Veritas Storage Foundation™ and High Availability Solutions HA and Disaster Recovery Solutions Guide for Microsoft SQL 2008

Windows Server 2003
Windows Server 2008

5.1 Application Pack 1

Veritas SFW HA
HA and Disaster Recovery Solutions Guide for Microsoft SQL 2008

Storage Foundation 5.1 for Windows HA

Symantec Corporation
20330 Stevens Creek Blvd.
Cupertino, CA 95014
www.symantec.com

Third-party legal notices

This Symantec product may contain third party software for which Symantec is required to provide attribution to the third party (“Third Party Programs”). Some of the Third Party Programs are available under open source or free software licenses. The License Agreement accompanying the Software does not alter any rights or obligations you may have under those open source or free software licenses. Please see the TPIP ReadMe File accompanying this Symantec product for more information on the Third Party Programs.

Windows is a registered trademark of Microsoft Corporation.

Licensing and registration

Storage Foundation for Windows and Storage Foundation HA for Windows are licensed products. See the *Storage Foundation and High Availability Solutions for Windows, Installation and Upgrade Guide* for license installation instructions.

Technical support

For technical assistance, visit

http://www.symantec.com/business/support/index.jsp and select phone or email support. Use the Knowledge Base search feature to access resources such as TechNotes, product alerts, software downloads, hardware compatibility lists, and our customer email notification service.

Contents

Chapter 10 Configuring Replicated Data Clusters for SQL Server 2008

Chapter 11 Configuring disaster recovery for SQL Server 2008

Section 1

Introduction and Concepts

This section contains the following chapters:

Chapter 1

Introducing Veritas Storage Foundation and High Availability Solutions for Microsoft SQL 2008

This chapter contains the following topics:

■ "Typical SQL Server 2008 disaster recovery configuration" on page 25

About the deployment guides

The *Veritas Storage Foundation and High Availability Solutions HA and Disaster Recovery Solutions Guide for Microsoft SQL 2008* contains solutions for the following configurations:

- High Availability (HA)
- Campus Clusters
- Replicated Data Clusters
- Disaster Recovery (DR)

For Microsoft clustering solutions, see *Veritas Storage Foundation and High Availability Solutions Microsoft Clustering Solutions Guide for Microsoft SQL 2008*

For Quick Recovery solutions, see *Veritas Storage Foundation and High Availability Solutions Quick Recovery Solutions Guide for Microsoft SQL 2008*.

Separate guides are available for Microsoft Exchange solutions and for other application solutions.

How this guide is organized

The *Veritas Storage Foundation and High Availability Solutions HA and Disaster Recovery Solutions Guide for Microsoft SQL 2008* is organized to follow the workflow in the Solutions Configuration Center (SCC). Information about high availability for SQL Server includes procedures for installing and configuring clustered Microsoft SQL Server environments using SFW HA.

When setting up a site for disaster recovery using the Solutions Configuration Center, you first follow the steps under High Availability (HA) Configuration and then continue with the steps under Disaster Recovery Configuration. Likewise, in this guide, you first follow the instructions in the high availability section and then continue with the appropriate chapter, either RDC, campus cluster, or the disaster recovery section, for the remaining configuration steps.

The Solutions Configuration Center includes a number of wizards that were not available in earlier versions of the product, including a Disaster Recovery wizard.

See "Using the Solutions Configuration Center" on page 43.

What is high availability?

The term *high availability* refers to a state where data and applications are highly available because software or hardware is in place to maintain the continued functioning in the event of computer failure. High availability can refer to any software or hardware that provides fault tolerance, but generally the term has become associated with clustering. This section focuses on configurations that use Veritas Storage Foundation HA for Windows. Storage Foundation HA for Windows (SFW HA) includes Veritas Storage Foundation and Veritas Cluster Server.

Local clustering provides high availability (HA) through database and application failover. This solution provides local recovery in the event of application, operating system, or hardware failure, and minimizes planned and unplanned application downtime. The High Availability section includes procedures for installing and configuring clustered Microsoft SQL Server environments using Veritas Storage Foundation HA for Windows.

Setting up the clustered environment is also the first step in creating a disaster recovery solution. Some installation and configuration options in this section are identified as required for disaster recovery only. These options apply only if you intend to set up a secondary site for wide-area disaster recovery.

A cluster is a group of independent computers working together to ensure that mission-critical applications and resources are as highly available as possible. The group is managed as a single system, shares a common namespace, and is specifically designed to tolerate component failures and to support the addition or removal of components in a way that is transparent to users.

Why implement a high availability solution?

Keeping data and applications functioning 24 hours a day and seven days a week is the desired norm for critical applications today. Clustered systems have several advantages over standalone servers, including fault tolerance, high availability, scalability, simplified management, and support for rolling upgrades.

Using Veritas Storage Foundation HA for Windows as a local high availability solution paves the way for a wide-area disaster recovery solution in the future. A high availability solution is built on top of a backup strategy and provides the following benefits:

- Reduces planned and unplanned downtime.
- Serves as a local and wide-area failover (rather than load-balancing) solution. Enables failover between sites or between clusters.

- Manages applications and provides an orderly way to bring processes online and take them offline.
- Consolidates hardware in larger clusters. The HA environment accommodates flexible fail over policies, active-active configurations, and shared standby servers for SQL Server.

What is a campus cluster?

Campus clusters are clusters in separate buildings (or sites) with mirrored SAN-attached storage located in each building. Typical campus clusters involve two sites; you can use more than two sites for additional redundancy. In a typical configuration, each node has its own storage array and contains mirrored data of the storage on the other array.

Campus clusters are usually located across a campus or a city but can range over much wider distances if their infrastructure supports it, using Fibre Channel SANs and long-wave optical technologies.

Campus clusters are multiple-node clusters that provide protection against disasters. These clusters are in separate buildings (or sites) with mirrored SAN-attached storage located in each building. Typical campus clusters involve two sites; you can use more than two sites for additional redundancy. In a typical configuration, each node has its own storage array with the same number of disks and contains mirrored data of the storage on the other array.

Campus clusters provide disaster protection when an entire site goes down by locating the clustered servers in different buildings or areas. This solution provides a level of high availability that is above mirroring or clustering at a single site and is an alternative to using replication software.

Administrators can use campus clusters to protect data from natural disasters, such as floods and hurricanes, and unpredictable power outages. Campus clusters provide a layer of protection that extends beyond local high availability but is not as complex as disaster recovery with replication.

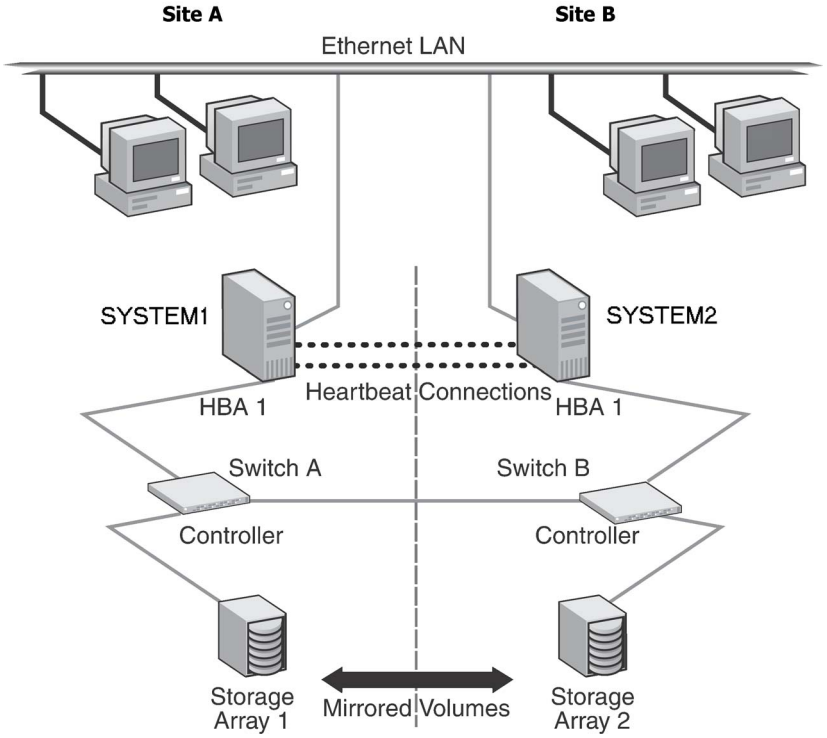
Differences between campus clusters and local clusters

The procedures for setting up a campus cluster are nearly the same as those for local clusters, except that a campus cluster has the nodes located in separate buildings, so the hardware setup requires SAN interconnects that allows these connections. Also, in a campus cluster, each node has its own storage array rather than having a shared storage array between the two clusters. Both local clusters and campus clusters have SFW dynamic disk groups and volumes, but the volumes on each campus cluster node are mirrors of one another.

Sample campus cluster configuration

The following sample configuration represents a campus cluster with two sites, Site A and Site B.

Figure 1-1 SQL campus cluster: Active-Passive configuration



With SFW, a campus cluster can be set up using a Veritas Cluster Server (VCS) configuration. Both configurations involve setting up a single cluster with two nodes that are in separate buildings and are connected via a single subnet and Fibre Channel SAN. Each node has its own storage array with an equal number of disks and contains mirrored data of the storage on the other array. SFW provides the mirrored storage and the disk groups that make it possible to fail over the storage by deporting the disk groups on one node and importing them on the other.

If a site failure occurs in a two-node campus cluster, the remaining cluster node will not be able to bring the cluster disk groups online because it cannot reserve a majority of disks in the disk groups. To allow for failover to the other site, a procedure forces the import to the other node, allowing a cluster disk group to be brought online on another node when that node has a minority of the cluster disks.

Implementing these force import procedures should be done with care. The primary site may appear to have failed but what really has happened is that both the storage interconnect between sites and the heartbeats have been lost. In that case, cluster disk groups can still be online on the primary node. If a force import is done so that the data can be accessed on the secondary site, the cluster disks will be online on both sites, risking data corruption.

Why implement a campus cluster?

In the event of a site disaster, such as power failure in a building, campus clusters offer a level of high availability that surpasses mirroring or clustering at a single site by dispersing the clustered servers into different buildings or sites. This environment also provides a simpler solution for disaster recovery than a more elaborate SFW HA DR environment with replication software; however, a campus cluster generally stretches a shorter distance than a replication-based solution depending on the hardware.

What is a replicated data cluster?

A Replicated Data Cluster (RDC) uses data replication, instead of shared storage, to assure data access to all the nodes in a cluster.

The Replicated Data Cluster configuration provides both local high availability and disaster recovery functionality in a single VCS cluster. You can set up RDC in a VCS environment using Veritas Volume Replicator (VVR.)

An RDC exists within a single VCS cluster with a primary zone and a secondary zone, which can stretch over two buildings or data centers connected with Ethernet. In an RDC configuration, if an application or a system fails, the application is failed over to another system within the current primary zone. If the entire primary zone fails, the application is migrated to a system in the secondary zone (which then becomes the new primary).

For VVR replication to occur, the disk groups containing the Replicated Volume Group (RVG) must be imported at the primary and secondary zones. The replication service group must be online at both zones simultaneously, and must be configured as a hybrid VCS service group.

The SQL Server service group is configured as a failover service group. The SQL Server service group must be configured with an online local hard dependency on the replication service group.

Note: VVR supports multiple replication secondary targets for any given primary. However, RDC for VCS supports only one replication secondary for a primary.

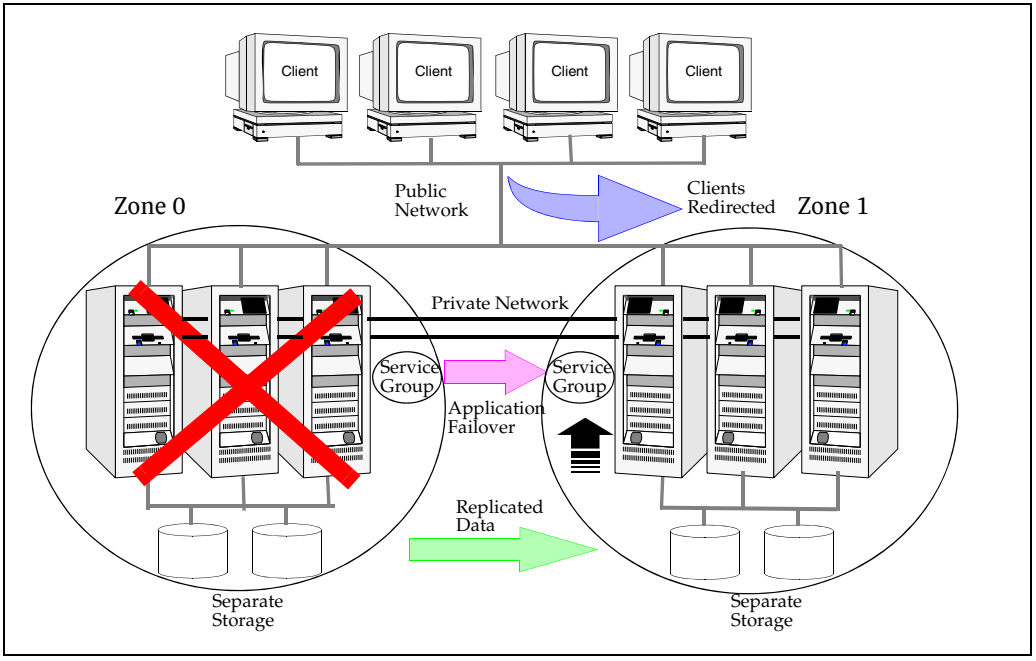
An RDC configuration is appropriate in situations where dual dedicated LLT links are available between the primary zone and the secondary zone but lacks shared storage or SAN interconnect between the primary and secondary data centers. In an RDC, data replication technology is employed to provide node access to data in a remote zone. You must use dual dedicated LLT links between the replicated nodes.

How VCS replicated data clusters work

To understand how a RDC configuration works, let us take the example of SQL 2008 configured in a VCS replicated data cluster. The configuration has two system zones:

- Primary zone (zone 0) comprising nodes located at the primary site and attached to the primary storage
- Secondary zone (zone 1) comprising nodes located at the secondary site and attached to the secondary storage

SQL 2008 is installed and configured on all nodes in the cluster. The SQL 2008 data is located on shared disks within each RDC zone and is replicated across RDC zones to ensure data concurrency. The SQL Server service group is online on a system in the current primary zone and is configured to fail over in the cluster.



In the event of a system or SQL 2008 failure, VCS attempts to fail over the SQL Server service group to another system within the same RDC system zone. However, in the event that VCS fails to find a failover target node within the primary zone, VCS switches the service group to a node in the current secondary system zone (zone 1). VCS also redirects clients once the application is online on the new location.

About disaster recovery

Wide area disaster recovery (DR) provides the ultimate protection for data and applications in the event of a disaster. If a disaster affects a local or metropolitan area, data and critical services are failed over to a site hundreds or thousands of miles away. Veritas Storage Foundation HA for Windows (SFW HA) provides the capability for implementing disaster recovery.

A disaster recovery (DR) solution is a series of procedures which you can use to safely and efficiently restore application user data and services in the event of a catastrophic failure. A typical DR solution requires that you have a source or *primary site* and a destination or *secondary site*. The user application data on the primary site is replicated to the secondary site. The cluster on the primary site provides data and services during normal operations. In the event of a disaster at the primary site and failure of the cluster, the secondary site provides the data and services.

Information about the disaster recovery solution for SQL Server includes procedures for installing, configuring, and testing clustered and replicated Microsoft SQL Server environments for disaster recovery using SFW HA.

Why implement a disaster recovery solution?

A DR solution is vital for businesses that rely on the availability of data. A well-designed DR solution prepares a business for unexpected disasters and provides the following benefits in a DR situation:

- Minimizes economic loss due to the unavailability or loss of data.
- Provides a plan for the safe and orderly recovery of data in the event of a disaster.
- Ensures safe and efficient recovery of data and services.
- Minimizes any decision making during DR.
- Reduces the reliance on key individuals.

Strategically planning a DR solution provides businesses with affordable ways to meet their service level agreements, comply with government regulations, and minimize their business risks.

Understanding replication

The term replication refers to the use of a tool or service to automate the process of maintaining a consistent copy of data from a designated source (primary site) on one or more remote locations (secondary sites).

In the event that the primary site data center is destroyed, the application data is readily available at the remote site, and the application can be restarted at the remote site.

SFW HA provides Veritas Volume Replicator for use in replication. The SFW HA disaster recovery solution also supports hardware replication.

For more information on VVR refer to the *Veritas Volume Replicator, Administrator's Guide.*

What needs to be protected in a SQL Server environment?

The following components of a SQL Server environment must be protected in the event of a disaster:

- **User Databases:** The most critical component in any SQL Server implementation is the user data that is stored in user-defined databases.
- **Logins:** Logins allow clients to connect to SQL Server and execute queries on user data. Logins are stored in the master database and each of the user-defined databases.
- **Jobs:** Jobs are a set of scheduled tasks that maintain SQL Server databases. The job configuration is stored in the msdb system database.
- **Alerts:** Alerts are actions that are taken when a specific event occurs. They are used to respond to and correct errors that occur in SQL Server. The alert configuration is stored in the msdb system database.
- **Operators:** Operators are contacts that address problems occurring in SQL Server. They are notified in the event of errors. The operator configuration is stored in the msdb system database.
- **Extended Stored Procedures:** Extended stored procedures are external routines that are called from within SQL Server. They are typically stored in DLL files on the file system.
- **Other Server Extensions:** SQL Server is a very flexible database engine and it is possible to extend its functionality in several ways. These extensions are also important to the operation of the SQL Server.

Running SQL Server in an active-active clustered environment

SQL Server allows multiple independent instances of SQL Server to run on a single machine. Using this feature, the VCS database agent for Microsoft SQL Server supports SQL Server in an active-active environment by allowing a node to run as many instances as supported by SQL. A SQL Server instance can fail over to any of the other configured nodes that are part of the service group's system list.

You can choose an active-active SQL Server configuration where several instances are intended to run on a single node. However, remember that you must configure the failover nodes such that a single node can never host more instances than what is supported by SQL server.

Refer to the Microsoft SQL server documentation for more information about multiple instance support.

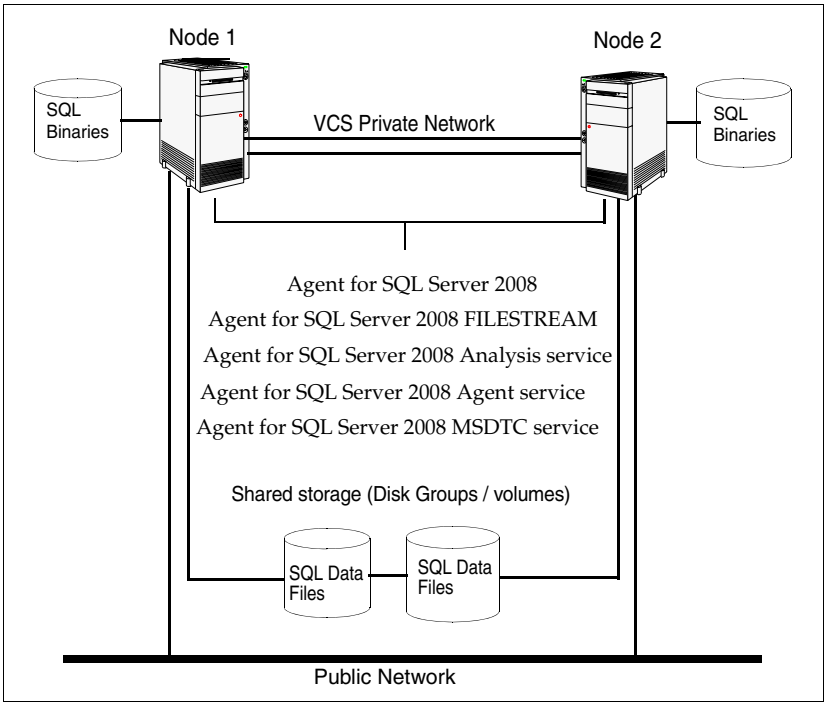
Typical SQL Server 2008 configuration in a VCS cluster

A typical SQL Server 2008 configuration in a VCS cluster involves two cluster nodes accessing a shared storage. The SQL Server binaries are installed on the cluster nodes. The shared storage is used to store SQL Server data files and the MSDTC log files. The cluster nodes access the shared storage. The shared storage can be managed using SFW.

The cluster nodes are configured to host the SQL Server 2008 resource, the SQL Server 2008 FILESTREAM resource, the SQL Server 2008 Analysis, and Agent service resources. The MSDTC resource can be configured on the same cluster nodes. You need not configure an MSDTC client if the MSDTC resource is configured on the same nodes that have SQL Server 2008 resource configured. However, if the MSDTC resource is configured on other nodes, you must configure an MSDTC client to point to the virtual server name of the MSDTC resource.

Figure 1-2 on page 24 illustrates a two node cluster hosting a SQL Server 2008 service group with the different services configured. MSDTC resource is also configured on the same nodes.

Figure 1-2 Typical SQL Server 2008 configuration in a VCS cluster

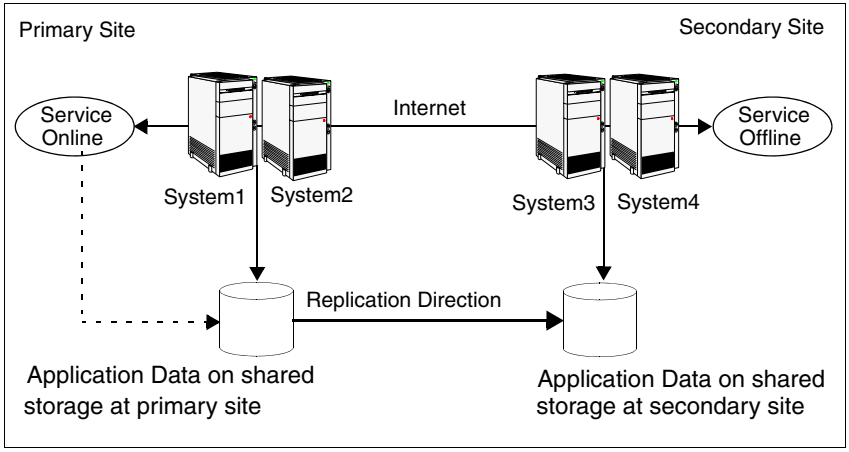


Typical SQL Server 2008 disaster recovery configuration

A disaster recovery (DR) configuration enables you to restore application data and services in the event of a catastrophic failure. A typical DR solution requires primary and secondary sites, and clusters within those sites. The cluster at the primary site provides data and services during normal operation, and the cluster at the secondary site provides data and services if the primary site fails.

Figure 1-3 on page 25 illustrates a typical SQL Server 2008 DR configuration.

Figure 1-3 Typical DR configuration in a VCS cluster



The illustration displays an environment with a DR solution that is prepared for a disaster. In this case, the primary site consists of two nodes, System1 and System2. Similarly the secondary setup consists of two nodes, System3 and System4. Each site has a clustered setup with the nodes set up appropriately for failover within the site.

Data is replicated from the primary site to the secondary site. Replication between the storage is set up using a replication software. If the Microsoft SQL Server on System1 fails, SQL Server comes online on node System2 and begins servicing requests. From the user's perspective there might be a small delay as the backup node comes online, but the interruption in effective service is minimal.

When a failure occurs, such as an earthquake that destroys the data center in which the primary site resides, the DR solution is activated. System3 at the secondary site takes over, and the data that was replicated to the secondary site is used to restore the application services to clients.

Chapter 2

Introducing the VCS agents for SQL Server 2008

This chapter contains the following topics:

About the VCS database agent for Microsoft SQL Server 2008

The VCS database agent for Microsoft SQL Server 2008 provides high availability for Microsoft SQL Server 2008 in a VCS cluster. The agent monitors Microsoft SQL Server RDBMS and its services on a VCS cluster to ensure high availability. The agent detects an application failure if a configured virtual server becomes unavailable. When this occurs, the SQL Server service group is failed over to the next available system in the service group's system list. The configured SQL services and virtual server are started on the new system.

The agent for SQL Server 2008 monitors specific resources within an enterprise application, determines the status of these resources, brings them online, and takes them offline. The database agent also provides "active-active" support for SQL Server. In an Active-Active configuration, several SQL server instances are intended to run on a single node when necessary.

The VCS database agent package for SQL Server 2008 includes the following:

- Agent for SQL Server 2008 Database Engine
  The agent provides high availability for SQL Server 2008 Database Engine. This agent also monitors the Full-Text Search service, an optional component that is integrated with the Database Engine. If the SQL Server 2008 Database Engine service is not running, the agent returns a failure status and declares the state as OFFLINE. Depending on the detail monitoring configuration, the agent checks the health of critical SQL databases or executes a monitoring script. If the detail monitoring is successful, the agent declares the service group as online.
- Agent for SQL Server 2008 FILESTREAM
  The agent provides high availability for the SQL Server 2008 FILESTREAM feature. The agent monitors the Windows FILESTREAM configuration settings for the SQL Server instance.
- GenericService Agent for SQL Server 2008 Agent and Analysis service
  VCS employs the GenericService agent to provide high availability for the SQL Server 2008 Agent service and the Analysis service. The VCS GenericService agent monitors the SQL Server 2008 Agent and Analysis service. If the services are not running, the agent declares the services as OFFLINE.

- Agent for SQL Server 2008 MSDTC
  The VCS database agent for MSDTC provides high availability for the Microsoft Distributed Transaction Coordinator (MSDTC) service used in distributed transactions. The MSDTC agent monitors the MSDTC service to detect failure. The agent detects an MSDTC failure if the MSDTC service is not running.

About the agent for SQL Server 2008 Database Engine

This SQL Server 2008 agent monitors the SQL Server Database Engine service and all the optional components that are integrated with the Database Engine service. The agent brings the SQL Server 2008 service online, monitors the status, and takes it offline.

Specific agent functions include the following:

Online	Brings the SQL Server 2008 service online.
Offline	Takes the SQL Server 2008 service offline.
Monitor	Queries the Service Control Manager (SCM) for the status of SQL Server 2008 services. Also, if detail monitoring is configured, the agent performs a database health check depending on the configuration. See "Database monitoring options" on page 36.
Clean	Forcibly stops the SQL Server service.

Resource type definition

The agent for SQL Server 2008 is configured as a resource of type SQLServer2008.

```
type SQLServer2008 (
    static i18nstr ArgList[] = { Instance,
    "LanmanResName:VirtualName", SQLOnlineTimeout,
    SQLOfflineTimeout, DetailMonitorInterval,
    SQLDetailMonitorTimeout, Username, Domain, Password, DBList,
    SQLFile, FaultOnDMFailure, "LanmanResName:IPResName" }
    str Instance
    str LanmanResName
    int SQLOnlineTimeout = 90
    int SQLOfflineTimeout = 90
    int DetailMonitorInterval = 0
    int SQLDetailMonitorTimeout = 30
    i18nstr Username
    i18nstr Domain
    str Password
    i18nstr DBList[]
    i18nstr SQLFile
    boolean FaultOnDMFailure = 1
)
```

Attribute definitions

Review the following information to familiarize yourself with the agent attributes for a SQLServer2008 resource type.

Table 2-1 describes the required attributes associated with the VCS agent for SQL Server 2008 Database Engine.

Table 2-1 SQL Server 2008 agent required attributes

Required Attributes	Definition
Instance	Name of SQL Server instance to monitor. If the attribute is blank, the agent monitors the default instance. Type and dimension: string-scalar
LanmanResName	The Lanman resource name on which the SQL Server 2008 resource depends. Type and dimension: string-scalar
SQLOnlineTimeout	Number of seconds that can elapse before online entry point aborts. Default is 90. Type and dimension: integer-scalar

Table 2-1 SQL Server 2008 agent required attributes

Required Attributes	Definition
SQLOfflineTimeout	Number of seconds that can elapse before offline entry point aborts. Default is 90. Type and dimension: integer-scalar

Table 2-2 describes the optional attributes associated with the VCS agent for SQL Server 2008 Database Engine.

Table 2-2 SQL Server 2008 agent optional attributes

Required Attributes	Definition
DetailMonitorInterval	Defines whether the agent performs detail monitoring of SQL Server 2008 database. If set to 0, the agent will not monitor the database in detail. A non-zero value indicates the number of online monitor cycles that the agent must wait before performing detail monitoring. Default = 5 **Note:** If the attribute is set to a non-zero value, and script-based detail monitoring is configured, then the attributes Username, Password, Domain, SQLDetailMonitorTimeOut, and SQLFile must be assigned appropriate values. Type and dimension: integer-scalar
FaultOnDMFailure	Defines whether the agent fails over the service group if the detail monitoring script execution fails. The value 1 indicates that the agent fails over the service group if detail monitoring script fails to execute. The value 0 indicates that it does not. Default = 1 Type and dimension: boolean
SQLDetailMonitor Timeout	Number of seconds that can elapse before the detail monitor routine aborts. Default is 30. Type and dimension: integer-scalar

Table 2-2 SQL Server 2008 agent optional attributes (Continued)

Required Attributes	Definition
Username	The Microsoft Windows authentication name when logging in to a database for detail monitoring. This attribute must not be null if DetailMonitorInterval attribute is set to a non-zero value and script-based detail monitoring is configured. **Note:** This attribute can take localized values. Type and dimension: string-scalar
Domain	Domain for the user account. This attribute is used to create a trusted connection to the SQL Server 2008 instance if DetailMonitorInterval attribute is set to a non-zero value and script-based detail monitoring is configured. **Note:** This attribute can take localized values. Type and dimension: string-scalar
Password	Password for logging in to a database for in-depth monitoring. This attribute must not be null if DetailMonitorInterval attribute is set to a non-zero value and script-based detail monitoring is configured. Type and dimension: string-scalar
SQLFile	The location of the SQLFile executed during a monitor cycle. This attribute must not be null if the DetailMonitorInterval attribute is set to a non-zero value and script-based detail monitoring is configured. **Note:** This attribute can take localized values. Type and dimension: string-scalar
DBList	List of databases for which the agent will perform detail monitoring. **Note:** This attribute can take localized values. Type and dimension: string-vector

About the agent for SQL Server 2008 FILESTREAM

FILESTREAM in SQL Server 2008 enables SQL Server-based applications to store unstructured data, such as documents and images, on the file system. FILESTREAM integrates the SQL Server Database Engine with an NTFS file system by storing varbinary(max) binary large object (BLOB) data as files on the file system. Transact-SQL statements can insert, update, query, search, and back up FILESTREAM data. Win32 file system interfaces provide streaming access to the data.

The agent for SQL Server 2008 FILESTREAM enables FILESTREAM, monitors the status, and disables it. The agent makes FILESTREAM highly available in a clustered environment.

Specific agent functions include the following:

Online	Enables FILESTREAM on the node on which the service group comes online.
Offline	Disables FILESTREAM on the node on which the service group goes offline.
Monitor	Monitors FILESTREAM status on the node on which the service group is online. If the agent is unable to query the status of FILESTREAM or if FILESTREAM is disabled on the node, the FILESTREAM resource in the service group faults.

Resource type definition

The agent for SQL Server 2008 FILESTREAM is configured as a resource of type SQLFilestream.

```
type SQLFilestream (
    static i18nstr ArgList[] = { InstanceName }
    i18nstr InstanceName
)
```

Attribute definitions

Review the following information to familiarize yourself with the agent attributes for a SQLFilestream resource type.

Table 2-3 describes the required attribute associated with the VCS agent for SQL Server 2008 FILESTREAM.

Table 2-3 SQL Server 2008 Filestream agent required attribute

Required Attributes	Definition
InstanceName	The name of the SQL Server 2008 instance to which the FILESTREAM is bound. If this attribute is blank, the agent monitors the SQL server default instance (MSSQLSERVER). **Note:** This attribute can take localized values. Type and dimension: string-scalar

About the GenericService agent for SQL Server 2008 Agent and Analysis service

VCS uses the GenericService agent to make the SQL Server 2008 Agent service and Analysis service highly available. The GenericService agent brings these services online, monitors their status, and takes them offline.

Specific agent functions include the following:

Online	Brings the configured SQL Server 2008 services online.
Offline	Takes the configured SQL Server 2008 services offline.
Monitor	Queries the Service Control Manager (SCM) for the status of configured SQL Server 2008 services. See "Database monitoring options" on page 36.
Clean	Forcibly stops the configured SQL Server 2008 services.

Refer to *Veritas Cluster Server Bundled Agents Reference Guide* for more information about the GenericService agent.

About the agent for SQL Server 2008 MSDTC service

The MSDTC agent comprises two parts; MSDTC client and MSDTC server. The MSDTC client and the MSDTC server must not be configured on the same cluster node.

The MSDTC agent brings the MSDTC service online, monitors its status, and takes it offline. The agent provides high availability for the MSDTC service in a clustered environment.

Specific agent functions include the following:

Online	Brings the configured MSDTC service online.
Offline	Takes the configured MSDTC service offline.
Monitor	Monitors the configured MSDTC service.
Clean	Forcibly stops the configured MSDTC service.

Resource type definition

The MSDTC agent is configured as a resource of type MSDTC.

```
type MSDTC (
    static i18nstr ArgList[] = {"LanmanResName:VirtualName",
    "MountResName:MountPath", LogPath }
    str LanmanResName
    str MountResName
    i18nstr LogPath
)
```

Attribute definitions

Review the following information to familiarize yourself with the agent attributes for an MSDTC resource type.

Table 2-4 on page 35 describes the required attributes associated with the VCS agent for MSDTC.

Table 2-4 MSDTC agent required attributes

Required Attributes	Definition
LanmanResName	Name of the Lanman resource on which the MSDTC resource depends. Type and dimension: string-scalar

Table 2-4 MSDTC agent required attributes

Required Attributes	Definition
MountResName	The mount resource name on which the MSDTC resource depends. Type and dimension: string-scalar
LogPath	The path for MSDTC logs. This attribute can take localized values. Type and dimension: string-scalar

Database monitoring options

Use the detail monitoring capability of the VCS database agent for SQL Server 2008 to monitor the status of a database. The VCS database agent for SQL Server 2008 provides two levels of application monitoring: basic and detail. Basic monitoring queries the Windows Service Control Manager (SCM) to verify whether the configured SQL Server services are continuously active. Detail monitoring queries the database to verify the availability of the database instance.

You can configure detail monitoring in the following ways:

- DBList detail monitoring
  The SQL Server agent monitors only the list of databases specified in the SQL Server 2008 agent's DBList attribute. The agent uses Microsoft ActiveX Data Objects (ADO) to establish a connection with the selected databases to verify the health of those databases. If the connection is successful the agent considers the database as available. If the connection fails, the database instance is considered not available and, if the FaultOnDMFailure agent attribute is configured, the service group fails over to the failover nodes.
- Script-based detail monitoring
  The SQL Server agent uses a script to monitor the status of the database. If the script is successfully executed during monitoring, the agent considers the database instance available. If the execution fails, the database instance is considered not available and, if the FaultOnDMFailure attribute is configured, the service group fails over to the failover nodes.
  A sample SQL script is provided with the agent for the purpose. You can customize the script to meet your configuration requirements.
  The script is located at:
  `%VCS_HOME%\bin\SQLServer2005\sample_script.sql`

Here, the variable *%VCS_HOME%* is the default installation directory for VCS, typically it is `C:\Program Files\Veritas\Cluster Server`.
You should use a separate script for each SQL Server service group that exists in the cluster. The script should exist on all the nodes in the service group.

You can enable and configure detail monitoring by running the SQL Server 2008 Configuration Wizard for VCS. Refer to the instructions for configuring a SQL Server service group for more information.

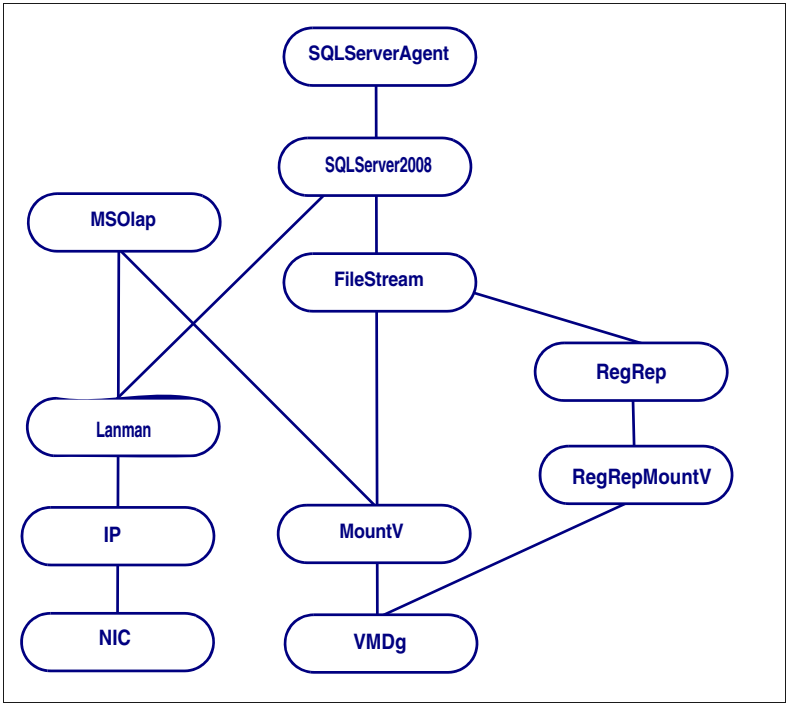
See "Configuring the VCS SQL Server 2008 service group" on page 164.

Note: If you start the SQL server services from outside VCS, then the SQL resource will go in an UNKNOWN state, because the VCS database agent for Microsoft SQL Server 2008 monitors the computer context of the services. If the SQL service is not started in the virtual server context the resource goes in an UNKNOWN state. You must ensure that you start all the SQL related services from within VCS.

SQL Server 2008 sample dependency graph

A sample configuration graphically depicts the resources and their dependencies within the service group. The following example illustrates a typical service group configured to make SQL Server 2008 highly available in a VCS cluster. The shared disk group is configured using the Volume Manager Disk Group resource (VMDg) resource. The virtual name for the SQL Server is created using the Lanman resource. The service group IP address for the SQL Server is configured using the IP and NIC resources. The MountV mount point is created using the MountV resource. SQL Server 2008 registry is replicated using the RegRep and RegRepMount resources. The Filestream resource monitors the Windows FILESTREAM configuration settings for the SQL Server instance. The SQL Server 2008 resource comes online after each of these resources are brought online. The SQL Server 2008 Analysis service (MSOlap) and SQL Server 2008 Agent service (SQLServerAgent) are configured as GenericService resources.

Figure 2-1 SQL Server 2008 service group dependency graph

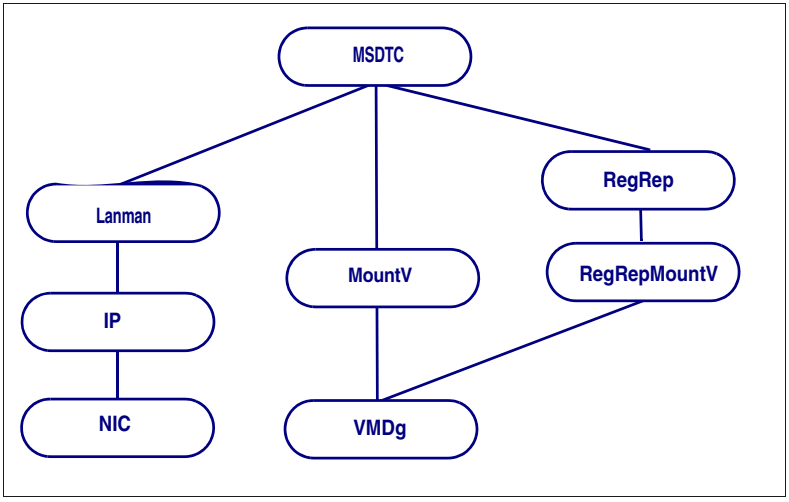


MSDTC sample dependency graph

A sample configuration graphically depicts the resources and their dependencies within the service group. The following example describes a typical MSDTC service group configured to monitor the state of the MSDTC services in a VCS cluster.

In the sample configuration shown in the dependency graph below, the shared disk group is configured using the Volume Manager Diskgroup (VMDg) resource. The virtual name for the MSDTC Server is created using the Lanman resource. The service group IP address for the MSDTC Server is configured using the IP and NIC resources. The MountV mount point is created using the MountV resource. MSDTC registry is replicated using the RegRep and RegRepMountV resources. The MSDTC resource comes online after each of these resources are brought online.

Figure 2-2 MSDTC service group dependency graph



Section 2

Configuration Workflows

This section contains the following chapters:

Chapter 3

Using the Solutions Configuration Center

This chapter covers the following topics:

About the Solutions Configuration Center

The Storage Foundation and High Availability Solutions Configuration Center guides you through setting up your Veritas Storage Foundation for Windows (SFW) or SFW High Availability (HA) environment. The Configuration Center provides solutions for the following applications:

- Microsoft Exchange Server 2003 and 2007
- Microsoft SQL Server 2000, 2005, and 2008
- Enterprise Vault Server (high availability solution only)
- Additional applications

You can use the Configuration Center and its wizards to set up your environment for any combination of the following solutions:

- High availability at a single site for a new installation
- High availability at a single site for an existing server

- Campus cluster disaster recovery, including the following:
  - Campus cluster using Veritas Cluster Server (SFW HA)
  - Campus cluster using Microsoft clustering
- Wide area disaster recovery involving multiple sites
- Quick Recovery for on-host recovery from logical errors in application data (available for Microsoft Exchange 2003 and 2007 and for Microsoft SQL Server 2005 and 2008)
- Fire drill to test the fault readiness of a disaster recovery environment that uses VVR replication

The Solutions Configuration Center provides two ways to access Solutions wizards:

- The Applications tab lists solutions by application. It provides step-by-step configuration instructions that include buttons to launch the appropriate wizard for each step.
- The Solutions tab, for advanced users, lists wizards by solution without additional instructions.

Starting the Configuration Center

You can start the Configuration Center in two ways:

- Click **Start > All Programs > Symantec > Veritas Storage Foundation > Solutions Configuration Center**.
- Click **Start > Run** and type **scc**.

Available options from the Configuration Center

On the Applications tab, the Solutions Configuration Center is context-sensitive to the application. For example, the Solution Guides listed in the right pane match the selected application.

In addition, some choices can vary depending on the operating system of the node on which you launch the wizard. For example, since Microsoft Exchange 2003 runs only on 32-bit operating systems, on a 64-bit system only the Exchange 2007 configuration wizard is shown.

Figure 3-1 shows the choices available on a 32-bit system when you click Solutions for Microsoft Exchange.

Figure 3-1 Solutions Configuration Center for Microsoft Exchange

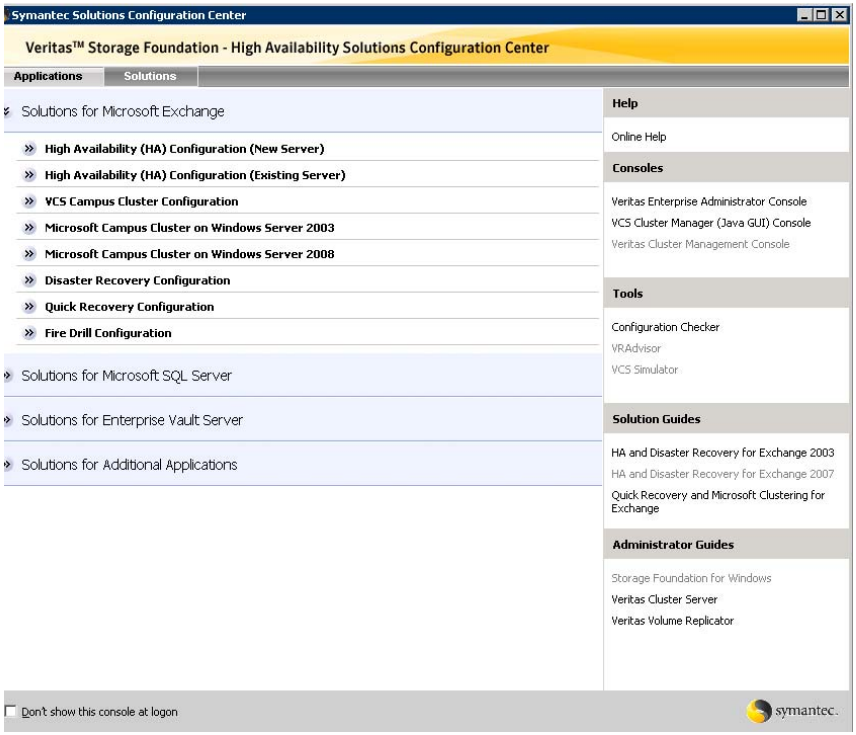


Figure 3-2 shows the choices available when you click Solutions for Microsoft SQL Server.

Figure 3-2 Solutions Configuration Center for Microsoft SQL Server

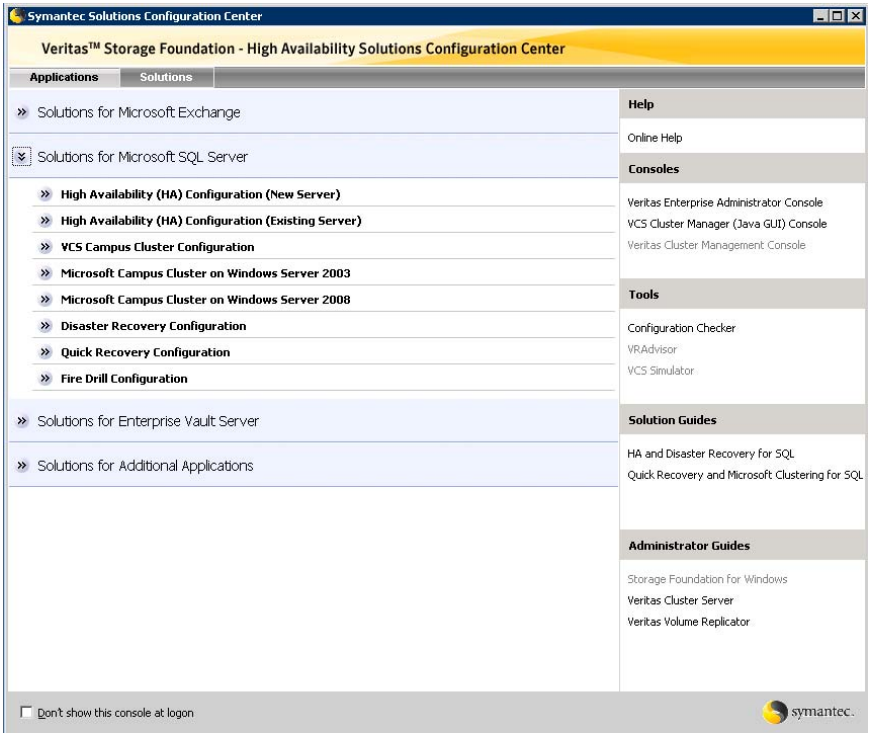


Figure 3-3 shows the choices available when you click Solutions for Enterprise Vault Server.

Figure 3-3 Solutions Configuration Center for Enterprise Vault Server

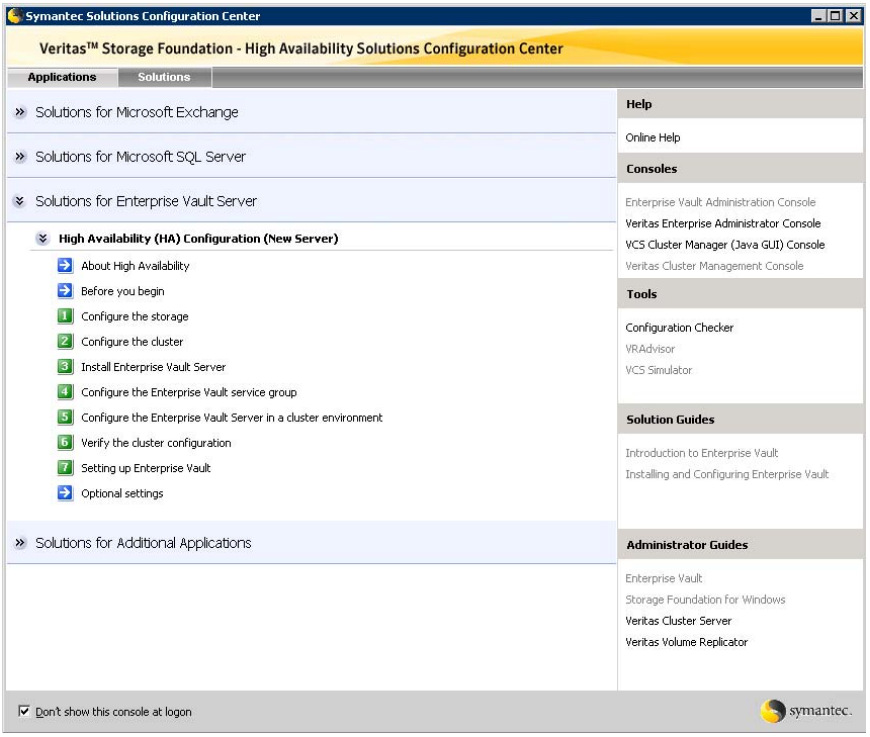
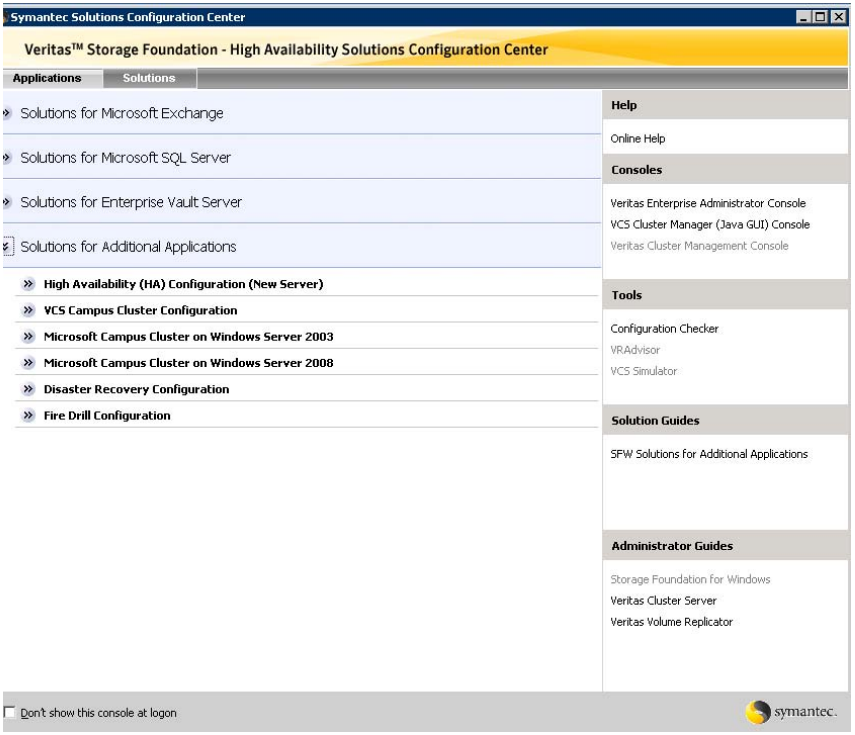


Figure 3-4 shows the choices available when you click Solutions for Additional Applications.

