Administration Guide

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Using SAP Failover in a High Availability System

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1 Failover and Failback

Failover is when databases, metadata, and user connections are switched to a backup server. Failback is the process of returning the servers to normal companion mode.

1.1 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 SAP Adaptive Server Enterprise, 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 SAP ASE 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.

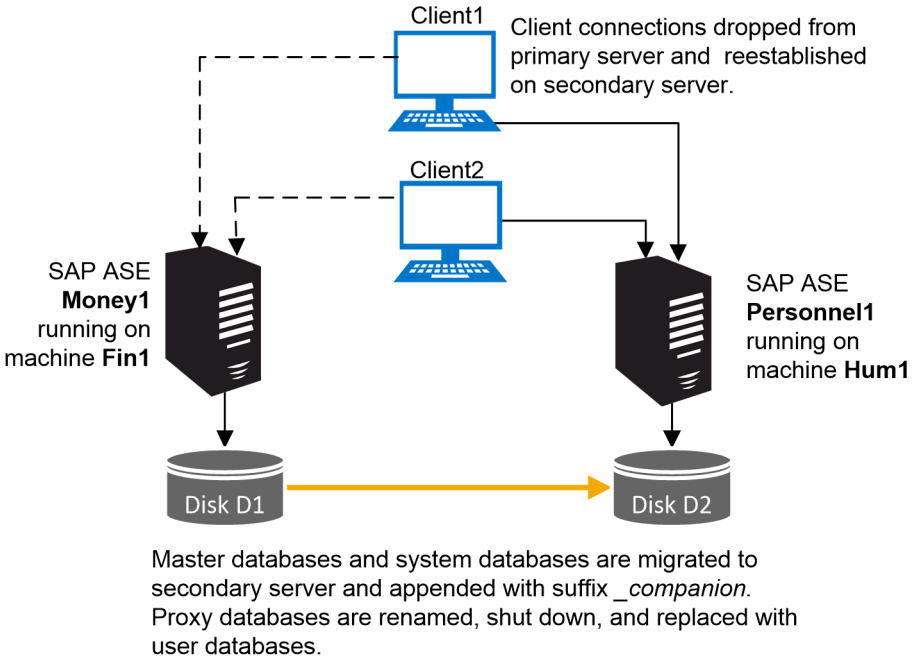


Figure 1: Failover Process

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.

1.1.1 Client Connections During Failover

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.

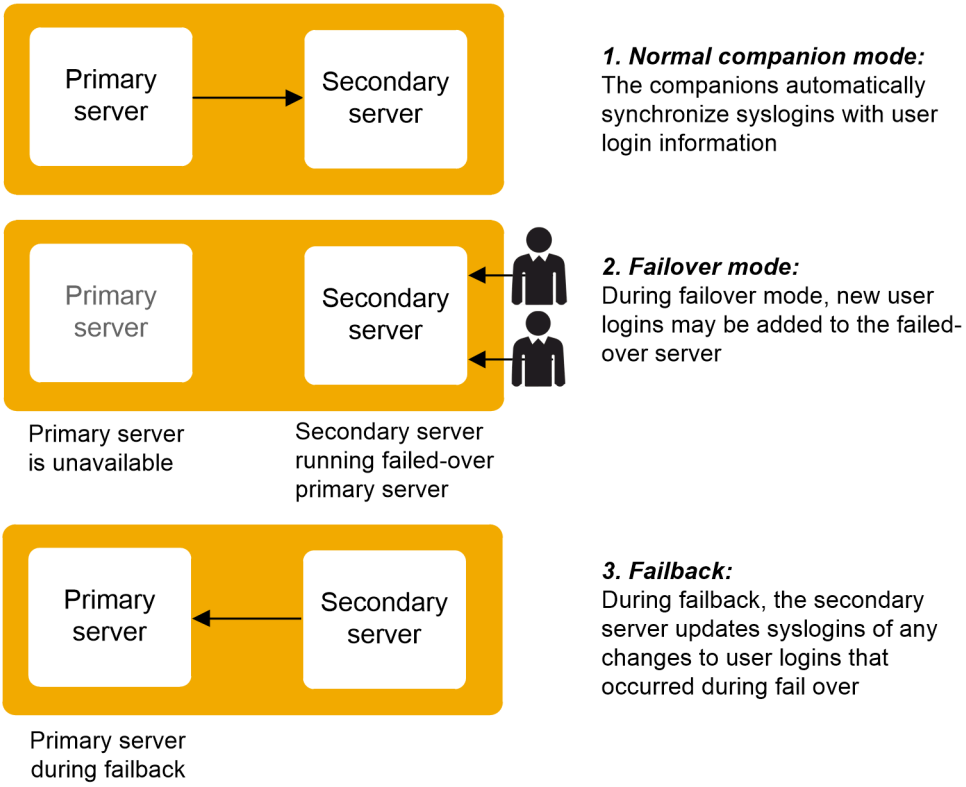
Related Information

Open Client Functionality in a Failover Configuration [page 217]

1.1.2 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.



All user roles and privileges are maintained after fail over.

1.2 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 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.

1.2.1 Performing Failback

Failback is accomplished in four steps.

Procedure

1. Prepare for failback.

   > **Note**
   >
   > IBM HACMP for AIX automatically fails back when the primary node is ready to resume normal companion mode. See *Configuring SAP ASE 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 *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.`

Related Information

Configuring SAP ASE for Failover on IBM AIX HACMP [page 74]
Running do_advisory [page 37]

1.3 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.

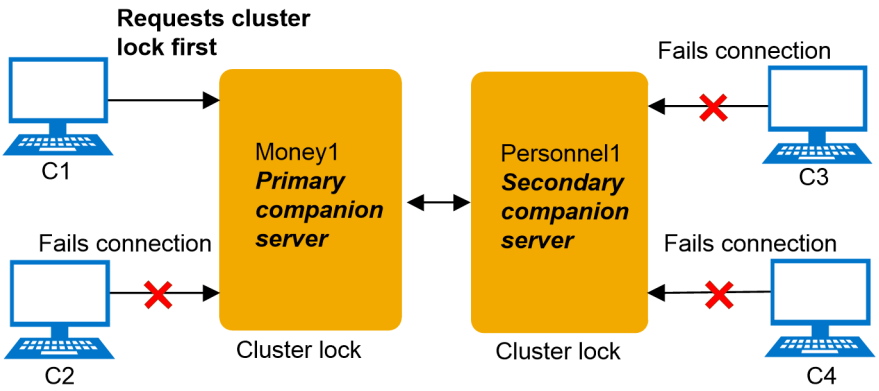
Generally, you will never notice a cluster lock. They do not affect any other transactions that occur in the database, only cluster operations. However, if the client connection that holds the cluster lock fails during its cluster operation (for example, if you terminate a cluster operation before it 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*.

The image below describes client connections for a cluster operation. There are two companion servers, to which four clients are connecting. All of them are attempting to perform 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.

Related Information

dbcc Options for High Availability Systems [page 229]

2 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.

SAP® High Availability Failover enables SAP ASE 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 SAP ASE high availability system.

A high availability cluster includes two 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.

2.1 Active-Active Configuration

8.11

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

The SAP ASE server that takes over the workload is called a secondary companion, and the SAP ASE 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 servers during fail over. See your operating system documentation for information about configuring your system for high availability. An SAP ASE configured for failover in an active-active setup can be shut down using the shutdown command only after you have suspended SAP ASE from the companion configuration, at both the server level and the platform level.

2.2 Active-Passive Configuration

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

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

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

SAP provides active-passive configuration support for Sun Cluster 3.0 or. Contact your provider for other cluster platforms. See *Active-Passive Configuration for Sun Cluster 3.0 and 3.1*, for detailed information on configuring SAP ASE 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**
>
> SAP ASE configured for failover in an *active-passive* setup can be shut down using the `shutdown` command only after you disable monitoring on the server at the platform level.

SAP ASE supports following cluster platforms for SAP-HA configuration:

- HPIA – MCSG 11.19
- IBM AIX – HACMP 6.2
- Sun Solaris - VCS 5.0, SunCluster 3.2
- Linux:
  - RHEL 5.0 / VCS 5.0
  - RHEL 6.0 / VCS 5.1 SP1
  - SuSE Enterprise 11 / VCS 5.1
- Win2000 - Cluster Manger 5.0
- Win2003 - Cluster Manger 5.2

> **Note**
>
> SAP ASE version 15.7 and later does not support high availability on Windows x86 32-bit. If you are currently running high availability on Windows x86 32-bit, contact your customer support representative.

Related Information

Active-Passive Configuration for Sun Cluster 3.0 and 3.1 [page 145]

2.3 Differences Between Active-Active and Active-Passive

There are differences in setup, failover, failback and client connection between an active-active and an active-passive configuration.

Active-Active	Active-Passive
Setup: Two 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 server runs either on the primary node or on the secondary node. The 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 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 failover or relocation of the 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 server to resubmit uncommitted transactions. Clients with the failover property reestablish their connections automatically.

2.4 Requirements for Failover

You must purchase the ASE_HA license option to use SAP ASE with Failover.

See the installation guide for your platform for information about enabling the ASE_HA license.

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

- Be running SAP ASE 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)
- Be configured for either parallel or nonparallel processing.

2.5 Resource Requirements

SAP ASE servers configured as companions in a high availability system have different resource requirements than 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, a server in a high availability system has higher resource requirements than if it is a single server. For more information, see *Single-System Presentation*.

The following are some of the resource requirements that you should consider when you configure SAP ASE 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 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 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 SAP ASE must be configured with 37 as the `number of devices`.
- `sp_configure` option `number of open databases` – on an SAP ASE 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 SAP ASE 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* for more information about using Open Client with failover.

Related Information

Single-System Presentation [page 19]
CTLIB Application Changes [page 217]

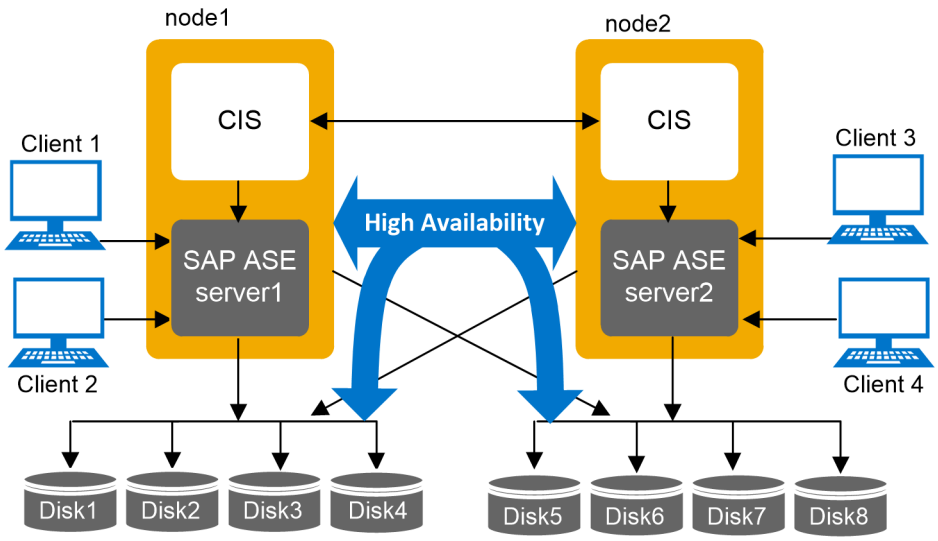
2.6 How Does Failover Work with High Availability?

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

A system that uses SAP Failover includes two machines. Each machine is one node of the high availability cluster. Each SAP ASE 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.

The diagram below describes high availability system using SAP Failover consisting of two servers. Included with the operating system is a high availability system (for example, Veritas for Linux) that detects and broadcasts to the cluster that part of the system is failing or is being shut down for maintenance. When SAP ASE goes down, the high availability system tells the second machine to take over the workload. Any clients connected to the SAP ASE server that is failing are automatically reconnected to the second SAP ASE server.



The machines 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 SAP ASE server1 is the primary companion and it fails, SAP ASE server2, as the secondary companion, reads its disks (1 – 4) and manages any databases on them until SAP ASE server1 can be brought back online. Any clients that are connected to SAP ASE server1 and are using the failover property are connected automatically to SAP ASE server2.

2.7 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 SAP ASE 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 servers. Both servers must be installed and configured individually, and their configuration may not be the same. Both individual servers, as well as the cluster, may require system maintenance.

2.8 Special Considerations for SAP Failover

Some SAP ASE functions require special consideration when you configure SAP Failover.

2.8.1 Configuring tempdb Devices for Failover

Running `sp_companion ... 'configure'` may fail because of duplicate device names for the `tempdbdev` logical device when you attempt to install SAP ASE for a high availability configuration.

Logical device names must be unique between the primary and secondary servers.

Do not specify the `tempdb` device when you install the secondary server, leave this field blank

If you require additional `tempdb` space on the primary or secondary server, log into this server after installation is complete and use `alter database` to increase the size of `tempdb`. If SAP ASE requires additional disk space to allocate the `tempdb` database, use `disk init` to create a new database device for `tempdb`.

2.8.2 Installing the Monitoring Table Scripts

If you add monitoring tables to your high availability configuration, you must provide the local host or server name.

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.

2.8.3 Using Disk Mirroring

8.10.1

SAP 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 SAP Failover in conjunction with a data protection mechanism, such as disk mirroring or RAID.

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

2.8.4 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 SAP ASE 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**
>
> You must rerun `installhasvss` if you rerun the `installmaster` script (see *Reinstalling installmaster* and *Rerunning installhasvss*). Do not use an `installhasvss` script from a different version of SAP ASE.

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

Related Information

Reinstalling installmaster [page 220]
Rerunning installhasvss [page 220]

2.8.5 Creating a SYB_HACMP Server Entry

The `installhasvss` script creates an entry in `sysservers` for a server named SYB_HACMP. Before the SAP ASE 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`.

2.8.6 Defining User-Defined Datatypes

Updates to tables that include either Java or user-defined datatypes are not synchronized after 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.

2.8.7 SAP ASE and Two-Phase Commit Transactions

SAP ASE servers configured as companion servers using SAP Failover do not support SAP two-phase `commit` (SYB2PC) transactions, which use the SAP two-phase commit protocol.

3 Asymmetric and Symmetric Configurations

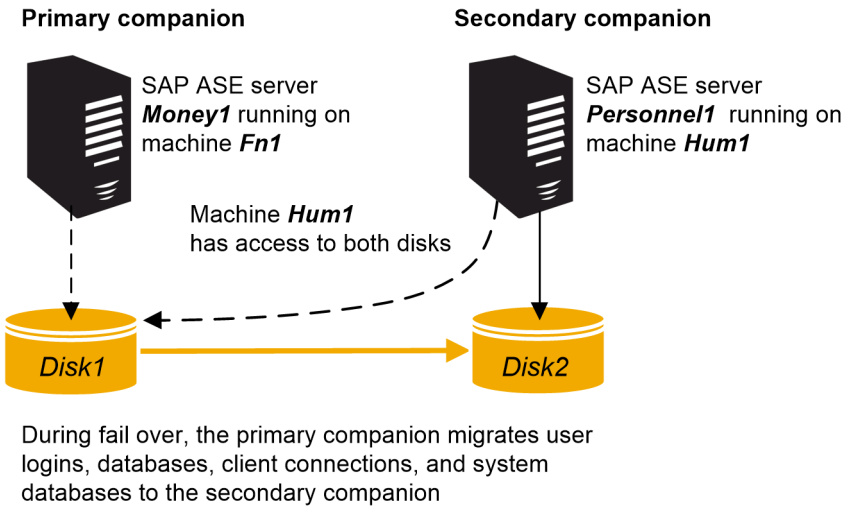
You can configure companion servers either asymmetrically or symmetrically. You must configure companions asymmetrically before you can configure them symmetrically.

3.1 Configuring the Asymmetric Companion

An asymmetric configuration consists of two SAP ASE servers s running on separate machines.

The primary SAP ASE server performs the work during day-to-day operations, while the secondary server is prepared to take over the work during a system failure or scheduled maintenance. The secondary companion is an independent server, and can have its own applications running. To configure for fail over, the secondary companion must be a newly installed 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 SAP ASE for fail over, SAP ASE 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 *Reference Manual: Procedures* for information about `sp_companion`.



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 SAP ASE for an asymmetric setup.

3.1.1 Performance of SAP ASE in an Asymmetric Configuration

During normal companion mode, performance of system procedures that update user information (`create login`, `create role`, 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.

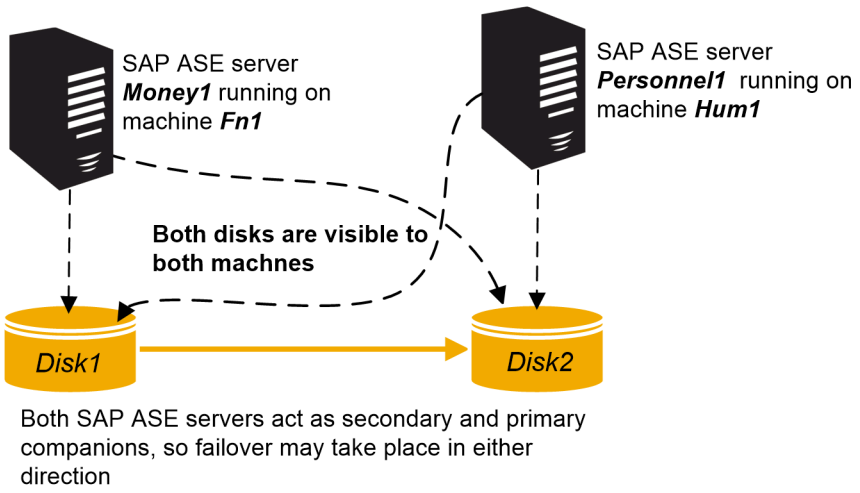
3.2 Configuring the Symmetric Companion

Like asymmetric configuration, symmetric configuration consists of two fully functional 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 servers acts as a primary or secondary companion for the other server.

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

The diagram below describes a symmetric configuration between a financial department machine (FN1 running SAP ASE server MONEY1) and a human resources machine (HUM1 running SAP ASE server PERSONNEL1):



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 SAP ASE in a symmetric setup.

3.2.1 Performance of SAP ASE in a Symmetric Configuration

During normal companion mode, do not run both 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 server and its own server with a reasonable level of performance. If both servers maximize their system resources, failover succeeds, but performance may be poor.

3.3 Auditing in a High Availability System

Configure a companion for auditing the same way you configure a server that does not use failover.

