SYBASE®

Using Sybase Failover in a High Availability System

Adaptive Server® Enterprise

15.0

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Contents

About This Book

Audience

This manual is intended for Sybase System Administrators and Database Owners.

How to use this book

This book describes how to install, configure, and use Sybase Failover in a high availability system.

- Chapter 1, "What is High Availability?" introduces the concepts of a high availability system and Sybase Failover.
- Chapter 2, "Failover and Failback," provides an overview of failing over and failing back between Adaptive Servers in a high availability system.
- Chapter 3, "Asymmetric and Symmetric Configurations," discusses the differences between asymmetric and symmetric configurations.
- Chapter 4, "Modes of Failover," describes the different modes in which Adaptive Server operates when configured for a fail over.
- Chapter 5, "Proxy Databases, User Databases, and Proxy System Tables," discusses the concepts of proxy databases, the effect of a failover on user databases, and the concepts of proxy system tables.
- Chapter 6, "Running do_advisory," describes how to configure two Adaptive Servers for fail over.
- Chapter 7, "Configuring Adaptive Server for Failover on HP," describes how to configure failover on HP.
- Chapter 8, "Configuring Adaptive Server for Failover on IBM AIX HACMP," describes how to configure failover on IBM AIX.
- Chapter 9, "Active-Active Configuration for Sun Cluster 3.0 and 3.1," describes how to configure failover on Sun Clusters.
- Chapter 10, "Active-Passive Configuration for Sun Cluster 3.0 and 3.1," describes how to configure failover on Sun Clusters.
- Chapter 11, "Configuring Adaptive Server for Failover on Veritas 4.0," describes how to configure failover on Veritas.

- Chapter 12, "Configuring Adaptive Server for Failover on Windows," describes how to configure Windows 2000 and 2003.
- Appendix A, "Troubleshooting Secondary Points of Failure," describes methods of troubleshooting second point of failures.
- Appendix B, "Changes to Commands, System Procedures, and Databases," describes how commands, system procedures, and system databases change when Adaptive Server is configured for failover.
- Appendix C, "Open Client Functionality in a Failover Configuration," describes changes required for Open Client™ to work with Sybase Failover.

Related documents

The Sybase® Adaptive Server® Enterprise documentation set consists of the following:

- The release bulletin for your platform – contains last-minute information that was too late to be included in the books.

  A more recent version of the release bulletin may be available on the World Wide Web. To check for critical product or document information that was added after the release of the product CD, use the Sybase Technical Library.
- The *Installation Guide* for your platform – describes installation, upgrade, and configuration procedures for all Adaptive Server and related Sybase products.
- *What's New in Adaptive Server Enterprise?* – describes the new features in Adaptive Server version 15.0, the system changes added to support those features, and changes that may affect your existing applications.
- *ASE Replicator User's Guide* – describes how to use the Adaptive Server Replicator feature of Adaptive Server to implement basic replication from a primary server to one or more remote Adaptive Servers.
- *Component Integration Services User's Guide* – explains how to use the Adaptive Server Component Integration Services feature to connect remote Sybase and non-Sybase databases.
- The *Configuration Guide* for your platform – provides instructions for performing specific configuration tasks for Adaptive Server.
- *Full-Text Search Specialty Data Store User's Guide* – describes how to use the Full-Text Search feature with Verity to search Adaptive Server Enterprise data.

- *Glossary* – defines technical terms used in the Adaptive Server documentation.
- *Historical Server User’s Guide* – describes how to use Historical Server to obtain performance information for SQL Server® and Adaptive Server.
- *Java in Adaptive Server Enterprise* – describes how to install and use Java classes as data types, functions, and stored procedures in the Adaptive Server database.
- *Job Scheduler User's Guide* – provides instructions on how to install and configure, and create and schedule jobs on a local or remote Adaptive Server using the command line or a graphical user interface (GUI).
- *Messaging Service User’s Guide* – describes how to useReal Time Messaging Services to integrate TIBCO Java Message Service and IBM WebSphere MQ messaging services with all Adaptive Server database applications.
- *Monitor Client Library Programmer’s Guide* – describes how to write Monitor Client Library applications that access Adaptive Server performance data.
- *Monitor Server User’s Guide* – describes how to use Monitor Server to obtain performance statistics from SQL Server and Adaptive Server.
- *Performance and Tuning Guide* – is a series of four books that explains how to tune Adaptive Server for maximum performance:
  - *Basics* – the basics for understanding and investigating performance questions in Adaptive Server.
  - *Locking* – describes how the various locking schemas can be used for improving performance in Adaptive Server.
  - *Optimizer and Abstract Plans* – describes how the optimizer processes queries and how abstract plans can be used to change some of the optimizer plans.
  - *Monitoring and Analyzing* – explains how statistics are obtained and used for monitoring and optimizing performance.
- *Quick Reference Guide* – provides a comprehensive listing of the names and syntax for commands, functions, system procedures, extended system procedures, datatypes, and utilities in a pocket-sized book.
- *Reference Manual* – is a series of four books that contains the following detailed Transact-SQL® information:

    - *Building Blocks* – Transact-SQL datatypes, functions, global variables, expressions, identifiers and wildcards, and reserved words.
    - *Commands* – Transact-SQL commands.
    - *Procedures* – Transact-SQL system procedures, catalog stored procedures, system extended stored procedures, and dbcc stored procedures.
    - *Tables* – Transact-SQL system tables and dbcc tables.
- *System Administration Guide* – provides in-depth information about administering servers and databases. This manual includes instructions and guidelines for managing physical resources, security, user and system databases, and specifying character conversion, international language, and sort order settings.
- *System Tables Diagram* – illustrates system tables and their entity relationships in a poster format. Available only in print version.
- *Transact-SQL User's Guide* – documents Transact-SQL, Sybase's enhanced version of the relational database language. This manual serves as a textbook for beginning users of the database management system. This manual also contains descriptions of the pubs2 and pubs3 sample databases.
- *Using Adaptive Server Distributed Transaction Management Features* – explains how to configure, use, and troubleshoot Adaptive Server DTM features in distributed transaction processing environments.
- *Using Sybase Failover in a High Availability System* – provides instructions for using Sybase's Failover to configure an Adaptive Server as a companion server in a high availability system.
- *Unified Agent and Agent Management Console* – Describes the Unified Agent, which provides runtime services to manage, monitor and control distributed Sybase resources.
- *Utility Guide* – documents the Adaptive Server utility programs, such as isql and bcp, which are executed at the operating system level.
- *Web Services User's Guide* – explains how to configure, use, and troubleshoot Web Services for Adaptive Server.
- *XA Interface Integration Guide for CICS, Encina, and TUXEDO* – provides instructions for using the Sybase DTM XA interface with X/Open XA transaction managers.

- *XML Services in Adaptive Server Enterprise* – describes the Sybase native XML processor and the Sybase Java-based XML support, introduces XML in the database, and documents the query and mapping functions that comprise XML Services.

Other sources of information

Use the Sybase Getting Started CD, the SyBooks CD, and the Sybase Product Manuals Web site to learn more about your product:

- The Getting Started CD contains release bulletins and installation guides in PDF format, and may also contain other documents or updated information not included on the SyBooks CD. It is included with your software. To read or print documents on the Getting Started CD, you need Adobe Acrobat Reader, which you can download at no charge from the Adobe Web site using a link provided on the CD.
- The SyBooks CD contains product manuals and is included with your software. The Eclipse-based SyBooks browser allows you to access the manuals in an easy-to-use, HTML-based format.

  Some documentation may be provided in PDF format, which you can access through the PDF directory on the SyBooks CD. To read or print the PDF files, you need Adobe Acrobat Reader.

  Refer to the *SyBooks Installation Guide* on the Getting Started CD, or the *README.txt* file on the SyBooks CD for instructions on installing and starting SyBooks.
- The Sybase Product Manuals Web site is an online version of the SyBooks CD that you can access using a standard Web browser. In addition to product manuals, you will find links to EBFs/Maintenance, Technical Documents, Case Management, Solved Cases, newsgroups, and the Sybase Developer Network.

  To access the Sybase Product Manuals Web site, go to Product Manuals at http://www.sybase.com/support/manuals/.

Sybase certifications on the Web

Technical documentation at the Sybase Web site is updated frequently.

❖ **Finding the latest information on product certifications**

1. Point your Web browser to Technical Documents at http://www.sybase.com/support/techdocs/.
2. Select Products from the navigation bar on the left.
3. Select a product name from the product list and click Go.
4. Select the Certification Report filter, specify a time frame, and click Go.

5 Click a Certification Report title to display the report.

❖ **Finding the latest information on component certifications**

1 Point your Web browser to Availability and Certification Reports at http://certification.sybase.com/.

2 Either select the product family and product under Search by Product; or select the platform and product under Search by Platform.

3 Select Search to display the availability and certification report for the selection.

❖ **Creating a personalized view of the Sybase Web site (including support pages)**

Set up a MySybase profile. MySybase is a free service that allows you to create a personalized view of Sybase Web pages.

1 Point your Web browser to Technical Documents at http://www.sybase.com/support/techdocs/.

2 Click MySybase and create a MySybase profile.

Sybase EBFs and software maintenance

❖ **Finding the latest information on EBFs and software maintenance**

1 Point your Web browser to the Sybase Support Page at http://www.sybase.com/support.

2 Select EBFs/Maintenance. If prompted, enter your MySybase user name and password.

3 Select a product.

4 Specify a time frame and click Go. A list of EBFs/Maintenance releases is displayed.

Padlock icons indicate that you do not have download authorization for certain EBFs/Maintenance releases because you are not registered as a Technical Support Contact. If you have not registered, but have valid information provided by your Sybase representative or through your support contract, click Edit Roles to add the “Technical Support Contact” role to your MySybase profile.

5 Click the Info icon to display the EBFs/Maintenance report, or click the product description to download the software.

Conventions

The following sections describe conventions used in this manual.

SQL is a free-form language. There are no rules about the number of words you can put on a line or where you must break a line. However, for readability, all examples and most syntax statements in this manual are formatted so that each clause of a statement begins on a new line. Clauses that have more than one part extend to additional lines, which are indented. Complex commands are formatted using modified Backus Naur Form (BNF) notation.

Table 1 shows the conventions for syntax statements that appear in this manual:

Table 1: Font and syntax conventions for this manual

Element	Example
Command names, procedure names, utility names, and other keywords display in sans serif font.	select sp_configure
Database names and datatypes are in sans serif font.	master database
Book names, file names, variables, and path names are in italics.	*System Administration Guide* *sql.ini* file *column_name* *$SYBASE/ASE* directory

Variables—or words that stand for values that you fill in—when they are part of a query or statement, are in italics in Courier font.	`select` *`column_name`*
	`    from` *`table_name`*
	`    where` *`search_conditions`*

Type parentheses as part of the command.	compute *row_aggregate* (*column_name*)
Double colon, equals sign indicates that the syntax is written in BNF notation. Do not type this symbol. Indicates "is defined as".	`::=`
Curly braces mean that you must choose at least one of the enclosed options. Do not type the braces.	`{cash, check, credit}`
Brackets mean that to choose one or more of the enclosed options is optional. Do not type the brackets.	`[cash | check | credit]`
The comma means you may choose as many of the options shown as you want. Separate your choices with commas as part of the command.	`cash, check, credit`
The pipe or vertical bar(|) means you may select only one of the options shown.	`cash | check | credit`

An ellipsis (...) means that you can *repeat* the last unit as many times as you like.	`buy thing = price [cash | check | credit]`
	`[, thing = price [cash | check | credit]]...`
	You must buy at least one thing and give its price. You may choose a method of payment: one of the items enclosed in square brackets. You may also choose to buy additional things: as many of them as you like. For each thing you buy, give its name, its price, and (optionally) a method of payment.

- Syntax statements (displaying the syntax and all options for a command) appear as follows:

  sp_dropdevice [*device_name*]

  For a command with more options:

  select *column_name*
  from *table_name*
  where *search_conditions*

  In syntax statements, keywords (commands) are in normal font and identifiers are in lowercase. Italic font shows user-supplied words.

- Examples showing the use of Transact-SQL commands are printed like this:

  ```
  select * from publishers
  ```

- Examples of output from the computer appear as follows:

```
pub_id    pub_name                 city          state
-------   ---------------------    -----------   -----
0736      New Age Books            Boston        MA
0877      Binnet & Hardley         Washington    DC
1389      Algodata Infosystems     Berkeley      CA

(3 rows affected)
```

In this manual, most of the examples are in lowercase. However, you can disregard case when typing Transact-SQL keywords. For example, SELECT, Select, and select are the same.

Adaptive Server's sensitivity to the case of database objects, such as table names, depends on the sort order installed on Adaptive Server. You can change case sensitivity for single-byte character sets by reconfiguring the Adaptive Server sort order. For more information, see the *System Administration Guide*.

Accessibility features

This document is available in an HTML version that is specialized for accessibility. You can navigate the HTML with an adaptive technology such as a screen reader, or view it with a screen enlarger.

Adaptive Server HTML documentation has been tested for compliance with U.S. government Section 508 Accessibility requirements. Documents that comply with Section 508 generally also meet non-U.S. accessibility guidelines, such as the World Wide Web Consortium (W3C) guidelines for Web sites.

Note You might need to configure your accessibility tool for optimal use. Some screen readers pronounce text based on its case; for example, they pronounce ALL UPPERCASE TEXT as initials, and MixedCase Text as words. You might find it helpful to configure your tool to announce syntax conventions. Consult the documentation for your tool.

For information about how Sybase supports accessibility, see Sybase Accessibility at http://www.sybase.com/accessibility. The Sybase Accessibility site includes links to information on Section 508 and W3C standards.

If you need help

Each Sybase installation that has purchased a support contract has one or more designated people who are authorized to contact Sybase Technical Support. If you cannot resolve a problem using the manuals or online help, please have the designated person contact Sybase Technical Support or the Sybase subsidiary in your area.

CHAPTER 1

What is High Availability?

As more businesses depend on computer systems they also expect these systems to be available at all times. High availability means that a system is setup so that if a computer system or network has a hardware or software failure, the system fails over into a backup system. Business can then go on as usual. Once the problem is resolved, the system fails back to the primary system.

Sybase High Availability Failover enables Adaptive Server Enterprise to work in a cluster of servers in a network in a specific configuration such as active-active or active-passive. Such a system allows for failover and then the failback on servers. This manual includes information about how to set up and run the Adaptive Server high availability system.

A **high availability** cluster includes two or more machines that are configured so that, if one machine (or application) is brought down, the second machine assumes the workload of both machines. Each of these machines is called one **node** of the high availability cluster. A high availability cluster is typically used in an environment that must always be available, for example, a banking system to which clients must connect continuously.

When the **primary companion** or machine fails, the databases, metadata, and user connections are moved to a secondary server so that users can still access data. This is known as **failover**.

When the primary companion or machine is prepared to resume operation, the user with the ha_role performs a failback, which returns the servers to normal companion mode.

Active-active configuration

An **active-active** setup is a two-node configuration where both nodes in the **cluster** include Adaptive Servers managing independent workloads, capable of taking over each other's workload in the event of a failure.

The Adaptive Server that takes over the workload is called a secondary companion, and the Adaptive Server that fails is called the primary companion. Together they are **companion servers**. This movement from one node to another is called fail over. After the primary companion is ready to resume its workload, it is moved back to its original node. This movement is called a failback.

When a system fails over, clients that are connected to the primary companion and use the failover property automatically reestablish their network connections to the secondary companion.

You must tune your operating system to successfully manage both Adaptive Servers during fail over. See your operating system documentation for information about configuring your system for high availability.

Note An Adaptive Server configured for failover in an *active-active* setup can be shut down using the shutdown command only after you have suspended Adaptive Server from the companion configuration, at both the server level and the platform level. For more information, see the appropriate platform-specific configuration chapter of this manual.

Active-passive configuration

An **active-passive** configuration is a multi-node setup that involves a single Adaptive Server, a primary node on which the Adaptive Server runs, and a set of secondary nodes which can host the Adaptive Server and its resources, if necessary.

When the Adaptive Server cannot run on the primary node, it fails over, and the Adaptive Server is relocated and restarted on a secondary node. The Adaptive Server can be moved back to the primary node after it recovers and when it can successfully host the Adaptive Server and any associated resources.

In the case of fail over or fail back, clients connected to the Adaptive Server reestablish their network connections and resubmit any uncommitted transactions when the Adaptive Server is restarted on the secondary node. Client connections using the failover property automatically reestablish their connections.

Sybase provides active-passive configuration support for Sun Cluster 3.0 or. Contact your provider for other cluster platforms. See Chapter 10, “Active-Passive Configuration for Sun Cluster 3.0 and 3.1,” for detailed information on configuring Adaptive Server in the active-passive mode for Sun Cluster 3.0. Other chapters of this manual pertain to the active-active configuration unless otherwise specified.

Note Adaptive Server configured for failover in an *active-passive* setup can be shut down using the shutdown command only after you disable monitoring on the Adaptive Server at the platform level.

ASE 15.0 supports following cluster platforms for Sybase-HA configuration:

- HP Unix - MCSG 11.15
- IBM Aix - HACMP 5.2
- Sun Solaris - VCS4.0, SunCluster3.0 and 3.1
- Linux - VC4.0
- Win2000 - Cluster Manger 5.0
- Win2003 - Cluster Manger 5.2

Differences between active-active and active-passive

Table 1-1 summarizes the differences between an active-active and an active-passive configuration.

Table 1-1: Difference between active-active and active-passive

Active-active	**Active-passive**
Setup: Two Adaptive Servers are configured as companion servers, each with independent workloads. These companions run on the primary and secondary nodes, respectively, as individual servers until one fails over.	*Setup*: A single Adaptive Server runs either on the primary node or on the secondary node. The Adaptive Server runs on the primary node before a fail over and the secondary node after fail over.
Failover: When fail over occurs, the secondary companion takes over the devices, client connections, and so on from the primary companion. The secondary companion services the failed-over clients, as well as any new clients, until the primary companion fails back and resumes its activities.	*Failover*: When a system fails over, the Adaptive Server and its associated resources are relocated to, and restarted on, the secondary node.
Failback: Failback is a planned event during which the primary companion takes back its devices and client connections from the secondary companion to resume its services.	*Failback*: Failback is a planned fail over or relocation of the Adaptive Server and its resources to the primary node. Failback is not required, but can be done for administrative purposes.
Client Connection failover: During failover, clients connect to the secondary companion to resubmit their uncommitted transactions. During failback, clients connect to the primary companion to resubmit their transactions. Clients with the failover property reestablish their connections automatically.	*Client Connection failover*: During failover and failback, clients connect to the same Adaptive Server to resubmit uncommitted transactions. Clients with the failover property reestablish their connections automatically.

Requirements for failover

You must purchase the ASE_HA license option to use Adaptive Server with Failover. See the installation guide for your platform for information about enabling the ASE_HA license.

The two Adaptive Servers in a high availability system must have similar, compatible configurations. Both must:

- Be running Adaptive Server 15.0 or higher

- Be running the latest version of Open Client
- Be at the same release level
- Have a compatible configuration
- Be running Component Integration Services (CIS)
- Be running a high availability system (for example Sun Cluster, Windows 2000 and 2003 running the Microsoft Cluster Server, and so on)
- Be configured for either parallel or nonparallel processing.

Resource requirements

Adaptive Servers configured as companions in a high availability system have different resource requirements than Adaptive Servers that function individually. These differences exist because the **secondary companion** must process all the work during fail over. This is true even if the companions are set up asymmetrically. Consequently, an Adaptive Server in a high availability system has higher resource requirements than if it is a single server. For more information, see “Single-system presentation” on page 8.

The following are some of the resource requirements that you should consider when you configure Adaptive Server as a cluster companion (your site will have its own set of resource requirements that must be addressed).

- Logins, roles, and databases – you must set the number of logins, roles, and databases for the cluster equal to the total number for one Adaptive Server.
- number of user connections – each companion must be configured for the total number of user connections required for the system.
- number of open databases – each companion must be configured for the total number of open databases required for the system.
- srids – each companion must be configured for the total number of srids required for the system.
- number of devices – each Adaptive Server must be configured for the total number of devices used by the cluster, not the number of devices used individually. That is, if one companion uses 14 devices and the second uses 23, each Adaptive Server must be configured with 37 as the number of devices.

- sp_configure option number of open databases – on an Adaptive Server configured for failover, the number of open databases is reduced by two to ensure successful failover. That is, if you currently have the number of open databases as ten, you can open only eight databases.
- sp_configure option number of user connections – on an Adaptive Server configured for failover, the number of user connections is reduced by two to ensure successful failover. That is, if the number of user connections is 50, you can use only 48 user connections.

Client applications that connect to companion servers must relink their libraries with the libraries included with failover software. See "CTLIB application changes" on page 219 for more information about using Open Client with failover.

How does Sybase Failover work with high availability?

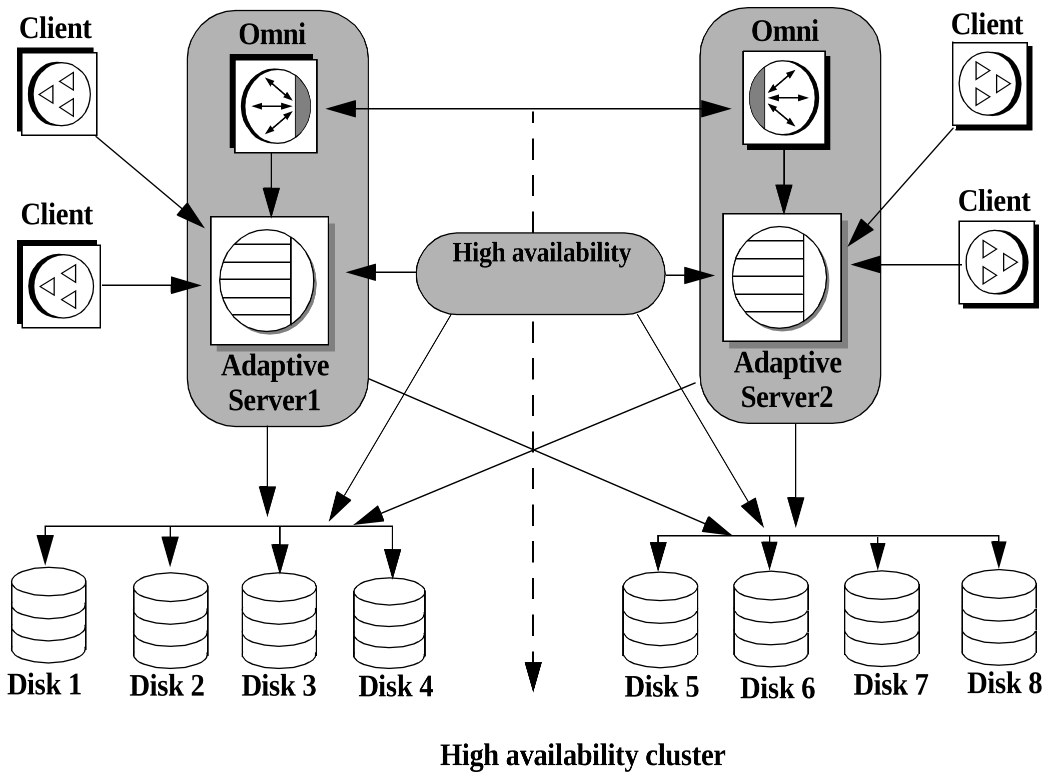
A high availability system includes both hardware and software. Sybase Failover is software that allows a companion server to withstand a single point of failure in the cluster.

A system that uses Sybase Failover includes two machines. Each machine is one **node** of the high availability **cluster**. Each Adaptive Server is either a **primary companion** or **secondary companion**. Each companion performs work during operations; the secondary companion takes over the workload when the primary companion fails or is brought down. The primary companion can be brought down for any number of reasons: scheduled maintenance, system failure, power outage, and so on. When the second server assumes another server's workload, it is called **fail over**. Moving the workload back to the original server once it is up and running again is called a **failback**.

Figure 1-1 describes a typical configuration consisting of two Adaptive Servers.

Included with the operating system is a high availability system (for example, Sun Cluster for Sun, Microsoft Cluster Server for Windows 2000, 2003, and so on) that detects and broadcasts to the cluster that part of the system is failing or is being shut down for maintenance. When Adaptive Server goes down, the high availability system tells the second machine to take over the workload. Any clients connected to the Adaptive Server that is failing are automatically reconnected to the second Adaptive Server.

Figure 1-1: High availability system using Sybase Failover



The machines in Figure 1-1 are configured so that each machine can read the other machine’s disks, although not at the same time (all the disks that are failed-over should be shared disks).

For example, if Adaptive Server1 is the primary companion and it fails, Adaptive Server2, as the secondary companion, reads its disks (1 – 4) and manages any databases on them until Adaptive Server1 can be brought back online. Any clients that are connected to Adaptive Server1 and are using the failover property are connected automatically to Adaptive Server2.

Single-system presentation

One of the hallmarks of a cluster system is that users are unaware that they are logged in to a system made up of two Adaptive Servers; it appears as if they are logging in to a single system with access to all the databases on the cluster. Applications also see only a single system. They log in to either companion and have access to all the databases on the cluster.

However, the System Administrator must treat the system as being made up of two distinct Adaptive Servers. Both Adaptive Servers must be installed and configured individually, and their configuration may not be the same. Both individual Adaptive Servers, as well as the cluster, may require system maintenance.

Special considerations for Sybase Failover

The Adaptive Server functions discussed in this section require special consideration when you configure Sybase Failover.

Installing the monitoring table scripts

If you add monitoring tables to your high availability configuration, you must add either of the following to the interfaces entry for both servers before you can monitor the performance of the primary and the secondary companions:

```
loopback
master tcp ether localhost port_number
query tcp ether localhost port_number
```

Or,

```
loopback
master tcp ether servername port_number
query tcp ether servername port_number
```

The *port_number* is any open port on the primary companion.

Using disk mirroring

Sybase Failover and the high availability system enable users to access data while the server to which they were originally connected has failed. However, neither of these systems prevent disk failures. To make sure you do not lose any data because of a disk failure, use Sybase Failover in conjunction with a data protection mechanism, such as disk mirroring or RAID.

Sybase disk mirroring is not supported in an Adaptive Server companion cluster, and is disabled when you issue sp_companion to configure the Adaptive Servers as companions. Use a third-party vendor mirroring system to protect your disk devices.

Running the *installhasvss* script

The stored procedures required for failover are not included with the *installmaster* script. Run the *installhasvss* script to install the stored procedures and perform many of the tasks required to configure Adaptive Server for failover. *installhasvss* is located in the *$SYBASE/$SYBASE_ASE/scripts* directory.

On Windows, this script is *insthasv*, and is located in *%SYBASE%\%SYBASE_ASE%\scripts*.

Note Do not run the *installmaster* script after running *installhasvss*. Do not use an *installhasvss* script from a different version of Adaptive Server.

For more information, see the appropriate platform-specific configuration chapter.

Creating a *SYB_HACMP* server entry

The *installhasvss* script creates an entry in sysservers for a server named SYB_HACMP. Before the Adaptive Server is configured as a companion, the SYB_HACMP server entry points to the local server. The SYB_HACMP sysservers entry allows the primary companion to communicate with the secondary companion using the entries in the *interfaces* file. Do not use the SYB_HACMP server entry to create any queries or stored procedures with the companion server.

Do not delete the SYB_HACMP server entry. If this entry is inadvertently deleted, you must re-run *installmaster* and *installhasvss.*

Defining user-defined datatypes

Updates to tables that include either Java or user-defined datatypes are not synchronized after Adaptive Servers in a high availability system are configured as primary and secondary companion servers. For example, if a table in the pubs2 database on the primary companion stores Java objects as column data, updates to this column are not propagated to the proxy table. You must manually update any changes made to columns that store user-defined datatypes.

Additionally, for another example, if the pubs2 database on the primary companion includes a table that uses user-defined datatypes, the pubs2 proxy table on the secondary companion does not include any updates made to pubs2 on the primary companion.

Adaptive Server and two-phase commit transactions

Adaptive Servers configured as companion servers using Sybase Failover do not support Sybase two-phase commit (SYB2PC) transactions, which use the Sybase two-phase commit protocol.

CHAPTER 2 Failover and Failback

This chapter describes the characteristics of failover and failback.

What is failover?

When a computer system fails, the databases, metadata, and user connections are moved to a secondary server so that users can still access data. This is known as failover.

With Adaptive Server, you set up a high availability cluster that is configured for failover. There are three sequential steps for failover:

1. System failover – the primary node fails over to the secondary node.
2. Companion failover – the primary companion fails over to the secondary node.
3. Connection failover – connection with the failover property fails over to the secondary companion.

   Steps 2 and 3 are described below. See your high availability system documentation for a description of step 1.

During fail over, a secondary server detects the primary failure through the operating system's high availability system and initiates the failover mechanism, which:

1. Performs a `disk reinit` to remap the master device path name to its local drive. `disk reinit` does not disturb the contents of the master device.
2. Mounts the master database, recovers it, and brings it online.

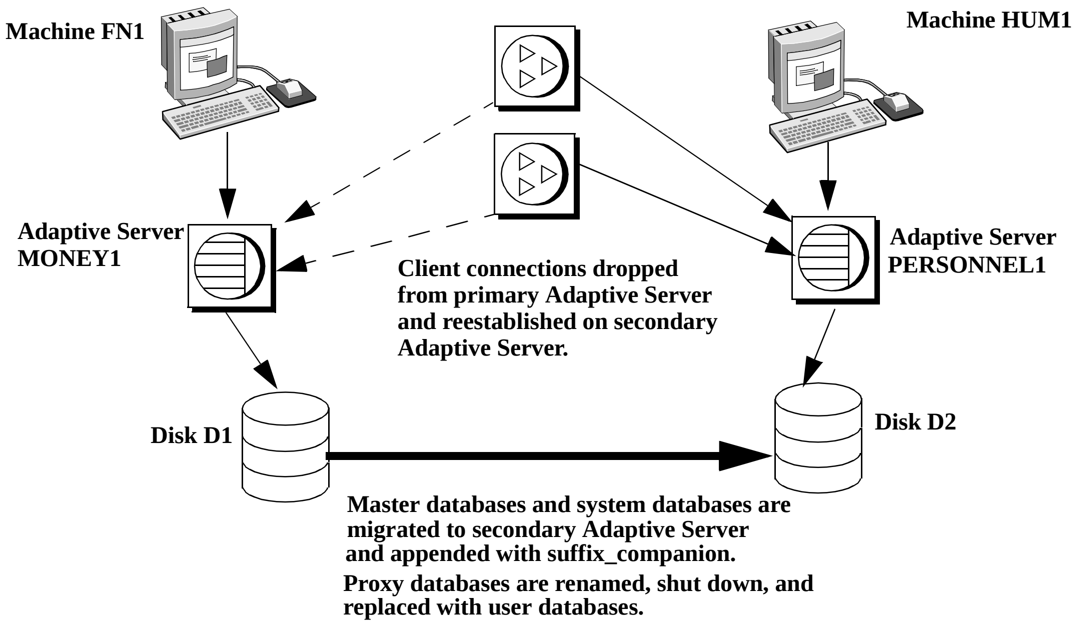
3 Maps each of the devices listed in the primary companion's sysdevices to the secondary companion's sysdevices and performs a disk reinit on the disks.

4 Mounts all the primary companion databases on the secondary companion. The secondary companion brings all databases online, after performing recovery from the logs. tempdb and model are not mounted. Proxy databases are mounted with the name comp_dbid_dbname.

Each database the secondary companion mounts has the suffix _companion appended to its name (for example, the master database becomes master_companion, sybsystemprocs becomes sybsystemprocs_companion, and so on). The secondary Adaptive Server adds this suffix to ensure the unique identity of the databases currently on its system. The user databases do not have the _companion suffix appended to their name; they are guaranteed to be unique.

User connections with the failover property and clients using the CS_FAILOVER property are retained and reestablished on the secondary companion. Uncommitted transactions must be resubmitted.

Figure 2-1: Failover process


Machine FN1
Machine HUM1
Adaptive Server MONEY1
Adaptive Server PERSONNEL1
Client connections dropped from primary Adaptive Server and reestablished on secondary Adaptive Server.
Disk D1
Disk D2
Master databases and system databases are migrated to secondary Adaptive Server and appended with suffix_companion.
Proxy databases are renamed, shut down, and replaced with user databases.

Once the secondary companion receives the failover message from the high availability system, no new transactions are started on the clients connected to the primary companion. Any transactions that are not complete at the time of fail over are rolled back. After fail over is complete, clients or users must resubmit rolled-back transactions.

Client connections during fail over

Clients with the failover property reconnect automatically during fail over. To accommodate this, you must add a line labeled *hafailover* to the *interfaces* file to provide the connection information necessary for the client to connect to the secondary companion. You can add this line using either a file editor or the dsedit utility.

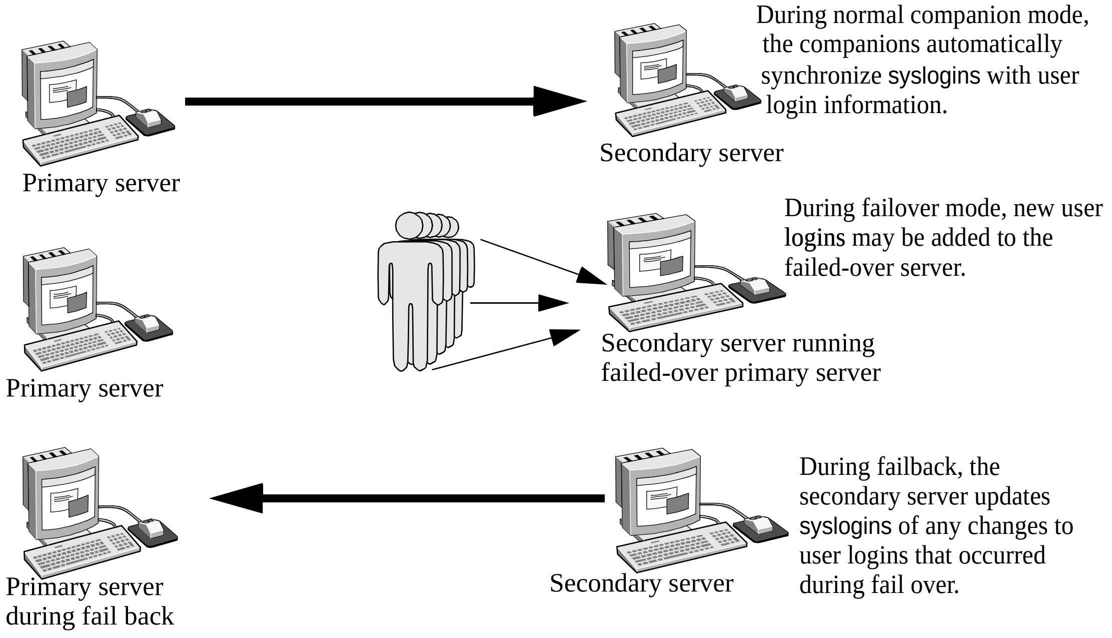
For more information about adding this information to the *interfaces* file or *sql.ini*, see the appropriate platform-specific configuration chapter.

Client applications must resend any queries that were interrupted by fail over. See Appendix C, “Open Client Functionality in a Failover Configuration,” for more information about client applications.

User logins in failover

During **normal companion mode**, companions automatically synchronize any changes to user logins, access and security information, and so on. Any logins added during failover are automatically added to the primary companion when it gets updated during failback. Any uncommitted transactions must be resubmitted and any options set at the session level must be reestablished once the companion has successfully failed-over.

Figure 2-2: Synchronizing syslogins between primary and secondary servers


During normal companion mode, the companions automatically synchronize syslogins with user login information.
Secondary server
Primary server
During failover mode, new user logins may be added to the failed-over server.
Primary server
Secondary server running failed-over primary server
During failback, the secondary server updates syslogins of any changes to user logins that occurred during fail over.
Primary server during fail back
Secondary server

All user roles and privileges are maintained after fail over.

What is failback?

When the primary companion or machine is prepared to resume operation, the user with the ha_role performs fail back to return the servers to normal companion mode. Because fail back temporarily shuts down the databases of the failed-over companion, you should choose a time for fail back when the application load is light. If you choose a time when the Adaptive Server is very busy, failback succeeds, but is very slow, and the performance of the secondary companion is sacrificed. Choosing the appropriate time for fail back can dramatically reduce the amount of time clients must wait to reconnect.

Performing failback

Failback is accomplished in four steps:

1. Prepare for failback.

   Note IBM HACMP for AIX automatically fails back when the primary node is ready to resume normal companion mode. See Chapter 8, "Configuring Adaptive Server for Failover on IBM AIX HACMP," for more information.

   Issue prepare_failback from the secondary companion to release database devices and databases.

   ```
   sp_companion server_name 'prepare_failback'
   ```

   where *server_name* is the name of the secondary companion. The secondary companion issues messages similar to the following during a failback:

```
Step:Access across the servers verified
Step:Primary databases are shutdown in secondary
Step:Primary databases dropped from current secondary
Step:Primary devices released from current secondary
Step:Prepare failback for primary server  complete
(return status = 0)
```

   Move the devices back to the primary node according to individual platform subsystem.

2. The high availability system restarts the primary companion automatically.

3. Run sp_companion with the do_advisory option to make sure there are no attribute settings to prevent a failback from succeeding. See Chapter 6, "Running do_advisory."

4 After fail back is complete, issue sp_companion from the primary companion (the companion that originally failed) to return to normal companion mode. See the appropriate platform-specific chapter for more information about sp_companion resume

---

Note You cannot connect clients with the failover property until you issue sp_companion resume. If you try to reconnect them after issuing sp_companion prepare_failback, the client hangs until you issue sp_companion resume.

Cluster locks in a high availability node

User information for companion servers in a high availability cluster must be synchronized. Operations that affect the configuration of the companions are called cluster operations, and are usually initiated by sp_companion. Because companions must be synchronized, clients performing cluster operations that affect the configuration of the node are only allowed to run serially, not in parallel. That is, only one client can perform a cluster operation at a time.

Before a client performs a cluster operation, it obtains a *cluster-wide lock*, which prevents any other client from performing a cluster operation at the same time. The cluster lock is not released until both companions are synchronized. If a client cannot obtain a cluster lock, its cluster operation fails. Even though operations are performed in serial, there is no queue for the clients; you must resubmit the failed cluster operations.

A cluster lock may also be obtained if the cluster operation being run requires it.

