sites on the RaQ server	The IP addresses fail over to the new active RaQ.
Availability monitoring	The IP addresses are paired to the media access control (MAC) address of the server and do NOT fail over to the new server.
Data synchronization	The IP addresses are paired to the media access control (MAC) address of the server and do NOT fail over to the new server.

Effects on services

If an active RaQ fails over to a standby RaQ, any outstanding connections are terminated. When a standby RaQ takes over for the failed active RaQ, it notifies the RaQ Administrator by email. The services provided by the active RaQ are affected in the same manner as services on a RaQ that reboots unexpectedly.

Data that has been written to the hard disk drive is safe. A program designed with server failures in mind is able to recover from an automatic failover with a minimum of problems.

The specific effects on each service offered on the RaQ are:

1. **Web**—Any transactions that have not been completed are not performed. The user must perform those transactions again.
2. **Email**—Sendmail, Post Office Protocol (POP) and Internet Message Access Protocol (IMAP) all write to the disk before indicating that a transfer was successful. If a failure occurs during a transfer, the user may receive a duplicate email message as well as a truncated copy of the message. The email messages are not lost.
3. **File transfer protocol**—The current connection fails, leaving a partially completed FTP transfer. The user must re-initiate the connection and perform the transfer again.
4. **Legato/Arkeia/Web backup**—The current connection fails, leaving a partially completed backup or restore function. The user must re-initiate the connection. Important configuration files can be corrupted if the failover occurs while restoring the files.
5. **Domain Name System service**—You receive an "Unresolved host lookup" error during the time that the failure has occurred. Web-related updates that have not been completed must be re-entered.
6. **Frontpage**—Any transactions that have not been completed are not performed. The user must perform those transactions again.

Possible failure scenarios

Table 4 describes some of the possible failover scenarios and the results of those failovers. These scenarios assume that only the network interfaces are down and that the systems are still operational.

Note: The term **HA state** means that the StaQware Cluster software is functioning normally on the cluster. The automatic failover and the data synchronization features are available. The term **non-HA state** means that the automatic failover feature is not available, and the data synchronization feature may or may not be available, depending on the source of failure.

The StaQware Cluster software reacts to the first error condition that it encounters. It does not provide StaQware Cluster services in the presence of multiple sources of failure. For example, if the standby RaQ is unable to contact both the active RaQ and the local gateway, it does not fail over; the cluster drops into non-HA state. Similarly, if the standby RaQ experiences a power outage or disk failure during a failover, services will be interrupted.

In each failure scenario, the active RaQ sends an email notification to the RaQ Administrator.

Table 4. Possible failure scenarios

Condition	Result
The Availability Monitoring channel (Network 1) of the active RaQ is inaccessible.	The standby RaQ shuts down the active RaQ. There is a clean failover.
The Data Synchronization channel (Network 2) of the active RaQ is inaccessible.	The active RaQ reports the standby RaQ as inaccessible. The StaQware Cluster goes into non-HA state. Data synchronization takes place when the active RaQ recovers.
The Availability Monitoring channel (Network 1) of the standby RaQ is inaccessible.	The standby RaQ still synchronizes with the active RaQ over the Data Synchronization channel. The StaQware Cluster goes into non-HA state. The standby RaQ can recover when the connection is re-established.
The Data Synchronization channel (Network 2) of the standby RaQ is inaccessible.	The active RaQ reports the standby RaQ as inaccessible. The StaQware Cluster goes into non-HA state. Data synchronization takes place when the active RaQ recovers.
The local gateway is inaccessible.	Because the standby RaQ cannot see the gateway, it does not have a connection to the outside world; thus, there is no reason for the standby RaQ to fail over, because it cannot receive service requests. The StaQware Cluster goes into non-HA state but data synchronization between the RaQ servers continues. ***Note:*** If the email notification address for the RaQ Administrator is an email address external to the RaQ server, an email is sent but it will bounce. The system tries to resend the email for four hours.
A disk I/O on the active RaQ fails.	The standby RaQ fails over. The active RaQ shuts down. The StaQware Cluster goes into non-HA state.
A disk write on the standby RaQ fails.	The StaQware Cluster goes into non-HA state.

Table 4. Possible failure scenarios

Condition	Result
The power fails on the active RaQ.	The standby RaQ detects the failure of the active RaQ and fails over. The StaQware Cluster goes into non-HA state. When the active RaQ is powered on again, it becomes the standby RaQ.
The power fails on the standby RaQ.	The StaQware Cluster goes into non-HA state. When the standby RaQ is powered on again, a full data synchronization occurs.
There is a power failure; both the active RaQ and standby RaQ lose power individually and fail (improper shutdown).	The StaQware Cluster is non-operational. Once the power returns, the active RaQ searches for its standby RaQ and the standby RaQ searches for its active RaQ. When power is restored, a full data synchronization occurs.