All updates to user and security information (for example, `create login`, `create role`, 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.

Related Information

Setting Auditing Options [page 26]

3.3.1 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.

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

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.

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.

4 Modes of Failover

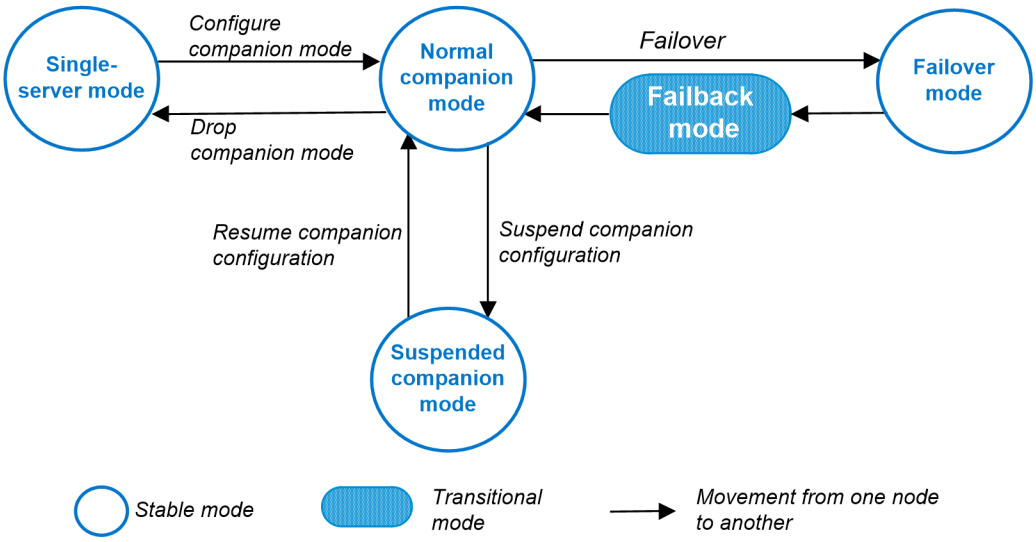
There are a series of modes that SAP ASE runs through during high availability. There are two types of modes, stable and transitional.

A stable mode is a system state in which SAP ASE can exist for an extended period of time, such as the day-to-day operation of SAP ASE .

Stable modes include:

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

Failback mode, which is transitional, occurs when SAP ASE 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 below:



Before you can configure two SAP ASE servers as companions, both must be in single-server mode, which is the default mode of a newly installed server after running `installhasvss`. After you configure the servers as companions, they are in one of three stable companion modes.

4.1 Different Modes of a Companion Server

The different modes are: Single-server mode, normal companion mode, suspended companion mode, failback mode.

Single-Server Mode

In this mode, SAP ASE acts as a standalone server. A newly installed SAP ASE 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 SAP ASE 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 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 *Changes to Commands, System Procedures, and Databases*, for more information.

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

Failback Mode

SAP ASE 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 server to its original node. See *Performing Failback*.

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 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.

Related Information

Changes to Commands, System Procedures, and Databases [page 223]
Performing Failback [page 12]

4.2 Determine the Companion Mode

Issue `sp_companion` without any options to display the current mode of the companion.

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
```

> **Note**
>
> The `<@@cmpstate>` global variable is not used in an non-high availability environment, and reports a value of -2.

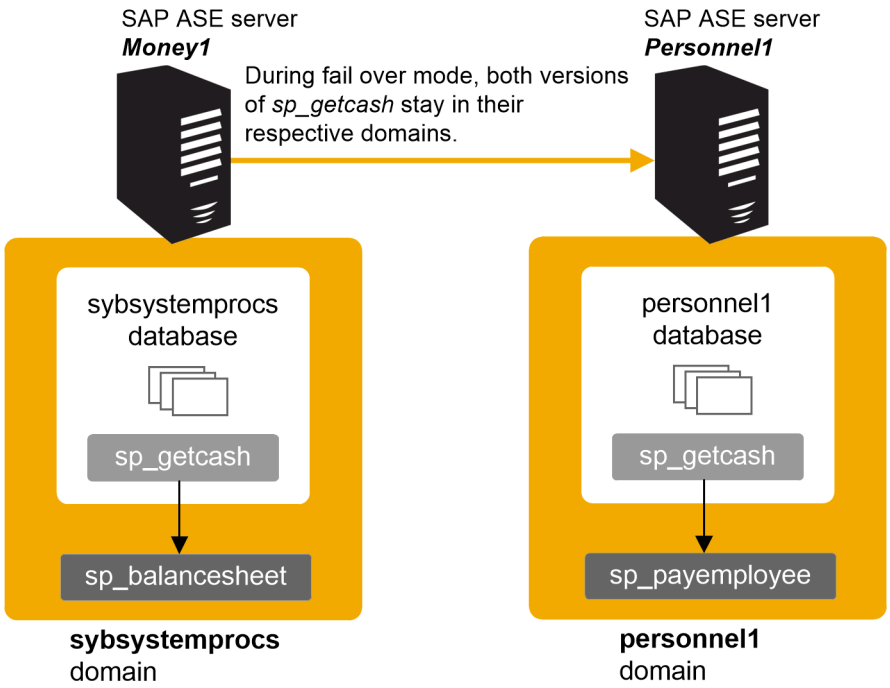
Table 1: @@cmpstate return values

@@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

4.3 Domains

Both the primary and the secondary companions can have stored procedures, users, and devices with the same names. Servers configured for failover use *domains* to determine to which database these objects belong.

For example, suppose both SAP ASE servers MONEY1 and PERSONNEL1 have a stored procedure named `sp_getcash`:



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 failover, 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.

5 Proxy Databases, User Databases, and Proxy System Tables

Proxy databases are not created by default when you configure SAP ASE 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`.

This document assumes you used `sp_companion` with the `with_proxydb` option. Proxy databases are created dynamically as they are needed. See the *Reference Manual: Procedures*.

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.

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

5.1 Creating Proxy Databases

SAP ASE uses Component Integration Services (CIS) to create the proxy databases.

Both the primary server and the secondary server must have CIS running before you can configure them for SAP Failover.

CIS does not import column defaults that exist in the primary database into the proxy table.

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 SAP ASE for CIS, see the *Component Integration Services User's Guide*.

When proxy databases are created, 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.

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.

5.2 Size of the Proxy Database

When SAP ASE 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. SAP ASE 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.

5.3 Commands and System Procedures in Proxy Databases

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

5.3.1 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.

5.3.2 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.

5.3.3 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 *Reference Manual: Procedures*.

5.3.3.1 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.

5.4 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.

See the *Reference Manual: Procedures*.

5.5 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>
```

6 Running do_advisory

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*.

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 SAP ASE 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).

Related Information

Quorum Attributes [page 40]

6.1 Running the do_advisory Option

`sp_companion do_advisory` output includes a number of attributes.

Including:

- 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.

  This is the syntax for `sp_companion do_advisory`:

```
sp_companion <server_name>, do_advisory [, all | help |
```

```
    <group_attribute_name> | <base_attribute_name>]
```

where:

- <server_name> is the name of the remote 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.

For example, the following checks the attributes between 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.

6.2 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
- 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`
- `partition 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`

7 Configuring SAP ASE for Failover on HP

Configuring SAP ASE for failover on HP requires hardware and system components, configuring HP, configuring companion servers, and administering failover.

7.1 Hardware and Operating System Requirements

Configuring SAP ASE for high availability requires hardware and operating system components.

- Two homogeneous 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.

7.2 Preparing SAP ASE for High Availability

Prepare SAP ASE for a high availability configuration.

7.2.1 Install SAP ASE 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 SAP ASE 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 multi-host disk.

See the installation documentation for your platform for information about installing and configuring SAP ASE.

7.2.2 Add Entries for Both SAP ASE Servers to the interfaces File

The `interfaces` file for the primary and secondary companions must include entries for both companions.

The `interfaces` file for both companions must include a host name (instead of an IP address) that matches the host name string in the output from:

```
/usr/sbin/cmviewcl -p <package_name>
```

The server entry in the `interfaces` file must use the network name that is specified in `sysservers`. For information see the installation documentation for your platform.

7.2.2.1 Add 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`.

7.2.3 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.

Prerequisites

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.

Procedure

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.

Results

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`.

7.2.4 Configuring the sybha Executable

The `sybha` executable enables the SAP ASE High Availability Basic Services Library to interact with each platform's high availability cluster subsystem.

Prerequisites

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. SAP strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

You must perform these steps as root.

Procedure

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.
2. 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.
3. Change to the `$SYBASE/$SYBASE_ASE/bin` directory:

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

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 SAP ASE 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
```

7.2.5 Creating a New Default Device Other than master

The master device is the default device in a newly installed SAP ASE server.

Context

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, create a new device.

Procedure

1. Create a new device using `disk init`.
2. Use `sp_diskdefault` to specify the new device as the default before you configure SAP ASE as a companion for fail over.

   For example, to add a new default device named `money_default1` to the MONEY1 server, enter:

   ```
   sp_diskdefault money1_default1, defaulton
   ```

3. 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
   ```

Results

See the *Reference Manual: Commands* for more information about `disk init` and `sp_diskdefault`.

7.2.6 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.

Procedure

1. For example, if the companion MONEY1 uses the network name of MONEY1 in the `interfaces` file, enter:

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

2. Restart the server for this change to take effect.

7.2.7 Adding the Secondary Companion to sysservers

Add the secondary companion as a remote server in `sysservers`.

Procedure

Use the syntax:

```
sp_addserver <server_name>
```

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

7.2.8 Running installhasvss

Run the `installhasvss` script to install the stored procedures required for failover (such as sp_companion) the SYB_HACMP server in `sysservers`.

Prerequisites

You must have System Administrator privileges to run `installhasvss`. You must perform the tasks described in *Add Entries for Both SAP ASE Servers to the interfaces File*, before executing `installhasvss`. If you run `installhasvss` before performing these tasks, re-run `installmaster` to reinstall all the system stored procedures.

Procedure

1. Enable High Availability, then restart the server.

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

2. To execute the `installhasvss` script, enter:

   ```
   $SYBASE/$SYBASE_OCS/bin/isql -Usa -P<password> -S<servername> < $SYBASE/
   $SYBASE_ASE/scripts/installhasvss
   ```

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

Related Information

Add Entries for Both SAP ASE Servers to the interfaces File [page 43]

7.2.9 Assigning ha_role to System Administrator

You must have `ha_role` permission on both servers to run `sp_companion`.

Procedure

1. To assign the `ha_role`, issue the following from `isql`:

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

2. You must log out and then log back in to the SAP ASE for the change to take effect.

7.2.10 Verify Configuration Parameters

You must enable the configuration parameters: `enable cis`, `enable xact coordination`, and `enable HA` before you configure SAP ASE 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 SAP ASE to function as a companion in a high availability system. `enable HA` is off by default. This configuration is static, so you must restart the server for it to take effect. This parameter writes a message to the error log stating that you have started the server in a high availability system.

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

7.3 Configuring HP for Failover

Prepare your HP MC/ServiceGuard high availability system for SAP 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.

7.3.1 Creating the Package Configuration

The package configuration process defines the SAP ASE server and associated resources run by the package manager when a package starts on a node in the cluster.

Prerequisites

The name of the 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.

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.

Perform the following steps as root for both the primary and secondary companions.

Context

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.

Procedure

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
   ```

7. Copy the configuration file to the subdirectory you created on the second node.

   For example, to copy the `MONEY1.ascii` file using `rcp`:

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

7.3.2 Editing the ASE_HA.sh Script

The `ASE_HA.sh` template script configures the high availability system to start, stop, and monitor SAP ASE for failover.

Prerequisites

You must perform the following steps as root.

Context

The `ASE_HA.sh` template script is included in the `$SYBASE/$SYBASE_ASE/install` directory.

Procedure

1. Make a copy of this script in the package subdirectory you created from the first step of "Creating the Package Configuration"and modify it to include the environment variables for your cluster environment. Both the primary and secondary companions require a copy of this script.
2. If you are currently using a script to configure SAP ASE 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`.
3. 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
   ```

4. 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
   ```

5. 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). See *server_name.sh File Entries*.

   See *Example Settings for MONEY1 in the ASE_HA.sh Script*, and *Example Settings for PERSONNEL1 in the ASE_HA.sh Script* . These tables 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.
6. 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
   ```

7. 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
   ```

8. Repeat the above steps for the secondary companion.

7.3.2.1 server_name.sh File Entries

Edit the `server_name.sh` to be used by the `ASE_HA.sh` script.

- *ASE_12_0* – specifies the version of SAP ASE. 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 SAP ASE version 12.0 or later.
  - No if you are using earlier versions of SAP ASE.
- *ASE_HAFAILOVER* – specifies whether you are using SAP Failover.
  Set this to:
  - Yes if you are using SAP 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 SAP 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 SAP ASE process is alive.
- *SHUTDOWN_TIMEOUT* – the maximum amount of time, in seconds, to wait for a companion server abort to complete before killing the SAP ASE 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 SAP 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 SAP ASE products.
- `SYBASE_OCS` – the installation directory for Open Client products.
- `SYBUSER` – the name of the user who starts the SAP ASE 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 SAP ASE 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 SAP ASE 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 SAP ASE 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 SAP ASE 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 SAP ASE 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.`

Example Settings for PERSONNEL1 in the ASE_HA.sh Script

Values for `PERSONNEL1.sh` in the `ASE_HA.sh` script:

Variable	Setting
ASE_12_0	yes
ASE_HAFAILOVER	yes
BASIC_FAILOVER	yes

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

Example Settings for MONEY1 in the ASE_HA.sh Script

Values for `MONEY1.sh` in the `ASE_HA.sh` script:

Variable	Setting
ASE_12_0	yes
ASE_HAFAILOVER	yes
BASIC_FAILOVER	yes

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

7.3.2.2 Example Settings for PERSONNEL1 in the ASE_HA.sh Script

Values for `PERSONNEL1.sh` 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`
PRIM_RUNSCRIPT	Name of RUNSERVER file – default to `$SYBASE/$SYBASE_ASE/install/RUN_<servername>`
SEC_SYBASE	`/opt/sybase`
SEC_SERVER	MONEY1
SEC_HOSTNAME	FN1
SEC_CONSOLE_LOG	`$PRIM_SYBASE/$SYBASE_ASE/install/PERSONNEL1.cs_log`

7.3.2.3 Example Settings for MONEY1 in the ASE_HA.sh Script

Values for `MONEY1.sh` 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`

7.3.2.4 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, and halt the package.

Prerequisites

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.

You must be the root user.

Procedure

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*).

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
}
```

d. 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
}
```

e. 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*).

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
}
```

f. 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
}
```

g. 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"
```

h. 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
```

i. Repeat these steps for the secondary companion.

Related Information

Editing the ASE_HA.sh Script [page 50]

7.3.3 Verifying and Distributing the Configuration

Verify the configuration using `cmcheckconf`.

Context

> **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.

Procedure

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.

2. In the `cmclconfig.ascii` file, change the `max_configured_packages` to 2
3. 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_name>.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
   ```

4. 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_companion_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
```

7.3.3.1 Starting the Primary and Secondary Companions

Start the companion cluster, including its packages.

Procedure

1. Use this syntax as “root” on one companion node:

```
cmruncl -v
```

2. To view the information on the companion cluster, enter:

```
cmviewcl -v
```

3. To add packages to an individual node, enter:

```
/usr/sbin/cmrunpkg -n <node_name primary_companion _name>
```

For example:

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

7.4 Configuring Companion Servers for Failover

Configure the SAP ASE servers as primary and secondary companions in a high availability system.

7.4.1 Run sp_companion with the 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 a server as a secondary companion) will be successful. `sp_companion do_advisory` advises you of any configuration options that should be changed.

See *Running do_advisory* for a complete description of the `sp_companion do_advisory` option.

Related Information

Running do_advisory [page 37]

7.4.2 Create 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 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 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
```

7.4.3 Create 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 for a description of symmetric configuration.

Issue `sp_companion` from the secondary companion to configure it for symmetric configuration. See *Create an Asymmetric Companion Configuration*, for a description of the syntax for `sp_companion`.

The following example adds a server named MONEY1 as the secondary companion to the server named PERSONNEL1 described in *Create an Asymmetric Companion Configuration*. 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
```

Related Information

Create an Asymmetric Companion Configuration [page 63]

7.5 Administering SAP Failover

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.

7.5.1 Failing Back to the Primary Companion

Failback to the primary companion and resuming normal companion mode.

Procedure

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, where `<primary_companion_name>` is the name of primary companion server:

   ```
   sp_companion <primary_companion_name>, prepare_failback
   ```

3. From the primary companion, issue, where `<secondary_companion_name>` is the name of the secondary companion server:

   ```
   sp_companion <secondary_companion_name>, resume
   ```

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`.

7.6 Suspending Companion Mode

Suspended mode temporarily disables the ability of the primary companion to fail over to the secondary companion.

Context

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.

Procedure

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, where `<primary_package_name>` is the name of the primary package, which is also the same as the name of the primary companion:

   ```
   cmhaltserv -v <primary_package_name>
   ```

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.

7.6.1 Resume Normal Companion Mode From Suspended Mode

Resume normal companion mode between two companions that have been moved to suspended mode.

Prerequisites

You must be the root user.

Procedure

1. Issue `cmhaltpkg` from the primary node to shut down the primary companion, where `<primary_package_name>` is the name of the primary package, which is the same as the name of the primary companion server:

   ```
   cmhaltpkg <primary_package_name>
   ```

2. Issue `cmmodpkg` and `cmrunpkg` from the primary companion to run the package which restarts the primary companion, where `<primary_package_name>` is the name of the primary package, which is the same as the name of the primary companion server.

   ```
   cmmodpkg -e <primary_package_name>
   cmrunpkg <primary_package_name>
   ```

7.7 Dropping Companion Mode

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

Procedure

To drop companion mode, issue:

```
sp_companion <companion_name>, "drop"
```

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.

7.8 Troubleshoot Failover for HP

Troubleshoot common errors of failover on HP.

7.8.1 Error Message 18750

If a companion server issues error message 18750, check the `<@@cmpstate>` of the servers.

Context

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.

Procedure

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
```

7.8.2 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, roll back and then reissue the `prepare_failback` command.

Procedure

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`

7.8.3 Location of Error Logs

SAP Failover and HP MC/ServiceGuard includes logs which may be helpful for investigating and diagnosing errors encountered during failover.

- `/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 SAP 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 SAP ASE 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 SAP ASE from the `ASE_HA.sh` script for the secondary.