Generally, you will never notice a cluster lock. They do not affect any other transactions that occur in the database, only cluster operations. However, if the client connection that holds the cluster lock fails during its cluster operation (for example, if you terminate a cluster operation before it is finished), the client that failed leaves behind a lock that blocks the next client from attempting to obtain a cluster lock.

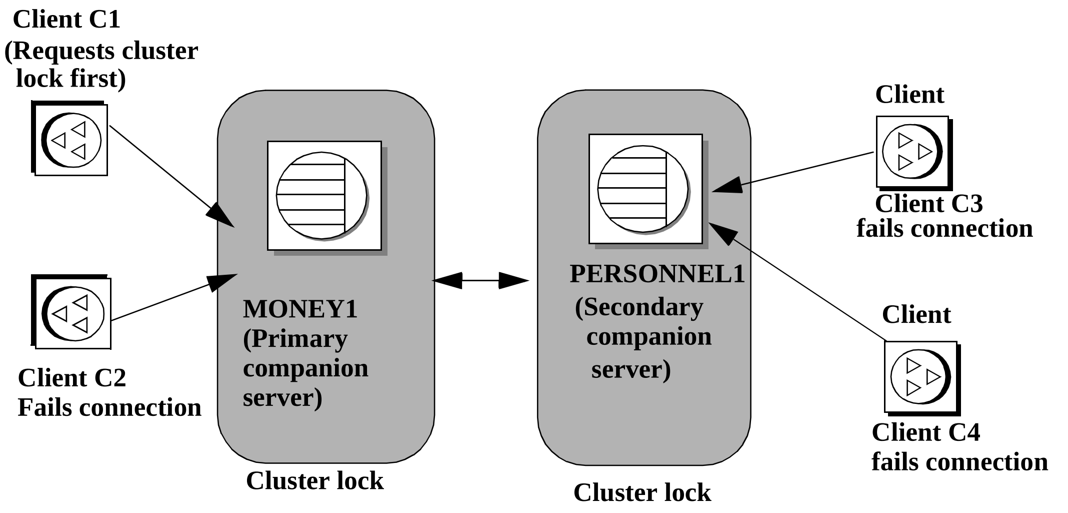
Issue dbcc ha_admin to acquire or release cluster locks:

```
dbcc ha_admin server_name clusterlock [acquire | release]
```

For more information about dbcc ha_admin, see “dbcc options for high availability systems” on page 217.

Figure 2-3 describes two companion servers to which four clients are connecting. All of them are attempting to perform cluster operations:

Figure 2-3: Clients connecting for cluster operations



1 Client connections C1 and C2 simultaneously attempt to obtain a cluster-wide lock to perform a cluster operation.

2 Client C1 connects to MONEY1 first and receives the cluster-wide lock.

3 Client C2 cannot obtain a cluster-wide lock, so it cannot perform a cluster operation.

4 Clients C3 and C4 attempt to obtain a cluster-wide lock from PERSONNEL1 while C1 is performing its cluster operation.

5 Clients C3 and C4 cannot obtain a cluster-wide lock because it is held by C1.

6 After client C1 is finished with its cluster operation, it releases the cluster-wide lock.

7 Client connections C2, C3, and C4 inform the System Administrator that they cannot obtain a cluster-wide lock. The System Administrator can resubmit these client connections for their cluster operations after client C1 has released its cluster-wide lock.

CHAPTER 3

Asymmetric and Symmetric Configurations

This chapter describes asymmetric and symmetric setups for Adaptive Server in a high availability system.

Asymmetric and symmetric configuration

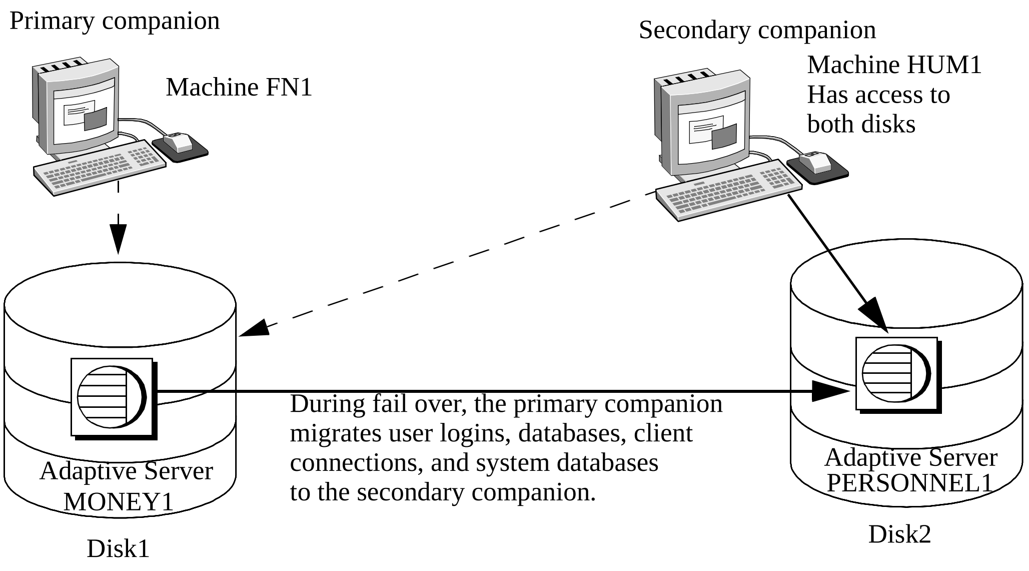
You can configure companion servers either asymmetrically or symmetrically. You must configure companions asymmetrically before you can configure them symmetrically.

Configuring the asymmetric companion

An asymmetric configuration consists of two Adaptive Servers running on separate machines. The primary Adaptive Server performs the work during day-to-day operations, while the secondary Adaptive Server is prepared to take over the work during a system failure or scheduled maintenance. The secondary companion is an independent Adaptive Server, and can have its own applications running. To configure for fail over, the secondary companion must be a newly installed Adaptive Server, and cannot yet have any user logins or user databases. After configuration is complete, you can add user logins and databases to the secondary companion.

When you install and configure Adaptive Server for fail over, Adaptive Server is in **single-server mode**. Use sp_companion to change it from single-server mode to a companion server in an asymmetric setup. See the *Adaptive Server Reference Manual* for information about sp_companion.

Figure 3-1: Asymmetric configuration in high availability system


Primary companion
Machine FN1
Secondary companion
Machine HUM1
Has access to
both disks
During fail over, the primary companion
migrates user logins, databases, client
connections, and system databases
to the secondary companion.
Adaptive Server
MONEY1
Disk1
Adaptive Server
PERSONNEL1
Disk2

In this setup, MONEY1 is the primary companion and fails over to PERSONNEL1, the secondary companion. Both disks are visible to machine HUM1, which connects to machine FN1 with a dual-ported SCSI. Because this is an asymmetric setup, PERSONNEL1 cannot fail over to MONEY1. Disk1 must be shared, and Disk2 can be a local disk.

See the appropriate platform-specific configuration chapter for detailed information about configuring Adaptive Server for an asymmetric setup.

Performance of Adaptive Server in an asymmetric configuration

During normal companion mode, performance of system procedures that update user information (sp_addlogin, sp_addrole, and so on) and of commands such as create database is slightly degraded because the primary companion must perform the command locally, then synchronize with the secondary companion. For example, if you add user "joe" to the primary companion, both the primary companion and the secondary companion must update syslogins to include this new user.

Performance after fail over depends on the configuration of the secondary companion. If the secondary server is configured similarly to the primary server, performance should be similar before and after fail over. However, if the secondary server is not as robust (for example, has less memory or fewer CPUs) as the primary server, then performance after fail over is degraded. The performance of the secondary companion can also be degraded after fail over because it is running the primary companion as well as any applications.

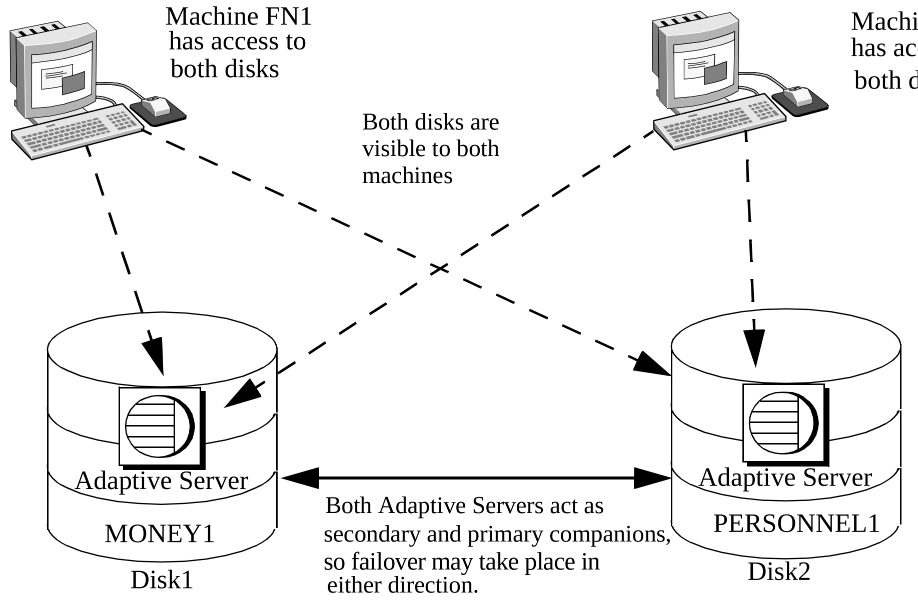
Configuring the symmetric companion

Like asymmetric configuration, symmetric configuration consists of two fully functional Adaptive Servers running on separate machines, each with their own system devices, system databases, user databases, and user logins. However, when failover occurs, either of the Adaptive Servers acts as a primary or secondary companion for the other Adaptive Server.

Before you configure two Adaptive Servers as symmetric companions, you must first configure them as asymmetric companions.

Figure 3-2 describes a symmetric configuration between a financial department machine (FN1 running Adaptive Server MONEY1) and a human resources machine (HUM1 running Adaptive Server PERSONNEL1):

Figure 3-2: Symmetric configuration in a high availability system



During scheduled maintenance or system failure, either MONEY1 fails over to PERSONNEL1, or PERSONNEL1 fails over to MONEY1. Disk1 and Disk2 are both shared disks.

See the appropriate platform-specific configuration chapter for detailed information about configuring Adaptive Server in a symmetric setup.

Performance of Adaptive Server in a symmetric configuration

During normal companion mode, do not run both Adaptive Servers in a symmetric configuration at the full capacity of their system resources. For example, each machine can run at 60% of the possible configuration for user connections, data cache, remote server connections, and so on. This allows the secondary companion to manage both the failed-over Adaptive Server and its own Adaptive Server with a reasonable level of performance. If both Adaptive Servers maximize their system resources, failover succeeds, but performance may be poor.

Auditing in a high availability system

Configure a companion for auditing the same way you configure a server that does not use failover. For more information, see “Setting auditing options” on page 23.

All updates to user and security information (for example, sp_addlogin, sp_addrole, and so on) are performed on both the systems in transactional fashion. This keeps the user and security data identical on both companions.

For the following auditing parameters, both companions must be configured identically. These parameters are checked as a quorum attribute, or when explicitly listed with do_advisory:

- allow procedure grouping
- unified login required
- secure default login
- systemwide password expiration
- use security services
- check password for digit
- minimum password length
- maximum failed logins
- auditing – turning this parameter on and off is not synchronized dynamically for the companions. If you change this parameter locally, you must manually update the remote companion.

Setting auditing options

You can configure auditing options (global, database-wide, and for each login) for each companion server on a per-node basis. That is, each companion has its own auditing setting. Global options are not synchronized between the companions.

During failover, database-wide options are audited as they are currently configured.

After failover:

- Auditing continues to enforce global options, and database-wide options run the same as before failover.

- Users can still set database-wide options.
- The audit options of the local domain are used for both local and remote logins.

sybsecurity and Sybase Failover

The sybsecurity database is created by *installsecurity* as part of audit installation. If it exists in either companion during the initial configuration of Sybase Failover, it must exist in both companions.

Audit trails and Sybase Failover

Audit trails are logged in the audit tables of the sybsecurity database. During fail over, sybsecurity for the failed server is mounted as sybsecurity_companion on the secondary companion. However, audit trails are always placed in the audit table of the current server. That is, after fail over, any new audit trails are placed in the audit table of the secondary companion. Any configuration or individual record changes related to auditing that are made on one companion are not automatically implemented on the other companion. For example, if you change an auditing configuration parameters on the primary companion, this change is not made on the secondary companion. If a user makes a change to a database on the primary companion that requires an audit record, this audit record is not made on the secondary companion.

On failback, no audit trails are transferred from the failed-over domain to the failed domain.

CHAPTER 4 Modes of Failover

This chapter describes the different modes that Sybase Failover moves through during its processing.

What are modes?

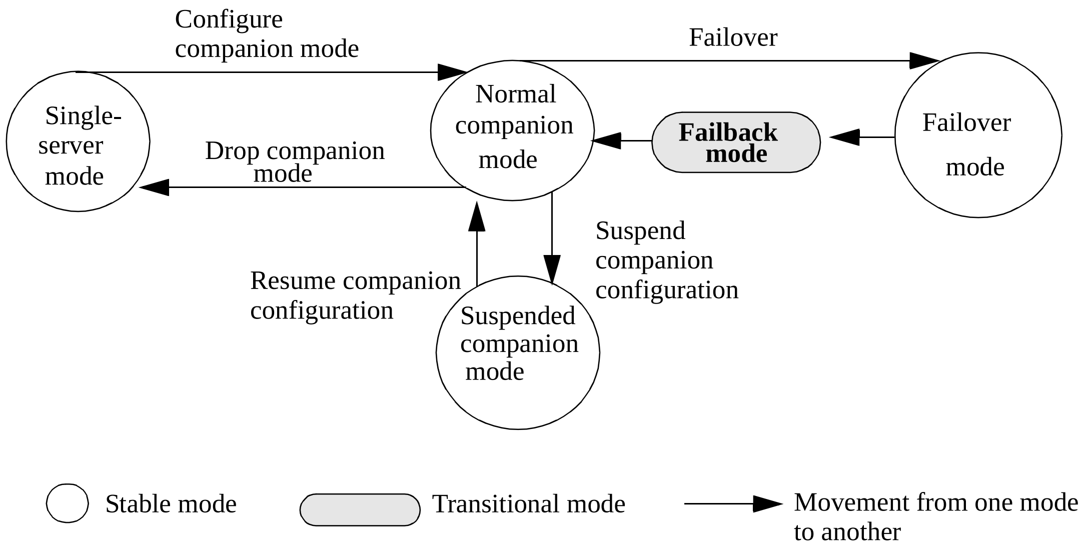
There are a series of modes that Adaptive Server runs through during high availability. There are two types of modes, stable and transitional. A **stable mode** is a system state in which Adaptive Server can exist for an extended period of time, such as the day-to-day operation of Adaptive Server.

Stable modes include:

- Single-server mode
- Normal companion mode
- **Failover mode**
- Suspended companion mode

Failback mode, which is **transitional**, occurs when Adaptive Server shifts from a failover mode to a normal companion mode, and is typically of very short duration. The movement that the primary companion makes while changing modes is shown in Figure 4-1:

Figure 4-1: Modes of operation for high availability



Before you can configure two Adaptive Servers as companions, both must be in single-server mode, which is the default mode of a newly installed Adaptive Server after running *installhasvss*. After you configure the Adaptive Servers as companions, they are in one of three stable modes:

- Normal companion mode
- Failed-over mode
- Suspended companion mode

Different modes of a companion server

This section describes each mode in detail.

Single-server mode

In this mode, Adaptive Server acts as a standalone server. A newly installed Adaptive Server is in single-server mode by default.

Normal companion mode

When both companions are running and are configured for fail over, they operate in normal companion mode. This is the mode in which the day-to-day operations of Adaptive Server occur. In **asymmetrical** systems, the primary companion can fail over to the secondary companion. In **symmetric** systems, either companion can fail over to the remaining companion.

Suspended mode

In suspended mode, both servers act as single servers. Suspended mode is useful for performing system maintenance because you can start and stop the Adaptive Server and associated resources without risking failover.

The companions cannot fail over, but the nodes upon which they are working can; you must perform some platform-specific steps to suspend node fail over. Also, before you shut down a companion in suspended mode, you must perform some platform-specific tasks. See the appropriate platform-specific chapter for more information.

Many utilities and commands are severely restricted in suspended mode. See Appendix B, "Changes to Commands, System Procedures, and Databases," for more information.

Note You should suspend a companion mode only from the secondary companion.

Failback mode

Adaptive Server must enter a failback mode to move from failover mode on the secondary companion to normal companion mode on the primary companion.

Failback is a planned event. That is, it is only done when the System Administrator determines that the system is ready to resume normal operations. Use sp_companion prepare_failback to initiate fail back and migrate the failed-over Adaptive Server to its original node. See "Performing failback" on page 15.

Resuming normal companion mode from suspended mode

To resume normal companion mode, enter:

```
sp_companion "primary_server_name", resume
```

Dropping failover mode

To permanently disable companion mode, enter:

```
sp_companion "server_name", 'drop'
```

When this command is complete, the two Adaptive Servers are no longer companion servers and are running in single-server mode.

Note drop is an irreversible operation. Once you have reverted the companion servers to single-server mode, you must dump, drop, and reload all user databases to reconfigure them as companions.

If the companion you drop is in a symmetric setup, the cluster automatically assumes an asymmetric setup between the companions.

Determining the companion’s mode

Issue sp_companion without any options to display the mode the companion is currently in. For example:

```
sp_companion
Server 'MONEY1' is alive and cluster configured.
Server 'MONEY1' is configured for HA services.
Server 'MONEY1' is currently in ‘Symmetric normal’ mode.
```

MONEY1 is configured for symmetric failover and is running in normal companion mode.You can also use the *@@cmpstate* global variable to determine the mode. At the isql prompt, enter:

```
select @@cmpstate
```

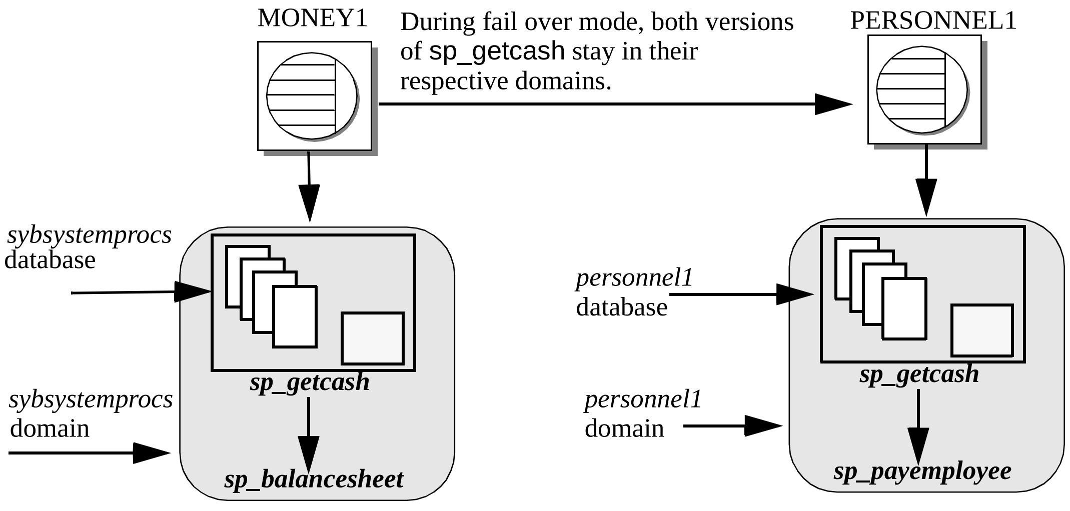
Table 4-1: @@cmpstate return values

@@cmpstate	Companion mode
0	Single server
1	Reserved
2	Secondary normal
3	Secondary suspended
4	Secondary failover
5	Secondary failback
6	Reserved
7	Primary normal
8	Primary suspended
9	Primary failback
10	Reserved
11	Symmetric normal
12	Symmetric failover
13	Symmetric suspended
14	Symmetric failback
15	Reserved

Domains

Both the primary and the secondary companions can have stored procedures, users, and devices with the same names. Adaptive Servers configured for failover use *domains* to determine to which database these objects belong. For example, suppose both Adaptive Servers MONEY1 and PERSONNEL1 have a stored procedure named sp_getcash, as described in Figure 4-2:

Figure 4-2: Domains during failover



In MONEY1, sp_getcash (which issues a secondary stored procedure named sp_balancesheet) is defined in the sybsystemprocs domain. In PERSONNEL1, sp_getcash (which issues a secondary stored procedure named sp_payemployee) is defined in the personnel1 domain. During fail over, even though sybsystemprocs for MONEY1 migrates to PERSONNEL1 as sybsystemprocs_companion, its domain does not change, nor do the objects that are defined for this domain. Users that issue sp_getcash in sybsystemprocs for MONEY1 during fail over mode still issue the correct secondary stored procedure, sp_balancesheet.

The concept of domains is transparent to users.

System procedures that are stored in the master database are not controlled by domains. System procedures should never have a dependency on an object that is stored in the master database.

CHAPTER 5

Proxy Databases, User Databases, and Proxy System Tables

For complete information about proxy databases and tables, see the *Component Integration Services User's Guide*.

Proxy databases

Proxy databases are not created by default when you configure Adaptive Servers as companions in an asymmetric setup. They are created in the remote server only if you configure for failover using the with_proxydb option of sp_companion. The discussion in this chapter assumes you used sp_companion with the with_proxydb option. **Proxy database**s are created dynamically as they are needed. For more information about sp_companion with_proxydb, see the *Adaptive Server Reference Manual*.

Do not use the with_proxydb on a symmetric setup.

Databases in companion servers are either primary or proxy databases. Primary databases are where data is physically located. Each proxy database corresponds to a primary database; it has the same name as the primary database, and proxy entries for all the objects in the primary database, but it contains no data.

After you configure the companions for failover and the proxy databases are created, the user databases are visible to both companions. This means that you can perform transactions on a primary database from either companion. For example, if a primary companion named PERSONNEL1 includes a database named salary, its secondary companion, MONEY1, includes a salary proxy database. You can perform inserts, updates, and deletes on salary from either MONEY1 or from PERSONNEL1. Also, sysdatabases on either companion lists the salary database. For example, the following query produces the same result on PERSONNEL1 and MONEY1:

```
1> select name from sysdatabases
 name
 ------------------------------
 master
 model
 salary
 sybsystemdb
 sybsystemprocs
 tempdb
```

Note When the primary companion fails over, all current connections to proxy databases on the secondary server are terminated and disconnected. During failback, the secondary companion reverses the process, mounting the primary databases and then re-creating the proxy databases.

Creating proxy databases

Adaptive Server uses Component Integration Services (CIS) to create the proxy databases. Both the primary Adaptive Server and the secondary Adaptive Server must have CIS running before you can configure them for Sybase Failover. To determine if you have CIS running, enter:

```
sp_configure "enable cis"

 Parameter Name      Default    Memory Used  Config Value  Run Value
 ------------------  ---------  -----------  ------------  ---------
 enable cis                  1            0             1              1
```

A Run Value of 1 indicates that CIS is running.

For information about configuring Adaptive Server for CIS, see the *Component Integration Services User's Guide*.

When it creates the proxy databases, CIS:

1 Estimates the size of the database required to contain all the proxy tables if a size or database device is not specified.

2 Creates all proxy tables. Proxy tables act as placeholders for the tables and views found in the primary companion's database.

3 Imports the metadata (column names, size, indexes, and so on) from the primary companion.

4 Grants all permissions on the proxy tables to public.

5 Adds the user guest to the proxy database.

6 Sets the database status to indicate that the database is a proxy database. The status is indicated in the status3 column of sysdatabases. sp_helpdb includes information about whether a database is a proxy or primary database.

When are proxy databases created?

After the companions are configured with sp_companion...with_proxydb option:

- Proxy databases for all the primary companion's user databases are created when a companion configuration is created.
- Proxy databases are created for any new user databases that you create in the primary companion using create database.
- During failover, the secondary companion mounts the primary databases and then drops the proxy databases. During failback, the secondary companion reverses the process, mounting the primary databases and then re-creating the proxy databases.

Size of the proxy databases

When Adaptive Server creates a proxy database, it checks the number of tables and views in the primary database and calculates the amount of space required to accommodate the same number of proxy tables in the proxy database. Each proxy table requires eight pages (one extent). Each index on a proxy table also requires eight pages. Adaptive Server also adds either an additional 10 percent or 500 pages—whichever is larger—to the database to allow for table growth.

As a result, the size of the proxy databases depends on the number of tables and views in the primary database. Proxy databases do not have a default size; the minimum size is at least the size of the model database.

Commands and system procedures in proxy databases

The behavior of some commands and system procedures changes when issued in proxy databases.

Changes to commands in proxy databases

For most commands, it does not matter whether you issue them from the primary database or the proxy database; only the primary database is updated. These commands cannot be issued from within the proxy database:

- create or drop procedure
- create or drop view
- create or drop trigger
- create or drop rule
- create or drop default

You must run dump and load database commands from the primary companion. If you issue these commands from the proxy database, they update only the proxy database; they do not update the primary companion.

Changes to system procedures in proxy databases

System procedures always perform their tasks *locally*. That is, if you issue a system procedure in a proxy database, any changes it makes do not appear in the primary database, and vice-versa.

Issuing user-defined stored procedures in proxy databases

User-defined stored procedures always perform their tasks in the primary database. For example, whether you issue user_created_proc from the pubs2 primary database or from the pubs2 proxy database, it executes on the pubs2 primary database.

System procedures issued from a proxy database are handled based on these criteria:

- A request to execute a user-defined stored procedure in a high availability system proxy database is transformed into a remote procedure call (RPC) request and sent to the server that owns the original database.
- For system procedures, search rules are invoked such that the procedure is looked for first in the current database, then in sybsystemprocs, then in master. If a procedure is not found, the request is converted to a remote procedure call (RPC) and forwarded to the server that owns the original database (as is the case with user-defined stored procedures).
- CIS first looks for the system procedure in the local server. If it finds the system procedure locally, it is executed as a local stored procedure.
- If the system procedure cannot be found locally, it is forwarded to the primary companion as an RPC.
- If it is a user-defined stored procedure, it is turned into an RPC and forwarded to the primary companion.

This behavior applies only to “system” proxy databases—that is, those that are created automatically by the high availability configuration. User proxy databases do not exhibit this behavior.

System procedures issued in a companion configuration are processed using the same rules as a single server. For a description of how system procedures are processed, see the *Adaptive Server Reference Manual*.

sp_dboption does not update proxy databases

If you use sp_dboption to change the database options on the primary database, these changes are not automatically forwarded to the proxy databases on the secondary companion. You must set the sp_dboption on the proxy database as well.

For example, if you use sp_dboption to change the pubs2 database so that select into bulkcopy/pllsort is on the primary companion, the pubs2 proxy database on the secondary companion is not set.

Manually updating the proxy databases

You can use the for proxy_update option with alter database to manually synchronize your proxy databases with their primary databases.

. You must issue this command from the master database:

```
alter database <dbname>
```

```
        [existing options]
        [for proxy_update]
```

for proxy_update is useful for synchronizing changes to the primary databases that are not automatically migrated to the proxy databases. For example, if you rename the primary database using sp_rename, the proxy database is not automatically renamed. However, if you issue alter database... for proxy_update after renaming the database, the proxy database is rebuilt using the new database name.

If you enter for proxy_update with no other options (for example, alter database pubs2 for proxy_update), the size of the database is not extended; instead, the proxy tables are dropped from the proxy database and then re-created using the metadata from the primary companion's database.

If you use alter database to extend the size of the database, the proxy table update is performed after the size extensions are made.

for proxy_update is supported for all external data sources, not only the primary companion in a cluster environment. Also, a database needs not be created with the for proxy_update clause for it to be manually updated. If you specify a default storage location, either through the create database command or sp_defaultloc, the primary companion's metadata can be synchronized with the metadata at the remote storage location.

For more information about alter database, see the *Adaptive Server Reference Manual*.

Proxy system tables in *master*

Proxy system tables enable a secondary companion to access the primary companion's system tables. One extent is allocated for the proxy system tables in sysobjects. You cannot drop these proxy system tables. Proxy system tables use the following naming syntax:

```
rmt_ha_system_table_name
```

C H A P T E R 6

Running *do_advisory*

This chapter describes how to run sp_companion with the do_advisory option.

What is the *do_advisory* option?

When you perform a cluster operation (for example, moving from failover mode to normal companion mode), either companion may have attribute settings that prevent the cluster operation from succeeding. For example, the secondary companion may be configured with a stack size that is too small to accommodate both companions during fail over mode, or the companions may be configured for different languages.

To prevent these problems, sp_companion includes a do_advisory option that checks hundreds of attribute settings for each companion and issues warnings about any settings that may prevent a successful cluster operation. The attributes do not necessarily require the same values on both companions, but they must be compatible. sp_companion...do_advisory does not change any attributes; it only advises about potential problems.

sp_companion...do_advisory is not triggered automatically; run it periodically to verify that there are no compatibility issues between your companions.

do_advisory allows you to specify the attributes to investigate. You can either include all the attributes, or you can specify subsets of attributes.

You can select subsets of *group*, *base*, or *quorum* attributes. A *group* subset includes a broad set of server settings (for example, all the login attributes or all the space attributes); a *base* subset includes specific settings within the *group* subset (for example, user logins or CIS settings). do_advisory reports only the attributes of the specified subset that will prevent a successful cluster operation.

Quorum attributes are configuration parameters that sp_companion checks every time, whether or not you specify group or base attributes. If sp_companion finds that a quorum attribute is set such that it will prevent a successful cluster operation, the command fails. For more information, see "Quorum attributes" on page 42.

The following describes the server settings that make up each group:

- Application group – checks to make sure the configuration settings for the applications running on the local companion are compatible with the remote companion. The application group includes the following:
    - Charsets – verifies that the character sets for which the secondary companion is configured include all the character sets for which the primary companion is configured.
    - Java archives – verifies that the Java archive on the primary companion has the same name and class definition on the secondary companion. If a class definition belongs to Java archive on the primary companion, it must belong to the same Java archive on the secondary companion.

      Note The archives are not automatically synchronized; if you configure one companion for Java, you must manually configure the other.

    - Languages – verifies that the languages for which the secondary companion is configured include all the languages for which the primary companion is configured.
    - Remote servers – checks that remote server entries used by the application on the primary companion are the same on the secondary companion, if they exist. This ensures that server names and the associated server IDs used by the companions are unique and consistent within the cluster.

      All default server entries (including SYB_BACKUP, local server name, companion server name, SYB_HACMP, local XP Server, and companion XP Server) are automatically synchronized.

- Sort order – verifies that the sort orders for which the secondary companion is configured include all the sort orders for which the primary companion is configured.
- Time ranges – verifies that time range definitions defined and used by the primary companion are the same as those used by the secondary companion, if they exist.
- User types – verifies that all user-defined datatype definitions in the master database used by an application on the primary companion are defined the same way on the secondary companion, if they exist.

- Config group – checks for compatibility between configuration parameters defined in the configuration file (located in *$SYBASE/server_name.cfg*). Configuring the Adaptive Server as companions does not automatically synchronize the configuration options. The config group includes the following base attributes:
  - CIS – verifies that CIS is correctly configured for the cluster operation.
  - DTM – verifies that the Distributed Transaction Manager parameters are compatible between the companions.
  - Disk i/o – makes sure the disk configuration (disk i/o structures, allow sql server async i/o, and so on) is compatible between the companions.
  - ESP – makes sure the extended stored procedures are compatible between the companions.
  - Errorlog – makes sure that the error log information (event logging, event log computer name, and so on) is compatible between the companions.
  - General config – verifies that all the general configuration parameters (those set in the configuration file) are correctly set for the cluster operation.
  - Java – makes sure that Java is either enabled or disabled for both companions.
  - Languages – makes sure that both companions have the same language, character set, and sort order.
  - Network – makes sure that the network related parameters (allow remote access, default network packet size, and so on) are compatible between the companions.

    - Parallel – verifies that the parallel configuration parameters (max parallel degree, memory per worker process, and so on) are compatible between the companions.
    - Q Diag – verifies that the Q Diagnostic attributes (autostart collector, sql text pipe active, and so on) are compatible between the companions.
    - Security – verifies that the security configuration (auditing, allow procedure grouping, and so on) for the companions is compatible.
- Database group – checks that database attributes are compatible between the companions. The database group includes:
    - Unique dbid – verifies that database IDs on the primary companion are not used on the secondary companion.

    Note If a user database ID conflicts with a system database ID on the secondary companion, you must drop and re-create the system database on the secondary companion.

- Devices group – checks that device attributes are compatible between the companions. The devices group includes:
    - Devnames – verifies that logical device names on the primary companion are not used on the secondary companion.
- Logins group – verifies that logins and permissions are consistent between the primary and secondary companions.
    - All user information (logins, permissions, and so on) defined on the primary companion must be defined, available, and compatible on the secondary companion, if it exists. Logins on the primary companion are checked to verify that they have unique names and suids on the secondary companions. The logins group also checks that remote logins, external logins, and aliases, and user names in master are compatible across the companions. do_advisory automatically corrects any issues that it finds.
    - Default login incompatibilities of probe, qcollector, qrepository, and so on are fixed automatically.
- Roles group – verifies that all user-defined roles, login roles, and server-wide permissions are compatible between the primary and secondary companions.

- Space group – verifies that the secondary companion has sufficient space available for the primary companion databases during failover.
    - Master Space – estimates the space required to synchronize the metadata during the initial configuration of the companion server or during sp_companion...resume.
    - Proxydb Space – estimates the space required for creating the proxy databases (when you configure the companion servers with with_proxydb in an asymmetric setup).

Running the *do_advisory* option

The syntax for sp_companion do_advisory is:

sp_companion *server_name*, do_advisory [, all | help |
   group_attribute_name | *base_attribute_name*]

where:

- *server_name* is the name of the remote Adaptive Server.
- all indicates to include information about both the group and the base attributes.
- help prints the sp_companion do_advisory syntax and a list of the group and base attributes
- *group_attribute_name* is the name of the group attribute upon which sp_companion to report.
- *base_attribute_name* is the name of the base attribute upon which you want sp_companion do_advisory reports.

sp_companion do_advisory output includes:

- Attribute name – the name of the attribute that sp_companion do_advisory is investigating.
- Attribute type – the type of attribute. For example, the type might be CIS, disk i/o, General Config (these are the configuration parameters set in the *server_name.cfg* file).
- Local value – the value of the attribute on the companion from which you entered sp_companion do_advisory.
- Remote value – the value of the attribute on the remote companion.

- Advisory – after comparing the attributes on the two companions, sp_companion do_advisory prints its findings in the Advisory column. The values in this column are:
  - 0 – the attributes do not affect the cluster operation.
  - 1 – the attributes are not configured for the best configuration, but they will not prevent a cluster operation.
  - 2 – you cannot proceed with the cluster operation without altering the attributes.

  For example, the following checks the attributes between Adaptive Servers MONEY1 and PERSONNEL1:

```
sp_companion "MONEY1", do_advisory, ‘all’
go

Attribute Name   Attrib Type  Local Value  Remote Value  Advisory
--------------   -----------  -----------  -----------  ------
cis connect time  CIS         1            0            2
cis rpc handling  CIS         1            0            2
max cis remote se CIS         10           25           2

(1 row affected)
(return status = 0)
```

  In this example, the attributes cis connect, cis rpc handling, and max cis remote servers all have a value of 2 under the Advisory column, which indicates that these attributes will prevent a successful companion configuration between MONEY1 and PERSONNEL1. The values in the Local Values column for these three attributes differs from the values in the Remote Values. The companions must have the same or compatible values.

Quorum attributes

If you issue sp_companion with either the configure or resume option, sp_companion checks a select group of attributes to make sure the companions have compatible values. These are called quorum attributes. If one of the companions has a value for a quorum attribute that is not compatible with the other companion, sp_companion fails.

If sp_companion issues a message stating that a quorum attribute prevented it from successfully finishing, run sp_companion... do_advisory for a list of the problem attributes. do_advisory checks the following configuration parameters as quorum attributes:

- enable cis
- cis packet size
- max cis remote connections
- max cis remote servers
- number of devices
- esp execution stack size
- start mail session
- xp_cmdshell context
- default character set id
- default language id
- default sortorder id
- disable character set conversions
- enable repagent thread
- allow backward scans
- allow netsted triggers
- allow resource limits
- parition groups
- size of auto identity columns
- SQL perform integration
- cfg read committed with lock
- enable Java
- enable DTM
- number of DTX participants
- strict dtm enforcement
- allow remote access

- default network packetsize
- max network packetsize
- max parallel degree
- number of remote logins
- number of remote sites
- max parallel degree

do_advisory also checks the following database attributes:

- Charsets
- Java archives
- Languages
- Remote servers
- Sort order
- Time ranges
- User types
- Unique dbid
- Devnames
- Logins
- Roles

CHAPTER 7

Configuring Adaptive Server for Failover on HP

This chapter contains the information for configuring Adaptive Server for Failover on HP.

Hardware and operating system requirements

High availability requires the following hardware and system components:

- Two homogenous, network systems with similar configurations in terms of resources such as CPU, memory, and so on
- High availability system package and the associated hardware
- Devices that are accessible to both nodes
- A logical volume manager (LVM) to maintain unique device path names across the cluster nodes
- Third-party mirroring for media failure protection

  See your hardware and operating system documentation for information about installing platform-specific high availability software.

Preparing Adaptive Server for high availability

This section discusses how to prepare Adaptive Server for a high availability configuration.

Installing Adaptive Servers

Install the primary and secondary servers. They must be installed in the same location on each node. The primary companion can be either newly installed, or it can be upgraded from an earlier version, with existing databases, users, and so on. The secondary companion must be a newly installed Adaptive Server and cannot have any user logins or user databases. This is to ensure that all user logins and database names are unique within the cluster.

After configuration for fail over is complete, you can add user logins and databases to the secondary companion.

If you are installing on the local disk, ensure that any databases are created on the multihost disk.

See the installation documentation for your platform for information about installing and configuring Adaptive Server.

Adding entries for both Adaptive Servers to the *interfaces* file

The *interfaces* file for the primary and the secondary companion must include entries for both companions. The server entry in the *interfaces* file must use the same network name that is specified in sysservers. For information about adding entries to the *interfaces* file, see the installation documentation for your platform.