Technical Information

This chapter provides technical descriptions of the services provided by the StaQware Cluster software.

- The term **HA state** means that the StaQware Cluster software is functioning normally on the cluster. The automatic failover and the data synchronization features are available.
- The term **non-HA state** means that the automatic failover feature is not available, and the data synchronization feature may or may not be available, depending on the source of failure.

The StaQware Cluster software uses the gateway to determine whether the Network 1 interface is inaccessible. For example:

The standby RaQ contacts the gateway to determine whether the Network 1 interface of the standby RaQ is down (case 1) or the Network 1 interface of the active RaQ is down (case 2). Based on this information, the standby RaQ does not fail over (case 1) or it does fail over (case 2).

Failure detection

The StaQware Cluster software detects a failure in the following manner.

1. The standby RaQ sends an Internet Control Message Protocol (ICMP) echo (a “ping”) to the active RaQ every five seconds on the Availability Monitoring (Network 1) interface. The active RaQ responds to the pings from the standby RaQ.
2. If the active RaQ does not respond to the standby RaQ within a specified tolerance interval, the standby RaQ tells the active RaQ to shut down. The active RaQ shuts down properly and the standby RaQ fails over to become the new active RaQ.
3. You can set this tolerance interval (the Monitoring Outage Tolerance parameter) on the **Failover Control** screen in the user interface (UI). For more information, see “Monitoring Outage Tolerance” on page 40.

If the standby RaQ detects that the Availability Monitoring (Network 1) channel is accessible but the Data Synchronization (Network 2) channel is inaccessible, there is no failover. The active RaQ degrades to a non-HA state.

If the standby RaQ detects that the Data Synchronization (Network 2) channel and the gateway are accessible but the Availability Monitoring (Network 1) channel is inaccessible, the standby RaQ tells the active RaQ to shut down. The standby RaQ fails over to become the new active RaQ.

Before using StaQware Cluster software

Before using the StaQware Cluster software, users should be aware of the following items.

1. Before you load the StaQware Cluster software package file (.pkg), ensure that you have installed OS Update 2.0 or later for the RaQ on the active RaQ. For more information, see "System setup" on page 18.
2. The process of converting a RaQ into a standby RaQ destroys all the data on the standby RaQ. Ensure that you back up all data on the RaQ before you convert it into a standby RaQ.

   The StaQware Cluster software does not affect the data on the active RaQ.
3. The two RaQ servers must have the same SKU number because the hard drives in the two RaQ servers must be the same size. Verify the SKU number on the rear label of each server.
4. The StaQware Cluster software mirrors only the first internal IDE hard disk drive to the standby RaQ. External storage devices or additional internal hard disk drives cannot be used in conjunction with the StaQware Cluster software. If necessary, a link to the **Maintenance** screen of the Server Management section is provided so that the RaQ Administrator can disable an external storage device.
5. To restore a standby RaQ to the normal RaQ server functionality, you need to rebuild the standby RaQ with an OS Restore CD. An OS Restore CD is included with the purchase of the StaQware Cluster software.

Note: Rebuilding the RaQ server with the OS Restore CD is a destructive process. All data is lost on the rebuilt RaQ.

6. Do not interrupt the process of synchronizing the standby RaQ. The process of synchronizing a standby RaQ takes approxmately 1.5 hours, depending on the size of the hard disk drive.

   Interrupting the synchronization process can leave the standby RaQ in an unbootable condition for which you will need to use the OS Restore CD to rebuild the RaQ.

7. The StaQware Cluster software uses the Network 2 interface to synchronize the data from the active RaQ to the standby RaQ. If you perform scheduled backups of the RaQ through the Network 2 interface, the IP address assigned to the Network 2 interface for data synchronization (in the StaQware Cluster Configuration Wizard) must be different from the IP address assigned to the Network 2 interface for the backup function (in the **Server Management > Maintenance > Backup** screen).

   Also, in this case, use the wiring solution as displayed in Figure 2.

StaQware Cluster monitoring daemon at bootup

1. The active RaQ and the standby RaQ know who they are on the network even though the content of their disks is identical.
2. On bootup, the active RaQ searches for its standby RaQ on the network, and the standby RaQ searches for its active RaQ.
3. If one of the two servers sees an active RaQ, it knows to become a standby RaQ.
4. If a standby RaQ is not found within five minutes, the active RaQ goes into a degraded state, meaning that the StaQware Cluster services are not available. However, the active RaQ still services requests.
5. If an active RaQ is not found within five minutes, the standby RaQ fails over and attempts to become the active RaQ.