7.9 Upgrading SAP ASE

To upgrade an SAP ASE server in a high availability configuration, you must temporarily break the companionship between the primary and secondary companion, and disable monitoring of the SAP ASE packages.

You can shut down or restart either server companion independently during the upgrade process without triggering unexpected failovers by the MC/ServiceGuard cluster.

> **Note**
>
> Unless you specify a different node with the `-n <node_name>` parameter, the MC/ServiceGuard commands for starting packages assume you are issuing the command for the node on which the command is performed. Before you issue these commands, use the MC/ServiceGuard documentation to verify the packages are started on the correct node. You cannot add, delete, or modify any databases, objects, users, or logins during the upgrade process. Making these changes after the companionship is dropped and before it is reestablished may cause the upgrade to fail or destabilize the cluster by causing inconsistencies between servers.

7.9.1 Stopping the Monitoring Service and Dropping Companionship

Drop the companionship of servers and stop the monitoring service.

Procedure

1. Drop the companionship. From the secondary companion, issue:

   ```
   sp_companion <primary_server_name>, "drop"
   ```

2. From the primary companion, issue:

   ```
   sp_companion <secondary_server_name>,"drop"
   ```

3. Ensure that both nodes are in single-server mode by issuing, on each node:

   ```
   sp_companion
   ```

If the companions are in single-server mode, they return:

```
Server '<server_name>' is not cluster configured.
Server '<server_name>' is currently in 'Single server' mode.
```

4. On SAP ASE packages on all nodes in the cluster, stop the monitoring service. As root, issue:

```
cmhaltserv -v <primary_package_name>
```

7.9.2 Upgrading SAP ASE

Disable high availability before upgrading SAP ASE.

Procedure

1. On each node, disable high availability:

```
sp_configure 'enable HA', 0
```

   Restart the server for this change to take effect.
2. Follow the instructions in the installation guide to upgrade each server.
3. On all nodes, reenable high availability:

```
sp_configure 'enable HA', 1
```

   Restart the server for this change to take effect.
4. On the upgraded servers, reinstall the `installmaster` and `installhasvss` scripts. See *Reinstalling installmaster* and *Rerunning installhasvss*. When you reinstall `installmaster`, you must reinstall `installhasvss`.
5. Ensure that permissions are set correctly for the `sybha` binary and `sybhausers` file.

   As root, issue these commands from `$SYBASE/$SYBASE_ASE/bin`:

```
chown root sybha
chmod 4550 sybha
```

   As root, perform these tasks from `$SYBASE/$SYBASE_ASE/install`:
   1. Ensure that the `sybase` user is included in the `sybhauser` file.
   2. Issue:

```
chown root sybhauser
chmod 600 sybhauser
```

6. Changes are properly reflected in package properties or any files related to high availability in the new installation (for example, `<PRIM_SYBASE>`, `<PRIM_RUNSCRIPT>`, `<PRIM_CONSOLE_LOG>`, and so on) in the `/etc/cmcluster/package_name/package_name.sh` script.

Related Information

Reinstalling installmaster [page 220]
Rerunning installhasvss [page 220]

7.9.3 Reestablishing Companionship and Resuming Monitoring

To reestablish companionship and resume monitoring, manually restart the server and the monitoring service, then reestablish companionship.

Procedure

1. On each node, manually restart the server.
2. As root, from the primary node, restart the monitoring service:

```
cmmodpkg -e <primary_package_name>
```

3. Verify you have performed the prerequisite steps for establishing companionship described in *Configuring Companion Servers for Failover*.
4. Reestablish companionship between the servers.

   For asymmetric configurations, issue these commands on the secondary server; for symmetric configurations, issue these commands on both companions:

```
dbcc traceon (2209)
sp_companion <primary_server_name>, configure, NULL, <user_name>, <password>
```

   If user databases exist on the secondary server, you may see one or more warning messages, which you can safely ignore:

```
Msg 18739, Level 16, State 1:
Server 'svr2', Procedure 'sp_hacmpcfgvrfy', Line 102:
Database 'svr2_db1': a user database exists. Drop this
database and retry the configuration again.
```

5. As root, take the packages offline:

```
dbcc traceoff(2209)
cmhaltpkg "<primary_package_name>"
cmhaltpkg "<secondary_package_name>"
```

6. Restart the packages on their appropriate nodes. As root on the primary node, issue:

```
cmrunpkg -v "<primary_package_name>"
```

   As root on the secondary node, enter:

```
cmrunpkg -v "<secondary_package_name>"
```

7. Run `sp_companion` to verify that the system is properly configured for failover. To verify that failover and failback works for the companion servers, relocate the primary package to the secondary node.

Related Information

Configuring Companion Servers for Failover [page 62]

8 Configuring SAP ASE for Failover on IBM AIX HACMP

Configuring SAP ASE for failover on IBM AIX HACMP requires hardware and system components, configuring the IBM subsystem, configuring companion servers, and administering failover.

8.1 Hardware and Operating System Requirements

Configuring SAP ASE for high availability requires hardware and operating 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.

8.1.1 Requirements for Running Failover on IBM AIX HACMP

Configuring for high availability on IBM High Availability Cluster Multiprocessing (HACMP) requires hardware and operating system components.

- 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.
  SAP 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 SAP ASE server companion.

8.1.1.1 Special Considerations for Running SAP ASE 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 SAP 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

8.1.1.2 Check the Debug Level

Verify that Debug Level is set to low.

Procedure

1. From SMIT, select HACMP Logs from the System Management (C-SPOC) menu.
2. Select Change/Show HACMP Log File Parameters.
3. Select the node name and press Enter.
4. Verify the Debug Level field is set to low (change if necessary).
5. Select other nodes and verify the Debug Level field is set to low
6. Synchronize the cluster if you changed the Debug Level for any node.

8.2 Preparing SAP ASE for High Availability

Prepare SAP ASE for a high availability configuration.

8.2.1 Installing SAP ASE Servers

Before you install SAP ASE, start the HACMP services on the same node on which you are installing SAP ASE. 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 SAP ASE server, or it can be upgraded from an earlier version of SAP ASE with existing databases, users, and so on.

The secondary companion must be a newly installed SAP ASE 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 SAP ASE.

8.2.2 Add Entries for Both SAP ASE 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.

8.2.2.1 Add Entries to 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`.

8.2.3 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.

Prerequisites

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.

Procedure

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.

Results

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`.

8.2.4 Configuring the sybha Executable

The SAP ASE High Availability Basic Services library calls `sybha`, which is located in `$SYBASE/$SYBASE_ASE/bin`.

Prerequisites

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. SAP strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

You must perform these steps as root.

Procedure

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.
2. Add “sybase” user to the group “hacmp”. This group is created as part of HACMP Cluster Software installation.
3. 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.

4. Change to the `$SYBASE/$SYBASE_ASE/bin` directory:

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

5. Change the ownership of `sybha` to “root”:

```
chown root sybha
```

6. Change the group for the `sybha` program to `sybhagrp`:

```
chgrp sybhagrp sybha
```

7. Modify the file permissions for `sybha` to 4550:

```
chmod 4550 sybha
```

8. Change to the `$SYBASE/$SYBASE_ASE/install` directory:

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

9. Add the `sybase` user to the `sybhauser` file. These logins must be in the format of UNIX login IDs, not SAP ASE logins.

   For example:

```
sybase
coffeecup
spooner
venting
howe
```

10. Change the ownership of `sybhauser` to “root”:

```
chown root sybhauser
```

11. Modify the file permissions for `sybhauser`:

```
chmod 600 sybhauser
```

8.2.5 Verify Configuration Parameters

You must enable the configuration parameters `enable cis`, `enable xact coordination`, and `enable HA` before you configure SAP ASE 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 SAP ASE to function as a companion in a high availability system. `enable HA` is off by default. This configuration is static, so you must restart the server for it to take effect. This parameter writes a message to the error log stating that you have started the server in a high availability system.

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

8.2.6 Adding Thresholds to the master Log

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

Procedure

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. SAP ASE does not supply `sp_thresholdaction`. See the *Reference Manual: Procedures* 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.

8.2.7 Creating a New Default Device Other than master

The master device is the default device in a newly installed SAP ASE server.

Context

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, create a new device.

Procedure

1. Create a new device using `disk init`.
2. Use `sp_diskdefault` to specify the new device as the default before you configure SAP ASE as a companion for fail over. For example, to add a new default device named `money_default1` to the MONEY1 server, enter:

```
sp_diskdefault money1_default1, defaulton
```

3. 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
```

Results

See the *Reference Manual: Commands* for more information about `disk init` and `sp_diskdefault`.

8.2.8 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.

Procedure

1. For example, if the companion MONEY1 uses the network name of MONEY1 in the `interfaces` file, enter:

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

2. Restart the server for this change to take effect.

8.2.9 Adding the Secondary Companion to sysservers

Add the secondary companion as a remote server in `sysservers`.

Procedure

Use the syntax:

```
sp_addserver <server_name>
```

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

8.2.10 Running installhasvss

Run the `installhasvss` script to install the stored procedures required for failover (such as sp_companion) the SYB_HACMP server in `sysservers`.

Prerequisites

You must have System Administrator privileges to run `installhasvss`. You must perform the tasks described in "Add Entries for Both SAP ASE Servers to the interfaces File", before executing `installhasvss`. If you run `installhasvss` before performing these tasks, re-run `installmaster` to reinstall all the system stored procedures.

Procedure

1. Enable High Availability, then restart the server.

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

2. To execute the `installhasvss` script, enter:

```
$SYBASE/$SYBASE_OCS/bin/isql -Usa -P<password> -S<servername> < $SYBASE/
$SYBASE_ASE/scripts/installhasvss
```

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

8.2.11 Assigning ha_role to System Administrator

You must have `ha_role` permission on both servers to run `sp_companion`.

Procedure

1. To assign the `ha_role`, issue the following from `isql`:

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

2. You must log out and then log back in to the SAP ASE for the change to take effect.

8.3 Configuring the IBM AIX Subsystem for SAP Failover

You must prepare your IBM AIX subsystem for SAP Failover.

8.3.1 Editing the ASE_HA.sh Script

The `ASE_HA.sh` template script configures the high availability system to start, stop, and monitor SAP ASE for failover.

Prerequisites

As "root," perform the following steps.

Context

The `ASE_HA.sh` template script is included in the `$SYBASE/$SYBASE_ASE/install` directory.

Procedure

1. Make a copy of the template script and modify it for your environment for both 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.
2. Change to the `$SYBASE/$SYBASE_ASE/install` directory.
3. Copy `ASE_HA.sh` to the HACMP event handler script directory, usually `/usr/sbin/cluster/events`, and enter the following, where `<servername>` is the SAP ASE server to be monitored:

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

4. 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:
5. Edit the script for the primary companion.
6. 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.

8.3.1.1 server_name.sh File Entries

Edit the `server_name.sh to be used by the ASE_HA.sh script`.

- *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.

  Caution

  Set ASE_FAILOVER to “yes” only if both servers are running SAP ASE 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 SAP 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 SAP 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 SAP ASE products.
- `SYBASE_OCS` – the installation directory of 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`.

> **⚠ Caution**
>
> 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 SAP ASE products are installed. Usually this is `$SYBASE/$SYBASE_ASE`.
- `SEC_SYBASE_HOME` – the path to the directory in the secondary host in which the SAP ASE 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`.

8.3.2 Configuring Resource Groups in HACMP

Configure the resource groups in HACMP5.2. If you are using a later version, see your operating system documentation.

Context

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. See the IBM HACMP for AIX documentation for information about configuring resource groups from the command line.

Procedure

1. Shut down the cluster services on both nodes in graceful mode, then log in to start IP addresses of the primary node as “root”.
2. Start SMIT from the command line - `smit hacmp`.
3. From Extended Configuration menu:
   a. Select Extended Resource Configuration.
   b. Select HACMP Extended Resource Group Configuration.
   c. 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.
4. Select the appropriate start, failover, 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”
Failover Policy	“Failover To Next Priority Node In The List”
Fallback Policy	“Fallback To Higher Priority Node In The List”

5. Click OK.
6. 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”
Failover Policy	“Failover To Next Priority Node In The List”
Fallback Policy	“Fallback To Higher Priority Node In The List”

7. Click OK.
8. 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”
Failover Policy	“Failover To Next Priority Node In The List”
Fallback Policy	“Fallback To Higher Priority Node In The List”

9. 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.

10. Define the primary and secondary companions as application servers in HACMP. From Extended Configuration menu:
    a. Select Extended Resource Configuration
    b. Select HACMP Extended Resources Configuration
    c. Select Configure HACMP Applications
    d. Select Configure HACMP Application Servers
    e. 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 “Editing the ASE_HA.sh Script”, 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 “Editing the ASE_HA.sh Script”, 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

f. See *Examples of Settings for Resource Groups*. Click OK when done.

11. Configure each of the resource groups you defined for the Application Servers. From Extended Configuration menu:
    a. Select Extended Resource Configuration.
    b. Select HACMP Extended Resource Group Configuration.
    c. Select Changes/Show Resources and Attributes for a Resource Group.
    d. On the Single Select List, select the resource group you want to configure.
    e. 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).
    f. Enter information in all the required fields, such as IP Label, Volume Groups, and File systems. Repeat this step for each of the companions.
12. Synchronize the cluster resources. Using `smit`, 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.

    Use this example to set the start, failover, and fallback policies when defining the resource groups:

    - 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]`

Field name		Enter
	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]`
	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.

8.3.2.1 Example Settings for Resource Groups

Use this example to set the start, failover, and fallback policies when defining the resource groups.

- 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:		

Field name		Enter
	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]`
	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.

8.4 Configuring Companion Servers for Failover

Configure the SAP ASE servers as primary and secondary companions in a high availability system.

8.4.1 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 server as a secondary companion) will be successful. `sp_companion do_advisory` advises you of any configuration options that should be changed.

See *Running do_advisory* for a complete description of the `sp_companion do_advisory` option.

Related Information

Running do_advisory [page 37]

8.4.2 Create an Asymmetric Companion Configuration

To configure the primary companion asymmetrically, issue the `sp_companion` command from the secondary companion.

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

- `<primary_server_name>` is the name of the primary 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 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
```

8.4.3 Create 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 *Configuring the Symmetric Companion* for a description of symmetric configuration.

Issue `sp_companion` from the secondary companion to configure it for symmetric configuration. See *Create an Asymmetric Companion Configuration*, for a description of the syntax for `sp_companion`.

The following example adds an server named MONEY1 as the secondary companion to the server named PERSONNEL1 described in *Create an Asymmetric Companion Configuration*. 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
```

Related Information

Create an Asymmetric Companion Configuration [page 91]

8.4.4 Starting the Primary Companion as a Monitored Resource

Start the primary companion as a service monitored by the high availability system.

Prerequisites

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.

Procedure

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

8.5 Administering SAP Failover

Administer SAP Failover using HACMP5.2. If you are using a later version, see your operating system documentation.

8.5.1 Failback 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.

8.5.1.1 Failing Back Manually

Failback to the primary companion and resuming normal companion mode.

Procedure

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`.

8.5.2 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.

Context

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.

Procedure

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>
```

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

3. Shut down the primary companion.

8.5.2.1 Restarting the Primary Companion During Suspended Mode

Use the start-up script in `$SYBASE/$SYBASE_ASE/install` to restart the primary companion without monitoring.

Procedure

Enter:

```
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.

8.5.3 Resume 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.

8.5.3.1 Resuming Normal Companion Mode from Suspended Mode

Resume normal companion mode between two companions that have been moved to suspended mode.

Procedure

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.

8.5.3.2 Resuming Normal Companion Mode from Failover Mode

Resume normal companion mode between two companions that are in failover mode.

Procedure

1. Restart the HACMP services on the primary node.
2. Check that both companions are in failback mode by issuing `sp_companion` with no parameters.
3. 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
   ```

8.5.4 Dropping Companion Mode

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

Procedure

To drop companion mode, issue:

```
sp_companion <companion_name>, "drop"
```

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:

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

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.

8.6 Troubleshoot Failover for HACMP on IBM AIX

Troubleshoot common errors of failover on or HACMP on IBM AIX.

8.6.1 Error Message 18750

If a companion server issues error message 18750, check the `<@@cmpstate>` of the servers.

Context

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.

Procedure

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. Restart the HACMP services on the primary node.

8.6.2 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, roll back and then reissue the `prepare_failback` command.

Procedure

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.

8.6.3 Location of Error Logs

SAP Failover includes logs which 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 information from the most recent execution of the `RUNHA_<servername>.sh` script.

8.7 Upgrading SAP ASE

To upgrade an SAP ASE server in a high availability configuration, you must temporarily break the companionship between the primary and secondary companion, and disable monitoring of the SAP ASE resource groups.

You can shutdown or restart either SAP ASE server independently during the upgrade process without triggering unexpected failovers by the HACMP cluster.

> **Note**
>
> You cannot add, delete, or modify any databases, objects, users, or logins during the upgrade process. Making these changes after the companionship is dropped and before it is reestablished may cause the upgrade to fail or destabilize the cluster by causing inconsistencies between servers.

8.7.1 Stopping the Monitoring Service and Dropping Companionship

Drop the companionship of servers and stop the monitoring service.

Procedure

1. As root, issue these commands to take the resource group offline:

```
dbcc traceoff(2209)
clRGmove -g secondary_resource_group -d -s false
clRGmove -g secondary_resource_group -d -s true
clRGmove -g <group_name> -d -s false
clRGmove -g <group_name> -d -s true
```

   You may also use SMIT (see your SMIT user documentation).

2. On all nodes in the cluster, stop the monitoring service. As root, issue:

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

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

3. From the secondary companion, issue:

```
sp_companion <primary_server_name>, "drop"
```

4. (For symmetric configuration) Drop the secondary's companionship from the primary companion:

```
sp_companion <secondary_server_name>,"drop"
```

5. Ensure that both nodes are in single-server mode by issuing, on each node:

```
sp_companion
```

   If the companions are in single-server mode, they return:

```
Server '<server_name>' is not cluster configured.
Server '<server_name>' is currently in 'Single server' mode.
```

8.7.2 Upgrading SAP ASE

Disable high availability before upgrading SAP ASE.

Procedure

1. On each node, disable high availability:

   ```
   sp_configure 'enable HA', 0
   ```

   Restart SAP ASE for this change to take effect.
2. Follow the instructions in the installation guide to upgrade each server.
3. On all nodes, reenable high availability:

   ```
   sp_configure 'enable HA', 1
   ```

   Restart SAP ASE for the change to take effect.
4. On the upgraded servers, reinstall the scripts (`installmaster`, `installhasvss`, `installsecurity`, and so on). See *Reinstalling installmaster* and *Rerunning installhasvss*. When you reinstall `installmaster`, you must reinstall `installhasvss`.
5. Ensure that permissions are set correctly for the `sybha` binary and `sybhausers` file.