Adding entries to *interfaces* file for client connections

To enable clients to reconnect to a failed-over companion, you must add a line to the *interfaces* file. By default, clients connect to the port listed in the query line of the server entry. If that port is not available (because the server has failed-over), the client connects to the server listed in the *hafailover* line of the server entry. Here is a sample *interfaces* file for a primary companion named MONEY1 and a secondary companion named PERSONNEL1:

```
MONEY1
    master tcp ether FN1 4100
```

```
query tcp ether FN1 4100
hafailover PERSONNEL1
```

Use dsedit to add entries to the *interfaces file*. If the *interfaces* entries already exist, you modify them as necessary to work for fail over.

See the *Utility Guide* for information about dsedit.

Setting the value of *$SYBASE*

If you installed *$SYBASE* on a local file system, *$SYBASE* must point to the same directory name on both companions:

- Make sure that the *$SYBASE* release directory on each companion is created in the same directory, or
- If the companions have the *$SYBASE* release directory in different locations, create a directory with the same path on both companions that acts as a symbolic link to the actual *$SYBASE* release directory.

  For example, even though primary companion MONEY1 has a release directory of */usr/u/sybase1* and PERSONNEL1 uses */usr/u/sybase2* as its release directory, *$SYBASE* must point to the same path.

  Both MONEY1 and PERSONNEL1 have */sybase*, which they establish as a symbolic link to their respective *$SYBASE* release directories. On MONEY1, */sybase* is a link to */usr/u/sybase1*, and on PERSONNEL1, */sybase* is a link to */usr/u/sybase2*.

If you installed $SYBASE on a local file system, you must also have copies of both companion RUN_<*SERVERNAME*> files in *$SYBASE/$SYBASE_ASE/install* on both nodes.

Configuring *sybha* executable

The *sybha* executable enables the Adaptive Server High Availability Basic Services Library to interact with each platform’s high availability cluster subsystem. Before *sybha* can run, you must change its ownership and permissions. You must also edit a file named *sybhauser* in *$SYBASE/$SYBASE_ASE/install* contains a list of the users who have System Administrator privileges on the cluster. Sybase strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

As "root," perform the following:

1 Add a new group named *sybhagrp*. You can either add this group to the */etc/group* file or you can add it to your NIS maps. Add the sybase user (the user that owns the *$SYBASE* directory) to this group. When the server is started, the sybase user runs the data server. If you have multiple servers running and different users owning the *$SYBASE* directory for each of them, you must add each of these users to the group.

2 Change to the *$SYBASE/$SYBASE_ASE/bin* directory:

```
cd $SYBASE/$SYBASE_ASE/bin
```

3 Change the ownership of *sybha* to "root":

```
chown root sybha
```

4 Change the group for the *sybha* program to *sybhagrp*:

```
chgrp sybhagrp sybha
```

5 Modify the file permissions for *sybha* to 4550:

```
chmod 4550 sybha
```

6 Change to the *$SYBASE/$SYBASE_ASE/install* directory:

```
cd $SYBASE/$SYBASE_ASE/install
```

7 Add the sybase user to the *sybhauser* file. These logins must be in the format of UNIX login IDs, not Adaptive Server logins. For example:

```
sybase
coffeecup
spooner
venting
howe
```

8 Change the ownership of *sybhauser* to "root":

```
chown root sybhauser
```

9 Modify the file permissions for *sybhauser*:

```
chmod 600 sybhauser
```

Creating a new default device other than master

The master device is the default device in a newly installed Adaptive Server. This means that, if you create any databases (including the proxy databases used by failover), they are automatically created on the master device. However, adding user databases to master makes it difficult to restore the master device from a system failure. To make sure that the master device contains as few extraneous user databases as possible, using disk init to create a new device. Use sp_diskdefault to specify the new device as the default before you configure Adaptive Server as a companion for fail over. For example, to add a new default device named money_default1 to the MONEY1 Adaptive Server, enter:

```
sp_diskdefault money1_default1, defaulton
```

The master device continues to be a default device until you specifically issue this command to suspend it as the default device:

```
sp_diskdefault master, defaultoff
```

See the *Adaptive Server Reference Manual* for more information about disk init and sp_diskdefault.

Adding the local server to *sysservers*

Use sp_addserver, to add the local server as the local server in sysservers, using the network name specified in the *interfaces* file. For example, if the companion MONEY1 uses the network name of MONEY1 in the *interfaces* file, enter:

```
sp_addserver MONEY1, local, MONEY1
```

You must restart Adaptive Server for this change to take effect.

Adding the secondary companion to *sysservers*

Add the secondary companion as a remote server in sysservers:

```
sp_addserver server_name
```

By default, Adaptive Server adds the server with an srvid of 1000. You need not restart Adaptive Server for the change to take effect.

Running *installhasvss*

Note You must perform the tasks described in “Adding entries for both Adaptive Servers to the interfaces file” on page 46, before executing *installhasvss*. If you run *installhasvss* before performing these tasks, re-run *installmaster* to reinstall all the system stored procedures.

Enable High Availability, then restart Adaptive Server:

```
sp_configure "enable HA", 1
```

The *installhasvss* script:

- Installs the stored procedures required for Failover (for example, sp_companion).
- Installs the SYB_HACMP server in sysservers.

You must have System Administrator privileges to run *installhasvss*.

installhasvss is located in the *$SYBASE/$SYBASE_ASE/scripts* directory. To execute the *installhasvss* script, enter:

```
$SYBASE/$SYBASE_OCS/bin/isql -Usa -Ppassword -Sservername <
$SYBASE/$SYBASE_ASE/scripts/installhasvss
```

installhasvss prints messages as it creates stored procedures and creates the SYB_HACMP server.

Assigning *ha_role* to system administrator

You must have ha_role permission on both Adaptive Servers to run sp_companion. To assign the ha_role, issue the following from isql:

```
sp_role "grant", ha_role, sa
```

You must log out and then log back in to the Adaptive Server for the change to take effect.

Verifying configuration parameters

You must enable the following configuration parameters before you configure Adaptive Server for fail over:

- enable cis – enables Component Integration Services (CIS). This configuration parameter is enabled by default.
- enable xact coordination – enables Distributed Transaction Management (DTM). This configuration parameter is enabled by default.
- enable HA – enables Adaptive Server to function as a companion in a high availability system. enable HA is off by default. This configuration is static, so you must restart Adaptive Server for it to take effect. This parameter writes a message to the error log stating that you have started the Adaptive Server in a high availability system.

See the *System Administration Guide* for information about enabling configuration parameters.

Configuring HP for failover

This section describes the steps for preparing your HP MC/ServiceGuard high availability system for Sybase Failover. This section assumes that you have:

- Familiarized yourself with HP MC/ServiceGuard.
- Configured a two-node cluster hardware for MC/ServiceGuard.
- Installed HP MC/ServiceGuard version 11.15 on both nodes running under HPUX 11.11.
- Installed and configured the cluster system.
- Set up volume groups to contain all the database devices in the cluster on the shared disk devices.
- Made all the shared volume groups part of the cluster configuration.

See your HP documentation *Managing MC/ServiceGuard* for more information about installing, configuring, and managing MC/ServiceGuard.

Creating the package configuration

The package configuration process defines the Adaptive Server and associated resources run by the package manager when a package starts on a node in the cluster. The package configuration also includes a prioritized list of cluster nodes on which the package runs, and defines the types of failover the package allows. You must define a package for each companion server.

Note The name of the Adaptive Server specified in the *interfaces* file must be the same as the name of the HP MC/ServiceGuard package.

For example, you might create a package named MONEY1 for primary companion MONEY1 and another package named PERSONNEL1 for secondary companion PERSONNEL1.

Note You can use either SAM or MC/ServiceGuard commands to create and customize your package configuration file. See the *HP MC/ServiceGuard* document for information on how to use SAM to perform these operations. This document describes the steps uses MC/ServiceGuard commands.

As “root,” perform the following steps for both the primary and secondary companions:

1 Create a subdirectory on the primary node in the */etc/cmcluster* directory to contain the package information for your primary companion. For example, to create a directory for primary companion MONEY1:

```
mkdir /etc/cmcluster/MONEY1
```

2 Change the permissions for this directory so it is accessible only by “root”:

```
chmod 700 /etc/cmcluster/MONEY1
```

3 Create the same subdirectory on the secondary node. For example, to create this directory on machine FN1 for primary companion MONEY1:

```
rsh FN1 "mkdir /etc/cmcluster/MONEY1"
```

4 Change the permissions for this directory so it is only accessible by “root”:

```
rsh FN1 chmod 700 /etc/cmcluster/MONEY1
```

5 Generate a package configuration template for the primary companion using the cmmakepkg command:

```
/usr/sbin/cmmakepkg -p
/etc/cmcluster/subdirectory_name/companion_name.ascii
```

- where *subdirectory_name* is the name of the subdirectory you created in step 1,
- *companion_name* is the name of the companion for which you are configuring the package.

For example, to create a package configuration template for primary companion, MONEY1:

```
/usr/sbin/cmmakepkg -p
/etc/cmcluster/MONEY1/MONEY1.ascii
```

6 Edit the configuration template file you just created so it specifies the package name, a prioritized list of nodes, the location of the control script, and the failover parameters for each package.

The following are the edits made to the *MONEY1.ascii* configuration file (your changes will differ, depending on your machine names and parameters):

```
PACKAGE_NAME                     MONEY1
FAILOVER_POLICY                  CONFIGURED_NODE
FAILBACK_POLICY                  MANUAL
NODE_NAME                        FN1
NODE_NAME                        HUM1
RUN_SCRIPT                       /etc/cmcluster/MONEY1/MONEY1.cntl
HALT_SCRIPT                      /etc/cmcluster/MONEY1/MONEY1.cntl
SERVICE_NAME                     MONEY1
SERVICE_FAIL_FAST_ENABLED        NO
SERVICE_HALT_TIMEOUT             300
```

Copy the configuration file to the subdirectory on the second node you created in step 3. For example, to copy the *MONEY1.ascii* file using rcp:

```
rcp /etc/cmcluster/MONEY1/MONEY1.ascii HUM1:/etc/cmcluster/MONEY1/MONEY1.ascii
```

Editing the *ASE_HA.sh* script

The *ASE_HA.sh* template script configures the high availability system to start, stop, and monitor Adaptive Server for failover. The *ASE_HA.sh* template script is included in the *$SYBASE/$SYBASE_ASE/install* directory. Make a copy of this script in the package subdirectory you created in step 1 in the previous section, and modify it to include the environment variables for your cluster environment. Both the primary and secondary companions require a copy of this script. As “root,” perform the following steps:

1. If you are currently using a script to configure Adaptive Server applications to run in your high availability system, make a backup copy of this file. For example, if you have a script named *SYBASE1.sh*, copy it to *SYBASE1.sh.backup*.

2. On the primary node, change to the package subdirectory under */etc/cmcluster*. For example, if you are configuring the primary companion MONEY1:

   ```
   cd /etc/cmcluster/MONEY1
   ```

3. Copy the *ASE_HA.sh* template script from the *$SYBASE/$SYBASE_ASE/install* directory to the primary companion's package subdirectory. Use the following syntax for the package template name:

   ```
   <package_name>.sh
   ```

   where *package_name* is the name of the companion server you are configuring. For example, to make a copy of the *ASE_HA.sh* file for MONEY1:

```
cp ASE_HA.sh /etc/cmcluster/MONEY1/MONEY1.sh
```

4. Edit the *server_name.sh* file for your environment. Edit the lines that include "__FILL_IN__" (and any other lines that require editing for your site). This is a list of these lines:

   - *ASE_12_0* – specifies the version of Adaptive Server. This indicates whether the $SYBASE directory structure is *$SYBASE/$SYBASE_ASE/bin* (starting with 12.0) or *$SYBASE/bin* (before 12.0)

     Set this to:

     - Yes if both servers are using Sybase Adaptive Server version 12.0 or later.
     - No if you are using earlier versions of Adaptive Server.

   - *ASE_HAFAILOVER* – specifies whether you are using Sybase Failover. Set this to:

     - Yes if you are using Sybase Failover.
     - No if you are using mode 0 failover.

   - *BASIC_FAILOVER* – is set to either yes or no:

  - Yes – use the failover mechanisms provided by the HP MC/ServiceGuard high availability system if it determines the servers are running in modes that allow failover.

    When a failover occurs, the script first checks if the companions are in a correct mode to perform a failover. If the companions are not enabled for Sybase Failover (that is, they are running in single-server mode), the script attempts to start the primary companion on the secondary node.

  - No – do not revert to mode 0 failover.

    That is, if *BASIC_FAILOVER* is set to no, failover does not happen at either the node or the companion level.

- *PACKAGE_NAME* – the name of the package as specified in the MC/ServiceGuard package configuration script.

Note The value of PACKAGE_NAME must be the same as the companion name.

- *MONITOR_INTERVAL* – the amount of time, in seconds, this script waits between checks to see if the Adaptive Server process is alive.
- *SHUTDOWN_TIMEOUT* – the maximum amount of time, in seconds, to wait for a companion server abort to complete before killing the Sybase Adaptive Server process. *SHUTDOWN_TIMEOUT* protects a suspended companion server that prevents the halt script from completing. The value of *SHUTDOWN_TIMEOUT* must be less than the *timeout* variable set in the package configuration file.
- *RECOVERY_TIMEOUT* – the maximum amount of time the high availability system waits, in seconds, before determining that the companion failed to start. Set this number high enough to allow a loaded companion to restart. RECOVERY_TIMEOUT is also used as the maximum amount of time the subsystem waits for the failover and failback to complete.
- *SYBASE* – the location where Sybase products are installed. This value is automatically set to PRIM_SYBASE if you are on primary host and to SEC_SYBASE if you are on the secondary host.
- *SYBASE_ASE* – the installation directory of Sybase Adaptive Server products.

- *SYBASE_OCS* – the installation directory for Sybase Open Client products.
- *SYBUSER* – the name of the user who starts the Adaptive Server session.
- *HALOGIN* – the login of the user with the sa_role and ha_role. This must be the same on both the primary and secondary companion.
- *HAPWD* – the password for HALOGIN. This must be the same on both the primary and secondary companion.

Note HA_LOGIN and HA_PWD must be the same name and password used when configuring Adaptive Server as a companion server (that is, when running sp_companion).

- *PRIM_SYBASE* – the path to the directory in the primary node in which the Adaptive Server products are installed. If you are using local devices, the location must be the same on both nodes. If you are using a shared device, this location must be different on each node.
- *PRIM_ASE_HOME* – the path to the directory in which the Adaptive Server products are installed on the primary node. The default is *$SYBASE/$SYBASE_ASE.*
- *PRIM_SERVER* – the name of the primary companion.
- *PRIM_HOSTNAME* – the name of the primary node.
- *PRIM_CONSOLE_LOG* – the full path to the error log for the current primary companion session. This can be any file that has sufficient space and is writable by SYBUSER. The default is *$SYBASE/$SYBASE_ASE/install/server_name.cs_log.*
- *PRIM_RUNSCRIPT* – the name of the RUNSERVER file that is used to bring up the primary companion. The default is *$SYBASE/$SYBASE_ASE/install/RUN_server_name.*
- *SEC_SYBASE* – the directory in which the Adaptive Server products are installed on the secondary node. If you are using local devices, the location must be the same on both nodes. If you are using a shared device, this location must be different on both nodes.
- *SEC_ASE_HOME* – the path to the directory in which the Adaptive Server products are installed on the secondary node. The default is *$SYBASE/$SYBASE_ASE.*
- *SEC_SERVER* – the name of the secondary companion.

- *SEC_HOSTNAME* – the name of the secondary node.
- *SEC_CONSOLE_LOG* – the full path to the error log for the current secondary companion session. This can be any file that has sufficient space and is writable by SYBUSER. The default is *$SYBASE/$SYBASE_ASE/install/server_name.cs_log*.
- *ISQL* – the path to the isql binary. The default is *$SYBASE/$SYBASE_OCS/bin/isql*.

Table 7-1 shows the *ASE_HA.sh* settings in *MONEY1.sh* for the primary companion MONEY1 running on host FN1, and for the secondary companion PERSONNEL1, running on host HUM1. Both use a local file system. During failover, MONEY1 restarts on HUM1 if PERSONNEL1 is not running or not in companion mode.

Table 7-1: Settings for MONEY1 in the ASE_HA.sh script

Variable	Setting
ASE_12_0	yes
ASE_HAFAILOVER	yes
BASIC_FAILOVER	yes
PACKAGE_NAME	MONEY1
MONITOR_INTERVAL	5
SHUTDOWN_TIMEOUT	60
RECOVERY_TIMEOUT	300
SYBASE_ASE	ASE-15_0
SYBASE_OCS	OCS-15_0
HALOGIN	“SA”
HAPASSWD	“Odd2Think”
PRIM_ASE_HOME	Defaults to directory *$SYBASE/$SYBASE_ASE*
PRIM_SYBASE	*/opt/sybase*
PRIM_SERVER	MONEY1
PRIM_HOSTNAME	FN1
PRIM_CONSOLE_LOG	*$PRIM_SYBASE/$SYBASE_ASE/install/MONEY1.cs_log*
PRIM_RUNSCRIPT	Name of RUNSERVER file – default to *$SYBASE/$SYBASE_ASE/install/RUN_<servername>*
SYBASE	PRIM_SYBASE for primary and SEC_SYBASE if on the secondary host. Automatically set.
SEC_ASE_HOME	Default *$SYBASE/$SYBASE_ASE*
SEC_SYBASE	*/opt/sybase*
SEC_SERVER	PERSONNEL1
SEC_HOSTNAME	HUM1

Variable	**Setting**
ISQL	Default *$SYBASE/$SYBASE_OCS/bin/isql*
SEC_CONSOLE_LOG	*$PRIM_SYBASE/$SYBASE_ASE/install/PERSONNEL1.cs_log*

5 Change the permission on the file to 700 so it is only readable, writable, and executable by "root". For example, to change permissions for *MONEY1.sh*, enter:

```
chmod 700 MONEY1.sh
```

6 Distribute the script to the secondary node. For example, to distribute the file to the secondary node HUM1:

```
rcp /etc/cmcluster/MONEY1/MONEY1.sh
HUM1:/etc/cmcluster/MONEY1/MONEY1.sh
```

7 Repeat the above steps for the secondary companion.

The secondary companion package script uses values for PRIM_SERVER, PRIM_HOSTNAME, PRIM_SYBASE, SEC_SERVER, SEC_HOSTNAME, and SEC_SYBASE that are the opposite of the primary companion package script. Table 7-2 shows values for *PERSONNEL1.sh*.

Table 7-2: Settings for PERSONNEL1 in the ASE_HA.sh script

Variable	**Setting**
ASE_12_0	yes
ASE_HAFAILOVER	yes
BASIC_FAILOVER	yes
PACKAGE_NAME	PERSONNEL1
MONITOR_INTERVAL	5
SHUTDOWN_TIMEOUT	60
RECOVERY_TIMEOUT	300
SYBASE_ASE	ASE-15_0
SYBASE_OCS	OCS-15_0
HALOGIN	"SA"
HAPASSWD	"Odd2Think
PRIM_SYBASE	*/opt/sybase*
PRIM_SERVER	PERSONNEL1
PRIM_HOSTNAME	HUM1
PRIM_CONSOLE_LOG	*$PRIM_SYBASE/$SYBASE_ASE/install/MONEY1.cs_log*

Variable	Setting
PRIM_RUNSCRIPT	Name of RUNSERVER file – default to *$SYBASE/$SYBASE_ASE/install/RUN_<servername>*
SEC_SYBASE	*/opt/sybase*
SEC_SERVER	MONEY1
EC_HOSTNAME	FN1
SEC_CONSOLE_LOG	*$PRIM_SYBASE/$SYBASE_ASE/install/PERSONNEL1.cs_log*

Creating the package control script

The package control script contains the information necessary to:

- Run the companion servers in the package
- Monitor the companion servers
- Respond to failure
- Halt the package

For security reasons, the control script must reside in a directory that includes *cmcluster* in its path.

Each package requires a separate control script. The control script placed in the package subdirectory under */etc/cmcluster* is given the same name that it has in the package configuration file. It must be executable.

Perform the following as “root”:

1. Use the cmmakepkg utility to generate a package control script template for the primary companion in the same directory you created. The cmmakepkg utility uses this syntax:

   ```
   /usr/sbin/cmmakepkg -s
   /etc/cmcluster/package_name/companion_name.cntl
   ```

   Where

   - *package_name* – the name of the directory you created
   - *companion_name* – the name of the companion you are configuring

2. Edit the package control script to reflect your cluster environment:

   a. Define the volume groups that are used by this companion server package:

      ```
      VG[0]=""
      ```

For example, if the primary companion uses volume group *ha_vg1*, enter the following:

```
VG[0]="ha_vg1"
```

b If you are using a shared file system, define the logical volumes and file system in the following line in the FILESYSTEMS section of the script:

```
LV[0]="";FS[0]="", FS_MOUNT_OPT[0]="-Fvxfs -o rw, suid, log,
mincache, dync, blkclear, detainlog, largefiles"
```

For example, if the primary companion has data on a *ha_fs1* file system on logical volume *ha_lv1*:

```
LV[0]="ha_lv1";FS[0]="/ha_fs1", FS_MOUNT_OPT[0]=""
```

c Enter the command to halt the companion service inside the customer_defined_halt_cmds function. This command includes the location of the *ASE_HA.sh* file (described in "Editing the ASE_HA.sh script" on page 53). Before editing, this section looks similar to:

```
function customer_defined_halt_cmds
{
# ADD customer defined run commands.
: # do nothing instruction, because a function must contain some
command.

test_return 52
}
```

Edit the function to include the halt command. For example, to include the halt command for companion MONEY1:

```
function customer_defined_halt_cmds
{
# ADD customer defined run commands.
: # do nothing instruction, because a function must contain some
command.

/etc/cmcluster/MONEY1/MONEY1.sh halt
test_return 52
}
```

d Move to the START OF CUSTOMER DEFINED FUNCTIONS section of *companion_name.cntl* and enter the command to start the companion service. Enter this command inside the customer_defined_run_cmds function. This command includes the location of the *ASE_HA.sh* file (described in “Editing the ASE_HA.sh script” on page 53). Before editing, this section looks similar to:

```
function customer_defined_run_cmds
{
# ADD customer defined run commands.
: # do nothing instruction, because a function must contain some
command.

test_return 51
}
```

Edit the function to include the start command. For example, to include the start command for companion MONEY1, enter:

```
function customer_defined_run_cmds
{
# ADD customer defined run commands.
: # do nothing instruction, because a function must contain some
command.

/etc/cmcluster/MONEY1/MONEY1.sh start
test_return 51
}
```

e Define the script that monitors the server process as a service in the SERVICE NAMES AND COMMANDS section of the script:

```
SERVICE_NAME[0]=""
SERVICE_CMD[0]=""
SERVICE_RESTART[0]=""
```

For example, to configure monitoring for primary companion MONEY1, enter:

```
SERVICE_NAME[0]="MONEY1"
SERVICE_CMD[0]="/etc/cmcluster/MONEY1/MONEY1.sh monitor"
SERVICE_RESTART[0]="-R"
```

f Distribute the script to each node in the cluster. For example, to distribute the script to the secondary node HUM1:

```
# rcp /etc/cmcluster/MONEY1/MONEY1.cntl
HUM1:/etc/cmcluster/MONEY1/MONEY1.cntl
```

g Repeat these steps for the secondary companion.

Verifying and distributing the configuration

1 Use the cmquerycl utility to create the cluster configuration information file:

```
cmquerycl -n primary_node_name -n secondary_node_name -v -C
/etc/cmcluster/cmclconfig.ascii
```

primary_node_name – the host name for the primary node.

secondary_node_name – the host name for the secondary node.

In the *cmclconfig.ascii* file, change the max_configured_packages to 2.

2 Use the cmcheckconf utility to verify that the package configuration file is correct. cmcheckconf uses this syntax:

```
cmcheckconf -C /etc/cmcluster/cmclconfig.ascii -P
/etc/cmcluster/package_name/primary_companion_name.ascii -P
/etc/cmcluster/secondary_package_name/secondary_companion_n
ame.ascii
```

where:

- *package_name* is the name of the directory you created
- *primary_companion_name* is the name of the companion you are configuring,
- and *secondary_companion_name* is the name of its secondary companion.

For example, to verify the package configuration file for MONEY1:

```
cmcheckconf -C /etc/cmcluster/cmclconfig.ascii -P
/etc/cmcluster/MONEY1/MONEY1.ascii
-P /etc/cmcluster/PERSONNEL1/PERSONNEL1.ascii
```

3 To distribute the binary cluster configuration file:

a Issue the vgchange command to activate the cluster lock volume group so that the lock disk can be initialized:

```
/usr/sbin/vgchange -a y /dev/vglock
```

b Use the cmapplyconf utility to generate the binary configuration file and distribute it across the nodes:

```
/usr/sbin/cmapplyconf -v -C
```

```
/etc/cmcluster/cmclconf.ascii -P
/etc/cmcluster/primary_package_name/primary_com
panion_name.ascii
-P
/etc/cmcluster/secondary_package_name/secondary
_companion_name.ascii
```

where *primary_package_name* is the name of the directory you created, *primary_companion_name* is the name of the companion you are configuring, *secondary_package_name* is the name of the secondary directory you created, and *secondary_companion_name* is the name of the secondary companion. For example, to generate a binary configuration file for MONEY1, enter:

```
# cmapplyconf -v -C /etc/cmcluster/cmclconf.ascii -P
 /etc/cmcluster/MONEY1/MONEY1.ascii
 -P /etc/cmcluster/PERSONNEL1/PERSONNEL1.ascii
```

c To deactivate the cluster lock volume group:

```
/etc/sbin/vgchange -a n /dev/vglock
```

Note The cluster lock volume group can be activated only on the node from which you issue the cmapplyconf command so that the lock disk can be initialized. When you configure the cluster, the cluster lock volume group must be active only on the configuration node and deactivated on all other nodes. Deactivate the cluster lock volume group on the configuration node after cmapplyconf is executed.

You must run cmcheckconf and cmapplyconf any time you make changes to the cluster and package configuration files.

Starting the primary and secondary companions

Start the companion cluster, including its packages, using this syntax as “root” on one companion node:

```
cmruncl -v
```

To view the information on the companion cluster, enter:

```
cmviewcl -v
```

To add packages to an individual node, enter:

/usr/sbin/cmrunpkg -n *node_name primary_companion _name*

For example:

```
/usr/cmrunpkg -n FN1 MONEY1
```

Configuring companion servers for failover

This section discusses how to configure the Adaptive Servers as primary and secondary companions in a high availability system.

Running *sp_companion* with *do_advisory* option

You must configure the secondary companion with sufficient resources to perform the work of both servers during failover. The secondary companion may have attributes that prevents a successful cluster operation. For example, if both the primary and secondary companions are configured for 250 user logins, during failover, the secondary companion has the resources for only half the number of potential user logins necessary. Instead, configure both MONEY1 and PERSONNEL1 for 500 user logins.

sp_companion do_advisory checks the configuration options on both the primary and the secondary companion to make sure a cluster operation (such as configuring an Adaptive Server as a secondary companion) will be successful. sp_companion do_advisory advises you of any configuration options that should be changed.

See Chapter 6, "Running do_advisory" for a complete description of the sp_companion do_advisory option.

Creating an asymmetric companion configuration

To configure the primary companion asymmetrically, issue this command from the secondary companion:

sp_companion "*primary_server_name*", configure, NULL, *login_name*, *password*

- *primary_server_name* is the name of the primary Adaptive Server as defined in the *interfaces* file entry and in sysservers.
- *login_name* is the name of the user performing this cluster operation (this person must have the ha_role).

- *password* is the password of the person performing this cluster operation.

Note You must execute the above command *only* from the secondary companion.

This example configures an Adaptive Server named MONEY1 as a primary companion. Issue the following command from the secondary server PERSONNEL1:

```
sp_companion "MONEY1", configure, NULL, sa, Odd2Think
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'PERSONNEL1' and 'MONEY1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

If user databases are created during the sp_companion configuration, you see messages similar to these:

```
Step: Created proxy database ‘pubs2’
Step: Proxy status for database has been set. Please Checkpoint the database
'pubs2'
Step: Server configured in normal companion mode
Starting companion watch thread
```

Creating the symmetric configuration

After you configure your companion for asymmetric failover, you can configure them for symmetric configuration. In a symmetric configuration, both servers act as primary and secondary companions. See Figure 3-2 on page 22 for a description of symmetric configuration.

Issue sp_companion from the secondary companion to configure it for symmetric configuration. See “Creating an asymmetric companion configuration,” above, for a description of the syntax for sp_companion.

The following example adds an Adaptive Server named MONEY1 as the secondary companion to the Adaptive Server named PERSONNEL1 described in “Creating an asymmetric companion configuration” on page 64. Issue the following command from the MONEY1 server:

```
sp_companion 'PERSONNEL1', configure, sa, Think2Odd
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'MONEY1' and 'PERSONNEL1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

Administering Sybase Failover

This section includes information about using Sybase Failover.

Failing back to the primary companion and resuming normal companion mode

Failback moves the primary companion's shared disks from the secondary node back to the primary node and starts the primary companion on the primary node. A failback is a planned event. To fail back to the primary companion:

1. Issue sp_companion from the secondary companion to verify that it is in failover mode.

   Note The high availability system automatically restarts the primary companion.

2. Issue the following from the secondary companion:

   ```
   sp_companion primary_companion_name, prepare_failback
   ```

   where *primary_companion_name* is the name of primary companion server.

3. From the primary companion, issue:

   ```
   sp_companion secondary_companion_name, resume
   ```

   where *secondary_companion_name* is the name of the secondary companion server.

4. Issue sp_companion without any options from either companion to make sure you are in normal companion mode.

Note You cannot connect clients with the failover property until you issue sp_companion resume. If you do try to reconnect them after issuing sp_companion prepare_failback, the client stops responding until you issue sp_companion resume.

Suspending companion mode

Suspended mode temporarily disables the ability of the primary companion to fail over to the secondary companion. When you move companions to suspended mode, synchronization between the companions does not occur, and the primary companion cannot fail over to the secondary companion. However, suspended mode is useful for performing such maintenance tasks as changing configuration parameters. To switch from normal companion mode to suspended mode:

1. As “root”, issue cmhaltserv to disable the monitoring process so it does not trigger a fail over when you shut down the companion server:

   ```
   cmhaltserv -v primary_package_name
   ```

   where *primary_package_name* is the name of the primary package, which is also the same as the name of the primary companion.

2. Move the companions from normal companion mode to suspended mode. Issue the following from the secondary companion:

   ```
   sp_companion primary_server_name, suspend
   ```

   You can now shut down the primary companion as necessary and it does not fail over to the secondary companion.

Resuming normal companion mode from suspended mode

To resume normal companion mode between two companions that have been moved to suspended mode:

1. As “root,” issue cmhaltpkg from the primary node to shut down the primary companion:

   ```
   cmhaltpkg primary_package_name
   ```

   where *primary_package_name* is the name of the primary package, which is the same as the name of the primary companion server.

2. As “root,” issue cmmodpkg and cmrunpkg from the primary companion to run the package which restarts the primary companion:

   ```
   cmmodpkg -e primary_package_name
   cmrunpkg primary_package_name
   ```

   where *primary_package_name* is the name of the primary package, which is the same as the name of the primary companion server.

Dropping companion mode

To drop companion mode, issue:

```
sp_companion companion_name, "drop"
```

Dropping companion mode is irreversible; to reestablish failover, you must reconfigure the Adaptive Server companion servers. However, the nodes upon which the Adaptive Servers are running are still monitored by the high availability system.

If you drop companion mode while the monitor script is running, the script continues to monitor the server. If you plan to shut down the server and do not want the node to fail over, kill the monitor process by issuing:

```
/usr/sbin/cmhaltsrv service_name
```

Alternatively, you can halt the package, reactivate the volume group, and then restart the companion only.

If you do not kill the monitor process and it detects that the companion has stopped responding, it triggers a failover to the secondary node. It restarts the primary companion on the secondary node, depending on your settings for BASIC_FAILOVER.

Troubleshooting Sybase Failover on HP

This section includes troubleshooting information about common errors.

Error message 18750

If a companion server issues error message 18750, check the *@@cmpstate* of the servers. If the primary companion is in normal companion mode, but the secondary companion is in secondary failover mode, the cluster is in an inconsistent state, and you must recover manually. This inconsistent state may be caused by an sp_companion 'prepare_failback' command failing on the secondary companion. You can determine whether this happened by examining the log on the secondary node. To recover from error 18750:

1. Shut down both the primary and the secondary companions by halting both their packages.
2. Restart the secondary companion by starting the package for the secondary companion.
3. Repair all databases marked "suspect." To determine which databases are suspect, issue:

   ```
   select name, status from sysdatabases
   ```

   Databases marked suspect have a status value of 320.
4. Allow updates to system tables:

```
sp_configure “allow updates”, 1
```

5 For each suspect, failed-over database, perform the following:

```
1> update sysdatabase set status=status-256 where name='database_name'
2> go
1> dbcc traceon(3604)
2> go
1> dbcc dbrecover(database_name)
2>go
```

6 From the secondary companion, issue:

```
sp_companion primary_companion_name, prepare_failback
```

Make sure that this command executes successfully.

7 Resume normal companion mode. From the primary companion, issue:

```
sp_companion secondary_companion, resume
```

Recovering from a failed *prepare_failback*

During a fail back, if prepare_failback executed successfully on the secondary companion but the primary companion does not start, perform the following to roll back and then reissue the prepare_failback command:

1 Check the primary companion’s error log, the HP MC/ServiceGuard package log, or the system log to find the reason the server failed to start, and correct the problems.

2 If the package for the primary companion is running on the primary node, halt the package.

3 Log in to the secondary companion and issue:

```
dbcc ha_admin ("", "rollback_failback")
dbcc ha_admin ("", "rollback_failover")
```

4 Verify that the secondary companion is in normal companion mode.

5 As “root”, start up the package for the primary companion to run on secondary node.

```
/usr/sbin/cmrunpkg -n secondary_node primary_companion_package_name
```

The secondary companion is now in failover mode. Once you verify that everything is ready for the primary companion to fail back to normal companion mode, issue sp_companion...prepare_failback.

Location of error logs

Sybase Failover and HP MC/ServiceGuard includes the following error logs:

- */var/adm/syslogs/syslog.log* – contains the output of HP MC/ServiceGuard cluster activities as well as operating system activities.
- */etc/cmcluster/<package_name>/<package_name>.cntl.log* – contains the output of the HP MC/ServiceGuard package activities and Sybase Failover activities from the companion start, stop, and monitor scripts.

  For output from the companion start, stop, and monitor scripts, search for "SYBASE HA".

  For MC/ServiceGuard package failure output, search for the string "ERROR".
- *$PRIM_CONSOLE_LOG* – the location of this log is defined in */etc/cmcluster/<package_name>/<package_name>.sh*. This error log includes information from the last execution of Adaptive Server from the *ASE_HA.sh* script for the primary.
- *SEC_CONSOLE_LOG* – the location of this log is defined in */etc/cmcluster/<package_name>/<package_name>.sh*. This error log includes information from the last execution of Adaptive Server from the *ASE_HA.sh* script for the secondary.

CHAPTER 8

Configuring Adaptive Server for Failover on IBM AIX HACMP

This chapter contains the information for configuring Adaptive Server for Failover on IBM AIX HACMP.

Hardware and operating system requirements

High availability requires the following hardware and system components:

- Two homogenous, network systems with similar configurations in terms of resources such as CPU, memory, and so on
- High availability system package and the associated hardware
- Devices that are accessible to both nodes
- A logical volume manager (LVM) to maintain unique device path names across cluster nodes
- Third-party mirroring, for media failure protection

  See your hardware and operating system documentation for information about installing platform-specific high availability software.

Requirements for running Failover on IBM AIX HACMP

Configuring for high availability on IBM High Availability Cluster Multiprocessing (HACMP) requires:

- Two hardware-compatible nodes running HACMP for AIX, Version 5.2, that are configured in the same cluster.
- Each node must have three IP addresses, one for service, one for start, and one for standby. The standby IP address should be on a different subnet from the other two.
- Shared disk devices set up for the high availability system between the nodes.
- Shared logical volume groups set up to contain all the database devices in the cluster. Both nodes must have the same major number for each of the shared volume groups defined in the cluster. In this chapter, these resources are referred to as:

  – *shared_vg1* for the primary node
  – *shared_vg2* for the secondary node

  See the *HACMP for AIX Installation or Administration Guide* for information about installing the high availability system.

  Sybase also recommends that you identify the following resources in advance:

- A resource group name for the primary companion (for example, *resgrp1*)
- A resource group name for the secondary companion (for example, *resgrp2*)
- The name of the primary companion
- The name of the secondary Adaptive Server companion

Special considerations for running Adaptive Server on HACMP for AIX

When the primary companion fails over on HACMP 5.2, the entire node fails over, not only the primary companion. During this node failover, the IP address of the servicing host (the primary node) is swapped with another standby address. In some networking environments, this may cause all the processes on the initial IP address to freeze and eventually timeout. Because of this, when you use Sybase Failover with HACMP on AIX:

- Do not allow clients to log in directly to the primary node

- Limit the primary node to running only one high availability application at a time

Preparing Adaptive Server to work with high availability

This section discusses how to prepare Adaptive Server for a high availability configuration.

Installing Adaptive Servers

Before you install Adaptive Server, start the HACMP services on the same node on which you are installing Adaptive Server. The HACMP node must be running on its service IP address, not the start or standby IP address.

Install the primary and the secondary servers. You can install the companions on either local or shared file systems.

If they are installed on shared file systems, the file systems cannot be the same for each companion. This is to prevent the file systems from overwriting each other during a device fail over. For example, you can install the primary companion on *node1_sybase*, but install the secondary companion on */node2_sybase*.

If the servers are installed on local file systems, the name of the file systems must be the same. For example, both the primary and the secondary companion can be installed in */sybase*.

The file systems that contain *$SYBASE* must be either local or shared; you cannot mix local and shared file systems for *$SYBASE* in the cluster.

The database devices for the primary companion must be devices in the shared volume group on the primary node (for example, *shared_vg1*), so the volume group for this node must be “varied on,” which means make the volume group active and accessible on this node.

If you are creating an asymmetric configuration, you can use any device (shared or local) for the database device of the secondary companion. If you are creating a symmetric configuration, you must use a device in the shared volume group on the secondary node (for example, *shared_vg2*) for its database devices, so the volume group for this node must be “varied on,” which means make the volume group active and accessible on this node.