Figure 3-4 Solutions Configuration Center for additional applications



The submenu choices also vary by application. For example, different steps, information, or wizards are shown under High Availability (HA) Configuration for Exchange than those shown for SQL Server.

Figure 3-5 shows one of the steps for implementing high availability for Exchange.

Figure 3-5 Context-sensitive step for Exchange

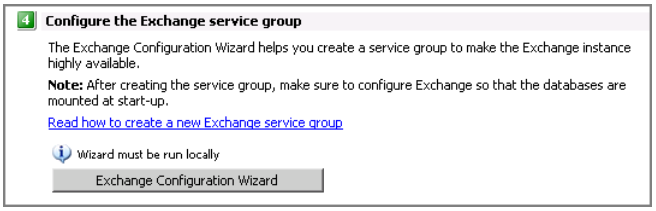


Figure 3-6 shows one of the steps for implementing high availability for SQL Server. The SQL Server 2008 Configuration Wizard is shown if SFW HA 5.1 Application Pack 1 (for SQL Server 2008 support) is installed.

Figure 3-6 Context-sensitive step for SQL Server

Figure 3-7 shows one of the steps for implementing high availability for Enterprise Vault Server.

Figure 3-7 Context-sensitive step for Enterprise Vault Server

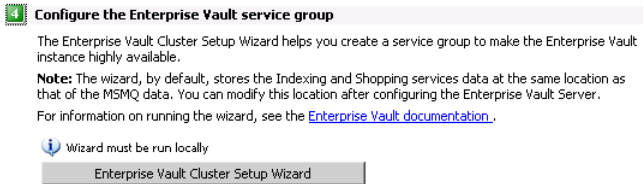
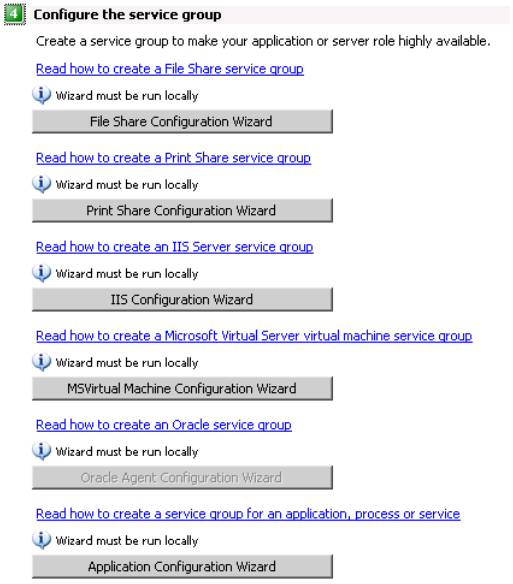


Figure 3-8 shows one of the steps for implementing high availability for additional applications.

Figure 3-8 Context-sensitive step for additional applications



About running the Configuration Center wizards

You can run the wizards from the Applications tab if you are walking through the configuration steps on the Solutions Configuration Center. If you are already familiar with configuration, you can also go directly to a particular wizard by selecting the Solutions tab.

The Configuration Center and some wizards can be run from a remote system. Wizards that you can run remotely include the following:

VCS Configuration Wizard	Sets up the VCS cluster
Disaster Recovery Configuration Wizard	Configures wide area disaster recovery, including cloning storage, cloning service groups, and configuring the global cluster Also can configure Veritas Volume Replicator (VVR) replication or configure the VCS resource for EMC SRDF and Hitachi TrueCopy array-based hardware replication. Requires first configuring high availability on the primary site
Quick Recovery Configuration Wizard	Schedules preparation of snapshot mirrors and schedules the Quick Recovery snapshots
Fire Drill Wizard	Sets up a fire drill to test disaster recovery Requires configuring disaster recovery first

Wizards related to storage configuration and application installation must be run locally on the system where the process is occurring. Wizards that you must run locally include the following:

New Dynamic Disk Group Wizard	Launched from the Veritas Enterprise Administrator console
New Volume Wizard	Launched from the Veritas Enterprise Administrator console
Exchange Setup Wizard	Installs and configures Exchange for the high availability environment If Exchange is already installed, refer to the documentation for further instructions.
Exchange Configuration Wizard	Configures the service group for Exchange high availability

SQL Server Configuration Wizard	Configures the service group for SQL Server 2000 or SQL Server 2005 high availability You must first install SQL Server on each node according to the instructions in the documentation.
SQL Server 2008 Configuration Wizard	Configures the service group for SQL Server 2008 high availability (requires SFW HA 5.1 Application Pack 1) You must first install SQL Server on each node according to the instructions in the documentation.
Enterprise Vault Cluster Setup Wizard	Configures the service group for Enterprise Vault Server high availability.

In addition, the Additional Applications section of the Configuration Center provides wizards to be run locally for creating service groups for the following applications or server roles:

File Share Configuration Wizard	Configures FileShare for high availability.
Print Share Configuration Wizard	Configures PrintShare for high availability.
IIS Configuration Wizard	Configures IIS for high availability.
MSVirtual Machine Configuration Wizard	Configures MS Virtual Machine for high availability.
Oracle Agent Configuration Wizard	Configures Oracle for high availability
Application Configuration Wizard	Configures any other application service group for which application-specific wizards have not been provided.

Following the workflow in the Configuration Center

During the multi-step High Availability Configuration workflow, you may find it helpful to run an SFW HA client on another system and leave the Configuration Center open on that system. In this way, you can see what step comes next, drill down to the information about that step, and access the online help if needed. You can also print the online help topics and the documentation in PDF format.

When setting up a site for disaster recovery, you first follow the steps under High Availability (HA) Configuration and then continue with the steps under Disaster Recovery Configuration.

Figure 3-9 shows the high-level overview of the workflow steps for configuring high availability for Exchange from the Solutions Configuration Center.

Figure 3-9 Workflow for configuring Exchange high availability

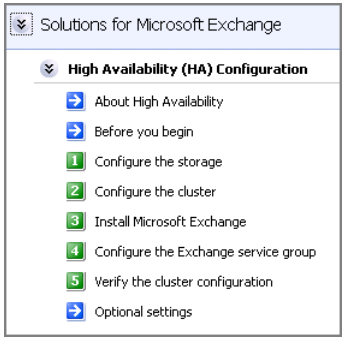


Figure 3-10 shows the high-level overview of the workflow steps for configuring high availability for SQL Server from the Solutions Configuration Center.

Figure 3-10 Workflow for configuring SQL Server high availability

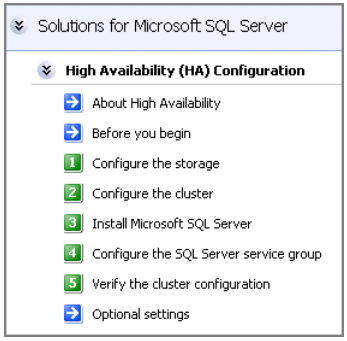


Figure 3-11 shows the high-level overview of the workflow steps for configuring high availability for Enterprise Vault Server from the Solutions Configuration Center.

Figure 3-11 Workflow for configuring high availability for Enterprise Vault Server

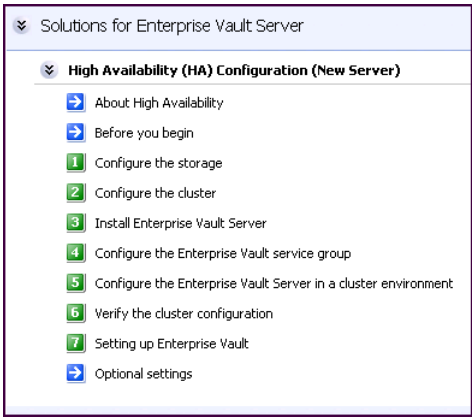
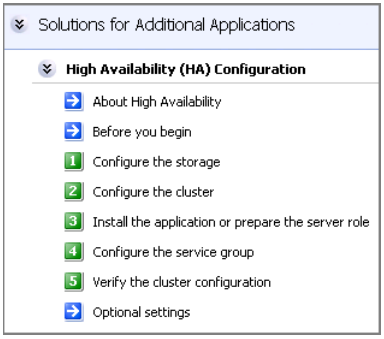


Figure 3-12 shows the high-level overview of the workflow steps for configuring high availability for additional applications from the Solutions Configuration Center.

Figure 3-12 Workflow for configuring high availability for additional applications



Solutions wizard logs

The Solutions Configuration Center provides access to many wizards. However, three wizards are built in to the Solutions Configuration Center:

- Disaster Recovery Wizard
- Fire Drill Wizard
- Quick Recovery Configuration Wizard

These three Solutions wizards are launched only from the Solutions Configuration Center, whereas other wizards can be launched from product consoles or the Start menu.

Logs created by these three Solutions wizards are located in the following paths:

For Windows Server 2003:

```
C:\Documents and Settings\All Users\Application
Data\VERITAS\winsolutions\log
```

For Windows Server 2008:

```
C:\ProgramData\Veritas\winsolutions\log
```

Chapter 4

Configuration workflows for SQL Server 2008

This chapter contains the following topics:

About using the workflow tables

Configuring a high availability or a disaster recovery environment involves a series of tasks such as evaluating the requirements, configuring the storage, installing and configuring VCS, installing and configuring the application, and so on. A configuration workflow table provides high level description of all the required tasks, with links to the topics that describe these tasks in detail.

Separate workflow tables are provided for HA, campus cluster, Replicated Data Cluster and DR configurations. Depending on the required high availability configuration, use the appropriate workflow table as a guideline to perform the installation and configuration.

Symantec recommends using the Solutions Configuration Center as a guide for installing and configuring SFW HA for SQL Server 2008.

See "About the Solutions Configuration Center" on page 43.

High availability (HA) configuration (New Server)

Table 4-1 outlines the high-level objectives and the tasks to complete each objective for an Active-Passive or an Active-Active SQL configuration.

Table 4-1 SQL Server 2008: Active-Passive configuration tasks

Action	Description
Verify hardware and software requirements	See "Reviewing the requirements" on page 80.
Review the HA configuration	■ Understanding active-passive and active-active configuration ■ Reviewing the sample configuration See "Reviewing the HA configuration" on page 85.
Configure the storage hardware and network	■ Setting up the storage hardware for a cluster environment ■ Verifying the DNS entries for the systems on which SQL will be installed See "Configuring the storage hardware and network" on page 112.
Install SFW HA and Application Pack 1	■ Verifying the driver signing option for the system ■ Installing Veritas Storage Foundation HA for Windows (automatic installation) ■ Selecting the option to install Veritas Cluster Server Database Agent for Microsoft SQL Server See "Installing Veritas Storage Foundation HA for Windows" on page 115.
Configure disk groups and volumes for SQL Server	■ Creating a dynamic cluster disk group using the Veritas Enterprise Administrator (VEA) ■ Creating dynamic volumes for the SQL system database, user databases, transaction logs, and replicated registry keys for each instance See "Configuring cluster disk groups and volumes for SQL Server 2008" on page 121.
Configure VCS cluster	■ Verifying static IP addresses and name resolution configured for each node ■ Running the VCS Cluster Configuration Wizard (VCW) to configure cluster components and set up secure communication for the cluster See "Configuring the cluster" on page 137.

Table 4-1 SQL Server 2008: Active-Passive configuration tasks (Continued)

Action	Description
Install and configure SQL Server on the first cluster node	■ Installing and configuring SQL Server 2008 ■ Setting SQL Server services to manual start ■ Follow the guidelines for installing SQL Server 2008 in the SFW HA environment See "Installing and configuring SQL Server 2008 on the first cluster node" on page 157.
Install and configure SQL Server on the second or additional failover nodes	■ Stopping SQL Server services on the first node ■ Ensuring that the disk group and volumes are mounted on the second or additional node ■ Follow the guidelines for installing SQL Server 2008 on failover nodes in the SFW HA environment See "Installing and configuring SQL Server 2008 on the second cluster node" on page 158.
Create a SQL Server user-defined database	■ Creating volumes, if not created already, for a user-defined database and transaction log ■ Creating a user-defined database in SQL Server See "Creating a SQL Server user-defined database" on page 160.
Perform additional configuration steps for multiple instances or disaster recovery configuration	See "Completing configuration steps in SQL Server" on page 161.
Create a SQL service group	■ Creating a SQL Server service group using the VCS SQL Server 2008 Configuration Wizard ■ For an active-active SQL configuration, ensuring that the priority order of the systems in the service group for each instance is set up in reverse order See "Configuring the VCS SQL Server 2008 service group" on page 164.
Verify the HA configuration	Testing failover between nodes "Verifying the SQL Server 2008 cluster configuration" on page 172

Table 4-1 SQL Server 2008: Active-Passive configuration tasks (Continued)

Action	Description
In case of an active-active configuration, repeat the installation and configuration steps for the next SQL instance, or proceed to the additional steps depending on the desired HA configuration.	See "Determining additional steps needed" on page 182.

High availability (HA) configuration (Existing Server)

This topic describes the procedure to convert an existing standalone SQL Server 2008 into a “clustered” SQL Server in a new Veritas Storage Foundation HA environment. This environment involves an active-passive configuration with one to one failover capabilities.

Note: Some installation and configuration options are identified as required “for a disaster recovery configuration.” These options apply only if you intend to set up a secondary site for disaster recovery using Veritas Volume Replicator (VVR).

Table 4-2 outlines the high-level objectives and the tasks to complete each objective for converting an existing standalone SQL Server 2008 for high availability.

Table 4-2 SQL Server 2008: Standalone server HA configuration tasks

Action	Description
Verifying hardware and software prerequisites	See “Reviewing the requirements” on page 80.
Review the HA configuration	■ Understanding active-passive configuration ■ Reviewing the sample configuration See “Reviewing a standalone SQL Server configuration” on page 89.
Configure the storage hardware and network	■ Setting up the storage hardware for a cluster environment ■ Verifying the DNS entries for the systems on which SQL will be installed See “Configuring the storage hardware and network” on page 112.
Install SFW HA and Application Pack 1	■ Verifying the driver signing option for the system ■ Installing Veritas Storage Foundation HA for Windows (automatic installation) ■ Selecting the option to install Veritas Cluster Server Database Agent for Microsoft SQL Server See “Installing Veritas Storage Foundation HA for Windows” on page 115.

Table 4-2 SQL Server 2008: Standalone server HA configuration tasks

Action	Description
Configure disk groups and volumes for SQL Server	■ Planning the storage layout ■ Creating a dynamic cluster disk group using the Veritas Enterprise Administrator (VEA) ■ For a new shared storage configuration, creating dynamic volumes for the SQL system database, user databases and transaction logs using VEA See "Configuring cluster disk groups and volumes for SQL Server 2008" on page 121.
Configure the VCS cluster	■ Verifying static IP addresses and name resolution configured for each node ■ Running the VCS Cluster Configuration Wizard (VCW) to configure cluster components and set up secure communication for the cluster See "Configuring the cluster" on page 137.
Move SQL Server database and log files to shared storage	■ Backing up existing SQL data ■ Setting SQL Server services to manual start ■ Stopping SQL Server service ■ Modifying data file and user database locations See "Verifying that SQL Server 2008 databases and logs are moved to shared storage" on page 156.
Install and configure SQL Server on the second or additional failover nodes	■ Stopping SQL Server services on the first node ■ Ensuring that the disk group and volumes are mounted on the second or additional node ■ Optionally, renaming system data files ■ Follow the guidelines for installing SQL Server 2008 on failover nodes in the SFW HA environment See "Installing and configuring SQL Server 2008 on the second cluster node" on page 158.
Create a SQL Server service group	Creating a SQL Server service group using the VCS SQL Configuration wizard See "Configuring the VCS SQL Server 2008 service group" on page 164.

Table 4-2 SQL Server 2008: Standalone server HA configuration tasks

Action	Description
Create a SQL user defined database	■ Creating volumes, if not created already, for a user-defined database and transaction log ■ Creating a new user-defined database in SQL Server ■ Adding resources for a user-defined database in VCS See "Creating a SQL Server user-defined database" on page 160.
Verify the HA configuration	Testing fail over between nodes See "Verifying the SQL Server 2008 cluster configuration" on page 172.

Tasks for configuring MSDTC for high availability

You can configure high availability for MSDTC either before or after configuring high availability for Microsoft SQL Server 2008. The MSDTC agent comprises two parts, MSDTC Server and MSDTC client. To configure high availability for MSDTC, you first use the SQL Server Configuration Wizard (not the SQL Server 2008 Configuration Wizard) to create a service group for the MSDTC Server and then configure the MSDTC client manually.

Note: You cannot use the SQL Configuration Wizard to configure the MSDTC client.

Table 4-3 outlines the high-level objectives and the tasks to complete each objective for an MSDTC configuration.

Table 4-3 Tasks for configuring MSDTC for high availability

Action	Description
Verifying hardware and software prerequisites	See "Reviewing the requirements" on page 80.
Review the MSDTC configuration	■ Understanding MSDTC service group configuration ■ Reviewing the sample configuration See "Reviewing the MSDTC configuration" on page 92.
Configure disk groups and volumes for MSDTC	Configuring cluster disk groups and volumes for an MSDTC service group See "Configuring cluster disk groups and volumes for SQL Server 2008" on page 121.
Create an MSDTC service group	Creating an MSDTC service group See "Configuring an MSDTC Server service group" on page 173.
Configure the MSDTC client	Configuring the MSDTC client See "About configuring the MSDTC client" on page 177.
Viewing DTC transactions	View DTC transaction lists and statistics See "Viewing DTC transaction information" on page 179.

VCS campus cluster configuration

This workflow section provides information on how to install and configure a new Veritas Storage Foundation HA environment for SQL Server in a campus cluster configuration. A campus cluster environment provides high availability and disaster recovery that extends beyond local clustering and mirroring at a single site, but is not as complex as SFW HA DR solution with replication.

Symantec recommends using the Solutions Configuration Center as a guide for installing and configuring SFW HA for SQL Server 2008.

See "About the Solutions Configuration Center" on page 43.

Table 4-4 outlines the high-level objectives and the tasks to complete each objective for a campus cluster configuration for SQL.

Table 4-4 Task list: SQL Server 2008 campus cluster configuration

Action	Description
Verify hardware and software prerequisites	See "Reviewing the requirements" on page 80.
Review the campus cluster configuration	■ Understanding active/passive configuration ■ Reviewing the sample configuration See "Reviewing the campus cluster configuration" on page 95.
Configure storage hardware and network	■ Setting up the network and storage for a cluster environment ■ Verifying the DNS entries for the systems on which SQL will be installed See "Configuring the storage hardware and network" on page 112.
Install SFW HA and Application Pack 1	■ Verifying the driver signing options for the system ■ Installing SFW and VCS (automatic installation) and installing Veritas Cluster Server Application Agent for Microsoft SQL Server ■ Restoring driver signing options for the system See "Installing Veritas Storage Foundation HA for Windows" on page 115.

Table 4-4 Task list: SQL Server 2008 campus cluster configuration

Action	Description
Configure disk groups and volumes for SQL Server	■ Creating a dynamic cluster disk group using the Veritas Enterprise Administrator (VEA) ■ Creating dynamic volumes for the SQL system database, user databases and transaction logs using the VEA See "Configuring cluster disk groups and volumes for SQL Server 2008" on page 121.
Configure the VCS cluster	■ Verifying static IP addresses and name resolution configured for each node ■ Running the Veritas Cluster Server Configuration Wizard (VCW) to configure cluster components and set up secure communication for the cluster See "Configuring the cluster" on page 137.
Install and configure SQL Server on the first cluster node	■ Installing and configuring SQL Server ■ Setting SQL Server services to manual start ■ Follow the guidelines for installing SQL Server in the SFW HA environment See "Installing and configuring SQL Server 2008 on the first cluster node" on page 157.
Install and configure SQL Server on the second or additional failover nodes	■ Stopping SQL Server services on the first node ■ Ensuring that the disk group and volumes are mounted on the second or additional node ■ Follow the guidelines for installing SQL Server 2008 on failover nodes in the SFW HA environment See "Installing and configuring SQL Server 2008 on the second cluster node" on page 158.
Create a SQL user defined database	■ Creating volumes, if not created already, for a user-defined database and transaction log ■ Creating a user-defined database in SQL Server See "Creating a SQL Server user-defined database" on page 160.
Create a SQL Server service group	Creating a SQL Server service group using the SQL Server Configuration Wizard See "Configuring the VCS SQL Server 2008 service group" on page 164.

Table 4-4 Task list: SQL Server 2008 campus cluster configuration

Action	Description
Modify the Address and SubNetMask attributes if the sites are in different subnets	Modifying the Address and SubNetMask attributes if the sites are in different subnets. See "Modifying the IP resource in the SQL Server 2008 service group" on page 184.
Set the ForceImport attribute of the VMDg resource as per the requirement	If a site failure occurs, setting the ForceImport attribute of the VMDg resource to 1 to ensure proper failover See "Setting the ForceImport attribute to 1 after a site failure" on page 186.

VCS Replicated Data Cluster configuration

This workflow section provides information on how to install and configure a new Veritas Storage Foundation HA environment for SQL Server in a Replicated Data Cluster configuration.

The configuration process for a Replicated Data Cluster configuration has the following three main stages:

- Configure the SFW HA and SQL Server components for high availability on the primary zone nodes.
- Install and configure SFW HA and SQL Server components on the secondary zone.
- Configure the VVR components for both zones.
  Refer to the *Veritas Volume Replicator Administrator's Guide* for additional details on VVR.

Table 4-5 outlines the high-level objectives and the tasks to complete each objective for a Replicated Data Cluster configuration for SQL.

Table 4-5 Process for deploying a Replicated Data Cluster

Action	Description
Verify hardware and software prerequisites	See "Reviewing the requirements" on page 80.
Understand the configuration	■ Understand active/passive configuration and zone failover in a RDC environment ■ Review the sample configuration See "What is a replicated data cluster?" on page 19. See "How VCS replicated data clusters work" on page 20. See "Reviewing the Replicated Data Cluster configuration" on page 99. See "About setting up a Replicated Data Cluster configuration" on page 100.
Configure the storage hardware and network	For all nodes in the cluster: ■ Set up the storage hardware for a cluster environment ■ Verify the DNS entries for the systems on which SQL will be installed See "Configuring the storage hardware and network" on page 112.

Table 4-5 Process for deploying a Replicated Data Cluster (Continued)

Action	Description
Install SFW HA and Application Pack 1	■ Verify the driver signing option for the system ■ Install Veritas Storage Foundation for Windows HA on all nodes that will become part of the cluster ■ During installation select the option to install VVR; this will also automatically install the Veritas Cluster Server Agent for VVR ■ If you plan to configure a disaster recovery site in addition to configuring RDC, install the Global Cluster Option (GCO) ■ Select the option to install Veritas Cluster Server Agent for Microsoft SQL Server 2008 See "Installing Veritas Storage Foundation HA for Windows" on page 115.
Configure the cluster	■ Verify static IP addresses and name resolution configured for each node ■ Configure cluster components using the Veritas Cluster Server Configuration Wizard ■ Set up secure communication for the cluster See "Configuring the cluster" on page 137.
Configure cluster disk groups and volumes for SQL Server	■ Create dynamic cluster disk groups using the Veritas Enterprise Administrator (VEA) ■ Create dynamic volumes for the SQL system database, registry replication, user databases and transaction logs using the VEA See "Configuring cluster disk groups and volumes for SQL Server 2008" on page 121.
Install and configure SQL Server on the first cluster node of the primary zone	■ Ensure that the disk group and volumes for the system database are mounted on the first node ■ Follow the guidelines for installing SQL Server 2008 in the SFW HA environment See "Installing and configuring SQL Server 2008 on the first cluster node" on page 157.

Table 4-5 Process for deploying a Replicated Data Cluster (Continued)

Action	Description
Install and configure SQL Server on the failover node(s) of the primary zone	■ Stop SQL Server services on the first node ■ Ensure that the disk group and volumes are mounted on the second node ■ Follow the guidelines for installing SQL Server 2008 on failover nodes in the SFW HA environment See "Installing and configuring SQL Server 2008 on the second cluster node" on page 158.
Create a SQL Server user-defined database	■ If not done earlier, create volumes for a user-defined database and transaction log ■ Create a new user-defined database in SQL Server See "Creating a SQL Server user-defined database" on page 160.
Create a SQL Server service group	■ Ensure that you have met the prerequisites ■ Create a SQL Server service group using the VCS SQL Server 2008 Configuration Wizard See "Configuring the VCS SQL Server 2008 service group" on page 164.
Create the primary system zone	■ Create the primary system zone ■ Add the nodes to the primary zone See "Creating the primary system zone" on page 190.
Verify failover within the primary zone	■ See "Verifying the SQL Server 2008 cluster configuration" on page 172.
Create a parallel environment in the secondary zone	■ Install SFW HA on the systems in the secondary zone ■ Configure disk groups and volumes using the same names as on the primary zone ■ Install SQL Server following the prerequisites and guidelines for installing on the second zone. See "Creating a parallel environment in the secondary zone" on page 191.
Add the secondary zone systems to the cluster	Add the secondary zone systems to the cluster. See "Adding the systems in the secondary zone to the cluster" on page 192.

Table 4-5 Process for deploying a Replicated Data Cluster (Continued)

Action	Description
Set up security for VVR on all cluster nodes	Set up security for VVR on all nodes in both zones. This step can be done at any time after installing SFW HA on all cluster nodes, but must be done before configuring VVR replication. See "Setting up security for VVR" on page 200.
Set up the Replicated Data Set	Use the Setup Replicated Data Set Wizard to create RDS and start replication for the primary and secondary zones See "Setting up the Replicated Data Sets (RDS)" on page 203.
Configure a hybrid RVG service group	■ Create a hybrid Replicated Volume Group (RVG) service group ■ Configure the hybrid RVG service group See "Configuring a hybrid RVG service group for replication" on page 214.
Set a dependency between the service groups	Set up a dependency from the VVR RVG Service Group to the SQL Server Service Group See "Setting a dependency between the service groups" on page 230.
Add the nodes from the secondary zone to the RDC	■ Add the nodes from the secondary zone to the RVG service group ■ Configure the IP resources for failover ■ Add the nodes from the secondary zone to the SQL Server service group See "Adding the nodes from the secondary zone to the RDC" on page 231.
Verify the RDC configuration	Verify that failover occurs first within zones and then from the primary to the secondary zone See "Verifying the RDC configuration" on page 237.

Disaster recovery configuration

You begin by configuring the primary site for high availability. After setting up an SFW HA high availability environment for SQL on a primary site, you can create a secondary or "failover" site for disaster recovery.

The Disaster Recovery (DR) wizard helps you to clone the storage and service group configuration from the primary site to the secondary site. You can install the application on the secondary site during the DR wizard workflow.

The DR wizard also helps you set up replication and the global clustering (GCO option). You can choose to configure replication using Veritas Volume Replicator (VVR) or an agent-supported array-based hardware replication. The DR wizard can configure required options for the VCS agents for EMC SRDF and for Hitachi TrueCopy. To use the wizard with any other agent-supported array-based replication, you must complete configuring global clustering with the wizard before configuring replication on the array.

The DR wizard is available from the Solutions Configuration Center. Symantec recommends using the Solutions Configuration Center as a guide for installing and configuring disaster recovery.

See Chapter 3, "Using the Solutions Configuration Center" on page 43.

To follow the workflow in the Solutions Configuration Center, the disaster recovery workflow has been split into two tables, one covering the steps for configuring high availability at the primary site, and the other covering the steps for completing the disaster recovery configuration at the secondary site.

DR configuration tasks: Primary site

Table 4-6 outlines the high-level objectives and the tasks to complete each objective for a DR configuration at the primary site.

Table 4-6 Configuring the primary site for disaster recovery

Action	Description
Verify hardware and software prerequisites	See "Reviewing the requirements" on page 80. **Note:** If the DR site is on a different network segment, ensure that you allocate two IP addresses for the virtual server, one for the primary site and one for the DR site.
Understand the configuration	Understand the DR configuration See "Reviewing the disaster recovery configuration" on page 103

Table 4-6 Configuring the primary site for disaster recovery (Continued)

Action	Description
Configure the storage hardware and network	For all nodes in the cluster: ■ Set up the storage hardware for a cluster environment ■ Verify the DNS entries for the systems on which SQL will be installed See "Configuring the storage hardware and network" on page 112.
Install SFW HA	■ Verify the driver signing option for the system ■ Install Veritas Storage Foundation for Windows HA on all nodes that will become part of the cluster ■ Select the option to install the Global Cluster Option (GCO). ■ Select the option to install the appropriate replication agents for your configuration. ■ Select the option to install Veritas Cluster Server Agent for Microsoft SQL Server 2008 See "Installing Veritas Storage Foundation HA for Windows" on page 115.
Configure the cluster	■ Verify static IP addresses and name resolution configured for each node ■ Configure cluster components using the Veritas Cluster Server Configuration Wizard ■ Set up secure communication for the cluster See "Configuring the cluster" on page 137.
Configure cluster disk groups and volumes for SQL Server	■ Create dynamic cluster disk groups using the Veritas Enterprise Administrator (VEA) ■ Create dynamic volumes for the SQL system database, user databases and transaction logs using the VEA See "Configuring cluster disk groups and volumes for SQL Server 2008" on page 121.
Install and configure SQL Server on the first cluster node	■ Ensure that the disk group and volumes for the system database are mounted on the first node ■ Follow the guidelines for installing SQL Server 2008 in the SFW HA environment See "Installing and configuring SQL Server 2008 on the first cluster node" on page 157.

Table 4-6 Configuring the primary site for disaster recovery (Continued)

Action	Description
Install and configure SQL Server on the failover node(s)	■ Stop SQL Server services on the first node ■ Ensure that the disk group and volumes are mounted on the second node ■ Follow the guidelines for installing SQL Server 2008 on failover nodes in the SFW HA environment See "Installing and configuring SQL Server 2008 on the second cluster node" on page 158.
Create a SQL Server user-defined database	■ If not done earlier, create volumes for a user-defined database and transaction log ■ Create a new user-defined database in SQL Server See "Creating a SQL Server user-defined database" on page 160.
Create a SQL Server service group	■ Ensure that you have met the prerequisites ■ Create a SQL Server service group using the VCS SQL Server 2008 Configuration Wizard See "Configuring the VCS SQL Server 2008 service group" on page 164.
Verify the primary site configuration	Test failover between nodes on the primary site. See "Verifying the SQL Server 2008 cluster configuration" on page 172.

DR configuration tasks: Secondary site

Table 4-7 outlines the high-level objectives and the tasks to complete each objective for a DR configuration at the secondary site.

Table 4-7 Configuring the secondary site for disaster recovery

Action	Description
Install SFW HA and configure the cluster on the secondary site	**Caution:** Ensure that the name you assign to the secondary site cluster is different from the name assigned to the primary site cluster. See "Guidelines for installing SFW HA and configuring the cluster on the secondary site" on page 246.

Table 4-7 Configuring the secondary site for disaster recovery (Continued)

Action	Description
Verify that SQL Server has been configured for high availability at the primary site	Verify that SQL has been configured for high availability at the primary site and that the service groups are online See "Verifying your primary site configuration" on page 247.
Set up the replication prerequisites	Ensure that replication prerequisites for your selected method of replication are met before running the DR wizard See "Setting up security for VVR" on page 248. See "Requirements for EMC SRDF array-based hardware replication" on page 251. See "Requirements for Hitachi TrueCopy array-based hardware replication" on page 253.
(Secure cluster only) Assign user privileges	For a secure cluster only, assign user privileges See "Assigning user privileges (secure clusters only)" on page 255.
Start running the DR wizard	■ Review prerequisites for the DR wizard ■ Start the DR wizard and make the initial selections required for each task: selecting a primary site system, the service group, the secondary site system, and the replication method See "Configuring disaster recovery with the DR wizard" on page 256.
Clone the storage configuration (VVR replication only)	(VVR replication option) Clone the storage configuration on the secondary site using the DR wizard See "Cloning the storage on the secondary site using the DR wizard (VVR replication option)" on page 260.
Create temporary storage for application installation (other replication methods)	(EMC SRDF, Hitachi TrueCopy, or GCO only replication option) Use the DR wizard to create temporary storage for installation on the secondary site See "Creating temporary storage on the secondary site using the DR wizard (array-based replication)" on page 264.

Table 4-7 Configuring the secondary site for disaster recovery (Continued)

Action	Description
Clone the service group configuration	Clone the service group configuration from the primary to the secondary site using the DR wizard See "Cloning the service group configuration from the primary to the secondary site" on page 268.
Configure replication and global clustering, or configure global clustering only	■ (VVR replication) Use the wizard to configure replication and global clustering ■ (EMC SRDF replication) Set up replication and then use the wizard to configure the SRDF resource and global clustering ■ (Hitachi TrueCopy) Set up replication and then use the wizard to configure the HTC resource and global clustering ■ (Other array-based replication) Use the wizard to configure global clustering, and then set up replication See "Configuring replication and global clustering" on page 272.
Verify the disaster recover configuration	Verify that the secondary site has been fully configured for disaster recovery "Verifying the disaster recovery configuration" on page 288
(Optional) Add secure communication	Add secure communication between local clusters within the global cluster (optional task) "Establishing secure communication within the global cluster (optional)" on page 290
(Optional) Add additional DR sites	Optionally, add additional DR sites to a VVR environment "Adding multiple DR sites (optional)" on page 292
Handling service group dependencies after failover	If your environment includes dependent service groups, review the considerations for bringing the service groups online after failover to the secondary site "Recovery procedures for service group dependencies" on page 293

Section 3

Requirements and Planning

This section contains the following chapter:

Chapter 5

Requirements and planning for your HA and DR configurations

This chapter contains the following topics:

Reviewing the requirements

Verify that the requirements for your configuration are met before starting the Veritas Storage Foundation HA for Windows installation.

Disk space requirements

For normal operation, all installations require an additional 50 MB of disk space.

Table 5-1 estimates disk space requirements for SFW HA.

Table 5-1 Disk space requirements

Installation options	Install directory/drive
SFW HA + all options + client components	1564 MB
SFW HA + all options	1197 MB
Client components	528 MB

Requirements for Veritas Storage Foundation High Availability for Windows (SFW HA)

Before you install SFW HA, verify that your configuration meets the following criteria and that you have reviewed the SFW 5.1 Hardware Compatibility List to confirm supported hardware:

http://www.symantec.com/business/support/index.jsp

For a Disaster Recovery configuration select the Global Clustering Option and depending on your replication solution select Veritas Volume Replicator or a hardware replication agent.

Supported software

Microsoft SQL Server

For Microsoft SQL Server 2008, you need the following SFW software:

- Veritas Storage Foundation HA 5.1 for Windows (SFW HA)
- Veritas Storage Foundation HA 5.1 Application Pack 1 for Windows, with the Veritas Cluster Server Database Agent for Microsoft SQL Server 2008, and any of the following SQL Server environments with the corresponding operating system.

For a Microsoft SQL Server 2008 environment, any of the following SQL Servers and their operating systems:

Microsoft SQL Server 2008, 32-bit Standard Edition, Enterprise Edition, or Web Edition on Windows Server 2003	■ Windows Server 2003 (32-bit) Standard Edition, Enterprise Edition or Datacenter Edition (SP2 required) ■ Windows Server 2003 R2 (32-bit) Standard Edition, Enterprise Edition, or Datacenter Edition (SP2 required) ■ Windows Server 2003 for Itanium-based Systems Enterprise Edition or Datacenter Edition (SP2 required for both) ■ Windows Server 2003 Standard x64 Edition, Enterprise x64 Edition, or Datacenter x64 Edition (SP2 required) ■ Windows Server 2003 x64 Editions (for AMD64 or Intel EM64T): Standard x64 R2 Edition, Enterprise x64 R2 Edition, or Datacenter x64 R2 Edition (SP2 required)
Microsoft SQL Server 2008, 64-bit Standard Edition, Enterprise Edition, Enterprise IA64 Edition, Web Edition on Windows Server 2003	■ Windows Server 2003 (64-bit) Standard x64 Edition, Enterprise x64 Edition or Datacenter x64 Edition (SP2 required) ■ Windows Server 2003 x64 Editions (for AMD64 or Intel EM64T): Standard x64 R2 Edition, Enterprise x64 R2 Edition, or Datacenter x64 R2 Edition (SP2 required) ■ Windows Server 2003 (64-bit) for Itanium-based systems Enterprise Edition or Datacenter Edition (SP2 required for both)
Microsoft SQL Server 2008, 32-bit Standard Edition, Enterprise Edition, or Web Edition on Windows Server 2008	■ Windows Server 2008 (32-bit) Standard Edition, Enterprise Edition, Datacenter Edition, or Web Edition
Microsoft SQL Server 2008, 64-bit Standard Edition, Enterprise Edition, Enterprise IA64 Edition, Web Edition on Windows Server 2008	■ Windows Server 2008 x64 Editions (for AMD64 or Intel EM64T): Standard x64 Edition, Enterprise x64 Edition, or Datacenter x64 Edition ■ Windows Server 2008 64-bit Itanium (IA64)

System requirements

Systems must meet the following requirements:

- Memory: minimum 1 GB of RAM per server for SFW HA.
- Memory: minimum 1 GB of RAM per server for SQL Server; refer to the Microsoft documentation for more information.
- Shared disks to support applications that migrate between nodes in the cluster. Campus clusters require more than one array for mirroring. Disaster recovery configurations require one array for each site. Replicated data clusters with no shared storage are also supported.

  Note: If your storage devices are SCSI-3 compliant, and you wish to use SCSI-3 Persistent Group Reservations (PGR), you must enable SCSI-3 support using the Veritas Enterprise Administrator (VEA). See the *Veritas Storage Foundation Administrator's Guide* for more information.

- SCSI, Fibre Channel, iSCSI host bus adapters (HBAs), or iSCSI Initiator supported NICs to access shared storage.
- Two NICs: one shared public and private, and one exclusively for the private network. Symantec recommends three NICs.
  See "Best practices" on page 84.
- All servers must run the same operating system, service pack level, and system architecture.

Network requirements

This section lists the following network requirements:

- Install SFW HA on servers in a Windows Server 2003 or Windows Server 2008 domain.
- Ensure that your firewall settings allow access to ports used by SFW HA wizards and services. For a detailed list of services and ports used by SFW HA, refer to the *Veritas Storage Foundation and High Availability Solutions for Windows Installation and Upgrade Guide*.
- Static IP addresses for the following purposes:
  - One static IP address available per site for each SQL Virtual Server.
  - A minimum of one static IP address for each physical node in the cluster.
  - One static IP address per cluster used when configuring the following options: Notification, Cluster Management Console (web console), or Global Cluster Option. The same IP address may be used for all options.
  - For VVR replication in a disaster recovery configuration, a minimum of one static IP address per site for each application instance running in the cluster.

- For VVR replication in a Replicated Data Cluster configuration, a minimum of one static IP address per zone for each application instance running in the cluster.

- Configure name resolution for each node.
- Verify the availability of DNS Services. AD-integrated DNS or BIND 8.2 or higher are supported.
  Make sure a reverse lookup zone exists in the DNS. Refer to the application documentation for instructions on creating a reverse lookup zone.
- DNS scavenging affects virtual servers configured in VCS because the Lanman agent uses Dynamic DNS (DDNS) to map virtual names with IP addresses. If you use scavenging, then you must set the DNSRefreshInterval attribute for the Lanman agent. This enables the Lanman agent to refresh the resource records on the DNS servers.
  See the *Veritas Cluster Server Bundled Agents Reference Guide*.

Permission requirements

This section lists the following permission requirements:

- You must be a domain user.
- You must be a member of the Local Administrators group for all nodes where you are installing.
- You must have write permissions for the Active Directory objects corresponding to all the nodes.
- If you plan to create a new user account for the VCS Helper service, you must have Domain Administrator privileges or belong to the Account Operators group. If you plan to use an existing user account context for the VCS Helper service, you must know the password for the user account.

Additional requirements

Please review the following additional requirements:

- Installation media for all products and third-party applications
- Licenses for all products and third-party applications
- You must install the operating system in the same path on all systems. For example, if you install Windows Server 2003 on C:\WINDOWS of one node, installations on all other nodes must be on C:\WINDOWS. Make sure that the same drive letter is available on all nodes and that the system drive has adequate space for the installation.

- For a Replicated Data Cluster, when installing, install only in a single domain.

Best practices

Symantec recommends that you perform the following tasks:

- Configure Microsoft Exchange Server and Microsoft SQL Server on separate failover nodes within a cluster.
- Verify that you have three network adapters (two NICs exclusively for the private network and one for the public network).
  When using only two NICs, lower the priority of one NIC and use the low-priority NIC for public and private communication.
- Route each private NIC through a separate hub or switch to avoid single points of failure.
- NIC teaming is not supported for the private network.
- Verify that you have set the Dynamic Update option for the DNS server to Secure Only.

Note: This is applicable for a Replicated Data Cluster configuration. Although you can use a single node cluster as the primary and secondary zones, you must create the disk groups as clustered disk groups. If you cannot create a clustered disk group due to the unavailability of disks on a shared bus, use the vxclus UseSystemBus ON command.

Reviewing the prerequisites for a standalone SQL Server

This is applicable if you are configuring an existing standalone SQL Server for high availability.

Review the following requirements before you begin the process of installing Veritas Storage Foundation HA for Windows and creating a clustered environment:

- Create a backup of the data on the existing standalone SQL Server.
- Set all SQL Server 2008 services to manual start, except for the SQL Browser service. Ensure that the SQL Browser service is set to automatic.
  Refer to the SQL Server documentation for instructions.

Reviewing the HA configuration

Review the information for the configurations you have planned:

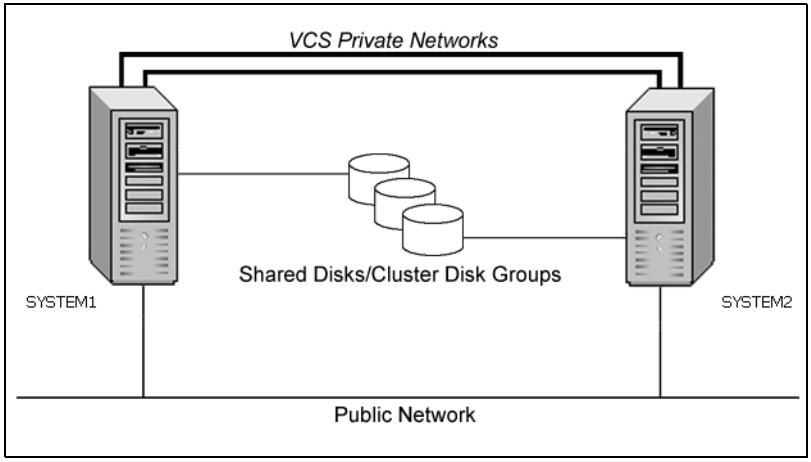
- Active-Passive configuration
- Active-Active configuration

Active-Passive configuration

In a typical example of a high availability cluster, you create a virtual SQL server in an Active-Passive configuration. The active node of the cluster hosts the virtual server. The second node is a dedicated redundant server able to take over and host the virtual server in the event of a failure on the active node.

Figure 5-1 illustrates a typical Active-Passive configuration. SQL Server is installed on both SYSTEM1 and SYSTEM2 and configured as a virtual server (INST1-VS) with a virtual IP address. The SQL databases are configured on the shared storage on volumes contained in cluster disk groups. The SQL virtual server is configured to come online on SYSTEM1 first. If SYSTEM1 fails, SYSTEM2 becomes the active node and the SQL virtual server comes online on SYSTEM2.

Figure 5-1 Active-Passive configuration



The virtual SQL Server is online on SYSTEM1, serving client requests. The shared disks provide storage for the SQL Server databases. SYSTEM2 waits in a warm standby state as a backup node, prepared to begin handling client requests if SYSTEM1 becomes unavailable. From the user's perspective there

will be a small delay as the backup node comes online, but the interruption in effective service is minimized.

Sample Active-Passive configuration

A sample setup is used to illustrate the installation and configuration tasks.

Table 5-2 on page 86 describes the objects created and used during the installation and configuration.

Table 5-2 Active-Passive configuration objects

Object Name	Description
SYSTEM1 & SYSTEM2	servers
INST1_DG	cluster disk group
INST1_DATA_FILES	volume for SQL Server system data files
INST1_DB1_VOL	volume for SQL Server user-defined database
INST1_DB1_LOG	volume for SQL Server user-defined database log file
INST1_REGREP_VOL	volume that contains the list of registry keys that must be replicated among cluster systems for the SQL Server
INST1_FS_VOL	volume that contains FILESTREAM enabled data objects
SQL_CLUS1	SQL Server cluster
INST1	SQL Server instance
INST1-VS	SQL Server virtual server
INST1_SG	SQL Server service group

IP addresses for sample Active-Passive configuration

In addition to preparing the names you want to assign configuration objects, you should obtain all required IP addresses before beginning configuration. Each SQL Server virtual server requires its own virtual IP address. In the sample configuration there is one SQL Server virtual server. Therefore you would need one virtual server IP address. If you want to use the VCS Web Console or the notification service, you require a cluster IP address. The cluster IP address is also used by the Global Cluster Option for disaster recovery.

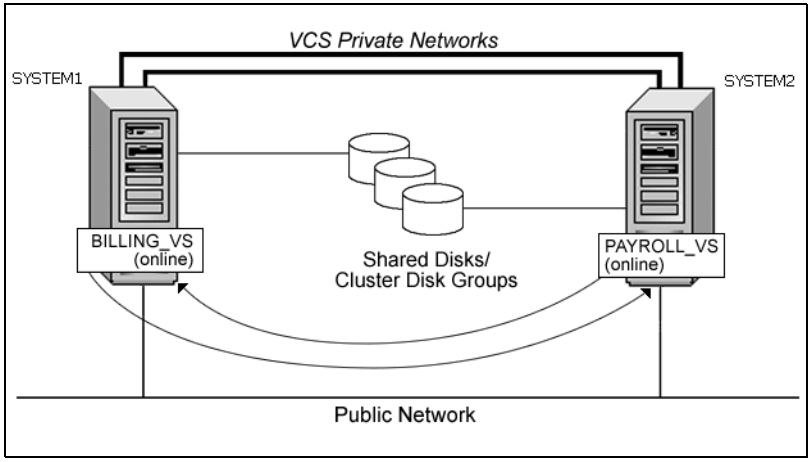
Active-Active configuration

In an Active-Active SQL Server configuration, several instances are intended to run on a single node when necessary. A SQL Server instance is a completely independent SQL Server installation, with its own services, master database, storage, and memory resources. Each instance is defined uniquely by a separate SQL Server virtual server and service group.

A SQL Server instance can fail over to any of the other cluster nodes that you specify when you configure the SQL Server service group.

The following figure illustrates a two node Active-Active configuration. The SQL Server databases are configured on the shared storage on volumes contained in cluster disk groups. Each SQL Server virtual server is configured in a separate SQL Server service group. Each service group can fail over to the other node in the cluster.

Figure 5-2 Active-Active configuration



For example, consider a two-node cluster hosting two SQL Server virtual servers, BILLING_VS and PAYROLL_VS.

The table below and the sample configuration illustrate that the virtual servers are configured in two separate service groups with BILLING_VS online on SYSTEM1 but able to fail over to SYSTEM2, and PAYROLL_VS online on SYSTEM2 but able to fail over to SYSTEM1.

SQL Virtual Server	Service Group	System List
BILLING_VS	BILLING_SG	SYSTEM1, SYSTEM2

SQL Virtual Server	Service Group	System List
PAYROLL_VS	PAYROLL_SG	SYSTEM2, SYSTEM1

Sample Active-Active configuration

A sample setup is used to illustrate the installation and configuration tasks for two instances of SQL Server, Billing and Payroll. During normal operation, one instance will be online on each of the two servers. If a failure occurs, the instance on the failing node will be brought online on the other server, resulting in two instances running on one server.

Table 5-3 on page 88 describes the objects created and used during the installation and configuration.