   As root, issue these commands from `$SYBASE/$SYBASE_ASE/bin`:

   ```
   chown root sybha
   chgrp sybhagrp sybha
   chmod 4550 sybha
   ```

   As root, perform these tasks from `$SYBASE/$SYBASE_ASE/install`:
   1. Ensure that the `sybase` user is included in the `sybhauser` file.
   2. Issue:

      ```
      chown root sybhauser
      chmod 600 sybhauser
      ```
6. Verify:
   - Changes are properly reflected in resources, Resource Group properties, or any files related to high availability in the new installation (for example, `<PRIM_SYBASE_HOME>`, `<PRIM_RUNSCRIPT>`, `<PRIM_CONSOLE_LOG>`, and so on) in the `/usr/sbin/cluster/event/RUNHA_server_name.sh` script.
   - You have performed all actions required for establishing companionship described *Preparing SAP ASE for High Availability* and *Configuring the IBM AIX Subsystem for SAP Failover* and the system maintains these changes after the upgrade is complete.

Related Information

Reinstalling installmaster [page 220]
Configuring the IBM AIX Subsystem for SAP Failover [page 83]
Rerunning installhasvss [page 220]

8.7.3 Reestablishing Companionship and Resuming Package Monitoring

To reestablish companionship and resume monitoring, manually restart the server and the monitoring service, then reestablish companionship.

Procedure

1. On each node, manually restart SAP ASE.
2. As root, restore the monitoring service for the cluster by issuing this command, which automatically executes the `RUNHA_server_name.sh` monitoring script:

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

3. Verify you have performed the prerequisite steps for establishing companionship described in *Configuring Companion Servers for Failover*.
4. Reestablish companionship between the servers. On the secondary server, issue:

   ```
   dbcc traceon (2209)
   sp_companion <primary_server_name>,configure
   ```

   > **Note**
   >
   > For symmetric configurations, issue this command on both companions.

   If the secondary server includes user databases, you may see one or more warning messages, which you can safely ignore:

   ```
   Msg 18739, Level 16, State 1:
   Server '<server_name>', Procedure 'sp_hacmpcfgvrfy', Line 102:
   Database '<database_name>': a user database exists. Drop this
   database and retry the configuration again.
   ```

5. Restart the resource groups on their appropriate nodes. As root, on the primary node, enter

   :

   ```
   clRGmove -g <group_name> -u -s false
   ```

As root, on the secondary node, enter:

```
clRGmove -g <group_name> -u -s true
```

6. Run `sp_companion` to verify that the system is properly configured for failover. Verify failover and failback.

Related Information

Configuring Companion Servers for Failover [page 90]

9 Active-Active Configuration for Sun Cluster 3.0 and 3.1

Configuring SAP ASE for failover on Sun Cluster 3.0 and 3.1 in an active-active setup requires hardware and system components, configuring the Sun Cluster subsystem, configuring companion servers, configuring resource groups, and administering failover.

SAP ASE 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 SAP ASE for High Availability on Sun Solaris.

9.1 Hardware and Operating System Requirements

Configuring SAP ASE for high availability requires hardware and operating system components.

- Two homogeneous 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 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.

9.1.1 Active-Active Setup in Sun Cluster

In Sun Cluster, SAP ASE runs as a data service and is managed by the Sun Clusters Resource Group Manager (RGM).

SAP ASE 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 SAP ASE resource and defines various extension properties for the resources of type `SY.ase`. See *SAP ASE Resource Extension Properties* for more information. See the Sun Cluster documentation for more information on standard resource properties.

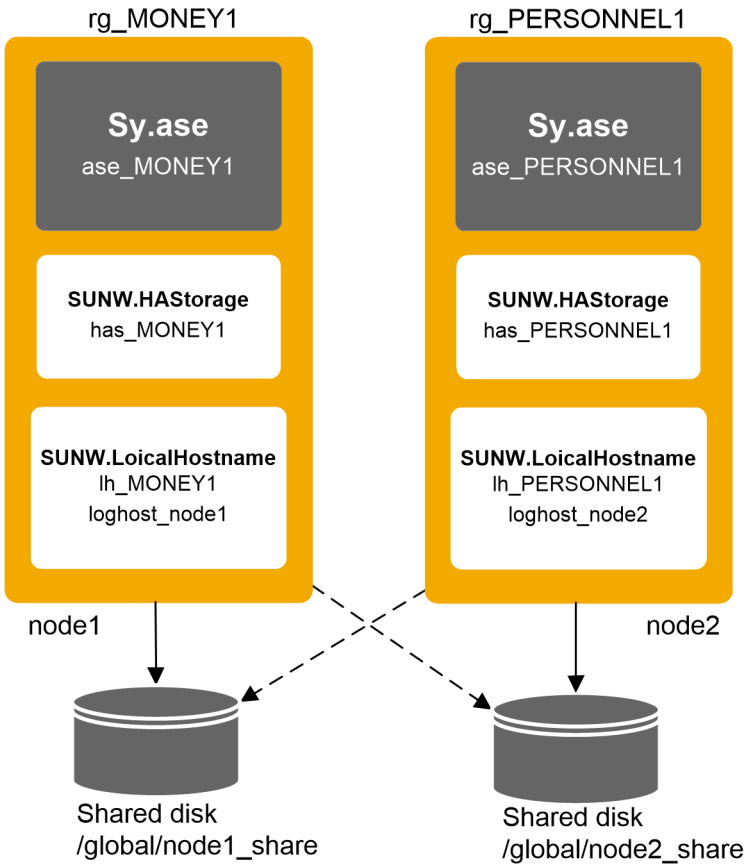


Figure 2: Sample Sun Cluster resource group configuration

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 `loghost_node1`. The SAP ASE 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 `loghost_node2`. The SAP ASE resource `ase_PERSONNEL1` uses on `has_PERSONNEL1` and `lh_PERSONNEL1`.

Related Information

SAP ASE Resource Extension Properties [page 118]

9.2 Prepare SAP ASE for Active-Active Setup

You must prepare SAP ASE for an active-active high availability configuration.

9.2.1 Install SAP ASE 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 SAP ASE server, or it can be upgraded from an earlier version of SAP ASE with existing databases, users, and so on.

The secondary companion must be a newly installed SAP ASE 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 SAP ASE.

9.2.2 Add Entries for Both SAP ASE 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 SAP ASE 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 SAP ASE 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`.

9.2.3 Setting the Value of $SYBASE

`$SYBASE` on both companions must point to the same directory path name.

Procedure

Make sure that the `$SYBASE` release directory on each companion is created in the same directory, or

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.

Results

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`.

9.2.4 Configuring the sybha Executable

The SAP ASE High Availability Basic Services Library calls `sybha`, which allows the library to interact with each platform's high availability cluster subsystem.

Prerequisites

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. SAP strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

You must perform these steps as root.

Procedure

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.
2. 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.
3. Change to the `$SYBASE/$SYBASE_ASE/bin` directory:

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

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

   ```
   chown root sybhauser
   ```

10. Modify the file permissions for `sybhauser`:

    ```
    chmod 600 sybhauser
    ```

9.2.5 Creating a New Default Device Other than master

The master device is the default device in a newly installed SAP ASE server.

Context

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, create a new device.

Procedure

1. Create a new device using `disk init`.
2. Use `sp_diskdefault` to specify the new device as the default before you configure SAP ASE as a companion for fail over. For example, to add a new default device named `money_default1` to the MONEY1 server, enter:

   ```
   sp_diskdefault money1_default1, defaulton
   ```

3. 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
   ```

Results

See the *Reference Manual: Commands* for more information about `disk init` and `sp_diskdefault`.

9.2.6 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.

Procedure

1. For example, if the companion MONEY1 uses the network name of MONEY1 in the `interfaces` file, enter:

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

2. Restart the server for this change to take effect.

9.2.7 Adding the Secondary Companion to sysservers

Add the secondary companion as a remote server in `sysservers`.

Procedure

Use the syntax:

```
sp_addserver <server_name>
```

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

9.2.8 Assigning ha_role to System Administrator

You must have `ha_role` permission on both servers to run `sp_companion`.

Procedure

1. To assign the `ha_role`, issue the following from `isql`:

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

2. You must log out and then log back in to the SAP ASE for the change to take effect.

9.2.9 Running installhasvss

Run the `installhasvss` script to install the stored procedures required for failover (such as sp_companion) the SYB_HACMP server in `sysservers`.

Prerequisites

You must have System Administrator privileges to run `installhasvss`. You must perform the tasks described in *Add Entries for Both SAP ASE Servers to the interfaces File*, before executing `installhasvss`. If you run `installhasvss` before performing these tasks, re-run `installmaster` to reinstall all the system stored procedures.

Procedure

1. Enable High Availability, then restart the server.

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

2. To execute the `installhasvss` script, enter:

```
$SYBASE/$SYBASE_OCS/bin/isql -Usa -P<password> -S<servername> < $SYBASE/
$SYBASE_ASE/scripts/installhasvss
```

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

Related Information

Add Entries for Both SAP ASE Servers to the interfaces File [page 107]

9.2.10 Verify Configuration Parameters

You must enable the configuration parameters `enable cis`, `enable xact coordination`, and `enable HA` before you configure SAP ASE 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 SAP ASE to function as a companion in a high availability system. `enable HA` is off by default. Restart SAP ASE for this parameter to take effect. This parameter writes a message to the error log stating that you have started the server in a high availability system.

See, *Setting Configuration Parameters* in the *System Administration Guide: Volume 1*.

9.2.11 Adding Thresholds to the master Log

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

Procedure

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. SAP ASE does not supply `sp_thresholdaction`. See the *Reference Manual: Procedures* 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.

9.2.12 Adding User and Login for Fault Monitor

Create or specify a special user and login for the monitor to perform a thorough probe operation.

Procedure

Use `isql` to connect to the data servers and issue:

```
sp_adduser <<user for monitoring ase>>
```

When the high availability agent fault monitor, `ase_monitor`, runs thorough `probe`, a number of processes are performed.

These are:

- Connection to the SAP ASE server.
- Creation of a temporary table, an entry is inserted into the table, the table is updated and deleted.
- Disconnect from the SAP ASE server after the cycle count reaches the value specified by the resource property `<Connect_cycle_count>`.

> **Note**
>
> During SAP ASE 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.

9.3 Configure the Sun Cluster Subsystem

You must prepare your Sun Cluster subsystem for SAP Failover.

To configure your system, the following must be completed:

- Your PATH environment variable must contain `/usr/cluster/bin` when you run the cluster system command.
- Install the Sun Cluster high availability system.
- Install SAP ASE server and created the required database device files on the shared disk.
- Configure SAP ASE following the instructions in *Prepare SAP ASE for Active-Active Setup*.
- Create `$SYBASE/SYBASE.sh` and edit the file with the required environment for SAP ASE.
  As the file is executed in the high availability agent scripts, protect the file from unauthorized access and make sure only "root" has read and executable permissions.
- Create `$SYBASE/$SYBASE_ASE/install/RUN_<Dataserver_name>` file. You must specify the SAP ASE error log with the `-e` option in this file.
  If you specify the `-s` option, it must be the same as the resource property `<Dataserver_name>`.
- Install `$SYBASE/$SYBASE_ASE/SC-3_0` properly. This directory must contain all the required files for the SAP ASE high availability agent.
  The default `$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 SAP ASE resource.

Related Information

Prepare SAP ASE for Active-Active Setup [page 107]

9.3.1 Using the syscadm Script

Use the `syscadm` script to configure and administer SAP ASE resource groups and their associated resources.

You can use `syscadm` to create, remove, or no longer control the SAP ASE 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 SAP ASE 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. SAP 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*.

The input file is divided into three sections.

- Section 1 – enter the right-side values for all entries. This section includes entries for the SAP ASE 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 SAP ASE 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"
```

Related Information

Sample sysc_input_file [page 116]

9.3.1.1 Sample sysc_input_file

The file, `sysc_input_file` is used to create and configure the SAP ASE resource group.

The following is the `sysc_input_file` used to create and configure the SAP ASE resource group `rg_MONEY` and its resources as shown in *Active-Active Setup in Sun Cluster*:

```
##########################################################################
##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
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 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`.

9.3.2 SAP ASE Resource Extension Properties

There are a number of extension properties for the resource.

Refer to the respective Sun Cluster documentation for more information about resources.

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

Property	Default	Description
<RUN_server_file>	Sybase_home/$SYBASE_ASE/install/RUN_<Dataserver_name>	Absolute path to the RUN_SERVER file for the SAP ASE server specified by the property Dataserver_name. Do not include environment variables in this file.
<Thorough_probe_script>	Ignored. Reserved for future use.	Absolute path to a file containing SQL scripts for the fault monitoring program to perform thorough probe.
<Monitor_log>	Sybase_home/$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 SAP ASE 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>.
<Debug_callback >	FALSE	If TRUE, the SAP ASE 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 SAP ASE reuses before the connection is dropped and a new one is established.

Property	Default	Description
<Failback_strategy>	Ignored. Reserved for future use.	

9.3.3 Configuring SAP ASE Resource Groups

You must configure the resource groups on Sun Cluster.

Procedure

1. Modify the SAP ASE 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 SAP ASE 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 SAP ASE 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). SAP 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.TmFBarGS2Kl553WDR7g8m5vrf8
6t@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.TmFBarGS2Kl553WDR7g8m5vrf8
6t@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*.

You can also perform these steps manually. See *Manually Configure the Resource Groups* for more information.

4. For the primary SAP ASE 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 SAP ASE resource group, run `scswitch` command and use the same steps as for the primary server.

Related Information

Using the syscadm Script [page 115]
Manually Configure the Resource Groups [page 132]

9.3.4 Using SUNW.HAStoragePlus

If you are running Sun Cluster 3.0 with Update2 or later, you can use the `<SUNW.HAStoragePlus>` resource in the SAP ASE resource group.

Context

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.

Procedure

1. To add a `SUNW.HAStoragePlus` resource to the SAP ASE 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`.
2. Register the resource type `SUNW.HAStoragePlus`:

   ```
   scrgadm -a -t SUNW.HAStoragePlus
   ```
3. Add the `SUNW.HAStoragePlus` resource to the SAP ASE 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 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.

4. Enable the `SUNW.HAStoragePlus` resource:

```
scswitch -e -j <hastorageplus_name>
```

For example:

```
scswitch -e -j hasp_MONEY
```

5. 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
```

Results

See the Sun Cluster documentation for more information about `SUNW.HAStoragePlus` resource type.

9.4 Configure Companion Servers for Failover

You must configure the SAP ASE servers as primary and secondary companions in a high availability system.

9.4.1 Load the High Availability Services Library

You must load the high availability services library for Sun Cluster.

Procedure

1. Verify that the high availability services library is available. Use `isql` to connect to any SAP ASE server:

   ```
   sp_companion "MONEY1", show_cluster
   ```

   You see:

   ```
   The default cluster is: SC.
   The current cluster is set to default.
   Supported cluster systems for SunOS are:
   SC
   VCS
   ```

2. Set the high availability services library for SC3.0. For example, from PERSONNEL1, enter:

   ```
   sp_companion "MONEY1", set_cluster, "SC"
   ```

   ```
   The current cluster is set to SC.
   ```

3. Check the interaction of SAP ASE 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 SAP ASE server in the cluster. If the high availability services library has been loaded on another SAP ASE 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`.

9.4.2 Running sp_companion with do_advisory

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 server as a secondary companion) will be successful. `sp_companion do_advisory` advises you of any configuration options that should be changed.

See *Running do_advisory* for a complete description of the `sp_companion do_advisory` option.

Related Information

Running do_advisory [page 37]

9.4.2.1 Creating an Asymmetric Companion Configuration

Use `sp_companion` to configure the primary companion for asymmetric configuration.

Procedure

1. Use `scswitch` to disable the monitoring of the primary and secondary resources:

```
scswitch -n -M -j <primary_resource>
scswitch -n -M -j <secondary_resource>
```

2. Drop the user and login for monitor for the secondary SAP ASE server, where `<secondary_probe_ase>` is the login and user created in *Adding User and Login for Fault Monitor*:

```
sp_dropuser <secondary_probe_ase>
sp_droplogin <secondary_probe_ase>
```

3. 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 a 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
```

4. Add the user and login for monitor for secondary SAP ASE server:

```
sp_adduser <secondary_probe_ase>
```

   where `<secondary_probe_ase>` is the login and user created in *Adding User and Login for Fault Monitor*.

5. Enable monitoring of secondary SAP ASE server:

```
scswitch -e -M -j <primary_resource>
scswitch -e -M -j <secondary_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* for more information about asymmetric configuration.

Related Information

Configuring the Asymmetric Companion [page 23]
Adding User and Login for Fault Monitor [page 113]

9.4.2.2 Configuring Symmetric Companions

After you configure the companions for asymmetric fail over, you can set them up for symmetric configuration.

Context

In a symmetric configuration, both servers act as primary and secondary companions.

Procedure

1. 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>
```

2. 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.

   Use a syntax similar to the one for asymmetric configuration, but replace `with_proxydb` by NULL. See *Creating an Asymmetric Companion Configuration* 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
```

3. 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 SAP ASE server PERSONNEL1:

```
scrgadm -c -g rg_PERSONNEL1 -y NodeList=node2,node1
```

4. Use `scswitch` to enable the monitoring of the primary and secondary resources:

```
scswitch -e -M -j <primary_resource>
scswitch -e -M -j <secondary_resource>
```

Related Information

Creating an Asymmetric Companion Configuration [page 125]

9.5 Administering SAP Failover

Administer SAP Failover for Sun Cluster includes failing back and suspending, resuming, and dropping companions.

9.5.1 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.

Procedure

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.

Results

> **Note**
>
> You cannot connect clients with the failover property to an SAP ASE 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`.

9.5.2 Suspending Normal Companion Mode

Suspended mode temporarily disables the ability of the primary companion to fail over to the secondary companion.

Procedure

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
```

9.5.3 Resuming Normal Companion Mode

Move from suspended mode to normal companion mode.

Procedure

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>
```

9.5.4 Dropping Companion Mode

Stop the high availability system from monitoring the companions.

Procedure

1. 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 SAP ASE server companion servers before they again fail over in a high availability system.

9.6 Verifying High Availability on Sun Cluster

To ensure that you have properly configured high availability on the Sun Cluster, perform verification tests.