The primary companion can be either a newly installed Adaptive Server, or it can be upgraded from an earlier version of Adaptive Server with existing databases, users, and so on.

The secondary companion must be a newly installed Adaptive Server without any user logins or user databases. This ensures that all user logins and database names are unique within the cluster. After configuration for failover is complete, you can add user logins and databases to the secondary companion.

See the installation documentation for your platform for information about installing and configuring Adaptive Server.

Adding entries for both Adaptive Servers to the *interfaces* file

The *interfaces* file for the primary and the secondary companion must include entries for both companions. The server entry in the *interfaces* file must use the same network name that is specified in sysservers. For information about adding entries to the *interfaces* file, see the installation documentation for your platform.

Adding entries to the *interfaces* file for client connections

To enable clients to reconnect to the failed-over companion, you must add a line to the *interfaces* file. By default, clients connect to the port listed in the query line of the server entry. If that port is not available (because the server has failed-over), the client connects to the server listed in the *hafailover* line of the server entry. Here is a sample *interfaces* file for a primary companion named MONEY1 and a secondary companion named PERSONNEL1:

```
MONEY1
        master tcp ether FN1 4100
        query tcp ether FN1 4100
        hafailover PERSONNEL1
```

Use dsedit to add entries to the *interfaces* file. If the interfaces entries already exist, modify them to work for fail over.

See the *Utility Guide* for information about dsedit.

Setting the value of *$SYBASE*

If you installed *$SYBASE* on a local file system, *$SYBASE* must point to the same directory name on both companions. You can accomplish this by either:

- Making sure that the *$SYBASE* release directory on each companion is created in the same directory, or
- If the companions have the *$SYBASE* release directory in different locations, creating a directory with the same path on both companions that acts as a symbolic link to the actual *$SYBASE* release directory.

  For example, even though primary companion MONEY1 has a release directory of */usr/u/sybase1* and PERSONNEL1 use */usr/u/sybase2* as its release directory, *$SYBASE* must point to the same path.

  Both MONEY1 and PERSONNEL1 uses */sybase*, which is established as a symbolic link to their respective *$SYBASE* release directories. On MONEY1, */sybase* is a link to */usr/u/sybase1*, and on PERSONNEL1, */sybase* is a link to */use/u/sybase2*.

If you installed *$SYBASE* on a local file system, you must also have copies of companion *RUNSERVER* files in *$SYBASE/$SYBASE_ASE/install* on both nodes.

sybha executable

The Adaptive Server High Availability Basic Services library calls *sybha*, which is located in *$SYBASE/$SYBASE_ASE/bin*. Before *sybha* can run, you must change its ownership and permissions. You must also edit a file named *sybhauser* in *$SYBASE/$SYBASE_ASE/install* contains a list of the users who have System Administrator privileges on the cluster. Sybase strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

As “root”

1. Add a new group named *sybhagrp*. You can either add this group to the */etc/group* file, or you can add it to your NIS maps. Add the sybase user (the user that owns the *$SYBASE* directory) to this group. When the server is started, the sybase user runs the data server. If you have multiple servers running, and different users own the *$SYBASE* directory for each of them, each user must be added to the group.

2. Add “sybase” user to the group “hacmp”. This group is created as part of HACMP Cluster Software installation.

3. Change to the *$SYBASE/$SYBASE_ASE/bin* directory.

4. Change the ownership of *sybha* to “root”:

   ```
   chown root sybha
   ```

5. Change the group for the *sybha* program to *sybhagrp*:

   ```
   chgrp sybhagrp sybha
   ```

6. Modify the file permissions for *sybha* to 4550:

   ```
   chmod 4550 sybha
   ```

7. Change to the *$SYBASE/$SYBASE_ASE/install* directory:

   ```
   cd $SYBASE/$SYBASE_ASE/install
   ```

8. Add the sybase user to the *sybhauser* file. These logins must be in the format of UNIX login IDs, not Adaptive Server logins. For example:

   ```
   sybase
   coffeecup
   spooner
   venting
   howe
   ```

9. Change the ownership of *sybhauser* to “root”:

   ```
   chown root sybhauser
   ```

10. Modify the file permissions for *sybhauser*:

    ```
    chmod 600 sybhauser
    ```

Verifying configuration parameters

You must enable the following configuration parameters before you configure Adaptive Server for failover:

- enable CIS – enables Component Integration Services (CIS). This configuration parameter is enabled by default.
- enable xact coordination – enables Distributed Transaction Management (DTM). This configuration parameter is enabled by default.
- enable HA – enables Adaptive Server to function as a companion in a high availability system. enable HA is off by default. This configuration is static, so you must restart Adaptive Server for it to take effect. This parameter causes a message to be written to your error log stating that you have started the Adaptive Server in a high availability system.

See the *System Administration Guide* for information about enabling configuration parameters.

Adding thresholds to the master log

If you have not already done so, add a threshold to the master log.

1 Define and execute sp_thresholdaction on the master database's log to set a threshold on the number of pages left before a dump transaction occurs. Sybase does not supply sp_thresholdaction. See the *Adaptive Server Reference Manual* for information about creating this system procedure.

2 Place thresholds on the master and sybsystemprocs log segments so they do not fill up:

```
sp_addthreshold "master", "logsegment", 250, sp_thresholdaction
sp_addthreshold "sybsystemprocs", "logsegment", 250, sp_thresholdaction
```

3 Perform both steps on the primary and secondary servers, then restart both servers to allow the static configuration parameters to take effect.

Creating a new default device other than master

The master device is the default device in a newly installed Adaptive Server. This means that, if you create any databases (including proxy databases used by failover), they are automatically created on the master device. However, adding user databases to the master device makes it more difficult to restore the master device from a system failure. To make sure that the master device contains as few extraneous user databases as possible, use disk_init to create a new device. Use sp_diskdefault to specify the new device as the default.

For example, to add a new default device named money1_default1 to the MONEY1 Adaptive Server, enter:

```
sp_diskdefault money1_default1, defaulton
```

The master device continues to be a default device until you specifically issue this command to suspend it as the default device:

```
sp_diskdefault master, defaultoff
```

See the *Adaptive Server Reference Manual* for more information about disk init and sp_diskdefault.

Adding a local server to *sysservers*

Use sp_addserver, to add the local server as the local server to sysservers using the network name specified in the *interfaces* file. For example, if the companion MONEY1 uses the network name of MONEY1 in the *interfaces* file:

```
sp_addserver MONEY1, local, MONEY1
```

You must restart Adaptive Server for this change to take effect.

Adding a secondary companion to *sysservers*

Add the secondary companion as a remote server in sysservers:

```
sp_addserver server_name
```

By default, Adaptive Server adds the server with an srvid of 1000. You need not restart Adaptive Server for this change to take effect.

Running *installhasvss* script

Note You must perform the tasks described in "Adding entries for both Adaptive Servers to the interfaces file" on page 76, before running *installhasvss*. If you run *installhasvss* before performing these tasks, you must then re-run *installmaster* to reinstall all the system stored procedures.

The *installhasvss* script:

- Installs the stored procedures required for fail over (for example, sp_companion)
- Installs the SYB_HACMP server in sysservers

You must have System Administrator privileges to run *installhasvss*.

installhasvss is located in the *$SYBASE/$SYBASE_ASE/scripts* directory. To execute the script, enter:

```
$SYBASE/$SYBASE_OCS/bin/isql -Usa -Ppassword -Sservername
<../scripts/installhasvss
```

installhasvss prints messages as it creates stored procedures and creates the SYB_HACMP server.

Assigning *ha_role* to System Administrator

To run sp_companion you must have the ha_role on both Adaptive Servers. To assign the ha_role, issue the following from isql:

```
sp_role "grant", ha_role, sa
```

You must log out and then log back in to the Adaptive Server for the change to take effect.

Configuring the IBM AIX subsystem for Sybase Failover

This section discusses how to configure IBM AIX for failover.

Modifying the *ASE_HA.sh* script

The *ASE_HA.sh* script is used to start, stop, and monitor Adaptive Server in a high availability environment. Adaptive Server includes this script in the *$SYBASE/$SYBASE_ASE/install* directory. Make a copy of this script and modify it for your environment for both Adaptive Servers in the cluster. The modifications you make to the script depend on whether the script is for the primary or secondary companion. Each node must have a copy of this script at the same location (for example, both nodes have a copy of the script in */usr/u/sybase*), and both copies must have read, write, and execute permissions for “root”. The easiest way to do this is to first modify both scripts on the same node, copy both the scripts to the other node, then set the appropriate permissions for the scripts on both nodes.

To modify the script for your environment:

1. Change to the *$SYBASE/$SYBASE_ASE/install* directory.
2. As “root”, copy *ASE_HA.sh* to the HACMP event handler script directory, usually */usr/sbin/cluster/events*, and enter the following, where *servername* is the Adaptive Server to be monitored.:

   ```
   RUNHA_<servername>.sh
   ```

3. You must edit the *RUNHA_<servername>.sh* script for your environment. The original *ASE_HA.sh* script contains the variables listed below. Edit the lines that include “__FILL_IN__” (and any other lines that require editing) with the values for your site:

   - *MONITOR_INTERVAL* – the interval of time, in seconds, *RUNHA_<servername>.sh* waits between checks to see if the data server process is alive.
   - *RECOVERY_TIMEOUT* – the maximum amount of time, in seconds, the high availability system waits before determining that the companion did not start. Set this number high enough for a loaded companion to restart. *RECOVERY_TIMEOUT* is also used as the maximum amount of time the subsystem waits for the failover and failback to complete.

- *SHUTDOWN_TIMEOUT* – the maximum amount of time the high availability system waits for the companion to shut down before killing it.

Note This value should always be less than the amount of time it takes for the HACMP wait time parameter to go into a config_too_long state. By default this is 360 seconds. If your server takes longer than this to start, reconfigure this value by executing:

```
    chssys -s clstrmgr -a "-u milliseconds_to_wait"
```

- *RESPONSE_TIMEOUT* – the maximum amount of time the subsystem allows for a simple query to return a result set is used to diagnose whether the companion server is hung. For example, if isql fails to establish a connection in 60 seconds, it automatically times out and exits. However, if isql successfully connects, but does not return a result set, RESPONSE_TIMEOUT may determine that the companion server has stopped responding. By default, RESPONSE_TIMEOUT is set to 999999.
- *ASE_FAILOVER* – set to:
  - yes – monitors the companion server for stopped or dead processes and stops HACMP services on this node so the devices fail over to the secondary node. You must also run sp_companion configure on the server.
  - no – do not bring down the HACMP subsystem on this node even if the primary companion fails over. This setting is useful if you must bring down a companion for maintenance or reconfigure.

    If you are configuring an asymmetric setup, set *ASE_FAILOVER* to no.

Warning! Set ASE_FAILOVER to “yes” only if both servers are running Adaptive Server Version 12.0 or later. For version earlier than 12.0 set ASE_FAILOVER to “no”.

- *BASIC_FAILOVER* – set to:

    - yes – use the failover mechanisms provided by the HACMP subsystem if it determines the servers are running in modes that allow failover. When a failover occurs, the HACMP subsystem monitor first checks if the companions are in a correct mode to perform a failover. If the companions are not enabled for Sybase Failover (that is, they have enable ha set to 1), if they are running in single-server mode, or if the secondary companion is down, the HACMP subsystem monitor checks if BASIC_FAILOVER is set. If it is, the monitor attempts to start the primary companion on the secondary node.
    - no – do not revert to mode 0 failover even if Sybase Failover criteria is not met. That is, if BASIC_FAILOVER is set to no, failover neither at the node nor the companion level.
- retry – the number of times the HACMP subsystem attempts to restart on the local node before failing over. Set this to a high number for an asymmetric setup, so the secondary companion is more likely to restart itself if it ever goes down. The default is 0, which means that the companion does not restart on the same node if it goes down.
- *SYBASE_ASE* – the installation directory of Sybase Adaptive Server products.
- *SYBASE_OCS* – the installation directory of Sybase Open Client products.
- *PRIM_SERVER* – the name of the primary companion.
- *SEC_SERVER* – the name of the secondary companion.
- *PRIM_HOST* – the name of the primary host as returned by hostname.
- *SEC_HOST* – the name of the secondary host as returned by the hostname.

Warning! You must set *PRIM_HOST* and *SEC_HOST* to the string as returned by hostname command, otherwise, failover or failback may not happen properly.

- *PRIM_SYBASE* – the directory to which the *$SYBASE* environment variable should be set on the primary host. If you are using local devices, the location must be the same on both nodes. If you are using a shared device, this location must be different on both nodes.

- *SEC_SYBASE* – the directory to which the *$SYBASE* environment variable should be set on the secondary host. If you are using local devices, the location must be the same on both nodes. If you are using a shared device, this location must be different on both nodes.
- *PRIM_SYBASE_HOME* – the path to the directory in the secondary host in which the Adaptive Server products are installed. Usually this is *$SYBASE/$SYBASE_ASE*.
- *SEC_SYBASE_HOME* – the path to the directory in the secondary host in which the Adaptive Server products are installed. Usually this is *$SYBASE/$SYBASE_ASE*.
- *PRIM_ISQL* – the path to the isql binary on the primary host.
- *SEC_ISQL* – the path to the isql binary on the secondary host.
- *HA_LOGIN* – the login of the user with the sa_role and ha_role. This must be the same on the primary and secondary companion.
- *HA_PWD* – the password for the HA_LOGIN. This must be the same on the primary and secondary companion.
- *PRIM_RUNSCRIPT* – the name of the *RUNSERVER* file that is used to bring up the primary companion.
- *PRIM_CONSOLE_LOG* – the full path to the error log for the current primary companion session. This can be any file that has sufficient space and is writable by "root". The default is *$SYBASE/$SYBASE_ASE/install*.
- *SEC_CONSOLE_LOG* – the full path to the error log for the current secondary companion session. This can be any file that has sufficient space and is writable by "root". The default is *$SYBASE/$SYBASE_ASE/install*.

4. Edit the script for the primary companion.
5. Edit the script for the secondary companion. These values differ depending on whether you are using an asymmetric or a symmetric configuration.

   If this is an asymmetric setup, the values for *PRIM_SERVER* should be the same as *SEC_SERVER* (the name of the secondary companion). *PRIM_HOST* should be the same as *SEC_HOST*, and *PRIM_SYBASE* should be the same as *SEC_SYBASE*.

If this is a symmetric setup, the values for the PRIM_SERVER, PRIM_HOST, PRIM_SYBASE, SEC_SERVER, SEC_HOST, and SEC_SYBASE in the secondary companion script are the opposite of what is set in the primary companion script.

Configuring resource groups in HACMP

Note You can perform the steps described in this section from the command line or through the SMIT configuration utility. See your IBM documentation for information about starting and using the SMIT utility. This document explains how to use SMIT to configure resource groups. See the IBM HACMP for AIX documentation for information about configuring resource groups from the command line.

Shut down the cluster services on both nodes in graceful mode, then log in to start IP addresses of the primary node as “root” and perform these tasks:

1 Start SMIT from the command line - `smit hacmp`.

2 From Extended Configuration menu:

- Select Extended Resource Configuration.
- Select HACMP Extended Resource Group Configuration.
- Select Add a Resource Group if you are creating a new resources group, or select Change/Show a Resource Group if you are changing an existing resources group.

3 Select the appropriate start, fallover, and fallback policies when defining the resource groups:

For the Resource Group for the primary companion:

Field name	Enter
Resource Group Name	[<*resgrp1*>]
Participating Nodes (Default Node Priority)	[<*primary_node*> <*secondary_node*>]
Start Policy	“Online On Home Node Only”
Fallover Policy	“Fallover To Next Priority Node In The List”
Fallback Policy	“Fallback To Higher Priority Node In The List”

Click OK.

For the Resource Group for the secondary companion, Asymmetric Failover Configuration:

Field name	Enter
Resource Group Name	[<*resgrp2*>]
Participating Nodes (Default Node Priority)	[<*secondary_node*>]
Start Policy	"Online On Home Node Only"
Fallover Policy	"Fallover To Next Priority Node In The List"
Fallback Policy	"Fallback To Higher Priority Node In The List"

Click OK.

For the Resource Group for the secondary companion, as a Symmetric Failover Configuration:

Field name	Enter
Resource Group Name	[<*resgrp2*>]
Participating Nodes (Default Node Priority)	[<*secondary_node*> <*primary_node*>]
Start Policy	"Online On Home Node Only"
Fallover Policy	"Fallover To Next Priority Node In The List"
Fallback Policy	"Fallback To Higher Priority Node In The List"

Click OK.

Note The start and stop policies can also be "Bring Offline (On Error Node Only)" and "Never Fallback" for secondary companion in Asymmetric HA configuration.

4 Define the primary and secondary companions as application servers in HACMP. From Extended Configuration menu:

- Select Extended Resource Configuration
- Select HACMP Extended Resources Configuration
- Select Configure HACMP Applications
- Select Configure HACMP Application Servers
- Select Add an Application Server for defining a new Application Server or Change/Show an Application Server if you are changing an existing Application Server, then enter these values:

Field name	Enter
Server Name	the corresponding companion server name for this Application Server being created.
Start Scrip	the full path name of the corresponding script you created in section "Modifying the ASE_HA.sh script" on page 82, for this companion server. Enter "monitor" as argument for the start script.
Stop Script	the full path name of the corresponding script you created in section "Modifying the ASE_HA.sh script" on page 82, for this companion server. Enter "failover" as argument for the stop script corresponding to primary and symmetric secondary companion servers. Enter "stop" as argument for asymmetric secondary companion server.
Application Monitor Name(s)	leave blank

Click OK when information is completed.

- As examples,

  For the primary companion server MONEY1:

Field name	Enter
Server Name	[MONEY1].
Start Scrip	`[/usr/sbin/cluster/events/RUN_MONEY1.sh monitor]`
Stop Script	`[/usr/sbin/cluster/events/RUN_MONEY1.sh failover]`
Application Monitor Name(s)	[ ]

For secondary companion server PERSONNEL1 in Symmetric HA configuration:

Server Name	[PERSONNEL1]
Start Script	`[/usr/sbin/cluster/events/RUN_PERSONNEL1.sh monitor]`
Stop Script	`[/usr/sbin/cluster/events/RUN_PERSONNEL1.sh failover]`
Application Monitor Name(s)	[ ]

For secondary companion server PERSONNEL1 in Asymmetric HA configuration:

Server Name	[PERSONNEL1]
Start Script	`[/usr/sbin/cluster/events/RUN_PERSONNEL1.sh monitor]`

Field name	**Enter**
Stop Script	`[/usr/sbin/cluster/events/RUN_PERSONNEL1.sh stop]`
Application Monitor Name(s)	[ ]

Only the secondary node is listed in the Participating Nodes field for secondary resource group in Asymmetric HA configuration, whereas both nodes are listed in reverse order, when compared to primary resource group, in the Symmetric HA configuration.

5 Configure each of the resource groups you defined for the Application Servers. From Extended Configuration menu:

- Select Extended Resource Configuration.
- Select HACMP Extended Resource Group Configuration.
- Select Changes/Show Resources and Attributes for a Resource Group.
- On the Single Select List, select the resource group you want to configure.
- In the Application Server field, enter corresponding application server name defined in step (4) for the resource group (such as, primary companion name for primary resource group and secondary companion server name for the secondary resource group).

  Enter information in all the required fields, such as IP Label, Volume Groups, and File systems. Repeat this step for each of the companions.

6 Synchronize the cluster resources. Using smit on the node where you performed steps 1 through 5, go to Extended configuration Screen and select “Extended Verification and Synchronization”. This propagates the changes you made to all the other nodes within the same cluster.

In some cases, you may need to stop the HACMP services and restart both nodes before performing the synchronization. Verify that the synchronization does not produce any errors.

Configuring companion servers for failover

This section contains instructions for configuring the Adaptive Servers as primary and secondary companions in a high availability system.

Running *sp_companion* with *do_advisory* option

You must configure the secondary companion with sufficient resources to perform the work of both servers during failover. The secondary companion may have attributes that will prevent a successful cluster operation. For example, if both the primary and secondary companions are configured for 250 user logins, during failover, the secondary companion has the resources for only half the number of potential user logins necessary. Instead, configure both MONEY1 and PERSONNEL1 for 500 user logins.

sp_companion do_advisory checks the configuration options on both the primary and the secondary companion to make sure a cluster operation (such as configuring an Adaptive Server as a secondary companion) will be successful. sp_companion do_advisory advises you of any configuration options that should be changed.

See Chapter 6, "Running do_advisory" for a complete description of the sp_companion do_advisory option.

Creating an asymmetric companion configuration

To configure the primary companion asymmetrically, issue this command from the secondary companion:

```
sp_companion "primary_server_name", configure, NULL, login_name,
password
```

- *primary_server_name* is the name of the primary Adaptive Server as defined in the *interfaces* file entry and in sysservers.
- *login_name* is the name of the user performing this cluster operation (this person must have the ha_role).

- *password* is the password of the person performing this cluster operation.

Note You must execute the above command *only* from the secondary companion.

This example configures an Adaptive Server named MONEY1 as a primary companion. Issue the following command from the secondary server PERSONNEL1:

```
sp_companion "MONEY1", configure, NULL, sa, Odd2Think
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'PERSONNEL1' and 'MONEY1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

If user databases are created during the sp_companion configuration, you see messages similar to these:

```
Step: Created proxy database 'pubs2'
 Step: Proxy status for database has been set. Please Checkpoint the database
'pubs2'
 Step: Server configured in normal companion mode"
 Starting companion watch thread
```

Creating the symmetric configuration

After you configure your companion for asymmetric failover, you can configure them for symmetric configuration. In a symmetric configuration, both servers act as primary and secondary companions. See Figure 3-2 on page 22 for a description of symmetric configuration.

Issue sp_companion from the secondary companion to configure it for symmetric configuration. See "Creating an asymmetric companion configuration," above, for a description of the syntax for sp_companion.

The following example adds an Adaptive Server named MONEY1 as the secondary companion to the Adaptive Server named PERSONNEL1 described in "Creating an asymmetric companion configuration" on page 90. Issue the following command from the MONEY1 server:

```
sp_companion 'PERSONNEL1', configure, sa, Think2Odd
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'MONEY1' and 'PERSONNEL1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

Starting the primary companion as a monitored resource

Follow the instructions in this section to start the primary companion as a service monitored by the high availability system.

Note Before monitoring begins on the primary companion, make sure that there is no need to shut down the primary server for maintenance or any other purpose. Once monitoring begins, the primary companion must be moved to suspended mode to bring it down. If you are unsure, start the primary server using the startserver script in *$SYBASE/$SYBASE_ASE/install*, finish configuring the companion, then restart the server using the steps described here.

To start the primary companion as a resource monitored for fail over:

1 Stop the HACMP services on the primary node.

2 Check */tmp/hacmp.out* to make sure the node_down event completed, then restart the HACMP services either by using SMIT or by executing this command as "root" at the command line:

```
/usr/sbin/cluster/etc/rc.cluster -boot '-N' '-b'  '-i'
```

This automatically executes the *RUNHA_<servername>.sh* monitor script, which brings up the primary companion and monitors it during crash or hang situations.

Repeat this process on the secondary node to start the secondary companion.

Administering Sybase Failover

This section includes information about using Sybase Failover.

Failing back to the primary node

Failback occurs automatically on HACMP. When you start HACMP on the primary node, the *stop_server* event on the secondary node triggers the monitoring script to execute sp_companion 'prepare_failback'.

To failback to the primary node, make sure that the secondary companion is in secondary failover mode, and start HACMP services on the primary node. To make sure that sp_companion 'prepare_failback' was executed successfully, search for this string in */tmp/hacmp.out*:

```
SYBASE HA MONITOR: Prepare_failback was successful.
```

Note Before you start the HACMP services on the primary node, make sure the secondary node is running and the secondary companion is running in secondary failover mode. If the secondary companion or secondary node is not up and running, do not start the primary companion. If both nodes are down, or the HACMP services has stopped on both nodes, always restart the secondary node and its HACMP services before restarting the primary node.

Failing back manually

Note If the automatic failback fails, examine the logs to make sure that the high availability system performed the following steps. If it did not, perform them manually. You must perform them in the sequence described below.

1. Stop the HACMP subsystem with the takeover mode on the primary node (See your IBM documentation for information). This shuts down the primary companion and fails over its resources to the secondary companion.
2. Shut down and restart the secondary companion. *RUNHA_<servername>.sh* restarts the companion automatically after you shut it down if RETRY is set to a value greater than 0.
3. Log in as HA_LOGIN, as specified in *RUNHA_<servername>.sh*, to the secondary companion through isql and verify that it is running in secondary failover mode.
4. Issue sp_companion 'prepare_failback'. For example, to fail back from the secondary companion PERSONNEL1:

   ```
   sp_companion MONEY1, 'prepare_failback'
   ```
5. Restart HACMP on the primary node.
6. Log in to the primary companion using isql and make sure it is running in primary failback mode.

7 Issue sp_companion 'resume'. For example, to resume companion mode for primary companion MONEY1:

```
    sp_companion PERSONNEL1, 'resume'
```

Note You cannot connect clients with the failover property until you issue sp_companion resume. If you do try to reconnect them after issuing sp_companion prepare_failback, the client stops responding until you issue sp_companion resume.

Suspending companion mode

If you must shut down the primary companion for maintenance but do not want to fail over to the secondary companion, you must temporarily suspend companion mode. When the companion mode is suspended, synchronization between companions does not occur, and the primary companion cannot fail over to the secondary companion. However, suspended mode is useful for performing such maintenance tasks as changing configuration parameters.

1 To move to suspended mode, issue:

```
    sp_companion <primary_server_name>, suspend
```

2 Kill the monitoring process so it does not trigger a fail over when the companion server goes down. As “root”, enter:

```
    ps -ef|grep "RUNHA_<servername>.sh monitor"
    kill -9 <pid>
```

3 Shut down the primary companion.

After killing the monitoring process, you can bring the companion server down as many times as necessary and it does not fail over.

Restarting companion during suspended mode

Use the start-up script in *$SYBASE/$SYBASE_ASE/install* to restart the primary companion without monitoring it:

```
startserver -f ./RUN_<server_name>
```

If you use this script to start a companion server, it does not fail over when the server goes down, even if it is configured to do so. Use this method only if you are performing maintenance and you do not want the server databases to be accessible while the server is down.

Resuming normal companion mode

The steps for resuming normal companion mode are slightly different depending on whether you are moving from suspended mode or from failover mode.

Resuming normal companion mode from suspended mode

To resume normal companion mode between two companions that have been moved to suspended mode:

1. Shut down the primary companion.
2. Stop the HACMP services on the primary node in “graceful” mode.
3. Restart the HACMP services on the primary node.

Resuming normal companion mode from failover mode

To resume normal companion mode between two companions that are in failover mode, restart the HACMP services on the primary node, and:

1. Check that both companions are in failback mode by issuing sp_companion with no parameters.
2. Resume normal companion mode by issuing:

   ```
   sp_companion secondary_server_name, resume
   ```

   For example, to issue normal companion mode for primary companion PERSONNEL1:

```
sp_companion PERSONNEL1, resume
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
Step: Checkin to See if the remote server is up
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
sys_id ses_id      ses_id2     ses_status Purged from s1.
------ ----------- ----------- ---------- ------------------------------

(0 rows affected)
sys_id ses_id      ses_id2     ses_status Copied to s1.
```

```
------ ----------- ----------- ---------- ------------------------------

(0 rows affected)
sys_id ses_id      ses_id2     ses_status Purged from s2.
------ ----------- ----------- ---------- ------------------------------
(0 rows affected)
Step: Syssession information syncup succeeded
```

Dropping companion mode

To drop companion mode, issue:

```
sp_companion companion_name, "drop"
```

Dropping companion mode is irreversible; you must reconfigure the Adaptive Servers companion servers to retain the failover functionality. However, the nodes upon which the Adaptive Servers are running are still monitored by the high availability system.

If you drop the companion mode while the *RUNHA_<servername>.sh* script is running, the script continues to monitor the server for any down or stopped instances. If you plan to shut down the server and do not want the node to fail over, kill the monitor process by issuing:

```
kill -9 `ps -ef | grep "RUNHA_<servername>.sh monitor" | grep -v grep | awk
     '(print $2}'`
```

If you do not kill the monitor process, it triggers a failover of the resources when it detects that the companion has gone down, and attempts to restart the companion from either the primary or secondary node, depending on your settings for RETRY and BASIC_FAILOVER.

Troubleshooting fail over for HACMP for AIX

This section includes troubleshooting information about common errors.

Error message 18750

If a companion server issues error message 18750, check the *@@cmpstate* of the servers. If the primary companion is in normal companion mode, but the secondary companion is in secondary failover mode, the cluster is in an inconsistent state requiring manual recovery. The inconsistent state may be caused by the failure of an sp_companion 'prepare_failback' command on the secondary companion. You can determine whether this happened by examining the HACMP log (located in */tmp/hacmp.out*) on the secondary node. To recover:

1 Shut down both the primary and the secondary companions.

2 Restart the secondary companion.

3 Repair all databases marked “suspect.” To determine which databases are suspect, issue:

```
select name, status from sysdatabases
```

Databases marked suspect have a status value of 320.

4 Allow updates to system tables:

```
sp_configure "allow updates", 1
```

5 For each suspect failed-over database, perform the following:

```
1> update sysdatabases set status=status-256 where name='database_name'
2> go
1> dbcc traceon(3604)
2> go
1> dbcc dbrecover(database_name)
2> go
```

6 From the secondary companion, issue:

```
sp_companion primary_companion_name, prepare_failback
```

Make sure that this command executes successfully.

7 Restart the HACMP services on the primary node.

Recovering from a failed *prepare_failback*

During failback, if prepare_failback executes successfully on the secondary companion but the primary companion fails to start, perform the following to roll back, then reissue the prepare_failback command:

1. Check the primary companion's error log and the HACMP error log to find the reason the server failed to start, and correct the problems.
2. Stop the HACMP services on the primary node with takeover.
3. Log in to the secondary companion as LOGIN_NAME, and issue:

   ```
   dbcc ha_admin ("", "rollback_failback")
   dbcc ha_admin ("", "rollback_failover")
   ```

   Both companion servers should both be back in failover mode.
4. Restart HACMP on the primary node.

Location of error logs

Sybase Failover includes the following logs, which logs may be helpful for investigating and diagnosing errors encountered during failover:

- */tmp/hacmp.out* – contains output of the HACMP activities, as well as the output from the *RUNHA_<servername>.sh* monitoring script. For general HACMP failure, search for the string "ERROR". For output of the *RUNHA_<servername>.sh* script, search for "SYBASE HA MONITOR".

  After determining the reason for the failure, correct it, then go to the Cluster Recovery Aids screen of SMIT and perform a Recover From Script Failure before continuing.

  If a node does not include a sufficient amount of space in a particular file system, HACMP stops responding in the middle of fail over or fail back process, which results in a config_too_long lock. If this occurs, you must clean up the full directories, then start SMIT and move to the Cluster Recovery Aids screen and perform a Recover From Script Failure before continuing.
- $PRIM_CONSOLE_LOG – the location of this log is defined in the *RUNHA_<servername>.sh* monitoring script. This error log includes the Adaptive Server information from the most recent execution of the *RUNHA_<servername>.sh* script.

CHAPTER 9

Active-Active Configuration for Sun Cluster 3.0 and 3.1

This chapter contains the information for configuring Adaptive Server Enterprise on Sun Cluster 3.0 and 3.1 in an active-active setup.

Adaptive Server Enterprise version 15.0 does not support Sun Cluster version 2.2. If you currently have these clusters configured, you must upgrade the respective cluster versions to configure Adaptive Server 15.0 for High Availability on Sun Solaris.

Hardware and operating system requirements

High availability requires:

- Two homogenous, network systems with similar configurations in terms of resources such as CPU, memory, and so on
- The high availability package and the associated hardware
- Devices that are accessible to both nodes
- A logical volume manager (LVM) to maintain unique device path names across the cluster nodes
- Volumes or disk suite objects on the multihost disks

- Third-party vendor mirroring for media failure protection
- Logical host name or floating IP address that can be bound to the primary or secondary node. In a symmetric configuration, you need two logical host names, each corresponding to a primary companion.

See the documentation for Sun Cluster for more information about requirements, and for installing platform-specific high availability software.

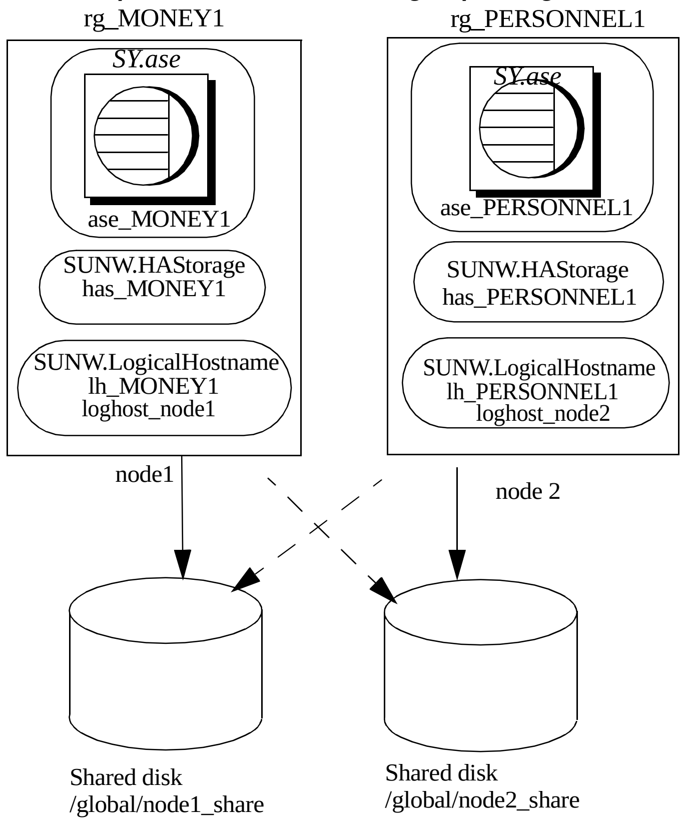
Active-active setup in Sun Cluster

Figure 9-1 on page 103 depicts an active-active configuration in Sun Cluster.

In Sun Cluster, Adaptive Server runs as a data service and is managed by the Sun Clusters Resource Group Manager (RGM). Adaptive Server is associated with a resource group that contains the Adaptive Sever resource and all other resources it requires, such as the *SUNW.HAStorage, SUNW.HAStoragePlus*, and *SUNW.LogicalHostname*.

SY.ase is the Adaptive Server resource and defines various extension properties for the resources of type *SY.ase*. See “Adaptive Server resource extension properties” on page 116 for more information. See the Sun Cluster documentation for more information on standard resource properties.

Figure 9-1: Sample Sun Cluster resource group configuration



In this figure, there are two resource groups, *rg_MONEY1* and *rg_PERSONNEL1*, corresponding to the companion servers MONEY1 and PERSONNEL1 in a symmetric configuration.

rg_MONEY1 consists of three resources: *ase_MONEY1* of resource type *SY.ase*, *has_MONEY1* of resource type SUNW.HAStorage, and *lh_MONEY1* of resource type SUNW.LogicalHostname. The storage resource *has_MONEY1* manages the global file system */global/node1_share* on the shared disk and the logical host resource *lh_MONEY1* manages the logical host name or floating IP address *loghost_node1*. The Adaptive Server resource *ase_MONEY1* uses on *has_MONEY1* and *lh_MONEY1*.

rg_PERSONNEL1 consists of three resources: *ase_PERSONNEL1* of resource type *SY.ase*, *has_PERSONNEL1* of resource type SUNW.HAStorage, and *lh_PERSONNEL1* of resource type SUNW.LogicalHostname. The storage resource *has_PERSONNEL1* manages the global file system */global/node2_share* on the shared disk and the logical host resource *lh_PERSONNEL1* manages the logical host name or floating IP address *loghost_node2*. The Adaptive Server resource *ase_PERSONNEL1* uses on *has_PERSONNEL1* and *lh_PERSONNEL1*.

Preparing Adaptive Server for active-active setup

This section discusses how to set up Adaptive Server for active-active high availability.

Installing Adaptive Servers

Install the primary and the secondary servers in the same directory path, but on separate disks. The primary companion can be either a newly installed Adaptive Server, or it can be upgraded from an earlier version of Adaptive Server with existing databases, users, and so on.

The secondary companion must be a newly installed Adaptive Server and cannot have any user logins or user databases. To ensure that all user logins and database names are unique within the cluster. After you have completed the configuration, you can add user logins and databases to the secondary companion.

See the installation documentation for your platform for information about installing and configuring Adaptive Server.

Adding entries for both Adaptive Servers to the *interfaces* file

The *interfaces* file for the primary and secondary companions must include entries for both companions. The server entry in the *interfaces* file must use the network name that is specified in sysservers. For information about adding entries to the *interfaces* file, see the installation documentation for your platform.

For each entry added to the *interfaces* file, the host name must be a logical host. You must create an entry for the logical host in */etc/hosts*, NIS hosts map, or in directory services, whichever is appropriate for your system. The logical host name in the *interfaces* file must be the same as the name used with the -l (lowercase L) parameter of the scrgadm command used to add a SUNW.LogicalHostname resource when you configure Adaptive Server to work with the Sun Cluster subsystem.

Here is a sample *interfaces* file for a primary companion named MONEY1 and a secondary companion named PERSONNEL1:

```
MONEY1

    query tcp ether loghost_node1 9865
    master tcp ether loghost_node1 9865
    hafailover PERSONNEL1

PERSONNEL1

    query tcp ether loghost_node2 9866
    master tcp ether loghost_node2 9866
    hafailover MONEY1
```

This *interfaces* file is also used by Adaptive Server clients.

Here is a sample */etc/hosts* file with proper entries for the logical host names used in the above *interfaces* file:

```
#
# Internet host table on machine node1
#
127.0.0.1      localhost
10.22.98.43     node1
10.22.98.44     node2
10.22.98.165    loghost_node1
10.22.98.166    loghost_node2
```

Use dsedit to add entries to the *interfaces* file. If the interfaces entries already exist, modify them to work for fail over.

See the *Utility Guide* for information about dsedit.

The value of *$SYBASE* is the same for both companions

$SYBASE on both companions must point to the same directory path name. You can accomplish this by:

- Making sure the *$SYBASE* release directory on each companion is created in the same directory.
- Creating a directory with the same path on both companions that acts as a symbolic link to the actual *$SYBASE* release directory, if the companions have the *$SYBASE* release directory in different locations.