Table 5-3 Active-Active configuration objects

Object Name	Description
SYSTEM1 & SYSTEM2	server names
BILLING_DG	cluster disk group for the billing instance
PAYROLL_DG	cluster disk group for the payroll instance
BILLING_VS_SYS_FILES	volume for the SQL Server system data files for the billing instance
PAYROLL_VS_SYS_FILES	volume for the SQL Server system data files for the payroll instance
BILLING_DATA	volume for a SQL Server user-defined database for the billing instance
PAYROLL_DATA	volume for a SQL Server user-defined database for the payroll instance
BILLING_LOG	volume for a SQL Server user-defined database log file for the billing instance
PAYROLL_LOG	volume for a SQL Server user-defined database log file for the payroll instance
BILLING_REGREP	volume for the list of registry keys replicated among the nodes for the billing instance
PAYROLL_REGREP	volume for the list of registry keys replicated among the nodes for the payroll instance
SQL_CLUS1	virtual SQL Server cluster

Table 5-3 Active-Active configuration objects

Object Name	Description
BILLING_INST	instance name for the billing instance
PAYROLL_INST	instance name for the payroll instance
BILLING_VS	virtual SQL Server name for the billing instance
PAYROLL_VS	virtual SQL Server name for the payroll instance
BILLING_SG	SQL Server service group for the billing instance
PAYROLL_SG	SQL Server service group for the payroll instance

IP addresses for sample Active-Active configuration

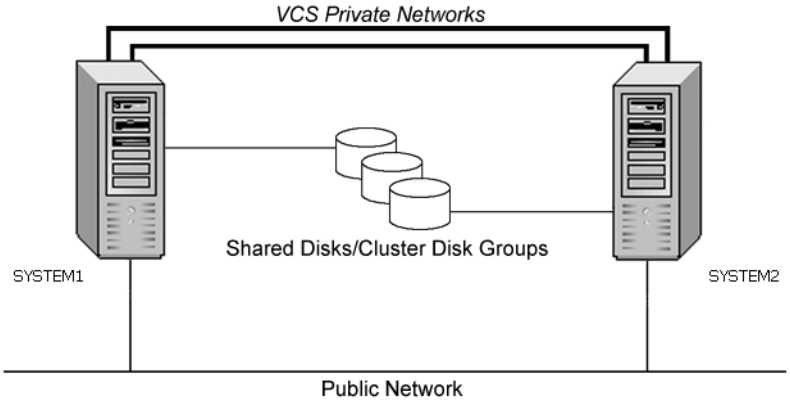
In addition to preparing the names you want to assign configuration objects, you should obtain all required IP addresses before beginning configuration. Each SQL Server virtual server requires its own virtual IP address. In the sample configuration there are two virtual servers: BILLING-VS and PAYROLL-VS. Therefore, you would need two virtual server IP addresses. If you want to use the VCS Web Console or the notification service, you require a cluster IP address. The cluster IP address is also used by the Global Cluster Option for disaster recovery.

Reviewing a standalone SQL Server configuration

This section describes the tasks needed to incorporate an existing standalone SQL Server into a high availability environment in order to ensure that the mission critical SQL resource is always available.

This section describes the tasks necessary to create a virtual server in an Active-Passive SQL configuration. The active node of the cluster hosts the virtual server. The second node is a dedicated redundant server able to take over and host the virtual server in the event of a failure on the active node. At the end of this process, their environment will look like this:

Figure 5-3 Active-Passive configuration



The virtual SQL Server is online on SYSTEM1, serving client requests. The shared disks provide storage for the SQL Server databases. SYSTEM2 waits in a warm standby state as a backup node, prepared to begin handling client requests if SYSTEM1 becomes unavailable. From the user's perspective there will be a small delay as the backup node comes online, but the interruption in effective service is minimized.

Sample configuration

A sample setup is used through this guide to illustrate the installation and configuration tasks.

During the configuration process you will create virtual IP addresses for the following:

- SQL virtual server: the IP address should be the same on all nodes
- Cluster IP address: used by Veritas Cluster Management Console (Single Cluster Mode) also referred to as Web Console

You should have these IP addresses available before you start deploying your environment.

Table 5-4 on page 91 describes the objects created and used during the installation and configuration:

Table 5-4 Standalone SQL Server 2008 configuration objects

Object Name	Description
SYSTEM1 & SYSTEM2	server names; SYSTEM1 is the existing standalone SQL Server
INST1_SG	Microsoft SQL Server 2008 service group
SQL_CLUS1	virtual SQL Server cluster
INST1_DG	cluster disk group
INST1_DATA_FILES	volume for Microsoft SQL Server system data files
INST1_DB1_VOL	volume for storing a Microsoft SQL Server user-defined database
INST1_DB1_LOG	volume for storing a Microsoft SQL Server user-defined database log file
INST1_REGREP_VOL	volume that contains the list of registry keys that must be replicated among cluster systems for the SQL Server
INST1_FS_VOL	volume that contains FILESTREAM enabled data objects
INST1	SQL Instance Name
INST1-VS	name of the SQL Virtual Server

Reviewing the MSDTC configuration

Microsoft Distributed Transaction Coordinator or the MSDTC service enables you to perform distributed transactions. A distributed transaction updates data on more than one computer in a network. The MSDTC service ensures that a transaction is successfully committed on each computer. A failure to commit on a single system aborts the transaction on all systems in the network. If a transaction spans across more than one computer in the network, you must ensure that the MSDTC service is running on all the computers. Also, all the computers must be able to communicate with each other.

MSDTC servers can co-exist with SQL servers on the same cluster nodes. If the MSDTC server and the SQL server are running on the same node, the MSDTC client is configured in the default configuration. If the MSDTC Server is not configured on the same node as the SQL Server, then the MSDTC client must be configured on that node. In general, you must configure the MSDTC client on all nodes except the node on which the MSDTC Server is configured. The MSDTC client and the MSDTC server must not run on the same cluster node.

For example, consider a SQL Server configuration in a VCS cluster that spans four nodes and two sets of shared storage. The shared storage is managed using Veritas Storage Foundation for Windows (SFW).

The following configurations are possible:

- SQL Server and MSDTC Server are configured on different nodes
- SQL Server is configured on the same node as the MSDTC Server

Figure 5-4 SQL Server and MSDTC Server configured on different nodes

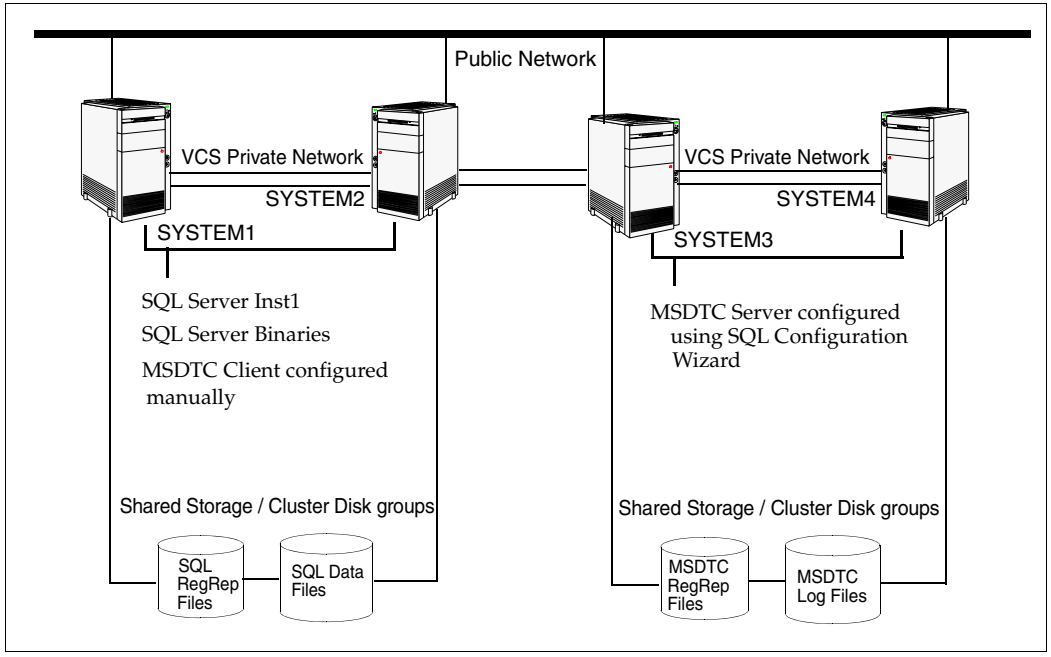
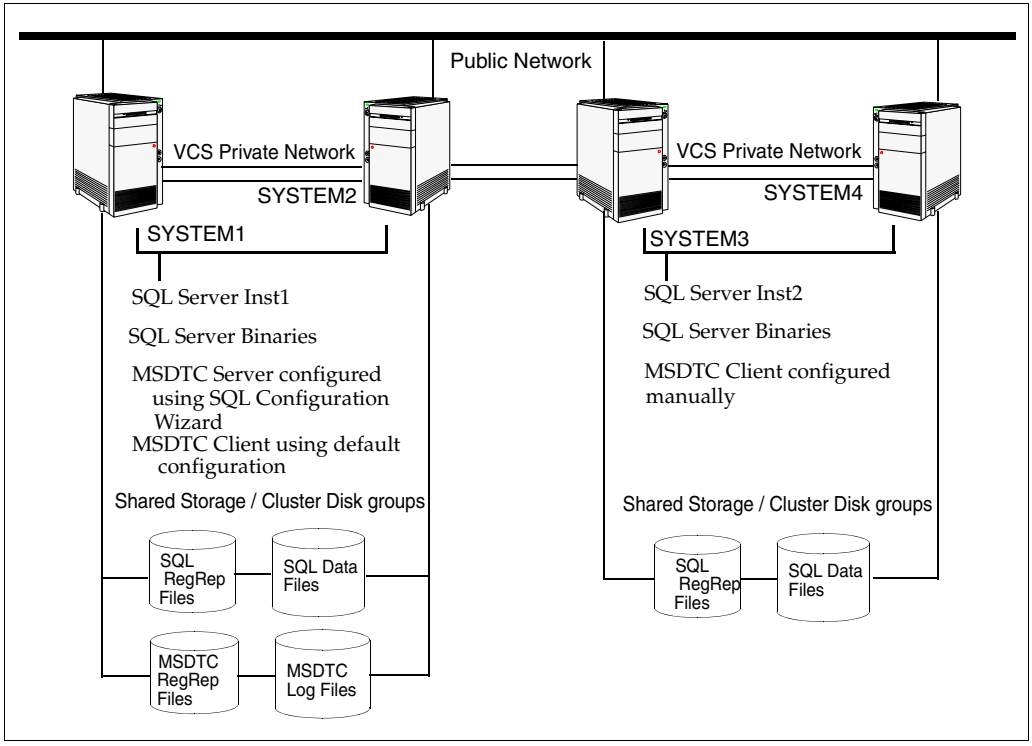


Figure 5-5 SQL Server and MSDTC Server configured on the same node

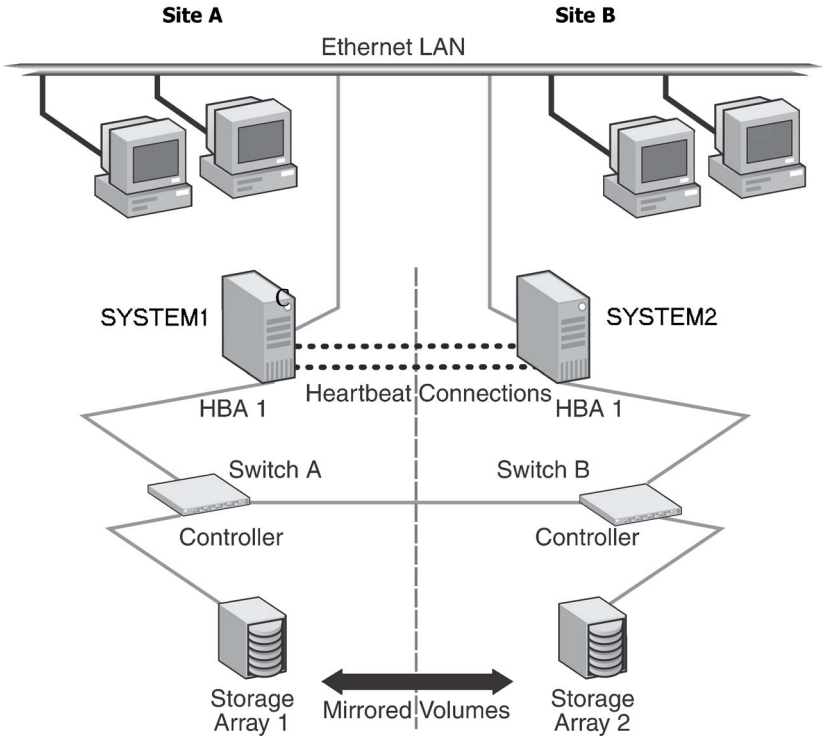


Reviewing the campus cluster configuration

This section uses the example of a two-node campus cluster with each node in a separate site (Site A or Site B). In this example, each node has its own storage array with the same number of disks and contains mirrored data of the storage on the other array.

Figure 5-6 illustrates a Active-Passive configuration for SQL Server with one to one failover capabilities. In an Active-Passive configuration, the active node of the cluster hosts the SQL virtual server. The second node is a dedicated redundant server able to take over and host the virtual server in the event of a failure on the active node. In this case, the SQL virtual server can fail over from SYSTEM1 to SYSTEM2 and vice versa.

Figure 5-6 SQL Server 2008 campus cluster: Active-Passive configuration



The two nodes can be located miles apart and are connected via a single subnet and Fibre Channel SAN. Each node has its own storage array with an equal number of disks and contains mirrored data of the storage on the other array. The example describes a generic database application.

Plan for an equal number and size of disks on the two sites, because each disk group should contain the same number of disks on each site for the mirrored volumes.

Campus cluster failover using the ForceImport attribute

Automated recovery is handled differently in a VCS campus cluster than with a VCS local cluster. Table 5-5 lists failure situations and the outcomes depending on the settings for the ForceImport attribute of the VMDg resource. You can set this attribute to 1 (forcing the import of the disk groups to the other node) or 0 (not forcing the import). Use the VCS Java Console or command line to modify the ForceImport attribute.

To ensure proper failover in a VCS campus cluster, you must verify the value of the ForceImport attribute of the VMDg resource.

Table 5-5 Failure Situations

Failure Situation	ForceImport set to 0 (import not forced)	ForceImport set to 1 (automatic force import)
1) Application fault May mean the services stopped for an application, a NIC failed, or a database table went offline.	Application automatically moves to another node.	Service Group failover is automatic on the standby or preferred system or node.
2) Server failure May mean a power cord became unplugged or a failure caused the system to stop responding.	Application automatically moves to other node. 100% of the disks are still available.	Service Group failover is automatic on the standby or preferred system or node. 100% of the mirrored disks are still available.
3) Failure of disk array or all disks Remaining disks in mirror are still accessible from the other site.	No interruption of service. Remaining disks in mirror are still accessible from the other node.	The Service Group does not failover. 50% of the mirrored disk is still available at remaining site.
4) Zone failure Complete Site failure, all accessibility to the servers and storage is lost.	Manual intervention required to online the Service Group at remaining site. Can not automatically import 50% of mirrored disk.	Automatic failover of Service Group to online site. Force Import must be set to True before site failure to ensure VCS can import 50% of mirrored disk.

Table 5-5 Failure Situations (Continued)

Failure Situation	ForceImport set to 0 (import not forced)	ForceImport set to 1 (automatic force import)
5) Split-brain (loss of both heartbeats) If the public network link serves as a low-priority heartbeat, the assumption is made that the link is also lost.	No interruption of service. Can't import disks because the original node still has the SCSI reservation.	No interruption of service. Failover does not occur due to Service Group resources remaining online on the original nodes. Example: Online node has SCSI reservation to own disk.
6) Storage interconnect lost Fibre interconnect severed.	No interruption of service. Disks on the same node are functioning. Mirroring is not working.	No interruption of service. Service Group resources remain online, but 50% of the mirror disk becomes detached.
7) Split-brain and storage interconnect lost If a single pipe is used between buildings for the Ethernet and storage, this situation can occur.	No interruption of service. Cannot import with only 50% of disks available. Disks on the same node are functioning. Mirroring is not working.	Automatically imports 50% of mirrored disk to the alternate node. Disks online for a short period in both locations but offlined again due to IP and other resources being online on original node. No interruption of service.

Reinstating faulted hardware

Once a failure occurs and an application is migrated to another node or site, it is important to know what will happen when the original hardware is reinstated.

For failure scenarios 3 through 7 described in Table 5-5 on page 96 earlier, Table 5-6 on page 98 lists the behavior when various hardware components affecting the configuration (array or disks, site hardware, networking cards or cabling, storage interconnect, etc.) are reinstated after failure. Situations 1 and

2 have no effect when reinstated. Keep in mind that the cluster has already responded to the initial failure as indicated in Table 5-5 on page 96 earlier.

Table 5-6 Behavior exhibited when hardware is reinstated

Failure Situation, before Reinstating the Configuration	ForceImport set to 0 (import not forced)	ForceImport set to 1 (automatic force import)
3) Failure of disk array or all disks Remaining disks in mirror are still accessible from the other site.	No interruption of service. Resync the mirror from the remote site.	Same behavior.
4) Site failure All access to the server and storage is lost.	Inter-node heartbeat communication is restored and the original cluster node becomes aware that the application is online at the remote site. Resync the mirror from the remote site.	Same behavior.
5) Split-brain situation (loss of both heartbeats)	No interruption of service.	Same behavior.
6) Storage interconnect lost Fibre interconnect severed.	No interruption of service. Resync the mirror from the original site.	Same behavior.
7) Split-brain situation and storage interconnect lost	No interruption of service. Resync the mirror from the original site.	VCS alerts administrator that volumes are online at both sites. Resync the mirror from the copy with the latest data.

While the outcomes of using both settings of the ForceImport attribute for most scenarios are the same, the ForceImport option provides automatic failover in the event of site failure. This advantage comes at the cost of potential data loss if all storage and network communication paths between the sites are severed. Choose an option that is suitable given your cluster infrastructure, uptime requirements, and administrative capabilities.

Reviewing the Replicated Data Cluster configuration

During the configuration process you will create virtual IP addresses for the following:

- SQL virtual server: the IP address should be the same on all nodes at the primary and secondary zones
- Replication IP address for the primary zone
- Replication IP address for the secondary zone

You should have these IP addresses available before you start deploying your environment.

Sample configuration

The sample setup has four servers, two for the primary zone and two for the secondary zone. The nodes will form two separate clusters, one at the primary zone and one at the secondary zone.

The procedures in this section are illustrated by a sample deployment and use the following names to describe the objects created and used during the installation and configuration:

Primary zone	
SYSTEM1 & SYSTEM2	First and second nodes of the primary zone
INST1_SG	Microsoft SQL Server 2008 service group
INST1-VS	Virtual SQL Server cluster
INST1	SQL Instance Name
INST1_DG	Cluster disk group for SQL system database and files
INST1_DATA_FILES	Volume for Microsoft SQL Server system data files
INST1_REGREP_VOL	Volume that contains the list of registry keys that must be replicated among cluster systems for the SQL Server
INST1_FS_VOL	Volume that contains FILESTREAM enabled data objects for the instance
INST1_REPLOG	Replicator log volume required by VVR
INST1_DB1_DG	Cluster disk group for SQL Server user-defined database and files

INST1_DB1_VOL	Volume for storing a Microsoft SQL Server user-defined database
INST1_DB1_LOG	Volume for storing a Microsoft SQL Server user-defined database log file
INST1_DB1_REPLOG	Replicator log volume required by VVR for SQL user-defined database

Secondary zone

SYSTEM3 & SYSTEM4	First and second nodes of the secondary zone

All the other parameters are the same as on the primary zone.

RDS and VVR Components

INST1_RDS	RDS name for SQL system database and files
INST1_RVG	RVG name for SQL system database and files
INST1_RVG_SG	Replication service group for SQL system database and files
INST1_DB1_RDS	RDS name for SQL Server user-defined database and files
INST1_DB1_RVG	RVG name for SQL Server user-defined database and files
INST1_DB1_RVG_SG	Replication service group for SQL Server user-defined database and files

About setting up a Replicated Data Cluster configuration

In the example, SQL Server is configured as a VCS service group in a four-node cluster, with two nodes in the primary RDC zone and two in the secondary RDC zone. In the event of a failure on the primary node, VCS can fail over the SQL 2008 instance to the second node in the primary zone.

The process involves the following steps:

- About setting up replication
- About configuring and migrating the service group

About setting up replication

Set up replication between the shared disk groups. Use VVR to group the shared data volumes into a Replicated Volume Group (RVG), and create the VVR Secondary on hosts in your secondary zone.

Create a Replicated Data Set (RDS) with the Primary RVG consisting of the shared volumes between the nodes in the first zone and Secondary RVG consisting of shared volumes between nodes in the second zone. Use the same disk group and RVG name in both zones so that the MountV resources will mount the same block devices.

About configuring and migrating the service group

For a successful wide-area failover, the mount points and applications must fail over to the secondary RDC zone. Additionally, the VVR secondary disk group and RVG must be imported and started on the secondary RDC zone.

In the RDC configuration, consider a case where the primary RDC zone suffers a total failure of the shared storage. In this situation, none of the nodes in the primary zone see any device.

The service group cannot fail over locally within the primary RDC zone, because the shared volumes cannot be mounted on any node. So, the service group must fail over to a node in the current secondary RDC zone.

The RVGPrimary agent ensures that VVR volumes are made writable. The application can be started at the secondary RDC zone and run there until the problem with the local storage is corrected.

If the storage problem is corrected, you can switch the application back to the primary zone using VCS.

Before switching the application back to the original primary RDC zone, you must resynchronize any changed data from the active secondary RDC zone since the failover. Once the resynchronization completes, switch the service group to the primary zone.

In the **Service Groups** tab of the of the Cluster Explorer configuration tree, right-click the service group. Click **Switch To** and select the system in the primary RDC zone to switch to and click **OK**.

Reviewing considerations for Active-Active configurations

For an Active-Active configuration or in other cases when you are installing multiple instances of SQL Server on the same system, there are special considerations.

To assist you in planning your deployment, the considerations are summarized in the following topics:

- "Key information for Active-Active configurations" on page 102
- "Following the workflow in the Solutions Configuration Center" on page 108

Key information for Active-Active configurations

Table 5-7 on page 102 summarizes key information about Active-Active configurations and multiple instances and cross-references additional information:

Table 5-7 Key information for Active-Active configuration

Task	Description
Configuring disk groups and volumes	Create a separate set of cluster disk groups and volumes for each instance. You can create all the disk groups and volumes at one time or create them as a separate step for each instance. See "Considerations for disk groups and volumes for multiple instances" on page 125.
Configuring the cluster	If you are setting up a cluster with multiple instances of SQL, plan to add all nodes for all instances to the cluster the first time that you run the wizard. That way, you do not need to run the wizard again later to add the nodes. See "Configuring the cluster" on page 137.
Installing and configuring SQL Server	Assign a unique instance name, instance ID, virtual server name, and port to each instance. "About installing multiple SQL instances" on page 156. "Assigning ports for multiple SQL Server instances" on page 161.

Table 5-7 Key information for Active-Active configuration

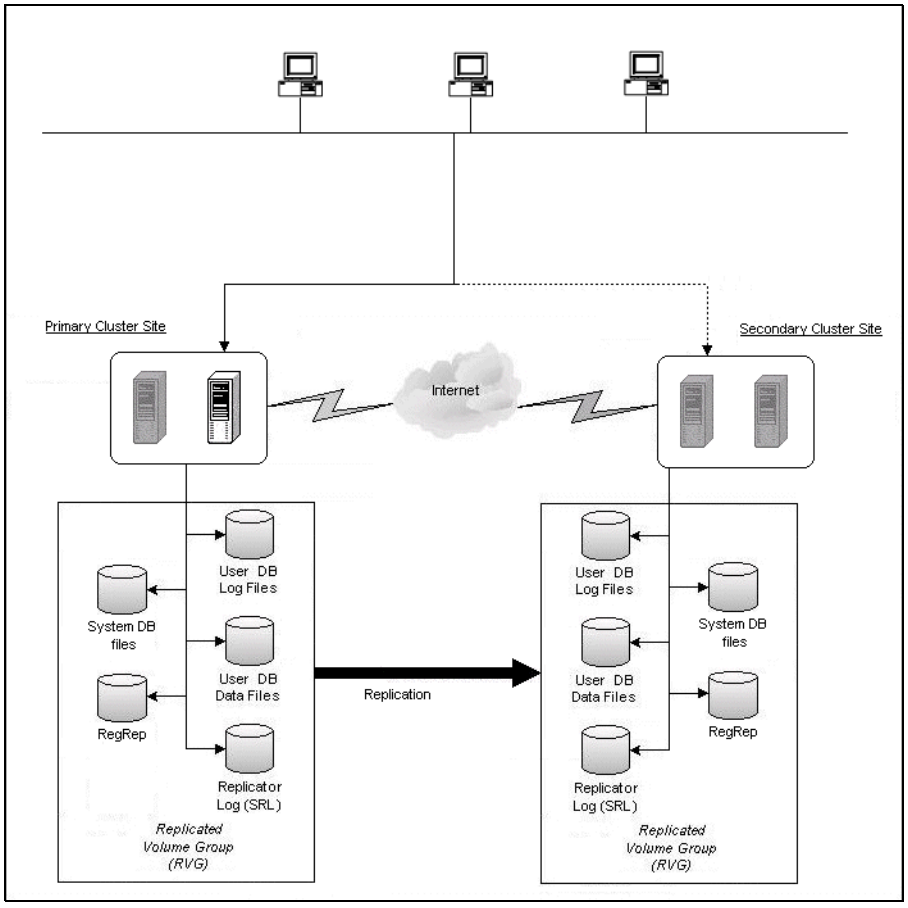
Task	Description
Configuring the service group	For an Active-Active configuration, create a separate service group for each instance. Each service group must have a unique name and virtual IP address. There are also special considerations for specifying the priority order of systems for failover. See "Service group requirements for Active-Active configurations" on page 164.

Reviewing the disaster recovery configuration

You may be preparing to configure both a primary site and a secondary site for disaster recovery.

Figure 5-7 illustrates a typical Active-Passive disaster recovery configuration using Veritas Volume Replicator (VVR). In the example illustration, the primary site consists of two nodes, SYSTEM1 and SYSTEM2. Similarly the secondary setup consists of two nodes, SYSTEM3 and SYSTEM4. Each site has a clustered setup with the nodes set up appropriately for failover within the site. The cluster on the primary site has a shared disk group that is used to create the volumes required by VVR for setting up the Replicated Volume Group (RVG). The Microsoft SQL Server application data is stored on the volumes that are under the control of the RVG.

Figure 5-7 Typical VVR configuration



If the Microsoft SQL Server 2008 server on SYSTEM1 fails, SQL Server comes online on node SYSTEM2 and begins servicing requests. From the user's perspective there might be a small delay as the backup node comes online, but the interruption in effective service is minimal. If there is a disaster at the primary site, SYSTEM3 at the secondary site takes over.

You can choose to configure replication using VVR or an agent-supported array-based hardware replication. You can use the DR wizard to configure VVR replication or required options for the VCS agents for EMC SRDF or Hitachi TrueCopy. To use the wizard with any other agent-supported array-based replication, you must complete configuring global clustering with the wizard before configuring replication on the array.

During the configuration process you will create virtual IP addresses. The virtual IP address for the SQL virtual server at the primary and disaster recovery site can be the same if both sites can exist on the same network segment. Otherwise, you need to allocate one IP address for the virtual server at the primary site and a different IP address for the virtual server at the disaster recovery site. You should have these IP addresses available before you start deploying your environment.

Sample disaster recovery configuration

The sample setup has four servers, two for the primary site and two for the secondary site. The nodes will form two separate clusters, one at the primary site and one at the secondary site.

The procedures in this section are illustrated by a sample deployment and use the following names to describe the objects created and used during the installation and configuration:

Primary Site

SYSTEM1 & SYSTEM2	first and second nodes of the primary site
INST1_SG	Microsoft SQL Server 2008 service group
SQL_CLUS1	virtual SQL Server cluster
INST1-VS	virtual server name
INST1_DG	cluster disk group
INST1_DATA_FILES	volume for Microsoft SQL Server system data files
INST1_DB1_VOL	volume for storing a Microsoft SQL Server user-defined database
INST1_DB1_LOG	volume for storing a Microsoft SQL Server user-defined database log file
INST1_REGREP_VOL	volume that contains the list of registry keys that must be replicated among cluster systems for the SQL Server
INST1_FS_VOL	volume that contains the FILESTREAM enabled data objects for the SQL instance
INST1_REPLOG	(VVR only) replicator log volume required by VVR
INST1	SQL Instance Name

Secondary Site

SYSTEM3 & SYSTEM4	first and second nodes of the secondary site All the other parameters are the same as on the primary site.
DR Components (VVR only)	
INST1_DB1_RDS	RDS Name
INST1_DB1_RVG	RVG Name
INST1_DB1_RVG_SG	Replication service group

IP addresses for sample disaster recovery configuration

In addition to preparing the names you want to assign configuration objects, you should obtain all required IP addresses before beginning configuration.

You specify the following addresses during the replication process:

SQL virtual server IP address	For a disaster recovery configuration, the virtual IP address for the SQL virtual server at the primary and disaster recovery site can be the same if both sites can exist on the same network segment. Otherwise, you need to allocate one IP address for the virtual server at the primary site and a different IP address for the virtual server at the disaster recovery site.
Cluster IP address	You need one for the primary site cluster and one for the secondary site cluster.
Replication IP address	You need two IP addresses per application instance, one for the primary site and one for the secondary site.

Supported disaster recovery configurations for service group dependencies

Service group dependencies have special requirements and limitations for disaster recovery configuration and for actions to be taken in a disaster recovery scenario.

Service group dependency configurations are described in detail in the VCS documentation.

See *Veritas Cluster Server Administrator's Guide*.

For disaster recovery only certain dependent service group configurations are supported:

- Online local soft
- Online local firm
- Online local hard

If the service group has an unsupported type of dependency and you select it in the DR wizard, you receive an error notification when you attempt to move to the next wizard page.

The Disaster Recovery wizard supports only one level of dependency (one child). If you need to configure more levels, you will need to add the service group and the dependency link manually on the secondary site after you finish running the DR wizard.

The wizard clones dependent service groups as global groups.

Following the workflow in the Solutions Configuration Center

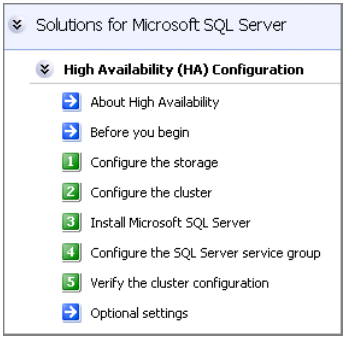
The Solutions Configuration Center helps you through the process of installing and configuring a new Veritas Storage Foundation HA environment for one or more instances of SQL Server 2008, in either an Active-Passive or Active-Active configuration.

Figure 5-8 shows the workflow under the High Availability (HA) Configuration in the Solutions Configuration Center.

If you are setting up multiple instances of SQL in the cluster, you may find it helpful to use the Configuration Center as follows:

- Under High Availability (HA) Configuration, complete all the steps for the first instance.
- For the next instance:
  - For step 1, Configure the storage: If you configured disk groups and volumes for the instance earlier, verify that they are available and continue with step 2.
  - For step 2, Configure the cluster: If you configured the nodes as part of the cluster earlier, as recommended, continue with step 3 and complete all subsequent steps.

Figure 5-8 Configuration steps in the Solutions Configuration Center



See Chapter 3, "Using the Solutions Configuration Center" on page 43.

Section 4

Deployment

This section contains the following chapters:

Chapter 6

Installing and configuring SFW HA

This chapter contains the following topics:

Configuring the storage hardware and network

Use the following procedures to configure the hardware and verify DNS settings. Repeat this procedure for every node in the cluster.

Note: Follow the appropriate procedure for verifying the DNS settings, as the procedures for Windows Server 2003 and Windows Server 2008 are slightly different.

To configure the hardware

1. Install the required network adapters, and SCSI controllers or Fibre Channel HBA.
2. Connect the network adapters on each system.
   - To prevent lost heartbeats on the private networks, and to prevent VCS from mistakenly declaring a system down, Symantec recommends disabling the Ethernet autonegotiation options on the private network adapters. Contact the NIC manufacturer for details on this process.
   - Symantec recommends removing TCP/IP from private NICs to lower system overhead.
3. Use independent hubs or switches for each VCS communication network (GAB and LLT). You can use cross-over Ethernet cables for two-node clusters. LLT supports hub-based or switch network paths, or two-system clusters with direct network links.
4. Verify that each system can access the storage devices. Verify that each system recognizes the attached shared disk and that the attached shared disks are visible.

For Windows Server 2003, use the following procedure.

To verify the DNS settings and binding order for Windows Server 2003 systems

1. Open the Control Panel (**Start>Control Panel**).
2. Double-click **Network Connections**, or right-click **Network Connections** and click **Open**.
3. Ensure the public network adapter is the first bound adapter:
   - From the Advanced menu, click **Advanced Settings**.
   - In the Adapters and Bindings tab, verify the public adapter is the first adapter in the Connections list. If necessary, use the arrow button to move the adapter to the top of the list.

- Click **OK**.

4 In the Network and Dial-up Connections window, double-click the adapter for the public network.
When enabling DNS name resolution, make sure that you use the public network adapters, and not those configured for the VCS private network.

5 In the Public Status dialog box, in the General tab, click **Properties**.

6 In the Public Properties dialog box, in the General tab:
- Select the **Internet Protocol (TCP/IP)** check box.
- Click **Properties**.

7 Select the **Use the following DNS server addresses** option.

8 Verify the correct value for the IP address of the DNS server.

9 Click **Advanced**.

10 In the DNS tab, make sure the **Register this connection's address in DNS** check box is selected.

11 Make sure the correct domain suffix is entered in the **DNS suffix for this connection** field.

12 Click **OK**.

For Windows Server 2008 systems, use the following procedure.

To verify the DNS settings and binding order for Windows Server 2008 systems

1 Open the Control Panel (**Start > Control Panel**).

2 Click **Network and Internet**, and then click **Network and Sharing Center**.

3 In the Network and Sharing Center window, on the left side of the screen under Tasks, double-click **Manage network connections**.

4 Ensure the public network adapter is the first bound adapter:
- From the Advanced menu in the Network Connections window, click **Advanced Settings**.
- In the Adapters and Bindings tab, verify the public adapter is the first adapter in the Connections list. If necessary, use the arrow button to move the adapter to the top of the list.
- Click **OK**.

5 Open the Public status dialog box by doing one of the following in the Network Connections window:
- Double-click the adapter for the public network.

- Right-click the adapter for the public network and click **Status**.
- Select the adapter for the public network and click **View status of this connection** in the toolbar.

When enabling DNS name resolution, make sure that you use the public network adapters, and not those configured for the VCS private network.

6 In the Public Status dialog box, on the General tab, click **Properties**.

7 In the Public Properties dialog box, on the **General** tab:

- Select the **Internet Protocol Version 4 (TCP/IPv4)** check box.
- Click **Properties**.

8 Select the **Use the following DNS server addresses** option.

9 Verify the correct value for the IP address of the DNS server.

10 Click **Advanced**.

11 In the **DNS** tab, make sure the **Register this connection's address in DNS** check box is selected.

12 Make sure the correct domain suffix is entered in the **DNS suffix for this connection** field.

13 Click **OK**.

Installing Veritas Storage Foundation HA for Windows

The product installer enables you to install the software for Veritas Storage Foundation HA 5.1 for Windows. The installer automatically installs Veritas Storage Foundation for Windows and Veritas Cluster Server. You must select the option to install the Veritas Cluster Server Database Agent for SQL. For a disaster recovery configuration, select the option to install GCO, and depending on your replication solution, select the option to install VVR or a hardware replication agent.

Refer to the *Veritas Storage Foundation and High Availability Solutions 5.1 Installation and Upgrade Guide* for installation instructions.

The product installer enables you to install the software for Veritas Storage Foundation HA 5.1 for Windows. The installer automatically installs Veritas Storage Foundation for Windows and Veritas Cluster Server. You must select the option to install the Veritas Cluster Server Database Agent for SQL. For a disaster recovery configuration, select the option to install GCO, and depending on your replication solution, select the option to install VVR or a hardware replication agent.

Setting Windows driver signing options

Depending on the installation options you select, some Symantec drivers may not be signed by Microsoft.

When installing on systems running Windows Server 2003, you must set the Windows driver signing options to allow installation.

The following table describes the product installer behavior on local and remote systems when installing options with unsigned drivers on Windows Server 2003.

Table 6-1 Installation behavior with unsigned drivers

Driver Signing Setting	Installation behavior on the local system	Installation behavior on remote systems
Ignore	Always allowed	Always allowed
Warn	Warning message, user interaction required	Installation proceeds. The user must log on locally to the remote system to respond to the dialog box to complete the installation.

Table 6-1 Installation behavior with unsigned drivers (Continued)

Driver Signing Setting	Installation behavior on the local system	Installation behavior on remote systems
Block	Never allowed	Never allowed

On local systems set the driver signing option to either Ignore or Warn. On remote systems set the option to Ignore in order to allow the installation to proceed without user interaction.

Note: Windows Server 2008 does not enable you to change the driver signing option. Symantec provides an installation option to install a Symantec Trusted certificate to allow installation of Symantec drivers that are not certified by Microsoft. For details, see "Installing Symantec Trusted certificate for unsigned drivers" on page 116.

To change the driver signing options on each system

1. Log on locally to the system.
2. Open the Control Panel and click **System**.
3. Click the **Hardware** tab and click **Driver Signing**.
4. In the Driver Signing Options dialog box, note the current setting, and select **Ignore** or another option from the table that will allow installation to proceed.
5. Click **OK**.
6. Repeat for each computer.
   If you do not change the driver signing option, the installation may fail on that computer during validation. After you complete the installation, reset the driver signing option to its previous state.

Installing Symantec Trusted certificate for unsigned drivers

The product installer provides an installation option for Symantec Trusted Software Publisher Certificate for Veritas Storage Foundation for Windows drivers that are not certified by Microsoft.

If you select this installation option, a Symantec Trusted certificate is installed on the systems you select for installation.

Warning: On Windows Server 2008, if this option is not selected, a remote install will not install any SFW drivers that are not certified by Microsoft. No notification is given and it will appear that installation was successful, but issues can arise later because the drivers were not installed.

If installing locally on Windows Server 2008, if this option is not selected, a driver signing popup will be displayed requiring user interaction.

If you select this option when installing on Windows Server 2003, you do not need to set the driver signing options to Warn or Ignore.

Installing Storage Foundation HA for Windows

Install Veritas Storage Foundation HA for Windows.

To install the product

1. Allow the autorun feature to start the installation or double-click **Setup.exe.** The SFW Select Product screen appears.
2. Click **Storage Foundation HA 5.1 for Windows**.
3. Do one of the following:
   - Click **Complete/Custom** to begin installation.
   - Click the **Administrative Console** link to install only the client components.
4. Review the Welcome message and click **Next**.
5. Read the License Agreement by using the scroll arrows in the view window. If you agree to the license terms, click the radio button for **I accept the terms of the license agreement**, and then click **Next**.
6. Enter the product license key before adding license keys for features. Enter the license key in the top field and click **Add**.
   If you do not have a license key, click **Next** to use the default evaluation license key. This license key is valid for a limited evaluation period only.
7. Repeat for additional license keys. Click **Next**
   - To remove a license key, click the key to select it and click **Remove**.
   - To see the license key's details, click the key.
8. Select the appropriate SFW product options and click **Next**. Be sure to select the following as appropriate for your installation:

Veritas Cluster Server Database Agent for SQL	Required to configure high availability for SQL Server.

Client	Required to install VCS Cluster Manager (Java console) and Veritas Enterprise Administrator console, which are used during configuring high availability. Also required to install the Solutions Configuration Center which provides information and wizards to assist configuration.
Global Cluster Option	Required for a disaster recovery configuration only.
Veritas Volume Replicator	If you plan to use VVR for replication, select the option to install VVR.
High Availability Hardware Replication Agents	If you plan to use hardware replication, select the appropriate hardware replication agent.

9 Select the following for the installation and click **Next**.

Domain	Select a domain from the list. Depending on domain and network size, speed, and activity, the domain and computer lists can take some time to populate.
Computer	To add a computer for installation, select it from the Computer list or type the computer's name in the Computer field. Then click **Add**. To remove a computer after adding it, click the name in the Selected computers for installation field and click **Remove**. Click a computer's name to see its description.
Install Path	Optionally, change the installation path. ■ To change the path, select a computer in the Selected computers for installation field, type the new path, and click **Change**. ■ To restore the default path, select a computer and click **Default**. The default path is: C:\Program Files\Veritas For 64-bit installations, the default path is: C:\Program Files (x86)\Veritas

10 When the domain controller and the computer running the installation program are on different subnets, the installer may be unable to locate the target computers. In this situation, after the installer displays an error message, enter the host names or the IP addresses of the missing computers manually.

11 The installer checks the prerequisites for the selected computers and displays the results. Review the information and click **Next**.

   If a computer fails validation, address the issue, and repeat the validation. Click the computer in the list to display information about the failure. Click **Validate Again** to begin the validation process again.

12 If you are using multiple paths and selected a specific DSM, you receive the Veritas Dynamic Multi-pathing warning. At the Veritas Dynamic Multi-pathing warning, the time required to install the Veritas Dynamic Multi-pathing DSMs feature depends on the number of physical paths connected during the installation. To reduce installation time for this feature, connect only one physical path during installation. After installation, reconnect additional physical paths before rebooting the system.

13 Click **OK**.

14 Review the information and click **Install**. Click **Back** to make changes, if necessary.

15 The Installation Status screen displays status messages and the progress of the installation.

   If an installation fails, click **Next** to review the report and address the reason for failure. You may have to either repair the installation or uninstall and re-install.

16 When the installation completes, review the summary screen and click **Next**.

17 If you are installing on remote nodes, click **Reboot**. Note that you cannot reboot the local node now, and that failed nodes are unchecked by default. Click the check box next to the remote nodes that you want to reboot.

18 When the nodes have finished rebooting successfully, the Reboot Status shows Online and the **Next** button is available. Click **Next**.

19 Review the log files and click **Finish**.

20 Click **Yes** to reboot the local node.

Installing SFW HA 5.1 Application Pack 1

You must install SFW HA 5.1 Application Pack 1 if you wish to set up an HA configuration for SQL Server 2008. While installing the Application Pack ensure that you choose to install the VCS agents for SQL Server 2008.

Refer to the *SFW HA 5.1 Application Pack 1 Release Notes* for installation instructions.

Resetting the driver signing options

After completing the installation sequence, reset the driver signing options on each computer.

To reset the driver signing options

1. Open the Control Panel, and click **System**.
2. Click the **Hardware** tab and click **Driver Signing**.
3. In the Driver Signing Options dialog box, reset the option to **Warn** or **Block**.
4. Click **OK**.
5. Repeat for each computer.

Configuring cluster disk groups and volumes for SQL Server 2008

Before installing SQL Server, you must create cluster disk groups and volumes using the Veritas Enterprise Administrator (VEA) console installed with SFW.

Planning and configuring cluster disk groups and volumes is covered in the following topics:

About cluster disk groups and volumes

SFW uses disk groups to organize disks or LUNs for management purposes. A dynamic disk group is a collection of disks that is imported or deported as a single unit. A cluster disk group is a special type of dynamic disk group that is created on shared storage and is designed to be moved or to failover between hosts. In order to prevent data corruption a cluster disk group uses SCSI reservations to protect the shared disks and limits access to a single host at a time.

Volumes are logical entities that are comprised of portions of one or more physical disks and are accessed by a drive letter or mount point. Volumes can be configured for performance and high availability.

Note: You create a cluster disk group and volumes on only one node of a cluster. The volumes can be accessed by other nodes in a high-availability cluster by first deporting the cluster disk group from the current node and then importing it on the desired node. In a campus cluster, the volumes are mirrored across the storage arrays.

Note: If your storage devices are SCSI-3 compliant, and you wish to use SCSI-3 Persistent Group Reservations (PGR), you must enable SCSI-3 support using the Veritas Enterprise Administrator (*VEA - Control Panel - System Settings*). See the *Veritas Storage Foundation Administrator's Guide* for more information.

Prerequisites for configuring cluster disk groups and volumes

Before you create a disk group, consider the following items:

- The type of volume configurations that are required
- The number of volumes or LUNs required for the disk group
- The implications of backup and restore operations on the disk group setup
- The size of databases and logs that depend on the traffic load
- For campus clusters, consider the following:
  - The disk groups and number of disks on each site
    For campus clusters, each disk group must contain an equal number of disks on each site.
  - Each volume should be a mirrored volume with one plex of the volume on Site A's storage array and the other plex of the volume on Site B's storage array.

Complete the following tasks before you create the cluster disk group and volumes for the SQL instance:

- Determine the layout or configuration for each volume and the total number of disks needed. Symantec recommends that you place SQL Server user database files and log files on separate volumes.
- Determine the initial size necessary for the volumes. You may increase the volume size at a later time using the Expand Volume command but you can not decrease the size.
- Verify that the disks you plan to include in the cluster disk group are shared and are available from all nodes. If new disks are installed, you must rescan, and if necessary, use the Write Signature command in order to identify the disks to the operating system.

- Verify that the drive letters that will be assigned to the volumes are available on all nodes so that the volumes can be accessed from any node.

You may be configuring new shared storage for the high availability environment, or the existing standalone SQL Server databases and logs may already be on shared storage.

If the existing databases and logs are already on shared storage, read the following topic:

- "Creating a cluster disk group" on page 127

For a Replicated Data Cluster configuration or a disaster recovery configuration using Veritas Volume Replicator, read the following topic:

- "Considerations for volumes for a VVR configuration" on page 124

Considerations for disks and volumes for campus clusters

Ensure that each disk group has the same number of disks on each site. Each volume must be a mirrored volume with one plex of the volume on Site A's storage array and the other plex of the volume on Site B's storage array.

While creating the dynamic disk groups and volumes at Site A, note carefully which disks and volumes are allocated. These will later become the Site A plexes for the mirrors.

Consider the following when creating new volumes:

- For campus clusters, when creating a new volume, you must select the "mirrored across enclosures" option.
- Choosing "Mirrored" and the "mirrored across" option without having two enclosures that meet requirements causes new volume creation to fail.
- Logging can slow performance.
- Symantec recommends using either simple mirrored (concatenated) or striped mirrored options for the new volumes. Striped mirrored gives you better performance compared to concatenated.
  When selecting striped mirrored, select two columns in order to stripe one enclosure that is mirrored to the second enclosure.
- You cannot selecting RAID-5 for mirroring.
- Selecting "stripe across enclosures" is not recommended because then you need four enclosures, instead of two.

Considerations for converting existing shared storage to cluster disk groups and volumes

The databases and logs for your existing standalone SQL Server may already be on shared storage. In this case, when you create cluster disk groups, you specify the disks that contain the existing databases and logs.

Creating a disk group converts the disks from basic disks to dynamic disks. Partitions on the disks are automatically converted to volumes on the dynamic disks.

Therefore, if your existing disk layout contains databases and logs in the same partition, they become part of the same volume in the cluster disk group. If the disk contains multiple partitions, each containing a user database, each partition becomes a separate volume, but all will become part of the same cluster disk group. If this configuration does not meet your requirements, you may want to modify your disk layout before creating the cluster disk group.

For additional information on converting basic to dynamic disks, see *Veritas Storage Foundation Administrator's Guide*.

Symantec recommends creating a separate 100 MB RegRep volume that contains the list of registry keys that must be replicated among cluster systems for the SQL service. However, if no additional disks are available on the shared storage, you can specify an existing volume as the registry replication path during service group creation.

For a disaster recovery configuration using Veritas Volume Replicator, you need to allow additional disk space for a Storage Replicator Log volume.

See "Considerations for volumes for a VVR configuration" on page 124.

Considerations for volumes for a VVR configuration

For a configuration using Veritas Volume Replicator, either a disaster recovery configuration on a secondary site or a Replicated Data Cluster, note the following:

- VVR does not support the following types of volumes: SFW (software) RAID 5 volumes, volumes with the Dirty Region Log (DRL) or Data Change Object (DCO), and volumes with commas in the names.
- A configuration with VVR requires a Storage Replicator Log (SRL) volume for each disk group that contains volumes that are replicated. You can create the SRL volume when configuring the other volumes for the application or you can create it later when you set up replication. If you create it later, ensure that you allow sufficient disk space for this volume. For more about VVR planning, see the *Veritas Volume Replicator, Administrator's Guide*.

- Do not assign a drive letter to the Storage Replicator Log volume. This will limit access to that volume and avoid potential data corruption.
- In a disaster recovery configuration, Symantec recommends that for replication considerations, you create a separate volume for tempdb, for example, INST1_TEMPDB, within the system database disk group. When you later configure replication for disaster recovery, you replicate that disk group but exclude the tempdb volume from the replication.
  It would waste bandwidth to replicate tempdb because the data is transitory and is not needed for DR site recovery.
  You can create the volume now and later, after the SQL installation is complete and before configuring replication, move tempdb to the volume.
  See "Moving the tempdb database if using VVR for disaster recovery" on page 161.

Considerations for disk groups and volumes for multiple instances

For an Active-Active configuration or other cases where you are setting up multiple SQL instances in the cluster, you create a separate set of cluster disk groups and volumes for each instance.

For example, if you have a Billing instance and a Payroll instance, you could create the following disk groups and volumes.

For the Billing instance, create the following:

- BILLING_DG: a cluster disk group for the volumes related to the Billing instance
- BILLING_DATA_FILES: volume for the SQL Server system data files
- BILLING_REGREP_VOL: volume for the list of registry keys replicated among cluster nodes for the Billing instance
- BILLING_DB1_VOL: volume for the user database files
- BILLING_DB1_LOG: volume for the user database log files

For the Payroll Instance, create the following:

- PAYROLL_DG: a cluster disk group for the volumes related to the Payroll instance
- PAYROLL_DATA_FILES: volume for the SQL Server system data files
- PAYROLL_REGREP_VOL: volume for the list of registry keys replicated among cluster nodes for the Payroll instance
- PAYROLL_DB1_VOL: volume for the user database files
- PAYROLL_DB1_LOG: volume for the user database log files

You can choose either of the following:

- Set up disk groups and volumes for all instances at one time.
- Set up disk groups and volumes for the current instance only and complete all configuration steps for this instance. Then return to this step for the next instance.