Force the server to boot as active RaQ or standby RaQ

During the boot process, you can force the RaQ to boot as either the active RaQ or the standby RaQ.

Force the server to boot as an active RaQ

To force the RaQ to boot as an active RaQ:

1. Reboot the RaQ; see "Rebooting" on page 60. The LCD screen displays the scrolling Cobalt logo and then

   ```
   LOADING KERNEL...
   ```

2. When the LCD screen displays the message

   ```
   BOOTING...
   ```

   press and hold down the right arrow button.

3. The message

   ```
   BOOTING AS ACTIVE RAQ
   ```

   appears on the screen very briefly, followed by

   ```
   LOOKING FOR STANDBY RAQ...
   ```

4. When this message appears, you can release the right arrow button.

5. The RaQ boots up as the active RaQ.

Force the server to boot as a standby RaQ

To force the RaQ to boot as a standby RaQ:

1. Reboot the RaQ; see "Rebooting" on page 60. The LCD screen displays the scrolling Cobalt logo and then

   ```
   LOADING KERNEL...
   ```

2. When the LCD screen displays the message

   ```
   BOOTING...
   ```

   press and hold down the left arrow  button.

3. The message

   ```
   BOOTING AS STANDBY RAQ
   ```

   appears on the screen very briefly, followed by

   ```
   LOOKING FOR ACTIVE RAQ...
   ```

4. When this message appears, you can release the left arrow  button.
5. The RaQ server boots up as the standby RaQ.

Glossary

This document uses the following terms:

1. **Active RaQ**: the live RaQ server that is currently providing the services.
2. **Standby RaQ**: the RaQ server that is monitoring the active RaQ and is configured to take over if the active RaQ fails.
3. **StaQware Cluster**: the active RaQ and the standby RaQ taken as a unit.
4. **Crossover cable**: a cable in which the transmission pair on one end of the cable connects to the receive pair on the other end, and vice versa. A crossover cable allows you to connect two "like" devices without using a hub.
5. **HA state**: High Availability state. The StaQware Cluster software is functioning normally on the cluster. The automatic failover and the data synchronization features are available.
6. **Non-HA state**: non-High Availability state. The automatic failover feature is not available; the data synchronization feature may or may not be available, depending on the point of failure.
7. **Address Resolution Protocol (ARP)**: a protocol used by the Internet Protocol (IP) network-layer protocol to map IP network addresses to the hardware addresses used by a data link protocol. The ARP protocol is used when IP is used over ethernet. The hardware address is also known as the Media Access Control (MAC) address, in reference to the standards which define ethernet.

Using the LCD Console

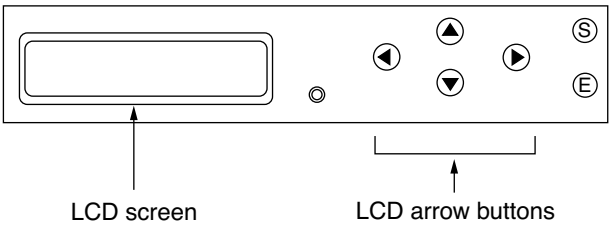
LCD console

When setting up the RaQ, you use the LCD console to enter network configuration information for the RaQ. During startup, the LCD screen on the front panel of the RaQ displays status information about the boot process itself.

Figure 13 shows the LCD console for the RaQ.

The LCD screen on the front of the RaQ displays two lines of text. The top line of the LCD presents instructions on data to enter; the bottom line displays the data already entered. Use the arrow buttons to the right of the LCD screen to enter the required network information manually.

Figure 13. LCD console



The arrow buttons function as follows:

- The Left arrow button moves the cursor to the left.
- The Right arrow button moves the cursor to the right.
- The Up arrow button increases the digit located at the cursor position.
- The Down arrow button decreases the digit located at the cursor position.
- The S button (“select”) displays the next option.
- The E button (“enter”) accepts the information entered or the option displayed.

LCD display and messages

When StaQware Cluster is operating normally:

- the LCD screen on the active RaQ displays

  ```
  <hostname.domainname of the active RaQ>
  <IP  address of the active RaQ>
  ```

- the LCD screen on the standby RaQ displays

  ```
  STANDBY RAQ FOR <IP address of
  the active RaQ>
  ```

The following messages can appear on the LCD display of the standby RaQ:

- The following message is displayed when one of the ethernet cables is disconnected.

  ```
  STANDBY RAQ IS NOT HA.  *CHECK CABLING*
  ```

  For more information on the error, go to the **Cluster Status** screen on the UI of the active RaQ; the **Cluster Status** screen displays a red circle and the error condition.