  For example, even though primary companion MONEY1 uses a release directory of */usr/u/sybase1* and PERSONNEL1 uses */usr/u/sybase2* as its release directory, their *$SYBASE* must point to the same path.

  Both MONEY1 and PERSONNEL1 use */sybase*, which they establish as a symbolic link to their respective *$SYBASE* release directories. On MONEY1, */sybase* is a link to */usr/u/sybase1*, and on PERSONNEL1, */sybase* is a link to */usr/u/sybase2*.

Executing *sybha*

The Adaptive Server High Availability Basic Services Library calls *sybha*, which allows the library to interact with each platform's high availability cluster subsystem. *sybha* is located in *$SYBASE/$SYBASE_ASE/bin*. Before you can run *sybha*, you must change its ownership and permissions.

You must also edit a file named *sybhauser* in *$SYBASE/$SYBASE_ASE/install*. This file contains a list of the users who have System Administrator privileges on the cluster. Sybase strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

As “root”:

1. Add a new group called sybhagrp either in the */etc/group* file or to your NIS maps.
2. Add the Sybase user to sybhagrp. This is the user who owns the *$SYBASE* directory, and when the server is started, this user runs the data server. If you have multiple servers running, with different users owning the *$SYBASE* directory, you must add all of these users to sybhagrp.
3. Change to the *$SYBASE/$SYBASE_ASE/bin* directory.
4. Change the ownership of the sybha program to “root”:

   ```
   chown root sybha
   ```
5. Change the group of the sybha program to sybhagrp:

   ```
   chgrp sybhagrp sybha
   ```

6 Modify the file permissions for sybha to 4550:

```
chmod 4550 sybha
```

7 Change to the *$SYBASE/$SYBASE_ASE/install* directory.

8 Add the sybase user to the *sybhauser* file.

9 Change the permissions of *sybhauser* to “root”:

```
chown root sybhauser
```

10 Modify the file permissions for *sybhauser* so it can be modified only by “root:”

```
chmod 600 sybhauser
```

Creating new default devices

By default, master is the default device in a newly installed Adaptive Server. This means that any databases (including proxy databases used by fail over) are automatically created on the master device. However, having user databases on the master device makes it more difficult to restore from a system failure.

To make sure that the master device contains as few user databases as possible, use disk init to create a new device. Use sp_diskdefault to specify the new device as the default.

For example, to add a new default device named money_default_1 to the MONEY1 Adaptive Server, enter:

```
sp_diskdefault money1_default1, defaulton
```

The master device continues to be a default device until you specifically make it a non default device:

```
sp_diskdefault master, defaultoff
```

See the *Adaptive Server Enterprise Reference Manual* for more information about disk init and sp_diskdefault.

Adding the local server to *sysservers*

Use sp_addserver to add the local server in sysservers using the network name specified in the *interfaces* file. For example, if the companion MONEY1 uses the network name of MONEY1 in the *interfaces* file enter:

```
sp_addserver MONEY1, local, MONEY1
```

You must restart Adaptive Server for this change to take effect.

Adding secondary companion to *sysservers*

Add the secondary companion as a remote server in sysservers:

```
sp_addserver server_name
```

By default, Adaptive Server adds the server with srvid of 1000. You need not restart Adaptive Server for the change to take effect.

Assigning the *ha_role* to System Administrator

You must have the ha_role on both Adaptive Servers to run sp_companion. To assign the ha_role, issue the following from isql:

```
sp_role "grant", ha_role, sa
```

Log out and then log back in to the Adaptive Server for this change to take effect.

Running *installhasvss* script

Note You must perform the tasks described in "Adding entries for both Adaptive Servers to the interfaces file" on page 104 before you run *installhasvss*. If you run *installhasvss* before performing these tasks, you must re-run *installmaster* to reinstall all of the system stored procedures.

The *installhasvss* script:

- Installs the stored procedures required for fail over (for example, sp_companion)
- Installs the *SYB_HACMP* server in sysservers

You must have System Administrator privileges to run *installhasvss*.

installhasvss is located in *$SYBASE/$SYBASE_ASE/scripts*. To execute *installhasvss*, enter:

```
$SYBASE/$SYBASE_OCS/bin/isql -Usa -Ppassword
-Sservername
< $SYBASE/$SYBASE_ASE/scripts/installhasvss
```

installhasvss prints messages as it creates stored procedures and creates the *SYB_HACMP* server.

Verifying configuration parameters

You must enable the following configuration parameters before you configure Adaptive Server for fail over:

- enable CIS – enables Component Integration Services (CIS). This configuration parameter is enabled by default.
- enable xact coordination – enables Distributed Transaction Management (DTM). This configuration parameter is enabled by default.
- enable HA – enables Adaptive Server to function as a companion in a high availability system. enable HA is off by default. Restart Adaptive Server for this parameter to take effect. This parameter writes a message to the error log stating that you have started the Adaptive Server in a high availability system.

See the *Adaptive Server Enterprise System Administration Guide* for information about enabling configuration parameters.

Adding thresholds to the master log

If you have not already done so, add a threshold to the master log.

1. Define and execute sp_thresholdaction in the master database's log to set a threshold on the number of pages left before a dump transaction occurs. Sybase does not supply sp_thresholdaction. See the *Adaptive Server Reference Manual* for information about creating this system procedure.
2. Place thresholds on the master log segment so it does not fill up:

```
sp_addthreshold "master", "logsegment", 250, sp_thresholdaction
```

3. Restart the primary companion for this static parameter to take effect.

Adding user and login for fault monitor

When the high availability agent fault monitor, *ase_monitor,* runs thorough probe, it:

1. Connects to the Adaptive Server.
2. Creates a temporary table, inserts an entry into the table, updates the table, and deletes the table.
3. Disconnects from Adaptive Server after the cycle count reaches the value specified by the Adaptive Server resource property *Connect_cycle_count*.

Create or specify a special user and login for the monitor to perform a thorough probe operation. Use isql to connect to the data servers and issue:

```
sp_addlogin <user for monitoring ase>, <password>
sp_adduser <user for monitoring ase>
```

Note During Adaptive Server configuration, the System Administrator should take into account that the user and login used for probe actually reduces by one the total number of connections available for other purposes. That is, if the total number of connections is 25, the effective number of connections available for other purposes will be 24, as one is used by the fault monitor probe.

Configuring the Sun Cluster subsystem

This section assumes that you have:

- Set up your PATH environment variable to contain */usr/cluster/bin* when you run the cluster system command.
- Installed the Sun Cluster high availability system.
- Installed Adaptive Server and created the required database device files on the shared disk.
- Configured Adaptive Server following the instructions in “Preparing Adaptive Server for active-active setup” on page 104.
- Created *$SYBASE/SYBASE.sh* and edited the file with the required environment for Adaptive Server.

As the file is executed in the high availability agent scripts, protect the file from unauthorized access and make sure only "root" has read and executable permissions.

- Created *$SYBASE/$SYBASE_ASE/install/RUN_<Dataserver_name>* file. You must specify the Adaptive Server error log with the -e option in this file.

  If you specify the -s option, it must be the same as the Adaptive Server resource property *Dataserver_name*.

- Installed *$SYBASE/$SYBASE_ASE/SC-3_0* properly. This directory must contain all the required files for the Adaptive Server high availability agent.

  The default *$SYBASE/$SYBASE_ASE/SC-3_0/* contains these directories:

  - *bin*
  - *etc*
  - *log*

  $SYBASE/$SYBASE_ASE/SC-3_0/bin contains these files:

  - *ase_start*
  - *ase_stop*
  - *ase_monitor_start*
  - *ase_monitor_stop*
  - *ase_update*
  - *ase_validate*
  - *utils.ksh*
  - *ase_monitor*
  - *syscadm*

  $SYBASE/$SYBASE_ASE/SC-3_0/etc contains these files:

  - *SY.ase*
  - *ase_monitor_action*
  - *ase_login_file*
  - *sysc_input_file*

$SYBASE/$SYBASE_ASE/SC-3_0/log initially contains no files, but eventually contains *Callback_log* and *Monitor_log* files once you create the Adaptive Server resource.

Using the *syscadm* script

Use the *syscadm* script to configure and administer Adaptive Server resource groups and their associated resources in Sun Cluster. You can use *syscadm* to create, remove, or no longer control the Adaptive Server resource group and its resources. The *syscadm* script is located in *$SYBASE/$SYBASE_ASE/SC-3_0/bin/*.

The create option of the script:

- Registers required resource types with the Resource Group Manager
- For each specified resource group, creates the resource group, specified resources and adds them to the resource group
- Establishes resource dependencies for the Adaptive Server resource on the storage and logical host resources

The remove option in the script removes specified resource groups and their resources.

The unmanage option:

- Disables all the resources in the resource group
- Brings the resource group to an offline state, then brings the resource group to the unmanaged state

Note You must be logged in as "root" to run the *syscadm*.

syscadm works with an input file called *sysc_input_file*, which you edit to provide the correct input values for your configuration. The *sysc_input_file* is located in *$SYBASE/$SYBASE_ASE/SC-3_0/etc/*.

Note Make sure the file is not tampered with when you finish editing the *sysc_input_file*. If erroneous values are included in this file, they may affect your installation. Sybase suggests that you change the permissions on this file so only System Administrators can edit it.

When editing the *sysc_input_file*, make sure that:

- There are no spaces around "`=`" in the "`<name>=<value>`" entries.
- Comments start with #.
- Names ending with 1 correspond to the primary companion.
- Names ending with 2 correspond to the secondary companion.

See "Sample sysc_input_file" on page 113 for a sample of the *sysc_input_file*.

The input file is divided into three sections.

- Section 1 – enter the right-side values for all entries. This section includes entries for the Adaptive Server installation directory, the high availability setup, the data server name, the Nodelist, and so on.
- Section 2 – enter right-side values for the required entries. For example, if you are using only the SUNW.HAStoragePlus resource, you must enter values for SUNW.HAStoragePlus-related entries. Do not enter values for the entries you are not using.
- Section 3 – all the entries in this section are assigned default values. You need not provide right-side values except to override the defaults.

For example, to edit the file for the Adaptive Server resource name, change this line:

```
ASE_RNAME="ase_$Dataserver_name"
```

To:

```
ASE_RNAME="my_ase_name"
```

Or, to specify the *RUN_SERVER* file and to set *Debug_callback* flag, change the entry for *OTHER_PROPERTIES*, whose value is a space-separated list of <*name*>=<*value*> strings, to:

```
OTHER_PROPERTIES="RUN_server_file=/mypath/RUN_my_ase Debug_callback=TRUE"
```

Sample *sysc_input_file*

The following is the *sysc_input_file* used to create and configure the Adaptive Server resource group rg_MONEY and its resources as shown in Figure 9-1 on page 103:

```
###########################################################################
##NOTE:                                                                  ##
##    1. This file will be executed by ksh to set environment of syscadm ##
##      You will be responsible for executing anything in this file      ##
##       So, make sure THERE ARE NO DANGEROUS COMMANDS IN THIS FILE      ##
##                                                                         ##
##    2. No spaces around = in the <Variable_name>=<value> pairs          ##
##                                                                         ##
##    3. Comments should start with #, like ksh comments                   ##
##                                                                         ##
##    4. Names ending with 1 correspond to primary, and 2 to secondary     ##
#############################################################################

###########################################################
##  Section1: Must specify right hand side values        ##
###########################################################
# Sybase home directory
SYBASE=”/sybase”

# Valid HA Setups are "ACTIVE_PASSIVE" or "ASYMMETRIC" or "SYMMETRIC"
HA_SETUP="SYMMETRIC"

# Comma separated list of nodes, Ex: "node1,node2"
Nodelist="node1,node2"

# ASE Dataserver name and Dataserver login file
Dataserver_name1="MONEY1"
Dataserver_login_file1="/sybase/ASE-15_0/SC-3_0/etc/ase_login_file"

Dataserver_name2="PERSONNEL1"
Dataserver_login_file2="/sybase/ASE-15_0/SC-3_0/etc/ase_login_file"

############################################################################
##  Section2: Must specify right hand side values, if required           ##
############################################################################

# if using Logical Hostname or Virtual/Floating IP address
LOGHOST_NAME_OR_FLOATING_IP1="loghost_node1"
LOGHOST_NAME_OR_FLOATING_IP2="loghost_node2"

# if using HAStorage resource
ServicePaths1=”/global/node1_share”
ServicePaths2=”/global/node2_share”

# if using HAStoragePlus resource
GlobalDevicePaths1=
FilesystemMountPoints1=

GlobalDevicePaths2=
FilesystemMountPoints2=
############################################################################
## Section3: May specify right hand side values to override defaults      ##
############################################################################

# bin of the cluster commands
CLUSTER_BIN="/usr/cluster/bin"

# ASE Resource Type and corresponding registration file
RT_NAME="SY.ase"
RT_FILE="$SYBASE/ASE-15_0/SC-3_0/etc/$RT_NAME"

# Resource Group names
RG_NAME1="rg_$Dtatserver_name1"
RG_NAME2="rg_$Dataserver_name2"

# ASE Resource names and space separated extended properties
ASE_RNAME1="ase_$Dataserver_name1"
ASE_RNAME2="ase_$Dataserver_name2"

OTHER_PROPERTIES1="RUN_server_file=  Callback_log=  Monitor_log="
OTHER_PROPERTIES2="RUN_server_file=  Callback_log=  Monitor_log="

# Logical Host Resource names
LOGHOST_RNAME1="lh_$Dataserver_name1"
LOGHOST_RNAME2="lh_$Dataserver_name2"

# HA Storage Resource names
HASTORAGE_RNAME1="has_$Dataserver_name1"
HASTORAGE_RNAME2="has_$Dataserver_name2"

# HA Storage Plus Resource names
HASTORAGE_PLUS_RNAME1="hasp_$Dataserver_name1"
HASTORAGE_PLUS_RNAME2="hasp_$Dataserver_name2"
```

The syntax for *syscadm* is:

```
syscadm [-v] -c|r|u [primary|secondary|both] -f <sysc_input_file>
syscadm [-v] -r|u <rg1,rg2,...> [-t <ASE_resource_type>]
```

Where:

- -c creates resource groups
- -r removes resource groups
- -u unmanages the resource groups
- -f specifies the input file
- -v is verbose (shows the Sun Cluster commands as they are being run)

- -t specifies the Adaptive Server resource type name, if it is not *SY.ase* (useful for -r and -u commands when the input file is not specified)

SUNW.HAStoragePlus resources are created with `AffinityOn=True`.

Adaptive Server resource extension properties

Table 9-1 summarizes all extension properties for the Adaptive Server resource. Refer to the respective Sun Cluster documentation for more information about resources.

Table 9-1: Extension properties for the SY.ase resource

Property	Default	Description
Sybase_home	None	The home directory of the Adaptive Server installation, and the same as the value for the *$SYBASE* environment variable in an Adaptive Server installation. This property is required to create the Adaptive Server resource.
Environment_file	*Sybase_home/SYBASE.sh*	Absolute path to the environment file where you specify the environment to pass to the Adaptive Server. This file must be available for proper functioning of the high availability agent.
Dataserver_name	None	Name of the Adaptive Server data server. This property is required to create the Adaptive Server resource.
Backup_server_name	None	Name of the Backup Server.
Monitor_server_name	None	Name of the Monitor Server.
Text_server_name	None	Name of the full-text search server.
Secondary_companion_name	None	Name of the secondary companion server, which is automatically set or un-set by sp_companion commands configure or drop. Reserved for active-active setup. Do not set this property manually.

Property	**Default**	**Description**
Dataserver_login_file	*Sybase_home/$SYBASE-ASE/SC-3_0/etc/ase_login_file*	Absolute path to a file containing login information for the data server. The file consists of two lines; the first line is the login and password for the System Administrator, the second line is the user login and password for the thorough probe used by the fault monitor program *ase_monitor*.
Action_file	*Sybase_home/$SYBASE_ASE/SC-3_0/etc/ase_monitor_action*	Absolute path to a file that associates error codes with actions to be taken by the fault monitor program *ase_monitor*.
RUN_server_file	*Sybase_home/$SYBASE_ASE/install/RUN_<Dataserver_name>*	Absolute path to the *RUN_SERVER* file for the Adaptive Server specified by the property *Dataserver_name*. Do not include environment variables in this file.
Thorough_probe_script	Ignored. Reserved for future use.	Absolute path to a file containing SQL scripts for the fault monitoring program to perform thorough probe.
Monitor_log	*Sybase_home/$SYBASE_ASE/SC-3_0/log/ase_monitor_<Dataserver_name>.log*	Absolute path to the log file for the fault monitor program, *ase_monitor*.
Callback_log	*Sybase_home/$SYBASE_ASE/SC-3_0/log/ase_callback_<Dataserver_name>.log*	Absolute path to the log file used by Adaptive Server high availability agent callback scripts in *$SYBASE/$SYBASE_ASE/SC-3_0/bin*.
Callback_log_max_size	5000000	Maximum size for the callback log file. If the log size exceeds this limit, the callback log is renamed using the current date and time as its extension. Any new log messages are written to the *Callback_log*.
Monitor_log_max_size	Ignored. Reserved for future use.	
Probe_timeout	30	Time, in seconds, after which the fault monitoring probe times out and registers an error.
Restart_delay	30	Time, in seconds, to delay the next probe after a restart.
Debug_monitor	FALSE	If TRUE, the fault monitor program *ase_monitor* logs debugging message to the file specified by property *Monitor_log*.

Property	Default	Description
Debug_callback	FALSE	If TRUE, the Adaptive Server high availability agent scripts log debugging messages to the file specified by property *Callback_log*.
Connect_cycle_count	5	The number of thorough probe cycles that an existing connection to Adaptive Server reuses before the connection is dropped and a new one is established.
Failback_strategy	Ignored. Reserved for future use.	

Configuring Adaptive Server resource groups

To configure Adaptive Server resource groups on Sun Cluster:

1 Modify the Adaptive Server resource type registration file *SY.ase*. This file is located in *$SYBASE/$SYBASE_ASE/SC-3_0/etc/*. Find the line for resource type property, *RT_BASEDIR*, which specifies the location of the Adaptive Server high availability agent. Change the value to point to the installation location of *$SYBASE/$SYBASE_ASE/SC-3_0/bin*.

For example:

```
RT_BASEDIR=/sybase/ASE-15_0/SC-3_0/bin/
```

Note You cannot use environment variables in *SY.ase*. Use the full path for this value. Substitute the value for *SYBASE*, *SYBASE_ASE* in *$SYBASE/$SYBASE_ASE/SC-3_0/bin.*

2 If you use another file at a different location, specify the full path for the resource extension property *Dataserver_login_file* when configuring the *SY.ase* resource. Create or edit a file that contains Adaptive Server login information for system administrator and the user you added for the fault monitor. The default file is *$SYBASE/$SYBASE_ASE/SC-3_0/etc/ase_login_file*.

The file consists of two lines; the first line is the login and password of the System Administrator, and the second line is the login and password of monitor_user. The fault monitoring program, ase_monitor, performs the thorough probe as user monitor_user.

```
login_type <tab> login string
login_type <tab> login_string
```

Valid values for login type are "encrypted" and "normal". If you set *login_type* to "normal", the value of the *login_string* is in the form "login_name/password". If you set *login_type* to "encrypted", the value of *login_string* is the encrypted string you get from the haisql utility (located in *$SYBASE/$SYBASE_ASE/bin*). Sybase recommends usage of "encrypted" *login_type* so the sensitive information in the file is well protected. To use haisql to generate the encrypted login string:

a Run haisql with no arguments to generate the encrypted string for a given *login_name* and *password*:

```
/$SYBASE/ASE-12_5/bin/haisql
Enter Username: sa
Enter Password:
TWAS8n1jSF2gBsvayUlw97861.cyTKaS1YhavBRQ2qKcJwtx.TmFBarGS2Kl553WDR7
g8m5vrf86t@K4CU62HEccm4zkeexsP9E=FeuvX
```

b Copy and then paste the encrypted string to the *ase_login_file* file.

The following is an example of the *ase_login_file* using the "encrypted" login type:

```
encrypted
TWAS8n1jSF2gBsvayUlw97861.cyTKaS1YhavBRQ2qKcJwtx.TmFBarGS2Kl553WDR7g8m5
vrf86t@K4CU62HEccm4zkeexsP9E=FeuvX
encrypted
rX2S8n1jSF2gBuD0q=AXEXKCZvzGcK5K3kWnp_P+e4avf=67kYVSzy7+h640@97FSP_dlkH
_oV2Zima5+7tUyHnsm4zmSIHIUnKSTPoTD
```

The following is an example of the *ase_login_file* file using "normal" login type:

```
normal    sa/sa_password
normal     monitor_user/monitor_user_password
```

Note The two lines of the *ase_login_file* may use different login types.

You should protect the *ase_login_file* file with proper access permissions, particularly if you are not using the encrypted login strings. Perform the following to make the file readable only to the root user after editing the file with proper *login_type* and *login_string* values:

```
chmod 400 ase_login_file
chown root ase_login_file
chgrp sys ase_login_file
```

3. Create or edit the *sysc_input_file* and run the following *syscadm* command, which registers the resource type, creates the resource group, adds resources to the resource group, and establishes resource dependencies.

   For example, to run the *syscadm* script with an input file named *sysc_input_file,* enter:

   ```
   syscadm -c both -f sysc_input_file
   ```

   For more information on the syscadm script, see “Using the syscadm script” on page 112.

   You can also perform these steps manually. See “Configuring the resource groups manually” on page 130 for more information.

4. For the primary Adaptive Server resource group, run the scswitch command to complete the following tasks:

   - Move the resource group to the “managed” state.
   - Enable all resources and their monitors.
   - Bring the resource group online on the primary node:

     scswitch -Z -g *resource_group_name*

     For example:

     ```
     scswitch -Z -g rg_MONEY1
     ```

5. For the secondary Adaptive Server resource group, run scswitch command and use the same steps as in number 4.

Using *SUNW.HAStoragePlus*

If you are running Sun Cluster 3.0 with Update2 or later, you can use the *SUNW.HAStoragePlus* resource in the Adaptive Server resource group. You can use *SUNW.HAStoragePlus* resource in place of *SUNW.HAStorage* resource, or you can have both *SUNW.HAStorage* and *SUNW.HAStoragePlus* resources in your resource group.

To add a *SUNW.HAStoragePlus* resource to the Adaptive Server resource group, set the *SUNW.HAStoragePlus* resource properties *GlobalDevicePaths* and *FilesystemMountPoints* as required. If you are using *syscadm*, you can specify values for corresponding entries in the *sysc_input_file*. To enable connection, you must set the *SUNW.HAStoragePlus* resource property AffinityOn to TRUE.

To manually add a *SUNW.HAStoragePlus* resource:

1 Register the resource type *SUNW.HAStoragePlus*:

```
scrgadm -a -t SUNW.HAStoragePlus
```

2 Add the *SUNW.HAStoragePlus* resource to the Adaptive Server resource group.

scrgadm -a -j *hasp_resource_name*
-t SUNW.HAStoragePlus
-g *resource_group*
-x FilesystemMountPoints=*shared_disk_filesystem*
-x AffinityOn=TRUE

For example:

```
scrgadm -a -j hasp_MONEY1
-t SUNW.HAStoragePlus
-g rg_MONEY1
-x fileSystemMountPoints=/global/node1_share
-x Affinityon=TRUE
```

When you are using *SUNW.HAStoragePlus* resources, you can create Adaptive Server database devices either on a global file system or on a Failover File System (FFS) managed by the *SUNW.HAStoragePlus* resource. In either case, data must reside on shared disk. Specify all corresponding file system and device paths when creating the *SUNW.HAStoragePlus* resource.

3 Enable the *SUNW.HAStoragePlus* resource:

scswitch -e -j *hasp_resource_name*

For example:

```
scswitch -e -j hasp_MONEY1
```

4 Establish a resource dependency between *SY.ase* resource and the *SUNW.HAStoragePlus* resource:

```
scrgadm -c -j ase_resource_name
-y Resource_dependencies=hasp_resource_name
```

For example:

```
scrgadm -c -j ase_MONEY1
-y Resource_dependencies=hasp_MONEY1
```

If you are using both *SUNW.HAStorage* and *SUNW.HAStoragePlus* resources, specify all the storage resource names as a comma- separated list.

```
scrgadm -c -j ase_resource_name
-y Resource_dependencies=hasp_resource_name,hastorage_name
```

For example:

```
scrgadm -c -j ase_MONEY1
-y Resource_dependencies=hasp_MONEY1,has_MONEY1
```

See the Sun Cluster documentation for more information about *SUNW.HAStoragePlus* resource type.

Configuring companion servers for failover

Follow the instructions in this section to configure the Adaptive Servers as primary and secondary companions in a high availability system.

High availability services library within Adaptive Server

You must load the high availability services library for Sun Cluster.

First, verify that the high availability services library is available. Use isql to connect to any Adaptive Server:

```
sp_companion "MONEY1", show_cluster
```

You see:

```
The default cluster is: SC-3.0.
The current cluster is set to default.
Supported cluster systems for SunOS are:
SC-3.0
VCS-HAase
```

Set the high availability services library for SC3.0. For example, from PERSONNEL1, enter:

```
sp_companion "MONEY1", set_cluster, "SC-3.0"
The current cluster is set to SC-3.0.
```

Check the interaction of Adaptive Server with the underlying cluster system. From PERSONNEL1, enter:

```
sp_companion
Server 'PERSONNEL1' is alive and cluster configured.
Server 'PERSONNEL1' is configured for HA services.
Server 'PERSONNEL1' is currently in 'Single server'
mode.
```

Note Perform these steps from only one of the servers in the cluster. The high availability services library is populated to another Adaptive Server in the cluster. If the high availability services library has been loaded on another Adaptive Server, you see the following when you issue sp_companion on server MONEY1:

```
Server 'MONEY1' is alive and cluster configured.
Server 'MONEY1' is configured for HA services.
Server 'MONEY1' is currently in 'Single server' mode.
```

Since the two companion servers synchronize user information to remove any potential conflict, there should be no user login and password used for thorough probe on secondary companion server. If they do exist, both sp_companion configure and sp_companion do_advisory fail during the user information synchronization process,

To drop the user and login of user probe in the secondary companion server, use sp_dropuser and sp_droplogin.

Running *sp_companion* with *do_advisory*

Before initiating *sp_companion*

Before executing sp_companion do_advisory and sp_companion configure:

1. Disable the monitoring of the secondary Adaptive Server:

   scswitch -n -M -j *secondary-resource*

2. Drop the user and login for monitor for the secondary Adaptive Server, where *secondary_probe_ase* is the login and user created in "Adding user and login for fault monitor" on page 110:

   ```
   sp_dropuser secondary_probe_ase
   sp_droplogin secondary_probe_ase
   ```

After successfully executing sp_companion do_advisory and sp_companion configure for an asymmetric configuration (see the two sections below for detail), perform the following steps:

1. Add the user and login for monitor for secondary Adaptive Server:

```
sp_addlogin secondary_probe_ase, secondary_probe_passwd
sp_adduser secondary_probe_ase
```

where *secondary_probe_ase* is the login and user created in “Adding user and login for fault monitor” on page 110.

2 Enable monitoring of secondary Adaptive Server:

```
scswitch -e -M -j secondary-resource
```

You must configure the secondary companion with sufficient resources to perform the work of both servers during failover. The secondary companion may have attributes that will prevent a successful cluster operation. For example, if both the primary and secondary companions are configured for 250 user logins, during failover, the secondary companion has the resources for only half the number of potential user logins necessary. Instead, configure both MONEY1 and PERSONNEL1 for 500 user logins.

sp_companion do_advisory checks the configuration options on both the primary and the secondary companion to make sure a cluster operation (such as configuring an Adaptive Server as a secondary companion) will be successful. sp_companion do_advisory advises you of any configuration options that should be changed.

See Chapter 6, “Running do_advisory” for a complete description of the sp_companion do_advisory option.

Creating an asymmetric companion configuration

Before you configure for an asymmetric setup, you must first use scswitch to disable the monitoring of the primary and secondary resources.:

```
scswitch -n -M -j primary_resource
scswitch -n -M -j secondary_resource
```

Use sp_companion to configure the primary companion for asymmetric configuration:

```
sp_companion "primary_server_name", configure, with_proxydb,
login_name,password
```

- *primary_server_name* is the name of the primary Adaptive Server as defined in the *interfaces* file entry and in sysservers.
- *login_name* is the name of the user performing this cluster operation (this person must have the ha_role).

- *password* is the password of the person performing this cluster operation.

Note You must execute the above command *only* from the secondary companion.

This example configures an Adaptive Server named MONEY1 as a primary companion. Issue the following command from the secondary server PERSONNEL1:

```
sp_companion "MONEY1", configure, NULL, sa, Odd2Think
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'PERSONNEL1' and 'MONEY1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

If user databases are created during the sp_companion configuration, you see messages similar to these:

```
Step: Created proxy database 'pubs2'
 Step: Proxy status for database has been set. Please Checkpoint the database
'pubs2'
 Step: Server configured in normal companion mode
 Starting companion watch thread
```

Use scswitch to enable the monitoring of the primary resource:

scswitch -e -M -j *primary_resource*

To prevent the failover of the secondary companion server in an asymmetric configuration, you must disable the monitoring of the secondary resource after failover.

See "Configuring the asymmetric companion" on page 19 for more information about asymmetric configuration.

Setting up a symmetric configuration

After you configure the companions for asymmetric fail over, you can set them up for symmetric configuration. In a symmetric configuration, both servers act as primary and secondary companions. See Figure 3-2 on page 22 for a description of asymmetric configuration.

Before you configure for a symmetric set up, you must first use the scswitch utility to disable the monitoring of the primary and secondary resources:

```
scswitch -n -M -j primary_resource
scswitch -n -M -j secondary_resource
```

Issue sp_companion from the primary companion to configure it for symmetric configuration. Use a syntax similar to the one for asymmetric configuration, but replace with_proxydb by NULL. See "Creating an asymmetric companion configuration" on page 124 for a description of the syntax for sp_companion.

In the following example, PERSONNEL1 is the secondary server of MONEY1. This is an asymmetric configuration, and will be changed to a symmetric one. Connect to MONEY1.

```
sp_companion 'PERSONNEL1', configure, NULL, sa, Think2Odd
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'MONEY1' and 'PERSONNEL1' for cluster config
Step: Server configuration initialization succeeded
```

```
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

Change the NodeList property of the secondary resource group to include both nodes:

scrgadm -c -g *secondary_group* -y
NodeList=*secondary_node*,*primary_node*

The following example changes the NodeList property of the resource group *rg_PERSONNEL1*, which contains the Adaptive Server PERSONNEL1:

```
scrgadm -c -g rg_PERSONNEL1 -y NodeList=node2,node1
```

Use scswitch to enable the monitoring of the primary and secondary resources:

scswitch -e -M -j *primary_resource*
scswitch -e -M -j *secondary_resource*

Administering Sybase Failover

This section includes information about using Sybase Failover.

Failing back to the primary companion

Failback moves the primary companion's resource group from the secondary node back to the primary node and starts the primary companion on the primary node.

1 After the primary host is ready to take over the primary companion, disable the monitoring of the secondary resource with the scswitch utility, if you have already not done so:

```
scswitch -n -M -j secondary_resource
```

2 Issue the following from the secondary companion:

```
sp_companion primary_companion_name, prepare_failback
```

This command moves the primary companion's resource group back to the primary host.

Note Alternatively, you can use this command to fail back the resource group:

scswitch -z -h *primary_host* -g *failed_over_group*

For example, perform a failback to the primary companion MONEY1 on *node1*, issue the following command from either the secondary or primary host (if it is running normally under cluster control):

```
scswitch -z -h node1 -g rg_MONEY1
```

---

3 To resume normal companion mode, disable monitoring of the primary resource:

   scswitch -n -M -j *primary_resource*

4 Issue the following from the primary companion:

```
sp_companion secondary_companion_name, resume
```

5 Enable the monitoring of the primary resource with:

   scswitch -e -M -j *primary_resource*

6 If you are in symmetric mode, use scswitch to enable monitoring of the secondary resource.

Note You cannot connect clients with the failover property to an Adaptive Server configured for high availability until you issue sp_companion resume. If you attempt to connect them after issuing sp_companion prepare_failback, the client hangs until you issue sp_companion resume.

Suspending normal companion mode

Suspended mode temporarily disables the ability of the primary companion to fail over to the secondary companion. To switch from normal companion mode to suspended mode:

1 Stop the high availability system from monitoring the primary and secondary companion as resources. As "root", issue:

   scswitch -n -M -j *primary-resource-name*
   scswitch -n -M -j *secondary-resource-name*

2. Suspend normal companion mode. From the secondary companion, issue:

   ```
   sp_companion companion_name, suspend
   ```

Resuming normal companion mode

To move from suspended mode to normal companion mode:

1. Make sure both companions are running.
2. Resume normal companion mode. From the secondary companion, issue:

   ```
   sp_companion primary_companion_name, resume
   ```

3. Begin monitoring the primary and secondary companion as resources. Issue the following as “root”:

   ```
   scswitch -e -M -j primary-resource-name
   scswitch -e -M -j secondary-resource-name
   ```

Dropping companion mode

1. To stop the high availability system from monitoring the companions. Issue:

   ```
   scwitch -n -M -j primary-resource-name
   scswitch -n -M -j secondary-resource-name
   ```

2. To drop companion mode, issue:

   ```
   sp_companion companion_name, "drop"
   ```

   Dropping companion mode is irreversible; you must reconfigure the Adaptive Server companion servers before they again fail over in a high availability system.

Verifying high availability on Sun Cluster

To ensure that you have properly configured high availability on the Sun Cluster, perform the verification tests in this section.

The following steps assume that you have configured two Adaptive Server resource groups in asymmetric mode.

1. Log in to the primary node for the Adaptive Server resource group.
2. Set the Adaptive Server environment variables: SYBASE, SYBASE_ASE, SYBASE_OCS, and so on. Use the *Environment_file* extension property to specify environment variables.
3. Verify the Adaptive Server resource group is online:

   ```
   scstat -g
   ```

4. Use isql to connect to the primary data server:

   ```
   isql -Usa -Ppassword -Sprimary-server-name
   >select name from sysdatabases
   >go
   >quit
   ```

5. Switch the primary resource group to the secondary node. This is a simulated fail over.

   scswitch -z -g *primary-resource-group* -h *secondary-host*

6. Use isql to connect to the secondary data server and confirm that the databases in the primary data server have been taken over by the secondary data server and can be accessed.

   ```
   isql -Usa -Ppassword -Ssecondary-server-name
   >select name from sysdatabases
   >go
   >quit
   ```

7. Follow the instructions in “Failing back to the primary companion” on page 127 to fail back the primary resource group.
8. Use isql to connect to the primary data server and verify that databases in the primary data server have been taken over by the primary data server and can be accessed.

   ```
   isql -Usa -Ppassword -Sprimary-server-name
   >select name from sysdatabases
   >go
   >quit
   ```

Configuring the resource groups manually

This section describes the commands executed by the *syscadm* script to create and configure the Adaptive Server resource groups.

If necessary, you can perform these steps manually, for example to configure, reconfigure, or troubleshoot the Adaptive Server resource groups. Make sure you have properly modified *SY.ase* and *ase_login_file* as explained in steps 1 and 2 in “Configuring Adaptive Server resource groups” on page 118.

You must be logged on as “root” to run these Sun Cluster commands.

Primary companion resource group

1 Register the *SY.ase* resource type.

scrgadm -a -t SY.ase -f *full-path-of-SY.ase-file*

For example:

```
scrgadm -a -t SY.ase
-f /sybase/ASE-15_0/SC-3_0/etc/SY.ase
```

Note Install the *SY.ase* resource type only once per cluster. An error message displays if the resource type is already installed.

2 Create a resource group for the primary companion server. Specify the primary and secondary nodes for the resource group property Nodelist.

scrgadm -a -g *resource_group*
-y Nodelist=*primary-node*,*secondary-node*

For example:

```
scrgadm -a -g rg_MONEY1 -y Nodelist=node1,node2
```

3 Register the SUNW.HAStorage resource type.

```
scrgadm -a -t SUNW.HAStorage
```

4 Create and add the *SUNW.HAStorage* resource to the Adaptive Server resource group. Specify the file system and device paths on the shared disk that must be relocated to the secondary node in case of fail over:

scrgadm -a -j *hastorage_resource_name*
-t SUNW.HAStorage
-g *resource_group*
-x ServicePaths=*shared-disk-storage-path*

For example:

```
scrgadm -a -j has_MONEY1 -g rg_MONEY1
-t SUNW.HAStorage
-x ServicePaths=/global/node1_share
```

5 Create and add the *SUNW.LogicalHostname* resource to the Adaptive Server resource group. Specify a logical host name or floating IP address that can be relocated to the secondary node in case of fail over.

```
scrgadm -a -L -j loghost_resource
-g resource_group
-l logical_hostname
```

For example:

```
scrgadm -a -L -j lh_MONEY1
-g rg_MONEY1
-l loghost_node1
```

6 The following command creates the Adaptive Server resource and adds it to the resource group:

```
scrgadm -a -j ase_resource_name -g resource_group \
   -t SY.ase \
   -x Sybase_home=sybase_home_value \
   -x Environment_file=environment_file_path \
   -x Dataserver_name=dataserver_name_value \
   -x Dataserver_login_file=login_file_path \
   -x RUN_server_file=run_server_file_path
```

For example:

```
scrgadm -a -j ase_MONEY1 -g rg_MONEY1 \
    -t SY.ase \
    -x Sybase_home=/sybase \
    -x Environment_file=/sybase/SYBASE.sh \
    -x Dataserver_name=MONEY1 \
    -x Dataserver_login_file=/sybase/ASE-15_0/SC-3_0/etc/ase_login_file
    -x RUN_server_file=/sybase/ASE-15_0/install/RUN_MONEY1
```

Specify any standard resource property values and extension property values.

You must specify the following three extension property values; otherwise, the command fails: *Sybase_home*, *Dataserver_name*, and *Dataserver_login_file*. You may let other extension properties use default values.

You may configure the following standard resource properties, which are used by the high availability agent fault monitor: *Cheap_probe_interval*, *Thorough_probe_interval*, *Retry_count*, and *Retry_interval*.

For more information about the standard resource properties, see the Sun Cluster documentation. Table 9-1 on page 116 describes the extension properties for the Adaptive Server resource.