Sample disk group and volume configuration

You first create a cluster disk group (INST1_DG) on shared disks and then create the following volumes:

- INST1_DATA_FILES contains the SQL Server system data files (including the master, model, msdb, and tempdb databases)
- INST1_REGREP_VOL contains the list of registry keys that must be replicated among cluster systems for the SQL service. Create a 100 MB volume for this purpose.
- INST1_FS_VOL contains the FILESTREAM enabled database objects for the SQL instance
- INST1_REPLOG contains the VVR Storage Replicator Log.
  This is required only for a configuration that uses VVR replication, either a Replicated Data Cluster or a disaster recovery configuration using VVR. You can create this volume later while setting up replication.

You may want to place user database files in a separate cluster disk group from the system database files, for example, by creating INST1_SHARED_DG for system files and INST1_USER_DG for user database files. As a best practice, create a separate disk group and volumes for SQL Server user-defined database and files.

The following disk group and volumes may be created now or later in the configuration process:

- INST1_DB1_DG is the disk group for the SQL Server user-defined database and files
- INST1_DB1_VOL contains the user database files
- INST1_DB1_LOG contains the user database log files
- INST1_DB1_FS_VOL contains the FILESTREAM enabled objects for the user database
- INST1_DB1_REPLOG contains the VVR Storage Replicator Log (required only for a configuration using VVR replication).

This configuration is a simple example. The recommended practice for disk groups and volume layout is dependent on your environment.

MSDTC sample disk group and volume configuration

For an MSDTC configuration, you will first need to create a cluster disk group (MSDTC_DG) on shared disks and then create the following volumes:

- MSDTC_LOG: contains the MSDTC log files.
- MSDTC_REGREP: contains the list of registry keys that must be replicated among cluster systems for the MSDTC service group. Create a 100 MB volume for this purpose.

Viewing the available disk storage

Before creating disk groups and volumes you may want to view available disk storage.

To view the available disk storage

1. Open the VEA console by clicking **Start > All Programs > Symantec > Veritas Storage Foundation > Veritas Enterprise Administrator** and select a profile if prompted.
2. Click **Connect to a Host or Domain**.
3. In the Connect dialog box select the host name from the pull-down menu and click **Connect**.
   To connect to the local system, select **localhost**. Provide the user name, password, and domain if prompted.
4. In the VEA configuration tree, expand **hostname > StorageAgent** and then click **Disks**.
   The internal names for the disks that the current system can access for available storage are displayed, with names Harddisk1, Harddisk2, etc. The list includes both disks internal to the local system and any external storage that is available.

Creating a cluster disk group

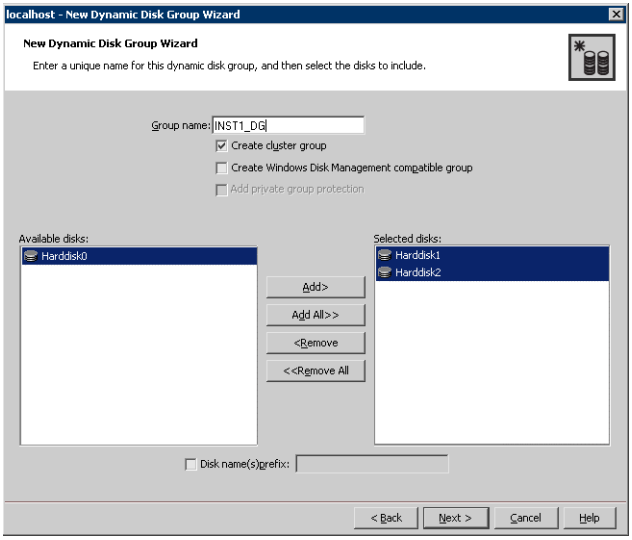
Use the Veritas Enterprise Administrator (VEA) to create a cluster disk group on the first node where the SQL instance is being installed. Repeat the procedure if you want to create additional disk groups.

To create a dynamic (cluster) disk group

Note: Dynamic disks belonging to a Microsoft Disk Management Disk Group do not support cluster disk groups.

---

1. Open the VEA console by clicking **Start > All Programs > S ymantec > Veritas Storage Foundation > Veritas Enterprise Administrator** and select a profile if prompted.
2. Click **Connect to a Host or Domain**.
3. In the Connect dialog box, select the host name from the pull-down menu and click **Connect**.
   To connect to the local system, select **localhost**. Provide the user name, password, and domain if prompted.
4. To start the New Dynamic Disk Group wizard, expand the tree view under the host node, right click the **Disk Groups** icon, and select **New Dynamic Disk Group** from the context menu.
5. In the Welcome screen of the New Dynamic Disk Group wizard, click **Next**.
6. Provide information about the cluster disk group.



- In the **Group name** field, enter a name for the disk group (for example**,** INST1_DG) .
- Click the checkbox for **Create cluster group**.
- Select the appropriate disks in the **Available disks** list, and use the **Add** button to move them to the **Selected disks** list.
  Optionally, check the **Disk names prefix** checkbox and enter a disk name prefix to give the disks in the disk group a specific identifier. For example, entering TestGroup as the prefix for a disk group that

contains three disks creates TestGroup1, TestGroup2, and TestGroup3 as internal names for the disks in the disk group.

Note: For Windows Server 2003, Windows Disk Management Compatible Dynamic Disk Group creates a disk group that is compatible with the disk groups created with Windows Disk Management and with earlier versions of Volume Manager for Windows products.
For Windows Server 2008, Windows Disk Management Compatible Dynamic Disk Group creates a type of disk group that is created by Windows Disk Management (LDM).

- Click **Next**.

7 Click **Next** to accept the confirmation screen with the selected disks.

8 Click **Finish** to create the new disk group.

Creating volumes

This procedure will guide you through the process of creating a volume on a cluster disk group. Repeat the procedure to create additional volumes.

Before you begin, review the following topics if applicable to your environment:

- "Considerations for disks and volumes for campus clusters" on page 123
- "Considerations for volumes for a VVR configuration" on page 124

Note: When assigning drive letters to volumes, ensure that the drive letters that you assign are available on all nodes.

To create dynamic volumes

1 If the VEA console is not already open, click **Start > All Programs > Symantec > Veritas Storage Foundation > Veritas Enterprise Administrator** and select a profile if prompted.

2 Click **Connect to a Host or Domain**.

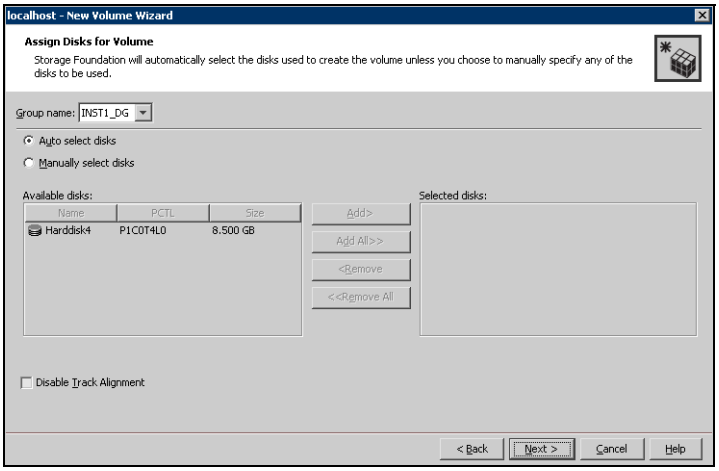
3 In the Connect dialog box select the host name from the pull-down menu and click **Connect**.
To connect to the local system, select **localhost**. Provide the user name, password, and domain if prompted.

4 To start the New Volume wizard, expand the tree view under the host node to display all the disk groups. Right click a disk group and select **New Volume** from the context menu.

You can right-click the disk group you have just created, for example INST1_DG.

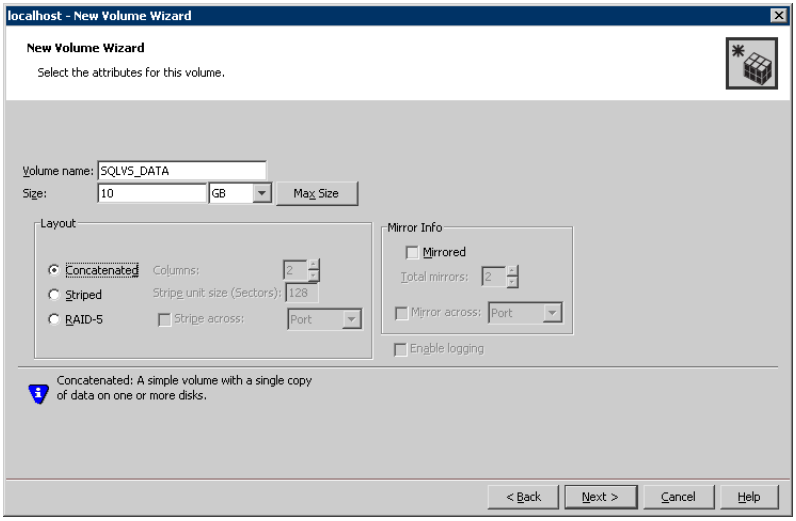
5 At the New Volume wizard opening screen, click **Next**.

6 Select the disks for the volume. Make sure the appropriate disk group name appears in the Group name drop-down list.



- Automatic disk selection is the default setting and is recommended for campus clusters. SFW automatically selects the disks based on the following criteria:
  - Their port assignment (disks with two different ports are selected). Note that in the list of available disks, the entry after each disk name starts with the port number. For example, the “P3” in the entry P3C0T2L1 refers to port 3.
  - Amount of available space on the disks. SFW will pick two disks (one from each array) with the most space.
- To manually select the disks, click the **Manually select disks** radio button and use the **Add** and **Remove** buttons to move the appropriate disks to the “Selected disks” list.
- You may also check Disable Track Alignment to disable track alignment for the volume. Disabling Track Alignment means that the volume does not store blocks of data in alignment with the boundaries of the physical track of the disk.
- Click **Next**.

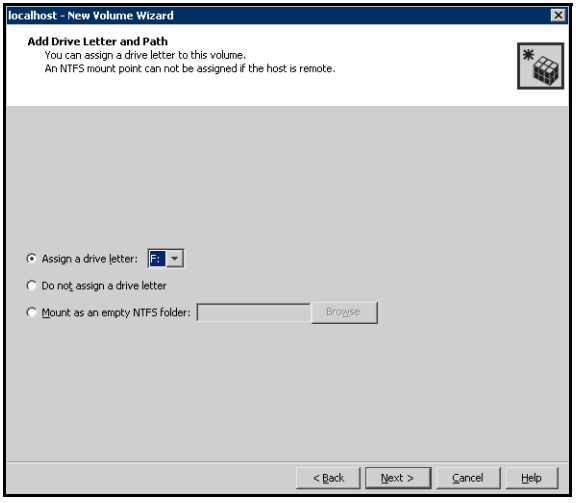
7 Specify the parameters of the volume.



- Enter a volume name. The name is limited to 18 ASCII characters and cannot contain spaces or forward or backward slashes.
- Provide a size for the volume. If you click the **Max Size** button, a size appears in the Size box that represents the maximum possible volume size for that layout in the dynamic disk group.
- Select a layout type.
  For campus clusters, select either **Concatenated** or **Striped**.
- If you are creating a striped volume, the **Columns** and **Stripe unit size** boxes need to have entries. Defaults are provided.
  For campus clusters, if you select Striped, click the **Stripe across** checkbox and select **Ports** from the drop-down list.
- To select mirrored striped, click both the **Mirrored** checkbox and the **Striped** radio button.
  For campus clusters, you select the **Mirrored** checkbox for either layout type.
- In the Mirror Info area, select the appropriate mirroring options.
  For campus clusters, in the **Mirror Info** area, after selecting the **Mirrored** checkbox, click **Mirror across** and select **Enclosures** from the drop-down list.
- Verify that **Enable logging** is not selected.
- Click **Next**.

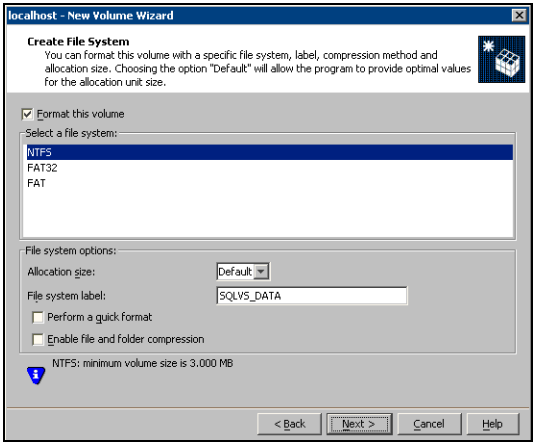
8 Assign a drive letter or mount point to the volume. You must use the same drive letter or mount point on all systems in the cluster. Make sure to verify the availability of the drive letter before assigning it.

- To assign a drive letter, select **Assign a Drive Letter**, and choose a drive letter.
- To mount the volume as a folder, select **Mount as an empty NTFS folder**, and click **Browse** to locate an empty folder on the shared disk.
- If creating a Replicator Log volume for Veritas Volume Replicator, select **Do not assign a drive letter**.



9 Click **Next**.

10 Create an NTFS file system.



- Make sure the **Format this volume** checkbox is checked and click **NTFS**.
- For a VVR configuration, for the Replicator Log volume only, clear the **Format this volume** check box.
- Select an allocation size or accept the default.
- The file system label is optional. SFW makes the volume name the file system label.
- Select **Perform a quick format** if you want to save time.
- Select **Enable file and folder compression** to save disk space. Note that compression consumes system resources and performs encryption and decryption, which may result in reduced system performance.
- Click **Next**.

11 Click **Finish** to create the new volume.

12 Repeat these steps to create additional volumes.

Create the cluster disk group and volumes on the first node of the cluster only.

About managing disk groups and volumes

During the process of setting up an SFW environment, refer to these general procedures for managing disk groups and volumes:

- When a disk group is initially created, it is imported on the node where it is created.
- A disk group can be imported on only one node at a time.
- To move a disk group from one node to another, unmount the volumes in the disk group, deport the disk group from its current node, import it to a new node and mount the volumes.

Importing a disk group and mounting a volume

Use the VEA Console to import a disk group and mount a volume.

To import a disk group

1. From the VEA Console, right-click a disk name in a disk group or the group name in the Groups tab or tree view.
2. From the menu, click **Import Dynamic Disk Group**.

To mount a volume

1. If the disk group is not imported, import it.
2. To verify if a disk group is imported, from the VEA Console, click the Disks tab and check if the status is imported.
3. Right-click the volume, click **File System**, and click **Change Drive Letter and Path**.
4. Select one of the following options in the Drive Letter and Paths dialog box depending on whether you want to assign a drive letter to the volume or mount it as a folder.
   - *To assign a drive letter*
     Select **Assign a Drive Letter**, and select a drive letter.
   - *To mount the volume as a folder*
     Select **Mount as an empty NTFS folder**, and click **Browse** to locate an empty folder on the shared disk.
5. Click **OK**.

Unmounting a volume and deporting a disk group

Use the VEA Console to unmount a volume and deport a disk group.

To unmount a volume and deport the dynamic disk group

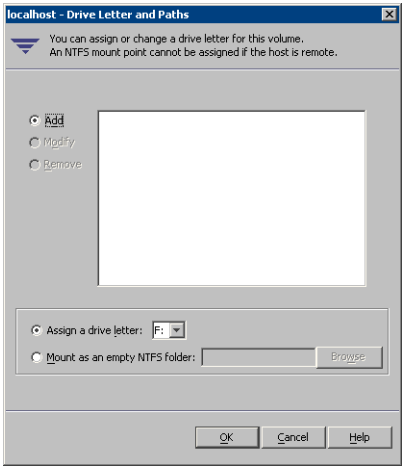
1. From the VEA tree view, right-click the volume, click **File System**, and click **Change Drive Letter and Path**.
2. In the Drive Letter and Paths dialog box, click **Remove.** Click **OK** to continue.
3. Click **Yes** to confirm.
4. From the VEA tree view, right-click the disk group, and click **Deport Dynamic Disk Group**.
5. Click **Yes**.

Adding drive letters to mount the volumes

Occasionally, when a disk group is imported a drive letter may not be associated with an existing volume. If this occurs, use the VEA console to add a drive letter and mount the volume so that it can be seen by the operating system. You can also mount the volume as a folder. Verify that all volumes are mounted.

To add a drive letter or path to a volume

1. Navigate to the **Volumes** folder.
2. Right-click the volume, click **File System** and click **Change Drive Letter and Path**.



3. In the Drive Letter and Paths dialog box, click **Add**.
4. Select one of the following options depending on whether you want to assign a drive letter to the volume or mount it as a folder.
   - *To assign a drive letter*

Select the **Assign a Drive Letter** option and select a drive letter from the drop-down list.

- *To mount the volume as a folder*
  Select the **Mount as an empty NTFS folder** option and click **Browse** to locate an empty folder on the shared disk.

Note: Assign the same drive letter or mount path that was assigned when the volume was created.

5 Click **OK**.

Deporting the cluster disk group

Before installing SQL on additional nodes you must move ownership of the cluster disk group from the first node to an additional node. To move ownership, you use the Veritas Enterprise Administrator (VEA) to deport the clustered cluster disk group from the current node (SYSTEM1) and then import it to the desired node (SYSTEM2).

To deport the cluster disk group

1 Stop all processes accessing the volumes in the cluster disk group.

2 Click **Start > All Programs > Symantec > Veritas Enterprise Administrator** and if prompted, select a profile.

3 Click **Connect to a Host or Domain** and in the Connect dialog box, specify the host name and click **Connect.**

4 In the tree view, expand the system name where the disk group is current imported, expand **Storage Agent**, and expand **Disk Groups.**

5 In the tree view, right-click the cluster disk group to be deported (for example, INST1_DG) and select **Deport Dynamic Disk Group**.

6 Click **Yes** to deport the dynamic cluster disk group.

Configuring the cluster

The VCS Cluster Configuration Wizard (VCW) sets up the cluster infrastructure, including LLT and GAB, and configures Symantec Product Authentication Service in the cluster. The wizard also provides the option to configure the ClusterService group, which can contain resources for Cluster Management Console (Single Cluster Mode) also referred to as Web Console, notification, and global clusters.

Complete the following tasks before creating a cluster:

- Verify that each node uses static IP addresses and that name resolution is configured for each node.
- Verify that you have the required privileges.
  See "Reviewing the requirements" on page 80.

Note: If you are setting up a cluster with multiple instances of SQL, plan to add all nodes for all instances to the cluster the first time that you run the wizard. If you do that, you do not need to run the wizard again later to add the nodes.

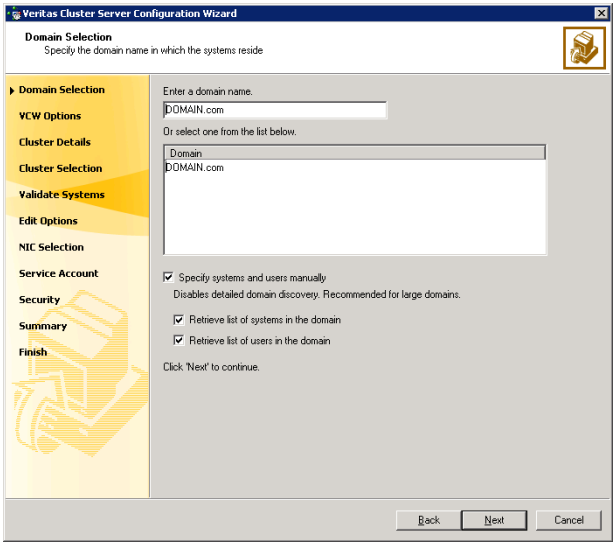
Note: If you are setting up a Replicated Data Cluster configuration, add only the systems in the primary zone (zone 0) to the cluster, at this time.

Refer to the *Veritas Cluster Server Administrator's Guide* for complete details on VCS, including instructions on adding cluster nodes or removing or modifying cluster configurations.

To configure a VCS cluster

1. Start the VCS Cluster Configuration Wizard.
   Click **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > Cluster Configuration Wizard**.
2. Read the information on the Welcome panel and click **Next**.
3. On the Configuration Options panel, click **Cluster Operations** and click **Next**.

4 On the Domain Selection panel, select or type the name of the domain in which the cluster resides and select the discovery options.



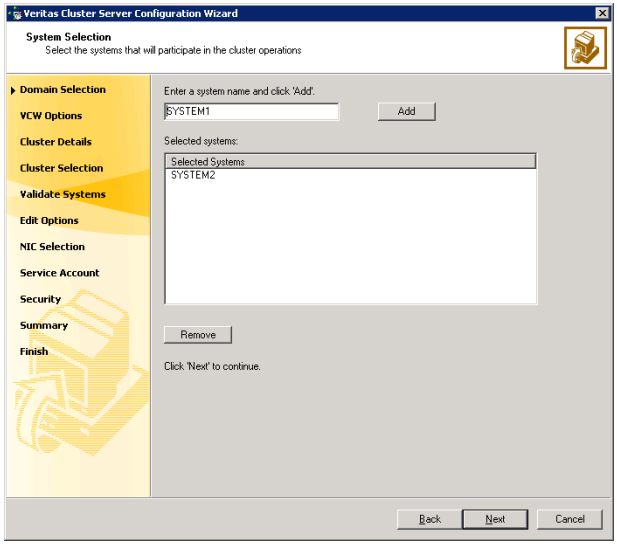
To discover information about all systems and users in the domain:

- Clear the **Specify systems and users manually** check box.
- Click **Next**.
  Proceed to step 8 on page 140.

To specify systems and user names manually (recommended for large domains):

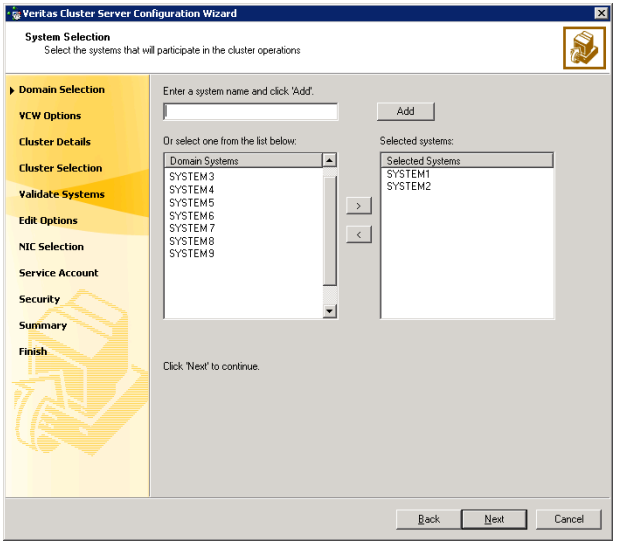
- Check the **Specify systems and users manually** check box.
  Additionally, you may instruct the wizard to retrieve a list of systems and users in the domain by selecting appropriate check boxes.
- Click **Next**.
  If you chose to retrieve the list of systems, proceed to step 6 on page 139. Otherwise, proceed to the next step.

5 On the System Selection panel, type the name of each system to be added, click **Add**, and then click **Next**. Do not specify systems that are part of another cluster.



Proceed to step 8 on page 140.

6 On the System Selection panel, specify the systems to form a cluster and then click **Next**. Do not select systems that are part of another cluster.



Enter the name of the system and click **Add** to add the system to the **Selected Systems** list, or click to select the system in the Domain Systems list and then click the **>** (right-arrow) button.

7 The System Report panel displays the validation status, whether *Accepted* or *Rejected*, of all the systems you specified earlier.

A system can be rejected for any of the following reasons:

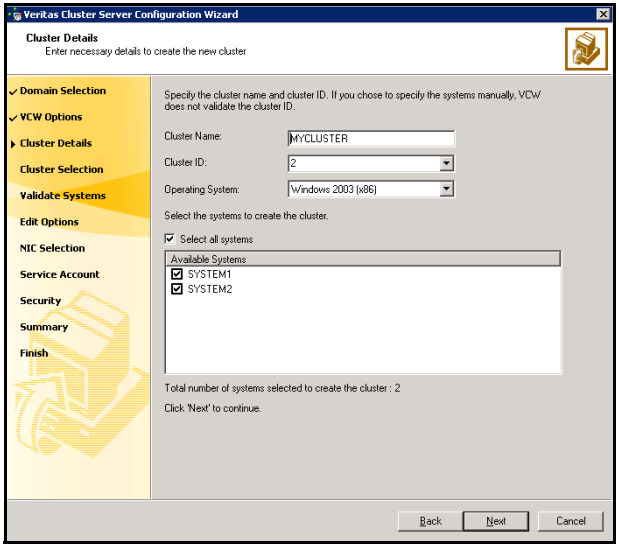
- System is not pingable.
- WMI access is disabled on the system.
- Wizard is unable to retrieve the system architecture or operating system.
- VCS is either not installed on the system or the version of VCS is different from what is installed on the system on which you are running the wizard.

Click on a system name to see the validation details. If you wish to include a rejected system, rectify the error based on the reason for rejection and then run the wizard again.

Click **Next** to proceed.

8 On the Cluster Configuration Options panel, click **Create New Cluster** and click **Next**.

9 On the Cluster Details panel, specify the details for the cluster and then click **Next**.



Cluster Name	Type a name for the new cluster. Symantec recommends a maximum length of 32 characters for the cluster name.
Cluster ID	Select a cluster ID from the suggested cluster IDs in the drop-down list, or type a unique ID for the cluster. The cluster ID can be any number from 0 to 255.
	Caution: If you chose to specify systems and users manually in step 4 or if you share a private network between more than one domain, make sure that the cluster ID is unique.
Operating System	From the drop-down list, select the operating system that the systems are running.
Available Systems	Select the systems that will be part of the cluster. The wizard discovers the NICs on the selected systems. For single-node clusters with the required number of NICs, the wizard prompts you to configure a private link heartbeat. In the dialog box, click **Yes** to configure a private link heartbeat. Check the **Select all systems** check box to select all the systems simultaneously.

10 The wizard validates the selected systems for cluster membership. After the systems are validated, click **Next**.

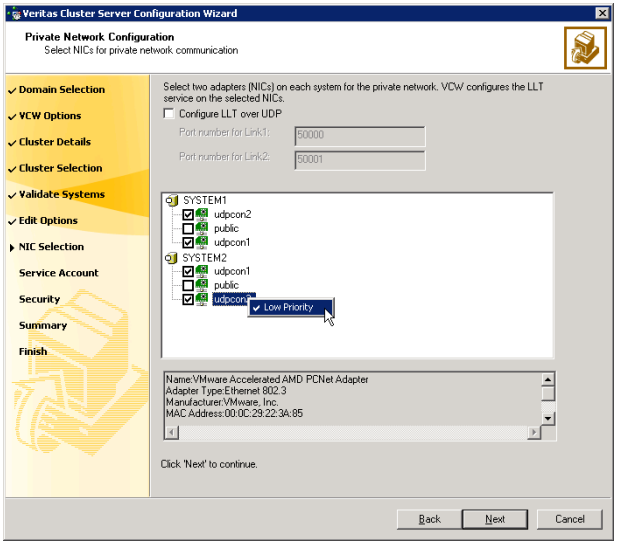
If a system is not validated, review the message associated with the failure and restart the wizard after rectifying the problem.

If you chose to configure a private link heartbeat in step 9 on page 140, proceed to the next step. Otherwise, proceed to step 12 on page 144.

11 On the Private Network Configuration panel, configure the VCS private network and click **Next**.

Do one of the following:

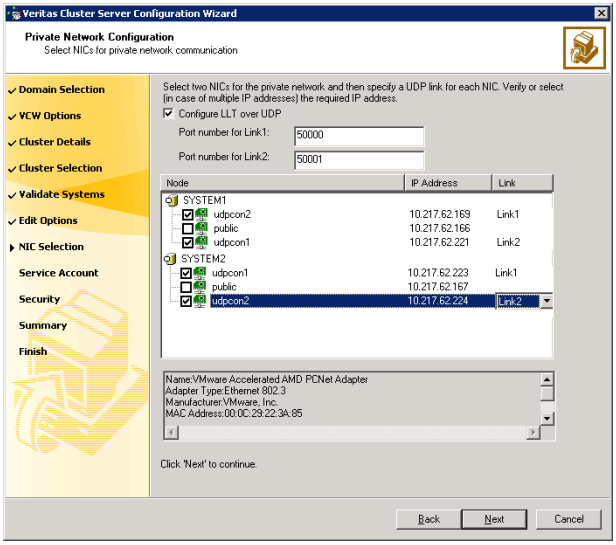
- To configure the VCS private network over Ethernet



  - Select the check boxes next to the two NICs to be assigned to the private network.
    Symantec recommends reserving two NICs exclusively for the private network. However, you could lower the priority of one NIC and use the low-priority NIC for public and private communication.
  - If you have only two NICs on a selected system, it is recommended that you lower the priority of at least one NIC that will be used for private as well as public network communication.
    To lower the priority of a NIC, right-click the NIC and select **Low Priority** from the pop-up menu.
  - If your configuration contains teamed NICs, the wizard groups them as "NIC Group #N" where "N" is a number assigned to the teamed NIC. A teamed NIC is a logical NIC, formed by grouping several physical NICs together. All NICs in a team have an identical MAC address. Symantec recommends that you do not select teamed NICs for the private network.

The wizard will configure the LLT service (over Ethernet) on the selected network adapters.

- To configure the VCS private network over the User Datagram Protocol (UDP) layer

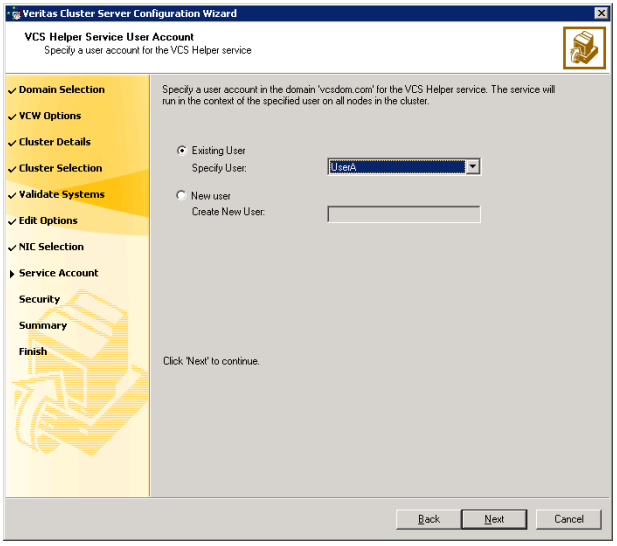


  - Check the **Configure LLT over UDP** check box.
  - Specify a unique UDP port in the **Port number for Link1** and **Port number for Link2** fields. You can use ports in the range 49152 to 65535. The default ports numbers are 50000 and 50001 respectively.
  - Select the check boxes next to the two NICs to be assigned to the private network. Symantec recommends reserving two NICs exclusively for the VCS private network.
  - For each selected NIC, verify the displayed IP address. If a selected NIC has multiple IP addresses assigned, double-click the field and choose the desired IP address from the drop-down list. Each IP address can be in a different subnet.

    The IP address is used for the VCS private communication over the specified UDP port.
  - For each selected NIC, double-click the respective field in the Link column and choose a link from the drop-down list. Specify a different link (Link1 or Link2) for each NIC. Each link is associated with a UDP port that you specified earlier.

The wizard will configure the LLT service (over UDP) on the selected network adapters. The specified UDP ports will be used for the private network communication.

12 On the VCS Helper Service User Account panel, specify the name of a domain user for the VCS Helper service. The VCS HAD, which runs in the context of the local system built-in account, uses the VCS Helper service user context to access the network. This account does not require domain admin privileges.



- To specify an existing user, do one of the following:
  - Click **Existing user** and select a user name from the drop-down list,
  - If you chose not to retrieve the list of users in step 4 on page 138, type the user name in the **Specify User** field, and then click **Next**.
- To specify a new user, click **New user** and type a valid user name in the **Create New User** field, and then click **Next**.

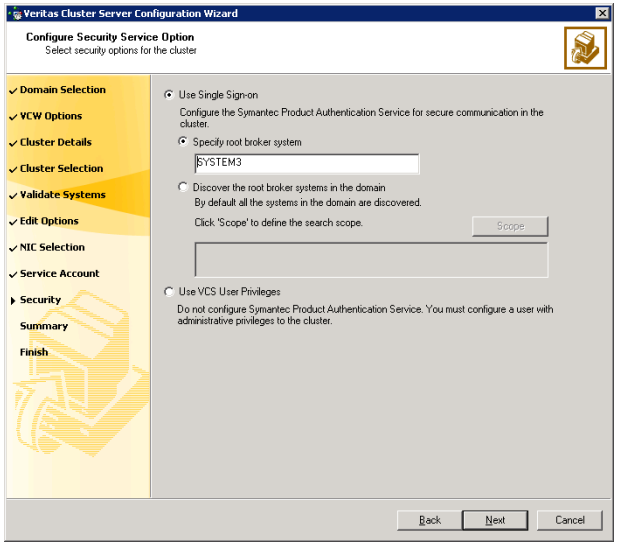
Do not append the domain name to the user name; do not type the user name as DOMAIN\user or user@DOMAIN.

- In the Password dialog box, type the password for the specified user and click **OK**, and then click **Next**.

13 On the Configure Security Service Option panel, specify security options for the cluster and then click **Next**.

Do one of the following:

- To use the single sign-on feature



  - Click **Use Single Sign-on**. In this mode, VCS uses SSL encryption and platform-based authentication. The VCS engine (HAD) and Veritas Command Server run in secure mode.

For more information about secure communications in a cluster, see the *Veritas Storage Foundation and High Availability Solutions Quick Start Guide for Symantec Product Authentication Service*.

- If you know the name of the system that will serve as the root broker, click **Specify root broker system**, type the system name, and then click **Next**.

  If you specify a cluster node, the wizard configures the node as the root broker and other nodes as authentication brokers. Authentication brokers reside one level below the root broker and serve as intermediate registration and certification authorities. These brokers can authenticate clients, such as users or services, but cannot authenticate other brokers. Authentication brokers have certificates signed by the root.

  If you specify a system outside of the cluster, make sure that the system is configured as a root broker; the wizard configures all nodes in the cluster as authentication brokers.

- If you want to search the system that will serve as root broker, click **Discover the root broker systems in the domain** and click **Next**. The wizard will discover root brokers in the entire domain, by default.

- If you want to define a search criteria, click **Scope**. In the Scope of Discovery dialog box, click **Entire Domain** to search across the domain, or click **Specify Scope** and select the Organization Unit from the Available Organizational Units list, to limit the search to the specified organization unit. Use the Filter Criteria options to search systems matching a certain condition.

  For example, to search for systems managed by a user *Administrator*, select **Managed by** from the first drop-down list, **is (exactly)** from the second drop-down list, type the user name **Administrator** in the adjacent field, click **Add**, and then click **OK**. Table 6-2 contains some more examples of search criteria.

Table 6-2 Search criteria examples

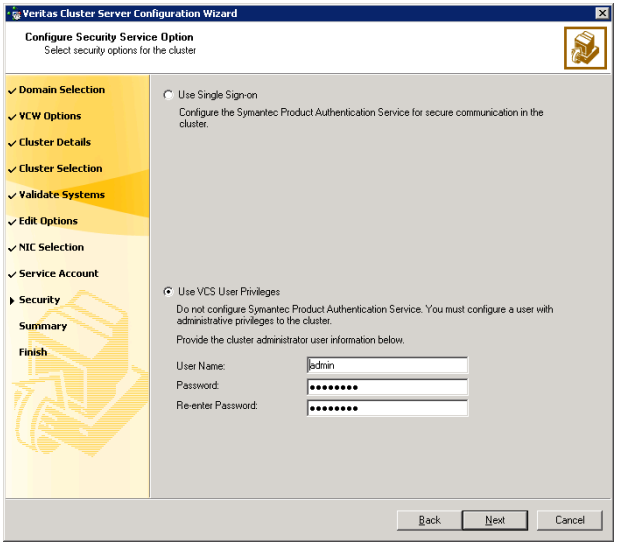
1st drop-down list value	2nd drop-down list value	Adjacent field entry	Search result
Name	is (exactly)	*system	Displays all systems with names that end with *system*.
Name	is (exactly)	*vcsnode*	Displays all systems with names that contain *vcsnode*.
Operating System	is (exactly)	*2003*	Displays all Windows Server 2003 systems.
Operating System	is (exactly)	*Enterprise*	Displays all Windows Server Enterprise Edition systems.
Operating System Version	is (exactly)	5.*	Displays all systems whose operating system version is 5.x, where x could be 0, 1, 2, etc.

  You can add multiple search criterion; the wizard will search for systems that match *ALL* the conditions specified.

- Click **Next**. The wizard discovers and displays a list of all the root brokers. Click to select a system that will serve as the root broker and then click **Next**.

If the root broker is a cluster node, the wizard configures the other cluster nodes as authentication brokers. If the root broker is outside the cluster, the wizard configures all the cluster nodes as authentication brokers.

- To use VCS user privilege:



  - Click **Use VCS User Privileges**.
    The default user name for the VCS administrator is *admin* and the default password is *password*. Both are case-sensitive. You can accept the default user name and password for the VCS administrator account or type a new name and password. Symantec recommends that you specify a new user name and password.
    Use this account to log on to VCS using Cluster Management Console (Single Cluster Mode) or Web Console, when VCS is not running in secure mode.
  - Click **Next**.

14 Review the summary information on the Summary panel, and click **Configure**. The wizard configures the VCS private network.
If the selected systems have LLT or GAB configuration files, the wizard displays an informational dialog box before overwriting the files. In the dialog box, click **OK** to overwrite the files. Otherwise, click **Cancel**, exit the wizard, move the existing files to a different location, and rerun the wizard.
The wizard starts running commands to configure VCS services. If an operation fails, click **View configuration log file** to see the log.

15 On the Completing Cluster Configuration panel, click **Next** to configure the ClusterService service group; this group is required to set up components for

the Cluster Management Console (Single Cluster Mode) or Web Console, notification, and for global clusters.

To configure the ClusterService group later, click **Finish**.

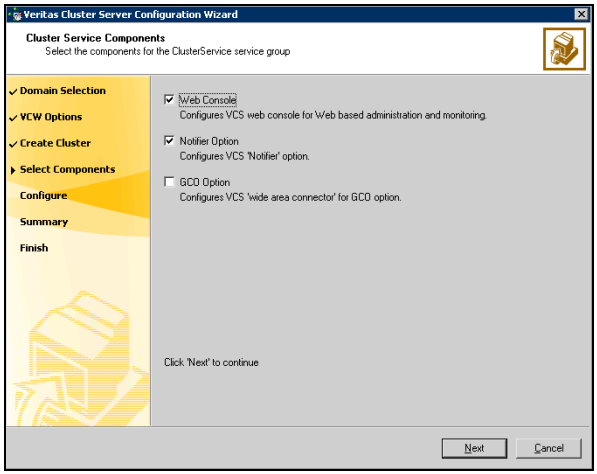
At this stage, the wizard has collected the information required to set up the cluster configuration. After the wizard completes its operations, with or without the ClusterService group components, the cluster is ready to host application service groups. The wizard also starts the VCS engine (HAD) and the Veritas Command Server at this stage.

Note: After configuring the cluster you must not change the names of the nodes that are part of the cluster. If you wish to change a node name, run this wizard to remove the node from the cluster, rename the system, and then run this wizard again to add the system to the cluster.

You are not required to configure the Cluster Management Console (Single Cluster Mode) or Web Console, for this HA environment. Refer to the *Veritas Cluster Server Administrator's Guide* for complete details on VCS Cluster Management Console (Single Cluster Mode), and the Notification resource.

The GCO Option applies only if you are configuring a Disaster Recovery environment and are not using the Disaster Recovery wizard. The Disaster Recovery chapters discuss how to use the Disaster Recovery wizard to configure the GCO option.

16 On the Cluster Service Components panel, select the components to be configured in the ClusterService service group and click **Next**.



- Check the **Web Console** checkbox to configure the Cluster Management Console (Single Cluster Mode), also referred to as the Web Console.

See "Configuring Web console" on page 149.

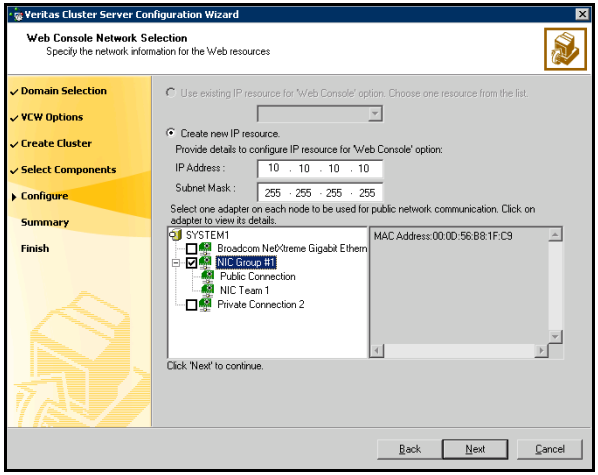
- Check the **Notifier Option** checkbox to configure notification of important events to designated recipients.
  See "Configuring notification" on page 150.

Configuring Web console

This section describes steps to configure the VCS Cluster Management Console (Single Cluster Mode), also referred to as the Web Console.

To configure the Web console

1 On the Web Console Network Selection panel, specify the network information for the Web Console resources and click **Next**.



- If the cluster has a ClusterService service group configured, you can use the IP address configured in the service group or configure a new IP address for the Web console.
- If you choose to configure a new IP address, type the IP address and associated subnet mask.
- Select a network adapter for each node in the cluster. Note that the wizard lists the public network adapters along with the adapters that were assigned a low priority.

2 Review the summary information and choose whether you want to bring the Web Console resources online when VCS is started, and click **Configure**.

3 If you chose to configure a Notifier resource, proceed to:

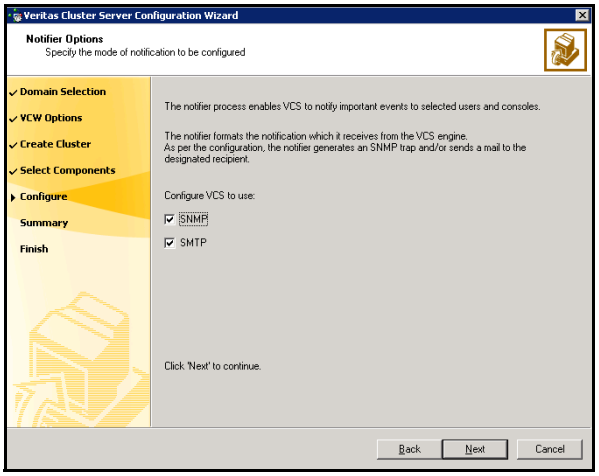
"Configuring notification" on page 150.
Otherwise, click **Finish** to exit the wizard.

Configuring notification

This section describes steps to configure notification.

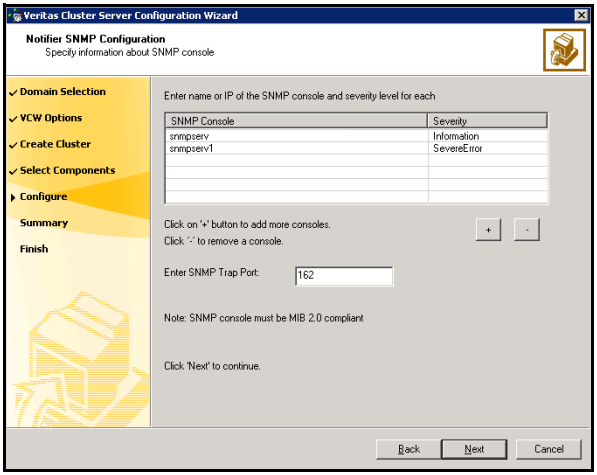
To configure notification

1 On the Notifier Options panel, specify the mode of notification to be configured and click **Next**.



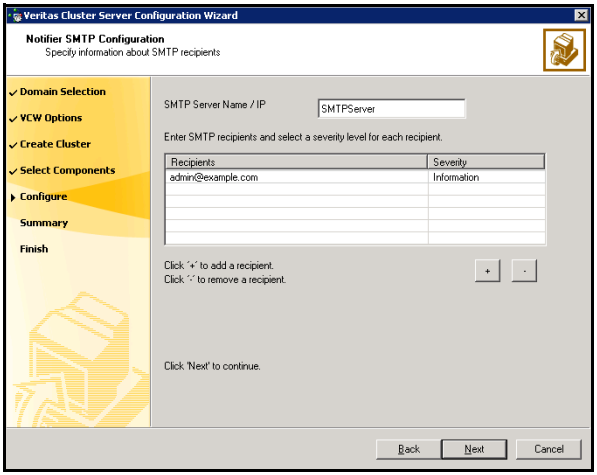
You can configure VCS to generate SNMP (V2) traps on a designated server and send emails to designated recipients in response to certain events.

2 If you chose to configure SNMP, specify information about the SNMP console and click **Next**.



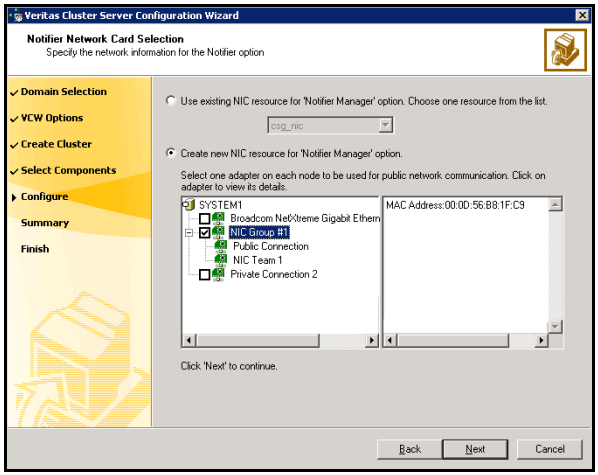
- Click a field in the SNMP Console column and type the name or IP address of the console. The specified SNMP console must be MIB 2.0 compliant.
- Click the corresponding field in the Severity column and select a severity level for the console.
- Click '**+**' to add a field; click '**-**' to remove a field.
- Enter an SNMP trap port. The default value is "162".

3 If you chose to configure SMTP, specify information about SMTP recipients and click **Next**.



- Type the name of the SMTP server.
- Click a field in the Recipients column and enter a recipient for notification. Enter recipients as admin@example.com.
- Click the corresponding field in the Severity column and select a severity level for the recipient. VCS sends messages of an equal or higher severity to the recipient.
- Click **+** to add fields; click **-** to remove a field.

4 On the Notifier Network Card Selection panel, specify the network information and click **Next**.



- If the cluster has a ClusterService service group configured, you can use the NIC resource configured in the service group or configure a new NIC resource for notification.
- If you choose to configure a new NIC resource, select a network adapter for each node in the cluster. The wizard lists the public network adapters along with the adapters that were assigned a low priority.

5 Review the summary information and choose whether you want to bring the notification resources online when VCS is started.

6 Click **Configure**.

7 Click **Finish** to exit the wizard.

Chapter 7

Installing SQL Server 2008

This chapter contains the following topics:

About installing multiple SQL instances

If you are installing multiple instances of SQL Server on the same system, as in an active-active cluster configuration, some additional requirements apply. The following summary is provided for your review to assist you in planning the installation:

- Symantec recommends that you follow all steps for installing and setting up high availability for the first instance before you begin installing the next instance.
- Assign a unique name and a unique instance ID to each SQL instance. When installing SQL Server on additional nodes for the same instance, ensure that you specify the same instance name and ID.
- Assign a unique port number for each instance.

Verifying that SQL Server 2008 databases and logs are moved to shared storage

Note: This is applicable only if you are configuring an existing standalone SQL Server in an SFW HA environment.

Verify the location of all SQL Server databases and logs for the existing standalone server. If they are located on local storage, move them from the local drive to the appropriate cluster disk groups and volumes on shared storage to ensure proper failover operations in the cluster.

Complete the following tasks to move the databases.

To move the database and logs to shared storage

1. Stop the SQL Server service.
2. Verify that you have backed up your existing data.
3. Create the required disk group and volumes for the SQL database and ensure that the dynamic disk group is imported on the node where the original database files are located on the local drives, and mount the volumes.
   See "Creating a cluster disk group" on page 127.
   See "Creating volumes" on page 129.
   See "Deporting the cluster disk group" on page 136.
   See "Importing a disk group and mounting a volume" on page 134.
   See "Adding drive letters to mount the volumes" on page 135.
4. Move the SQL Server 2008 data file and user database locations.

Refer to the Microsoft SQL Server 2008 documentation for instructions.

5 Restart SQL Server 2008.

Installing and configuring SQL Server 2008 on the first cluster node

Run the Microsoft SQL Server 2008 installer to install SQL Server 2008 on the first cluster node. Refer to the Microsoft documentation for instructions.

If you are configuring a standalone SQL Server, proceed to installing and configuring SQL on additional nodes.

See "Installing and configuring SQL Server 2008 on the second cluster node" on page 158.

Note the following requirements while installing and configuring SQL Server:

- Ensure that you have installed SFW HA 5.1 Application Pack 1 for Windows along with the VCS database agent for SQL Server 2008, on all the nodes on which you wish to configure SQL Server 2008.
  Refer to the Application Pack 1 release notes for more information.
- Ensure that the cluster disk group is imported and the volumes are mounted to the first node for this SQL instance.
  See "About cluster disk groups and volumes" on page 121.
  See "Deporting the cluster disk group" on page 136.
  See "Importing a disk group and mounting a volume" on page 134.
  See "Adding drive letters to mount the volumes" on page 135.
- Install SQL Server 2008 in the stand-alone installation mode in a non-clustered environment. Also, while installing SQL, ensure that you select all the desired features (for example, Full-Text Search, Analysis Services) that you wish to configure with SFW HA.
- Install the SQL program files to a local disk and the SQL database files to the shared storage managed by the cluster disk group.
- Use the same instance name and instance ID when you install the instance of SQL Server 2008 on failover nodes. If you are installing multiple instances of SQL in the cluster, each instance must have a unique instance name and instance ID on all the nodes.
- While specifying a user name for the SQL Server services account, specify a domain user account.