- The following message is displayed when you temporarily disable the monitoring function on the **Failover Control** screen. For more information on the Temporarily Disable Monitoring feature, see "Temporarily Disable Monitoring" on page 40.

  ```
  SERVICE INTERVAL IN PROGRESS
  ```

- The following message is displayed when the active RaQ is acquiring a standby RaQ, or if the Data Synchronization (Network 2) ethernet cable was disconnected and has now been reconnected.

  ```
  SYNCHRONIZING DATA...
  ```

If the StaQware Cluster returns to operating normally, the LCD screen returns to the normal display

```
STANDBY RAQ FOR <IP address of
the active RaQ>
```

LCD commands

Active RaQ

Through the LCD console on the active RaQ, you can:

- change the network configuration information, which is useful if the location of the RaQ is changed
- configure the uninterruptible power supply (UPS)
- reboot, which restarts the entire RaQ
- power down in a way that allows the RaQ to close all open files, and minimizes startup time the next time the RaQ is powered on
- exit from the LCD commands without making any changes

Important: Before turning off the RaQ, follow the proper power-down procedure, as described in "Powering down" on page 61.

You access each of these functions by holding down the (S) (select) button on the LCD console for approximately two seconds. This action causes the LCD screen to enter its function mode. Press the (S) button until the function you want appears on the LCD screen. To cancel the LCD function mode, select the **EXIT** function when it appears on the screen. Press the (E) (enter) button and select **YES**.

Changing network configuration

To reset the IP address or change the network configuration of the Network 1 interface:

1. On the LCD console, hold down the (S) button for approximately 2 seconds.

   The LCD screen displays:

   ```
   SELECT:
       SETUP NETWORK
   ```

2. Press the (E) button.
3. Enter the IP address using the arrow buttons. The left and right arrow buttons move the cursor position to the left or right. The up and down arrow buttons increase or decrease the digit at the cursor position.
4. Press the (E) button.
5. Enter the Netmask using the arrow buttons.
6. Press the (E) button.
7. Enter the Gateway using the arrow buttons.
8. Press the (E) button.
9. Use the arrow buttons to toggle the cursor between [S]ave and [C]ancel.
10. Press the (E) button.

If you select the Save option, the RaQ reboots using the new network configuration. If you select Cancel, you return to Step 1 of this procedure.

Configuring an uninterruptible power supply (UPS)

The are two options for configuring the RaQ for a UPS: as the *master* or as a *slave*.

The *master* communicates directly to the UPS through the serial port. The *slave* (or *slaves*) communicates with the master (not a RaQ server) over the network to verify the status of the power supply.

Note: The RaQ server cannot act as a *master* for other machines. Allowing *slave* access by arbitrary machines would pose a security risk.

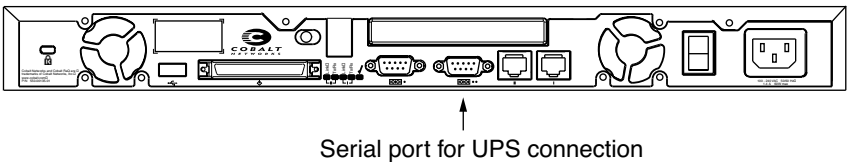
The distinction between *master* and *slave* is whether the RaQ is connected directly to the UPS (a *master*) or pointed to another machine that is directly connected to the UPS (a *slave*).

If you configure the RaQ as a *slave*, you must have, on the network, a machine acting as a UPS master that is configured to allow *slave* access for the IP address of your RaQ.

If you configure a RaQ as a *master*, the RaQ configures itself automatically. Before choosing this option, you must first connect the UPS to the RaQ through the serial port; see Figure 14 for the correct serial port.

If you configure a RaQ as a *slave*, the LCD screen prompts you for the IP address of the device that is configured as the master.

Figure 14. Serial port for UPS connection



To configure the RaQ for the UPS, first connect the UPS unit and the RaQ, and then configure the RaQ through the LCD panel. (Refer to the UPS manual for more information on connecting the devices.)

1. Plug the UPS into the wall socket.
2. Turn on the UPS.
3. Plug the RaQ server(s) into the UPS power sockets.
4. Connect the UPS serial cable to the UPS unit and the serial port on the RaQ that will serve as the master. See Figure 14.

Important: You must use the serial cable shipped with the UPS unit.