7 Establish resource dependency between the *SY.ase* resource and the *SUNW.HAStorage* resource. This means the *SY.ase* resource is online only if the *SUNW.HAStorage* resource is online, and the *SY.ase* resource is offline before the *SUNW.HAStorage* resource is offline:

scrgadm -c -j *ase_resource_name*
-y Resource_dependencies=*hastorage_resource_name*

For example:

```
scrgadm -c -j ase_MONEY1
-y Resource_dependencies=has_MONEY1
```

Note All resources in a resource group implicitly depend on the *SUNW.LogocalHostname* resource if one is added to the resource group.

8 For the primary Adaptive Server resource group, execute scswitch to:

- Move the resource group to managed state.
- Enable all resources and their monitors.
- Bring the resource group online on the primary node:

  scswitch -Z -g *resource_group_name*

  For example:

  ```
  scswitch -Z -g rg_MONEY1
  ```

Note See "Using SUNW.HAStoragePlus" on page 120 to create and add the *SUNW.HAStoragePlus* resource to the Adaptive Server resource group.

Secondary companion resource group

1 Create a resource group for the secondary companion server. Assuming symmetric configuration, specify both primary and secondary nodes for the resource group property NodeList.

scrgadm -a -g *resource_group*
-y Nodelist=*secondary-node, primary-node*

For example:

```
scrgadm -a -g rg_PERSONNEL1
-y Nodelist=node2,node1
```

Note the order of the nodes in the NodeList. node2 is the primary node and node1 is the secondary node for the secondary companion server resource group.

For asymmetric configuration, use:

```
scrgadm -a -g rg_PERSONNEL1
-y Nodelist=node2
```

2 Create and add the SUNW.HAStorage resource to the Adaptive Server resource group:

scrgadm -a -j *hastorage_resource_name*
-g *resource_group*
-t SUNW.HAStorage
-x ServicePaths=*shared-disk-storage-path*

For example:

```
scrgadm -a -j has_PERSONNEL1
-g rg_PERSONNEL1
-t SUNW.HAStorage
-x ServicePaths=/global/node2_share
```

3 Create and add *SUNW.LogicalHostname* to the Adaptive Server resource group:

scrgadm -a -L
-j *loghost_resource*
-g *resource_group*
-l *logical_hostname*

For example:

```
scrgadm -a -L
-j lh_PERSONNEL1
-g rg_PERSONNEL1
-l loghost_node2
```

4 Create and add the *SY.ase* resource to the Adaptive Server resource group:

scrgadm -a -j *ase_resource_name*
-g *resource_group* \
-t SY.ase \
-x Sybase_home=*sybase_home_value* \
-x Environment_file=*environment_file_path* \
-x Dataserver_name=*dataserver_name_value* \
-x Dataserver_login_file=*login_file_path* \
-x RUN_server_file=*run_server_file_path*

For example:

```
scrgadm -a -j ase_PERSONNEL1
```

```
-g rg_PERSONNEL1 \
-t SY.ase \
-x Sybase_home=/sybase \
-x Environment_file=/sybase/SYBASE.sh \
-x Dataserver_name=PERSONNEL1 \
-x Dataserver_login_file=/sybase/ASE-15_0/SC-3_0/etc/ase_login_file \
-x RUN_server_file=/sybase/ASE-15_0/install/RUN_PERSONNEL1
```

5 Establish resource dependency between *SY.ase* and *SUNW.HAStorage* so the *SY.ase* resource always depends on *SUNW.HAStorage* resource:

   scrgadm -c -j *ase_resource_name*
   -y Resource_dependencies=*hastorage_resource_name*

   For example:

   ```
   scrgadm -c -j ase_PERSONNEL1
   -y Resource_dependencies=has_PERSONNEL1
   ```

6 For the secondary Adaptive Server resource group, run scswitch command to complete the following tasks:

   - Move the resource group to managed state.
   - Enable all resources and their monitors.
   - Bring the resource group online on the secondary node, that is the primary node of the secondary companion resource group:

     scswitch -Z -g *resource_group_name*

     For example:

     ```
     scswitch -Z -g rg_PERSONNEL1
     ```

Troubleshooting

This section includes troubleshooting information about common errors.

Recovering from a failed *prepare_failback*

During fail back, if prepare_failback executes successfully on the secondary companion but the primary companion also fails, roll back and then reissue the prepare_failback command:

1. Check the cluster system error logs, callback error logs, high availability agent fault monitor error logs, and Adaptive Server error logs to find the reason the failback failed, and correct any problems.

2. Clear any error states in the resource group. To determine the states of resource group, enter:

   scha_resourcegroup_get -O RG_STATE -G *resource_group_name*

   For example:

   ```
   scha_resourcegroup_get -O RG_STATE -G rg_MONEY1
   ```

   To determine the states of resource group, enter:

   scha_resource_get
   -O RESOURCE_STATE_NODE
   -R *resource_name node_name*

   For example, to find the state of the resource ase_MONEY1 on node2:

   ```
   scha_resource_get
   -O RESOURCE_STATE_NODE -R ase_MONEY1 node2
   ```

   Issue the following command to clear the `STOP_FAILED` state:

   scswitch -c -h node_name -j *resource_name* -f STOP_FAILED

3. Log in to the secondary companion and issue:

   ```
   dbcc ha_admin("", "rollback_failback")
   ```

Recovering from a secondary failover on the secondary companion

If the primary companion is in normal companion mode, but the secondary companion is in failover mode, the cluster is in an inconsistent state, and you must recover manually. The inconsistent state may be caused by sp_companion 'prepare_failback' failing on the secondary companion. To recover:

1. Issue sp_helpdb on the secondary companion to see if any primary companion databases (for example, the master_companion) are mounted on the secondary companion.

2. Make sure the primary databases are accessible from the secondary node. To do this, move the primary SUNW.HAStorage resource to the secondary node, which can be done by disabling the primary Adaptive Server resource and starting the primary resource group on the secondary node. For example, the following starts the primary resource group *rg_MONEY1* on the secondary node:

```
scswitch -z -h node2  -g  rg_MONEY1
```

3 Issue ha_admin:

```
dbcc ha_admin("",  "rollback_failover")
```

Preventing the failover of secondary companion

You must disable monitoring after fail over.

Changing resource and resource group state

When you are performing maintenance on a cluster, bring all resources in the Adaptive Server resource group offline and move Adaptive Server resource group to an unmanaged state:

```
scswitch -F -g primary-resource-group
scswitch -F -g secondary-resource-group

scswitch -u -g primary-resource-group
scswitch -u -g secondary-resource-group
```

Location of the error logs

Use the information in these logs to debug the high availability system:

- Adaptive Server error log – the location is defined in the RUNSERVER file. For example:

  ```
  /sybase/ASE-15_0/install/MONEY1.log
  ```

- Adaptive Server high availability agent callback scripts log:

  ```
  $SYBASE/$SYBASE_ASE/SC-3_0/log/
      ase_callback_<server-name>.log
  ```

  or as specified by the Adaptive Server resource property *Callback_log*.

- Adaptive Server agent fault monitor log:

  ```
  $SYBASE/$SYBASE_ASE/SC-3_0/log/
      ase_monitor_<server-name>.log
  ```

  or as specified by the Adaptive Server resource property *Monitor_log*.

- Sun Cluster system log:

```
/var/adm/messages
```

CHAPTER 10

Active-Passive Configuration for Sun Cluster 3.0 and 3.1

This chapter discusses configuring Adaptive Server on Sun Cluster in an active-passive setup.

Adaptive Server Enterprise version 15.0 does not support Sun Cluster version 2.2. If you currently have these clusters configured, you have to upgrade the respective cluster versions to configure Adaptive Server 15.0 for High Availability on Sun Solaris.

An active-passive configuration is a configuration with two or more nodes and a single Adaptive Server. The set of nodes that hosts the Adaptive Server under normal conditions is called the primary nodes; the set of nodes that can potentially host the Adaptive Server is called the secondary nodes.

When the Adaptive Server or any of the resources it depends on, such as a disk or the node itself, crashes, the Adaptive Server, along with all required resources, is relocated and restarted on a secondary node. This movement from the primary node to the secondary node is called **failover**.

After failover, the node hosting Adaptive Server is considered the primary node until the System Administrator performs a planned failback, or until the Adaptive Server on the new primary node fails, causing another fail over.

After failover, all existing client connections are lost. The clients must reestablish their connections and resubmit any uncommitted transactions as soon as the Adaptive Server is started on the secondary node. The client connection failover can be performed automatically by using high availability connections and self-referencing the `hafailover` entry in the *interfaces* file. See "Configuring the interfaces file on the client side" on page 148 for information.

You can configure the active-passive setup with multiple secondary nodes so that Adaptive Server can survive multiple failures. With a multi-node setup, Adaptive Server can service requests from clients as long as at least one of the primary and secondary nodes is available to host the Adaptive Server and its resources. See "Working with a multi-node cluster" on page 161 for more information.

Hardware and operating system requirements

High availability requires:

- Two homogenous, network systems with similar configurations in terms of resources such as CPU, memory, and so on
- The high availability package and the associated hardware
- Devices that are accessible to both nodes
- A logical volume manager (LVM) to maintain unique device path names across the cluster nodes
- Volumes or disk suite objects on the multi host disks
- Third-party vendor mirroring for media failure protection
- Logical host name or floating IP address that can be bound to any of the primary and secondary nodes

For more information about requirements for running Sun Cluster, see the Sun Cluster documentation.

See your hardware and operating system documentation for information about installing platform-specific high availability software.

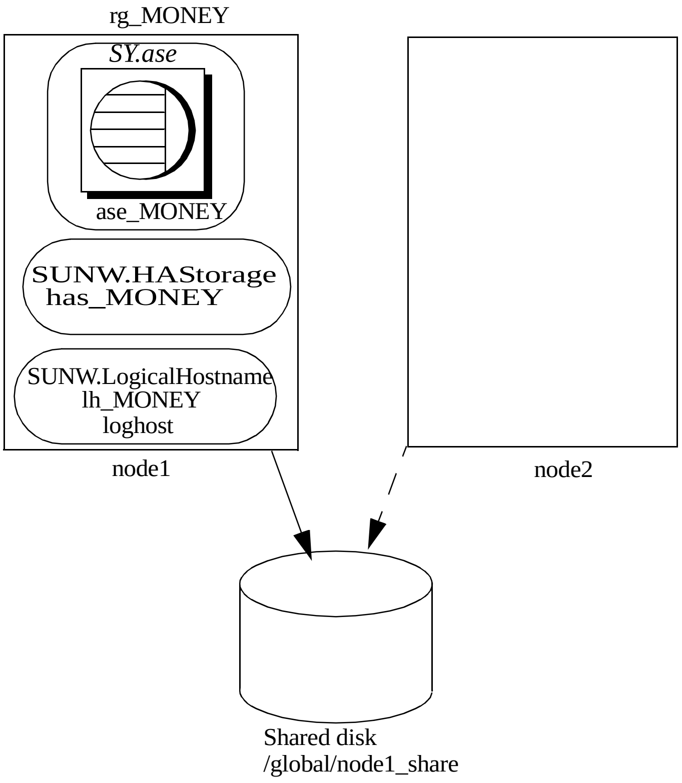
Active-passive setup in Sun Cluster

A two-node active-passive configuration is described in Figure 10-1.

In Sun Cluster, Adaptive Server runs as a data service and is managed by the Sun Cluster Resource Group Manager (RGM). Adaptive Server is associated with a resource group that contains the Adaptive Server resource and all other resources it requires, such as the *SUNW.HAStorage*, *SUNW.HAStoragePlus*, and *SUNW.LogicalHostname* resources.

SY.ase is the Adaptive Sever resource and it defines various extension properties. See “Adaptive Server resource extension properties” on page 116 for more information. See the Sun Cluster documentation for more information on standard resource properties.

Figure 10-1: Active-passive setup in Sun Cluster before failover



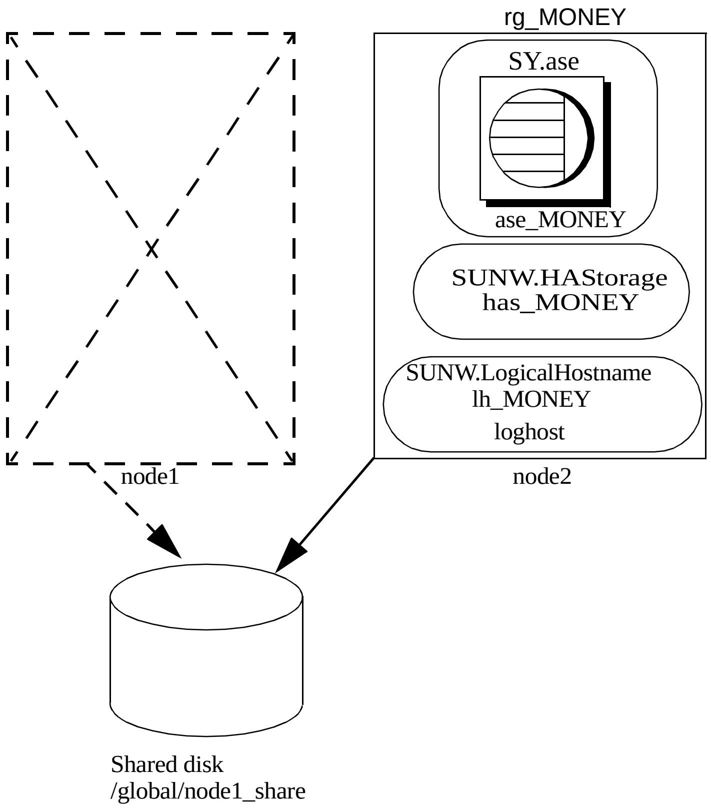
In Figure 10-1, the Adaptive Server MONEY is associated with the resource group *rg_MONEY*, which consists of three resources: the Adaptive Server resource, *ase_MONEY*, of resource type *SY.ase*, the storage resource, *has_MONEY*, of resource type *SUNW.HAStorage*, and the logical host resource, *lh_MONEY*, of resource type *SUNW.LogicalHostname*. *has_MONEY* manages the global file system */global/node1_share* on the shared disk. The logical host resource is associated with the logical host name or floating IP address *loghost*. *ase_MONEY* uses *has_MONEY* and *lh_MONEY*.

Initially, the Adaptive Server resource group, *rg_MONEY*, is hosted by the primary node, node1, and Adaptive Server MONEY serves its clients through the logical host name *loghost* associated with *lh_MONEY.*

When node1 crashes, the resource group *rg_MONEY* and all of its resources is relocated and restarted on the secondary node as shown in Figure 10-2.

After failover, the Adaptive Server runs on node2 and continues to serve its clients using the same *loghost*.

Figure 10-2: Active-passive setup on Sun Cluster after failover



The resource group properties Pingpong_interval and Global_resources_used may affect fail over. For example, in update 1 of Sun Cluster version 3.0 documentation, if the Adaptive Server resource group, *rg_MONEY*, is moving between the primary and secondary nodes too frequently (within about 300 seconds), the RGM may stop fail over of the Adaptive Server resource group with the following error:

```
608202 :scha_control: resource group ase_MONEY was
frozen on Global_resources_used within the past 300
seconds; exiting
```

Failing back in an active-passive configuration

You can relocate the Adaptive Server resource group back to the primary node when the node recovers and can successfully host the Adaptive Server resources group. This is called failback. A failback in an active-passive configuration is the same as failing over to the primary node; stopping Adaptive Server and its resources on the current node, then relocating and starting them on the primary node. A failback is not required, but can be performed solely for administration purposes. If fail back is not done, the recovered primary node acts as secondary node until another fail over.

Clients in an active-passive configuration

When a failover or a failback occurs, all existing client connections are lost. Clients do not see any difference between the two events. However, the client connection failover happens differently, depending on the type of connection the client has established with Adaptive Server. Client connections are either high availability connections or non-high-availability connections.

High availability connections must have the CS_HAFAILOVER property set in the connection handle, and the `hafailover` entry in the *interfaces* file. For clients that use the high availability connection, fail over is transparent; the broken connections are automatically reestablished when the Adaptive Server restarts on the secondary node. However, the client must resubmit any uncommitted transactions.

non-high-availability connections do not reconnect automatically; clients must first reestablish their connections to Adaptive Server, then resubmit uncommitted transactions.

For more information see “Configuring the interfaces file on the client side” on page 148.

Preparing Adaptive Server for active-passive setup

This section discusses how to set up Adaptive Server for active-passive high availability.

Installing Adaptive Server

You can install Adaptive Server on a global file system or on the local file systems of all the primary and secondary nodes.

Installing on a global file system

If you install Adaptive Server on a global file system, the advantage is that you need only maintain one server installation. However, you must install the Adaptive Server on a global file system that is managed by the *SUNW.HAStorage* or *SUNW.HAStoragePlus* resource in the Adaptive Server resource group, so that the installation directory *$SYBASE* also moves to the secondary node in the case of fail over.

Note Do not install *$SYBASE* on a failover file system managed by a SUNW.HAStoragePlus resource.

Installing on local file system

If you install Adaptive Server on a local file system:

- The installation directory *$SYBASE* must use the same directory path on all the primary and secondary nodes. If different nodes use the *$SYBASE* directory in different locations, create a directory with the same path on all the primary and secondary nodes that acts as a symbolic link to the respective actual *$SYBASE* release directory paths.

  For example, if the directory on node1 is */usr/sybase1* and on node2 is */usr/sybase2*, create a symbolic link */sybase* on both the nodes to their respective *$SYBASE* release directories.

  On node1, */sybase* is a link to */usr/sybase1*, and on node2 */sybase* is a link to */usr/sybase2*. Thus, the value of *$SYBASE* points to the same path on both primary and secondary nodes.

- The contents of *$SYBASE* on all the primary and secondary nodes must be consistent:

  - Contents of files such as RUNSERVER, interfaces, *SYBASE.sh*, server configuration file, <*servername*>*.cfg*, and so on, must be consistent.
  - The contents of *$SYBASE/$SYBASE-ASE/SC-3_0*, especially the files in the *etc* and *bin* directories, must be consistent.
  - You must apply upgrades and patches consistently.

- Various log files are created on all the nodes whenever a node hosts the Adaptive Server resource group. For example, *Callback_log*, *Monitor_log*, Adaptive Server and auxiliary server *error logs*, and so on. You must maintain consistency of these and any related files whether they are in default directories or you have specified different directory paths for any files using the corresponding Adaptive Server resource properties.

Passing environment to Adaptive Server

Use the *SYBASE.sh* file to specify the environment to pass to the Adaptive Server. Protect *SYBASE.sh* from unauthorized access; make sure only “root” has read and execute permissions.

The high availability agent looks for the file in *$SYBASE* or as specified in the Adaptive Server resource property *Environment_file*. The high availability agent may not behave as expected if *SYBASE.sh* is not available.

Note *SYBASE.csh* file is not supported.

Running the *SySam* license manager in the cluster

You must run the *SySam* license manager on all the primary and secondary nodes in the cluster. This does not require additional steps if *$SYBASE* is installed on the local file systems.

If *$SYBASE* is installed on the global file system, follow the steps below to run the license manager on all nodes using the same *license.dat* file.

- Create the same alias in the */etc/hosts* file for the respective physical host names of all the primary and secondary nodes.

  For example, if node1 and node2 are the host names of the primary and secondary nodes, add an alias, such as *license_host*, for both nodes in their */etc/hosts* files.

  For example, on node1, */etc/hosts* looks like:

  ```
  10.22.98.43     node1   license_host
  10.22.98.44     node2
  ```

  On node2, */etc/hosts* looks like:

  ```
  10.22.98.43     node1
  ```

```
        10.22.98.44     node2    license_host
```

- Edit the *license.dat* file in *$SYBASE/$SYBASE_SYSAM/licenses* or as specified by the environment variable LM_LICENSE_FILE.

  Change the host name in the SERVER line to the alias host name defined in the */etc/hosts* file. Following the above example, the SERVER line changes from:

  ```
  SERVER node1 any 1700
  ```

  ```
  SERVER license_host any 1700
  ```

For complete details about *sysam*, refer to the *Installation Guide for Adaptive Server Enterprise*.

Adding an entry for Adaptive Server to the *interfaces* file

You must maintain an *interfaces* file on both the server side and on the client side. The host name you specify in the *interfaces* file for the Adaptive Server entry must be a logical host name or a floating IP address that can be moved between the primary and secondary nodes.

Configuring the *interfaces* file on the server side

Modify the *interfaces* file for the server entry to use a floating IP address or logical host name. Do not include the *retry* and *timeout* options for the server entry on the server-side *interfaces* file. The following is an example of the server-side *interfaces* file using the logical host name loghost:

```
MONEY
    master tcp ether loghost 4010
    query tcp ether loghost 4010
```

Make sure the logical host name is accessible on all primary and secondary nodes by properly updating the */etc/hosts* or NIS hosts map and */etc/nsswitch.conf* files.

Note Sybase recommends that you use the local */etc/hosts* rather than the NIS hosts map in a cluster environment to avoid unnecessary dependency on the NIS server. Modify the */etc/nsswitch.conf* file appropriately.

For example, the */etc/hosts* file for the setup in Figure 10-1 on page 142 looks like this:

```
#
#internet host table
#
10.22.98.43          node1
10.22.98.44         node2
10.22.98.165         loghost
```

The hosts entry in */etc/nsswitch.conf* file looks like:

```
hosts:    files nis dns
```

Configuring the *interfaces* file on the client side

Client connections can be either high availability connections or non-high-availability connections. In either case, client connections require:

- Adequate values for the *retry* and *timeout* options in the *interfaces* file. When you determine these values, allow for failover delays, such as starting Adaptive Server on the secondary node, recovery time, and for multiple node failures. The Adaptive Server resource group tries to fail over until it finds a secondary node that can successfully host the resource group.
- The logical host name be accessible from the client machine.

non-high-availability connections

non-high-availability connections do not include neither the *hafailover* entry in the *interfaces* file nor the CS_HAFAILOVER property set in the client connection. When non-high-availability connections are lost, clients must reconnect to the Adaptive Server after failure. To reestablish the connections, clients must retry enough times, or wait long enough between retries, until fail over completes and Adaptive Server is running on the secondary node.

To reconnect to the server, clients can use the *retry* and *timeout* options in the *interfaces* file or the corresponding connection properties. In the following *interfaces* file example, the retry count is 10 and the timeout delay between each retry is 20 seconds:

```
MONEY    10    20
    master tcp ether loghost 4010
    query tcp ether loghost 4010
```

High-availability connections

High availability connections are made with:

- The CS_HAFAILOVER property set at the connection or context level (equivalent to the -Q option of isql).
- The *hafailover* entry in the *interfaces* file, which must point to the Adaptive Server entry to be contacted in case of fail over.

In an active-passive configuration, clients must self-reference the *hafailover* entry because they reconnect to the same Adaptive Server after fail over. That is, they must set the same server name as the *hafailover* server in the *interfaces* file because the same Adaptive Server is restarted on the secondary node.

For example, the Adaptive Server entry in the example above can be self-referenced as:

```
MONEY    10    20
    master tli tcp loghost 4010
    query tli tcp loghost 4010
    hafailover MONEY
```

For more information about configuring client connections with the failover property, see Appendix C, "Open Client Functionality in a Failover Configuration."

Verifying configuration parameters

To set up Adaptive Server for an active-passive configuration, you must set the enable HA configuration parameter to 2. By default, enable HA is set to 0.

To set enable HA to 2, enter:

```
sp_configure "enable HA", 2
```

You must restart Adaptive Server for this parameter to take effect.

See the *System Administration Guide* for information about enabling configuration parameters.

Adding thresholds to the master log

If you have not already done so, add a threshold to the master log.

1. Define and execute sp_thresholdaction on the master database’s log to set a threshold on the number of pages left before a dump transaction occurs. Sybase does not supply sp_thresholdaction. See the *System Administration Guide* and the *Adaptive Server Reference Manual* for information about creating this system procedure.
2. Place thresholds on the master log segment so it does not fill up:

```
sp_addthreshold "master", "logsegment", 250, sp_thresholdaction
```

3. Restart Adaptive Server for this static parameter to take effect.

Adding user and login for fault monitor

When the high availability agent fault monitor, *ase_monitor,* runs the thorough_probe in Sun Cluster and higher, it thoroughly checks the performance of the Adaptive Server. thorough_probe:

1. Connects to the Adaptive Server.
2. Creates a temporary table, inserts an entry into the table, updates the table, and deletes the table.
3. Disconnects from Adaptive Server after the thorough_probe runs the number of times as specified by the *Connect_cycle_count*. Next, thorough_probe establishes a new connection.

Create or specify a special user and login for the monitor to perform the thorough_probe operation. Use isql to connect to the dataserver and issue:

sp_addlogin *user for monitoring ase*, *password*
sp_adduser *user for monitoring ase*

For example:

```
sp_addlogin ase_monitor_user,ase_monitor_user_password
sp_adduser ase_monitor_user
```

Note During Adaptive Server configuration, the System Administrator should take into account that the user and login used for thorough_probe actually reduces by one the total number of connections available for other purposes. That is, if the total number of connections is 25, the effective number of connections available for other purposes will be 24, as one is used by the fault monitor probe.

Configuring the Sun Cluster subsystem

See the *Sun Cluster Installation Guide* for information about installing the high availability system.

This section assumes that you have:

- Set up the PATH environment variable to contain */usr/cluster/bin* when the cluster system command is run.
- Installed the Sun Cluster high availability system.
- Installed Adaptive Server and created the required database device files on the shared disk.
- Configured Adaptive Server according to the steps in "Preparing Adaptive Server for active-passive setup" on page 144.
- Created *$SYBASE/SYBASE.sh* and edited the file with the required environment for Adaptive Server. As the file is executed in the high availability agent scripts, protect the file from unauthorized access and make sure only the "root" user has read and execute permissions.
- Created the *$SYBASE/$SYBASE_ASE/install/RUN_<Dataserver_name>* file. You must specify Adaptive Server error log with the -e option in this file. If -s is specified, it must be the same as the Adaptive Server resource property *Dataserver_name*.
- Installed *$SYBASE/$SYBASE_ASE/SC-3_0* properly (automatically installed with Adaptive Server). This directory must contain all the required files for the Adaptive Server high availability agent.

  The default *$SYBASE/$SYBASE_ASE/SC-3_0/* contains these directories:

  - *bin*
  - *etc*

  $SYBASE/$SYBASE_ASE/SC-3_0/bin contains these files:

  - *ase_start*
  - *ase_stop*
  - *ase_monitor_start*
  - *ase_monitor_stop*
  - *ase_update*
  - *ase_validate*

- *utils.ksh*
- *ase_monitor*
- *syscadm*

$SYBASE/$SYBASE_ASE/SC-3_0/etc contains these files:

- *SY.ase*
- *ase_monitor_action*
- *ase_login_file*
- *sysc_input_file*

$SYBASE/$SYBASE_ASE/SC-3_0/log initially contains no files, but will eventually contains *Callback_log* and *Monitor_log* files once the Adaptive Server resource is created.

If a *log* directory does not exist, you must create one to store the *callback_log* and *monitor_log* files.

Using the *syscadm* script

Use the *syscadm* script to configure and administer Adaptive Server resource groups, and their associated resources in Sun Cluster. You can use *syscadm* to create, remove, or disable the Adaptive Server resource group and its resources. The *syscadm* script is located in *$SYBASE/$SYBASE_ASE/SC-3_0/bin/*.

The create option of the script:

- Registers required resource types with the Resource Group Manager
- For each specified resource group, creates the resource group, creates the specified resources and adds them to the resource group
- Establishes dependencies for the Adaptive Server resource on the storage and logical host resources

The remove option in the script removes specified resource groups and their resources.

The unmanage option:

- Disables all the resources in the resource group
- Brings the resource group to an offline state

- Brings the resource group to the unmanaged state

Note You must be logged in as “root” to run the *syscadm*.

---

syscadm works with an input file called *sysc_input_file*, which you edit to provide the correct input values for your configuration. The *sysc_input_file* is located in *$SYBASE/$SYBASE_ASE/SC-3_0/etc/*.

Note Make sure the file is not tampered with when you finish editing the *sysc_input_file*. If erroneous values are included in this file, they may affect your installation. Sybase suggests that you change the permissions on this file so only System Administrators can edit it.

When editing the *sysc_input_file*:

- Do not include any spaces around “`=`” in the “`<name>=<value>`” entries.
- Start comments with #.
- Use names that end with 1 to correspond to the primary companion, and 2 to the secondary companion.

Sample *sysc_input_file*

The following is the *sysc_input_file* used to create and configure the Adaptive Server resource group rg_MONEY and its resources as shown in Figure 10-1 on page 142:

```
############################################################################
##NOTE:                                                                  ##
##    1. This file will be executed by ksh to set environment of syscadm ##
##      You will be responsible for executing anything in this file      ##
##       So, make sure THERE ARE NO DANGEROUS COMMANDS IN THIS FILE      ##
##                                                                       ##
##    2. No spaces around = in the <Variable_name>=<value> pairs         ##
##                                                                       ##
##    3. Comments should start with #, like ksh comments                 ##
##                                                                       ##
##    4. Names ending with 1 correspond to primary, and 2 to secondary   ##
############################################################################

############################################################
##  Section1: Must specify right hand side values       ##
############################################################
```

```
# Sybase home directory
SYBASE="/sybase"

# Valid HA Setups are "ACTIVE_PASSIVE" or "ASYMMETRIC" or "SYMMETRIC"
HA_SETUP="ACTIVE_PASSIVE"

# Comma separated list of nodes, Ex: "node1,node2"
Nodelist="node1,node2"

# ASE Dataserver name and Dataserver login file
Dataserver_name1="MONEY"
Dataserver_login_file1="/sybase/ASE-15_0/SC-3_0/etc/ase_login_file"

Dataserver_name2=
Dataserver_login_file2=

############################################################################
##  Section2: Must specify right hand side values, if required           ##
############################################################################

# if using Logical Hostname or Virtual/Floating IP address
LOGHOST_NAME_OR_FLOATING_IP1="loghost"
LOGHOST_NAME_OR_FLOATING_IP2=

# if using HAStorage resource
ServicePaths1="/global/node1_share"
ServicePaths2=

# if using HAStoragePlus resource
GlobalDevicePaths1=
FilesystemMountPoints1=

GlobalDevicePaths2=
FilesystemMountPoints2=

############################################################################
## Section3: May specify right hand side values to override defaults      ##
############################################################################

# bin of the cluster commands
CLUSTER_BIN="/usr/cluster/bin"

# ASE Resource Type and corresponding registration file
RT_NAME="SY.ase"
RT_FILE="$SYBASE/ASE-15_0/SC-3_0/etc/$RT_NAME"
```

```
# Resource Group names
RG_NAME1="rg_$Dtatserver_name1"
RG_NAME2="rg_$Dataserver_name2"

# ASE Resource names and space separated extended properties
ASE_RNAME1="ase_$Dataserver_name1"
ASE_RNAME2="ase_$Dataserver_name2"

OTHER_PROPERTIES1="RUN_server_file=/sybase/ASE-15_0/install/RUN_MONEY"
OTHER_PROPERTIES2="RUN_server_file=  Callback_log=  Monitor_log="

# Logical Host Resource names
LOGHOST_RNAME1="lh_$Dataserver_name1"
LOGHOST_RNAME2="lh_$Dataserver_name2"

# HA Storage Resource names
HASTORAGE_RNAME1="has_$Dataserver_name1"
HASTORAGE_RNAME2="has_$Dataserver_name2"

# HA Storage Plus Resource names
HASTORAGE_PLUS_RNAME1="hasp_$Dataserver_name1"
HASTORAGE_PLUS_RNAME2="hasp_$Dataserver_name2"
```

The input file is divided into three sections.

- Section 1 – enter the right-side values for all entries. This section includes entries for the Adaptive Server installation directory, the high availability setup, the data server name, the node list, and so on.
- Section 2 – enter right-side values for the required entries. For example, if you are using only the SUNW.HAStoragePlus resource, enter values for SUNW.HAStoragePlus- related entries. Do not enter values for the entries you are not using.
- Section 3 – all the entries in this section are assigned default values. You need not provide the right-side values except to override the defaults.

For example, to edit the file for the Adaptive Server resource name, change this line:

```
ASE_RNAME="ase_$Dataserver_name"
```

To:

```
ASE_RNAME="MONEY_RNAME"
OTHER_PROPERTIES="RUN_server_file=/mypath/RUN_MONEY
Debug_callback=TRUE"
```

Or, to specify the *RUN_SERVER* file and to set the *Debug_callback* flag, change the entry for *OTHER_PROPERTIES*, whose value is a space-separated list of <*name*>=<*value*> strings.

The syntax for *syscadm* is:

```
syscadm [-v] -c|r|u [primary|secondary|both] -f <sysc_input_file>
syscadm [-v] -r|u <rg1,rg2,...> [-t <ASE_resource_type>]
```

Where:

- -c creates resource groups.
- -r removes resource groups.
- -u unmanages the resource groups.
- -f specifies the input file.
- -v is verbose (displays the Sun Cluster commands as they are being executed).
- –t specifies the Adaptive Server resource type name if it is not *SY.ase* (useful for -r and -u commands when the input file is not specified).

SUNW.HAStoragePlus resources are created with `AffinityOn=True`.

Note For the active-passive configuration, only *primary* should be used with the -c option to create the Adaptive Server resource group.

Configuring the Adaptive Server resource group

1 Modify the Adaptive Server resource type registration file *SY.ase*. This file is located in *$SYBASE/$SYBASE_ASE/SC-3_0/etc/*. Find the line for the resource type property, *RT_BASEDIR*, which specifies the location of the Adaptive Server high availability agent. Change the value to point to the installation location of *$SYBASE/$SYBASE_ASE/SC-3_0/bin*.

For example:

```
RT_BASEDIR=/sybase/ASE-15_0/SC-3_0/bin/
```

2 Create or edit a file that contains Adaptive Server login information for the System Administrator and the user you added for the fault monitor. The default file is *$SYBASE/$SYBASE_ASE/SC-3_0/etc/ase_login_file*. If you use another file in a different location, specify the full path for the resource extension property *Dataserver_login_file* when configuring the *SY.ase* resource. The file consists of two lines. The first line is for the System Administrator login and password, the second line is for the monitor user login and password.

    login_type <tab> *login_string*
    login_type <tab> *login_string*

The only valid value for login type is normal. The value for login string is in the form login-name/password. This is an example of *$SYBASE/$SYBASE_ASE/SC-3_0/etc/ase_login_file*:

    normal <tab> *sa/sa-password*
    normal <tab> *ase_monitor_user/ase_monitor_user_password*

Note After editing the file with proper values, make the file only readable to the "root" user:

```
chmod 400 ase_login_file
chown root ase_login_file
chgrp sys ase_login_file
```

---

3 Create or edit the *sysc_input_file* and run syscadm, which registers the resource type, creates the resource group, adds resources to the resource group, and establishes resource dependencies. For example:

```
syscadm -c primary
-f $SYBASE/$SYBASE_ASE/SC-3_0/etc/sysc_input_file
```

For more information, see "Using the syscadm script" on page 112.

You can also run the steps performed by the syscadm command manually. See "Configuring the resource group manually" on page 162 for more information.

Note For a list of the extension properties see Table 9-1 on page 116.

---

4 Run scswitch to:

- Move the resource group to managed state.
- Enable all resources and their monitors.
- Bring the resource group online on the primary node.

```
scswitch -Z -g resource_group_name
```

For example:

```
scswitch -Z -g rg_MONEY
```

Using *SUNW.HAStoragePlus*

If you are running Sun Cluster 3.0 with Update2 or later, you can use the *SUNW.HAStoragePlus* resource in the Adaptive Server resource group. You can use *SUNW.HAStoragePlus* resource instead of *SUNW.HAStorage* resource, or you can have both *SUNW.HAStorage* and *SUNW.HAStoragePlus* resources in your resource group.

To add a *SUNW.HAStoragePlus* resource to the Adaptive Server resource group, set the *SUNW.HAStoragePlus* resource properties *GlobalDevicePaths* and *FilesystemMountPoints* as required. If you are using *syscadm*, you can specify values for corresponding entries in the *sysc_input_file*. To enable connection, the *SUNW.HAStoragePlus* resource property AffinityOn must be set to TRUE.

To manually add a *SUNW.HAStoragePlus* resource:

1 Register the resource type *SUNW.HAStoragePlus*:

```
scrgadm -a -t SUNW.HAStoragePlus
```

2 Add the *SUNW.HAStoragePlus* resource to the Adaptive Server resource group.

```
scrgadm -a -j hasp_resource_name
-t SUNW.HAStoragePlus
-g resource_type
-x FilesystemMountPoints=shared_disk_filesystem
-x AffinityOn=TRUE
```

For example:

```
scrgadm -a -j hasp_MONEY
-t SUNW.HAStoragePlus
-g rg_MONEY
-x fileSystemMountPoints=\global\node1_share
-x Affinityon=TRUE
```

When you are using *SUNW.HAStoragePlus* resources, you can create Adaptive Server database devices either on the global file system or on the Failover File System (FFS) managed by the *SUNW.HAStoragePlus* resource. In either case, data must reside on shared disk. Specify all corresponding file system and device paths when creating the *SUNW.HAStoragePlus* resource.

- Enable the *SUNW.HAStoragePlus* resource:

  scswitch -e -j *hastorageplus_name*

  For example:

  ```
  scswitch -e -j hasp_MONEY
  ```

- Establish a resource dependency between *SY.ase* resource and the *SUNW.HAStoragePlus* resource:

  scrgadm -c -j *ase_resource_name*
  -y Resource_dependencies=*hastorageplus_name*

  For example:

  ```
  scrgadm -c -j ase_MONEY
  -y Resource_dependencies=hasp_MONEY
  ```

  If you are using both *SUNW.HAStorage* and *SUNW.HAStoragePlus* resources, you must specify all the storage resource names as a comma-separated list.

  scrgadm -c -j *ase_resource_name*
  -y Resource_dependencies=*hastorageplus-name*,
  hastorage-name

  For example:

  ```
  scrgadm -c -j MONEY
  -y Resource_dependencies=has_MONEY,hasp_MONEY
  ```

Refer to your Sun Cluster documentation for more information about *SUNW.HAStoragePlus* resource type.

Verifying the active-passive configuration

Perform the following tests to make sure you have correctly installed and configured the Adaptive Server for active-passive high availability on Sun Cluster.