Note: If SQL Server services are not installed with a domain user account, the SQL service group may fail to come online on the cluster nodes. It may come online only on the node on which SQL Server was installed last. In such a case, you must perform additional steps after configuring the SQL service group.
See Technote http://support.veritas.com/docs/281828.

- Apart from the SQL Browser service, make sure that the other SQL Server services are not set to start at the end of the SQL installation. While installing SQL Server on the first node, set the startup type of all the SQL Server 2008 services to manual. However, set the startup type of the SQL Server 2008 Browser service to automatic. You must do this only for the instance which you have installed.
  You can change the services startup type either during the installation or using the SQL Server Configuration Manager after the installation. Refer to the Microsoft documentation for instructions.

Installing and configuring SQL Server 2008 on the second cluster node

Run the Microsoft SQL Server 2008 installer to install SQL Server 2008 on the second or any additional cluster node. Refer to the Microsoft documentation for instructions.

Note the following prerequisites before installing SQL Server on the second or any additional failover nodes for the SQL instance:

- Ensure that the SQL Server services for the SQL instance are stopped on the first node where you installed SQL Server. This allows the installation on the second or additional nodes to manipulate the database files on the shared disks.
- Ensure that the cluster disk group for this SQL instance is deported from the first node and imported on the second or additional node. Ensure that the volumes are mounted and drive letters are assigned on the second or additional node.
  See "About cluster disk groups and volumes" on page 121.
  See "Deporting the cluster disk group" on page 136.
  See "Importing a disk group and mounting a volume" on page 134.
  See "Adding drive letters to mount the volumes" on page 135.
- Install SQL Server 2008 in the stand-alone installation mode in a non-clustered environment. Also, while installing SQL, ensure that you

select all the desired features (for example, Full-Text Search, Analysis Services) that you wish to configure with SFW HA.

- Before installing SQL on the second or additional node, open the SQL Server system data files volume (INST1_DATA_FILES) and rename or remove the first node SQL Server system data files. The files will be replaced during the installation of SQL Server on the second or additional nodes.
  If you rename the folder that contains the system data files, the files are available as backup files in case problems occur during the second or additional node SQL Server installation.

  Note: You can delete the renamed folder and its contents after the installation completes successfully.

- In case of multiple SQL Server instances, ensure that you specify a unique instance name and instance ID for each SQL instance, on all the cluster nodes.

Creating a SQL Server user-defined database

You can use SFW HA to manage a SQL Server user-defined databases. For making the user-defined databases highly available, create the user-defined databases and then configure them in the SQL Server service group. Refer to the Microsoft SQL Server documentation for instructions on how to create databases.

Refer to the following guidelines before creating and configuring the user-defined databases:

- The user-defined databases must reside on shared disks. If you have not already created volumes for a user-defined SQL Server database and its transaction log, create them first.
  See “Creating volumes” on page 129.
- Create the SQL Server database for the desired SQL server virtual server instance, and point the database files and transaction log to the new volumes created for them.
  Refer to the Microsoft SQL Server documentation for instructions.
- After creating the database, you may have additional steps to complete in the SQL Server configuration. Perform the desired steps depending on your configuration plans.
  See “Completing configuration steps in SQL Server” on page 161.
- If you have already configured the SQL Server service group, run the SQL Server 2008 Configuration Wizard again to modify the SQL Server service group. This allows the wizard to add storage agent resources for the new database, to the existing service group.
  See “Modifying a SQL 2008 service group to add VMDg and MountV resources” on page 181.

Note: You must run the SQL Server 2008 Configuration Wizard in the modify mode only if you create user-defined databases after creating the SQL Server 2008 service group.

Completing configuration steps in SQL Server

Depending on your configuration, you may have additional steps to complete in SQL Server.

If you plan to implement a disaster recovery configuration using Veritas Volume Replicator (VVR), Symantec recommends that you exclude the tempdb database from replication. To do this, you need to first move it to a separate volume within the system database disk group.

See "Moving the tempdb database if using VVR for disaster recovery" on page 161.

If you are running multiple SQL Server instances, you must assign a different port to each SQL Server instance.

See "Assigning ports for multiple SQL Server instances" on page 161.

Moving the tempdb database if using VVR for disaster recovery

If you plan to implement a disaster recovery configuration using VVR, Symantec recommends that you move tempdb to a separate volume within the system database disk group in order to be able to exclude it from replication.

If you have not yet created the volume for tempdb, you can do that now.

See "Creating volumes" on page 129.

Then, refer to the Microsoft SQL Server documentation for the instructions on moving the tempdb database.

Assigning ports for multiple SQL Server instances

If you are running multiple SQL Server instances, you must assign a different port to each named instance. You can assign static or dynamic ports. Refer to the Microsoft Knowledge Base for instructions on how to assign ports.

If you wish to change the port after configuring the SQL service group, you must perform the steps in the following order:

- Bring the SQL service group online or partially online (up to the registry replication resource) on a cluster node.
- On the node on which the SQL service group is online or partially online, change the port assigned to the SQL instance. Refer to the Microsoft SQL Server documentation for instructions.
- Take the SQL service group offline on the node, and then bring it online again. The configuration changes will be replicated to the remaining cluster nodes.

Chapter 8

Configuring SQL Server 2008 for failover

This chapter contains the following topics:

Configuring the VCS SQL Server 2008 service group

A VCS SQL Server service group is used to bring a SQL Server 2008 instance online on another node if the active node fails. If you have set up multiple cluster nodes, you specify the priority of the failover node while configuring the service group. You use the VCS SQL Server 2008 Configuration Wizard to configure the service group.

Read the following topics:

Service group requirements for Active-Active configurations

Note the following requirements for Active-Active configurations:

- For an Active-Active configuration, you must create a separate service group for each instance.
- Each service group that you create must have a unique service group name and virtual IP address.
- For an Active-Active configuration, when you specify the priority order of systems, reverse the order for each service group so that the active system and failover system are opposite for each instance. For example, if you have two instances and two systems, you would set the priority order as follows:

INSTANCE 1	Priority order:
	SYSTEM1
	SYSTEM2
INSTANCE2	Priority order:
	SYSTEM2
	SYSTEM1

Prerequisites for configuring the service group

Complete the following tasks before configuring the service group for a high availability cluster, campus cluster, or a Replicated Data Cluster:

- Verify that you have completed the steps in the high availability, campus cluster, or RDC workflows up through the step of installing SQL Server on all nodes.
  See the following topics as appropriate:
  - "High availability (HA) configuration (New Server)" on page 58
  - "High availability (HA) configuration (Existing Server)" on page 61
  - "VCS campus cluster configuration" on page 65
  - "VCS Replicated Data Cluster configuration" on page 68
- Verify that you have VCS Administrator privileges. This user classification is required to create and configure a service group.
- You must be a Local Administrator on the node where you run the wizard. If you wish to configure detail monitoring, you must be logged on as a Domain Administrator.
- Verify that the SQL Server 2008 instance is installed identically on all nodes that will participate in the service group.
- Verify that the drive containing the SQL Server 2008 system data files, registry replication information, and FILESTREAM enabled data objects is mounted on the node on which you are configuring the service group.
  See "About managing disk groups and volumes" on page 134.
- If you wish to configure high availability for FILESTREAM, ensure that FILESTREAM is configured for the SQL instance, and is enabled for the SQL instance on the node on which you run the wizard and disabled on all the remaining nodes. You can use the SQL Configuration Manager to enable FILESTREAM.
  Refer to the Microsoft SQL Server 2008 documentation for instructions.
- Assign a unique virtual IP address for the SQL Server 2008 instance. You specify this IP address when configuring the service group.
- If you wish to use a script for detail monitoring, for example, to create a table and write data to it, note the location(s) of the script to use. Either locate the script file in shared storage or ensure that the same file exists in the same location on all the cluster nodes. Detailed monitoring is often not necessary.
  See "Database monitoring options" on page 36.
  A sample script is supplied in

```
C:\Program Files\Veritas\cluster
server\bin\SQLServer2005\sample_script.sql
```

- If you have configured Windows Firewall, add the following to the Firewall Exceptions list:
  - Port 14150 or the VCS Command Server service, `%vcs_home%\bin\CmdServer.exe`.
    Here, *%vcs_home%* is the installation directory for VCS, typically `C:\Program Files\Veritas\Cluster Server`.
  - Port 14141
    For a detailed list of services and ports used by SFW HA, refer to the *Veritas Storage Foundation and High Availability Solutions for Windows Installation and Upgrade Guide*.
- Stop the SQL 2008 Server service for the SQL instance that you wish to configure the service group.

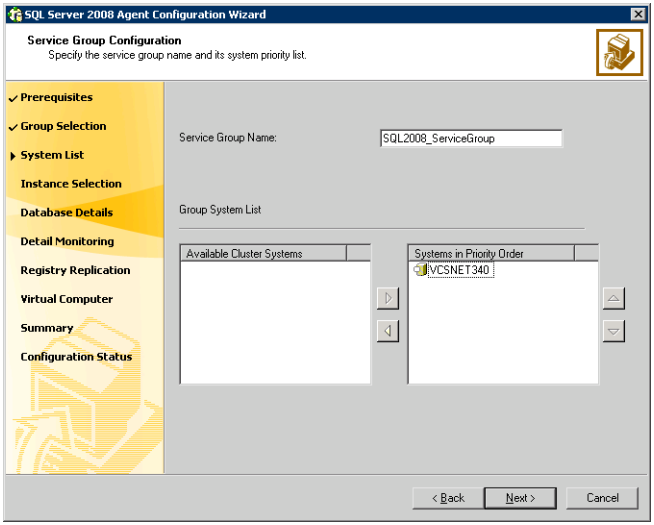
Creating the SQL Server 2008 service group

The VCS SQL Server 2008 Configuration Wizard enables you to create a SQL Server 2008 service group and define the attributes for its resources on all the nodes within the cluster simultaneously.

To create a SQL Server service group on the cluster

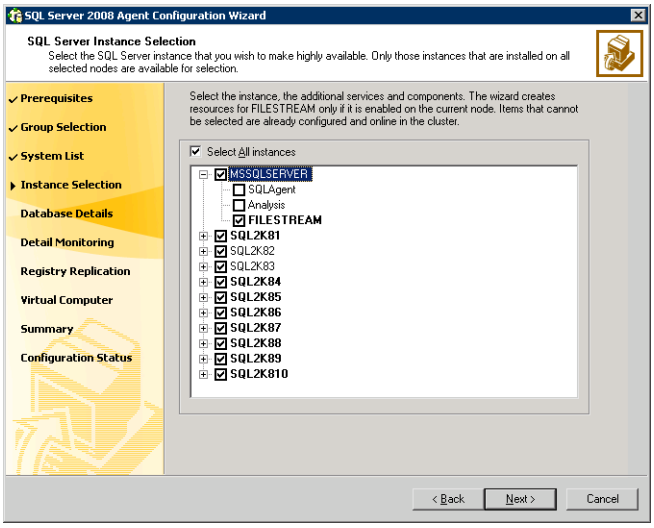
1. Ensure that you have stopped the SQL Server service for the instance.
2. Start the SQL Configuration Wizard from the Solutions Configuration Center or click **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > SQL Server 2008 Configuration Wizard**.
3. Review the prerequisites on the Welcome panel and then click **Next**.
4. On the Wizard Options panel, click **Create service group** and then click **Next**.

5 On the Service Group Configuration panel, specify the service group name and system list, as follows:



- In the Service Group Name field, specify a name for the SQL Server service group, for example, INST1_SG. If there are multiple instances, ensure that the name is unique within the cluster.
- In the Available Cluster Systems box, select the systems on which to configure the service group and click the right-arrow to move the systems to the Systems in Priority Order list.
- To change the priority of a system in the Systems in Priority Order list, select the system and click the up and down arrow icons. Arrange the systems in priority order as failover targets for the group. The server that needs to come online first must be at the top of the list.
  For an active/active configuration, ensure that the active and failover systems are set differently for each instance. For example, if the system priority for the first instance is SYSTEM1, then SYSTEM2, the system priority for the second instance should be SYSTEM2, then SYSTEM1.
- Click **Next**.

6 On the SQL Server Instance Selection panel, complete the following steps and then click **Next**:



- Select the SQL Server instance(s) that you wish to configure in the service group. The wizard displays only those instances that are installed on all the cluster nodes.
- If required, select the other services that you wish to make highly available. These options are available for selection only if the corresponding services are installed.

  Note that you can choose only one instance of the Analysis service per service group. If you have selected an instance of Analysis service, you must uncheck it before you can select another instance of the Analysis service.

  Note that services that are already configured and online in the cluster appear in bold and are not available for selection. You have to offline the service group and run the wizard in the modify mode to edit the service resources.
- Select SQLFILESTREAM if you wish to configure high availability for FILESTREAM enabled database objects. The wizard configures a resource only if FILESTREAM is enabled for the instance on the current node.

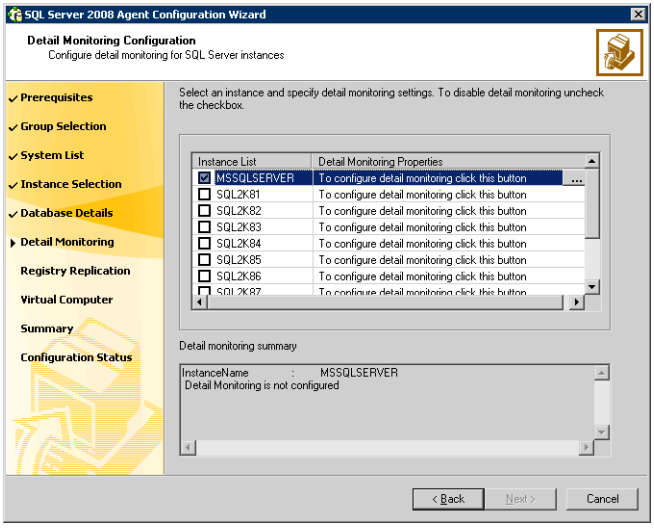
  Note that FILESTREAM option will not appear for selection if it is not enabled on the node.

7 On the User Databases List panel, view the summary of the databases for the selected instance and then click **Next**.

In case of multiple instances, select the required instance from the SQL Instance dropdown list. The panel displays the databases and the respective files for which the wizard configures resources. Click a database name to view its database files.

Databases that appear with a red cross indicate that the wizard does not configure the storage agent resources for those items. These databases either do not reside on shared storage or the wizard is unable to locate them. If you wish to configure resources for these databases, ensure that the database are located on shared storage and then run the wizard again.

8 On the Detail Monitoring Configuration panel, configure detail monitoring for the SQL server instances. This step is optional. If you do not want to configure detail monitoring, click **Next** and proceed to the next step.



Perform the following steps only if you wish to configure detail monitoring for an instance:

- Check the check box for a SQL instance, and then click the button from the Detail Monitoring Properties column to specify the detail monitoring settings.

  Clear the check box to disable detail monitoring for the instance.

- On the Detail Monitor configuration dialog box, specify the monitoring interval in the **Detail monitoring interval** field.

This sets the value for the DetailMonitoringInterval attribute of the SQL agent. It indicates the number of online monitor cycles that the agent must wait before performing detail monitoring. The default value is 5. Symantec recommends that you set the monitoring interval between 1 and 12.

- Select **DBList Detail Monitoring** and then choose the databases from the list of databases available for the instance. The selected databases populate the DBList attribute of the SQL agent. In this mode of detail monitoring the agent monitors the health of the databases by connecting to those databases. The agent monitors only the databases specified in the DBList attribute.
- Select **SQLFile Detail Monitoring** if you wish to use a script to monitor SQL databases. In this mode of detail monitoring, the agent executes the script that you specify for detail monitoring.
- Specify the fully qualified user name and the password for connecting to the SQL Server database. Make sure that the user has SQL Server logon permissions.
- Select **Global** or **Per System** depending on whether the monitoring script location is the same for all the nodes or is unique for each cluster node, and then specify the path of the script appropriately.
- Check **Fail over service group if detail monitoring fails** check box, if not already checked. This allows the SQL agent to fail over the service group to another node if the detail monitoring fails.
- Click **Apply**.
- Repeat these steps for each SQL instance that you wish to configure detail monitoring for, and then click **Next**.

9 On the Registry Replication Path panel, specify the mount path to the registry replication volume (INST1_REGREP_VOL) and click **Next**.
Symantec recommends that RegRep resources and SQL data be in separate volumes.

10 On the Virtual Server Configuration panel, configure the virtual server as follows:

- Enter the virtual name for the server, for example `INST1-VS`. Ensure that the virtual server name you enter is unique in the cluster. It is the same as the virtual server name specified when setting the internal name of the clustered instance.
- Enter a unique virtual IP address that is currently not being used on your network, but is in the same subnet as the current node.
- Enter the subnet mask to which the virtual IP address belongs.

- For each system in the cluster, select the public network adapter name. Select the **Adapter Display Name** field to view the adapters associated with a system.

  The wizard displays all TCP/IP enabled adapters on a system, including the private network adapters, if they are TCP/IP enabled. Make sure that you select the adapters to be assigned to the public network, and not those assigned to the private network.

  If you require a computer object to be created in the Active Directory (AD), click **Advanced Settings**, check the **Active Directory Update Required** checkbox, specify the desired Organizational Unit in the domain and then click **OK**.

  This sets the Lanman resource attributes ADUpdateRequired and ADCriticalForOnline to true. This allows the Lanman agent to update Active Directory with the SQL virtual server name.

  You can type the OU details in the format "CN=Computers,DC=domainname,DC=com". If you wish to search for the OU, click the ellipsis button and specify the search criteria in the Windows "Find Organizational Units" dialog box.
- Click **Next**.

11 In the Service Group Summary panel, review the service group configuration and then click **Next**.

   The Resources box lists the configured resources. The wizard assigns unique names to resources based on their respective name rules. Click a resource to view its attributes and their configured values in the Attributes box. Optionally, if desired, change the names of the resources as follows:

   - To edit a resource name, click the resource name or press the **F2** key. Press the **Enter** key after editing each resource name.
   - To cancel editing a resource name, press the **Esc** key.

12 Click **Yes** when prompted that the wizard will modify the configuration. The wizard begins to create the service group. Various messages indicate the status of the commands.

13 Check **Bring the service group online** checkbox if you want to bring the service group online and then click **Finish**.

   You may want to review the service group configuration in the Cluster Manager (Java Console) before bringing the service group online. You can use the Cluster Manager to bring the service group online later.

   The wizard marks all the resources in the service group as CRITICAL. If desired, use Cluster Manager (Java Console) or the command line to change the state.

If you have created a new SQL Server database, you must modify the SQL Server service group to add VMDg and MountV resources to the service group by running the SQL Server Configuration Wizard.
See "Modifying a SQL 2008 service group to add VMDg and MountV resources" on page 181.

Verifying the SQL Server 2008 cluster configuration

Failover simulation is an important part of configuration testing.

To verify the configuration of a cluster, either move the online groups, or shut down an active cluster node.

- Use Veritas Cluster Manager (Java Console) to switch all the service groups from one node to another.
- Simulate a local cluster failover by shutting down an active cluster node.

To switch service groups

1. In the Veritas Cluster Manager (Java Console), click the cluster in the configuration tree, click the Service Groups tab, and right-click the service group icon in the view panel.
   - Click **Switch To**, and click the appropriate node from the menu.
   - In the dialog box, click **Yes.** The service group you selected is taken offline on the original node and brought online on the node you selected.
     If there is more than one service group, you must repeat this step until all the service groups are switched.
2. Verify that the service group is online on the node you selected to switch to in step 1.
3. To move all the resources back to the original node, repeat step 1 for each of the service groups.

To shut down an active cluster node

1. Gracefully shut down or restart the cluster node where the service group is online.
2. In the Veritas Cluster Manager (Java Console) on another node, connect to the cluster.
3. Verify that the service group has failed over successfully, and is online on the next node in the system list.
4. If you need to move all the service groups back to the original node:

- Restart the node you shut down in step 1.
- Click **Switch To**, and click the appropriate node from the menu.
- In the dialog box, click **Yes.**
  The service group you selected is taken offline and brought online on the node that you selected.

Configuring an MSDTC Server service group

MSDTC is a global resource and can be accessed by more than one SQL Server service group. Symantec recommends that you configure one MSDTC service group in a VCS cluster.

To configure high availability for MSDTC Server, you first use the SQL Server Configuration Wizard (not the SQL Server 2008 Configuration Wizard) to create a service group for the MSDTC Server and then configure the MSDTC client manually.

Note: You have to use the SQL Server Configuration Wizard to configure the MSDTC Server service group. You cannot use the SQL Server 2008 Configuration Wizard to perform this task.

Prerequisites for MSDTC configuration

Review the following prerequisites before creating and configuring the MSDTC service group:

- Verify that the MSDTC service is installed on all nodes that will participate in the MSDTC service group.
- You must be a Cluster Administrator. This user classification is required to create and configure a service group.
- You must be a Local Administrator on the node where you run the wizard.
- Verify that the VCS Database Agent for SQL Server 2008 is installed on all cluster nodes.
- Verify that the VCS cluster is configured using the VCS Cluster Configuration Wizard (VCW).
- Verify that the drives containing the MSDTC logs and registry replication directory are mounted on the node on which you are configuring the service group and unmounted on all other nodes.
- Assign a unique virtual server name and virtual IP address for the MSDTC Server.

- Verify that the Microsoft Distributed Transaction Coordinator (MSDTC) service is stopped.

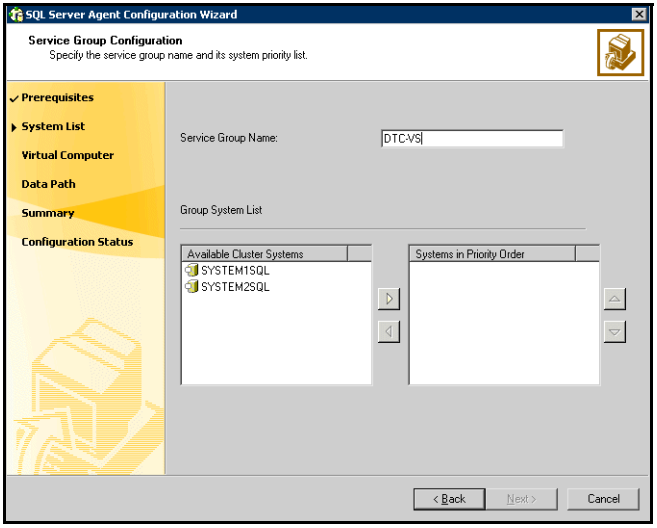
Creating an MSDTC Server service group

Use the SQL Server Configuration Wizard (not the SQL Server 2008 Configuration Wizard) to configure a service group for the MSDTC Server. After configuring the service group, proceed to configuring the MSDTC client.

Note: You have to use the SQL Server Configuration Wizard to configure the MSDTC Server service group. You cannot use the SQL Server 2008 Configuration Wizard to perform this task.

To configure an MSDTC service group

1. Start the SQL Server Configuration Wizard from the Solutions Configuration Center or click **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > SQL Server Configuration Wizard**.
2. On the SQL Configuration Option panel, click **MSDTC Server - Service Group Configuration**, click **Create** and then click **Next**.
3. Review and verify that you have met the prerequisites and then click **Next**.
4. On the Service Group Configuration panel, specify the service group name and the system list, as follows:

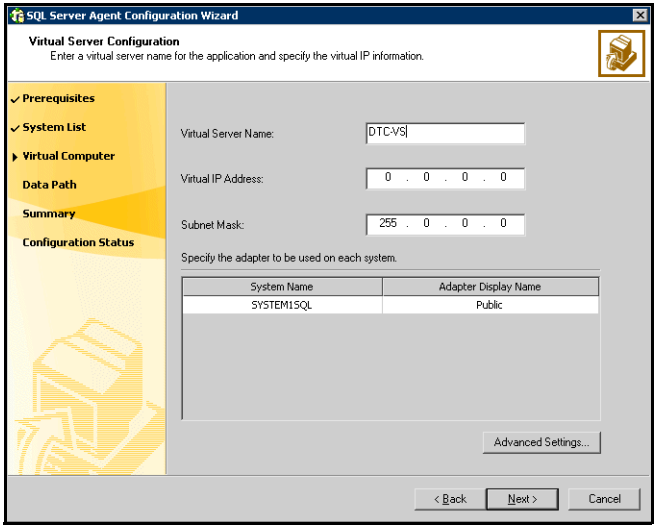


- Enter a name for MSDTC service group.

- In the Available Cluster Systems box, select the systems on which to configure the service group and click the right-arrow to move the systems to the service group's system list. Make sure you select the systems that are not in the SystemList attribute for an Exchange service group that may be configured in the cluster.
- To change a system's priority, in the Systems in Priority Order list, select the system and click the up and down arrows. Arrange the systems in priority order as failover targets for the group. The server that needs to come online first must be at the top of the list.
- Click **Next**.

  If the configuration is in read-only mode, the wizard prompts you before changing it to read-write mode. The wizard starts validating your configuration. Various messages indicate the validation status.

5 On the Virtual Server Configuration panel, specify the virtual server details as follows:



- Enter a virtual server name for the node on which the DTC service is running. Ensure that the virtual server name you enter is unique in the cluster.
- Enter a unique virtual IP address for the MSDTC server.
- Enter the subnet mask to which the virtual IP address belongs.
- For each system in the cluster, select the public network adapter name. Click the **Adapter Display Name** field to view the adapters associated with a system.

The wizard displays all TCP/IP enabled adapters on a system, including the private network adapters, if they are TCP/IP enabled. Make sure that you select the adapters to be assigned to the public network, and not those assigned to the private network.

- If you require a computer object to be created in the Active Directory, click **Advanced Settings**, check the **Active Directory Update Required** checkbox, and select the Organizational Unit from the drop down list.
  This sets the Lanman resource attributes ADUpdateRequired and ADCriticalForOnline to true. It allows the Lanman agent to update the Active Directory with the virtual server name.
- Click **Next**.

6 On the Specify Data Path panel, specify the volumes for MSDTC log and the replication directory and then click **Next**.
Symantec recommends using different paths for these directories. If the directory does not exist, the wizard creates it.

7 On the Service Group Summary panel, review the service group configuration, change the resource names if desired, and then click **Next**.

- The Resources box lists the configured resources. Click on a resource to view its attributes and their configured values in the Attributes box.
- The wizard assigns unique names to resources. Change names of the resources, if desired. To edit a resource name, select the resource name and either click it or press the **F2** key. Press **Enter** after editing each resource name. To cancel editing a resource name, press **Esc**.

8 Click **Yes** on the message that prompts you that the wizard will run commands to modify the service group configuration.
Various messages indicate the status of these commands.

9 In the Configuration Complete panel, check **Bring the service group online** to bring the configured service group online and then click **Finish** to exit the wizard.
To bring the service group online later, uncheck the option.

About configuring the MSDTC client

Configure the MSDTC client after configuring the service group for the MSDTC Server. Set the MSDTC client to run on nodes where a SQL instance is configured to run and the MSDTC server is not configured to run. In general, you must configure the MSDTC client on all nodes except the nodes on which the MSDTC Server is configured. You do not need to configure the MSDTC client on the nodes that are part of the MSDTC service group.

The MSDTC client and the MSDTC Server must not run on the same cluster nodes.

Note: You have to configure the MSDTC client manually. You cannot use the SQL Server Configuration Wizard to configure the MSDTC client.

Procedures for Windows 2003 and Windows 2008 are different. Follow the appropriate procedure depending on the operating system.

Configuring MSDTC client on Windows 2003

Complete the MSDTC client and security configuration on Windows 2003 systems as described below.

To configure an MSDTC client on Windows 2003

1. Ensure that the MSDTC service group is online.
2. Launch the Windows Component Services Administrative tool.
   Click **Start > Programs > Administrative Tools > Component Services**
   or
   Click **Start > Run**, type **dcomcnfg** and click **OK**.
3. In the console tree of the Component Services administrative tool, expand **Component Services > Computers**, right-click **My Computer** and then click **Properties**.
4. On the MSDTC tab perform the following steps:
   - Clear the **Use local coordinator** check box.
   - In the Remote Host field, specify the virtual server name that you specified while creating the MSDTC Server service group.
     If you are unsure of the exact name, click **Select** to search from a list of all computers on the network and select the virtual computer name from the list.
   - Click **Security Configuration**.

- On the Security Configuration dialog box, check **Network DTC Access**, **Allow Remote Clients**, **Allow Remote Administration**, **Allow Inbound** and **Allow Outbound** check boxes, and then click **OK**.
- Click **Apply** and then click **OK**.

Configuring MSDTC client on Windows 2008

Complete the MSDTC client and security configuration on Windows 2008 systems as described below.

To configure an MSDTC client on Windows 2008

1. Ensure that the MSDTC service group is online.
2. Launch the Windows Component Services Administrative tool.
   Click **Start | All Programs | Administrative Tools | Component Services**
   or
   Click **Start | Run**, type **dcomcnfg** and click **OK**.
3. In the console tree of the Component Services administrative tool, expand **Component Services > Computers**, right-click **My Computer** and then click **Properties**.
4. On the MSDTC tab, perform the following steps:
   - Clear the **Use local coordinator** check box.
   - In the Remote Host field, specify the virtual server name that you specified while creating the MSDTC Server service group.
     If you are unsure of the exact name, click **Select** to search from a list of all computers on the network and select the virtual computer name from the list.
   - Click **Apply** and then click **OK**.
5. In the console tree of the Component Services administrative tool, expand **My Computer > Distributed Transaction Coordinator**, right-click **Local DTC** and then click **Properties**.
6. On the Security tab, perform the following steps:
   - Check **Network DTC Access**, **Allow Remote Clients**, **Allow Remote Administration**, **Allow Inbound** and **Allow Outbound** check boxes.
   - Click **Apply** and then click **OK**.

About using the virtual MMC viewer

VCS starts the MSDTC service in the cluster under the context of the virtual server. Because the MMC snap-in is not aware of such a configuration, it is not possible to view the transactions on the DTC virtual server from a node where the MSDTC resource is online, in case of Windows 2003 systems. VCS provides a virtual MMC viewer that enables you to view the distributed transaction statistics on the DTC virtual server from a node where the MSDTC resource is online. You have to use the virtual MMC viewer only on Windows 2003 systems.

Viewing DTC transaction information

In cases where a communication line fails or a distributed transaction application leaves unresolved transactions, you might want to view transaction lists and statistics, control which transactions are displayed, set transaction time-out periods, and control how often transactions are updated. The following steps describe how to view the DTC transactions information.

Prerequisites for viewing DTC transaction information are as follows:

- An MSDTC service group must be configured and online in the cluster.
- MSDTC client must be configured on the nodes on which you wish to view the transactions.
- For Windows 2003 systems, the MSDTC service group must be online on the node where the virtual MMC viewer will be run.

To view transactions from a node where MSDTC resource is online

1. Run the virtual DTC viewer. Type the following on the command prompt:
   ```
   C:\>VCSVMMCView.exe -target MSDTC -u <username> - -p <password>
   -d <domain> -t <domain type>
   ```
   Running the Virtual DTC viewer will restart the COM+ services.
   The Component Services MMC snap-in is launched.
2. In the console tree of the Component Services administrative tool, expand **Component Services > Computers > My Computer > Distributed Transaction Coordinator > Local DTC**.
3. Click **Transaction List** to view all transactions, their status, and their identifiers. Right-click a transaction and click **View > Properties** to list the parent transaction and its children.
4. Click **Transaction Statistics** to view statistical information about the transactions in which a server participated.
   You can use transaction statistics to get an overview of DTC performance.
   Refer to the Microsoft documentation for further information.

The following steps describe how to view DTC transactions from nodes that are not part of the MSDTC Server service group.

To view transactions from any node in the domain

1. Launch the Windows Component Services Administrative tool.
   Click **Start > Programs > Administrative Tools > Component Services**
   or
   Click **Start > Run**, type **dcomcnfg** and click **OK**.
2. In the console tree of the Component Services administrative tool, double-click **Component Services**, right-click **Computers**, click **New > Computer**.
3. In the Add Computer dialog box, specify the virtual server name that you specified while creating the MSDTC Server service group. If you are unsure of the exact name, click **Browse** to search from a list of all computers on the network and select the virtual computer name from the list.
4. Click **OK**. The virtual computer entry is added to the Computers container.
5. Expand the newly added virtual computer entry and double-click **Distributed Transaction Coordinator**.
6. Click **Transaction List** to view all transactions, their status, and their identifiers. Right-click a transaction and click **View > Properties** to list the parent transaction and its children.
7. Click **Transaction Statistics** to view statistical information about the transactions in which a server participated.
   You can use transaction statistics to get an overview of DTC performance. Refer to the Microsoft documentation for further information.

Modifying a SQL 2008 service group to add VMDg and MountV resources

If you create a new SQL Server database after you have created the SQL Server service group, you must rerun the SQL Server 2008 Configuration Wizard to modify the service group. This allows the wizard to add VMDg and MountV resources for the new databases, to the existing SQL Server 2008 service group.

You must run the wizard in the modify mode even if you have added or changed volumes in your existing configuration. This allows the wizard to make the necessary changes to the SQL Server service group.

Ensure the following before running the SQL Server 2008 Configuration Wizard to add the VMDg and MountV resources:

- Make sure the volumes for the user database and transaction logs are mounted on the node.

To add VMDg and MountV resources using the SQL Server 2008 Configuration Wizard

1. Start the SQL Server Configuration Wizard from the Solutions Configuration Center or click **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > SQL Server Configuration Wizard**.

1. Start the SQL Server 2008 Configuration Wizard from the Solutions Configuration Center or click **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > SQL Server 2008 Configuration Wizard**.

2. Review the Prerequisites page and click **Next**.

3. On the Wizard Options panel, click Modify service group, select the service group, and then click **Next**.

4. Click **Yes** on the message informing you that the service is not completely offline. No adverse consequences are implied.

5. In the Service Group Configuration page, click **Next**.

6. In the SQL Server Instance Selection page, make sure the correct instance of SQL Server is selected and click **Next**.

7. In the User Databases List page, make sure the databases are shown with correct paths and click **Next**. Databases that are marked with a red cross will not contain MountV resources.

8. If a database is not configured correctly, a warning appears indicating potential problems. Click **OK** to continue.

9 In the Detail Monitoring and succeeding pages, review the information and click **Next** to continue.

10 Click **Yes** to continue when a message indicates the configuration will be modified.

11 Click **Finish** to exit the wizard.

If desired, use Cluster Manager (Java Console) or the command line to change the state.

Determining additional steps needed

This completes the high availability configuration steps for SQL Server 2008. Depending on the configuration being deployed, there are additional steps that you must perform to set up and complete the configuration.

Table 8-1 on page 182 contains a list of references to the chapters that describe configuration specific tasks in detail. Proceed to the desired chapter depending on the desired configuration.

You must perform the configuration specific tasks only after you complete the high availability steps mentioned in this and the earlier chapters.

Table 8-1 Additional SQL Server 2008 configuration steps

Tasks	Refer to
	Deployment
Setting up a campus cluster configuration for SQL Server	"Configuring campus clusters for SQL Server 2008" on page 183
Setting up a replicated data cluster configuration for SQL Server	"Configuring Replicated Data Clusters for SQL Server 2008" on page 187
Setting up a disaster recovery configuration for SQL Server	"Configuring disaster recovery for SQL Server 2008" on page 241
Configuring and running a fire drill for SQL Server configuration	"Testing fault readiness by running a fire drill" on page 297

Chapter 9

Configuring campus clusters for SQL Server 2008

This chapter covers the following topics:

Tasks for configuring campus clusters

In campus clusters you begin by configuring a high availability cluster and then continue with the steps specific to the campus cluster configuration.

Refer to the campus cluster configuration workflow table for a complete list of configuration steps.

See "VCS campus cluster configuration" on page 65.

Table 9-1 shows the steps specific to the campus cluster configuration that are done after configuring high availability on the nodes.

Table 9-1 Completing campus cluster configuration

Action	Description
Modify the IP resource in the SQL Server 2008 service group	Modify the IP resource in the SQL Server 2008 service group. See "Modifying the IP resource in the SQL Server 2008 service group" on page 184.
Verify the campus cluster configuration	Verify that failover occurs between the nodes. See "Verifying the campus cluster: Switching the service group" on page 185.
Set the ForceImport attribute	In case of a site failure, you may have to set the ForceImport attribute to ensure proper failover. See "Setting the ForceImport attribute to 1 after a site failure" on page 186.

Modifying the IP resource in the SQL Server 2008 service group

Note: This procedure is only applicable to a campus cluster with sites in different subnets.

Use the Java Console to modify the Address and SubNetMask attributes of the IP resource in the SQL Server 2008 service group.

To modify the IP resource

1 From the Cluster Explorer configuration tree, select the IP resource in the SQL Server 2008 service group.

2 In the Properties View, click the **Edit** icon for the **Address** attribute.

3 In the Edit Attribute dialog box:
- Select the **Per System** option.
- Select the system at Site B.
- Enter the virtual IP address at Site B.
- Click **OK**.

4 In the Properties View, click the **Edit** icon for the **SubNetMask** attribute.

5 In the Edit Attribute dialog box:
- Select the **Per System** option.
- Select the system at Site B.
- Enter the subnet mask at Site B.
- Click **OK**.

6 From the **File** menu of Cluster Explorer, click **Close Configuration**.

Verifying the campus cluster: Switching the service group

Failover simulation is an important part of configuration testing.

To verify the campus cluster is functioning properly

1 Bring the service group online on one node:
- In the Cluster Explorer configuration tree, right-click the service group.
- Click **Online**, and click the appropriate system from the menu.

2 Switch the service group to the other node:
- In the Cluster Explorer configuration tree, right-click the service group.
- Click **Switch To**, and click the appropriate system from the menu.

Setting the ForceImport attribute to 1 after a site failure

ForceImport is a flag that defines whether the agent forcibly imports the disk group when exactly half the disks are available. The value 1 indicates the agent imports the configured disk group when half the disks are available. The value 0 indicates it does not. Default is 0. This means that the disk group will be imported only when SFW acquires control over the majority of the disks.

Caution: Set this attribute to 1 only after verifying the integrity of your data. If due caution is not exercised before setting this attribute to 1, you risk potential data loss.

You must set the ForceImport attribute for the VMDg resource to 1 after a site failure to ensure proper failover.

To set the ForceImport attribute to 1 from the Java Console

1. From the Cluster Explorer configuration tree, select the VMDg resource in the SQL Server 2008 service group.
2. In the Properties View, click the **Edit** icon for the **ForceImport** attribute.
3. In the Edit Attribute dialog box:
   - Select the **Per System** option.
   - Select the system in Site B.
   - Select the **ForceImport** check box.
   - Click **OK**.
4. From the **File** menu of Cluster Explorer, click **Close Configuration**.
5. After the failover takes place, revert the ForceImport attribute to its original value.

You can also set the ForceImport attribute value using the command line. The command for implementing the force import setting in VCS is:

```
hares -modify <vmdg_resource_name> ForceImport 1|0
```

Example:

```
hares -modify vmdg_Dg1 ForceImport 1
```

Import is forced on vmdg_Dg1.

Chapter 10

Configuring Replicated Data Clusters for SQL Server 2008

This chapter contains the following topics:

Tasks for configuring Replicated Data Clusters

For a Replicated Data Cluster (RDC) you begin by configuring a high availability cluster on the primary zone systems.

You then continue with the steps specific to the RDC configuration.

For the complete RDC configuration workflow see "VCS Replicated Data Cluster configuration" on page 68.

Table 10-1 shows the steps specific to the RDC configuration that are done after configuring high availability on the primary zone.

Table 10-1 Completing the configuration of a Replicated Data Cluster

Action	Description
Create the primary system zone	■ Create the primary system zone ■ Add the nodes to the primary zone See "Creating the primary system zone" on page 190.
Verify failover within the primary zone	■ See "Verifying the SQL Server 2008 cluster configuration" on page 172.
Create a parallel environment in the secondary zone	■ Install SFW HA on the systems in the secondary zone ■ Configure disk groups and volumes using the same names as on the primary zone ■ Install SQL Server following the prerequisites and guidelines for installing on the second zone. See "Creating a parallel environment in the secondary zone" on page 191.
Add the secondary zone systems to the cluster	■ Add the secondary zone systems to the cluster. See "Adding the systems in the secondary zone to the cluster" on page 192.
Set up security for VVR on all cluster nodes	Set up security for VVR on all nodes in both zones. This step can be done at any time after installing SFW HA on all cluster nodes, but must be done before configuring VVR replication. See "Setting up security for VVR" on page 200.
Set up the Replicated Data Set	■ Use the Setup Replicated Data Set Wizard to create RDS and start replication for the primary and secondary zones See "Setting up the Replicated Data Sets (RDS)" on page 203.

Table 10-1 Completing the configuration of a Replicated Data Cluster

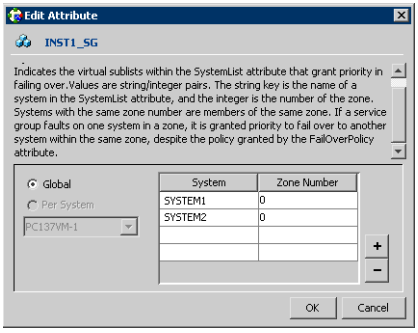
Action	Description
Configure a hybrid RVG service group	■ Create a hybrid Replicated Volume Group (RVG) service group ■ Configure the hybrid RVG service group See "Configuring a hybrid RVG service group for replication" on page 214.
Set a dependency between the service groups	■ Set up a dependency from the RVG Service Group to the SQL Server Service Group See "Setting a dependency between the service groups" on page 230.
Add the nodes from the secondary zone to the RDC	■ Add the nodes from the secondary zone to the RVG service group ■ Configure the IP resources for failover ■ Add the nodes from the secondary zone to the SQL Server service group See "Adding the nodes from the secondary zone to the RDC" on page 231.
Verify the RDC configuration	■ Verify that failover occurs first within zones and then from the primary to the secondary zone See "Verifying the RDC configuration" on page 237.

Creating the primary system zone

In the service group, set up systems in the primary zone (zone 0) to specify that initial failover occurs to systems within the primary zone.

To set up the primary system zone

1. From VCS Cluster Manager (Java Console), log on to the cluster.
2. Select the SQL Server service group (INST1_SG) in the left pane and the Properties tab in the right pane.
3. In the Properties pane, click the button **Show All Attributes**.
4. In the Attributes View, scroll down and select the **SystemZones** attribute.
5. Click the **Edit** icon for the **SystemZones** attribute.
6. In the Edit Attribute dialog box, click the plus sign and enter the systems and the zone number (zone 0) for the primary zone. Make sure you specify the systems in uppercase.



7. Click **OK**.
8. After setting up the primary system zone, you can verify failover within the primary zone.
   See “Verifying the SQL Server 2008 cluster configuration” on page 172.

Creating a parallel environment in the secondary zone

After setting up a SFW HA environment in the primary zone, you set up a parallel environment in the secondary zone.

Before you begin to configure the secondary zone, do the following:

- Offline the following resources in the SQL service group in the primary zone:
  - SQL Server resource (*<sqlservicegroupname>* - SQLServer2008)
  - SQL Virtual Server name resource (*<sqlservicegroupname>* - Lanman)
  - SQL Virtual IP resource (*<sqlservicegroupname>* - IP)

  The remaining resources should be online, including the VMDg resources and the MountV resources.
- In VEA, make sure to remove all the drive letters from the configured volumes, to avoid conflicts when configuring the zones.

Then complete the following tasks to configure the secondary zone, using the guidelines shown:

- "Configuring the storage hardware and network" on page 112
- "Installing Veritas Storage Foundation HA for Windows" on page 115
- "Configuring cluster disk groups and volumes for SQL Server 2008" on page 121

  During the creation of disk groups and volumes for the secondary zone, make sure the following is exactly the same as the cluster at the primary zone:
  - Cluster disk group name
  - Volume sizes
  - Volume names
  - Drive letters
- "Installing and configuring SQL Server 2008 on the first cluster node" on page 157

  When installing SQL Server make sure that you select the same installation options as you did for the primary zone. The instance name must be the same in the primary zone and secondary zone
- "Installing and configuring SQL Server 2008 on the second cluster node" on page 158

  After you install SQL Server 2008 on the nodes in the secondary zone, make sure to use VEA to remove all the drive letters from the configured volumes.

You do not create another cluster in the secondary zone. Instead you add the systems to the existing cluster.

See "Adding the systems in the secondary zone to the cluster" on page 192.

You do not create another SQL service group in the secondary zone. You continue with the remaining VVR configuration tasks, during which the secondary zone nodes will be added to the SQL service group.

For the complete RDC workflow, see"VCS Replicated Data Cluster configuration" on page 68.

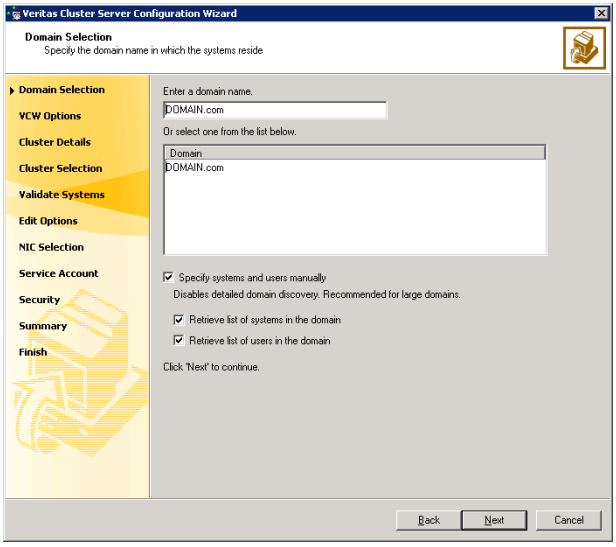
Adding the systems in the secondary zone to the cluster

Add the nodes in the secondary zone to the existing cluster with the following procedure.

To add a node to a VCS cluster

1. Start the VCS Cluster Configuration wizard.
   Click **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > Cluster Configuration Wizard**.
   Run the wizard from the node to be added or from a node in the cluster. The node that is being added should be part of the domain to which the cluster belongs.
2. Read the information on the Welcome panel and click **Next**.
3. On the Configuration Options panel, click **Cluster Operations** and click **Next**.

4 In the Domain Selection panel, select or type the name of the domain in which the cluster resides and select the discovery options.



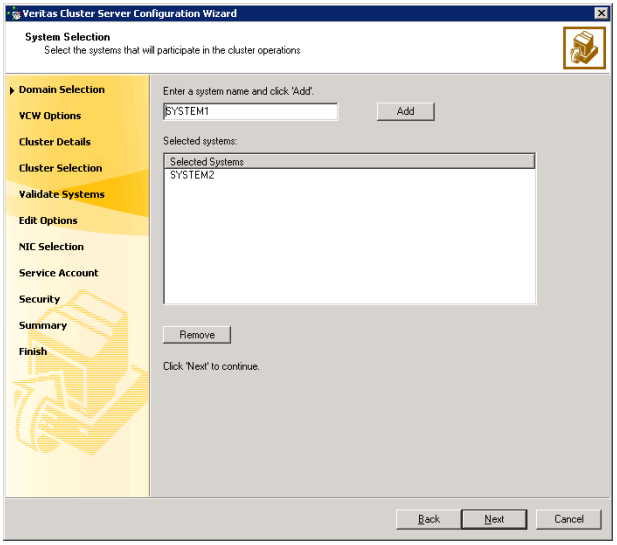
To discover information about all the systems and users in the domain:

- Clear the **Specify systems and users manually** check box.
- Click **Next**.
  Proceed to step 8 on page 196.

To specify systems and user names manually (recommended for large domains):

- Check the **Specify systems and users manually** check box.
  Additionally, you may instruct the wizard to retrieve a list of systems and users in the domain by selecting appropriate check boxes.
- Click **Next**.
  If you chose to retrieve the list of systems, proceed to step 6 on page 195. Otherwise proceed to the next step.

5 On the System Selection panel, complete the following and click **Next**.

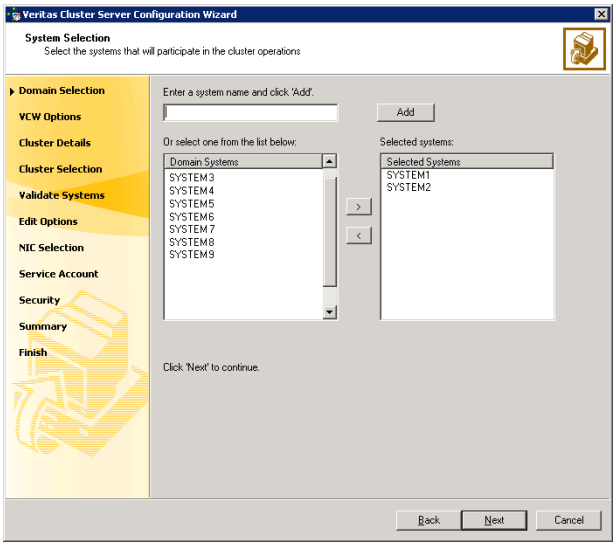


- Type the name of a node in the cluster and click **Add**.
- Type the name of the system to be added to the cluster and click **Add**.

If you specify only one node of an existing cluster, the wizard discovers all nodes for that cluster. To add a node to an existing cluster, you must specify a minimum of two nodes; one that is already a part of a cluster and the other that is to be added to the cluster.

Proceed to step 8 on page 196.

6 On the System Selection panel, specify the systems to be added and the nodes for the cluster to which you are adding the systems.



Enter the system name and click **Add** to add the system to the **Selected Systems** list. Alternatively, you can select the systems from the **Domain Systems** list and click the right-arrow icon.

If you specify only one node of an existing cluster, the wizard discovers all nodes for that cluster. To add a node to an existing cluster, you must specify a minimum of two nodes; one that is already a part of a cluster and the other that is to be added to the cluster.

7 The System Report panel displays the validation status, whether *Accepted* or *Rejected*, of all the systems you specified earlier.