Prerequisites

The following steps assume that you have configured two SAP ASE resource groups in asymmetric mode.

Procedure

1. Log in to the primary node for the SAP ASE resource group.
2. Set the environment variables: SYBASE, SYBASE_ASE, SYBASE_OCS, and so on. Use the `Environment_file` extension property to specify environment variables.
3. Verify the resource group is online:

```
scstat -g
```

4. Use `isql` to connect to the primary data server:

```
isql -Usa -P<password> -S<primary-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 -P<password> -S<secondary-server-name>
>select name from sysdatabases
>go
>quit
```

7. Follow the instructions in *Failing Back to the Primary Companion* 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 -P<password> -S<primary-server-name>
>select name from sysdatabases
>go
>quit
```

Related Information

Failing Back to the Primary Companion [page 129]

9.7 Manually Configure the Resource Groups

Commands executed by the `syscadm` script are used to create and configure the SAP ASE resource groups.

If necessary, you can perform these steps manually, for example to configure, reconfigure, or troubleshoot the SAP ASE resource groups. Make sure you have properly modified `SY.ase` and `ase_login_file` as explained in *Configuring SAP ASE Resource Groups*.

You must be logged on as “root” to run these Sun Cluster commands.

Related Information

Configuring SAP ASE Resource Groups [page 120]

9.7.1 Configuring the Primary Companion Resource Group

Configure a resource group for the primary companion server.

Procedure

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 SAP ASE 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 SAP ASE resource group. Specify a logical host name 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 SAP ASE 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
```

a. Specify any standard resource property values and extension property values.
b. 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.
c. 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. *SAP ASE Resource Extension Properties* describes the extension properties for the SAP ASE 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 SAP ASE 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
     ```

Related Information

Using SUNW.HAStoragePlus [page 122]

9.7.2 Configuring Secondary Companion Resource Group

Configure a resource group for the secondary companion server.

Procedure

1. 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 SAP ASE 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 the `SUNW.HAStorage` resource to the SAP ASE 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
```

4. Create and add `SUNW.LogicalHostname` to the SAP ASE 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
```

5. Create and add the `SY.ase` resource to the SAP ASE 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
```

6. 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
```

7. For the secondary SAP ASE 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
     ```

9.8 Upgrading SAP ASE

To upgrade an SAP ASE server in a high availability configuration, you must temporarily break the companionship between the primary and secondary companion, and disable monitoring of the Resource Groups.

You can shutdown or restart either server independently during the upgrade process without triggering unexpected failovers by the Sun Cluster subsystem.

> **Note**
>
> You cannot add, delete, or modify any databases, objects, users, or logins during the upgrade process. Making these changes after the companionship is dropped and before it is reestablished may cause the upgrade to fail or destabilize the cluster by causing inconsistencies between servers.

9.8.1 Stopping the Monitoring Service and Dropping Companionship

Drop the companionship of servers and stop the monitoring service.

Procedure

1. Halt the monitoring service and stop management for the SAP ASE resource groups on all nodes in the cluster. As root, issue:

```
scswitch -F -g <primary_resourcegroup_name>
scswitch -u -g <secondary_resourcegroup_name>
```

2. From the secondary companion, issue:

```
sp_companion <primary_server_name>, "drop"
```

3. (For symmetric configuration) Drop the secondary's companionship. Log in to the primary companion and issue:

```
sp_companion <secondary_server_name>,"drop"
```

4. Ensure that both nodes are in single-server mode by issuing on each node:

```
sp_companion
```

If the companions are in single-server mode, they return:

```
Server '<server_name>' is not cluster configured.
Server '<server_name>' is currently in 'Single server' mode.
```

Results

The servers are now running on their installation node and may be stopped and started independently without the cluster attempting to failover the resources between nodes.

9.8.2 Upgrading SAP ASE

Disable high availability before upgrading SAP ASE.

Procedure

1. On each node, disable high availability:

   ```
   sp_configure 'enable HA', 0
   ```

   Restart SAP ASE for this change to take effect.

   > **Note**
   >
   > Alternatively, if the companions are shut down, you can edit their server configuration files (`server_name.cfg`), changing the value of `enable HA` to zero

2. Follow the instructions in the installation guide to upgrade each server.
3. On each node, reenable high availability:

   ```
   sp_configure 'enable HA', 1
   ```

   Restart SAP ASE for the change to take effect. See the *Configuration Guide*.
4. On the upgraded servers, reinstall the scripts (`installmaster`, `installhasvss`, `installsecurity`, and so on). See *Reinstalling installmaster* and *Rerunning installhasvss*. When you reinstall `installmaster`, you must reinstall `installhasvss`.
5. Ensure that permissions are set correctly for the `sybha` binary and `sybhausers` file.

   As root, issue these commands from `$SYBASE/$SYBASE_ASE/bin`:

   ```
   chown root sybha
   chgrp sybhagrp sybha
   chmod 4550 sybha
   ```

   As root, perform these tasks from `$SYBASE/$SYBASE_ASE/install`:
   1. Ensure that the `sybase` user is included in the `sybhauser` file.
   2. Issue:

      ```
      chown root sybhauser
      chmod 600 sybhauser
      ```
6. Verify:
   - Changes are properly reflected in the resource group and resource properties (for example, `<Sybase_Home>`, runserver files, `<Dataserver_login_file>`, and so on) in the `<$SYBASE>` installation location, or any related files related to high availability in the new installation
   - You have performed all actions required for establishing companionship described *Prepare SAP ASE for Active-Active Setup* and *Configure the Sun Cluster Subsystem* and the system maintains these changes after the upgrade is complete.

- The following files exist and have correct information:

```
$SYBASE/$SYBASE_ASE/SC-3_0/etc/hacompanion.<server_name>
```

```
$SYBASE/$SYBASE_ASE/SC-3_0/etc/<ase_login_file>
```

Related Information

Reinstalling installmaster [page 220]
Prepare SAP ASE for Active-Active Setup [page 107]
Configure the Sun Cluster Subsystem [page 114]
Rerunning installhasvss [page 220]

9.8.3 Reestablishing Companionship and Resuming Resource Monitoring

To reestablish companionship and resume monitoring, manually restart the server and the monitoring service, then reestablish companionship.

Procedure

1. On each mode, manually restart SAP ASE.
2. As root, issue this command to restore the monitoring service:

```
scswitch -z -g primary_resourcegroup_name -h primary_node
scswitch -z -g secondary_resourcegroup_name -h secondary_node
```

3. Verify both the resource groups and the SAP ASE resources are online on their nodes with the `scstat -g` command (see your Sun documentation).
4. Log in to the primary and secondary companions with `isql` to verify both are running.
5. Select `SunCluster3.x` as the high availability library (see *Load the High Availability Services Library*).
6. Reestablish companionship between the servers (see *Creating an Asymmetric Companion Configuration* or *Configuring Symmetric Companions*.

```
dbcc traceon (2209)
sp_companion <primary_server_name>,configure
dbcc traceoff(2209)
```

> **Note**
>
> For symmetric configurations, issue this command on both companions.

If the secondary server includes user databases, you may see one or more warning messages, which you can safely ignore:

```
Msg 18739, Level 16, State 1:
Server '<server_name>', Procedure 'sp_hacmpcfgvrfy', Line 102:
Database '<database_name>': a user database exists. Drop this
database and retry the configuration again.
```

7. Run `sp_companion` to verify that the system is properly configured for symmetric or asymmetric configuration.

Related Information

Load the High Availability Services Library [page 124]
Creating an Asymmetric Companion Configuration [page 125]
Configuring Symmetric Companions [page 127]

9.8.4 Verify Failover and Failback

Verify the failover and failback configuration.

Procedure

1. Failover the primary companion by relocating the associated resource group to secondary node. As root:

   ```
   scswitch -z -g primary_resourcegroup_name -h secondary_node
   ```

   Log in to the secondary companion and issue `sp_companion` to verify the failover successfully completed.
2. Failback the SAP ASE server by following instructions in section *Failing Back to the Primary Companion*.

   Log in to the primary and secondary companions and issue `sp_companion` to verify the failover successfully completed.

Related Information

Failing Back to the Primary Companion [page 129]

9.9 Troubleshoot Failover for Sun Cluster

You can troubleshoot a number of common failover errors on Sun Cluster.

9.9.1 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, roll back and then reissue the `prepare_failback` command.

Procedure

1. Check the cluster system error logs, callback error logs, high availability agent fault monitor error logs, and SAP ASE 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")
   ```

9.9.2 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.

Context

The inconsistent state may be caused by `sp_companion 'prepare_failback'` failing on the secondary companion.

Procedure

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 SAP ASE 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")
   ```

9.9.3 Change the Resource and Resource Group State

When you are performing maintenance on a cluster, bring all resources in the SAP ASE resource group offline and move SAP ASE 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>
```

9.9.4 Location of the Error Logs

SAP Failover includes logs which may be helpful for investigating and diagnosing errors encountered during failover.

- SAP ASE error log – the location is defined in the RUNSERVER file. For example:

  ```
  /sybase/ASE-15_0/install/MONEY1.log
  ```

- SAP ASE high availability agent callback scripts log:

  ```
  $SYBASE/$SYBASE_ASE/SC-3_0/log/
        ase_callback_<<server-name>>.log
  ```

  or as specified by the SAP ASE resource property `Callback_log`.

- SAP ASE agent fault monitor log:

  ```
  $SYBASE/$SYBASE_ASE/SC-3_0/log/
        ase_monitor_<<server-name>>.log
  ```

  or as specified by the SAP ASE resource property `Monitor_log`.

- Sun Cluster system log:

  ```
  /var/adm/messages
  ```

10 Active-Passive Configuration for Sun Cluster 3.0 and 3.1

SAP ASE 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 SAP ASE 15.0 for High Availability on Sun Solaris.

An active-passive configuration includes two nodes and a single SAP ASE server. The node that hosts the SAP ASE server under normal conditions is the primary node; the node that can potentially host the SAP ASE server is called the secondary node.

When the SAP ASE server or any of the resources it depends on, such as a disk or the node itself, crashes, the SAP ASE server, along with all required resources, is relocated and restarted on the secondary node. This movement from the primary node to the secondary node is called failover.

After failover, the node hosting SAP ASE server is considered the primary node until the System Administrator performs a planned failback, or until the SAP ASE 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 SAP ASE 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.

Related Information

Configuring the interfaces File on the Client Side [page 151]

10.1 Hardware and Operating System Requirements

Configuring SAP ASE for high availability requires hardware and operating system components.

- Two homogeneous 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.

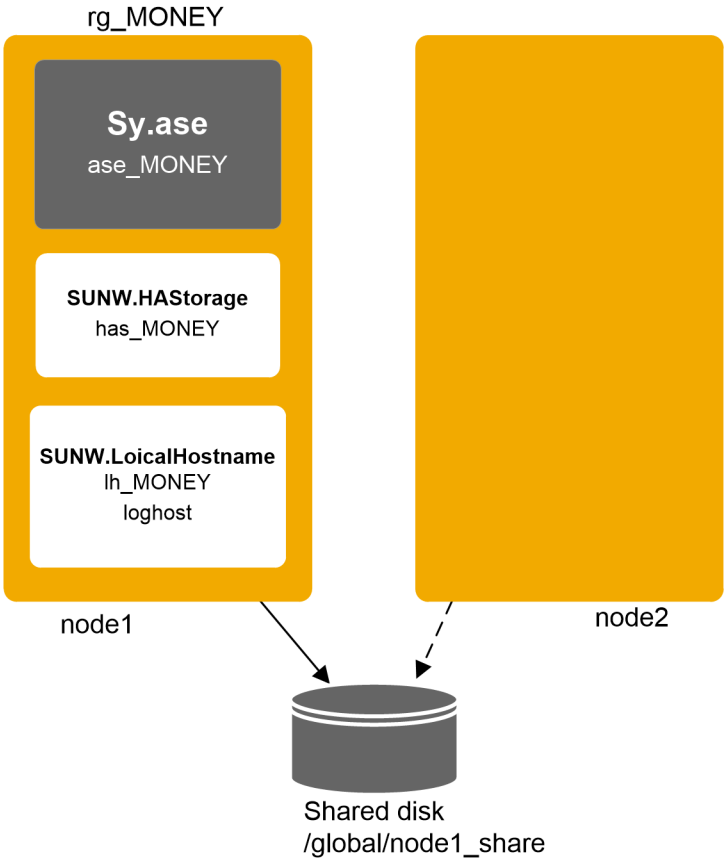
See your hardware and operating system documentation for information about installing platform-specific high availability software.

10.2 Active-Passive Setup in Sun Cluster

In Sun Cluster, SAP ASE runs as a data service and is managed by the Sun Cluster Resource Group Manager (RGM).

SAP ASE is associated with a resource group that contains the SAP ASE 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 *SAP ASE Resource Extension Properties* for more information. See the Sun Cluster documentation for more information on standard resource properties.

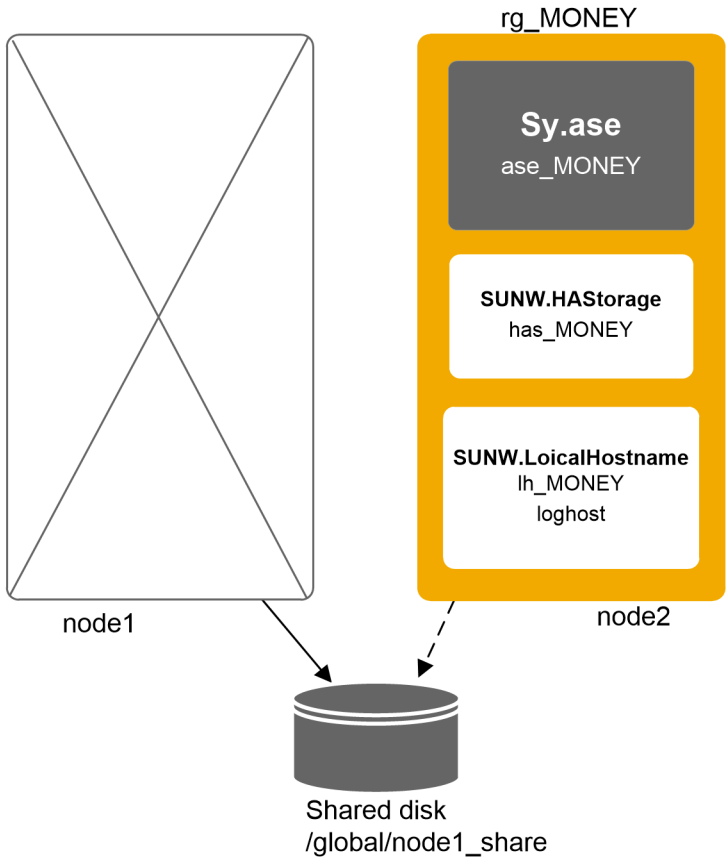


The SAP ASE server MONEY is associated with the resource group `rg_MONEY`, which consists of three resources: the SAP ASE resource, `ase_MONEY`, of resource type `SY.ase`, the storage resource, `<has_MONEY>`, of resource type `SUNW.HAStorage`, and the logical host resource, `<lh_MONEY>`, of resource 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 SAP ASE resource group, `rg_MONEY`, is hosted by the primary node, node1, and SAP ASE 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.

After failover, the SAP ASE server runs on node2 and continues to serve its clients using the same `loghost`.



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 SAP ASE 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 SAP ASE 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
```

Related Information

SAP ASE Resource Extension Properties [page 118]

10.2.1 Failing Back in an Active-Passive Configuration

You can relocate the SAP ASE resource group back to the primary node when the node recovers and can successfully host the SAP ASE resources group. This is called failback.

A failback in an active-passive configuration is the same as failing over to the primary node; stopping the SAP ASE 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.

10.2.2 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 SAP ASE. 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 SAP ASE 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 the SAP ASE server, then resubmit uncommitted transactions.

Related Information

Configuring the interfaces File on the Client Side [page 151]

10.3 Preparing SAP ASE for Active-Passive Setup

Preparing SAP ASE for active-active high availability configuration includes installing SAP, passing the environment to SAP ASE, running the license manager, and adding entries to the interfaces file.

10.3.1 Install SAP ASE

You can install SAP ASE on a global file system or on the local file systems of the primary and secondary nodes.

Installing on a Global File System

If you install SAP ASE on a global file system, the advantage is that you need only maintain one server installation. However, you must install the SAP ASE server on a global file system that is managed by the `SUNW.HAStorage` or `SUNW.HAStoragePlus` resource in the SAP ASE 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 SAP ASE on a local file system:

- The installation directory `$SYBASE` must use the same directory path on the primary and secondary nodes. If different nodes use the `$SYBASE` directory in different locations, create a directory with the same path on 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 both nodes whenever a node hosts the SAP ASE resource group. For example, `Callback_log`, `Monitor_log`, SAP ASE 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 SAP ASE resource properties.

10.3.2 Passing the Environment to SAP ASE

Use the `SYBASE.sh` file to specify the environment to pass to the SAP ASE 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 SAP ASE 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.

10.3.3 Running the SySam License Manager in the Cluster

You must run the `SySam` license manager on 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 both nodes using the same `license.dat` file.

- Create the same alias in the `/etc/hosts` file for the respective physical host names of 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
  ```

See the *Software Asset Management (SySAM) Users Guide*.
  ```

10.3.4 Adding an Entry for the SAP ASE 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 SAP ASE server entry must be a logical host name or a floating IP address that can be moved between the primary and secondary nodes.

10.3.4.1 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**
>
> SAP 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 before failure in *Active-Passive Setup in Sun Cluster* 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
```

10.3.4.2 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 SAP ASE on the secondary node and recovery time.
- The logical host name be accessible from the client machine.

10.3.4.2.1 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 SAP ASE server after failure. To reestablish the connections, clients must retry enough times, or wait long enough between retries, until fail over completes and SAP ASE 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
```

10.3.4.2.2 High-Availability Connections

High availability connections are made with the CS_HAFAILOVER property, and the <hafailover> entry in the interfaces file.

- The CS_HAFAILOVER property is set at the connection or context level (equivalent to the -Q option of isql).
- The <hafailover> entry is in the interfaces file, which must point to the SAP ASE 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 SAP ASE server after fail over. That is, they must set the same server name as the <hafailover> server in the interfaces file because the same SAP ASE server is restarted on the secondary node.