1 Bring the resource group online on its primary node and enable all resources and their fault monitors in the resource group. For example:

```
scswitch -Z -g rg_MONEY
```

2 Make sure clients such as isql connect to Adaptive Server using the logical host. To verify client connection failover, connect to Adaptive Server. Use isql to establish the high availability connection (modify the *interfaces* file to self-reference the hafailover entry, if necessary).

```
isql -Usa -Ppassword -SMONEY -Q
1> select @@servername
2> go

------------------------------
MONEY

(1 row affected)
```

3 Simulate fail over, either by shutting down the server:

```
isql -Usa -Ppassword -SMONEY
1> shutdown with nowait
2> go
```

Or by relocating the Adaptive Server resource group to the secondary node:

```
scswitch -z -h node2 -g rg_MONEY
```

4 Check the connection failover by issuing the following in the isql session started in step 2:

```
1> select @@servername
2> go
CT-LIBRARY error:
         ct_results(): user api layer: internal
Client Library error:
HAFAILOVER:Trying to connect to MONEY server.
1> select @@servername
2> go
------------------------------
MONEY

(1 row affected)
```

5 Simulate a failback by relocating the resource group back to the primary node.

```
scswitch -z -h node1 -g rg_MONEY
```

6 Check connection failover by issuing this command in the isql session started in step 2:

```
1> select @@servername
2> go
CT-LIBRARY error:
        ct_results(): user api layer: internal
Client Library error:
HAFAILOVER:Trying to connect to MONEY server.
1> select @@servername
2> go
------------------------------
MONEY

(1 row affected)
```

Working with a multi-node cluster

This section describes how to configure Adaptive Server in an active-passive setup in a Sun Cluster with more than two nodes.

Multi-node setup

You can configure an Adaptive Server resource group to withstand multiple node failures by configuring multiple secondary nodes. All the nodes that can potentially host the Adaptive Server resource group are specified in the resource group property Nodelist.

For example, to create a resource group with multiple nodes, use:

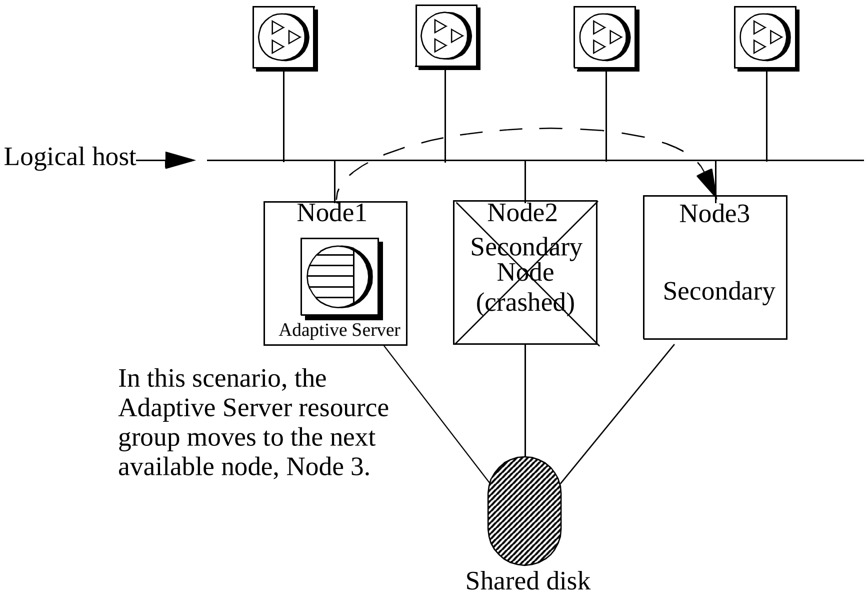
```
scrgadm -a -g rg_MONEY -y Nodelist=node1,node2,node3
```

The order of the node names is the preference in which the Resource Group Manager selects a node to host the Adaptive Server resource group. When Adaptive Server fails over, it does so to the next available secondary node, as determined by the Sun Cluster Resource Group Manager.

As long as at least one of the potential primary nodes is available, the Adaptive Server resource group is available, regardless of the number of crashes.

Figure 10-3 describes a three-node setup.

Figure 10-3: Multi-node setup


Logical host
Node1
Adaptive Server
Node2
Secondary Node (crashed)
Node3
Secondary
In this scenario, the Adaptive Server resource group moves to the next available node, Node 3.
Shared disk

In this example, the Adaptive Server running on Node1 could fail over to either Node2 or Node3, depending on the order of the node list. Because Node2 crashed, Adaptive Server fails over to Node3. If other nodes are included in the node list as candidates for secondary nodes, Adaptive Server can fail over to any of them as well.

After the primary node is brought back online, you can either fail back to it, or keep it available as a candidate for a secondary node.

Configuring the resource group manually

This section describes the commands executed by the *syscadm* script to create and configure the Adaptive Server resource group.

If necessary, you can perform these steps manually, for example to configure, reconfigure, or troubleshoot the Adaptive Server resource group. Make sure you have properly modified the files *SY.ase* and *ase_login_file* as explained in steps 1 and 2 in “Configuring the Adaptive Server resource group” on page 156.

You must be logged on as “root” to run these Sun Cluster commands.

1. Register the *SY.ase* resource type.

   scrgadm -a -t SY.ase -f *full-path-of-SY.ase-file*

   For example:

   ```
   scrgadm -a -t SY.ase
   -f /sybase/ASE-15_0/SC-3_0/etc/SY.ase
   ```

2. Create the Adaptive Server resource group. Specify the primary and secondary nodes for the resource group property Nodelist:

   scrgadm -a -g *resource_group*
   -y Nodelist=*primary-node,secondary-node*

   For example:

   ```
   scrgadm -a -g rg_MONEY -y Nodelist=node1,node2
   ```

3. Register the *SUNW.HAStorage* resource type.

   ```
   scrgadm -a -t SUNW.HAStorage
   ```

4. Create and add the *SUNW.HAStorage* resource to the Adaptive Server resource group. Specify the file system and device paths on the shared disk that must be relocated to the secondary node in case of fail over:

   ```
   scrgadm -a -j hastorage_resource_name
   -t SUNW.HAStorage
   -g resource_group
   -x ServicePaths=shared-disk-storage-path
   ```

   For example:

   ```
   scrgadm -a -j has_MONEY -g rg_MONEY
   -t SUNW.HAStorage
   -x ServicePaths=/global/node1_share
   ```

5. Create and add the *SUNW.LogicalHostname* resource to the Adaptive Server resource group. Specify a logical host name or floating IP address that can be relocated to the secondary node in case of fail over.

   ```
   scrgadm -a -L -j loghost_resource_name
   -g resource_group
   -l logicalhostname
   ```

   For example:

   ```
   scrgadm -a -L -j lh_MONEY -g rg_MONEY -l loghost
   ```

6 Create and add the *SY.ase* resource to the Adaptive Server resource group. Specify any standard resource property values and extension property values for the Adaptive Server resource.

You must specify these three extension property values; otherwise, the command fails: *Sybase_home*, *Dataserver_name*, and *Dataserver_login_file*.

You may let other extension properties use default values. Configure the following standard resource properties that are used by the high availability agent fault monitor: *Cheap_probe_interval*, *Thorough_probe_interval*, *Retry_count*, and *Retry_interval*.

The following command creates the Adaptive Server resource and adds it to the resource group:

```
scrgadm -a -j ase_resource_name -g resource_group \
   -t SY.ase \
   -x Sybase_home=sybase_home_value \
   -x Environment_file=environment_file_path \
   -x Dataserver_name=dataserver_name_value \
   -x Dataserver_login_file=login_file_path \
   -x RUN_server_file=run_server_file_path
```

For example:

```
scrgadm -a -j ase_MONEY -g rg_MONEY \
    -t SY.ase \
    -x Sybase_home=/sybase \
    -x Environment_file=/sybase/SYBASE.sh \
    -x Dataserver_name=MONEY \
    -x Dataserver_login_file=/sybase/ASE-15_0/SC-
  3_0/etc/ase_login_file\
    -x RUN_server_file=/sybase/ASE-15_0/install/RUN_MONEY
```

For more information about the standard resource properties, see the Sun Cluster documentation. Table 9-1 on page 116 describes the extension properties for the Adaptive Server resource.

7 Establish resource dependency between the *SY.ase* resource and the *SUNW.HAStorage* resource. This means the *SY.ase* resource is online only after the *SUNW.HAStorage* resource is online, and the *SY.ase* resource is offline before the *SUNW.HAStorage* resource is offline:

```
scrgadm -c -j ase_resource_name
-y Resource_dependencies=hastorage_resource_name
```

For example:

```
scrgadm -c -j ase_MONEY
```

```
-y Resource_dependencies=has_MONEY
```

Note All resources in a resource group implicitly depend on the *SUNW.LogocalHostname* resource if one is added to the resource group.

8 Run scswitch to:

- Move the resource group to managed state.
- Enable all resources and their monitors.
- Bring the resource group online on the primary node.

  scswitch -Z -g *resource_group_name*

For example:

```
scswitch -Z -g rg_MONEY
```

Note See “Using SUNW.HAStoragePlus” on page 120 to create and add the *SUNW.HAStoragePlus* resource to the Adaptive Server resource group.

Location of the error logs

Use this information to debug your high availability system:

- Adaptive Server error log – the location is specified in the RUNSERVER file. For example:

  ```
  /sybase/ASE-15_0/install/MONEY.log
  ```

- Adaptive Server high availability agent callback scripts log:

  $SYBASE/$SYBASE_ASE/SC-3_0
  /log/ase_callback_<*server-name*>.log

  or as specified by the Adaptive Server resource property *Callback_log*.

- Adaptive Server agent fault monitor log:

  $SYBASE/$SYBASE_ASE/SC-3_0/log
  /ase_monitor_<*server-name*>.log

  or as specified by the Adaptive Server resource property *Monitor_log*:

- Sun Cluster system log:

```
/var/adm/messages
```

CHAPTER 11

Configuring Adaptive Server for Failover on Veritas 4.0

This chapter discusses how to configure Adaptive Server for failover on Veritas Cluster Server (VCS), version 4.0.

Note Adaptive Server Enterprise version 15.0 does not support Veritas Cluster versions 2.2 or 3.0. If you currently have these clusters configured, you have to upgrade the respective cluster versions to configure Adaptive Server 15.0 for High Availability on Veritas.

Read the Veritas user manuals and familiarize yourself with the Veritas cluster before you implement the steps in this chapter.

Note If you are upgrading Veritas, first review "Upgrading from an agent of resource type Sybase" on page 190 before performing the tasks in this chapter.

Hardware and operating system requirements

High availability requires the following hardware and system components:

- Two homogenous, network systems, with similar configurations in terms of resources like CPU, memory, and so on. The two servers should be installed and configured with:
  - Either Solaris 2.8 and VCS version 4.0.
  - RedHat Advanced Server 2.1 and VCS version 4.0 for Linux

  You should also install the VCS graphical user interface to facilitate configuration and administration.
- The resource type *HAase*, imported into the VCS.
- Access to shared multihost disks, which store the databases for the Adaptive Server configured for high availability.
- Veritas Volume Manager 3.1 or later to manage disks and create resources like DiskGroup and Volume.
- Third-party vendor mirroring for media failure protection.
- A service group on each system. A service group is a set of resources that provides a specific service. To provide a service for an Adaptive Server that is configured for high availability, the service group should include such resources as DiskGroup, Volume, Mount, IP, NIC, and *HAase* for Adaptive Server. A sample service group and the resource dependency graph is shown in Figure 11-1. See the *Veritas Cluster Server User's Guide* for more information on how to create a service group and how to add resources to a service group.

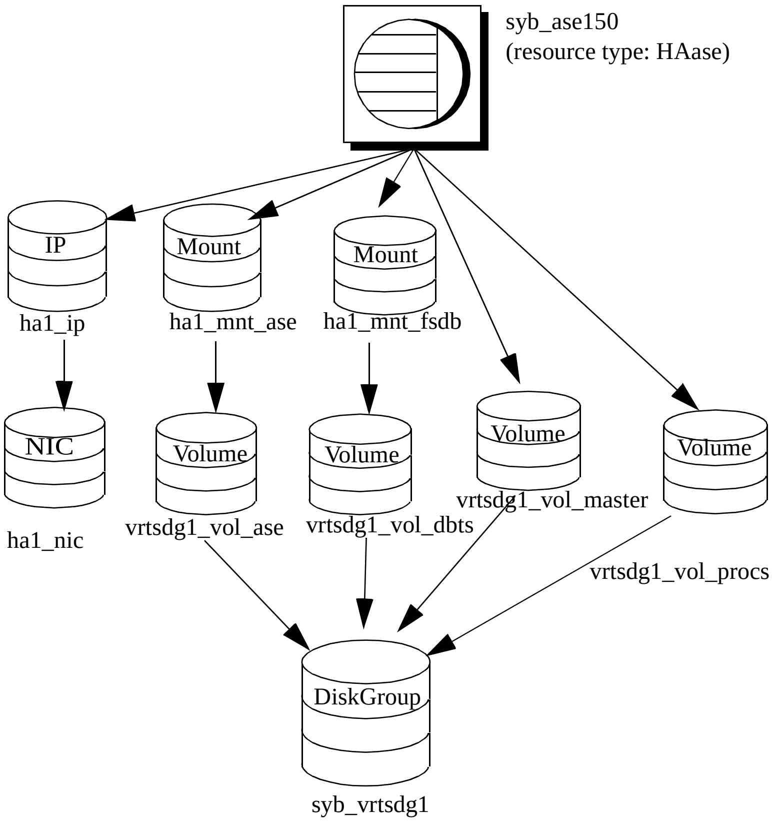
  Note Each service group must contain at least two resources with one resource of type *HAase*. Use the cluster command to establish resource dependency so that the resource of type *HAase* depends on the other resources.
- Both public and private networks on both the nodes.

See your hardware and operating system documentation for information about installing platform-specific high availability software.

In Figure 11-1 on page 170, the configuration of the service group has one DiskGroup, *syb_vrtsdg1*, on which four volumes are created. One volume is for the Adaptive Server installation, one is for databases that are created on the file system, and the other two are for databases created on raw devices. The two mount resources are created for file system of type ufs layering on the volume resources. The resource, *syb_ase150* of type *HAase* is the Adaptive Server installation, which sits on top of the mount resources. *syb_ase150* also requires resource IP, which also requires resource NIC for public network access.

Not shown in Figure 11-1 on page 170, the service group *SybASE* running on the primary node and service group, *SybASE2* running on the secondary node, with a similar configuration:

Figure 11-1: Sample service group running on Veritas Cluster Server



Preparing Adaptive Server to work with high availability

This section contains the instructions necessary to prepare Adaptive Server for a high availability configuration.

Installing Adaptive Servers

Install both the primary and the secondary servers. They can be installed on shared or local disks. The primary companion can be either a newly installed Adaptive Server, or it can be upgraded from an earlier version of Adaptive Server with existing databases, users, and so on. The secondary companion must be a newly installed Adaptive Server and cannot have any user logins or user databases, which ensures that all user logins and database names are unique within the cluster. After configuration for failover is complete, you can add user logins and databases to the secondary companion.

If you are installing on the local disk, make sure all databases are created on the multihost disk.

See the installation documentation for your platform for information about installing and configuring Adaptive Server.

Adding entries for both Adaptive Servers to the *interfaces* file

The *interfaces* file for both primary and secondary companion must include entries for both companions. The server entry in the *interfaces* file must use the same network name that is specified in sysservers. For information about adding entries to the *interfaces* file, see the installation documentation for your platform.

Adding entries to the *interfaces* file for client connections during fail over

To enable clients to reconnect to the failed-over companion, add a line to the *interfaces* file. By default, clients connect to the port listed in the query line of the server entry. If that port is not available (because the server has failed-over), the client connects to the server listed in the *hafailover* line of the server entry. Here is a sample *interfaces* file for a primary companion named MONEY1 and a secondary companion named PERSONNEL1:

```
MONEY1
        master tli tcp MONEY 9678
        query tli tcp MONEY 9678
        hafailover PERSONNEL1

PERSONNEL1
        master tli tcp PERSONNEL 9679
        query tli tcp PERSONNEL 9679
```

Use dsedit to add entries to the *interfaces* file. If the interfaces entries already exist, modify them to work for fail over.

See the *Adaptive Server Enterprise Utility Guide* for information about dsedit.

sybha executable

The *sybha* executable provides the ability for the Adaptive Server High Availability Basic Services Library to interact with each platform's high availability cluster subsystem. The Adaptive Server High Availability Basic Services Library calls *sybha*, which is located in *$SYBASE/$SYBASE_ASE/bin*. Before you can *sybha*, you must change its ownership and permissions. You must also edit a file named *sybhauser* in *$SYBASE/$SYBASE_ASE/install*. *sybhauser* contains a list of the users who have System Administrator privileges on the cluster. Sybase strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

As "root":

1. Add a new group named *sybhagrp*. You can either add this group to the */etc/group* file, or you can add it to your NIS maps. Add the sybase user to this group (this is the user that owns the *$SYBASE* directory). When the server is started, the sybase user runs the data server. If you have multiple servers running and different users owning the *$SYBASE* directory for each of them, each of these users must be added to the group
2. Change to the *$SYBASE/$SYBASE_ASE/bin* directory:

   ```
   cd $SYBASE/$SYBASE_ASE/bin
   ```
3. Change the ownership of *sybha* to "root":

   ```
   chown root sybha
   ```
4. Change the group for the *sybha* program to *sybhagrp*:

   ```
   chgrp sybhagrp sybha
   ```
5. Modify the file permissions for *sybha* to 4550:

   ```
   chmod 4550 sybha
   ```
6. Change to the *$SYBASE/$SYBASE_ASE/install* directory:

   ```
   cd $SYBASE/$SYBASE_ASE/install
   ```
7. Add the sybase user to the *sybhauser* file. These logins must be in the format of UNIX login IDs, not Adaptive Server logins. For example:

```
sybase
coffeecup
spooner
venting
howe
```

8 Change the ownership of *sybhauser* to “root”:

```
chown root sybhauser
```

9 Modify the file permissions for *sybhauser*:

```
chmod 600 sybhauser
```

Creating a new default device

master is the default device in a newly installed Adaptive Server. This means that any databases you create (including the proxy databases used by failover) are automatically created on the master device. Adding user databases to the master device makes it difficult to restore the master device from a system failure. To make sure that the master device contains as few extraneous user databases as possible, create a new device using disk init. Use sp_diskdefault to specify the new device as the default before you configure Adaptive Server as a companion for fail over.

For example, to add a new default device named money_default1 to the MONEY1 Adaptive Server, enter:

```
sp_diskdefault money1_default1, defaulton
```

The master device continues to also be a default device until you issue the following to suspend it as the default device:

```
sp_diskdefault master, defaultoff
```

See the *Adaptive Server Reference Manual* for more information about disk init and sp_diskdefault.

Adding the local server to *sysservers*

Use sp_addserver to add the local server in sysservers using the network name specified in the *interfaces* file. For example, if the companion MONEY1 uses the network name of MONEY1 in the *interfaces* file:

```
sp_addserver MONEY1, local, MONEY1
```

Restart Adaptive Server for this change to take effect.

Adding secondary companion to *sysservers*

Add the secondary companion as a remote server in *sysservers*:

```
sp_addserver server_name
```

By default, Adaptive Server adds the server with a srvid of 1000. You need not restart Adaptive Server for this change to take effect.

Assigning *ha_role*

To run sp_companion, you must have the ha_role on both Adaptive Servers. To assign the ha_role, issue the following from isql:

```
sp_role "grant", ha_role, sa
```

You can use the sa_role to turn the ha_role on or off for this session.

You must log out and then log in for these changes to take effect.

Installing high availability stored procedures

Note You must already have added both servers to the *interfaces* file before you can install the high availability stored procedures. If you run *installhasvss* before performing these tasks, you must reinstall all the system stored procedures.

The *installhasvss* script:

- Installs the stored procedures required for fail over (for example, sp_companion)
- Installs the *SYB_HACMP* server in sysservers

You must have System Administrator privileges to run *installhasvss*.

installhasvss is located in *$SYBASE/$SYBASE_ASE/scripts*. To execute *installhasvss*, enter:

```
$SYBASE/$SYBASE_OCS/bin/isql -Usa -Ppassword -Sservername
<../scripts/installhasvss
```

installhasvss prints messages as it creates stored procedures and creates the SYB_HACMP server.

Verifying configuration parameters

Enable the following configuration parameters before you configure Adaptive Server for fail over:

- enable CIS – enables Component Integration Services (CIS). This configuration parameter is enabled by default.
- enable xact coordination – enables Distributed Transaction Management (DTM). This configuration parameter is enabled by default.
- enable HA – enables Adaptive Server to function as a companion in a high availability system. enable HA is off by default. Restart Adaptive Server for it to take effect. This parameter causes a message to be written to your error log stating that you have started the Adaptive Server in a high availability system. You must purchase the ASE_HA license option separately. See the installation guide for your platform for information about enabling the ASE_HA license.

See the *System Administration Guide* for information about enabling configuration parameters.

Adding thresholds to the master log

Failing over, failing back, creating proxy databases, and so on, are log-intensive activities. If you do not have adequate log space, any of these activities can fail. If you have not already done so, you must add a threshold to the master log.

1. Define and execute sp_thresholdaction on the master database’s log to set a threshold on the number of pages left before a dump transaction occurs. Sybase does not supply sp_thresholdaction. See the *Adaptive Server Reference Manual* for information about creating this system procedure.
2. Place thresholds on the master log segment so it does not fill up:

```
sp_addthreshold "master", "logsegment", 250, sp_thresholdaction
```

3. Restart the primary companion for this static parameter to take effect.

Configuring the Veritas subsystem for Sybase Failover

This section assumes that you have already installed the high availability system. See your *VCS Installation Guide* and *VCS User's Guide* for information about installing and using the Veritas Cluster Server high availability system.

Installing the *HAase* agent

To install the *HAase* agent on each node of the cluster (you must have "root" permission to run these commands):

1. Change to the *$SYBASE/$SYBASE_ASE/install/veritas/HAase* directory:

   ```
   cd $SYBASE/$SYBASE_ASE/install/veritas/HAase
   ```

2. Execute the installation script:

   ```
   perl installHAase.pl
   ```

The installation script:

- Copies the *HAase* resource type file *HaaseTypes.cf* to */etc/VRTSvcs/conf/config/* on the local system
- Makes a new directory, */opt/VRTSvcs/bin/HAase*, if it does not already exist
- Copies the following agent binary and scripts to */opt/VRTSvcs/bin/HAase/* on the local system:
  - *HAaseAgent*
  - *online*
  - *offline*
  - *clean*
  - *sybhautil.pm*
  - *attr_changed*

Creating an Adaptive Server login file

Create a file that contains the Adaptive Server login information for the System Administrator and for the user you added for the fault monitor. A sample file containing a template for this information is located in: *$SYBASE/$SYBASE_ASE/install/veritas/HAase/ase_login_file*.

This file consists of two lines. The first line is the login and password for System Administrator; the second line is the monitor user login and password.

login-type<tab>*login string*
login-type<tab>*login string*

The *login-type* and the *login string* must be separated by a `tab` character.

Note If you use another file at a different location, specify the full path for the resource extension property *Dataserver_login_file* when you configure the *HAase* resource.

The default value for *login-type* is normal. Values for *login string* are in the form *login-name/password*. For example:

```
normal      sa/sa-password
normal      probe-user/probe-password
```

For security reasons, protect the *ase_login_file* so that read and write access permissions are restricted to “root”.

```
chmod 400 ase_login_file
chown root ase_login_file
chgrp  sys  ase_login_file
```

Note Sybase strongly recommends that you use a password. If you use an empty password, the agent scripts generate a warning message.

Importing the *HAase* resource type

There are two ways you can import the *HAase* resource type:

- Use the cluster GUI tool to import the new resource type, *HAase*. See your *VCS User’s Guide* for more information.

- Use cluster commands hatype and haattr to manually import the new resource type from the command line. See your VCS User Guide for more information.

Starting the *HAase* agent

You can start the *HAase* agent by either:

- Restarting the Veritas Cluster, or
- Using the cluster commands to manually start the *HAase* agent.

The second method causes no disruption. To manually start the *HAase* agent:

1 Check the status of the *HAase* agent with the *haagent* utility:

```
#haagent -display HAase
#Agent   Attribute  Value
HAase     AgentFile
HAase     Faults     0
HAase     Running    No
HAase      Started      No
```

2 Start the *HAase* agent on *myhost* with the *haagent* utility:

```
# haagent -start HAase -sys myhost
VCS:10001:Please look for messages in the log file
```

3 Check the status of *HAase* agent using the *haagent* utility:

```
# haagent -display HAase
#Agent    Attribute   Value
HAase     AgentFile
HAase     Faults      0
HAase     Running     Yes
HAase      Started       Yes
```

Adding the *HAase* resource

Each service group must contain an *HAase* resource. Table 11-1 shows the attributes of an *HAase* resource.

Table 11-1: HAase resource

Property	Datatype, dimension, and default	Description
Sybase_home	string, scalar, null	The home directory of the Adaptive Server installation, and the same as the value for the environment variable SYBASE in an Adaptive Server installation.
Dataserver_name	string, scalar, null	Name of the Adaptive Server that is supplied at the time of configuration.
Backup_server_name	string, scalar, null	Name of the Backup Server that is supplied at the time of configuration.
Monserver_name	string, scalar, null	Name of the Monitor Server that is supplied at the time of configuration.
Textserver_name	string, scalar, null	Name of the full-text search server that is supplied at the time of configuration.
Secondary_companion_name	string, scalar, null	Name of secondary companion server that is set when you run the 'sp_companion configure' command.
Dataserver_login_file	string, scalar, null	Absolute path to a file containing login information for current data server. The file consists of two lines; the first line is the login and password for System Administrator, the second line is the user login and password used for thorough probe used by the high availability agent monitor.
RUN_server_file	string, scalar, null	Absolute path to an alternative *RUN_server* file, which overwrites the default *$SYBASE/$SYBASE_ASE/install/RUN_SERVER*.
Thorough_probe_cycle	int, scalar, 3	The number of shallow probes before a thorough probe is performed.

Property	Datatype, dimension, and default	Description
Thorough_probe_script	string, scalar, null	Absolute path to an alternative file containing SQL scripts for the fault monitoring program to perform a thorough probe. If it is set to null, the agent uses the default SQL commands. For security reasons, this file should restrict write access to the owner of *$SYBASE* directory. **Note** This value is ignored by the *HAase* resource.
Debug	Boolean, scalar, 0	If set to 1 (true), the monitor logs debugging messages to *$VCS_LOG/log/HAase_A.log*; other scripts log debugging messages to *$VCS_LOG/log/engine_A.log*. The message number range is 2,000,001 and greater.
Log_max_size	int, scalar, 5000000	Maximum size for the *$VCS_LOG/log/HAase_A.log* file.
Failback_strategy	string, scalar, null	Reserved for future use.
HA_config	Boolean, scalar, 0	Reserved for future use.
Cmpstate	Boolean, scalar, 0	Reserved for future use.

Note The default value for *$VCS_LOG* is */var/VRTSvcs*.

Configuring an instance of the *HAase* resource for each service group

Configure an instance of the *HAase* resource by either:

- Using the cluster GUI tool to configure an instance of *HAase* (see your *VCS User's Guide* for more information), or,
- Using cluster commands to manually add a new resource and configure its attributes, as described below. The configuration of service group *SybASE* is shown in Figure 11-1 on page 170:

- Add the *HAase* resource:

```
#hares -add syb_ase150 HAase SybASE
VCS:10245:Resource added
NameRule and Enabled attributes must be set before agent monitors
# hares -modify syb_ase150 Dataserver_name MONEY1
# hares -modify syb_ase150 RUN_server_file  /release/rel150/ASE-
15_0/install/RUN_MONEY1
# hares -modify syb_ase150 Log_max_size 5000000
# hares -modify syb_ase150 Dataserver_login_file /release/rel150/ASE-
15_0/install/MONEY1_login
# hares -modify syb_ase150 Sybase_home  /release/rel150
# hares -modify syb_ase150 Thorough_probe_cycle 3
```

- Configure the agent to monitor the status of resource *syb_ase150*:

```
# hares -modify syb_ase150 Enabled 1
```

After you add the new resource to service group, you must establish the resource dependency between the *HAase* resource and other storage and network access resources access.

Use the following cluster commands to establish a resource dependency between *syb_ase150* and resources of types *Mount*, *Volume*, and *IP* (refer to Figure 11-1 for more details):

```
# hares -link syb_ase150 ha1_mnt_ase
# hares -link syb_ase150 ha1_mnt_fsdb
# hares -link syb_ase150 vrtsdg1_vol_master
# hares -link syb_ase150 vrtsdg1_vol_procs
#hares -link syb_ase150 ha1_ip
```

Configuring companion servers for failover

This section discusses how to configure the Adaptive Servers as primary and secondary companions in a high availability system.

Adding user and login for high availability monitor

Create a special user and login for the monitor for each data server associated with the *HAase* resource. Use isql to connect to the data servers and issue:

```
sp_addlogin probe_ase, password
sp_adduser probe_ase
```

Note During Adaptive Server configuration, the System Administrator should take into account that the user and login used for probe actually reduces by one the total number of connections available for other purposes.

For more information about storing the monitor login information, see “Creating an Adaptive Server login file” on page 177.

Running *sp_companion* with *do_advisory* option

You must configure the secondary companion with sufficient resources to perform the work of both servers during failover. The secondary companion may have attributes that will prevent a successful cluster operation. For example, if both the primary and secondary companions are configured for 250 user logins, during failover, the secondary companion has the resources for only half the number of potential user logins necessary. Instead, configure both MONEY1 and PERSONNEL1 for 500 user logins.

sp_companion do_advisory checks the configuration options on both the primary and the secondary companion to make sure a cluster operation (such as configuring an Adaptive Server as a secondary companion) will be successful. sp_companion do_advisory advises you of any configuration options that should be changed.

See Chapter 6, “Running do_advisory” for a complete description of the sp_companion do_advisory option.

Verifying the high availability agent

Because machines running the Solaris operating system can support different cluster software, sp_companion includes the show_cluster option to query the high availability agent currently running and the set_cluster option to set the high availability agent.

If you are running the Veritas Cluster Server subsystem, you must specify the cluster with sp_companion. Adaptive Server assumes it is running the cluster software for your operating system unless you specify otherwise.

The syntax is:

sp_companion *companion_server_name*, [show_cluster]
sp_companion *companion_server_name*, [set_cluster, "SC-3.0"|"VCS-HAase"]

To change the Adaptive Server to use the *HAase* agent for the Veritas Cluster:

```
sp_companion MONEY1, set_cluster, "VCS-HAase"

The current cluster is set to VCS-HAase
```

Note Do not change to another high availability agent type when Adaptive Server is configured for normal companion mode on your VCS system

Creating an asymmetric companion configuration

To configure the primary companion asymmetrically, issue this command from the secondary companion:

sp_companion "*primary_server_name*", configure, NULL, *login_name*, *password*

Where:

- *primary_server_name* – the name of the primary Adaptive Server as defined in the *interfaces* file entry and in sysservers.
- *login_name* – the name of the user performing this cluster operation (this person must have the ha_role).
- *password* – the password of the person performing this cluster operation.

Note You must execute the above command *only* from the secondary companion.

This example configures an Adaptive Server named MONEY1 as a primary companion. Issue the following command from the secondary server PERSONNEL1:

```
sp_companion "MONEY1", configure, NULL, sa, Odd2Think
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
(1 row affected)
(1 row affected)
```

```
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'PERSONNEL1' and 'MONEY1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

If user databases are created during the sp_companion configuration, you see messages similar to these:

```
Step: Created proxy database 'pubs2'
 Step: Proxy status for database has been set. Please Checkpoint the database
'pubs2'
 Step: Server configured in normal companion mode Starting companion watch
thread
```

Configuring for symmetric configuration

After you configure your companions for asymmetric failover, you can configure them for symmetric configuration. In a symmetric configuration, both servers act as primary and secondary companions. See Figure 3-2 on page 22 for a description of symmetric configuration.

Issue sp_companion from the primary companion to set it up for symmetric configuration. You use the same syntax as the asymmetric setup, except you cannot use the with_proxydb option. See Creating an asymmetric companion configuration, for a description of the syntax for sp_companion.

The following example adds an Adaptive Server named MONEY1 as the secondary companion to the Adaptive Server named PERSONNEL1 (issue this command from primary companion MONEY1):

```
sp_companion 'PERSONNEL1', configure, null, sa, Think2Odd
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
Server 'PERSONNEL1' is alive and cluster configured.
```

```
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'MONEY1' and 'PERSONNEL1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

Note The *login_name* and *password* in the above sp_companion configure command cannot be null. After you successfully execute sp_companion configure, the operating system creates a new file, */etc/VRTSvcs/conf/config/ha_companion.remote_server_name*. This file should have read and write access only for the user who runs the server; otherwise, security may be compromised.

Administering Sybase Failover

This section includes information about using Sybase Failover.

During failover

When the primary node fails over to the secondary node, the service group that is online on the primary node switches to the secondary node. At this point, all the resources except the Adaptive Server binary are online on the secondary node. The Adaptive Server on the secondary node takes over these resources.

Note When one service group fails over from the primary host to the secondary host, the Adaptive Server on the secondary host takes over all primary resources, but the Adaptive Server on the failed-over group is not started.

Failing back to the primary companion

The failback switches the service group that originally belonged to the primary node from the secondary node back to the primary node and brings it online.

To initiate a failback:

- After your primary node is ready to take back the service group, issue the following from the secondary companion:

  ```
  sp_companion primary_companion_name, prepare_failback
  ```

  where *primary_companion_name* is the name of primary companion. This command switches the primary node's service group from secondary node back to primary node.

- Make sure the primary nodes service group is successfully switched to primary node by issuing this command from the command line:

  ```
  hastatus -group service_group_name
  ```

  This command displays the status of the primary nodes service group.

- To resume normal companion mode, issue the following from the primary companion:

  ```
  sp_companion secondary_companion_name, resume
  ```

where *secondary_companion_name* is the name of the secondary companion server.

Note You cannot connect clients with the failover property to Adaptive Server until you issue sp_companion resume. If you do try to reconnect them after issuing sp_companion prepare_failback, the client stops responding until you issue sp_companion resume.

Suspending normal companion mode

Suspended mode temporarily disables the ability of the primary companion to fail over to the secondary companion. To switch from normal companion mode to suspended mode:

1. As “root”, use hares to change the attribute *Critical* for the *Sybase* resource on primary node to 0. The syntax is:

   hares -modify *name_of_Sybase_resource* Critical 0

2. Suspend normal companion mode. From the secondary companion, issue:

   sp_companion *companion_name*, suspend

Resuming normal companion mode

To move from suspended mode to normal companion mode:

1. Make sure both companions are running. As “root”, issue:

   ```
   hastatus
   ```

2. Change the *Critical* attribute of the *Sybase* resource on the primary node to 1. As “root”, issue:

   hares -modify *name_of_Sybase_resource* Critical 1

3. Resume normal companion mode. From the secondary companion, issue:

```
sp_companion primary_companion_name, resume
```

Note You cannot connect clients with the failover property until you issue sp_companion resume. If you do try to reconnect them after issuing sp_companion prepare_failback, the client hangs until you issue sp_companion resume.

Dropping companion mode

Dropping companion mode is irreversible; you must reconfigure the companion servers before they fail over in a high availability system and retain all the functionality that Sybase Failover provides. However, the companion server is still monitored by the high availability agent. Before dropping companion mode, you must first disable the agent to monitor Adaptive Server. Issue the following command:

```
hares -modify Sybase_resource_name Enabled 0
```

To drop companion mode, issue:

```
sp_companion companion_name, "drop"
```

Troubleshooting failover for Veritas Cluster

This section includes troubleshooting information about common errors.

- Turn on debugging for Adaptive Server. Use trace flag 2205 to get high-availability-related debugging information. The following isql session turns on debugging and redirects messages to the console:

  ```
  dbcc traceon(2205)
  dbcc traceon(3604)
  ```

- When your system reports errors, first check the error log. Any error message with a message ID greater than 2,000,000 is an error message from the *HAase* agent.

- The VCS error logs are located in */var/VRTSvcs/log/log_name.log*. Among them, the *engine_A.log* is an important source of information.

  The system error log is located in */var/log/syslog*.

- Sybase recommends that you use the following monitoring tools to find information about your system:
  - *hagui* – a GUI tool,
  - *hastatus* – a command line tool.
  - The following trigger scripts, which alert you of events on the VCS system: *injeopardy*, *preonline*, *postonline*, *postoffline*, *resnotoff*, *resfault*, *sysoffline*, *violation*.
- When one service group fails over from the primary host to the secondary host, the Adaptive Server on the secondary host takes over all its resources, but the Adaptive Server on the failed-over group is not started, and VCS may indicate that the HAase resource is "faulted" on the secondary host. Use the following command on the secondary host to clear the state after fail over:

```
hares -clear sybase_res_name -sys
secondary_host_name
```

Recovering from a failed *prepare_failback*

During fail back, if prepare_failback was executed successfully on the secondary companion but the primary companion does not start:

1. Check the primary companion's error log and the cluster error log to identify why the server did not start, and correct the problems.
2. To clear the FAULTED state of the *HAase* resource, issue:

   hasybase clear *HAase_res_name*
3. As "root", move the primary logical host back to the secondary node:

   hagrp -switch *primary_service_group* -to *secondary_host_name*
4. Log in to the secondary companion and issue:

   ```
   dbcc ha_admin ("", "rollback_failback")
   ```

   Your companion servers should both be back in failover mode. For more information about dbcc ha_admin, see "dbcc options for high availability systems" on page 217.
5. Reissue sp_companion...prepare_failback on the secondary companion.

Location of the logs

Use the information in these logs to debug your high availability system:

- Adaptive Server error log (defined in the RUNSERVER file).
- Veritas cluster log, located in */var/VRTSvcs/log/engine_A.log*.
- Operating system messages are in */var/log/syslog*.
- *HAase* agent log, located in */var/VRTSvcs/log/HAase_A.log*.

Upgrading from an agent of resource type *Sybase*

If you are using a high availability agent from an earlier release of VCS for resource type *Sybase* and you want to use the new agent for the resource type *HAase*, switch from the old to the new agent:

1. Install the new agent for resource type *HAase*. See “Installing the HAase agent” on page 176.
2. Import the new resource type, *HAase*. See “Importing the HAase resource type” on page 177.
3. Start the new agent for resource type, HAase. See “Starting the HAase agent” on page 178.
4. Disable the Sybase resource monitoring:

```
haconf -makerw
hares -modify Sybase_resource_name Enabled 0
haconf -dump -makero
```

5. Drop the existing resource instances of Sybase from the service group.

```
haconf -makerw
hares -delete sybase_resource_name
haconf -dump -makero
```

6. Configure a new resource instance of resource type *HAase*. See “Adding the HAase resource” on page 178.
7. Enable the new HAase resource:

```
hares -modify HAase_resurce_name Enabled 1
```

C H A P T E R 1 2

Configuring Adaptive Server for Failover on Windows

This chapter lists the steps necessary to configure Adaptive Server for failover on Windows.