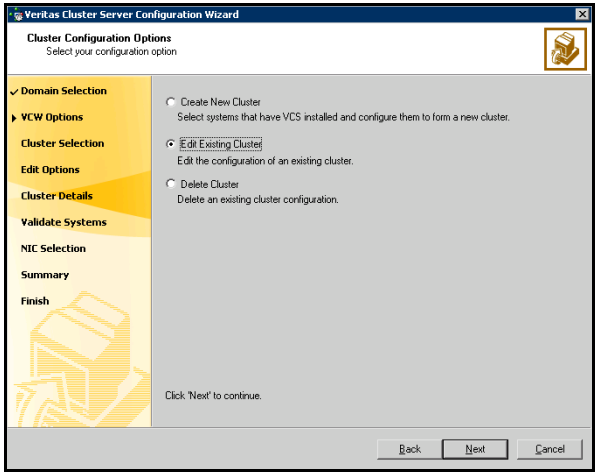
A system can be rejected for any of the following reasons:

- System is not pingable.
- WMI access is disabled on the system.
- Wizard is unable to retrieve the system architecture or operating system.
- VCS is either not installed on the system or the version of VCS is different from what is installed on the system on which you are running the wizard.

Click on a system name to see the validation details. If you wish to include a rejected system, rectify the error based on the reason for rejection and then run the wizard again.

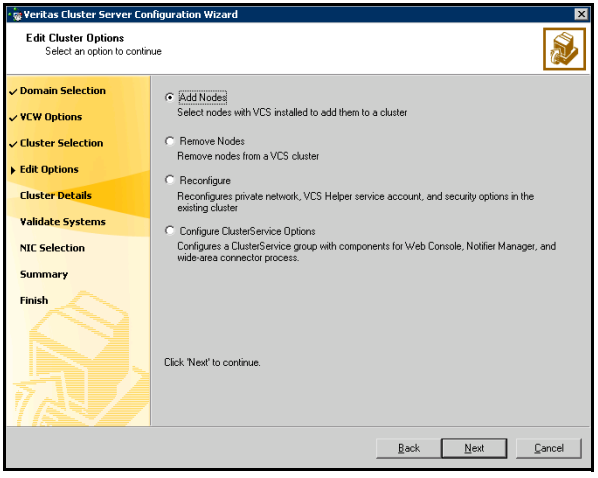
Click **Next** to proceed.

8 On the Cluster Configuration Options panel, click **Edit Existing Cluster** and click **Next**.



9 On the Cluster Selection panel, select the cluster to be edited and click **Next**. If you chose to specify the systems manually in step 4, only the clusters configured with the specified systems are displayed.

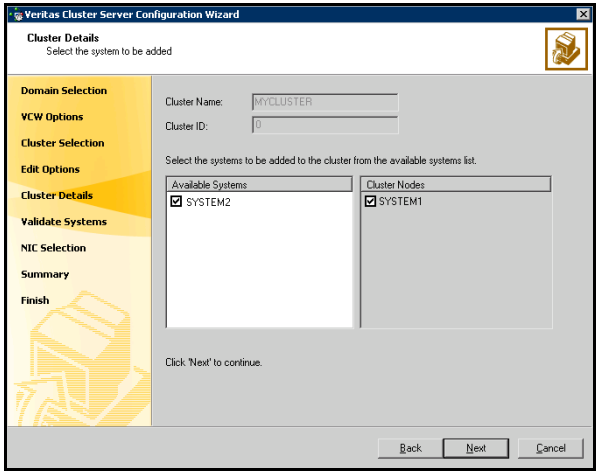
10 On the Edit Cluster Options panel, click **Add Nodes** and click **Next**.



In the Cluster User Information dialog box, type the user name and password for a user with administrative privileges to the cluster and click **OK**.

The Cluster User Information dialog box appears only when you add a node to a cluster with VCS user privileges (a cluster that is not a secure cluster).

11 On the Cluster Details panel, check the check boxes next to the systems to be added to the cluster and click **Next**.



The right pane lists nodes that are part of the cluster. The left pane lists systems that can be added to the cluster.

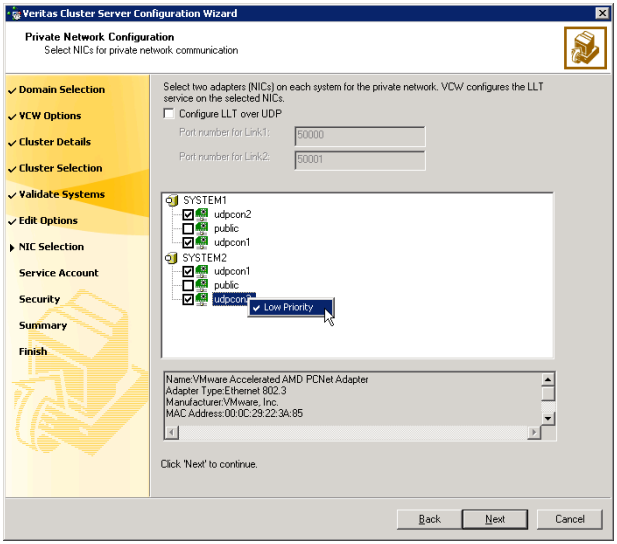
12 The wizard validates the selected systems for cluster membership. After the nodes have been validated, click **Next**.

If a node does not get validated, review the message associated with the failure and restart the wizard after rectifying the problem.

13 On the Private Network Configuration panel, configure the VCS private network communication on each system being added and then click **Next**. How you configure the VCS private network communication depends on how it is configured in the cluster. If LLT is configured over Ethernet, you have to use the same on the nodes being added. Similarly, if LLT is configured over UDP in the cluster, you have use the same on the nodes being added.

Do one of the following:

- To configure the VCS private network over Ethernet



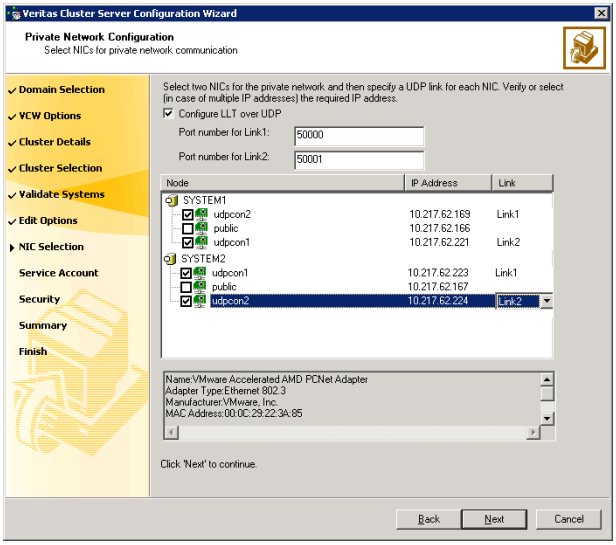
  - Select the check boxes next to the two NICs to be assigned to the private network.

    Symantec recommends reserving two NICs exclusively for the private network. However, you could lower the priority of one NIC and use the low-priority NIC for public and private communication.
  - If you have only two NICs on a selected system, it is recommended that you lower the priority of at least one NIC that will be used for private as well as public network communication.

    To lower the priority of a NIC, right-click the NIC and select **Low Priority** from the pop-up menu.
  - If your configuration contains teamed NICs, the wizard groups them as "NIC Group #N" where "N" is a number assigned to the teamed NIC. A teamed NIC is a logical NIC, formed by grouping several physical NICs together. All NICs in a team have an identical MAC address. Symantec recommends that you do not select teamed NICs for the private network.

The wizard will configure the LLT service (over Ethernet) on the selected network adapters.

- To configure the VCS private network over the User Datagram Protocol (UDP) layer



  - Check the **Configure LLT over UDP** check box.
  - Specify a unique UDP port in the **Port number for Link1** and **Port number for Link2** fields. You can use ports in the range 49152 to 65535. The default ports numbers are 50000 and 50001 respectively.
  - Select the check boxes next to the two NICs to be assigned to the private network. Symantec recommends reserving two NICs exclusively for the VCS private network.
  - For each selected NIC, verify the displayed IP address. If a selected NIC has multiple IP addresses assigned, double-click the field and choose the desired IP address from the drop-down list. Each IP address can be in a different subnet.

    The IP address is used for the VCS private communication over the specified UDP port.
  - For each selected NIC, double-click the respective field in the Link column and choose a link from the drop-down list. Specify a different link (Link1 or Link2) for each NIC. Each link is associated with a UDP port that you specified earlier.

The wizard will configure the LLT service (over UDP) on the selected network adapters. The specified UDP ports will be used for the private network communication.

14 On the Public Network Communication panel, select a NIC for public network communication, for each system that is being added, and then click **Next**.

This step is applicable only if you have configured the ClusterService service group, and the system being added has multiple adapters. If the system has only one adapter for public network communication, the wizard configures that adapter automatically.

15 Specify the credentials for the user in whose context the VCS Helper service runs.

16 Review the summary information and click **Add**.

17 The wizard starts running commands to add the node. After all commands have been successfully run, click **Finish**.

Setting up security for VVR

If you are using Veritas Volume Replicator (VVR) replication, you must configure the VxSAS service on all cluster nodes. For a Replicated Data Cluster environment, you configure the service on all nodes in both the primary and secondary zones.

Complete the following procedure to configure the VxSAS service for VVR.

The procedure has these prerequisites:

- You must be logged on with administrative privileges on the server for the wizard to be launched.
- The account you specify must have administrative and log-on as service privileges on all the specified hosts.
- Avoid specifying blank passwords. In a Windows Server environment, accounts with blank passwords are not supported for log-on service privileges.
- Make sure that the hosts on which you want to configure the VxSAS service are accessible from the local host.

Note: The VxSAS wizard will not be launched automatically after installing SFW or SFW HA. You must launch this wizard manually to complete the VVR security service configuration. For details on this required service, see *Veritas Storage Foundation Veritas Volume Replicator Administrator's Guide.*

To configure the VxSAS service

1 To launch the wizard, select **Start** > **All Programs > Symantec > Veritas Storage Foundation > Configuration Wizards > VVR Security Service Configuration Wizard** or run `vxsascfg.exe` from the command prompt of the required machine.
Read the information provided on the Welcome page and click **Next**.

2 Complete the Account Information panel as follows:

Account name (domain\account)	Enter the administrative account name.
Password	Specify a password.

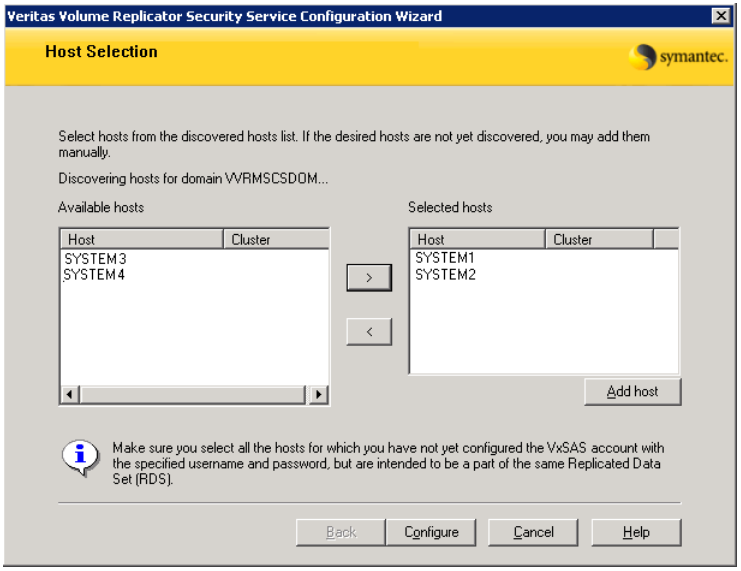
If you have already configured the VxSAS service for one host that is intended to be a part of the RDS, make sure you specify the same username and password when configuring the VxSAS service on the other hosts.
Click **Next**.

3 On the Domain Selection panel, select the domain to which the hosts that you want to configure belong:

Selecting domains	The Available domains pane lists all the domains that are present in the Windows network neighborhood. Move the appropriate name from the Available domains list to the Selected domains list, either by double-clicking it or using the arrow button.
Adding a domain	If the domain name that you require is not displayed, click **Add domain**. This displays a dialog that allows you to specify the domain name. Click **Add** to add the name to the Selected domains list.

Click **Next**.

4 On the Host Selection panel, select the required hosts:



Selecting hosts	The Available hosts pane lists the hosts that are present in the specified domain. Move the appropriate host from the Available hosts list to the Selected hosts list, either by double-clicking it or using the arrow button. Use the Shift key with the up or down arrow keys to select multiple hosts.
Adding a host	If the host name you require is not displayed, click **Add host**. In the Add Host dialog specify the required host name or IP in the **Host Name** field. Click **Add** to add the name to the Selected hosts list.

After you have selected a host name, the **Configure** button is enabled. Click **Configure** to proceed with configuring the VxSAS service.

5 After the configuration completes, the Configuration Results page displays whether or not the operation was successful. If the operation was not successful, the page displays the details on why the account update failed, along with the possible reasons for failure and recommendations on getting over the failure.
Click **Back** to change any information you had provided earlier.

6 Click **Finish** to exit the wizard.

Setting up the Replicated Data Sets (RDS)

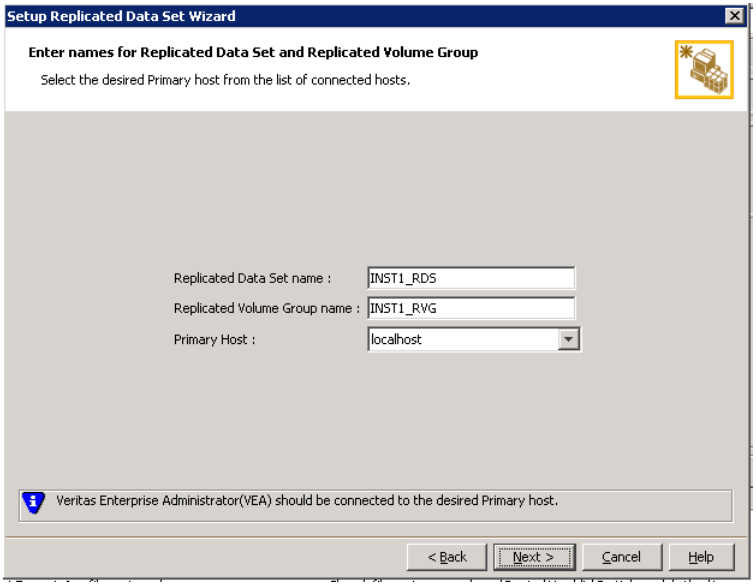
Set up the Replicated Data Sets (RDS) in the primary zone and secondary zone. You can configure an RDS for both zones using the Setup Replicated Data Set Wizard.

- Verify that the data volumes are not of the following types as VVR does not support these types of volumes:
  - Storage Foundation for Windows (software) RAID 5 volumes
  - Volumes with a Dirty Region Log (DRL)
  - Volumes that are already part of another RVG
  - Volumes names containing a comma
- Verify that the cluster disk group is imported and the volumes are mounted in the primary and secondary zone
- Verify that you have configured security for VVR
  See "Setting up security for VVR" on page 200.

To create the Replicated Data Set

1. From the cluster node on the Primary where the cluster disk group is imported, launch the Veritas Enterprise Administrator (VEA):
   - Use the VEA console to launch the Setup Replicated Data Set Wizard.
     OR
   - Launch the VEA by clicking **Start** > **All Programs** > **Symantec** > **Veritas Storage Foundation** > **Veritas Enterprise Administrator**.
     From the VEA console, click **View** > **Connection** > **Replication Network**.
2. Right-click **Replication Network** and select **Set up Replicated Data Set**.
3. Read the Welcome page and click **Next**.

4 Specify names for the Replicated Data Set (RDS) and Replicated Volume Group (RVG).

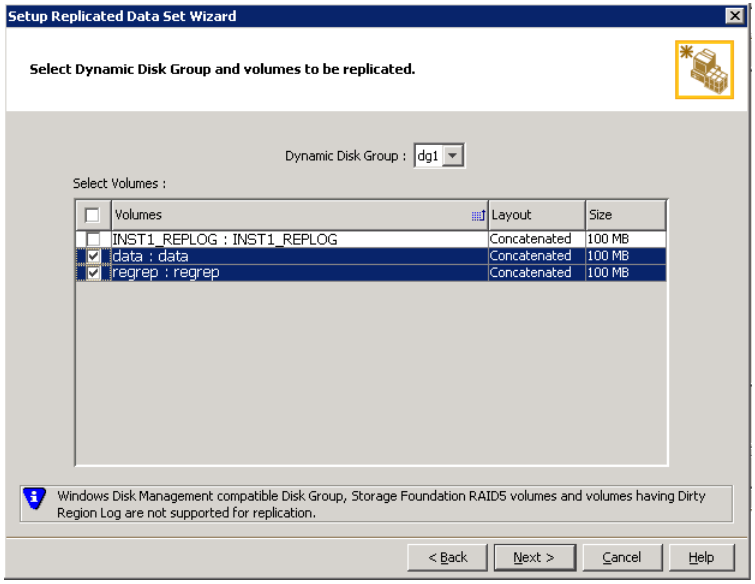


By default, the local host is selected as the **Primary Host**. To specify a different host name, make sure the required host is connected to the VEA console and select it in the **Primary Host** list.

If the required primary host is not connected to the VEA console, it does not appear in the drop-down list of the Primary Host field. Use the VEA console to connect to the host.

5 Click **Next**.

6 Select from the table the dynamic disk group and data volumes that will undergo replication.

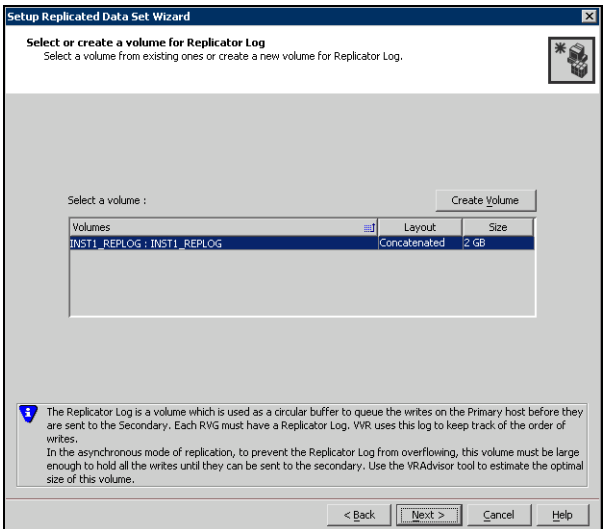


To select multiple volumes, press the Shift or Control key while using the up or down arrow keys.

By default, a mirrored DCM log is automatically added for all selected volumes. If disk space is inadequate to create a DCM log with two plexes, a single plex is created.

7 Click **Next**.

8 Complete the select or create a volume for Replicator Log page as follows:



To select an existing volume

- Select the volume for the Replicator Log in the table (INST1_REPLOG). If the volume does not appear in the table, click **Back** and verify that the Replicator Log volume was not selected on the previous page.
- Click **Next**.

To create a new volume

- Click **Create Volume** and enter the following information in the dialog box that displays.

Name	Enter the name for the volume in the **Name** field.
Size	Enter a size for the volume in the **Size** field.
Layout	Select the desired volume layout.
Disk Selection	■ Choose **Select disks automatically** if you want VVR to select the disks for the Replicator Log. ■ Choose **Select disks manually** to use specific disks from the available disks pane for creating the Replicator Log volume. Either double-click the disk to select it, or select **Add** to move the disks into the selected disks pane.

- Click **OK** to create the Replicator Log volume.

- Click **Next** in the **Select or create a volume for Replicator Log** dialog box.

9 Review the information on the summary page and click **Create Primary RVG**.

10 After the Primary RVG has been created successfully, VVR displays the following message:

```
RDS with Primary RVG has been created successfully. Do you want
to add Secondary host to this RDS for replication now?
```

Click **No** to exit the Setup Replicated Data Set wizard without adding the Secondary host. To add the Secondary host later, use the **Add Secondary** option from the RDS right-click menu.

Click **Yes** to add the Secondary host to the Primary RDS now. The Specify Secondary host for replication page appears.

11 On the Specify Secondary host for replication page, enter the name or IP address of the Secondary host in the **Secondary Host** field. Click **Next**. If the Secondary host is not connected to VEA, the wizard tries to connect it when you click **Next**. This wizard allows you to specify only one Secondary host. Additional Secondary hosts can be added using the Add Secondary option from the RDS right-click menu.

Wait till the connection process is complete and then click **Next** again.

12 If only a disk group without any data volumes or Replicator Log, as on the Primary host exists on the Secondary, then VVR displays a message. Read the message carefully.

The option to automatically create volumes on the Secondary host is available only if the disks that are part of the disk group have:

- the same or larger amount of space as that on the Primary
- Enough space to create volumes with the same layout as on the Primary

Otherwise, the RDS setup wizard enables you to create the required volumes manually.

- Click **Yes** to automatically create the Secondary data volumes and the Replicator Log.
- Click **No** to create the Secondary data volumes and the Replicator Log manually, using the Volume Information on the connected hosts page.

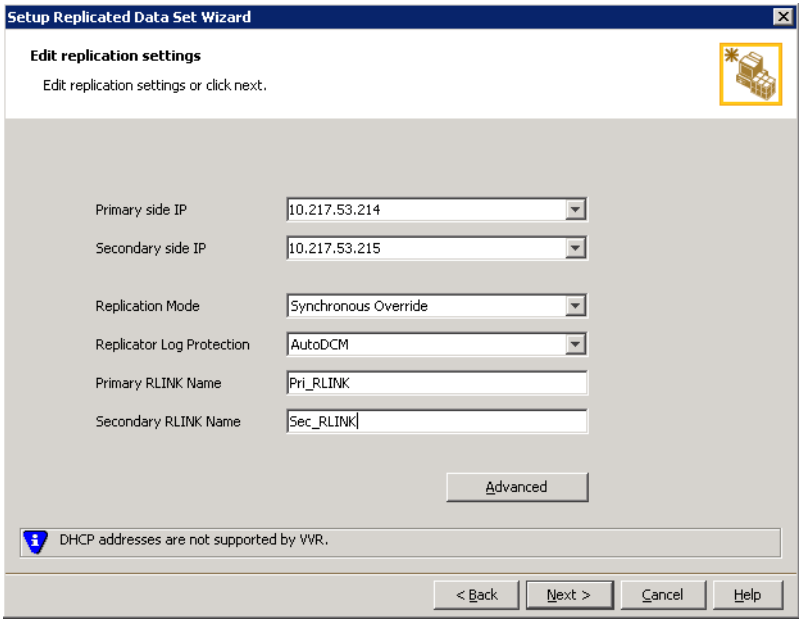
13 The Volume Information on connected hosts page appears. This page displays information on the availability of volumes on the Secondary nodes, if the Primary and Secondary hosts are connected to VEA.

This page does not appear if all the required volumes that are available on the Primary host are also available on the Secondary hosts.

- If the required data volumes and the Replicator Log have not been created on the Secondary host, then the page displays the appropriate message against the volume name on the Secondary.

- If an error occurs or a volume needs to be created, a volume displays with a red icon and a description of the situation. To address the error, or to create a new Replicator Log volume on the secondary site, click the volume on the secondary site, click the available task button and follow the wizard.
  Depending on the discrepancies between the volumes on the primary site and the secondary site, you may have to create a new volume, recreate or resize a volume (change attributes), or remove either a DRL or DCM log.
  When all the replicated volumes meet the replication requirements and display a green check mark, click **Next**.
- If all the data volumes to be replicated meet the requirements, this screen does not occur.

14 Complete the Edit replication settings page to specify the basic and advanced replication settings for a Secondary host as follows:



- To modify each of the default values listed on this page, select the required value from the drop-down list for each property. If you do not

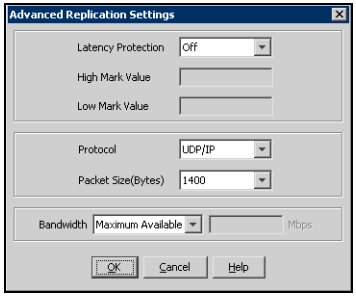
wish to modify basic properties then replication can be started with the default values when you click **Next**.

Primary side IP	Enter the virtual IP address for the Primary IP resource that will be used for replication. If there is more than one IP address available for replication, you can choose the one that you want to use from the drop-down list. If the required IP address is not displayed in the list then edit the field to add the IP address.
Secondary side IP	Enter the virtual IP address on the Secondary that is to be used for replication. If there is more than one IP address available for replication, you can choose the one that you want to use from the drop-down list. If the required IP address is not displayed in the list then edit the field to add the IP address.
Replication Mode	Select the required mode of replication: **Synchronous Override, Synchronous, or Asynchronous**. The default is synchronous override. **Synchronous Override** enables synchronous updates under typical operating conditions. If the Secondary site is disconnected from the Primary site, and write operations occur on the Primary site, the mode of replication temporarily switches to Asynchronous. **Synchronous** determines updates from the application on the Primary site are completed only after the Secondary site successfully receives the updates. **Asynchronous** determines updates from the application on the Primary site are completed after VVR updates in the Replicator Log. From there, VVR writes the data to the data volume and replicates the updates to the secondary site asynchronously. If the Secondary is set to the synchronous mode of replication and is disconnected, the Primary data volumes with NTFS file systems may be displayed with the status as MISSING.
Replicator Log Protection	The **AutoDCM** is the default selected mode for the Replicator Log overflow protection when all the volumes in the Primary RVG have a DCM log. The DCM is enabled when the Replicator Log overflows.

	The **DCM** option enables the Replicator Log protection for the Secondary host when the Replicator Log overflows, and the connection between the Primary and Secondary is lost. This option is available only if all the data volumes under the Primary RVG have a DCM Log associated with them. The **Off** option disables Replicator Log Overflow protection. In the case of the Bunker node. Replicator Log protection is set to **Off**, by default. Thus, if the Primary RLINK overflows due to the Bunker RLINK, then this RLINK is detached. The **Override** option enables log protection. If the Secondary node is still connected and the Replicator Log is about to overflow then the writes are stalled until a predetermined amount of space, that is, 5% or 20 MB (whichever is lesser) becomes available in the Replicator Log. If the Secondary becomes inactive due to disconnection or administrative action then Replicator Log protection is disabled, and the Replicator Log overflows. The **Fail** option enables log protection. If the log is about to overflow the writes are stalled until a predetermined amount of space, that is, 5% or 20 MB (whichever is lesser) becomes available in the Replicator Log. If the connection between Primary and Secondary RVG is broken, then, any new writes to the Primary RVG are failed.
Primary RLINK Name	This option enables you to specify a Primary RLINK name of your choice. If you do not specify any name then VVR assigns a default name.
Secondary RLINK Name	This option enables you to specify a Secondary RLINK name of your choice. If you do not specify any name then VVR assigns a default name.

Click **Next** to start replication with the default settings.

15 Click **Advanced** to specify advanced replication settings. Edit the replication settings for a secondary host as needed.



Latency protection Determines the extent of stalling write operations on the primary site to allow the secondary site to "catch up" with the updates before new write operations can occur.

- **Off** is the default option and disables latency protection.
- **Fail** enables latency protection. If the number of outstanding write operations reaches the **High Mark Value** (described below), and the secondary site is connected, VVR stalls the subsequent write operations until the number of outstanding write operations is lowered to the **Low Mark Value** (described below). If the secondary site is disconnected, the subsequent write operations fail.
- **Override** enables latency protection. This option resembles the Off option when the secondary site is disconnected, and the Fail option when the secondary site is connected.

Caution: Throttling of write operations affects application performance on the primary site; use this protection only when necessary according to replication throughput and application write patterns.

High Mark Value Is enabled only when either the Override or Fail latency protection option is selected. This value triggers the stalling of write operations and specifies the maximum number of pending updates on the Replicator Log waiting for replication to the secondary site. The default value is 10000, the maximum number of updates allowed in a Replicator Log.

Low Mark Value	Is enabled only when either the Override or Fail latency protection options is selected. After reaching the High Mark Value, write operations on the Replicator Log are stalled until the number of pending updates drops to an acceptable point at which the secondary site can "catch up" to the activity on the primary site; this acceptable point is determined by the Low Mark Value. The default value is 9950.

Caution: When determining the high mark and low mark values for latency protection, select a range that is sufficient but not too large to prevent long durations of throttling for write operations.

Protocol	UDP/IP is the default protocol for replication.
Packet Size	Updates to the host on the secondary site are sent in packets; the default size 1400 bytes. The option to select the packet size is enabled only when UDP/IP protocol is selected.
Bandwidth	By default, VVR uses the maximum available bandwidth. To control the bandwidth used, specify the bandwidth limit in Mbps.

Click **OK** to close the dialog box.

16 Click **Next**.

17 On the **Start Replication** page, select **Start Replication**.

Synchronize Automatically	If virtual IPs have been created, select the **Synchronize Automatically** option, which is the default recommended for initial setup to start synchronization of Secondary and start replication immediately. If the virtual IPs for replication are not yet created, automatic synchronization remains paused and resumes after the Replication Service Group is created and brought online. When this option is selected, VVR by default performs intelligent synchronization to replicate only those blocks on a volume that are being used by the file system. If required, you can disable intelligent synchronization. **Note:** Intelligent synchronization is applicable only to volumes with the NTFS file systems and not to raw volumes or volumes with FAT/FAT32 file systems.

Synchronize from Checkpoint	If you want to use this method, then you must first create a checkpoint. If you have considerable amount of data on the Primary data volumes, then you may first want to synchronize the secondary for existing data using the backup-restore method with checkpoint. After the restore is complete, use the Synchronize from Checkpoint option to start replication from checkpoint to synchronize the secondary with the writes that happened when backup-restore was in progress. For information on synchronizing from checkpoints, refer *Veritas Storage Foundation ™ Volume Replicator Administrator's Guide*.

- To add the secondary without starting replication, deselect the **Start Replication** option. You can start replication later by using the **Start Replication** option from the Secondary RVG right-click menu.
  Click **Next** to display the Summary page.

18 Review the information.
Click **Back** to change any information you had specified and click **Finish** to add the secondary host to the RDS and exit the wizard.

If the SQL Server user-defined database and files are in a separate disk group from the SQL Server system files, repeat the procedure for the disk group (INST1_DB1_DG) that contains the SQL Server user-defined database and files. Provide unique names for the Replicated Data Set name, and the Replicated Volume Group name.

See “Reviewing the Replicated Data Cluster configuration” on page 99 for a list of example names.

Configuring a hybrid RVG service group for replication

Create and configure a hybrid Replicated Volume Group (RVG) service group for replication.

The RVG service group is hybrid because it behaves as a failover service group within a zone and as a parallel service group between zones.

For additional information about service group types, see the *Veritas Cluster Server Administrator's Guide*.

Configure the RVG service group's resources manually by copying and modifying components of the SQL Server service group. Then create new RVG resources and bring them online.

The RVG service group for RDC contains the following resources:

Table 10-2 Replication service group resources

Resource	Description
IP	IP address for replication
NIC	Associated NIC for this IP
VMDg for the system files disk group	Disk group with SQL system files
VvrRvg for the system files disk group	Replicated volume group with SQL system files
VMDg for the user-defined database disk group	Disk group with SQL user-defined files
VvrRvg for the user-defined database disk group	Replicated volume group with SQL user-defined files

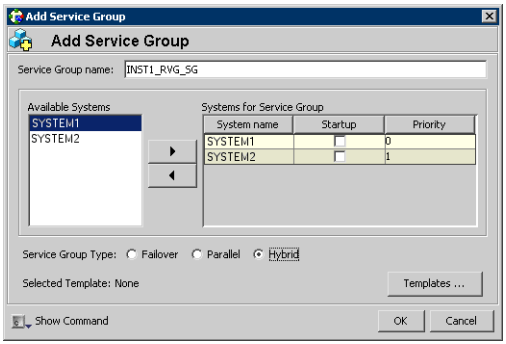
Creating the RVG service group

Create a hybrid replicated volume (RVG) service group, to contain the resources for replication.

To create a hybrid RVG service group

1. From VCS Cluster Manager (Java Console), log on to the cluster.
2. In the VCS Cluster Explorer window, right-click the cluster in the left pane and select **Add Service Group**.

3 In the **Add Service Group** window:



- Enter a name for the service group, for example INST1_RVG_SG. Make sure the service group name is in uppercase.
- Select the systems in the primary zone (zone 0) and click the right arrow to add them to the service group.
- Select **Hybrid**.
- Click **OK**.

Configuring the RVG service group for RDC replication

Configure the RVG service group's resources manually for RVG by completing the following tasks:

- "Configuring the IP and NIC resources"
  Copy IP and NIC resources of the SQL Server service group (INST1_SG), paste and modify them for the RVG service group (INST1_RVG_SG).
- "Configuring the VMDg resources" and "Configuring the VMDg resources for the disk group for the user-defined database"
  Copy the VMDg resources for the disk groups in the SQL Server service group (INST1_SG), paste and modify them for the RVG service group (INST1_RVG_SG).
- "Adding the VVR RVG resources for the disk groups"
  Create the VVR RVG resources for the disk groups and enter the attributes for each of the disk groups and the replication IP address.
- "Linking the VVR RVG resources to establish dependencies"
  Link the VVR RVG resources to establish the dependencies between the VMDg resources, the IP resource for replication, and the VVR RVG resources for the disk groups. Configure the RVG service group's VMDg resources to point to the disk groups that contain the RVGs.

- "Deleting the VMDg resource from the SQL Server service group"
  Delete the VMDg resources from the SQL Server service group, because they depend on the replication and were configured in the RVG service group.

Configuring the IP and NIC resources

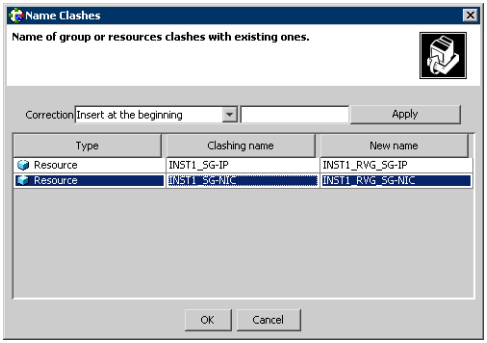
Configure the following resources and attributes for the IP and NIC:

Table 10-3 IP and NIC resources

Resource	Attributes to Modify
IP	Address
NIC	(none)

To create the IP resource and NIC resource

1. In the VCS Cluster Explorer window, select the SQL Server service group (INST1_SG) in the left pane.
2. On the **Resources** tab, right-click the IP resource (INST1_SG-IP), and click **Copy > Self and Child Nodes**.
3. In the left pane, select the RVG service group (INST1_RVG_SG).
4. On the **Resources** tab, right-click in the blank resource display area and click **Paste**.
5. In the **Name Clashes** window, change the names of the IP and NIC resources for the RVG service group.



6. Click **OK**.

To modify the IP resource and NIC

1. In the **Resources** tab display area, right-click the IP resource (INST1_RVG_SG-IP) and select **View > Properties View**.
2. In the **Properties View** window, for the **Address** attribute, click **Edit**.
3. In the **Edit Attribute** window, enter the VVR IP address for the Primary Zone as the scalar value.
4. Close the **Properties View** window.

To enable the IP resource and NIC

1. In the **Resources** tab display area, right-click the IP resource (INST1_RVG_SG-IP) and select **Enabled**.
2. In the **Resources** tab display area, right-click the NIC resource (INST1_RVG_SG-NIC) and select **Enabled**.

Configuring the VMDg resources

Create the VMDg resources in the RVG service group, and clear the DGGuid attribute for the new VMDg.

Configure the attributes in the SQL Server service group for the MountV resources.

Note: The MountV resources correspond to the volumes that you are configuring for replication. The table shows an example configuration. You may have additional volumes you want to include for replication, such as a FILESTREAM volume for SQL Server 2008.

Table 10-4 MountV resources

Resource	Attributes to Modify
Resources for the disk group for the SQL system files:	
MountV (for the SQL Server system volume)	VMDg Resource Name Volume Name
MountV (for the registry volume)	VMDg Resource Name Volume Name
Resources for the disk group for the SQL user-defined database files:	
MountV (for the SQL Server user-defined database log)	VMDg Resource Name Volume Name

Table 10-4 MountV resources

Resource	Attributes to Modify
MountV (for the SQL Server user-defined database)	VMDg Resource Name Volume Name

To create the VMDg resource for the disk group with the system files

1. In the VCS Cluster Explorer window, select the SQL Server service group (INST1_SG) in the left pane.
2. On the **Resources** tab, right-click the VMDg resource for the disk group, with the SQL system files (INST1_SG-VMDg), and click **Copy > Self**.
3. In the left pane, select the RVG service group (INST1_RVG_SG).
4. On the **Resources** tab, right-click in the blank resource display area and click **Paste**.
5. In the **Name Clashes** window, change the name of the VMDg resource for the RVG service group, for example to INST1_RVG_SG-VMDg.
6. Click **OK**.

To clear the DGGuid attribute for the new VMDg

1. In the **Resources** tab display area, right-click the new VMDg resource.
2. In the same **Properties View** window, for the **DGGuid** attribute, click **Edit**.
3. In the **Edit Attribute** window, clear the scalar value for the **DGGuid** attribute.
4. Close the **Properties View** window.

To modify the MountV resources in the SQL Server service group

1. In the VCS Cluster Explorer window, select the SQL Server service group (INST1_SG) in the left pane.
2. In the **Resources** tab display area, right-click the MountV resource for the SQL Server system data files (INST1_SG-MountV) and select **View > Properties View**.
3. In the **Properties View** window, verify that the **Volume Name** attribute is the SQL Server system data files (INST1_DATA_FILES).
4. In the same **Properties View** window, for the **VMDg Resource Name** attribute, click **Edit**.
5. In the **Edit Attribute** window, modify the **VMDGResName** scalar value to be the VMDg resource that was just created, for example INST1_RVG_SG-VMDg.

6 Close the **Properties View** window.

7 In the **Resources** tab display area, right-click the MountV resource for the registry volume (INST1_SG-MountV-1) and select **View > Properties View**.

8 In the **Properties View** window, verify that the **Volume Name** attribute is the registry volume (INST1_REGREP_VOL).

9 In the same **Properties View** window, for the **VMDg Resource Name** attribute, click **Edit**.

10 In the **Edit Attribute** window, modify the **VMDGResName** scalar value to be the VMDg resource that was just created, for example INST1_RVG_SG-VMDg.

11 Close the **Properties View** window.

To enable the VMDg resource

1 In the left pane, select the RVG service group (INST1_RVG_SG).

2 In the **Resources** tab display area, right-click the VMDg resource (INST1_RVG_SG-VMDg) and select **Enabled**.

Configuring the VMDg resources for the disk group for the user-defined database

Repeat the VMDg and MountV configuration for any additional disk group you may have created for a user-defined database. This is an example configuration. You should modify these steps as necessary to match the disk groups and volumes you want to include in replication.

To create the VMDg resource for the disk group for the user-defined database

1 In the VCS Cluster Explorer window, select the SQL Server service group (INST1_SG) in the left pane.

2 On the **Resources** tab, right-click the VMDg resource for the disk group, with SQL user-defined files (INST1_SG-VMDg-1), and click **Copy > Self**.

3 In the left pane, select the RVG service group (INST1_RVG_SG).

4 On the **Resources** tab, right-click in the blank resource display area and click **Paste**.

5 In the **Name Clashes** window, change the name of the VMDg resource for the RVG service group, for example to INST1_RVG_SG-VMDg-1.

6 Click **OK**.

To modify the MountV resources in the SQL Server service group

1. In the VCS Cluster Explorer window, select the SQL Server service group (INST1_SG) in the left pane.
2. In the **Resources** tab display area, right-click the MountV resource for the SQL Server user-defined log (INST1_SG-MountV-2) and select **View > Properties View**.
3. In the **Properties View** window, verify that the **Volume Name** attribute is the SQL Server user-defined log (INST1_DB1_LOG).
4. In the same **Properties View** window, for the **VMDg Resource Name** attribute, click **Edit**.
5. In the **Edit Attribute** window, modify the **VMDGResName** scalar value to be the VMDg resource that was just created, for example INST1_RVG_SG-VMDg-1.
6. Close the **Properties View** window.
7. In the **Resources** tab display area, right-click the MountV resource for the SQL Server user-defined database (INST1_SG-MountV-3) and select **View > Properties View**.
8. In the **Properties View** window, verify that the **Volume Name** attribute is the SQL Server user-defined database (INST1_DB1_VOL).
9. In the same **Properties View** window, for the **VMDg Resource Name** attribute, click **Edit**.
10. In the **Edit Attribute** window, modify the **VMDGResName** scalar value to be the VMDg resource that was just created, for example INST1_RVG_SG-VMDg.
11. Close the **Properties View** window.

To enable the VMDg resource

1. In the left pane, select the RVG service group (INST1_RVG_SG).
2. In the **Resources** tab display area, right-click the VMDg resource (INST1_RVG_SG-VMDg-1) and select **Enabled**.

Adding the VVR RVG resources for the disk groups

Add VVR RVG resources for replication of the disk groups.

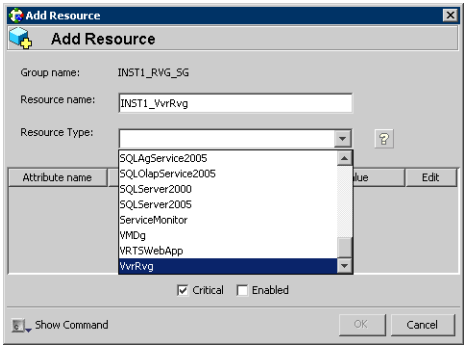
Configure the following attributes in the RVG service group for the VvrRvg resource:

Table 10-5 VvrRvg resources

Resource	Attributes to Modify
Resources for the disk group for the SQL system files:	
VvrRvg	VMDgResName IPResName
Resources for the disk group for the SQL user-defined database files:	
VvrRvg	VMDgResName IPResName

To create the VVR RVG resource for the disk group with the system files

1. In the left pane, select the RVG service group (INST1_RVG_SG). Right-click it and select **Add Resource**.
2. In the **Add Resource** window:



   - Enter the **Resource Name** for the VVR RVG resource.
   - Select the **Resource Type** of VvrRvg.
3. In the **Add Resource** window the attributes appear. For the **RVG** attribute, click **Edit**.
4. In the **Edit Attribute** window, enter the name of the RVG group that is being managed, for example INST1_RVG.
5. Click **OK**.
6. In the **Add Resource** window, for the **VMDGResName** attribute, click **Edit**.

7 In the **Edit Attribute** window, enter the name of the disk group containing the RVG, for example INST1_RVG_SG-VMDg.

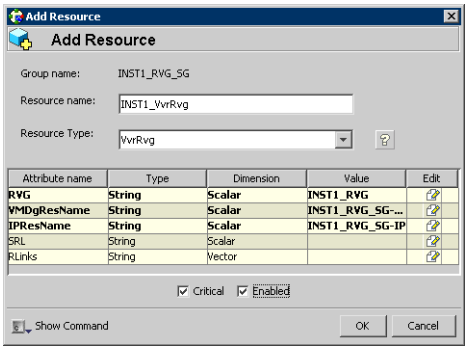
8 Click **OK**.

9 In the **Add Resource** window, for the **IPResName** attribute, click **Edit**.

10 In the **Edit Attribute** window, enter the name of the IP resource managing the IP address for replication, for example INST1_RVG_SG-IP.

11 Click **OK**.

12 In the **Add Resource** window, verify that the attributes have been modified:

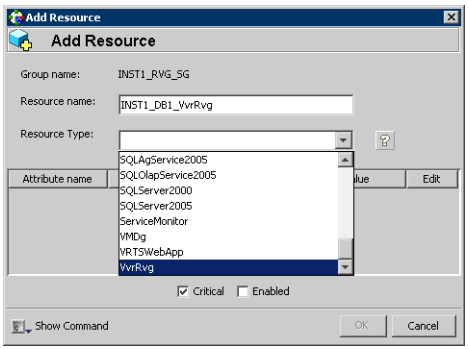


13 Click **OK**.

To create the VVR RVG resource for the disk group containing the user-defined database files

1 In the left pane, select the RVG service group (INST1_RVG_SG). Right-click it and select **Add Resource**.

2 In the **Add Resource** window:



- Enter the **Resource Name** for the VVR RVG resource for the disk group.

- Select the **Resource Type** of VvrRvg.

3 In the **Add Resource** window the attributes appear. For the **RVG** attribute, click **Edit**.

4 In the **Edit Attribute** window, enter the name of the RVG group that is being managed, for example INST1_DB1_RVG.

5 Click **OK**.

6 In the **Add Resource** window, for the **VMDGResName** attribute, click **Edit**.

7 In the **Edit Attribute** window, enter the name of disk group containing the RVG, for example INST1_RVG_SG-VMDg-1.

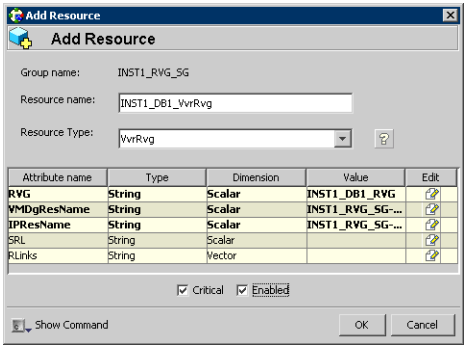
8 Click **OK**.

9 In the **Add Resource** window, for the **IPResName** attribute, click **Edit**.

10 In the **Edit Attribute** window, enter the name IP resource managing the IP address for replication, for example INST1_RVG_SG-IP. In this example both disk groups are using the same IP resource for replication.

11 Click **OK**.

12 In the **Add Resource** window, verify that the attributes have been modified:



13 Click **OK**.

Linking the VVR RVG resources to establish dependencies

In the VCS Cluster Explorer window, link the resources in the VVR RVG service group to establish the dependencies between the resources. Start from the top parent and link the following resources:

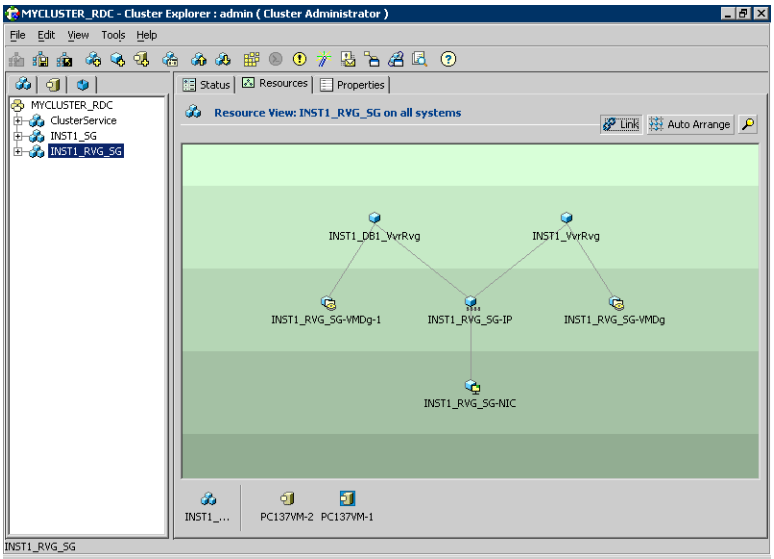
Table 10-6 Dependencies for VVR RVG resources for RDC

Parent	Child
Resources for the disk group for the SQL system files:	
INST1_ VvrRvg	The IP for replication, for example INST1_RVG_SG-IP
INST1_ VvrRvg	The VMDg for the SQL system files, for example INST1_RVG_SG-VMDg
Resources for the disk group for the SQL user-defined database files:	
INST1_DB1_VvrRvg	The IP for replication, for example INST1_RVG_SG-IP
INST1_DB1_VvrRvg	The VMDg for the SQL user-defined database files, for example INST1_RVG_SG-VMDg-1

To link the VVR RVG resources

1. In the left pane, select the RVG service group (INST1_RVG_SG).
2. Click the **Link** button in the right pane.
3. Click the parent resource, for example INST1_DB1_VvrRvg.
4. Click the child resource, for example INST1_RVG_SG-IP.
5. When prompted to confirm, click **OK**.

6 Repeat these steps to link all the RVG resources:



Notice that when you enable a resource and the state of the entity which it is monitoring is online, the corresponding VCS agent reports status for that resource as online. You do not have to bring the resource online manually.

Deleting the VMDg resource from the SQL Server service group

The VMDg resources must now be manually deleted from the SQL Server service group, because they depend on replication and were configured in the RVG service group.

To delete the VMDg Resources from the SQL Server service group

1 In the VCS Cluster Explorer window, select the SQL Server service group (INST1_SG) from the left pane.

2 In the **Resources** tab display area, right-click the VMDg resource for the system files disk group (INST1_SG-VMDg) and select **Delete**.

3 Click **Yes** to confirm that you want to delete it (even if it is online).

4 In the **Resources** tab display area, right-click the VMDg resource for the user-defined database disk group (INST1_SG-VMDg-1) and select **Delete**.

5 Click **Yes** to confirm that you want to delete it (even if it is online).

Configuring the RVG Primary resources

Add resources of type RVGPrimary to the SQL Server service group for each of the SQL Server disk groups (system and user-defined) and configure the attributes.

Set the value of the **RvgResourceName** attribute to the name of the RVG resource for the RVGPrimary agent.

Configure the following attributes in the SQL Server service group for the RVG Primary resources:

Table 10-7 RVG Primary resources

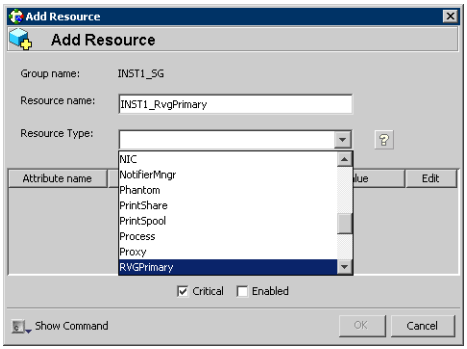
Resource	Attributes to Modify
Resources for the disk group for the SQL system files:	
RVGPrimary	RvgResourceName
Resources for the disk group for the SQL user-defined database files:	
RVGPrimary	RvgResourceName

Creating the RVG Primary resources

For all disk groups, create an RVG Primary Resource for replication.