For example, the SAP ASE 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
```

Related Information

Open Client Functionality in a Failover Configuration [page 217]

10.3.4.3 Verifying Configuration parameters

To set up SAP ASE for an active-passive configuration, you must set the `enable HA` configuration parameter to 2.

Procedure

1. To set `enable HA` to 2, enter:

   ```
   sp_configure "enable HA", 2
   ```

2. You must restart SAP ASE for this parameter to take effect.

   See, *Setting Configuration Parameters*, in the *System Administration Guide: Volume 1*

10.3.4.4 Adding Thresholds to the master Log

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

Procedure

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. SAP ASE does not supply `sp_thresholdaction`. See the *Reference Manual: Procedures* 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.

10.3.4.5 Adding User and Login for Fault Monitor

Create or specify a special user and login for the monitor to perform a thorough probe operation.

Procedure

Use `isql` to connect to the data servers and issue:

```
sp_adduser <<user for monitoring ase>>
```

When the high availability agent fault monitor, `ase_monitor`, runs thorough `probe`, a number of processes are performed.

These are:

- Connection to the SAP ASE server.
- Creation of a temporary table, an entry is inserted into the table, the table is updated and deleted.
- Disconnect from the SAP ASE server after the cycle count reaches the value specified by the resource property `<Connect_cycle_count>`.

> **Note**
>
> During SAP ASE 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.

10.4 Configuring the Sun Cluster subsystem

Prepare your Sun Cluster subsystem for SAP Failover.

See the *Sun Cluster Installation Guide* for information about installing the high availability system.

To configure your system, the following must be completed:

- The PATH environment variable must contain `/usr/cluster/bin` when the cluster system command is run.
- Install the Sun Cluster high availability system.
- Install SAP ASE and created the required database device files on the shared disk.
- Configure SAP ASE according to the steps in *Preparing SAP ASE for Active-Passive Setup*.
- Create `$SYBASE/SYBASE.sh` and edited the file with the required environment for SAP ASE. As the file is executed in the high availability agent scripts, protect the file from unauthorized access and make sure only the "root" user has read and execute permissions.
- Create the `$SYBASE/$SYBASE_ASE/install/RUN_<Dataserver_name>` file. You must specify the SAP ASE error log with the `-e` option in this file. If `-s` is specified, it must be the same as the SAP ASE resource property `<Dataserver_name>`.
- Install `$SYBASE/$SYBASE_ASE/SC-3_0` properly (automatically installed with SAP ASE). This directory must contain all the required files for the SAP ASE high availability agent.
  The default `$SYBASE/$SYBASE_ASE/SC-3_0/` must contain 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 SAP ASE resource is created.
If a log directory does not exist, you must create one to store the callback_log and monitor_log files.

Related Information

Preparing SAP ASE for Active-Passive Setup [page 149]

10.4.1 Using the syscadm Script

Use the syscadm script to configure and administer SAP ASE resource groups, and their associated resources in Sun Cluster.

You can use syscadm to create, remove, or disable the SAP ASE 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 SAP ASE 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. SAP 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.

10.4.1.1 Sample sysc_input_file

Use the `syscadm` script to configure and administer SAP ASE resource groups and their associated resources.

The following is the `sysc_input_file` used to create and configure the SAP ASE resource group `rg_MONEY` and its resources as shown in *Active-Passive Setup in Sun Cluster*:

```
#########################################################################
##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 SAP ASE 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 SAP ASE 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 SAP ASE 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 SAP ASE resource group.

10.4.2 Configuring the SAP ASE Resource Group

Configure the SAP ASE Resource Group

Procedure

1. Modify the SAP ASE 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 SAP ASE 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 SAP ASE 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*.

   You can also run the steps performed by the `syscadm` command manually. See *Configuring the SAP ASE Resource Group Manually* for more information.

   > **Note**
   >
   > For a list of the extension properties see *SAP ASE Resource Extension Properties*.

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
   ```

Related Information

Using the syscadm Script [page 155]
Configuring the SAP ASE Resource Group [page 158]

10.4.3 Using SUNW.HAStoragePlus

If you are running Sun Cluster 3.0 with Update2 or later, you can use the `<SUNW.HAStoragePlus>` resource in the SAP ASE resource group.

Context

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.

Procedure

1. To add a `SUNW.HAStoragePlus` resource to the SAP ASE 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`.

2. Register the resource type `SUNW.HAStoragePlus`:

   ```
   scrgadm -a -t SUNW.HAStoragePlus
   ```

3. Add the `SUNW.HAStoragePlus` resource to the SAP ASE 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 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.

4. Enable the `SUNW.HAStoragePlus` resource:

   ```
   scswitch -e -j <hastorageplus_name>
   ```

   For example:

   ```
   scswitch -e -j hasp_MONEY
   ```

5. 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
```

Results

See the Sun Cluster documentation for more information about `SUNW.HAStoragePlus` resource type.

10.4.4 Verifying the Active-Passive Configuration

Perform these tests to make sure you have correctly installed and configured the SAP ASE server for active-passive high availability on Sun Cluster.

Procedure

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 SAP ASE using the logical host. To verify client connection failover, connect to SAP ASE. 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 SAP ASE 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)
```

10.5 Configuring the Resource Groups Manually

Commands executed by the `syscadm` script are used to manually create and configure the SAP ASE resource groups.

Context

If necessary, you can perform these steps manually, for example to configure, reconfigure, or troubleshoot the SAP ASE resource group. Make sure you have properly modified the files `SY.ase` and `ase_login_file` as explained in *Configuring the SAP ASE Resource* Group.

You must be logged on as “root” to run these Sun Cluster commands.

Procedure

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 SAP ASE 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 SAP ASE 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 SAP ASE 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 SAP ASE resource group. Specify any standard resource property values and extension property values for the SAP ASE 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 SAP ASE 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. *SAP ASE Resource Extension Properties* describes the extension properties for the SAP ASE 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`

Related Information

Configuring the SAP ASE Resource Group [page 158]
Using SUNW.HAStoragePlus [page 159]

10.6 Upgrading SAP ASE

To upgrade an SAP ASE server in a high availability configuration, you must temporarily break the companionship between the primary and secondary companion, and disable monitoring of the SAP ASE Resource Groups.

You can shutdown or restart either SAP ASE server independently during the upgrade process without triggering unexpected failovers by the SunCluster subsystem.

> **Note**
>
> You cannot add, delete, or modify any databases, objects, users, or logins during the upgrade process. Making these changes after the companionship is dropped and before it is reestablished may cause the upgrade to fail or destabilize the cluster by causing inconsistencies between servers.

10.6.1 Stop the Monitoring Service and Drop Companionship

Halt the monitoring service and stop management for the SAP ASE resource groups on both nodes in the cluster.

Procedure

As root, issue these commands to bring the SunCluster resource group associated with SAP ASE offline, and shut down SAP ASE:

```
scswitch -F -g <primary_resourcegroup_name>
scswitch -u -g <secondary_resourcegroup_name>
```

10.6.2 Upgrading SAP ASE

Disable high availability before upgrading SAP ASE.

Procedure

1. On both node, disable high availability:

   ```
   sp_configure 'enable HA', 0
   ```

   Restart SAP ASE for this change to take effect.

> **Note**
>
> Alternatively, if the companions are shut down, edit their server configuration files (`server_name.cfg`), changing the value of `enable HA` to 0

2. Follow the instructions in the *Installation Guide* to upgrade each server.
3. Reenable high availability on both nodes:

   ```
   sp_configure 'enable HA', 2
   ```

   You must restart SAP ASE for the change to take effect. See the *Configuration Guide* for your platform.
4. Verify:
   - Changes are properly reflected in the resource group and resource properties (for example, `<Sybase_Home>`, runserver files, `<Dataserver_login_file>`, and so on) in the `<$SYBASE>` installation location, or any related files related to high availability in the new installation
   - You have performed all actions required for establishing companionship described *Prepare SAP ASE for Active-Passive Setup* and *Configuring the Sun Cluster Subsystem*, and the system maintains these changes after the upgrade is complete.

Related Information

Preparing SAP ASE for Active-Passive Setup [page 149]
Configuring the Sun Cluster subsystem [page 154]

10.6.3 Reestablishing Companionship and Resuming Resource Monitoring

To reestablish companionship and resume monitoring, start the resource group, then restore monitoring.

Context

Start the resource group (which starts SAP ASE, if it is not already started) and restore the monitoring service

Procedure

As root, issue:

```
scswitch -z -g ase_resourcegroup_name -h primary_node
```

10.6.4 Verify Failover and Failback

Verify the failover and failback configuration.

Procedure

1. Failover the primary companion by relocating the associated resource group to secondary node. As root, issue:

   ```
   scswitch -z -g <ase_resourcegroup_name> -h <secondary_node>
   ```

   Verify SAP ASE is properly running on the secondary node by checking for the operating system process and by logging into SAP ASE with `isql`.
2. Failback the SAP ASE server by relocating its associated resource group to primary node. As root, issue:

   ```
   scswitch -z -g ase_resourcegroup_name -h primary_node
   ```

   Verify SAP ASE is properly running on the primary node by checking for the operating system process and by logging into the server with `isql`.

10.7 Location of the Error Logs

SAP Failover includes logs that may be helpful for investigating and diagnosing errors encountered during failover.

- SAP ASE error log – the location is specified in the RUNSERVER file. For example:

  ```
  /sybase/ASE-15_0/install/MONEY.log
  ```

- SAP ASE high availability agent callback scripts log:

  ```
  $SYBASE/$SYBASE_ASE/SC-3_0
  /log/ase_callback_<<server-name>>.log
  ```

  or as specified by the SAP ASE resource property `Callback_log`.
- SAP ASE agent fault monitor log:

  ```
  $SYBASE/$SYBASE_ASE/SC-3_0/log
  /ase_monitor_<<server-name>>.log
  ```

  or as specified by the SAP ASE resource property `Monitor_log`:
- Sun Cluster system log:

  ```
  /var/adm/messages
  ```

11 Configure SAP ASE for Failover on Veritas 5.0 and Later

Configuring SAP ASE for failover on Veritas 5.0 and later requires hardware and system components, configuring the Veritas subsystem, configuring companion servers, and administering failover.

> **Note**
>
> SAP ASE version 15.0 does not support Veritas Cluster versions 2.2 or 3.0. If you currently have these clusters configured, you must upgrade the respective cluster versions to configure SAP ASE for high availability on Veritas. When upgrading Veritas, first review *Upgrading From an Agent of Resource Type Sybase* before configuring SAP ASE for failover.

Related Information

Upgrading From an Agent of Resource Type Sybase [page 189]

11.1 Preparing SAP ASE for High Availability

Prepare SAP ASE for a high availability configuration.

11.1.1 Install SAP ASE Servers

Install the primary and the secondary servers. They can be installed on shared or local disks. The primary companion can be either a newly installed SAP ASE, or it can be upgraded from an earlier version of SAP ASE with existing databases, users, and so on.

The secondary companion must be a newly installed SAP ASE 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 multi-host disk.

See the installation documentation for your platform for information about installing and configuring SAP ASE.

11.1.2 Add Entries for Both SAP ASE 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.

11.1.2.1 Add Entries to the interfaces File for Client Connections During Failover

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 *Utility Guide* for information about `dsedit`.

11.1.3 Configuring the sybha Executable

The `sybha` executable provides the ability for the SAP ASE High Availability Basic Services Library to interact with each platform's high availability cluster subsystem.

Prerequisites

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. SAP strongly recommends that you limit the number of users who have System Administrator privileges on the cluster.

You must perform these steps as root.

Procedure

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.
2. 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.
3. Change to the `$SYBASE/$SYBASE_ASE/bin` directory:

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

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 SAP ASE 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
    ```

11.1.4 Creating a New Default Device Other than master

`master` is the default device in a newly installed SAP ASE server. This means that any databases you create (including the proxy databases used by failover) are automatically created on the master device.

Context

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, create a new device.

Procedure

1. Create a new device using `disk init`.
2. Use `sp_diskdefault` to specify the new device as the default before you configure SAP ASE as a companion for fail over. For example, to add a new default device named `money_default1` to the MONEY1 server, enter:

   ```
   sp_diskdefault money1_default1, defaulton
   ```

3. 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
   ```

Results

See the *Reference Manual: Commands* for more information about `disk init` and `sp_diskdefault`.

11.1.5 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.

Procedure

1. For example, if the companion MONEY1 uses the network name of MONEY1 in the `interfaces` file, enter:

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

2. Restart the server for this change to take effect.

11.1.5.1 Adding the Secondary Companion to sysservers

Add the secondary companion as a remote server in `sysservers`.

Procedure

Use the syntax:

```
sp_addserver <server_name>
```

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

11.1.6 Assigning ha_role to System Administrator

You must have `ha_role` permission on both servers to run `sp_companion`.

Procedure

1. To assign the `ha_role`, issue the following from `isql`:

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

2. You must log out and then log back in to the SAP ASE for the change to take effect.

11.1.7 Running installhasvss

Run the `installhasvss` script to install the stored procedures required for failover (such as sp_companion) the SYB_HACMP server in `sysservers`.

Prerequisites

You must have System Administrator privileges to run `installhasvss`. You must perform the tasks described in *Add Entries for Both SAP ASE Servers to the interfaces File*, before executing `installhasvss`. If you run `installhasvss` before performing these tasks, re-run `installmaster` to reinstall all the system stored procedures.

Procedure

1. Enable High Availability, then restart the server:

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

2. To execute the `installhasvss` script, enter:

```
$SYBASE/$SYBASE_OCS/bin/isql -Usa -P<password> -S<servername> < $SYBASE/
$SYBASE_ASE/scripts/installhasvss
```

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

Related Information

Add Entries for Both SAP ASE Servers to the interfaces File [page 169]

11.1.8 Verifying Configuration Parameters

You must enable the configuration parameters `enable cis`, `enable xact coordination`, and `enable HA` before you configure SAP ASE 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 SAP ASE to function as a companion in a high availability system. `enable HA` is off by default. Restart SAP ASE for it to take effect. This parameter causes a message to be written to your

error log stating that you have started the 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, *Setting Configuration Parameters*, in the *System Administration Guide: Volume 1*.

11.1.9 Adding Thresholds to the master Log

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

Context

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.

Procedure

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. SAP ASE does not supply `sp_thresholdaction`. See the *Reference Manual: Procedures* 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
   ```

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

11.2 Hardware and Operating System Requirements

Configuring SAP ASE for high availability requires hardware and operating system components.

- Two homogeneous network systems, with similar configurations in terms of resources like CPU, memory, and so on. See *What is High Availability?*, for the installation configuration.
  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 multi-host disks, which store the databases for the SAP ASE 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 SAP ASE server that is configured for high availability, the service group should

include such resources as DiskGroup, Volume, Mount, IP, NIC, and `HAase` for SAP ASE. A sample service group and the resource dependency graph is shown in the diagram below. 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.

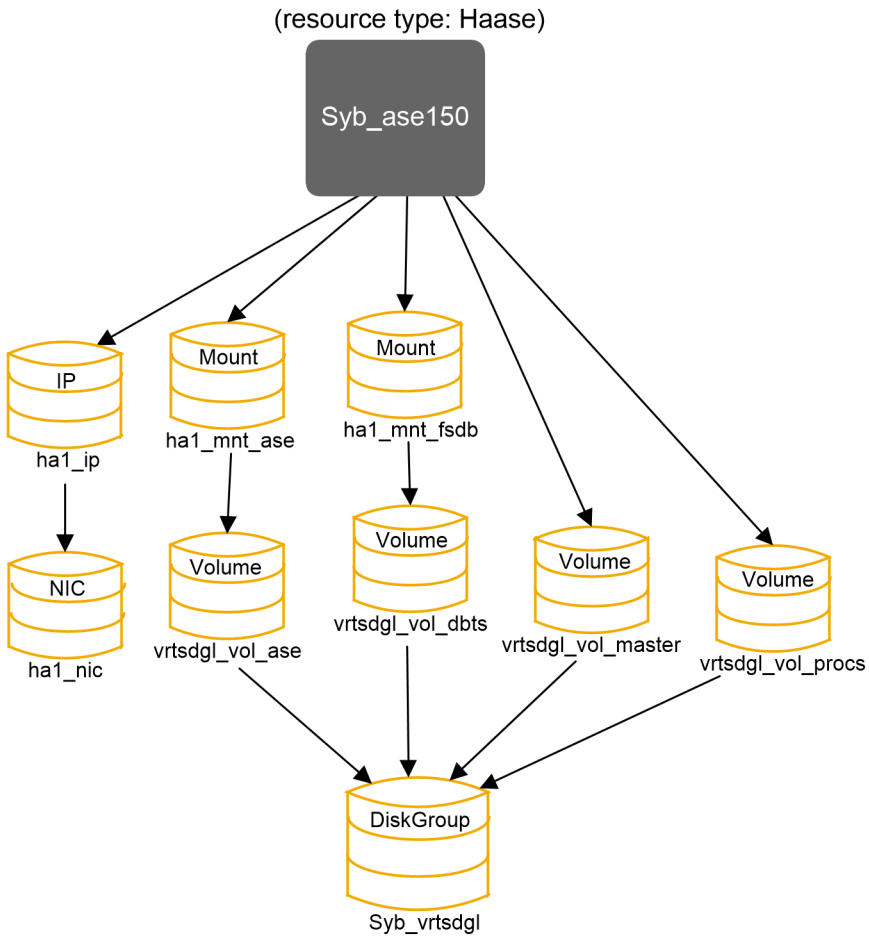
> **Note**
>
> Each service group must contain at least two resources with one resource of type `HAase`. Use the cluster command to establish resource dependency so that the resource of type `HAase` depends on the other resources.

- 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 the following figure, the configuration of the service group has one DiskGroup, `syb_vrtsdg1`, on which four volumes are created. One volume is for the SAP ASE 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 SAP ASE 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 is the service group `SybASE` running on the primary node and service group, `SybASE2` running on the secondary node, with a similar configuration:



Related Information

What is High Availability? [page 15]

11.3 Configuring the Veritas Subsystem for SAP Failover

Prepare your IBM AIX subsystem for SAP Failover.

See your *VCS Installation Guide* and *VCS User's Guide* for information about installing and using the Veritas Cluster Server high availability system.

11.3.1 Installing the HAase Agent

Install the `HAase` agent on each node of the cluster.

Prerequisites

You must have “root” permission to run these commands.

Procedure

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`

11.3.2 Create an SAP ASE Login File

Create a file that contains the SAP ASE 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**
>
> SAP strongly recommends that you use a password. If you use an empty password, the agent scripts generate a warning message.

11.3.3 Import the HAase Resource Type

You can import the `HAase` resource type using the cluster GUI tool, or by using the cluster commands `hatype` and `haattr`.

- 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.

11.3.4 Starting the HAase Agent

Start the `HAase` agent by either restarting the Veritas Cluster, or by using the cluster commands to manually start the `HAase` agent.

Context

Using the cluster commands to manually start the `HAase` agent causes no disruption. To manually start the `HAase` agent:

Procedure

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
```

11.3.5 Add the HAase Resource

Each service group must contain an `HAase` resource.