Hardware and operating system requirements

High availability requires the following hardware and system components:

- A microsoft certified cluster. See your microsoft documentation for a description of what constitute a certified cluster
- The following Operating System and Cluster Server combination are supported:
  - Windows 2000 and Microsoft Cluster Server 5.0
  - Windows 2003 and Microsoft Cluster Server 5.2
- The operating system and cluster server software are installed on both nodes, residing on local disk storage with the same path on both nodes (for example, *C:\WINNT* and *C:\WINNT\Cluster*). See your Microsoft documentation for a description of what constitutes a certified cluster.

- Adaptive Server software installed on both cluster nodes, with the Sybase release directory (*%SYBASE%*) residing on local disk storage on the nodes (rather than shared disk storage).
- Sybase data devices on shared disk drives.
- Both Adaptive Servers must have an independent shared disk (or set of shared disks) for their data device storage. This area of shared disk stores all the companion database device files. Each companion can use only its own area of shared disk for its data devices.

This section discusses how to prepare Adaptive Server for a high availability configuration.

Installing Adaptive Servers

Install both the primary and secondary Adaptive Servers. Do not use the machine name as the Adaptive Server name.

The primary companion can be either a newly installed Adaptive Server, or it can be upgraded from an earlier version of Adaptive Server with existing databases, users, and so on.

The secondary companion must be a newly installed Adaptive Server without any user logins or user databases. This ensures that all user logins and database names are unique within the cluster. After configuration for failover is complete, you can add user logins and databases to the secondary companion.

Place all data and log devices (including the master and sybsystemprocs devices) on dedicated shared disks, and the corresponding cluster resources must be in a dedicated Microsoft Cluster Server group (MSCS).

If you are installing on the local disk, make sure any databases are created on the shared disk.

Changing the domain administration account

After you install the Adaptive Servers, the servers run under an operating system account known as “LocalSystem”. For a clustered operation, the Adaptive Server must be able to communicate over the network to the other cluster node using Windows operating system services. Because the LocalSystem account is not allowed to access any Windows operating system services related to the network, it cannot communicate with the other node. You must reconfigure both Adaptive Servers to run under a domain administration account.

To configure an Adaptive Server to run as a domain administrator:

1. Start the Services application from the Windows Control Panel | Administrative Tools.
2. Select the service corresponding to the Adaptive Server. Its service name uses this syntax:

   ```
   Sybase SQLServer _ server_name
   ```

   For example, Sybase SQLServer_MONEY1
3. Double Click on *Sybase SQLServer_server_name*, for the Properties dialog box.
4. Select Log on tab.
5. Select This Account from Log on tab.
6. Enter a valid domain administration account name (for example, *MYDOMAIN\AdminUser1*). Enter and confirm this account’s password.
7. Click OK.
8. Restart the Adaptive Server.

Adding entries for both Adaptive Servers to *sql.ini*

The *sql.ini* file must include entries for both companions. The server entry in the *sql.ini* file must use the same network name that is specified in *sysservers*. For information about adding entries to *sql.ini*.

Adding entries to *sql.ini* for client connections

By default, clients connect to the port listed in the query line of the server entry. If that port is not available (because that server has failed-over), the client connects to the server listed in the hafailover line of the server entry in *sql.ini*. Here is a sample *sql.ini* file for a primary companion named MONEY1 and a secondary companion named PERSONNEL1:

```
[MONEY1]
    query=TCP,FN1,9835
    master=TCP,FN1,9835
    hafailover=PERSONNEL1

[PERSONNEL1]
    query=TCP,HUM1,7586
    master=TCP,HUM1,7586
    hafailover=MONEY1
```

Use dsedit to add entries to the *sql.ini* file. If *sql.ini* entries already exist, modify them to work for fail over.

Creating a new default device other than master

The master device is the default device in a newly installed Adaptive Server. This means that, if you create any databases (including the proxy databases used by failover), they are automatically created on the master device. However, adding user databases to master makes it more difficult to restore the master device from a system failure. To make sure that the master device contains as few extraneous user databases as possible, use disk init to create a new device (make sure this device is on a dedicated shared disk). Use sp_diskdefault to specify the new device as the default before you configure Adaptive Server as a companion for fail over. For example, to add a new default device named *money1_default1* to the MONEY1 Adaptive Server, enter:

```
sp_diskdefault MONEY1_default1, defaulton
```

The master device continues to also be a default device until you suspend it as the default device:

```
sp_diskdefault master, defaultoff
```

See the *Adaptive Server Reference Manual* for more information about disk init and sp_diskdefault.

Adding the primary companion as a local server

Use sp_addserver to list the local server as the local server in *sysservers* using the network name specified in the *sql.ini* file. For example, if the companion MONEY1 uses the network name of MONEY1 in the *sql.ini* file, enter:

```
sp_addserver MONEY1, local, MONEY1
```

You must restart Adaptive Server for this change to take effect.

Adding secondary companion to *sysservers*

Add the secondary companion as a remote server in sysservers:

```
sp_addserver server_name
```

By default, Adaptive Server adds the server with a srvid of 1000. You do not need to restart Adaptive Server for this change to take effect.

Running *insthasv* to install high availability stored procedures

Run the *insthasv* script on both Adaptive Servers. *insthasv*:

- Installs the stored procedures required for fail over (for example, sp_companion).
- Installs the SYB_HACMP server in sysservers.

You must have System Administrator privileges to run the *insthasv* script.

insthasv is located in the *%SYBASE%\%SYBASE_ASE%\scripts* directory. To execute *insthasv*, enter:

```
%SYBASE%\%SYBASE_OCS%\bin\isql -Usa -Ppassword
-Sservername
%SYBASE\%SYBASE_ASE%\scripts\insthasv
```

insthasv prints messages as it creates stored procedures and creates the SYB_HACMP server.

Assigning *ha_role* to the System Administrator

You must have the ha_role on both Adaptive Servers to run sp_companion. To assign the ha_role, issue the following from isql:

```
sp_role "grant", ha_role, user_name
```

Log out and then log back in to the Adaptive Servers for the change to take effect.

Verifying configuration parameters

Enable the following configuration parameters before you configure Adaptive Server for failover:

- enable CIS – enables Component Integration Services (CIS). This configuration parameter is enabled by default.
- enable xact coordination – enables Distributed Transaction Management (DTM). This configuration parameter is enabled by default.
- enable HA – enables Adaptive Server to function as a companion in a high availability system. enable HA is off by default. This configuration is static, so you must restart Adaptive Server for it to take effect. This parameter causes a message to be written to your error log stating that you have started the Adaptive Server in a high availability system.

  See the *System Administration Guide* for information about enabling configuration parameters.

Running *sp_companion* with *do_advisory* option

You must configure the secondary companion with sufficient resources to perform the work of both servers during failover. The secondary companion may have attributes that will prevent a successful cluster operation. For example, if both the primary and secondary companions are configured for 250 user logins, during failover, the secondary companion has the resources for only half the number of potential user logins necessary. Instead, configure both MONEY1 and PERSONNEL1 for 500 user logins.

sp_companion do_advisory checks the configuration options on both the primary and the secondary companion to make sure a cluster operation (such as configuring an Adaptive Server as a secondary companion) will be successful. sp_companion do_advisory advises you of any configuration options that should be changed.

See Chapter 6, “Running do_advisory” for a complete description of the sp_companion do_advisory option.

Configuring Windows

You can configure failover on Windows either from the command line or using the Cluster Administrator. Using the command line is described below; using the Cluster Administrator is described in “Configuring Windows using Cluster Administrator” on page 199.

If you are configuring for a symmetric setup, you must first configure the cluster for an asymmetric setup.

Asymmetric setup from the command line

To configure the primary companion asymmetrically, issue this command from the secondary companion:

sp_companion "*primary_server_name*", configure, NULL, *login_name*, *password*

Where:

- *primary_server_name* – the name of the primary Adaptive Server as defined in the *interfaces* file entry and in sysservers.
- *login_name* – the name of the user performing this cluster operation (this person must have the ha_role).
- *password* – the password of the person performing this cluster operation.

Note You must execute the above command *only* from the secondary companion.

This example configures an Adaptive Server named MONEY1 as a primary companion. Issue the following command from the secondary server PERSONNEL1:

```
sp_companion "MONEY1", configure, NULL, sa, Odd2Think
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
Server 'MONEY1' is alive and cluster configured.
```

```
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'PERSONNEL1' and 'MONEY1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

If user databases are created during the sp_companion configuration, you see messages similar to these:

```
Step: Created proxy database 'pubs2'
 Step: Proxy status for database has been set. Please Checkpoint the database
'pubs2'
 Step: Server configured in normal companion mode
 Starting companion watch thread
```

Symmetric configuration from the command line

You must configure your companions for an asymmetric setup before you can configure them for a symmetric setup. In a symmetric configuration, both servers act as primary and secondary companions.

Issue sp_companion from the secondary companion to configure it for symmetric setup. Use the same syntax as for the asymmetric setup, except you cannot use the with_proxydb option.

The following example adds an Adaptive Server named MONEY1 as the secondary companion to the Adaptive Server named PERSONNEL1. Issue the following command from the server MONEY1:

```
1> sp_companion 'PERSONNEL1', configure, null, sa, MyPassword,
sa_cluster_login, MyClusterPassword
2> go
```

```
Server 'MONEY1' is alive and cluster configured.
Step: Access verified from Server:'MONEY1' to Server:'PERSONNEL1'
Server 'PERSONNEL1' is alive and cluster configured.
Step: Access verified from Server:'PERSONNEL1' to Server:'MONEY1'
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
(1 row affected)
.....
Step: Companion servers configuration check succeeded
Step: Server handshake succeeded
Step: Master device accessible from companion
Step: Added the servers 'MONEY1' and 'PERSONNEL1' for cluster config
Step: Server configuration initialization succeeded
Step: Synchronizing server logins from companion server
Step: Synchronizing remoteserver from companion server
Step: Synchronizing roles from companion server
Step: Synchronizing server-wide privs from companion server
Step: User information syncup succeeded
Step: Server configured in normal companion mode
```

Configuring Windows using Cluster Administrator

This section assumes that the Microsoft Cluster Server is installed on your system. Use the following command on each node of the cluster to install the new resource type “Sybase Companion Server” and Cluster Administrator extensions:

```
%SYBASE%\%SYBASE_ASE%\bin\sybcpnin.exe -s
```

%SYBASE% is the release directory for the Adaptive Server executable.

To configure Sybase Failover on Microsoft Cluster Server:

1. Create a cluster group. See you Microsoft Cluster Server documentation for information, then move the dedicated shared disks for the companion you are configuring into the cluster group you created. See your Microsoft Cluster Server documentation for information.
2. In Select | Administrative Tools | Cluster Administrator.
3. In Select File | Resource | New Resource.
4. On the New Resource window, enter:

- Name – the name of the package you are configuring.
- Description – a brief description of the package. This field is optional.
- Resource type – select Sybase Companion Server.
- Group – the group in which you want this cluster included. This field is optional.
- Click OK to create this group.

5. Select Change Group, then select the name of the group to move the physical disk resources (data and log devices) of the primary companion to this new group. Click OK. You see the Possible Owners window.
6. The Possible Owners window specifies the nodes on which this resource can be brought online. Both nodes must be listed as possible owners in the right pane of this window. If the list is not correct, use Add or Remove to correct it. Select Next.
7. The Dependencies window lists the services that must be brought online before starting this resource. Make sure the shared disk device is listed as a dependency. Select Next.
8. On the ASE Server Information window, enter:
   - The name of the Adaptive Server you are configuring as the primary companion.
   - The System Administrator login for this companion (this must be sa
   - The System Administrator password for this login
   - A password check to make sure the password you entered is correct

     Select Next
9. In the Companion Server Information field, enter the name of the Adaptive Server that is to be the secondary companion.

   To configure the companions in a symmetric setup, select Symmetric, then click Next.
10. On the Cluster Parameters window, select Use System Generated Cluster Login. This provides a system-generated setup login that is used when the cluster logs into the Adaptive Server. Click Next. (Alternatively, you can create the login on the primary companion, assign it both the sa_role and ha_role before you perform this step.)

11 (Optional) On the Setup Options window, enter the path to the error log that records the steps made during this configuration. This log may be helpful if you need to call Technical Support. Select Finish.

12 The next window lists the configuration that you have selected for this cluster configuration. Select Back and reenter the appropriate data to change any information. When the configuration is correct, select Next to configure this cluster resource.

   You see a series of messages as the two Adaptive Servers are configured. If any error messages appear, address the issues and select Next. You do not have to start over again.

   When the configuration is complete, the companions are in normal companion mode in either an asymmetric or symmetric setup, depending on what you specified in the Companion Server Information window.

Configuring and securing Microsoft Cluster Server

This section describes how to set the pending timeout and the failback properties for the primary companion's cluster resource. If you are configuring a symmetric setup, you must set the properties for both companions.

- When the Microsoft Cluster Server (MSCS) takes the cluster resource for the primary companion online or offline, it allows for a certain amount of time to perform its processing before assuming that the operation will not complete. By default, this amount of time is 180 seconds (3 minutes). This value is known as the "pending timeout," and can be set for each resource in the MSCS cluster.

  For the Sybase Companion Server resource, the pending timeout period must be long enough to start the Adaptive Server, run recovery on its databases, and possibly execute sp_companion resume. For companions that have large databases, it is likely that this processing will take more than 180 seconds, and you should set the pending timeout property to a higher number.

- If you are repairing or restarting the primary node after a failover, MSCS automatically fails back to the primary node as soon as the primary node comes back up unless the MSCS group containing the Sybase Companion Server resource is set to not automatically fail back.

To configure these properties:

1 Select Start | Administrative Tools | Cluster Administrator.
2 From the Cluster Administrator window, select Configure an Existing Resource.
3 Select Advanced from the Properties window.
4 Change the Pending Timeout property to a value that is comfortably larger than the longest time the server takes to recover, plus about two minutes.
5 Select Failback and make sure the Prevent Failback radio button is selected.
6 Click OK.

Checking the MSCS configuration

Use the Cluster Administrator to verify the configuration of MSCS is correct:

- There should be a new cluster resource of type “Sybase Companion Server” for each companion that can fail over. An asymmetric setup, has one of these resources; a symmetric setup, has two of these resources.

  The names of these resources are same as the names of the primary and secondary companions they are managing. For example, if you created an asymmetric setup where PERSONNEL1 is the secondary companion for MONEY1, there should be a new cluster resource called MONEY1.
- The cluster resources described above belong in their own group, named *companion_name_GRP*, where *companion_name* is the name of the companion server resources it contains.
- The cluster group should contain one for each physical cluster disk upon which the companion’s data devices reside.

Securing the MSCS cluster

The Sybase integration software that interfaces MSCS to Adaptive Server requires a login (with ha_role and sa_role) and password for the Adaptive Server you are configuring as a companion server. This allows the integration software to log in to Adaptive Server to control it for cluster operations.

The login and its password are stored as part of the Windows Registry Cluster Database (under *HKLM\Cluster*). Even though this information is encrypted to prevent users from obtaining privileged login information, Sybase recommends that you protect the appropriate area of the registry using a Discretionary Access Control List (DACL) that allows only administrators access to the information.

To encrypt the cluster login and password:

1. Execute *REGEDT.EXE*.
2. From the window titled HKEY_LOCAL_MACHINE on Local Machine, double-click the Cluster folder, then select the Resources key.
3. Select Permissions from the Security menu. A dialog called Registry Key Permissions displays.
4. Select Remove from the Registry Key Permissions dialog box to remove all entries except CREATOR OWNER and *machine_name\Administrators*, where *machine_name* is the local machine name. This prevents anyone except administrative users from reading this part of the Registry.
5. Click OK.

Repeat this process on both cluster nodes.

Troubleshooting

This section includes troubleshooting information about common errors.

Error message 18750

If a companion server issues error message 18750, check the *@@cmpstate* of your servers. If your primary companion is in normal companion mode, but the secondary companion is in secondary failover mode, your cluster is in an inconsistent state, from which you must manually recover. This inconsistent state may be caused by an sp_companion 'prepare_failback' command failing on the secondary companion. You can determine whether this happened by examining the log on the secondary node. To recover from this:

1. Restart the secondary companion.

2 Repair all databases marked “suspect.” To determine which databases are suspect, issue:

```
select name, status from sysdatabases
```

Databases marked suspect have a status value of 320.

3 Allow updates to system tables:

```
sp_configure "allow updates", 1
```

4 For each suspect, failed-over database, perform the following:

```
1> update sysdatabases set status=status-256 where name='database_name'
2> go
1> dbcc traceon(3604)
2> go
1> dbcc dbrecover(database_name)
2>go
```

5 From the secondary companion, issue:

sp_companion *primary_companion_name*, prepare_failback

Make sure that this command executes successfully.

6 Make sure the primary companion is up and running, then resume normal companion mode. From the primary companion, issue:

sp_companion *secondary_companion*, resume

7 Make sure the Sybase Companion Server resource for the companion relationship is located on the primary node (use Move Group to move it if not) and is offline. Then use the Cluster Administrator to bring the resource online.

Recovering from a failed *prepare_failback*

During fail back, if prepare_failback was executed successfully on the secondary companion but the primary companion does not start, perform the following to roll back and then reissue the prepare_failback command:

1 Check the primary companion’s system event log to find the reason the server does not start, and correct the problems.

2 Check that the MSCS group that contains the resource for the primary server is located on the secondary node. If not, it does use Move Group to move it.

3 Log in to the secondary companion and issue:

```
dbcc ha_admin ("", "rollback_failback")
dbcc ha_admin ("", "rollback_failover")
```

4. Verify that the secondary companion is in normal companion mode.

5. Check that the MSCS resource for the primary server is online. If it is not, manually bring the resource online using the Cluster Administrator.

6. As "root," start the package for the primary companion to run on secondary node.

   ```
   /usr/sbin/cmrunpkg -n <secondary_node>
   primary_companion_package_name
   ```

   Your secondary companion is now in failover mode. Once you verify that everything is ready for the primary companion to fail back to normal companion mode, you can either issue sp_companion...prepare_failback or use the Move Group option.

APPENDIX A

Troubleshooting Secondary Points of Failure

This appendix discusses common problems that result from secondary points of failure with the high availability system.

Troubleshooting with *dbcc ha_admin*

A second point of failure for a high availability system occurs when the primary companion is already in failover mode, and another point in the system fails. Sybase Failover includes dbcc ha_admin, which addresses second points of failure.

See "dbcc options for high availability systems" on page 217 for information about dbcc ha_admin syntax and a complete list of options.

After you run *installhasvss* on a companion server, you should re-run this script only if the stored procedures it creates are corrupted, or to install a newer version of *installhasvss*. dbcc ha_admin (' ', state_machine) temporarily moves the companion to single-server mode so *installhasvss* can safely reinstall or update the stored procedures. If you attempt to run *installhasvss* without running dbcc ha_admin, the companion issues the following error message:

```
Server is not in single-server mode.
Please run dbcc ha_admin (' ', 'state_machine', 'halt') and try again
```

Note Because dbcc ha_admin moves the companion to single-server mode, run this command only when there is no concurrent activity.

❖ **Rerunning *installhasvss*:**

1. Make a note of the srvnetname for the SYB_HACMP entry in sysservers. When it is configured for Sybase Failover, SYB_HACMP points to the companion server's svrnetname (for example, the srvnetname for the SYB_HACMP entry on companion server MONEY1 is PERSONNEL1).
2. Run dbcc ha_admin to move the companion to single-server mode:

   ```
   dbcc ha_admin (' ', 'state_machine', 'halt')
   ```
3. Where `' '` is used as an empty placeholder.
4. Re-run *installhasvss*. After *installhasvss* finishes, the companion server reverts to its original mode.

If the node crashes after you perform step 2, above, the srvnetname of the remote server is removed from sysservers. If this occurs, add the name of the remote server to sysservers by issuing:

```
sp_addserver SYB_HACMP, null, 'remote_server_svrnetname'
```

Run dbcc ha_admin to return the companion server to its original mode:

```
dbcc ha_admin (' ', 'state_machine', 'restart')
```

Using *dbcc ha_admin* for rolling back failover commands

dbcc ha_admin includes the rollback_failover and rollback_failback options. Use these dbcc options as a last resort; only System Administrators who are knowledgeable about the high availability system should issue them.

These options allow you to roll back the steps performed by:

- A fail over that did not complete because of either a problem with the high availability system (for example, all the disks were not available during fail over, so the companion mark all databases as suspect) or because the secondary companion crashed during fail over.
- A sp_companion...prepare_failback command that did not complete because of either a problem with the high availability system or because the primary companion did not restart during failback.

There are platform-specific steps you must perform before you issue either dbcc ha_admin rollback_failover or rollback_failback. See the configuration chapter for your platform in this manual for information.

Using @@*hacmpservername*

Use the *@@hacmpservername* global variable to determine the name of the companion server:

```
select @@hacmpservername
```

For example, if you issue this command from primary companion MONEY1 you see output similar to this:

```
select @@hacmpservername

------------------------------
PERSONE1

(1 row affected)
```

Error messages

The following are common error messages you might receive.

- Error message 18805:

```
Warning: Server '%1!' is configured for ASE HA services. The network name
in its SYB_HACMP entry does not point to the local server. If this is due
to an earlier failed cluster command, refer to the System Administration
Guide.
```

  This error occurs when the SYB_HACMP network name is set to another server's network name. Use sp_addserver to set the srvnetname of SYB_HACMP to the local server's network name. During normal companion mode, the svrnetname for SYB_HACMP *always* points to the remote companion's network name, and should *never* be changed.

- Error message 18769:

```
The HA cluster is currently in use for other cluster operations. Retry
the command later. If the problem persists, it may be due to an earlier
failed cluster command; check the System Administration Guide (Error
%1!).
```

All cluster operations receive a cluster-wide lock and release the lock when they are done. This error occurs when you perform a cluster operation before the previous cluster operation releases the cluster-wide lock. For information about releasing a cluster-wide lock, see “Cluster locks in a high availability node” on page 16.

- Error message 18836:

```
Configuration operation '%1!' can not proceed due to Quorum AdvisoryCheck
failure. Please run 'do_advisory' command to find the incompatible
attribute and fix it
```

sp_companion checks a series of attributes to confirm the compatibility between the companion servers. One of your companion servers has attribute settings that are not compatible with the other companion server. Run do_advisory for a list of the problem attributes. See Chapter 6, “Running do_advisory”.

APPENDIX B

Changes to Commands, System Procedures, and Databases

This appendix discusses changes to commands, system procedures, and system databases when Adaptive Server is configured for failover.

Changes to commands

Table B-1: Changes to commands

Command	Asymmetric setup	Symmetric setup
create role add role drop role alter role	During normal companion mode, any changes made to the primary companion with these commands are synchronized with the secondary companion server. During failover mode, the secondary companion is updated with create role, create role, and alter role changes. The primary companion is updated with this information during the failback mode. You cannot run drop role during failover mode. You cannot run these commands during suspended mode.	These commands have the same behavior in symmetric configuration as they have in asymmetric configuration.
create database	During normal companion mode, create database creates a proxy database on the secondary companion. During failover mode, create database cannot run because the primary companion's model database is not in failover mode. During the failback mode, create database is allowed only under special circumstances. You cannot run create database during suspended mode.	create database has the same behavior in symmetric setup as it has in asymmetric setup.
alter database	During normal companion mode, alter database adds 2MB of space to the database.	alter database has the same behavior in symmetric setup as it has in asymmetric setup.

Command	Asymmetric setup	Symmetric setup
disk init	During normal companion mode, disk init has the same behavior as in symmetric configuration. During failover mode, the secondary server can add devices to its local set by ensuring the unique device name space. During suspended mode, disk init cannot run.	During normal companion mode, disk init ensures that the secondary companion does not already have a disk with same physical and logical name, and that the secondary companion server can access the device. disk init is not allowed to run during failover mode because it cannot verify access to the disk on the primary companion. However, disk init is allowed to perform some special duties such as log expansion. During suspended mode, disk init cannot run.
disk mirror disk remirror disk unmirror	Sybase mirroring is not supported for high availability.	
disk resize	disk resize does not alter the behavior of Adaptive Server running in a high availability environment. Adaptive Server assumes that the disk space allocated by the file system comes from a shared physical disk and not from a disk local to the primary server.	
drop database	During normal companion mode, drop database informs the companion server to free the database name space and may request to drop the proxy database. During failover mode, there are no restrictions on the drop database command. During suspended mode, you cannot run drop database.	This command has the same behavior in symmetric setup as is has in asymmetric setup.
grant revoke	During normal companion mode, changes to permissions from these commands are synchronized across the companion servers. During failover mode, there are no restrictions for grant. You cannot run revoke during failover mode. During suspended mode, you cannot issue either grant or revoke.	This command has the same behavior in symmetric setup as is has in asymmetric setup.
shutdown shutdown with nowait		

Changes to system procedures

Using proxy databases guarantees unique database names with the cluster, but it does not guarantee unique database IDs. The same database may have a different database ID before and after fail over. Because database IDs may change, system procedures are automatically recompiled after fail over to make sure they do not use an incorrect or out-of-date database or object ID from sysprocedures.

During failover mode, Adaptive Server performs a domain check to make sure that, if there are system procedures with duplicate names in the two Adaptive Servers, the system procedure in the correct domain is run. This domain check is performed only in failover mode.

System procedures hold table lock

System procedures cannot acquire explicit table locks on system tables. However, in a system using Sybase Failover, system procedures on both companions may attempt to modify the system tables at the same time.

If you issue a system procedure to modify a system table, the system procedure acquires a table lock on the proxy table of the system table it is modifying. That is, if you issue a system procedure to alter the syslogins system table on primary companion MONEY1, the system procedure acquires a table lock on the syslogins proxy table on the secondary companion, PERSONNEL1.

The system procedure then modifies the syslogins proxy table on PERSONNEL1, and the syslogins proxy table updates the syslogins system table on MONEY1. After the changes are committed, the table locks on syslogins are released.

Any other system procedures that must make changes to the same system table are in a queue for that table. After the lock is released, they acquire the table lock.

You can use the sp_configure "dtm lock timeout period" command to set the amount of time system procedures wait in the queue for the locked proxy system table. For more information, see the dtm lock timeout period in "Setting Configuration Parameters" in the *System Administration Guide*.

System procedures that synchronize changes

The following lists the system procedures that synchronize changes between the primary companion and the secondary companion. For example, if you use sp_droplanguage to drop the French language from the primary companion, sp_droplanguage also drops it from the secondary companion.

You can issue these system procedures from any database.

sp_addexternlogin	sp_dropremotelogin
sp_addlanguage	sp_drop_resource_limit
sp_addlogin	sp_dropserver
sp_addremotelogin	sp_drop_time_range
sp_add_resource_limit	sp_locklogin
sp_addserver	sp_modifylogin
sp_add_time_range	sp_modify_resource_limit
sp_defaultdb	sp_modify_time_range
sp_defaultlanguage	sp_password
sp_dropexternlogin	sp_remoteoption
sp_droplanguage	sp_serveroption
sp_droplogin	sp_setlangalias

The following system procedures synchronize changes between the primary companion and the secondary companion when you issue them from the master database.

- sp_addalias
- sp_addgroup
- sp_addtype
- sp_adduser
- sp_changegroup
- sp_dropalias
- sp_dropgroup
- sp_droptype
- sp_dropuser

Other changes to system procedures

This section describes system procedures that exhibit behavior changes when Adaptive Server is configured for failover. After Adaptive Server is configured as a companion server:

- System procedures exhibit no changes to their default functionality when they are run in single-server mode.
- You cannot run any of the system procedures listed in Table B-2 or Table B-3 during the failback mode.
- The “Normal companion mode,” column of Table B-2 and Table B-3 describes the behavioral changes for system procedures issued from an asymmetric primary, asymmetric secondary, or symmetric companion.
- The “Failover mode,” column of Table B-2 and Table B-3 describes the behavioral changes for system procedures issued during either asymmetric secondary failover or symmetric failover.

Table B-2 lists the system procedures that change *server-wide* attributes (for example, the default language or the resource limit):

- During normal companion mode, all the system procedures listed in Table B-2 must be run from master.
- You cannot these system procedures during asymmetric secondary suspended mode or symmetric suspended mode.
- An X indicates that the system procedure does not run in the listed mode.

Table B-2: Changes in system procedures that alter server-wide attributes

System procedure	Normal companion mode	Asymmetric primary suspended mode	Failover mode
sp_drop_resource _limit	You must manually run this system procedure on the remote server as well to synchronize the companions.	X	X
sp_drop_time_range		X	X
sp_dropexternlogin		X	X
sp_droplanguage		X	X
sp_droplogin		X	X
sp_dropremotelogin		X	X
sp_dropserver		X	X
sp_locklogin			

System procedure	Normal companion mode	Asymmetric primary suspended mode	Failover mode
sp_modify_resource _limit	You must manually run this system procedure on the remote server as well to synchronize the companions.		

Table B-3 lists the system procedures that change the attributes of the database in which they are run (such as adding a user, alias, or group to the current database). You cannot run these system procedures from master during either secondary suspended or symmetric suspended mode. An X indicates that you cannot run the system procedure in the listed mode.

Table B-3: Changes that alter database-wide attributes when they are run in master

System procedure	Normal companion mode	Asymmetric primary suspended mode	Failover mode	Notes
sp_changedbowner			X	See below for additional restrictions for this system procedure.
sp_changegroup	You must manually run this system procedure on the remote server as well to synchronize the companions.			
sp_dropalias		X	X	
sp_dropgroup		X	X	
sp_droptype		X	X	
sp_dropuser		X	X	
sp_renamedb			X	See below for additional restrictions on this system procedure.

sp_changedbowner and sp_renamedb run during failover mode; additionally, they exhibit these behavior changes:

- sp_changedbowner – after you run this procedure on local companion, you must manually run it on the remote server as well to synchronize the companions if the following are true:
  - You are not running this command in master.
  - The companion is in suspended or normal companion mode.
  - The companion was configured using the with_proxydb option.

- sp_renamedb – you must first run this system procedure in the primary database, then run it in the proxy database on the remote server, if the following are true:
    - You do not run this command in master.
    - The companion is in suspended or normal companion mode.
    - The companion is configured using the with_proxydb option.

dbcc options for high availability systems

Table B-4 includes information about the dbcc ha_admin options.

Table B-4: dbcc ha_admin options

Option name	Function	Syntax and comments
rollback_failback	Rolls back the effect of sp_companion... prepare_failback and returns the companion to failover mode. This command works regardless of the results of the prepare_failback command.	`dbcc ha_admin (" ", rollback_failback)` Where " " is a required empty placeholder. • Can be used only in failback mode. • Any failback threads waiting for the resume command are killed when this command is executed. • You may need to perform platform-specific steps to prepare your companions for the rollback_failback option. See the appropriate chapter in this manual for more information. • You can issue this command only from the secondary companion.
rollback_failover	Rolls back the effects of fail over from the primary companion, and returns it to normal companion mode. rollback_failover does not affect the secondary companion.	`dbcc ha_admin (" ", rollback_failover)` Where " " is a required empty placeholder. • This command can be used only in failover mode. • You may need to perform platform-specific steps to prepare you companions for the rollback_failover option. See the appropriate chapter in this manual for more information. • rollback_failover has no effect on the companion server that failed. The companion server that takes over the failed companion's workload resumes normal companion mode. • You can issue this command only from the secondary companion. • This command works even when fail over has marked the databases "suspect."

Option name	Function	Syntax and comments
drop_failoverdb	Used only in failover mode. drop_failoeverdb drops the failed-over databases that could not be dropped with the drop database command. This command also cleans up the master_companion of all the metadata relating to the dropped database.	`dbcc ha_admin (" ", drop_failedoverdb, database_name)` Where `" "` is a required empty placeholder, and *database_name* is the name of the database you are dropping. • Use only as a last resort, when you must drop a database to complete the load of another database.
clusterlock	Acquires or releases cluster-wide locks during a cluster operation.	`dbcc ha_admin (" ", clusterlock, [acquire | release])` For more information about cluster-wide locks and releasing them, see "Cluster locks in a high availability node" on page 16.
state_machine	Moves the companion server to single-server mode.	`dbcc ha_admin (' ', 'state_machine', 'halt')` Where `" "` is a required empty placeholder. For information about using this option, see Appendix A.
session	Invokes clients that are sleeping because of a failed sp_companion...resume. Clients that are invoked disconnect from the secondary companion and connect to the primary companion.	`dbcc ha_admin (SYB_HACMP, session, "drop")`

dbcc dbrepair option

Sybase Failover adds the dropproxydb option to dbcc dbrepair.

Table B-5: dbcc dbrepair dropproxydb option

Option name	Function	Syntax and comments
droppproxydb	Drops proxy databases	`dbcc dbrepair(database_name, dropproxydb)` where *database_name* is the name of the database of the proxy database you are dropping.

A P P E N D I X C

Open Client Functionality in a Failover Configuration

This appendix discusses the changes required for Open Client to work with Sybase Failover.

CTLIB application changes

Note An application installed in a cluster must be able to run on both the primary and secondary companions. That is, if you install an application that requires a parallel configuration, you must also configure the secondary companion for parallel processing so it can run the application during fail over.

You must modify all applications that are written with CTLIB API calls before they can work with the Sybase Failover. Use:

1 Set the CS_HAFAILOVER property using the ct_config and ct_con_props CTLIB API calls. You can set this property at either the context or the connection level. Using the following syntax:

```
ct_config(context, action, CS_HAFAILOVER, buf, buflen,
  outlen)
ct_con_props(connection, action, CS_HAFAILOVER, buf,
  buflen, outlen)
```

2 Modify the *interfaces* file so clients fail over to the secondary companion.

  The *interfaces* file includes a line labeled *hafailover* that enables clients to reconnect to the secondary companion when the primary companion crashes, or when you issue a shutdown with nowait, triggering a failover.

See the “Adding entries for both Adaptive Servers to the *interfaces* file” section in the chapter for your platform for information about adding this line.

3 Write application failover messages according to these parameters:

- As soon as the companion begins to go down, clients receive an informational message that fail over is about to occur. Treat this as an informational message in the client error handlers.
- Once the failover property is set (from step 1) and the *interfaces* file has a valid entry for the *hafailover* server, the client connection is a failover connection, and clients reconnect to the secondary companion appropriately.

  However, if the failover property is set but the *interfaces* file does not have an entry for the hafailover server (or vice-versa), then it is a not a failover connection. Instead, it is a normal connection with the failover property turned off. Inform the user to check the failover property to determine whether or not the connection is a failover connection.

4 Add return codes.

When a successful failover occurs, the client issues a return value named CS_RET_HAFAILOVER, which is specific to the following CTLIB API calls:

```
ret = ct_results(cmd, result_type)
ret = ct_send(cmd)
```

CS_RET_HAFAILOVER is returned from the API call during a synchronous connection. In an asynchronous connection, these API s issue CS_PENDING, and the callback function returns CS_RET_HAFAILOVER. Depending on the return code, the customer can perform the required processing, such as sending the next command to be executed.

a Rebuild your applications, linking them with the libraries included with the failover software.

Note You cannot connect clients with the failover property until you issue sp_companion resume. If you do try to reconnect them after issuing sp_companion prepare_failback, the client stops responding until you issue sp_companion resume.

Glossary

This glossary includes only the terms used in this book. For a description of Adaptive Server and SQL terms, see to the *Adaptive Server Glossary*.

active-active	A system that is set up as a two-node configuration where both nodes in the cluster include Adaptive Servers managing independent workloads, and are capable of taking over each other’s workload in the event of a failure.
active-passive	A multi-node setup that involves a single Adaptive Server, a primary node on which the Adaptive Server primarily runs, and a set of secondary nodes that can host the Adaptive Server and its resources, if necessary.
asymmetrical	A high-availability system consisting of one primary companion and one secondary companion. In an asymmetric system, only the primary companion can fail over. The secondary Adaptive Server is also known as a “hot standby.”
cluster	A collection of nodes in a high availability system. A cluster for the Adaptive Server high availability system consists of at least two nodes.
companion server	Each Adaptive Server in a primary availability system is a companion. One Adaptive Server is called a companion server and the other is called the secondary companion server.
connection failover	A connection that has the failover property set fails over to the secondary companion
failback or fail back	The planned event during which Adaptive Server is migrated back to, and restarted on, a primary companion, after failover has taken place. This involves moving the failed-over databases, devices, and client connections from the secondary companion to the restarted primary companion.
failover mode	The mode of the primary companion after it has failed-over and is running on the secondary companion.

failover or fail over	The process by which Adaptive Server migrates to another that which takes over the responsibility of managing the failed server. Failover may occur due to scheduled maintenance or a failure of Adaptive Server or the machine running Adaptive Server.
high availability	A system designed to reduce downtime.
node	A machine in a high availability system.
normal companion mode	The mode during which two Adaptive Servers in a high availability system are functioning as independent servers and are configured to fail over during a scheduled maintenance or system failure.
primary companion	The Adaptive Server whose databases and connections are migrated to the secondary Adaptive Server during failover.
proxy databases	Placeholder databases created on the secondary companion for every user database on the primary companion. Proxy databases reserve the database names so that during failover, all database names are unique on the system.
secondary companion	The Adaptive Server configured to accept a failed-over primary Adaptive Server.
single-server mode	The mode of Adaptive Server while it is being configured for high availability. During this mode, Adaptive Server cannot fail over.
stable mode	A system state where Adaptive Server can exist for an extended period of time, such as the day-to-day operation of Adaptive Server.
suspended companion mode	The mode of Adaptive Server after companion mode has been suspended. During this mode, Adaptive Server cannot fail over; it is working independently of the companion Adaptive Server.
symmetric	A high availability system in which two independent Adaptive Servers act as failover servers for each other. That is, each Adaptive Server acts as both a primary and a secondary companion.
thorough_probe	A utility executed by *ase_monitor*, runs the thorough_probe to thoroughly check the performance of the Adaptive Server.
transitional mode	Occurs when Adaptive Server shifts from failed-over mode to normal companion mode; is typically of very short duration.

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