To create the RVG Primary resource for the SQL Server system disk group

1. In the VCS Cluster Explorer window, right-click the SQL Server service group (INST1_SG) in the left pane, and select **Add Resource**.
2. In the **Add Resource** window:



   - Enter the **Resource Name** for the RVG Primary resource for the SQL Server system files disk group, for example INST1_RvgPrimary.
   - Select the **Resource Type** of RVGPrimary.
3. In the **Add Resource** window the attributes appear. For the **RvgResourceName** attribute, click **Edit**.
4. In the **Edit Attribute** window, enter the name of the VVR RVG resource, for example INST1_VvrRvg and click **OK**.
5. If desired, set the AutoTakeover and AutoResync attributes from their defaults. See the *Veritas Cluster Server Administrator's Guide* for more information about the RVG Primary agent.
6. Verify that **Critical** and **Enabled** are both checked.
7. Click **OK**.

To create the RVG Primary resource for the SQL Server user-defined database disk group

1. In the VCS Cluster Explorer window, right-click the SQL Server service group (INST1_SG) in the left pane, and select **Add Resource**.
2. In the **Add Resource** window:
   - Enter the **Resource Name** for the RVG Primary resource for the SQL Server user-defined database disk group, for example INST1_DB1_RvgPrimary.
   - Select the **Resource Type** of RVGPrimary.
3. In the **Add Resource** window the attributes appear. For the **RvgResourceName** attribute, click **Edit**.
4. In the **Edit Attribute** window, enter the name of the VVR RVG resource, for example INST1_DB1_VvrRvg and click **OK**.
5. If desired, set the AutoTakeover and AutoResync attributes from their defaults.
6. Verify that **Critical** and **Enabled** are both checked.
7. Click **OK**.

Linking the RVG Primary resources to establish dependencies

In the VCS Cluster Explorer window, link the resources in the SQL Server service group (INST1_SG) to establish the dependencies between the resources for replication.

Start from the top parent and link the following resources:

Table 10-8 Dependencies for the RVG Primary resources for RDC

Parent	Child
INST1_ SG-MountV	INST1_RvgPrimary
INST1_ SG-MountV-1	INST1_RvgPrimary
INST1_ SG-MountV-2	INST1_DB1_RvgPrimary
INST1_ SG-MountV-3	INST1_DB1_RvgPrimary

To link the RVG Primary resources

1. In the left pane, select the SQL Server service group (INST1_SG).
2. Click the **Link** button in the right pane.

3 Click the parent resource, for example INST1_ SG-MountV.

4 Click the child resource, for example INST1_RvgPrimary.

5 When prompted to confirm, click **OK**.

6 Repeat these steps to link all the RVG Primary resources.

Bringing the RVG Primary resources online

In the VCS Cluster Explorer window, bring the RVG Primary resources in the SQL Server service group (INST1_SG) online on the first node in the primary zone.

To bring the RVG Primary resources online

1 In the left pane, select the SQL Server service group (INST1_SG).

2 In the right pane on the **Resources** tab, right-click the first RVG Primary resource (INST1_RvgPrimary) and select **Online > SYSTEM1**.

3 In the right pane on the **Resources** tab, right click the second RVG Primary resource (INST1_DB1_RvgPrimary) and select **Online > SYSTEM1**.

Configuring the primary system zone for the RVG

In the RVG service group, set up systems in the primary zone (zone 0) to specify that initial failover occurs to systems within the primary zone for the RVG Service Group.

To configure the primary system zone for the RVG service group

1 From VCS Cluster Explorer, in the left pane, select the RVG service group (INST1_RVG_SG).

2 In the right pane, select the **Properties** tab.

3 In the Properties pane, click the button **Show All Attributes**.

4 In the Attributes View, scroll down and select the **SystemZones** attribute.

5 Click the **Edit** icon for the **SystemZones** attribute.

6 In the **Edit Attribute** dialog box, click the plus sign and enter the systems and the zone number (zone 0) for the primary zone.

7 Click **OK**.

Setting a dependency between the service groups

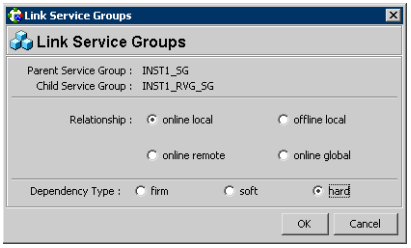
The RVG service group must be online on both the primary and secondary zones. However, if a failover occurs from one node to another within the same zone, the RVG service group must fail over along with the application service group.

To ensure that the SQL Server service group and the RVG service group fail over and switch together, set up an online local hard dependency from the RVG service group to the SQL Server service group.

The SQL service group (for example, INST1_SG) is dependent on the replication service group (for example, INST1_RVG_GRP).

To set up an online local hard dependency

1. From VCS Cluster Explorer, in the left pane, select the cluster (MYCLUSTER).
2. In the right pane, select the **Service Groups** tab.
3. Click the **Link** button to create a dependency between service groups.
4. Click the SQL Server service group (the parent service group), for example INST1_ SG.
5. Click the RVG service group (the child resource), for example INST1_RVG_SG.
6. In the **Link Service Groups** window:



- Select the **Relationship** of **online local**.
- Select the **Dependency Type** of **hard**.
- Click **OK**.

Adding the nodes from the secondary zone to the RDC

Configuration of the systems in the Primary Zone (zone 0) is complete. The nodes in the Secondary Zone (zone 1) can now be added to the RDC configuration.

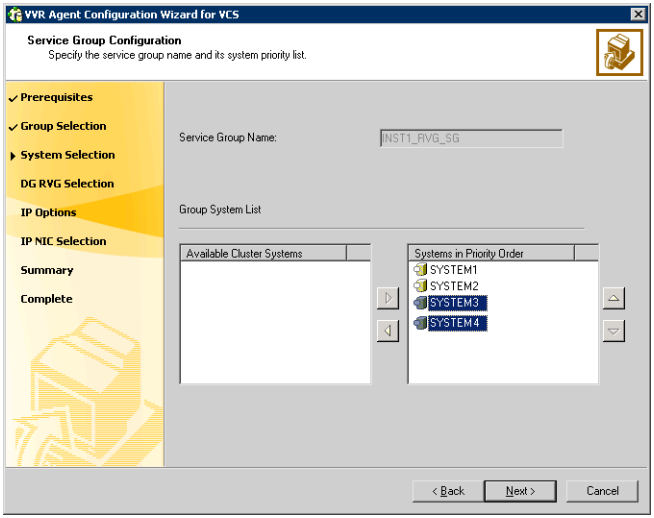
Adding the nodes from the secondary zone to the RVG service group

Use the Volume Replicator Agent Configuration Wizard to add the nodes from the secondary zone to the RVG.

To add the nodes from the secondary zone to the RVG

1. From the active node of the cluster in the primary zone, click **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > Volume Replicator Agent Configuration Wizard** to launch the configuration wizard.
2. Read and verify the requirements on the **Welcome page**, and click **Next.**
3. In the **Wizard Options** dialog box:
   - Click **Modify an existing replication service group**. The existing replication service group is selected, by default.
   - Click **Next**.
4. If a VCS notice message appears, asking if you want to continue, click **Yes**.

5 Specify the system priority list:



- In the **Available Cluster Systems** box, click the nodes in the secondary zone to add to the service group, and click the right-arrow icon to move the nodes to the service group's system list.
- To remove a node from the service group's system list, click the node in the **Systems in Priority Order** box, and click the left arrow icon.
- To change the priority of a node in the system list, click the node in the **Systems in Priority Order** box, then click the up and down arrow icons. The node at the top of the list has the highest priority.
- Click **Next**.

6 If a message appears, indicating that the configuration will be changed from Read Only to Read/Write, click **Yes** to continue.

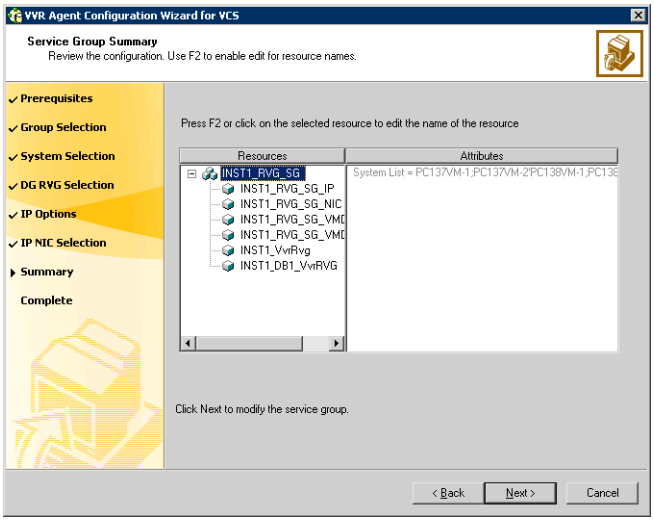
7 Review the Disk Group and Replicated Volume Group Configuration and click **Next**.

8 In the IP Resource Options dialog box, select **Modify IP resource** and click **Next**.

9 If a VCS error appears, click **OK**.

10 In the Network Configuration dialog box, verify that the selected adapters are correct and click **Next**.

11 Review the summary of the service group configuration:



The **Resources** box lists the configured resources. Click a resource to view its attributes and their configured values in the **Attributes** box.

- Click **Next** to modify the replication service group.

12 When prompted, click **Yes** to modify the service group.

13 Click **Finish**.

Configuring secondary zone nodes in the RVG service group

Specify zone 1 for the nodes in the secondary zone.

To specify the secondary zone for the nodes in the RVG service group

1 From VCS Cluster Explorer, in the left pane, select the RVG service group (INST1_RVG_SG).

2 In the right pane, select the **Properties** tab.

3 In the Properties pane, click the button **Show All Attributes**.

4 In the Attributes View, scroll down and select the **SystemZones** attribute.

5 Click the **Edit** icon for the **SystemZones** attribute.

6 If a message appears indicating that the configuration be changed to read/write, click **Yes**.

7 In the **Edit Attribute** dialog box, click the plus sign and enter the systems and the zone number (zone 1) for the secondary zone.

8 Click **OK**.

9 Close the Attributes View window.

Configuring the IP resources for failover

Modify the IP resources in the RVG service group to ensure the desired failover behavior in the RDC.

In the event of a system or SQL campus cluster failure, VCS attempts to fail over the SQL Server service group to another system within the same RDC system zone. However, in the event that VCS fails to find a failover target node within the primary zone, VCS switches the service group to a node in the current secondary system zone.

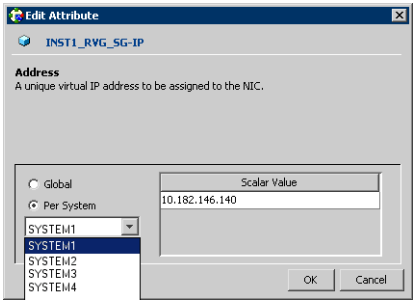
To modify the IP resources in the RVG service group

1 From VCS Cluster Explorer, in the left pane, select the RVG service group (INST1_RVG_SG).

2 In the right pane, select the **Resources** tab.

3 Right-click the RVG IP resource (INST1_RVG_SG-IP) and select **View > Properties View**.

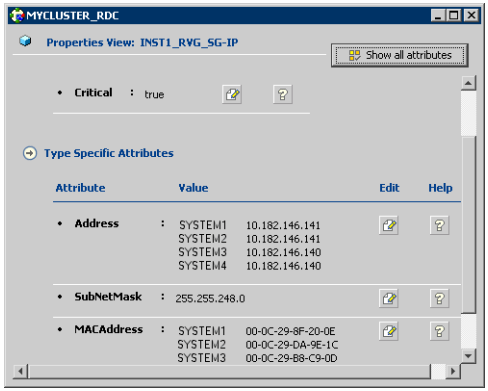
4 In the Edit Attributes window, edit the Address attribute.



- Select **Per System**.
- Select the first node in the primary zone and enter the virtual IP address for the primary zone.
- Select the second node in the primary zone and enter the virtual IP address for the primary zone (the same IP address as the first node).
- Repeat for all nodes in the primary zone.
- Select the first node in the secondary zone (SYSTEM3) and enter the virtual IP address for the secondary zone.

- Select the second node in the secondary zone and enter the virtual IP address for the secondary zone (the same IP address as the first node in the secondary zone).
- Repeat for all nodes in the secondary zone.
- Click **OK**.

5 In the Properties View window, verify that all nodes in the primary zone have the same IP address. Also verify that all nodes in the secondary zone have the same IP address, that is different from the IP address for the primary zone.



6 Close the Properties View window.

7 Since this is the final task in configuring the RVG service group for the primary and secondary zones, you can now bring the RVG service group online in both the primary and secondary zones.

Adding the nodes from the secondary zone to the SQL Server service group

Use the SQL Server 2008 Configuration Wizard to add the nodes from the secondary zone to the SQL Server service group.

To add the nodes from the secondary zone to the SQL Server service group

1 Select **Start > All Programs > Symantec > Veritas Cluster Server > Configuration Tools > SQL Server 2008 Configuration Wizard**.

2 Verify that you have met the prerequisites listed and click **Next**.

3 In the Wizard Options panel, click **Modify service group**, select the SQL Server service group to be modified (INST1_SG) and click **Next**.

If a VCS notice message appears indicating that resources are online, click **Yes** to continue.

4 On the Service Group Configuration page, select the nodes in the secondary zone, use the arrow button to move them from **Available Cluster Systems** to **System in Priority Order** and then click **Next**.

To change the priority of a system in the **Systems in Priority Order** list, select the system and click the up and down arrow icons. Arrange the systems in priority order in as failover targets for the group. The server that needs to come online first must be at the top of the list followed by the next one that will be brought online.

This set of nodes selected for the SQL Server service group must be the same as the nodes selected for the RVG service group. Ensure that the nodes are also in the same priority order.

5 On the SQL Server Instance Selection page, click **Next**.

6 On the User Databases List panel, click **Next**. This panel summarizes the databases for this instance of SQL.

7 On the Detail Monitoring Configuration page, clear the box in the SQL Instance List to disable monitoring, if required, and then click **Next**. Detailed monitoring is not necessary.

8 On the Registry Replication Path page, click **Next**.

9 On the Virtual Server Configuration page, verify that the public adapter is used on each system and click **Next**.

10 In the Service Group Summary, review the service group configuration and click **Next**.

A message appears if the configuration is currently in the Read Only mode. Click **Yes** to make the configuration read and write enabled. The wizard validates the configuration and modifies it.

11 Click **Finish**.

Configuring the zones in the SQL Server service group

Specify zone 1 for the nodes in the secondary zone.

To specify the secondary zone for the nodes in the SQL Server service group

1 From VCS Cluster Explorer, in the left pane, select the SQL Server service group (INST1_SG).

2 In the right pane, select the **Properties** tab.

3 In the Properties pane, click the button **Show All Attributes**.

4 In the Attributes View, scroll down and select the **SystemZones** attribute.

5 Click the **Edit** icon for the **SystemZones** attribute.

6 If a message appears indicating that the configuration be changed to read/write, click **Yes**.

7 In the **Edit Attribute** dialog box, click the plus sign and enter the systems and the zone number (zone 1) for the secondary zone.

8 Click **OK**.

9 Close the Attributes View window.

Verifying the RDC configuration

After completing all the configuration tasks for the primary and secondary zones, you can bring the service group online, then verify the configuration.

Perform the following tasks:

- Bringing the service group online
- Switching online nodes

Bringing the service group online

After completing all configuration, ensure that the RVG service group is online in both the primary and secondary zone. Then you can bring the SQL service group online in the primary zone.

To bring the SQL service group online

1 From VCS Cluster Explorer, in the left pane, right-click the SQL Server service group).

2 Click **Online**.

Switching online nodes

Failover simulation is an important part of configuration testing. Test the failover by switching online nodes.

The RVG service group is online in both the primary and secondary zone. However, within a zone, if more than node is configured, the RVG service group should fail over with the application service group.

Note: This should never be tested on systems with live data. A reliable and tested backup should be available. A tested backup means that it has been tested successfully by a restore.

Switch the application service group between nodes using Veritas Cluster Manager (Java Console). When you complete the procedure, you will see the online system role shift from one system to another.

If you enter the system name manually from the Java Console, specify the name in upper case.

To switch online nodes

1. In the Veritas Cluster Manager (Java Console), click the cluster in the configuration tree, and click the Service Groups tab.
2. Switch the service group as follows:
   - Right-click the service group icon in the view panel.
   - Click **Switch To**, and click the appropriate node from the menu.
   - In the dialog box, click **Yes.** The service group you selected is taken offline on the original node and brought online on the node you selected.

   If there is more than one service group, you must repeat this step until all the service groups are switched.
3. Verify that the service group is online on the node you selected.
4. To move all the resources back to the original node, repeat step 2 for each of the service groups.

Additional instructions for GCO disaster recovery

After completing the tasks for setting up a replicated data cluster for SQL Server 2008, you can optionally create a secondary site for wide area disaster recovery using the SFW HA Global Cluster option (GCO).

With this option, if a disaster affects a local or metropolitan area, data and critical services are failed over to a site hundreds or thousands of miles away.

To configure disaster recovery using a secondary site, you must install the SFW HA Global Cluster Option on all nodes on the primary (replicated data cluster) site cluster, as well as the secondary (DR) site cluster. GCO configuration also requires a static IP address available for each site.

You can use the Disaster Recovery (DR) wizard when setting up the secondary site. The secondary site is not configured as a replicated data cluster. There can

be only one replicated data cluster in the DR environment. The DR wizard does the following tasks:

- Clones the storage
- Clones the application service group
- Sets up VVR replication for the secondary site
- Configures the primary and secondary site clusters as global clusters

See "Disaster recovery configuration" on page 72.

Chapter 11

Configuring disaster recovery for SQL Server 2008

This chapter contains the following topics:

- "Adding multiple DR sites (optional)" on page 292
- "Recovery procedures for service group dependencies" on page 293

Tasks for configuring disaster recovery for SQL Server 2008

After setting up an SFW HA high availability environment for SQL on a primary site, you can create a secondary or "failover" site for disaster recovery.

The Disaster Recovery (DR) wizard helps you to clone the storage and service group configuration from the primary site to the secondary site. You can install the application on the secondary site during the DR wizard workflow.

The DR wizard also helps you set up replication and the global clustering (GCO option). You can choose to configure replication using Veritas Volume Replicator (VVR) or an agent-supported array-based hardware replication. The DR wizard can configure required options for the VCS agents for EMC SRDF and for Hitachi TrueCopy. To use the wizard with any other agent-supported array-based replication, you must complete configuring global clustering with the wizard before configuring replication on the array.

The DR wizard is available from the Solutions Configuration Center. Symantec recommends using the Solutions Configuration Center as a guide for installing and configuring disaster recovery.

Table 11-1 Configuring the secondary site for disaster recovery

Action	Description
Install SFW HA and configure the cluster on the secondary site	**Caution:** Ensure that the name you assign to the secondary site cluster is different from the name assigned to the primary site cluster. See "Guidelines for installing SFW HA and configuring the cluster on the secondary site" on page 246.
Verify that SQL Server has been configured for high availability at the primary site	Verify that SQL has been configured for high availability at the primary site and that the service groups are online See "Verifying your primary site configuration" on page 247.

Table 11-1 Configuring the secondary site for disaster recovery (Continued)

Action	Description
Set up the replication prerequisites	Ensure that replication prerequisites for your selected method of replication are met before running the DR wizard See "Setting up security for VVR" on page 248. See "Requirements for EMC SRDF array-based hardware replication" on page 251. See "Requirements for Hitachi TrueCopy array-based hardware replication" on page 253.
(Secure cluster only) Assign user privileges	For a secure cluster only, assign user privileges See "Assigning user privileges (secure clusters only)" on page 255.
Start running the DR wizard	■ Review prerequisites for the DR wizard ■ Start the DR wizard and make the initial selections required for each task: selecting a primary site system, the service group, the secondary site system, and the replication method See "Configuring disaster recovery with the DR wizard" on page 256.
Clone the storage configuration (VVR replication only)	(VVR replication option) Clone the storage configuration on the secondary site using the DR wizard See "Cloning the storage on the secondary site using the DR wizard (VVR replication option)" on page 260.
Create temporary storage for application installation (other replication methods)	(EMC SRDF, Hitachi TrueCopy, or GCO only replication option) Use the DR wizard to create temporary storage for installation on the secondary site See "Creating temporary storage on the secondary site using the DR wizard (array-based replication)" on page 264.
Install and configure SQL Server on the first cluster node	■ Ensure that the disk group and volumes for the system database are mounted on the first node ■ Follow the guidelines for installing SQL Server 2008 in the SFW HA environment See "Installing and configuring SQL Server 2008 on the first cluster node" on page 157.

Table 11-1 Configuring the secondary site for disaster recovery (Continued)

Action	Description
Install and configure SQL Server on the failover node(s)	■ Stop SQL Server services on the first node ■ Ensure that the disk group and volumes are mounted on the second node ■ Follow the guidelines for installing SQL Server 2008 on failover nodes in the SFW HA environment See "Installing and configuring SQL Server 2008 on the second cluster node" on page 158.
Clone the service group configuration	Clone the service group configuration from the primary to the secondary site using the DR wizard See "Cloning the service group configuration from the primary to the secondary site" on page 268.
Configure replication and global clustering, or configure global clustering only	■ (VVR replication) Use the wizard to configure replication and global clustering ■ (EMC SRDF replication) Set up replication and then use the wizard to configure the SRDF resource and global clustering ■ (Hitachi TrueCopy) Set up replication and then use the wizard to configure the HTC resource and global clustering ■ (Other array-based replication) Use the wizard to configure global clustering, and then set up replication See "Configuring replication and global clustering" on page 272.
Verify the disaster recover configuration	Verify that the secondary site has been fully configured for disaster recovery "Verifying the disaster recovery configuration" on page 288
(Optional) Add secure communication	Add secure communication between local clusters within the global cluster (optional task) "Establishing secure communication within the global cluster (optional)" on page 290
(Optional) Add additional DR sites	Optionally, add additional DR sites to a VVR environment "Adding multiple DR sites (optional)" on page 292

Table 11-1 Configuring the secondary site for disaster recovery (Continued)

Action	Description
Handling service group dependencies after failover	If your environment includes dependent service groups, review the considerations for bringing the service groups online after failover to the secondary site "Recovery procedures for service group dependencies" on page 293

Guidelines for installing SFW HA and configuring the cluster on the secondary site

Use the following guidelines for installing SFW HA and configuring the cluster on the secondary site.

- Ensure that you have set up the components required to run a cluster.
  See "Configuring the storage hardware and network" on page 112.
- Ensure that when installing SFW HA you install the appropriate disaster recovery options at both the primary and secondary sites. Be sure to select the following installation options as appropriate for your environment:

Veritas Cluster Server Database Agent for SQL	Required to configure high availability for SQL Server.
Client	Required to install VCS Cluster Manager (Java console) and Veritas Enterprise Administrator console, which are used during configuring high availability. Also required to install the Solutions Configuration Center which provides information and wizards to assist configuration.
Global Cluster Option	Required for a disaster recovery configuration only.
Veritas Volume Replicator	If you plan to use VVR for replication, select the option to install VVR.
High Availability Hardware Replication Agents	If you plan to use hardware replication, select the appropriate hardware replication agent.

  For more information see the *SFW HA Installation and Upgrade Guide*.
- Configure the cluster with the VCS Cluster Configuration Wizard (VCW). Ensure that the name you assign to the secondary site cluster is different from the name assigned to the primary site cluster.
  See "Configuring the cluster" on page 137.

Note: You do not need to configure the GCO option while configuring the cluster. This is done later using the Disaster Recovery wizard.

Verifying your primary site configuration

Before you begin configuring disaster recovery, make sure that SQL Server 2008 has been configured for high availability at the primary site. If you have not yet configured SQL for high availability at the primary site, go to High Availability (HA) Configuration in the Solutions Configuration Center and follow the steps in the order shown.

See "High availability (HA) configuration (New Server)" on page 58.

See "High availability (HA) configuration (Existing Server)" on page 61.

To verify the configuration, use the Cluster Manager (Java console) on the primary site and check the status of the service group in the tree view. Verify that all the resources are online.

Note: If you are setting up a replicated data cluster at the primary site, use the replicated data cluster instructions rather than the high availability configuration steps in the Solutions Configuration Center. See "VCS Replicated Data Cluster configuration" on page 68.

Setting up your replication environment

The DR wizard can assist you with setting up replication for the following methods of replication:

- Veritas Volume Replicator (VVR)
- EMC SRDF
- Hitachi TrueCopy

For array-based hardware replication, you can use any replication agent supported by Veritas Cluster Server. The DR wizard can help with configuring the methods listed above. If you choose a different replication method, you must run the wizard first to complete configuring global clustering; then afterwards, you configure replication separately.

See "Configuring global clustering only" on page 286.

Before configuring replication with the wizard, ensure that you set up the replication environment prerequisites.

Choose from the following topics, depending on which replication method you are using:

- "Setting up security for VVR" on page 248
- "Requirements for EMC SRDF array-based hardware replication" on page 251

- "Requirements for Hitachi TrueCopy array-based hardware replication" on page 253

Setting up security for VVR

If you are using Veritas Volume Replicator (VVR) replication, you must configure the VxSAS service on all cluster nodes. For a disaster recovery environment, you configure the service on all nodes on both the primary and secondary sites.

Complete the following procedure to configure the VxSAS service for VVR.

The procedure has these prerequisites:

- You must be logged on with administrative privileges on the server for the wizard to be launched.
- The account you specify must have administrative and log-on as service privileges on all the specified hosts.
- Avoid specifying blank passwords. In a Windows Server environment, accounts with blank passwords are not supported for log-on service privileges.
- Make sure that the hosts on which you want to configure the VxSAS service are accessible from the local host.

Note: The VxSAS wizard will not be launched automatically after installing SFW or SFW HA. You must launch this wizard manually to complete the VVR security service configuration. For details on this required service, see *Veritas Storage Foundation Veritas Volume Replicator Administrator's Guide*.

To configure the VxSAS service

1. To launch the wizard, select **Start** > **All Programs > Symantec > Veritas Storage Foundation > Configuration Wizards > VVR Security Service Configuration Wizard** or run `vxsascfg.exe` from the command prompt of the required machine.
   Read the information provided on the Welcome page and click **Next**.
2. Complete the Account Information panel as follows:

Account name (domain\account)	Enter the administrative account name.
Password	Specify a password.

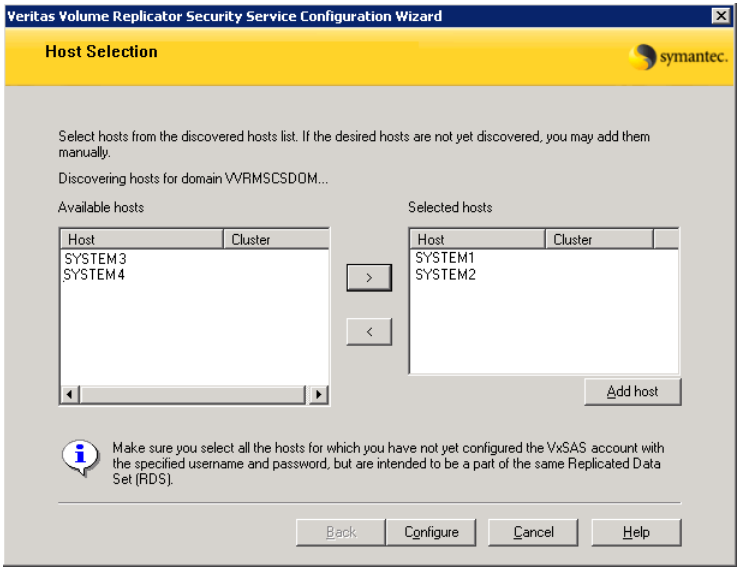
If you have already configured the VxSAS service for one host that is intended to be a part of the RDS, make sure you specify the same username and password when configuring the VxSAS service on the other hosts.
Click **Next**.

3 On the Domain Selection panel, select the domain to which the hosts that you want to configure belong:

Selecting domains	The Available domains pane lists all the domains that are present in the Windows network neighborhood. Move the appropriate name from the Available domains list to the Selected domains list, either by double-clicking it or using the arrow button.
Adding a domain	If the domain name that you require is not displayed, click **Add domain**. This displays a dialog that allows you to specify the domain name. Click **Add** to add the name to the Selected domains list.

Click **Next**.

4 On the Host Selection panel, select the required hosts:



Selecting hosts	The Available hosts pane lists the hosts that are present in the specified domain. Move the appropriate host from the Available hosts list to the Selected hosts list, either by double-clicking it or using the arrow button. Use the Shift key with the up or down arrow keys to select multiple hosts.
Adding a host	If the host name you require is not displayed, click **Add host**. In the Add Host dialog specify the required host name or IP in the **Host Name** field. Click **Add** to add the name to the Selected hosts list.

After you have selected a host name, the **Configure** button is enabled. Click **Configure** to proceed with configuring the VxSAS service.

5 After the configuration completes, the Configuration Results page displays whether or not the operation was successful. If the operation was not successful, the page displays the details on why the account update failed, along with the possible reasons for failure and recommendations on getting over the failure.
Click **Back** to change any information you had provided earlier.

6 Click **Finish** to exit the wizard.

Requirements for EMC SRDF array-based hardware replication

The DR wizard configures the settings required for the VCS hardware replication agent for EMC SRDF. The wizard configures the required settings for the SRDF resource in the VCS application service group. The wizard also configures the Symm heartbeat. Optional resource settings are left in the default state.

For more information about the EMC SRDF agent functions and the configuration options, see *Veritas Cluster Server Hardware Replication Agent for EMC SRDF, Configuration Guide*.

Before using the DR wizard, review the following topics:

- "Software requirements for configuring EMC SRDF" on page 251
- "Replication requirements for EMC SRDF" on page 251

Software requirements for configuring EMC SRDF

The EMC SRDF agent supports SYMCLI versions that EMC recommends for the firmware on the array. The agent supports SRDF on all microcode levels on all Symmetrix arrays, provided that the host/HBA/array combination is in EMC's hardware compatibility list.

To use the DR wizard to configure the required agent settings for EMC SRDF, ensure that the following software requirements are met:

- The EMC Solutions Enabler is installed on all cluster nodes.
- The SYMCLI version that is installed supports the generation of XML output.
- The SYMCLI version and the microcode level support dynamic swapping.
- The VCS EMC SRDF agent is installed on all cluster nodes.

Replication requirements for EMC SRDF

Before it performs any tasks, the wizard validates the array configuration as follows:

- On the primary site, the wizard verifies that no devices are RDF2.
- On the secondary site, the wizard verifies that no devices are RDF1.

Otherwise, the wizard displays an invalid configuration message and is unable to proceed.

The DR wizard does not start or stop replication. Array replication configuration is not a prerequisite for the wizard to perform storage cloning or service group cloning.

After the service group cloning task is complete, the DR wizard displays a screen describing the following replication requirements:

- All disks in SFW disk groups must belong to the same device group.
- The device group must not span more than one array (no composite device groups).
- A device group can contain one or more disk groups.
- Dynamic swap must be enabled on both sites.
- On the primary site:
  - All devices must be RDF1 and part of an RDF1 device group.
  - Devices must have write access.
- On the secondary site:
  - All devices must be RDF2 and part of an RDF2 device group.
  - Write access must be disabled.

It is recommended that you ensure that these requirements are met before proceeding with the wizard. The wizard then validates the array replication configuration.

If replication is configured correctly, the wizard populates the resource configuration screen with the required replication settings for the SRDF resource.

If the replication configuration does not meet the requirements, the wizard leaves the fields on the resource configuration screen blank. You can optionally enter the resource configuration information in the wizard and configure the array replication requirements later. The information you enter is applied only to the SRDF resource, not to the array configuration. However, the SRDF resource will be unable to come online in the service group until replication has been configured correctly.

In addition, note the following agent requirement:

- Device group configuration must be the same on all nodes of the cluster.

Requirements for Hitachi TrueCopy array-based hardware replication

The DR wizard configures the settings required for the VCS hardware replication agent for Hitachi TrueCopy. The wizard configures the required settings for the HTC resource in the VCS application service group. Optional settings are left in the default state.

For more information about the Hitachi TrueCopy agent functions and the configuration options, see *Veritas Cluster Server Hardware Replication Agent for Hitachi TrueCopy, Configuration Guide*.

Before using the DR wizard, review the following topics:

- "Software requirements for Hitachi TrueCopy" on page 253
- "Replication requirements for Hitachi TrueCopy" on page 253

Software requirements for Hitachi TrueCopy

The Hitachi TrueCopy agent supports all versions of Hitachi RAID Manager.

For details, see *Veritas Cluster Server Hardware Replication Agent for Hitachi TrueCopy, Configuration Guide*.

To use the DR wizard to configure the required agent settings for Hitachi TrueCopy, ensure that the following requirements are met:

- RAID Manager is installed in the same location on all nodes on a site.
- Enter the primary and secondary site file paths for the horcm files on the Hitachi TrueCopy Path Information panel in the wizard. The default location is:

  System Driver\Windows
- The horcm files are named `horcm`*nn*`.conf` (where *nn* is a positive number without a leading zero, for example, horcm1.conf but not horcm01.conf).

Replication requirements for Hitachi TrueCopy

Before it performs any tasks, the wizard validates the array configuration as follows:

- On the primary site, the wizard verifies that all devices are the same type, but not S-SWS or SSUS.
- On the secondary site, the wizard verifies that all devices are the same type, but not P-VOL or PSUS.

Otherwise, the wizard displays an invalid configuration message and does not proceed.

The DR wizard does not start or stop replication. Array replication configuration is not a prerequisite for the wizard to perform storage cloning or service group cloning.

After the service group cloning task is complete, the DR wizard displays a screen describing the following replication requirements:

- All configured instances are running.
- No disks in the SFW disk group span across the Device Group.
- A device group can contain one or more disk groups.
- The device group does not span more than one array.
- At the primary site, all devices are of the type P-VOL.
- At the secondary site, all devices are of the type S-VOL.
- All device groups at the primary site are paired to an IP address which must be online on the secondary node.
- Device group and device names include only alphanumeric characters or the underscore character.

It is recommended that you ensure that these requirements are met before proceeding with the wizard. The wizard then validates the array replication configuration.

If replication is configured correctly, the wizard populates the resource configuration screen with the required replication settings for the HTC resource.

If the replication configuration does not meet the requirements, the wizard leaves the fields on the resource configuration screen blank. You can optionally enter the resource configuration information in the wizard and configure the array replication requirements later. The information you enter is applied only to the HTC resource, not to the array configuration. However, the HTC resource will be unable to come online in the service group until replication has been configured correctly.

Assigning user privileges (secure clusters only)

In order to enable remote cluster operations you must configure a VCS user with the same name and privileges in each cluster.

When assigning privileges in secure clusters, you must specify fully-qualified user names, in the format username@domain. You cannot assign or change passwords for users when VCS is running in secure mode.

You must assign service group rights to the SQL Server service group as well as any dependent service groups except for the RVG service group.

See the *Veritas Cluster Server Administrator's Guide*.

To assign user privileges at the primary site

1. Set the configuration to read/write mode:
   ```
   haconf -makerw
   ```
2. Add the user. Specify the name in the format username@domain.
   ```
   hauser -add user [-priv <Administrator|Operator>]
   ```
3. Modify the attribute of the service group to add the user. Specify the SQL Server service group and any dependent service groups except for the RVG service group.
   ```
   hauser -add user [-priv <Administrator|Operator> [-group
          service_groups]]
   ```
4. Reset the configuration to read-only:
   ```
   haconf -dump -makero
   ```

To assign user privileges at the secondary site

1. Set the configuration to read/write mode:
   ```
   haconf -makerw
   ```
2. Add the user. Specify the name in the format username@domain.
   ```
   hauser -add user [-priv <Administrator|Operator>]
   ```
3. Reset the configuration to read-only:
   ```
   haconf -dump -makero
   ```

Configuring disaster recovery with the DR wizard

The Disaster Recovery Configuration Wizard (DR wizard) assists you to perform the following tasks for the selected service group:

- Clone the storage configuration (VVR replication) or prepare a temporary storage configuration for application installation (array-based hardware replication)
- Clone the service group
- Optionally, configure VVR replication, or configure the VCS hardware replication agent settings for EMC SRDF or Hitachi TrueCopy
- Configure global clustering

Warning: To use the Disaster Recovery Configuration Wizard in an array-based hardware replication environment that is not configured by the wizard, you must first run the wizard to configure global clustering before configuring replication.

You will need to exit the wizard after the storage cloning task to install the SQL application. The wizard allows you to exit after the logical completion of each task.

Each time you re-start the wizard, you specify the primary site system, service group, secondary site system, and replication method, as described in the following procedure. Clicking **Next** then takes you to the start page of the process following the one that you had last completed.

The DR Wizard list of service groups shows only those that contain a MountV resource. For a dependent service group to be listed, the parent service group must also contain a MountV resource.

Warning: Once you have completed configuring replication and global clustering with the DR wizard, you cannot use the wizard to change the method of replication.

Before running the DR wizard to configure disaster recovery, ensure that you meet the following prerequisites:

- SFW HA is installed and a cluster is configured at the secondary site. Ensure that the name assigned to the secondary site cluster is different than the name assigned to the primary site cluster.
- Your application or server role is configured for HA at the primary site and all required services are running at the primary site.
- The clusters taking part in the DR configuration should have distinct names.

- (SQL Server 2000 or 2005 only) After SQL Server is installed on the secondary site, SQL Server Full-Text Search service on the secondary site is configured to start in the manual mode and is initially in the stopped state.
- Enough free disk space is available at the secondary site to duplicate the storage configuration at the primary site.
- One static IP address is available per application service group to be cloned.
- If using VVR for replication, a minimum of one static IP address per site is available for each application instance running in the cluster.
- Global Cluster Option (GCO) is installed at the primary and secondary site, and one static IP address is available at each site for configuring GCO.
- A VCS user is configured with the same name and privileges in each cluster.
- If a firewall exists between the wizard and any systems it needs access to, the firewall is set to allow both ingoing and outgoing TCP requests on port 7419.

Note: The DR wizard does not support VVR configurations that include a Bunker secondary site.

In addition, see the following replication prerequisites, depending on the replication method you are using:

- "Setting up security for VVR" on page 248
- "Requirements for EMC SRDF array-based hardware replication" on page 251
- "Requirements for Hitachi TrueCopy array-based hardware replication" on page 253

To start configuring disaster recovery with the DR wizard

1 Start the DR Configuration Wizard from the Solutions Configuration Center. Click **Start** > **All Programs** > **Symantec** > **Veritas Cluster Server** > **Solutions Configuration Center**. Expand the Solutions for Microsoft SQL Server tab and click **Disaster Recovery Configuration > Configure Disaster Recovery** > **Disaster Recovery Configuration Wizard**.

Note: By design, the DR wizard requires specific settings for the Lanman attributes on the primary and secondary sites. Before beginning the DR configuration, the wizard checks for these values, and if they are not set as required, the wizard will automatically proceed with setting these values, both at the primary and secondary sites.

---

2 In the Welcome panel, review the prerequisites to ensure that they are met and click **Next**.

3 In the System Selection panel, complete the requested information:

System Name	Enter the IP address or Fully Qualified Host Name (FQHN) of the primary system where the SQL instance is online. If you have launched the wizard on the system where the instance is online at the primary site, you can also specify `localhost` to connect to the system.

Click **Next**.

4 In the Service Group Selection panel, select the service group that you want to clone to the secondary site.
You can choose to clone only the parent service group by not selecting the dependent service group. Only online and local dependencies are supported, in soft, firm, or hard configurations. The wizard can configure only one level of dependency. In a VVR environment, the wizard configures a dependency for the RVG service group, so no other dependency is supported.
The panel lists only service groups that contain a MountV resource.
Click **Next**.

5 In the Secondary System Selection panel, enter the Fully Qualified Host Name (FQHN) or the IP address of the secondary system for which you want to configure disaster recovery.
Click **Next**.

6 In the Replication Options panel, select the replication method. Although you must select the replication method now, configuring replication and the global cluster option is done later, after service group cloning.

Configure Veritas Volume Replicator (VVR) and the Global Cluster Option (GCO)	Select this option if you want to configure VVR replication. Select this option even if you plan to configure VVR replication or the GCO option manually. This option is required for the wizard to configure the storage cloning correctly for a VVR environment. The wizard verifies each configuration task and recognizes if a task has been completed successfully. You cannot mix replication methods. That is, if your primary site is using array-based replication, and you select the VVR option, the wizard will warn you that you cannot use VVR replication for the disaster recovery site.
Configure EMC SRDF and the Global Cluster Option (GCO)	Select this replication option if you want to configure the settings for the VCS EMC SRDF agent. All disks used for the service group on the primary site must belong to an EMC SRDF array. Select this option even if you plan to configure EMC SRDF replication or the GCO option manually. The wizard verifies each configuration task and recognizes if a task has been completed successfully.
Configure Hitachi TrueCopy and the Global Cluster Option (GCO)	Select this replication option if you want to configure the settings for the VCS Hitachi TrueCopy agent. All disks used for the service group on the primary site must belong to a Hitachi TrueCopy array. Select this option even if you configure GCO manually. The wizard verifies each configuration task and recognizes if a task has been completed successfully.

Configure the Global Cluster Option (GCO) only	If you select this option, the DR wizard does not configure any replication settings. It configures the global cluster option. Select this option if you want to use the wizard in an array-based replication environment that is not supported by this wizard. You must configure replication manually after you finish the wizard. If you select the GCO only option, the DR wizard sets up the storage and service group configuration on the secondary site for an array-based hardware replication environment. Therefore, you cannot use this option to clone the storage and service group for a VVR replication environment.

Click **Next**.

7 Continue with the next DR configuration task.

For VVR replication, see "Cloning the storage on the secondary site using the DR wizard (VVR replication option)" on page 260.

For array-based replication, see "Creating temporary storage on the secondary site using the DR wizard (array-based replication)" on page 264.

Cloning the storage on the secondary site using the DR wizard (VVR replication option)

The DR wizard enables you to clone the storage configuration present at the primary site on to the secondary site. To do this successfully, the systems at the secondary site must have adequate free storage. If you have created the configuration but there is a mismatch in the volume sizes, the wizard can correct this and then complete the configuration.

If you have not yet started the wizard, see the following topic for the wizard prerequisites before continuing with the storage cloning procedure:

- "Configuring disaster recovery with the DR wizard" on page 256.

To clone the storage configuration from the primary site to the secondary site (VVR replication method)

1 If you have not yet done so, start the Disaster Recovery Configuration Wizard and specify the information for the primary site system, the service group, and the secondary site system. In the Replication Options panel, select the VVR replication method and click **Next**.

2 Review the information in the Storage Validation Results panel. This panel compares the configuration at the secondary site with that on the primary. If the storage is already configured identically on both sites, the panel shows that results are identical. Otherwise, the panel shows the differences and recommended actions. You can toggle between a summary and detailed view of information about the differences.

The detailed view shows the following:

Disk Group	Displays the disk group name that needs to be created on the secondary site.
Volume	Displays the list of volumes, if necessary, that need to be created at the secondary site.
Size	Displays the size of the volume that needs to be created on the secondary site.
Mount	Displays the mount to be assigned the volume on the secondary site.
Recommended Action	Indicates the action that needs to be taken at the secondary to make the configuration similar to that on the primary. ■ If the volume does not exist, a new volume will be created. ■ If the volume exists but is of a smaller size than that on the primary, the volume will be expanded to the required size. ■ If the volume is of a greater size than that on the primary, the volume will be recreated using the appropriate size. ■ If the volume is the same as that on the primary, the message indicates that the volumes are identical and no action is required.

The summary view shows the following:

Disk groups that do not exist	Displays the names of any disk groups that exist on the primary but do not exist on the secondary.
Existing disk groups that need modification	Displays the names of any disk groups on the secondary that need to be modified to match the primary.
Free disks present on secondary	Displays the list of free disks that exist on the secondary along with details about the free space and total disk space information.

If the panel displays a message indicating that the available disks are inadequate to clone the primary site configuration on the secondary, you

can free some disks on the secondary or add more storage. Then click **Refresh/Validate** to have the wizard update its information about the secondary storage configuration.

You continue with the wizard to provide information for the recommended actions. Before proceeding to the service group configuration, the wizard ensures that the configuration of the disk groups and volumes for the service group is the same at the primary and secondary site.

Click **Next**.

3 In the Disk Selection for Storage Cloning panel, for each of the disk groups that does not exist or is not same as the corresponding disk group at the primary site, select disks that the wizard can use to create the respective disk groups at the secondary site.

Selecting Disks	For each of the disk groups that needs to be created, select the required disks from the Available Disks pane. Either double-click on the host name or the **>>** option to move the hosts into the Selected disks pane. Under the Available Disks label, a drop-down list allows you to filter available disks by disk enclosure name. The default is All, which displays all free disks available on all enclosures.

Click **Next**.

4 In the Volume Layout for Secondary Site Storage panel, complete the requested information:

Disk Group	Displays the disk group name to which the volume belongs.
Volume (Volume Size)	Displays the name and the size of the volume, corresponding to that on the primary, that needs to be created on the secondary.
Available Disks	Select the disks on which you want the wizard to create the volumes. From the Available Disks pane, either double-click on the disk name or the **>>** option to move the disks into the Selected Disks pane. For each disk group the Available disks pane displays the list of disks that are part of the disk group. Select disks for each unavailable volume that you want to clone on to the secondary.
Layout	By default, the same layout as the one specified for the primary volume is selected. Click **Edit** to change the layout to suit your specific requirements.
Selected Disks	Displays the list of disks that have been moved in from the Available Disks pane.

View Primary Layout	Displays the volume layout at the primary site. Use this information as a reference to specify the details for the Secondary layout.

Click **Next**.

5 In the Storage Configuration Cloning Summary panel, review the displayed information. If you want to change any selection, click **Back**. Otherwise, click **Next** to allow the wizard to implement the storage configuration at the secondary site.

6 In the Implementation panel, wait until the status for all the completed tasks is marked with a check symbol, indicating successful completion. Wait until the wizard completes cloning the storage. The progress bar indicates the status of the tasks. If some task could not be completed successfully, then the task is marked with an (**x**) symbol. The Information column displays details about the reasons for task failure. Click **Next**.

7 In the Storage Cloning Configuration Result screen, view the results and click **Next**.

8 In the SQL Server Installation panel, review the information and do one of the following:

- Click **Finish** to exit the wizard and proceed with installing the application on the required nodes. Before you begin installation, ensure that your disk groups are imported and volumes are mounted. If volumes were mounted as drive paths (folder mount) on the primary site, the wizard does not mount the volumes on the secondary site. You must manually format the volumes and assign the drive path to the volumes using Veritas Enterprise Administrator. Use the same letters and folder names that were assigned on the primary site.
  After completing the application installation, you can launch the DR wizard again.
- Click **Next** to continue with service group cloning if the application is already installed on the required nodes.
- If the DR wizard is run from a remote node, you can keep the wizard running on that node. You can then install the SQL application locally on each of the required nodes and then click **Next** to continue.
- If you are running the DR wizard from a local system and need to install the SQL application on that system, the system gets restarted when the application installation is complete. You can then restart the wizard.

If you exit the wizard at any point and then restart it, the wizard starts from the Welcome panel. Continue through the wizard, specifying the primary

site system, the service group, the secondary site system, and the replication method. The wizard proceeds to the storage cloning panel. If it detects that the storage is identical, it proceeds to the service group cloning.

Creating temporary storage on the secondary site using the DR wizard (array-based replication)

To enable you to install applications, the DR wizard can create a temporary disk group, DR_APP_INSTALL__DG, which contains the volumes and mount points for use in application installation. The temporary configuration uses 500 MB volumes or the volume size at the primary site, depending on which is smaller. The wizard deletes the temporary configuration after application installation.

If you have already installed the application on all nodes, you can skip this storage cloning step by unchecking the Perform storage cloning box on the Storage Cloning panel.

If you have not yet started the wizard, see the following topic for the wizard prerequisites before continuing with the procedure:

- "Configuring disaster recovery with the DR wizard" on page 256.

To create temporary storage for application installation (array-based replication)

1. If you have not yet done so, start the Disaster Recovery Configuration Wizard and specify the information for the primary site system, the service group, and the secondary site system.
2. In the Replication Options panel, select the array-based replication method you plan to use and click **Next**:
   - EMC SRDF
   - Hitachi TrueCopy
   - Global Cluster Option only (select if you are using another agent-supported array-based replication method)
3. If you selected Hitachi TrueCopy replication, the Hitachi TrueCopy File Paths panel is displayed. The wizard populates the fields if it locates the files in the default location. Otherwise, fill in the file path information for both the primary and secondary sites as follows:

RAID Manager bin path	Path to the RAID Manager Command Line interface Default: C:\HORCM\etc where C is the system drive.

HORCM files location	Path to the horcm configuration files (horcm*nn*.conf) Default: C:\Windows where C is the system drive An horcm configuration file is required by the RAID Manager on all nodes; however the wizard does not validate this.

4 In the Storage Cloning panel, choose one of the following:

- If you have not yet installed the application on all nodes, leave **Perform storage cloning** checked and click **Next**. Continue with the next step in this procedure.
- If you have already installed the application on all nodes, uncheck **Perform storage cloning** and click **Next**. Continue with the procedure for service group cloning.

5 The Storage Validation Results panel shows the temporary storage configuration that the wizard will configure at the secondary site. You can click **Show Summary** to toggle to a summary view and toggle back to a detailed view by clicking **Show Details.**

The detailed view shows the following:

Disk Group	Displays the name of the single disk group required on the secondary site for temporary storage: DR_APP_INSTALL__DG
Volume	Displays the list of volumes required at the secondary site.
Size	Displays the size of the volumes required on the secondary site.
Mount	Displays the mounts required at the secondary site.
Recommended Action	Indicates the action that the wizard will take at the secondary site.