Attributes of an `HAase` resource:

Property	Datatype, dimension, and default	Description
`<Sybase_home>`	string, scalar, null	The home directory of the SAP ASE installation, and the same as the value for the environment variable SYBASE in an SAP ASE installation.
`<Dataserver_name>`	string, scalar, null	Name of the SAP ASE server that is supplied at the time of configuration.

Property	Datatype, dimension, and default	Description
`<Backup_server_name>`	string, scalar, null	Name of the Backup 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.
`<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.

Property	Datatype, dimension, and default	Description
`<Cmpstate>`	Boolean, scalar, 0	Reserved for future use.

> **Note**
>
> The default value for `$VCS_LOG` is `/var/VRTSvcs`.

11.3.6 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, or by using cluster commands.

Context

- The cluster GUI tool can be used to configure an instance of `HAase` (see your *VCS User's Guide* for more information).
- Use cluster commands to manually add a new resource and configure its attributes, as described below. The configuration of service group `<SybASE>` is shown in *Hardware and Operating System Requirements*:

Procedure

1. 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
```

2. 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.

3. Use the following cluster commands to establish a resource dependency between `syb_ase150` and resources of types `<Mount>`, `<Volume>`, and `<IP>` (refer to *Hardware and Operating System Requirements* 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
```

11.4 Configuring Companion Servers for Failover

Configure the SAP ASE servers as primary and secondary companions in a high availability system.

11.4.1 Adding User and Login for Fault Monitor

Create a special user and login for the monitor for each data server associated with the `HAase` resource.

Procedure

Use `isql` to connect to the data servers and issue:

```
sp_adduser <<user for monitoring ase>>
```

> **Note**
>
> During SAP ASE 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.

Related Information

Create an SAP ASE Login File [page 177]

11.4.2 Run 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 server as a secondary companion) will be successful. `sp_companion do_advisory` advises you of any configuration options that should be changed.

See *Running do_advisory* for a complete description of the `sp_companion do_advisory` option.

Related Information

Running do_advisory [page 37]

11.4.3 Verify 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`. SAP ASE 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"|"VCS"]
```

To change the SAP ASE server to use the `HAase` agent for the Veritas Cluster:

```
sp_companion MONEY1, set_cluster, "VCS"
The current cluster is set to VCS
```

> **Note**
>
> Do not change to another high availability agent type when SAP ASE is configured for normal companion mode on your VCS system

11.4.4 Creating an Asymmetric Companion Configuration

Use `sp_companion` to configure the primary companion for asymmetric configuration.

Procedure

Configure the primary 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 a 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
```

11.4.5 Configuring Symmetric Companions

After you configure the companions for asymmetric fail over, you can set them up for symmetric configuration.

Context

In a symmetric configuration, both servers act as primary and secondary companions. See *Configuring the Symmetric Companion* for a description of symmetric configuration.

Procedure

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 server named MONEY1 as the secondary companion to the 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.

Related Information

Creating an Asymmetric Companion Configuration [page 184]

11.5 Administering SAP ASE Failover

Administering SAP Failover for Veritas includes failing back and suspending, resuming, and dropping companions.

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 SAP ASE binary are online on the secondary node. The SAP ASE 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 SAP ASE server on the secondary host takes over all primary resources, but the SAP ASE server on the failed-over group is not started.

11.5.1 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.

Procedure

1. 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.
2. 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`.
3. 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.

Results

> **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`.

11.5.2 Suspending Normal Companion Mode

Suspended mode temporarily disables the ability of the primary companion to fail over to the secondary companion.

Context

To switch from normal companion mode to suspended mode:

Procedure

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
   ```

11.5.3 Resuming Normal Companion Mode

Move from suspended mode to normal companion mode.

Procedure

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
```

Results

> **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`.

11.5.4 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 SAP Failover provides.

Context

However, the companion server is still monitored by the high availability agent. Before dropping companion mode, you must first disable the agent to monitor SAP ASE.

Procedure

1. Issue the following command:

```
hares -modify Sybase_resource_name Enabled 0
```

2. To drop companion mode, issue:

```
sp_companion <companion_name>, "drop"
```

11.6 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.

Procedure

1. Install the new agent for resource type `HAase`. See *Installing the HAase Agent*.
2. Import the new resource type, `HAase`. See *Import the HAase Resource Type*.
3. Start the new agent for resource type, `HAase`. See *Starting the HAase Agent*.
4. Disable resource monitoring:

```
haconf -makerw
hares -modify Sybase_resource_name Enabled 0
haconf -dump -makero
```

5. Drop the existing resource instances 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 *Add the HAase Resource*.
7. Enable the new `HAase` resource:

```
haconf -makerw
hares -modify <Sybase_resource_name> Enabled 1
haconf -dump -makero
```

Related Information

Import the HAase Resource Type [page 178]
Add the HAase Resource [page 179]

Installing the HAase Agent [page 177]
Starting the HAase Agent [page 178]

11.7 Upgrading SAP ASE

To upgrade an SAP ASE server in a high availability configuration, you must temporarily break the companionship between the primary and secondary companion, and disable monitoring of the SAP ASE server service groups in VCS.

You can shutdown or restart either SAP ASE server independently during the upgrade process without triggering unexpected failovers by VCS.

> **Note**
>
> You cannot add, delete, or modify any databases, objects, users, or logins during the upgrade process. Making these changes after the companionship is dropped and before it is reestablished may cause the upgrade to fail or destabilize the cluster by causing inconsistencies between servers.

11.7.1 Stop the Monitoring Service and Drop Companionship

Drop the companionship of servers and stop the monitoring service.

Procedure

1. On all nodes in the cluster halt the monitoring service. As root, issue:

   ```
   hares -modify <primary_resource> Enabled 0
   hares -modify <primary_resource> Critical 1
   ```

   If you configured the system for symmetric failover, disable monitoring for the secondary resource:

   ```
   hares -modify <secondary_resource> Enabled 0
   hares -modify <secondary_resource> Critical 0
   haconf -dump -makero
   ```

2. As root, issue:

   ```
   hares -offline <primary_resource> -sys <primary_system_name>
   hares -offline <secondary_resource> -sys <secondary_system_name>
   ```

3. From the secondary companion, issue:

   ```
   sp_companion <primary_server_name>, "drop"
   ```

4. (For symmetric configuration) Drop the secondary's companionship log in the primary companion and issue:

```
sp_companion <secondary_server_name>,"drop"
```

5. Ensure that both nodes are in single-server mode:

```
sp_companion
```

If the companions are in single-server mode, they return:

```
Server '<server_name>' is not cluster configured.
Server '<server_name>' is currently in 'Single server' mode.
```

Results

The servers are now running on their installation node and may be stopped and started independently without the VCS attempting to failover the resources between nodes.

11.7.2 Upgrading SAP ASE

Disable high availability before upgrading SAP ASE.

Procedure

1. On each node, disable high availability:

```
sp_configure 'enable HA', 0
```

Restart SAP ASE for this change to take effect.

2. Follow the instructions in the installation guide to upgrade each server.
3. On all nodes, reenable high availability:

```
sp_configure 'enable HA', 1
```

Restart SAP ASE for this change to take effect.

4. Ensure that permissions are set correctly for the `sybha` binary and `sybhausers` file.

As root, issue these commands from `$SYBASE/$SYBASE_ASE/bin`:

```
chown root sybha
chgrp sybhagrp sybha
chmod 4550 sybha
```

As root, perform these tasks from `$SYBASE/$SYBASE_ASE/install`:

1. Ensure that the `sybase` user is included in the `sybhauser` file
2. Issue:

```
chown root sybhauser
chmod 600 sybhauser
```

5. Verify:
   - Changes are properly reflected in the service group and resource properties (for example, `<Sybase_Home>`, runserver files, `<Dataserver_login_file>`, and so on) in the `<$SYBASE>` installation location, or any related files related to high availability in the new installation
   - You have performed all actions required for establishing companionship described *Preparing SAP ASE for High Availability* and *Configuring the Veritas Subsystem for SAP Failover* and the system maintains these changes after the upgrade is complete.

Related Information

Preparing SAP ASE for High Availability [page 168]
Configuring the Veritas Subsystem for SAP Failover [page 176]

11.7.3 Reestablishing Companionship and Resuming Resource Monitoring

To reestablish companionship and resume monitoring, manually restart the server and the monitoring service, then reestablish companionship.

Procedure

1. On each node, manually restart SAP ASE.
2. As root from the primary node, restore the monitoring service:

```
haconf -makerw
hares -modify <primary_resource> Enabled 1
hares -modify primary_resource Critical 1
```

   If you configured the system for symmetric failover, enable monitoring for the secondary resource:

```
hares -modify <secondary_resource> Enabled 1
hares -modify <secondary_resource> Critical 1
haconf -dump -makero
```

3. Verify you have performed the prerequisite steps for establishing companionship described in *Configuring Companion Servers for Failover*.

4. Reestablish companionship between the servers (see *Creating an Asymmetric Companion Configuration* or *Configuring Symmetric Companions*.

```
dbcc traceon (2209)
sp_companion <primary_server_name>,configure
dbcc traceoff(2209)
```

> **Note**
>
> For symmetric configurations, issue this command on both companions.

If the secondary server includes user databases, you may see one or more warning messages, which you can safely ignore:

```
Msg 18739, Level 16, State 1:
Server '<server_name>', Procedure 'sp_hacmpcfgvrfy', Line 102:
Database '<database_name>': a user database exists. Drop this
database and retry the configuration again.
```

5. Restart the SAP ASE resources on their appropriate nodes. As root on the primary node, enter:

```
hares -online <primary_resource> -sys <primary_system_name>
```

As root on the secondary node, enter

```
hares -online <secondary_resource> -sys <secondary_system_name>
```

6. Run `sp_companion` to verify that the system is properly configured for symmetric or asymmetric failover.

Related Information

Configuring Companion Servers for Failover [page 182]
Creating an Asymmetric Companion Configuration [page 184]

11.8 Troubleshoot Failover for Veritas Cluster

You can troubleshoot a number of common failover errors on Veritas Cluster.

- Turn on debugging for SAP ASE. 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`.

- SAP 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 SAP ASE server on the secondary host takes over all its resources, but the SAP ASE 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
```

11.8.1 Recovering From a Failed prepare_failback

Recover when `prepare_failback` executes successfully on the secondary companion but the primary companion does not start.

Procedure

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:

```
hares -clear <primaryHAase_resname>  -sys  <primary_hostname>
```

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*.
5. Reissue `sp_companion...prepare_failback` on the secondary companion.

Related Information

dbcc Options for High Availability Systems [page 229]

11.8.2 Location of the Logs

SAP Failover includes logs which may be helpful for investigating and diagnosing errors encountered during failover.

- SAP ASE 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`.

12 Configuring SAP ASE for Failover on Windows

Configuring SAP ASE for failover on Windows requires hardware and system components, configuring Windows, and configuring the primary companion's cluster resource.

12.1 Hardware and Operating System Requirements

Configuring SAP ASE for high availability requires hardware and operating system components.

These components are required:

- A Microsoft certified cluster. See your Microsoft documentation for a description of what constitutes a certified cluster
-
- Two Windows systems. Microsoft Cluster Server must be installed on both systems and they must be configured together as a Microsoft cluster. SAP recommends that you set up and test failover for a simple application (such as Notepad) on the cluster to verify that the cluster's basic failover capabilities are working properly. You must perform all configuration from an account that has the Domain Administrator privilege.
- Windows 2008 R2.
- 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.
- SAP ASE 64-bit software installed on both cluster nodes, with the SAP release directory (`%SYBASE%`) residing on local disk storage on the nodes (rather than shared disk storage).
- SAP data devices on shared disk drives.
- Both SAP ASE 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.
- You must install SAP ASE on the same hard drive letter and path on all cluster nodes. For example, if you use `C:\Sybase` as the installation directory on the first node, you must also use `C:\Sybase` on the second node.

This section discusses how to prepare SAP ASE for a high availability configuration.

12.2 Before You Begin

Prepare SAP ASE for a high availability configuration.

- Download and install Microsoft .NET runtime package V4.0.
- Copy the .NET `insatllutil.exe` utility to `%SYBASE%\ASE-15_0\install`.
- Run the `sybcpnin -s` command on each cluster node. `sybcpnin -s` installs the "SAP Companion Server" resource type and SAP Cluster Administrator extensions.

12.3 Starting the Failover Cluster Manager

Start the Failover Cluster Manager as administrator.

Context

Each instance of an SAP ASE cluster requires a dedicated shared disk which can be failed over between the cluster nodes (you may configure additional shared devices later). The shared disk must be available to the cluster node on which SAP ASE is being configured. To make the shared disk available, you may find it convenient to create a temporary group and assign the shared disk to this group. When you complete the SAP ASE companion server setup, SAP ASE automatically creates its own group, and you can then move the shared disk to the new SAP ASE group.

Procedure

1. Select Start | Administrative tools.
2. Right click Failover Cluster Manager and choose "run as administrator".

12.4 Installing SAP ASE Servers

Install both the primary and secondary SAP ASE servers. Do not use the machine name as the server name.

> **Note**
>
> Start all command-line utilities, Xterms, and executables related to configuring and executing high availability on Windows as the administrator. To run these as administrator, right-click on the command-tool icon and select "Run as administrator."

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

The secondary companion must be a newly installed SAP ASE 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.

12.4.1 Changing the Domain Administration Account

After you install the SAP ASE servers, the servers run under an operating system account known as "LocalSystem".

Context

For a clustered operation, the SAP ASE 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 SAP ASE servers to run under a domain administration account.

Procedure

1. Start the Services application from the Windows Control Panel | Administrative Tools.
2. Select the service corresponding to the SAP ASE server. Its service name uses this syntax:

   ```
   SAP SQLServer _ <server_name>
   ```

   For example, SAP SQLServer_MONEY1
3. Double Click on `SAP 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 SAP ASE server.

12.4.2 Add Entries for Both SAP ASE 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`.

12.4.2.1 Add 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.

12.4.3 Creating a New Default Device Other than master

The master device is the default device in a newly installed SAP ASE server. This means that, if you create any databases (including the proxy databases used by failover), they are automatically created on the master device.

Context

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, create a new device.

Procedure

1. Create a new device using `disk init`.

2. Use `sp_diskdefault` to specify the new device as the default before you configure SAP ASE as a companion for fail over. For example, to add a new default device named `money_default1` to the MONEY1 server, enter:

```
sp_diskdefault money1_default1, defaulton
```

3. 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
```

Results

See the *Reference Manual: Commands* for more information about `disk init` and `sp_diskdefault`.

12.4.4 Adding the Primary Companion as a Local Server

Use `sp_addserver`, to add the local server as the local server in `sysservers`, using the network name specified in the `interfaces` file.

Procedure

1. For example, if the companion MONEY1 uses the network name of MONEY1 in the `interfaces` file, enter:

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

2. Restart the server for this change to take effect.

12.4.5 Adding the Secondary Companion to sysservers

Add the secondary companion as a remote server in `sysservers`.

Procedure

Use the syntax:

```
sp_addserver <server_name>
```

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

12.4.6 Assigning ha_role to System Administrator

You must have `ha_role` permission on both servers to run `sp_companion`.

Procedure

1. To assign the `ha_role`, issue the following from `isql`:

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

2. You must log out and then log back in to the SAP ASE for the change to take effect.

12.4.7 Running insthasv to Install High Availability Stored Procedures

Create the `sybsecurity` database before running `insthasv`, then run `instsecu`.

Prerequisites

You must have System Administrator privileges to run the `insthasv` script.

SAP recommends that you increase the size of `sybsystemprocs` by 20MB before running `insthasv`.

Procedure

1. To execute `insthasv`, enter:

   ```
   isql -Usa -P<password> -S<servername> -i %SYBASE\%SYBASE_ASE%\scripts\insthasv
   ```

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

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

`insthasv` is located in the `%SYBASE%\%SYBASE_ASE%\scripts` directory. See the *Security Administration Guide*.

2. Run `instsecu` (located in `%SYBASE%\ASE-15_0\scripts`).

12.5 Verify Configuration Parameters

You must enable the configuration parameters `enable cis`, `enable xact coordination`, and `enable HA` before you configure SAP ASE 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 SAP ASE to function as a companion in a high availability system. `enable HA` is off by default. This configuration is static, so you must restart the server for it to take effect. This parameter writes a message to the error log stating that you have started the server in a high availability system.

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

12.6 Test the Servers

Ensure the two SAP ASE servers can execute remote commands.

For example, enter the following between two SAP ASE servers configured as companions (in this example, ASE1 and ASE2 on machine1 and machine2, respectively):

- From ASE1, enter:

```
ASE2...sp_who;
```

- From ASE2, enter:

```
ASE1...sp_who;
```

Both commands must succeed for the cluster to be properly configured. If either command fails, verify:

- The Windows global variables (such as `<%SYBASE%>`) are set.
- The entries in the `sql.ini` file are correct.
- Using `isql` to connect to ASE1 from machine1 and machine2. If connecting from machine1 fails, there is a problem with this machine. If connecting from machine2 fails, and you find that there is no problem with its environment, try connecting from a third machine. If the connection fails from the third machine, check that the firewall settings allow you to log in from outside of machine1.

> **Note**
>
> SAP strongly recommends that you make backup copies of your master, `sybsystemprocs`, and other devices at this point in the installation process. If something goes wrong with the companion configuration, you can revert to this backup and avoid repeating the earlier steps.

12.7 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 SAP Companion Servers*.

> **Note**
>
> If you are configuring for a symmetric setup, you must first configure the cluster for an asymmetric setup, running the commands from the secondary companion, then run them again from the primary companion.

Before you start the companion configuration, verify these are set correctly:

- The connection protocol must be TCP
- The connection value must be: `<hostname>,<portnumber>`
- If you do not start `syconfig` in the SAP ASE configuration file location, then you must specify the `syconfig -c <ase>.cfg` parameter, where `<ase>.cfg` is the full path of the configuration file

Related Information

Configuring SAP Companion Servers [page 205]

12.7.1 Verify you have the InstallUtil.exe tool

Microsoft Cluster Server must be installed on your system, and the Microsoft .NET framework installer (`InstallUtil.exe`), a Microsoft distributed tool, must be available.