5. On the LCD console, hold down the (S) button for approximately 2 seconds.

   The LCD screen displays:

   ```
   SELECT:
       SETUP NETWORK
   ```

6. Press the (S) button until **Configure UPS** appears in the LCD screen:

   ```
   SELECT:
       CONFIGURE UPS
   ```

7. Press the (E) button.
8. Use the arrow buttons to toggle the cursor between [ ] On and [ ] Off. Select [ ] On.
9. Press the (E) button.
10. Use the arrow buttons to toggle the cursor between [M]aster and [S]lave.
11. Press the (E) button. If you choose [M]aster, the RaQ configures itself automatically for the UPS.

12. If you choose [S]lave, the LCD screen prompts you for the IP address of the device configured as the master.

    Enter the IP address using the arrow buttons. The left and right arrow buttons move the cursor position to the left or right. The up and down arrow buttons increase or decrease the digit at the cursor position.

13. Press the (E) button.

    The LCD screen returns to the host name and IP address. The LCD screen does NOT prompt you to save the changes.

Verifying the UPS configuration

To verify that you have configured the UPS correctly:

1. Unplug the UPS unit from the wall socket to simulate a power outage to the UPS.
2. The UPS takes over the power supply to the RaQ servers. Each of the RaQ servers monitoring the UPS displays on the LCD screen:

    ```
    UPS:
        ON BATTERY
    ```

3. Plug the UPS into the wall socket again. Each of the RaQ servers monitoring the UPS displays on the LCD screen:

    ```
    UPS:
        POWER RESTORED
    ```

    After a few seconds, the LCD screen returns to the normal LCD display of host name and IP address.

Rebooting

To reboot the RaQ through the LCD console:

1. On the LCD console, hold down the (S) button for approximately 2 seconds.

   The LCD screen displays:

   ```
   SELECT:
       SETUP NETWORK
   ```

2. Press the (S) button until **Reboot** appears in the LCD screen:

   ```
   SELECT:
       REBOOT
   ```

3. Press the (E) button.
4. Use the arrow buttons to toggle the cursor between [Y] and [N]. Select [Y] to reboot the system.
5. Press the (E) button.

Powering down

Caution: To prevent the potential loss of data, it is important to follow the proper power-down procedure before turning off the RaQ.

To power down the RaQ:

1. On the LCD console, hold down the (S) button for approximately 2 seconds.

   The LCD screen displays:

   ```
   SELECT:
       SETUP NETWORK
   ```

2. Press the (S) button until **Power down** appears in the LCD screen:

   ```
   SELECT:
       POWER DOWN
   ```

3. Press the (E) button.
4. Use the arrow buttons to toggle the cursor between [Y] and [N]. Select [Y] to power down the system.

   The **OK to Power Off** light on the back panel blinks. The LCD screen displays:

   ```
   PLEASE SWITCH
   POWER OFF NOW
   ```

5. Toggle the **On/Off** switch on the back panel to the **Off** position.

Standby RaQ

Through the LCD console on the standby RaQ, you can:

- force the standby RaQ to fail over, taking over services from the active RaQ. The active RaQ shuts down automatically.
- shut down in a way that allows the RaQ to close all open files, and minimizes startup time the next time the RaQ is powered on. This command is the same as on the active RaQ; see "Powering down" on page 61.
- reboot, which restarts the entire RaQ. This command is the same as on the active RaQ; see "Rebooting" on page 60.
- exit from the LCD commands without making any changes. The LCD screen returns to the display

```
STANDBY RAQ FOR <IP address of
the active RaQ>
```

Forcing a failover

To force a failover from the LCD console of the standby RaQ:

1. On the LCD console, hold down the (S) button for approximately 2 seconds.

   The LCD screen displays:

   ```
   SELECT:
       FAILOVER NOW
   ```

2. Press the (E) button.

   The LCD screen displays:

   ```
   PREPARING TO
       FAILOVER
   ```

3. When the failover process is finished, the LCD screen on the new active RaQ displays

   ```
   <hostname.domainname>
   <IP address>
   ```

   of the former active RaQ.

4. The LCD screen on the former active RaQ displays

   ```
   PLEASE SWITCH
   POWER OFF NOW
   ```

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Worksheet

Request these IP addresses from your Network Administrator:

Standby RaQ IP address **(A)**: _____

Active RaQ Monitoring IP address **(D)**: _____

Standby RaQ Monitoring IP address **(E)**: _____

Monitoring (Network 1) Subnet Mask **(F)**: _____

Active RaQ Synchronization IP address **(G)**: _____

Standby RaQ Synchronization IP address **(H)**: _____

Synchronization (Network 2) Subnet Mask **(I)**: _____