Procedure

1. Find `InstallUtil.exe`:

- You may already have it: Check this location on your system:

  ```
  %SystemRoot%\Microsoft.NET\Framework64\v2.0.50727\installutil.exe
  ```

- If your system does not include the `InstallUtil.exe` tool, download and install the Microsoft.NET framework Version 2 utility from Microsoft.

2. Copy the `InstallUtil.exe` tool to the `%SYBASE%\%SYBASE_ASE%\install` directory.

   > **Note**
   >
   > If `installUtil.exe` does not exist in the `%SYBASE%\%SYBASE_ASE%\install` directory, you cannot configure SAP Failover using the Microsoft Management Console (MMC). However, you can configure SAP Failover using the steps outlined in *Configuring for an Asymmetric Setup From the Command Line* and *Configuring for a Symmetric Configuration From the Command Line*.

3. After you copy `installUtil.exe`, use this command on each node of the cluster to install the `SAP Companion Server` resource type and Cluster Administrator extensions:

   ```
   %SYBASE%\%SYBASE_ASE%\bin\sybcpnin.exe -s
   ```

   where `%SYBASE%` is the release directory for the SAP ASE executable.

Results

After you copy `installUtil.exe`, use this command on each node of the cluster to install the `SAP Companion Server` resource type and Cluster Administrator extensions:

```
%SYBASE%\%SYBASE_ASE%\bin\sybcpnin.exe -s
```

Related Information

Configuring for an Asymmetric Setup From the Command Line [page 206]
Configuring for a Symmetric Configuration From the Command Line [page 208]

12.7.2 Configuring SAP Companion Servers

Use the Windows management tools to configure SAP Failover on Microsoft Cluster Server.

Procedure

1. Use Windows Explorer to move to `%SYBASE%\SYBASE_ASE%\bin` and double-click on `SybCpnSetup.msc` (as a shortcut, hold the Windows key and press "R", type `SybCpnSetup.msc` in the dialog box, and press Enter).

   The Microsoft Management Console appears.
2. Click on SAP Companion Server Setup.
3. Click on "Create SAP companion server" on the right-hand panel of the Microsoft Management Console. Click Yes to confirm.

   Microsoft Management Console starts the SAP companion installer Wizard.
4. On the ASE Server Information window, enter:
   - The name of the SAP ASE 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
5. Select Next.
6. In the Companion Server Information field, enter the name of the SAP ASE server that is to be the secondary companion.

   To configure the companions in a symmetric setup, select Symmetric, then click Next.
7. 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 SAP ASE 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.)
8. (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.
9. 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 SAP ASE servers are configured. If any error messages appear, address the issues and select Next. You do not have to start over again.
10. Check the completion status of the Wizard. If the configuration failed, check the setup log for errors, if it succeeded, open the Windows Failover Cluster Manager (as a shortcut, press and release the Windows key, type "failover" to bring up the Failover Cluster Manager icon, then press Enter).
11. Locate the new SAP Companion server in the Services and Applications tree. The companion server is named `<primary_server_name>`_GRP.

    Click on companion server name to view the Summary of `<primary_server_name>`_GRP display.
12. In the right-hand side of this display, click "Add Storage," and add all shared storage devices the companion servers will use.

13. In the central part of the display, right-click the SAP Companion server under “Other Resources,” select Properties, and highlight the Dependencies tab. Add a dependency for every shared storage device.

12.7.3 Configuring for an Asymmetric Setup From the Command Line

Use `sp_companion` to configure the primary companion for asymmetric configuration.

Prerequisites

Start all command-line utilities, Xterms, and executables related to configuring and executing high availability on Windows as the administrator. To run these as administrator, right-click on the command-tool icon and select “Run as administrator.”

These steps assume two servers named MONEY1 and PERSONNEL1, running on MACHINE1 and MACHINE2, respectively.

Procedure

1. On PERSONNEL1 enter:

   ```
   sp_companion MONEY1, 'configure', null, sa, <password>, sa, <password>
   ```

   > **Note**
   >
   > For an asymmetric setup, you must execute this command *only* from the secondary companion.

   As part of the companion configuration, SAP ASE creates a new group called MONEY1_GRP, which contains the SAP ASE service. This name is the same as the server name (MONEY1).

   MONEY1 becomes the primary server and PERSONNEL1 the secondary server.
2. Move the shared disk containing MONEY1’s master and other devices into the new group, MONEY1_GRP.
3. From the Windows Cluster Manager:
   a. Select MONEY1_GRP, and right click the service name, MONEY1.
   b. Select Properties, and choose the Dependency tab.
   c. Add a new dependency for MONEY1 on the shared disk you moved into group, MONEY1_GRP, ensuring that the cluster will bring the disk online before attempting to start SAP ASE.
   d. Right click on the new group MONEY1_GRP and choose Properties. On the “Preferred owner” subwindow on the General tab, choose the machine on which MONEY1 is running (MACHINE1 in this example). For failback, it is important that MONEY1 is located on MACHINE1.
   e. Click the tab for failover and increase the value for “Maximum failures” in the specified period to set values based on the number of tasks: SAP recommends a value of 50-100 for a test environment and a value of 10-20 for a production environment.

> **Note**
>
> These values are for reference only. SAP strongly recommends that you determine values based on your specific needs.

f. Choose “Allow failback” if you require a failback; otherwise choose “Prevent failback.”

Results

This example configures a 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
```

12.7.4 Configuring for a Symmetric Configuration From the Command Line

After you configure the companions for asymmetric fail over, you can set them up for symmetric configuration.

Prerequisites

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. You cannot use the `with_proxydb` option in a symmetric setup.

Procedure

1. To configure a symmetric setup, rerun the steps described in *Configuring for an Asymmetric Setup From the Command Line*, but issue them from the primary companion.

   The following example adds a server named MONEY1 as the secondary companion to the 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
   ```

2. After `sp_companion` completes:
   a. If the configuration failed, check the setup log for errors, if it succeeded, open the Windows Failover Cluster Manager (as a shortcut, press and release the Windows key, type “failover” to bring up the Failover Cluster Manager icon, then press Enter).

b. Locate the new SAP Companion server in the Services and Applications tree. The companion server is named `<primary_server_name>`_GRP.
c. Click on companion server name to view the Summary of `<primary_server_name>`_GRP display
d. In the right-hand side of the display, click "Add Storage," and add all shared storage devices the companion servers will use.
e. In the central part of the display, right-click the SAP Companion server under "Other Resources," select Properties, and highlight the Dependencies tab. Add a dependency for every shared storage device.

Related Information

Configuring for an Asymmetric Setup From the Command Line [page 206]

12.7.5 Testing the Asymmetric Setup for Failover and Failback

Test the asymmetric companionship failover.

Context

These steps should result in a shared disk failover from the primary to the secondary companion, which will subsequently include the primary server's databases and devices. Client connections to the primary server that include the `-Q` failover property also failover to the secondary server.

Procedure

1. Shutdown the primary server, issuing `shutdown with nowait`.
2. Use the `taskmgr` on the primary host machine to kill the primary server process.
3. Using the primary host machine service, stop the primary server companion.
4. Shut down the primary host machine.
5. Power off primary host machine.

Results

> **Note**
>
> An asymmetric shutdown of the secondary companion will not cause a failover because you have not yet created the secondary companion's group.

12.7.6 Test for a Completed Failback

Test for a completed failback (using the MONEY1 and PERSONNEL1 configuration).

Procedure

1. On PERSONNEL1, enter:

   ```
   sp_companion ASE1 , 'prepare_failback'
   ```

2. Start MACHINE1.
3. From the Failover Cluster Manager, select MONEY1 from the MONEY1_GRP, and then select "bring online."
4. Start MONEY1 on MACHINE1.

12.8 Configure and Secure Microsoft Cluster Server

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 SAP Companion Server resource, the pending timeout period must be long enough to start the SAP ASE 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 SAP Companion Server resource is set to not automatically fail back.

12.8.1 Configuring Properties

Configure Microsoft Cluster Server properties.

Procedure

1. Start the Windows Failover Cluster Manager (as a shortcut, press and release the Windows key, type "failover" to bring up the Failover Cluster Manager icon, then press ENTER).
2. Locate the new SAP Companion server in the Services and Applications tree. The companion server is named `<primary_server_name>`_GRP.

   Click on companion server name to view the Summary of `<primary_server_name>`_GRP display.
3. In the center panel under Other Resources, right-click the SAP Companion server and select Properties.
4. Highlight the Policies tab of the Properties panel.
5. Change the Pending Timeout property to a value that is about two minutes larger than the longest time the server takes to recover.

12.8.2 Secure the MSCS Cluster

The SAP integration software that interfaces MSCS to SAP ASE requires a login (with `ha_role` and `sa_role`) and password for the SAP ASE server you are configuring as a companion server.

This allows the integration software to log in to SAP ASE 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, SAP 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.

12.8.2.1 Encrypting the Cluster Login and Password

Encrypt the cluster login and password on both cluster nodes.

Procedure

1. Execute `REGEDIT.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.

12.9 Troubleshoot Failover for Windows

You can troubleshoot a number of common failover errors on Windows.

12.9.1 Error Message 18750

If a companion server issues error message 18750, check the `<@@cmpstate>` of the servers.

Context

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.

Procedure

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

```
sp_companion <secondary_companion>, resume
```

7. Make sure the SAP 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.

12.9.2 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, roll back and then reissue the `prepare_failback` command.

Procedure

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 Administration.

12.10 Upgrading SAP ASE

To upgrade an SAP ASE server in a high availability configuration, you must temporarily break the companionship between the primary and secondary companion, and disable monitoring of the SAP ASE resource groups.

You can shutdown or restart either SAP ASE server independently during the upgrade process without triggering unexpected failovers by the MSCS cluster.

> **Note**
>
> You cannot add, delete, or modify any databases, objects, users, or logins during the upgrade process. Making these changes after the companionship is dropped and before it is reestablished may cause the upgrade to fail or destabilize the cluster by causing inconsistencies between servers.

12.10.1 Halting the Monitor Service and Dropping Companionship

Drop the companionship of servers and stop the monitoring service.

Procedure

1. Drop the companionship. From the secondary companion, issue:

   ```
   sp_companion <primary_server_name>, "drop"
   ```

2. (For symmetric configuration) From the primary companion, issue:

   ```
   sp_companion <secondary_server_name>,"drop"
   ```

3. Ensure that both nodes are in single-server mode by issuing, on each node:

   ```
   sp_companion
   ```

   If the companions are in single-server mode, they return:

   ```
   Server '<server_name>' is not cluster configured.
   Server '<server_name>' is currently in 'Single server' mode.
   ```

4. Use the Microsoft Cluster Manager to verify the SAP Server resources corresponding to the primary companion (and to the secondary companion, if you are using a symmetric environment) have been removed. If not, manually delete them in the Cluster Manager.

12.10.2 Upgrading SAP ASE

Disable high availability before upgrading SAP ASE.

Procedure

1. On each node, disable high availability:

   ```
   sp_configure 'enable HA', 0
   ```

   Restart SAP ASE for this change to take effect.
2. Follow the instructions in the installation guide to upgrade each server.
3. Reenable high availability on all nodes:

   ```
   sp_configure 'enable HA', 1
   ```

   You must restart SAP ASE for the change to take effect.
4. Reinstall the `instmstr` and `insthasv` scripts on the upgraded servers. When you reinstall `instmstr`, you must reinstall `insthasv`.

Related Information

Reinstalling installmaster [page 220]
Rerunning installhasvss [page 220]

12.10.3 Reestablishing Companionship and Resuming Package Monitoring

Use `sp_companion` to reestablish companionship between the servers.

Procedure

1. Verify you have performed the prerequisite steps for establishing companionship.
2. Reestablish companionship between the servers. On the secondary server, issue (For symmetric configurations, issue this command on both companions):

   ```
   sp_companion <primary_server_name>,configure
   ```

If user databases exist on the secondary server, you may see one or more warning messages, which you can safely ignore:

```
Msg 18739, Level 16, State 1:
Server 'svr2', Procedure 'sp_hacmpcfgvrfy', Line 102:
Database 'svr2_db1': a user database exists. Drop this
database and retry the configuration again.
```

3. Run `sp_companion` to verify that the system is properly configured for failover.
4. Verify the primary resource can successfully failover and failback by relocating it to the secondary node and then back to primary node. Repeat these steps for the secondary companion in symmetric configurations.

13 Open Client Functionality in a Failover Configuration

Applications that are written with CTLIB API calls require changes before they can work with SAP Failover.

> **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.

13.1 CTLIB Application Changes

Required changes to CTLIB applications include: setting the CS_HAFAILOVER property, modifying the interfaces file, writing application failover messages, and adding return codes.

Procedure

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 SAP ASE 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.

   1. 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`.

14 Troubleshooting Secondary Points of Failure

Address common problems that result from secondary points of failure with the high availability system.

14.1 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.

SAP Failover includes `dbcc ha_admin`, which addresses second points of failure.

See *dbcc Options for High Availability Systems* 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.

Related Information

dbcc Options for High Availability Systems [page 229]

14.1.1 Reinstalling installmaster

After you install `installmaster` on a companion server, you should only rerun this script if the stored procedures it creates are corrupted, or if you need to install a newer version of `installmaster`.

`dbcc ha_admin (' ', state_machine)` temporarily moves the companion to single-server mode so `installmaster` can safely reinstall or update the stored procedures. Do not run `installmaster` without running `dbcc ha_admin`.

> **Note**
>
> Because `dbcc ha_admin` moves the companion to single-server mode, you should only run this command when there is no concurrent activity.

Preform the following to re-install installmaster:

- Run `dbcc ha_admin` to the local companion server to single-server mode:

  ```
  dbcc ha_admin (' ', 'state_machine', 'halt')
  ```

  Where `'  '` is used as an empty placeholder.
- Rerun `installmaster`.
- Run `dbcc ha_admin` to return the companion server to its original mode:

  ```
  dbcc ha_admin (' ', 'state_machine', 'restart')
  ```
- You must reinstall installhasvss after you reinstall `installmaster`.

14.1.2 Rerunning installhasvss

Rerun `installhasvss` after you reinstall `installmaster`.

Procedure

1. Make a note of the `srvnetname` for the SYB_HACMP entry in `sysservers`. When it is configured for SAP 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')
   ```

   where `'  '` is used as an empty placeholder.
3. Re-run `installhasvss`. After `installhasvss` finishes, the companion server reverts to its original mode.

4. If the node crashes after you Re-run `installhasvss`, 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'
```

   a. Run `dbcc ha_admin` to return the companion server to its original mode:

```
dbcc ha_admin (' ', 'state_machine', 'restart')
```

14.1.3 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.

14.2 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)
```

14.3 Error Messages

There are a number of common error messages you might receive in a failover system.

- 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*.

- 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 *Running do_advisory*.

Related Information

Cluster Locks in a High Availability Node [page 13]
Running do_advisory [page 37]

15 Changes to Commands, System Procedures, and Databases

Changes are made to commands, system procedures, and system databases when SAP ASE is configured for failover.

15.1 Changes to Commands

Changes are made to commands when SAP ASE is configured for failover.

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`
	SAP mirroring is not supported for high availability.	

`disk resize`	`disk resize` does not alter the behavior of SAP ASE running in a high availability environment. SAP ASE 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.

Command	Asymmetric setup	Symmetric setup
`shutdown` `shutdown with nowait`		

15.2 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, SAP ASE performs a domain check to make sure that, if there are system procedures with duplicate names in the two SAP ASE servers, the system procedure in the correct domain is run. This domain check is performed only in failover mode.

15.2.1 System Procedures Hold Table Lock

System procedures cannot acquire explicit table locks on system tables. However, in a system using SAP 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. See, "Setting Configuration Parameters," in the *System Administration Guide: Volume 1*.

15.2.2 System Procedures that Synchronize Changes

Certain system procedures 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

15.2.3 Behavior of System Procedures

Certain system procedures exhibit behavior changes when SAP ASE is configured for failover.

After SAP ASE 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 *Changes in system procedures that alter server-wide attributes* or *Changes that alter database-wide attributes when they are run in master* during the failback mode.
- The "Normal companion mode," column of *Changes in system procedures that alter server-wide attributes* or *Changes that alter database-wide attributes when they are run in master* describes the behavioral changes for system procedures issued from an asymmetric primary, asymmetric secondary, or symmetric companion.
- The "Failover mode," column of *Changes in system procedures that alter server-wide attributes* or *Changes that alter database-wide attributes when they are run in master* describes the behavioral changes for system procedures issued during either asymmetric secondary failover or symmetric failover.

Changes in system procedures that alter server-wide attributes 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 *Changes in system procedures that alter server-wide attributes* 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 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.		

Changes that alter database-wide attributes when they are run in master 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 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.

15.2.4 dbcc Options for High Availability Systems

Manage high availability systems with `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*.
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")

Related Information

Cluster Locks in a High Availability Node [page 13]

15.2.4.1 dbcc dbrepair Option

SAP Failover supports the `dropproxydb` option for `dbcc dbrepair`.

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.

16 Glossary

This glossary includes only the terms used in this book.

active-active	A system that is set up as a two-node configuration where both nodes in the cluster include SAP ASE 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 SAP ASE server, a primary node on which the SAP ASE server primarily runs, and a set of secondary nodes that can host the SAP ASE 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 SAP ASE server is also known as a "hot standby."
cluster	A collection of nodes in a high availability system. A cluster for the SAP ASE high availability system consists of at least two nodes.
companion server	Each SAP ASE server in a primary availability system is a companion. One SAP ASE 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 SAP ASE 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 SAP ASE 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 SAP ASE or the machine running SAP ASE.
high availability	A system designed to reduce downtime.
node	A machine in a high availability system.
normal companion mode	The mode during which two SAP ASE 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 SAP ASE servers whose databases and connections are migrated to the secondary SAP ASE servers 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 SAP ASE servers configured to accept a failed-over primary SAP ASE server.
single-server mode	The mode of SAP ASE while it is being configured for high availability. During this mode, SAP ASE cannot fail over.
stable mode	A system state where SAP ASE can exist for an extended period of time, such as the day-to-day operation of SAP ASE.
suspended companion mode	The mode of SAP ASE after companion mode has been suspended. During this mode, SAP ASE cannot fail over; it is working independently of the companion SAP ASE server.
symmetric	A high availability system in which two independent SAP ASE servers act as failover servers for each other. That is, each SAP ASE 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 SAP ASE server.
transitional mode	Occurs when SAP ASE shifts from failed-over mode to normal companion mode; is typically of very short duration.

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