The summary view shows the following:.

Existing configuration	Displays the existing secondary configuration.
Free disks present on secondary	Displays the list of free disks that exist on the secondary along with details about the free space and total disk space information.

If the panel displays a message indicating that the available disks on the secondary are inadequate, you can free some disks on the secondary or add more storage. Then click **Refresh/Validate** so that the wizard can update its information about the secondary storage configuration.
Click **Next**.

6 In the Disk Selection for Storage Cloning panel, a default disk selection is shown for the temporary storage at the secondary site. You can change the selection by moving disks to and from the Available Disks and Selected Disks pane. Under the Available Disks label, a drop-down list allows you to filter available disks by disk enclosure name. The default is All, which displays all free disks available on all enclosures. Click **Next**.

7 The Volume Layout for Secondary Site Storage panel shows a default volume layout for the temporary storage based on the primary site volume layout. Optionally, you can change the default disk assignment and layout for any volume:

Disk Group	Displays the DR_APP_INSTALL__DG disk group.
Volume (Volume Size)	Displays the name and the size of the volume to be created on the secondary.
Available Disks	Displays the disks that are available for the volumes. To select a disk, either double-click on the host name or click the **>>** button to move the hosts into the Selected Disks pane.
Layout	By default, the same layout as the one specified for the primary volume is selected. Click **Edit** to change the layout to suit your specific requirements.
Selected Disks	Displays the list of disks that have been selected for the volume. To remove a disk from the list, select it and click the << button.
View Primary Layout	Displays the volume layout at the primary site.

Click **Next**.

8 In the Storage Configuration Cloning Summary panel, review the displayed information. If you want to change any selection, click **Back**. Otherwise, click **Next** to allow the wizard to implement the temporary storage configuration at the secondary site.

9 In the Implementation panel, wait until the status for all the completed tasks is marked with a check symbol, indicating successful completion. Wait until the wizard completes cloning the storage. The progress bar indicates the status of the tasks. If some task could not be completed successfully,

then the task is marked with an (**x**) symbol. The Information column displays details about the reasons for task failure. Click **Next**.

10 In the Storage Configuration Cloning Result screen, view the results and click **Next**.

11 In the SQL Server Installation panel, review the information and do one of the following:

- Before you begin installation, ensure that your disk groups are imported and volumes are mounted. If volumes were mounted as drive paths (folder mount) on the primary site, the wizard does not mount the volumes on the secondary site. You must manually format the volumes and assign the drive path to the volumes using Veritas Enterprise Administrator. Use the same letters and folder names that were assigned on the primary site.
- If you are running the DR Wizard from a local system and need to install the SQL application on that system, click **Finish** to exit the wizard and proceed with installing the application on the required nodes.

  After completing the application installation, you can launch the DR Wizard again to proceed with service group cloning. At this point the temporary cloned storage is no longer needed. Before beginning service group cloning, the wizard displays the Temporary Storage Deletion panel to confirm the deletion of the temporary storage.
- If the DR Wizard is run from a remote node, you can keep the wizard running on that node. You can then install the SQL application locally on each of the required nodes.

  After completing the application installation, click **Next** to proceed with service group cloning. At this point the temporary cloned storage is no longer needed. Before beginning service group cloning, the wizard displays the Temporary Storage Deletion panel to confirm the deletion of the temporary storage.

Installing and configuring SQL Server 2008 on the secondary site

Use the same installation and configuration procedures for SQL Server 2008 as on the primary site but note the following considerations when installing SQL Server 2008 on the secondary site.

- Before installing Microsoft SQL Server 2008, verify that the cluster disk group is imported to the first node and the volumes are mounted. If volumes were mounted as drive paths (folder mount) on the primary site, the DR Wizard does not mount the volumes on the secondary site and you must format the volumes and mount them manually.
  See "About managing disk groups and volumes" on page 134.
- During installation, use the same instance name as on the primary site.

Cloning the service group configuration from the primary to the secondary site

The Disaster Recovery Configuration Wizard enables you to create a SQL Server service group and define the attributes for its resources on all the nodes for this SQL instance within the cluster, simultaneously.

Before cloning the service group on the secondary site, verify that you have installed the application on the secondary site on all nodes for this SQL instance.

If you are launching the wizard for the first time, see the following topic for additional information:

- "Configuring disaster recovery with the DR wizard" on page 256.

Note: Although you can view the cloning progress in the VCS Java Console, do not save and close the configuration while cloning is in progress. Otherwise, the cloning fails and you have to delete the service group on the secondary site and run the wizard again.

To clone the service group configuration from the primary site to the secondary site

1. At the primary site, verify that you have brought the application service group online.
2. Start the DR Configuration Wizard from the Solutions Configuration Center. Click **Start** > **All Programs** > **Symantec** > **Veritas Cluster Server** > **Solutions Configuration Center**. Expand the Solutions for Microsoft SQL Server tab

and click **Disaster Recovery Configuration > Configure Disaster Recovery** > **Disaster Recovery Configuration Wizard**.

3 In the Welcome panel, click **Next** and continue through the wizard, providing the requested information for the primary site system, the service group, the secondary site system, and the replication method.

If you selected the VVR replication method, the wizard proceeds to the storage cloning task and notifies you if it detects that the storage is identical. Click **Next** until you reach the Service Group Analysis panel.

If you selected an array-based replication method (EMC SRDF, HTC, or GCO only), the temporary storage is no longer needed once the application is installed and the wizard confirms whether or not to delete it.

4 (Array-based replication method only) In the Temporary Storage Deletion panel, confirm whether or not to delete the cloned storage:

- If the application is already installed on the required nodes, leave **Delete cloned storage** checked and click **Next**. When the wizard prompts you to confirm deleting the shared storage, click **Yes**.
- If you want to delete the cloned storage manually later, uncheck **Delete cloned storage** and click **Next**.

5 (Array-based replication method only) If you selected to delete the cloned storage, the wizard shows the progress of the tasks in the Implementation panel. If the storage deletion fails, the wizard will show a failure summary page. Otherwise, when it shows the tasks are complete, click **Next**.

6 Review the following information displayed in the Service Group Analysis panel and click **Next** to continue with service group cloning.

Service Group Name	Displays the list of application-related service groups present on the cluster at the primary site.
Service Group Details on the Primary Cluster	Displays the resource attributes for the service group at the primary site. These include: ■ IP Resource: consists of the IP address and the subnet mask ■ NIC Resource: is the MAC address
Service Group Details on the Secondary Cluster	Displays a message to indicate whether the service group or the corresponding attributes have been configured at the secondary site.

7 In the Service Group Cloning panel, specify the requested system information for the secondary site.

Service Group Name	Depending on the application service group already created at the primary site, and subsequently selected on the Service Group Selection page, the wizard displays the names of the service groups that will be cloned at the secondary site.
Available Systems	Displays a list of available systems on the secondary cluster that are not yet selected for service group cloning. Select any additional secondary systems on which you want the wizard to clone the application service group configuration. Either double-click on the system name or use the > option to move the hosts into the Selected Systems pane. **Note:** If you want to add systems to a service group after you finish cloning the service group configuration with the DR wizard, you cannot do so by running the DR wizard again. Instead, run the VCS configuration wizard and edit the system list of the existing service group.
Selected Systems	Displays the list of selected systems. The secondary system that you selected earlier in the wizard is listed by default.

Click **Next**.

8 In the Service Group Attribute Selection panel, complete the requested information to create the required resources on the secondary site. The panel also displays the service group resource name and the attribute information at the primary site.

Resource Name	Displays the list of resources that exist on the primary cluster.
Attribute Name	Displays the attribute name associated with each of the resources displayed in the Resource Name column. If you need to edit additional attributes that are not shown, you must edit them manually on the secondary site service group once service group cloning is complete.
Primary Cluster	Displays the primary attribute values for each of the displayed attributes.

Secondary Cluster	The default is the same as the primary cluster. The same virtual IP address can be used if both sites exist on the same network segment. You can specify different attributes depending on your environment. For the MACAddress attribute select the appropriate public NIC from the drop-down list.

Click **Next**.

9 In the Service Group Summary, review the attribute information that will be cloned on to the secondary cluster. Click **Back** to change any of the secondary service group attributes. Otherwise, click **Next** to proceed with cloning the service group configuration on the secondary site.

10 In the Implementation panel, wait until all the tasks are completed.The progress bar indicates the status of the tasks. Successful tasks are marked with a check symbol. If some task could not be completed successfully, the task is marked with an (**x**) symbol. The Information column displays details about the reasons for task failure. Click **Next**

11 If the cloning failed, review the troubleshooting information. Otherwise, click **Next** to continue with the replication and GCO configuration, or with GCO only, depending on which option you selected.
Optionally, you can exit the wizard at this point and launch the wizard again later. When you launch the wizard again, continue through the wizard, specifying the primary site system, the service group, the secondary site system, and the replication method. Click **Next** to continue to the replication and/or GCO configuration task.
To configure an MSDTC service group, see “Tasks for configuring MSDTC for high availability” on page 64.

Configuring replication and global clustering

After creating the identical service group configuration on both sites, the DR wizard helps you set up replication and global clustering (GCO option). You can choose to configure replication using VVR or an agent-supported array-based hardware replication.

If you are using an array-based replication that is not supported by the wizard, you configure global clustering only. In this case, you must complete configuring global clustering before configuring replication.

The following topics cover the steps required for each replication method:

- "Configuring VVR replication and global clustering" on page 272
- "Configuring EMC SRDF replication and global clustering" on page 280
- "Configuring Hitachi TrueCopy replication and global clustering" on page 283
- "Configuring global clustering only" on page 286

Configuring VVR replication and global clustering

After you complete the service group configuration task in the DR wizard, you configure VVR replication and global clustering.

Note: By default, in an Exchange or SQL Server environment, the DR wizard organizes all the volumes in a disk group under one Replicated Volume Group (RVG). If you require a different organization, you should configure it using the Veritas Enterprise Administrator (VEA) rather than the DR wizard.

Before you begin, ensure that you have met the following prerequisites:

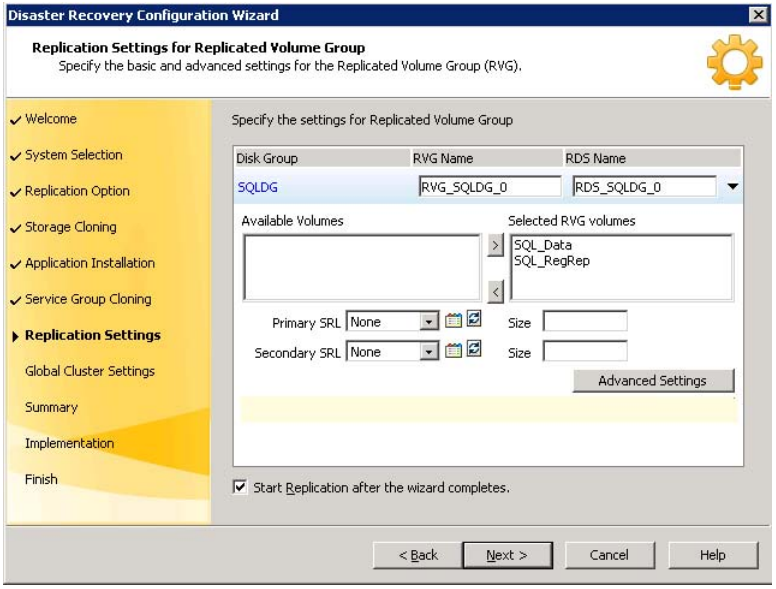
- Ensure that Veritas Volume Replicator is installed at the primary and secondary site.
- Ensure that Global Cluster Option (GCO) is installed at the primary and secondary site. One static IP address must be available per site for configuring GCO.
- Ensure that VVR Security Service (VxSAS) is configured at the primary and secondary site. See the following topic:
  - "Setting up security for VVR" on page 248
- Ensure that a minimum of one static IP address per site is available for each application instance running in the cluster.

- Ensure that you configure a VCS user with the same name and privileges in each cluster.

Use the following procedure to configure VVR replication and global clustering with the DR wizard.

To configure VVR replication and GCO

1. Verify that the application server service group is online at the primary site and the appropriate disk groups are imported at the secondary site.
2. If the wizard is still open after the service group cloning task, continue with the Replication Setup panel. Otherwise, launch the wizard and proceed to the Replication Setup panel as follows:
   - Start the DR Configuration Wizard from the Solutions Configuration Center. Click **Start** > **All Programs** > **Symantec** > **Veritas Cluster Server** > **Solutions Configuration Center**. Expand the Solutions for Microsoft SQL Server tab and click **Disaster Recovery Configuration > Configure Disaster Recovery** > **Disaster Recovery Configuration Wizard**.
   - On the Welcome panel, click **Next** and continue through the wizard, providing the requested information.
   - On the Replication Methods panel, click **Configure VVR and the Global Cluster Option (GCO)**. Click **Next** and continue to the Replication Setup panel.
3. In the Replication Setup panel, review the replication requirements. If you have met the requirements, click **Next**. If not, click **Cancel** and restart the wizard after meeting the requirements.
4. In the Replication Settings for Replicated Volume Group panel, specify the requested information. If you are adding a DR site to an existing DR configuration, fields that must match the existing settings, such as the RVG or RDS name, are dimmed so that you cannot change them.

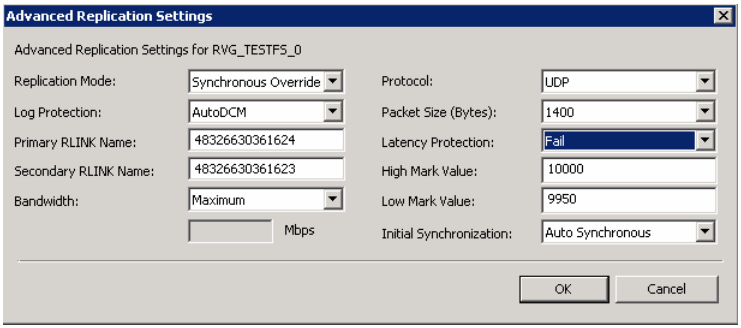


Disk Group	The left column lists the disk groups. By design, an RVG is created for each disk group.
RVG Name	Displays the default RVG name. If required, change this to a name of your choice.
RDS Name	Displays the default Replicated Data Set (RDS) name. If required, change this to a name of your choice.
Available Volumes	Displays the list of available volumes that have not been selected to be a part of the RVG. Either double-click on the volume name or use the > option to move the volumes into the Selected RVG Volumes pane.

Selected RVG Volumes	Displays the list of volumes that have been selected to be a part of the RVG. To remove a selected volume, either double-click the volume name or use the < option to move the volumes into the Available Volumes pane. Symantec recommends excluding tempdb from replication. If you earlier moved tempdb to a separate volume in the same disk group as the system database volumes, you can exclude tempdb from replication by removing the tempdb volume from the Selected RVG Volumes pane.
Primary SRL	If you did not create a Replicator Log volume on the primary site, click **Create New** on the drop-down menu. On the New Volume dialog box, specify the name, size, and disk. Otherwise, select the appropriate primary Replicator Log volume from the drop-down menu and enter an appropriate size.
Secondary SRL	If you did not create a Replicator Log volume on the primary site, click **Create New** on the drop-down menu. On the New Volume dialog box, specify the same name and size as you specified for the primary SRL. Otherwise, select the appropriate secondary Replicator Log volume from the drop-down menu and enter an appropriate size.
Start Replication after the wizard completes	Select this check box to start replication automatically after the wizard completes the necessary configurations. Once replication is configured and running, deselecting the checkbox does not stop replication.

- Click **Advanced Settings** to specify some additional replication properties. The options on the dialog box are described column-wise, from left to right; refer to the *Veritas Volume Replicator*

Administrator's Guide for additional information on VVR replication options.



Replication Mode — Select the required mode of replication; **Synchronous**, **Asynchronous**, or **Synchronous Override**. The default is synchronous override.

Log Protection — Select the appropriate log protection from the list.

The **AutoDCM** is the default selected mode for the Replicator Log overflow protection when all the volumes in the Primary RVG have a DCM log. The DCM is enabled when the Replicator Log overflows.

The **Off** option disables Replicator Log Overflow protection.

The **Override** option enables log protection. If the Secondary node is still connected and the Replicator Log is about to overflow then the writes are stalled until a predetermined amount of space, that is, 5% or 20 MB (whichever is lesser) becomes available in the Replicator Log.

If the Secondary becomes inactive due to disconnection or administrative action then Replicator log protection is disabled, and the Replicator Log overflows.

The **Fail** option enables log protection. If the log is about to overflow the writes are stalled until a predetermined amount of space, that is, 5% or 20 MB (whichever is lesser) becomes available in the Replicator Log. If the connection between primary and secondary RVG is broken, then, any new writes to the primary RVG are failed.

Primary RLINK Name	Enter a name of your choice for the primary RLINK. If you do not specify any name then the wizard assigns a default name.
Secondary RLINK Name	Enter a name of your choice for the Secondary RLINK. If you do not specify any name then the wizard assigns a default name.
Bandwidth	By default, VVR replication uses the maximum available bandwidth. You can select **Specify** to specify a bandwidth limit. The default unit is Mega bits per second (Mbps) and the minimum allowed value is 1 Mbps.
Protocol	Choose TCP or UDP. UDP/IP is the default replication protocol.
Packet Size (Bytes)	Default is 1400 Bytes. From the drop-down list, choose the required packet size for data transfer. The default unit for the packet size is Bytes. You can set the packet size only if the protocol is UDP/IP.
Latency Protection	By default, latency protection is set to **Off**. When this option is selected the **High Mark Value** and the **Low Mark Value** are disabled. Select the **Fail** or **Override** option to enable Latency protection. This **Override** option behaves like the **Off** option when the Secondary is disconnected and behaves like the **Fail** option when the Secondary is connected.
High Mark Value	This option is enabled only when Latency Protection is set to **Override** or **Fail**. It specifies the maximum number of pending updates by which the secondary site can be behind the primary site. The default value is 10000. To ensure that latency protection is most effective the difference between the high and low mark values must not be very large.
Low Mark Value	This option is enabled only when Latency Protection is set to **Override** or **Fail**. When the updates in the Replicator log reach the **High Mark Value,** then the writes to the system at the primary site continues to be stalled until the number of pending updates on the Replicator log falls back to the **Low Mark Value**. The default is 9950.

Initial Synchronization	If you are doing an initial setup, then use the **Auto Synchronous** option to synchronize the secondary site and start replication. This is the default. When this option is selected, VVR by default performs intelligent synchronization to replicate only those blocks on a volume that are being used by the file system. If required, you can disable intelligent synchronization. If you want to use the **Synchronize from Checkpoint** method then you must first create a checkpoint. If you have a considerable amount of data on the primary data volumes then you may first want to synchronize the secondary for existing data using the backup-restore method with checkpoint. After the restore is complete, use the **Synchronize from Checkpoint** option to start replication from the checkpoint to synchronize the secondary with the writes that happened when backup-restore was in progress.

To apply changes to advanced settings, click **OK.** On the Replication Settings for Replicated Volume Group panel click **Next**.

5 In the Replication Attribute Settings panel, specify required replication attribute information for the cluster at the primary and secondary site. Click the arrow iconto expand an RVG row and display the replication attribute fields. If you are configuring an additional secondary site (multiple DR sites), some fields are disabled.

Disk Group	Displays the list of disk groups that have been configured.
RVG Name	Displays the Replicated Volume Groups corresponding to the disk groups.
IP Address	Enter replication IPs that will be used for replication, one for the primary site and another for the secondary site.
Subnet Mask	Enter the subnet mask for the system at the primary site and the secondary site.
Public NIC	Select the public NIC from the drop-down list for the system at the primary and secondary site.
Copy	Enables you to copy the RLINK attributes across multiple RLINKs. You must have at least two RLINKs to be able to use this operation to copy RLINK attributes from the current to the other RLINKs.

After specifying the replication attributes for each of the RVGs, click **Next**.

6 In the Global Cluster Settings panel specify the heartbeat information for the wide-area connector resource. You must specify this information for the primary and the secondary cluster. Any existing WAC resource information can be reused. If you are adding a DR site to an existing DR configuration, GCO is already configured at the primary site, so the primary site fields are dimmed.

Use existing settings	Allows you to use a WAC resource that already exists at either the primary or secondary site. Click Primary or Secondary, depending on the site at which the WAC resource already exists.
Resource Name	Select the existing WAC resource name from the resource name list box.
Create new settings	Select the appropriate site, primary or secondary, for which you want to create a new WAC resource.
IP Address	Enter a virtual IP for the WAC resource.
Subnet Mask	Enter the subnet mask for the system at the primary site and the secondary site.
Public NIC	Select the public NIC for each system from the drop-down list for the system at the primary and secondary site.
Start GCO after configuration	Select this check box to bring the cluster service group online and start GCO automatically after the wizard completes the necessary configurations. Otherwise, you must bring the service group online and start GCO manually, after the wizard completes. Once GCO is configured and running, deselecting the checkbox does not stop GCO.

7 In the Settings Summary panel, review the displayed information. Click **Back** if you want to change any of the parameters. If you have a printer installed, you can click the printer icon at the bottom of the scrollable list to print the settings.
Click **Next** to implement the settings.

8 In the Implementation panel, wait till the wizard completes creating the replication configuration and the WAC resource required for global clustering. If a task could not be completed successfully, it is marked with an **(x)** symbol. For any critical errors, the wizard displays an error message. For less critical errors, the Information column displays a brief description

about the task failure and the next screen displays additional information on what action you can take to remedy it. Click **Next**.

9 In the Finish panel, review the displayed information. If a task did not complete successfully, the panel displays an error message, which will provide some insight into the cause for failure. Click **Finish** to exit the wizard.

Configuring EMC SRDF replication and global clustering

After you complete the service group configuration task in the DR wizard, you configure replication and global clustering.

The wizard helps you to configure the settings for the SRDF resource in the application service group.

Ensure that you have met the prerequisites for replication. See the following topic:

- "Requirements for EMC SRDF array-based hardware replication" on page 251

In addition, ensure that the Global Cluster Option (GCO) is installed at the primary and secondary site. One static IP address must be available per site for configuring GCO.

The wizard configures the required agent settings as well as the SYMM heartbeat. It uses defaults for optional settings. See the following topic:

- "Optional settings for EMC SRDF" on page 282

To configure EMC SRDF replication and GCO

1 Verify that you have brought the application service group online at the primary site.

2 If the wizard is still open after the service group cloning task, continue with the Replication Setup panel. Otherwise, launch the wizard and proceed to the Replication Setup panel as follows:

- Start the DR Configuration Wizard from the Solutions Configuration Center. Click **Start** > **All Programs** > **Symantec** > **Veritas Cluster Server** > **Solutions Configuration Center**. Expand the Solutions for Microsoft SQL Server tab and click **Disaster Recovery Configuration > Configure Disaster Recovery** > **Disaster Recovery Configuration Wizard**.
- In the Welcome panel, click **Next** and continue through the wizard, providing the requested information.
- In the Replication Methods panel, click **Configure EMC SRDF and the Global Cluster Option (GCO)**. Click **Next** and continue to the Replication Setup panel.

3 In the Replication Setup panel, review the replication requirements. If you have met the requirements, click **Next**.

Warning: Although you can continue with the wizard even if replication requirements are not met, the wizard will warn you that the configuration is not valid. If the configuration is not valid, the SRDF resource cannot come online in the service group.

4 In the SRDF Resource Configuration panel, the wizard populates the required resource fields if replication has been configured. Otherwise, you must enter the required resource settings manually.

Symmetrix Array ID (SID)	Specify the array ID for the primary site and for the secondary site.
Device Group name	Specify the name of the Symmetrix device group that contains the disks of the disk group for the selected instance.
Available VMDG Resources	Select the disk groups associated with the selected application instance.

5 If you want to configure an additional SRDF resource for the instance, click **Add**. Otherwise, click **Next**.

6 In the Global Cluster Settings panel, specify the heartbeat information for the wide-area connector resource. You must specify this information for the primary and the secondary cluster. Any existing WAC resource information can be reused. If you are adding a DR site to an existing DR configuration, GCO is already configured at the primary site, so the primary site fields are dimmed.

Use existing settings	Allows you to use a WAC resource that already exists at either the primary or secondary site. Click Primary or Secondary, depending on the site at which the WAC resource already exists.
Resource Name	Select the existing WAC resource name from the resource name list box.
Create new settings	Select the appropriate site, primary or secondary, for which you want to create a new WAC resource.
IP Address	Enter a virtual IP for the WAC resource.
Subnet Mask	Enter the subnet mask for the system at the primary site and the secondary site.

Public NIC	Select the public NIC for each system from the drop-down list for the system at the primary and secondary site.
Start GCO after configuration	Select this check box to bring the cluster service group online and start GCO automatically after the wizard completes the necessary configurations. Otherwise, you must bring the service group online and start GCO manually, after the wizard completes. Once GCO is configured and running, deselecting the checkbox does not stop GCO.

Click **Next.**

7 In the Settings Summary panel, review the displayed information. Click **Back** if you want to change any of the parameters specified for the replication resource settings or the global cluster settings.
Click **Next**.

8 In the Implementation panel, wait until the wizard completes creating the replication configuration and the WAC resource required for global clustering, A check (✔) symbol indicates successful completion of a task. An (**x**) symbol indicates a task that could not be completed successfully. The Information column shows details about the reasons for task failure. Click **Next**.

9 In the Finish panel, review the displayed information. If a task did not complete successfully, the panel displays an error message, which will provide some insight into the cause for failure. Click **Finish** to exit the wizard.

10 Proceed with configuring additional optional settings for the SRDF resource if desired, and then verifying the disaster recovery configuration.

Optional settings for EMC SRDF

The wizard configures the required settings for the SRDF resource in the VCS application service group.

Optional settings are left in the default state. For information on configuring the optional settings, see *Veritas Cluster Server Hardware Replication Agent for EMC SRDF, Configuration Guide*. If you change any settings, ensure that you edit the resource on both the primary and secondary sites.

The optional settings use the following defaults:

Option	Default setting
SymHome	C:\Program Files\EMC\SYMCLI\bin
DevFOTime	2 seconds per device required for a device to fail over
AutoTakeover	The default is 1; the agent performs a read-write enable on partitioned devices in the write-disabled state during a failover, if devices are consistent.
SplitTakeover	The default is 1; the agent brings service groups online on the R2 side even if the devices are in the split state because they are read-write enabled.

Configuring Hitachi TrueCopy replication and global clustering

After you complete the service group configuration task in the DR wizard, you configure replication and global clustering.

The wizard helps you to configure the settings for the HTC resource in the application service group.

Ensure that you have met the prerequisites. See the following topic:

- "Requirements for Hitachi TrueCopy array-based hardware replication" on page 253

In addition, ensure that the Global Cluster Option (GCO) is installed at the primary and secondary site. One static IP address must be available per site for configuring GCO.

The wizard configures the required agent settings. It uses defaults for optional settings. See the following topic:

- "Optional settings for HTC" on page 286

To configure Hitachi TrueCopy replication and GCO

1. Verify that you have brought the application server service group online at the primary site
2. If the wizard is still open after the service group cloning task, continue with the Replication Setup panel. Otherwise, launch the wizard and proceed to the Replication Setup panel as follows:
   - Start the DR Configuration Wizard from the Solutions Configuration Center. Click **Start** > **All Programs** > **Symantec** > **Veritas Cluster Server** > **Solutions Configuration Center**. Expand the Solutions for Microsoft

SQL Server tab and click **Disaster Recovery Configuration > Configure Disaster Recovery** > **Disaster Recovery Configuration Wizard**.

- In the Welcome panel, click **Next** and continue through the wizard, providing the requested information.
- In the Replication Methods panel, click **Configure Hitachi TrueCopy and the Global Cluster Option (GCO)**. Click **Next** and continue to the Replication Setup panel.

3 In the Replication Setup panel, review the replication requirements. If you have met the requirements, click **Next**.

Warning: Although you can continue with the wizard even if replication requirements are not met, the wizard will warn you that the configuration is not valid. If the configuration is not valid, the HTC resource cannot come online in the service group.

---

4 In the HTC Resource Configuration panel, the wizard populates the required resource fields if the horcm file is configured properly. If not, you can configure the horcm file and click **Refresh** to populate the fields. Alternatively, enter the required resource settings manually:

Instance ID	Specify the instance number of the device group. Multiple device groups may have the same instance number.
Device Group name	Specify the name of the Hitachi device group that contains the disk group for the selected instance. The device group name must be the same on both the primary and secondary sites.
Available VMDG Resources	Select the disk groups associated with the selected application instance.
Add, Remove, Reset buttons	Click Add or Remove to display empty fields so that you can manually add or remove additional resources. Click Refresh to repopulate all fields from the current horcm file.

5 If you want to configure an additional HTC resource for the instance, click **Add**. Otherwise, click **Next**.

6 In the Global Cluster Settings panel, specify the heartbeat information for the wide-area connector resource. You must specify this information for the primary and the secondary cluster. Any existing WAC resource information can be reused. If you are adding a DR site to an existing DR configuration,

GCO is already configured at the primary site, so the primary site fields are dimmed.

Use existing settings	Allows you to use a WAC resource that already exists at either the primary or secondary site. Click Primary or Secondary, depending on the site at which the WAC resource already exists.
Resource Name	Select the existing WAC resource name from the resource name list box.
Create new settings	Select the appropriate site, primary or secondary, for which you want to create a new WAC resource.
IP Address	Enter a virtual IP for the WAC resource.
Subnet Mask	Enter the subnet mask for the system at the primary site and the secondary site.
Public NIC	Select the public NIC for each system from the drop-down list for the system at the primary and secondary site.
Start GCO after configuration	Select this check box to bring the cluster service group online and start GCO automatically after the wizard completes the necessary configurations. Otherwise, you must bring the service group online and start GCO manually, after the wizard completes. Once GCO is configured and running, deselecting the checkbox does not stop GCO.

7 In the Settings Summary panel, review the displayed information. Click **Back** if you want to change any of the parameters specified for the replication resource settings or the global cluster settings.
Click **Next**.

8 In the Implementation panel, wait until the wizard completes creating the replication configuration and the WAC resource required for global clustering, A check (✔) symbol indicates successful completion of a task. An (**x**) symbol indicates a task that could not be completed successfully. The Information column shows details about the reasons for task failure. Click **Next**.

9 In the Finish panel, review the displayed information. If a task did not complete successfully, the panel displays an error message, which will provide some insight into the cause for failure. Click **Finish** to exit the wizard.

10 Proceed with configuring additional optional settings for the HTC resource if desired, and then verifying the disaster recovery configuration.

Optional settings for HTC

The wizard configures the required settings for the HTC resource in the VCS application service group.

Optional settings are left in the default state. For information on configuring the optional settings, see *Veritas Cluster Server Hardware Replication Agent for Hitachi TrueCopy, Configuration Guide*.

The optional settings use the following defaults:

Option	Default setting
LinkMonitor	The default is 0; the agent does not periodically attempt to resynchronize the S-VOL side if the replication link is disconnected.The value 1 indicates that when the replication link is disconnected, the agent periodically attempts to resynchronize the S-VOL side using the pairresync command.
SplitTakeover	The default is 0; the agent does not permit a failover to S-VOL devices if the replication link is disconnected; that is, if P-VOL devices are in the PSUE state.

Configuring global clustering only

If you are using a replication method that the DR wizard does not configure, you must select the replication option to configure global clustering only.
For the GCO only option, you use the wizard to complete all DR tasks except the replication configuration task. You must complete the final wizard task of configuring global clustering before configuring replication.

Before configuring GCO:

- Ensure that the Global Cluster Option (GCO) is installed at the primary and secondary site. One static IP address must be available per site for configuring GCO.
- If you created secure clusters at the primary site and secondary site, ensure that you have configured a VCS user with the same name and privileges in each cluster, and the user must be added in the Administrator role.

The following procedure assumes that you have completed the earlier wizard tasks through the service group cloning task and are continuing with the final step of configuring global clustering.

To configure GCO only

1. If the wizard is still open after the service group cloning task, continue with the GCO Setup panel. Otherwise, launch the wizard and proceed to the GCO Setup panel as follows:
   - Start the DR Configuration Wizard from the Solutions Configuration Center. Click **Start** > **All Programs** > **Symantec** > **Veritas Cluster Server** > **Solutions Configuration Center**. Expand the Solutions for Microsoft SQL Server tab and click **Disaster Recovery Configuration > Configure Disaster Recovery** > **Disaster Recovery Configuration Wizard**.
   - In the Welcome panel, click **Next** and continue through the wizard, providing the requested information.
   - In the Replication Methods panel, click **Configure Global Cluster Option (GCO) only**. Click **Next** and continue to the GCO Setup panel.
2. In the GCO Setup panel, review the requirements. If you have met the requirements, click **Next**.
3. In the Global Cluster Settings panel specify the heartbeat information for the wide-area connector resource. You must specify this information for the primary and the secondary cluster. Any existing WAC resource information can be reused. If you are adding a DR site to an existing DR configuration, GCO is already configured at the primary site, so the primary site fields are dimmed.

Use existing settings	Allows you to use a WAC resource that already exists at either the primary or secondary site. Click Primary or Secondary, depending on the site at which the WAC resource already exists.
Resource Name	Select the existing WAC resource name from the resource name list box.
Create new settings	Select the appropriate site, primary or secondary, for which you want to create a new WAC resource.
IP Address	Enter a virtual IP for the WAC resource.
Subnet Mask	Enter the subnet mask for the system at the primary site and the secondary site.
Public NIC	Select the public NIC for each system from the drop-down list for the system at the primary and secondary site.

Start GCO after configuration	Select this check box to bring the cluster service group online and start GCO automatically after the wizard completes the necessary configurations. Otherwise, you must bring the service group online and start GCO manually, after the wizard completes. Once GCO is configured and running, deselecting the checkbox does not stop GCO.

4. In the Settings Summary panel, review the displayed information. Click **Back** if you want to change any of the parameters specified.
   Click **Next**.
5. In the Implementation panel, wait until the wizard completes creating the replication configuration and the WAC resource required for global clustering, A check (✔) symbol indicates successful completion of a task. An (**x**) symbol indicates a task that could not be completed successfully. The Information column shows details about the reasons for task failure. Click **Next**.
6. In the Finish panel, review the displayed information. If a task did not complete successfully, the panel displays an error message, which will provide some insight into the cause for failure. Click **Finish** to exit the wizard.

Verifying the disaster recovery configuration

The steps you need to take to verify your DR configuration depend on the type of replication you are using.

After the DR wizard has completed, you can confirm the following to verify the DR configuration:

- For VVR replication, confirm that the configuration of disk groups and volumes at the DR site have been created by the DR wizard storage cloning.
- Confirm that the application VCS service group has been created in the DR cluster including the same service group name, same resources, and same dependency structure as the primary site's application VCS service group.
- Confirm that the application service group is online at the primary site. The application service group should remain offline at the DR site.
- For VVR replication:
  - Ensure VVR replication configuration. This includes ensuring that the RVGs have been created at primary and secondary with the correct

volume inclusion, replication mode, Replicator Log configuration, and any specified advanced options.

- Confirm that the replication state matches what was specified during configuration. If specified to start immediately, ensure that it is started. If specified to start later, ensure that it is stopped.
- Ensure that the VVR RVG VCS service group is configured on the primary and secondary clusters, including the correct dependency to the application service group, the specified IP for replication, and the correct disk group and RVG objects within the RVG VCS service group.
- Confirm that the RVG service groups are online at the primary and secondary sites.
- Confirm that the RVG Primary resources are online in the primary cluster's application service group. If they are offline, then bring them online in the primary site's cluster's application service group. Do not bring them online in the secondary site application service group.

- For array-based replication, verify that the required array resource is created in the primary and secondary cluster's application service group and that a dependency is set between the VMDg resource and the array resource.
- For EMC SRDF replication, verify that the SRDF resource is online in the primary cluster's application service group. If not, bring it online.
- For Hitachi TrueCopy replication, verify that the HTC resource is online in the primary cluster's application service group. If not, bring it online.
- For Hitachi TrueCopy replication, you must perform a manual Volume Manager rescan on all the secondary nodes after setting up replication and other dependent resources, in order to bring the disk groups online. This must be performed only once, after which the failover works uninterrupted. For more information, see *Veritas™ Cluster Server Hardware Replication Agent for Hitachi TrueCopy Installation and Configuration Guide*.
- Ensure that the application service groups are configured as global.
- Check to ensure that the two clusters are communicating and that the status of communication between the two clusters has a state of Alive.
- If you are using VVR for replication and configuring an additional DR site, verify the heartbeat and replication configuration between all sites.
- If you are using VVR for replication and chose to start replication manually in the DR wizard, to avoid replicating large amounts of data over the network the first time, then you will need to start the process necessary to synchronize from checkpoint. This typically consists of
  - starting a VVR replication checkpoint

- performing a block level backup
- ending the VVR replication checkpoint
- restoring the block level backup at the DR site
- starting replication from the VVR replication checkpoint

To learn more about the process of starting replication from a checkpoint, refer to the *Veritas Volume Replicator Administrator's Guide*.

- Do not attempt a wide area failover until data has been replicated and the state is consistent and up to date. The Solutions Configuration Center provides a Fire Drill Wizard to test wide area failover for VVR-based replication.

Establishing secure communication within the global cluster (optional)

A global cluster is created in non-secure mode by default. You may continue to allow the global cluster to run in non-secure mode or choose to establish secure communication between clusters.

The following prerequisites are required for establishing secure communication within a global cluster:

- The clusters within the global cluster must be running in secure mode.
- You must have Administrator privileges for the domain.

The following information is required for adding secure communication to a global cluster:

- The active host name or IP address of each cluster in the global configuration.
- The user name and password of the administrator for each cluster in the configuration.
- If the local clusters do not point to the same root broker, the host name and port address of each root broker.

Adding secure communication involves the following tasks:

- Taking the ClusterService-Proc (wac) resource in the ClusterService group offline on the clusters in the global environment.
- Adding the -secure option to the StartProgram attribute on each node.
- Establishing trust between root brokers if the local clusters do not point to the same root broker.

- Bringing the ClusterService-Proc (wac) resource online on the clusters in the global cluster.

To take the ClusterService-Proc (wac) resource offline on all clusters

1. From Cluster Monitor, log on to a cluster in the global cluster.
2. In the **Service Groups** tab of the Cluster Explorer configuration tree, expand the **ClusterService** group and the Process agent.
3. Right-click the **ClusterService-Proc** resource, click **Offline**, and click the appropriate system from the menu.
4. Repeat step 1 to step 3 for the additional clusters in the global cluster.

To add the -secure option to the StartProgram resource

1. In the **Service Groups** tab of the Cluster Explorer configuration tree, right-click the **ClusterService-Proc** resource under the **Process** type in the **ClusterService** group.
2. Click **View**, and then **Properties** view.
3. Click the Edit icon to edit the **StartProgram** attribute.
4. In the Edit Attribute dialog box, add `-secure` switch to the path of the executable Scalar Value.
   For example:
   ```
   "C:\Program Files\Veritas\Cluster Server\bin\wac.exe"
   -secure
   ```
5. Repeat step 4 for each system in the cluster.
6. Click **OK** to close the Edit Attribute dialog box.
7. Click the **Save and Close Configuration** icon in the tool bar.
8. Repeat step 1 to step 7 for each cluster in the global cluster.

To establish trust between root brokers if there is more than one root broker

- Establishing trust between root brokers is only required if the local clusters do not point to the same root broker.
  Log on to the root broker for each cluster and set up trust to the other root brokers in the global cluster. The complete syntax of the command is:
  vssat setuptrust --broker *<host:port>* --securitylevel <low|medium|high> [--hashfile *<filename>* | --hash *<root hash in hex>*]
  For example, to establish trust with a low security level in a global cluster comprised of Cluster1 pointing to RB1 and Cluster2 pointing to RB2:
  from RB1, type:

```
vssat setuptrust --broker RB2:14141 --securitylevel low
```

from RB2, type:

```
vssat setuptrust --broker RB1:14141 --securitylevel low
```

To bring the ClusterService-Proc (wac) resource online on all clusters

1. In the **Service Groups** tab of the Cluster Explorer configuration tree, expand the **ClusterService** group and the Process agent.
2. Right-click the **ClusterService-Proc** resource, click **Online**, and click the appropriate system from the menu.
3. Repeat step 1 and step 2 for the additional clusters in the global cluster.

Adding multiple DR sites (optional)

In a Veritas Volume Replicator replication environment only, you can use the DR wizard to add additional secondary DR sites. Veritas Cluster Server supports up to four DR sites. In other replication environments, additional DR sites require manual configuration.

Run the DR wizard and on the Secondary System selection panel, select the new site.

Before you start the wizard on the task of configuring replication and global clustering, ensure that the cluster service group is online at the existing primary and secondary sites. This enables the wizard to configure GCO not only between the selected primary site and the new secondary site but also between the new site and the earlier configured secondary site. Otherwise, the wizard displays a warning message after the global clustering task.

When configuring the VVR replication settings with the wizard for the additional site, fields that must match existing settings are dimmed so that you cannot change them. For example, you cannot change the RVG name or RVG layout on the Replication Settings panel. Similarly, on the Global Cluster Settings panel, GCO has already been configured at the primary site, so the primary site fields are dimmed.

Recovery procedures for service group dependencies

Service group dependencies have special requirements and limitations for disaster recovery configuration and for actions to be taken in a disaster recovery scenario.

See "Supported disaster recovery configurations for service group dependencies" on page 107.

The procedure and requirements for bringing service group dependencies online at the secondary site depends on their configuration: soft, firm, or hard.

In general, if a child or parent remains online at the primary site, you take it offline before you bring the child and parent service groups online in the correct order on the secondary site.

An exception is the RVG service group, used for VVR replication, which the wizard creates with an online, local, hard dependency. The RVG group remains online at the primary site in all cases and should be left online at the primary site.

The following tables show the recovery requirements if a child or parent service group fails at the primary site and is unable to fail over on the primary site, thus requiring the secondary site to be brought online.

Using a scenario of a parent and one child, the following table shows the expected results and necessary actions you must take for an online, local, soft dependency link.

Table 11-2 Online, local, soft dependency link

Failure condition	Results	Action required
The child service group fails	■ The parent remains online on the primary site. ■ An alert notification at the secondary site occurs for the child service group only. ■ The RVG group remains online.	1 Primary site: Manually take the parent service group offline at the primary site. Leave the RVG group online. 2 Secondary site: Bring the parent and child service groups online in the appropriate order (child first, then parent).

Table 11-2 Online, local, soft dependency link

Failure condition	Results	Action required
The parent service group fails	■ The child remains online on the primary site. ■ An alert notification at the secondary site occurs for the parent only. ■ The RVG group remains online.	1 Primary site: Manually take the child service group offline at the primary site. Leave the RVG group online. 2 Secondary site: Bring the service groups online in the appropriate order (child first, then parent).

Using a scenario of a parent and one child, the following table shows the expected results and necessary actions you must take for an online, local, firm dependency link.

Table 11-3 Online, local, firm dependency link

Failure condition	Results	Action required
The child service group fails	■ The parent goes offline on the primary site. ■ An alert notification at the secondary site occurs for the child service group only. ■ The RVG group remains online.	Secondary site: Bring the service groups online in the appropriate order (child first, then parent). Leave the RVG group online at the primary site.
The parent service group fails	■ The child remains online on the primary site. ■ An alert notification at the secondary site occurs for the parent only. ■ The RVG group remains online.	1 Primary site: Manually take the child service group offline at the primary site. Leave the RVG group online. 2 Secondary site: Bring the service groups online in the appropriate order (child first, then parent).

Using a scenario of a parent and one child, the following table shows the expected results and necessary actions you must take for an online, local, hard dependency link.

Table 11-4 Online, local, hard dependency link

Failure condition	Results	Action required
The child service group fails	■ The parent goes offline on the primary site. ■ An alert notification at the secondary site occurs for the child service group only. ■ The RVG group remains online.	Secondary site: Bring the service groups online in the appropriate order (child first, then parent). Do not take the RVG group offline at the primary site.
The parent service group fails	■ The child remains online on the primary site. ■ An alert notification at the secondary site occurs for the parent only. ■ The RVG group remains online.	1 Primary site: Manually take the child service group offline at the primary site. Leave the RVG group online. 2 Secondary site: Bring the service groups online in the appropriate order (child first, then parent).

Chapter 12

Testing fault readiness by running a fire drill

Topics in this chapter include:

About disaster recovery fire drills

A disaster recovery plan should include regular testing of an environment to ensure that a DR solution is effective and ready should disaster strike. This testing is called a fire drill. SFW HA provides a Fire Drill Wizard to help you set up and run a fire drill on a disaster recovery environment. that uses VVR replication.

About the Fire Drill Wizard

The Fire Drill Wizard tests the fault readiness of a disaster recovery configuration by mimicking a failover from the primary site to the secondary site. The wizard does this without stopping the application at the primary site and disrupting user access.

The wizard prepares for the fire drill by completing the following steps:

- Creates a fire drill service group on the secondary site
  The fire drill service group is a copy of the application service group, using the same service group name with the prefix FD*nn*. The wizard renames the fire drill service group resources by adding the prefix FD*nn* and changes attribute values as necessary to refer to the FD resources.
- Prepares a copy (mirror) of the production data on the secondary site
  You assign one or more disks for the mirrored volumes while running the wizard. Mirror preparation can take some time, so you can exit the wizard once this step is started and let the preparation continue in the background.

Once these steps are complete, the wizard can run the fire drill. Running the fire drill detaches the mirrors from the original volumes to create point-in-time snapshots of the production data. It also brings the application online in the fire drill service group at the secondary site. Bringing the fire drill service group online on the secondary site demonstrates the ability of the application service group to failover and come online at the secondary site should the need arise.

Fire drill service groups do not interact with outside clients or with other instances of resources, so they can safely come online even when the application service group is online on the primary site.

Running the fire drill creates a fire drill disk group on the secondary site with a snapshot of the application data to use for testing purposes. The wizard assigns the fire drill disk group name by prefixing the original disk group name with FD*nn*.

After you complete the fire drill, it is important to use the wizard to restore the fire drill configuration to a prepared state. Otherwise, the fire drill service group remains online. If you run a fire drill on one service group, restore that service group before you continue with a fire drill on another service group.

Warning: If the fire drill service group remains online, it could cause failures in your environment. For example, if the application service group were to fail over to the node hosting the fire drill service group, there would be resource conflicts, resulting in both service groups faulting. Therefore, always use the wizard to restore the fire drill configuration to a prepared state as soon as possible after completing the fire drill testing for a service group.
See "Restoring the fire drill system to a prepared state" on page 311.

You must also restore the fire drill configuration before you can delete it. If any errors occur while deleting the fire drill configuration, the wizard will list any incomplete steps so that you can complete them manually.

About post-fire drill scripts

You can specify a script to be run on the secondary site at the end of the fire drill.

For example, if you earlier created and populated a test table at the primary site, you could create a script to verify replication of the data. For the wizard to run the script, the script must exist on the secondary system that you are specifying for the fire drill.

Note: The wizard does not support using script commands to launch a user interface window. In such a case, the process is created but the UI window does not display.

Optionally, you can specify to run a Windows PowerShell cmdlet. To run a cmdlet, create a .bat file with the following entry:

%windir%\system32\WindowsPowerShell\v1.0\PowerShell.exe -command "$ScriptName"

Where

ScriptName = .ps1 script (fully qualified) / cmdlet entered by user.

For example:

D:\WINDOWS\system32\WindowsPowerShell\v1.0\PowerShell.exe -command C:\myTest.ps1

Specify the name of the .bat file as the script to run.

Tasks for configuring and running fire drills

The Fire Drill Wizard helps you configure and run a fire drill.

Table 12-1 outlines the high-level objectives and the tasks to complete each objective.

Table 12-1 Tasks for configuring and running fire drills

Objective	Tasks
"Prerequisites for a fire drill" on page 300	Verifying hardware and software prerequisites
"Preparing the fire drill configuration" on page 304	Using the wizard to prepare the initial fire drill configuration
"Running a fire drill" on page 307	Using the wizard to run the fire drill Performing your own tests of the application to confirm that it is operational **Note:** As soon as you complete the fire drill testing, you should use the wizard to restore the fire drill system. Restoring the fire drill system takes the fire drill service group offline.
"Restoring the fire drill system to a prepared state" on page 311	Using the wizard to restore the fire drill system to a state of readiness for future fire drills or to prepare for removal of the fire drill configuration This is a required action after running the fire drill.
"Deleting the fire drill configuration" on page 312	Using the wizard to remove the fire drill configuration

Prerequisites for a fire drill

Ensure that the following prerequisites are met before configuring and running a fire drill:

- The primary and secondary sites must be fully configured with VVR replication and the global cluster option.
- The Veritas FlashSnap option must be installed on all nodes of the clusters at the primary and secondary sites.
- The secondary system where you plan to run the fire drill must have access to the replicated volumes.

- All disk groups in the service group are configured for replication. The Fire Drill wizard does not support a configuration in which disk groups are excluded from replication. However, you can exclude individual volumes within a disk group from replication.
- On the secondary site, empty disks must be available with enough disk space to create snapshot mirrors of the volumes. Snapshot mirrors take up the same amount of space as the original volumes. In addition, two disk change object (DCO) volumes are created for each snapshot mirror, one for the source volume and one for the snapshot volume. The two DCO volumes must be on different disks. Allow 2 MB additional space for each DCO volume.

  The empty disks must be in the same disk group that contains the RVG. If the disk group does not have empty disks available, you must use the VEA to add the disks to the disk group before you run the wizard. The secondary system must have access to the disks or LUNs.
- For each IP address in the application service group, an IP address must be available to use on the secondary site for the fire drill service group.

  The wizard can accept input for one IP address and Lanman resource. If the application service group has multiple IP addresses and Lanman resources, the wizard notifies you to edit the fire drill service group resources to supply these values. Information on editing service group resources is covered in the VCS administration guide.

  See *Veritas Cluster Server Administrator's Guide*.
- If you want the fire drill wizard to run a script that you supply, ensure that the script file is available on any secondary site nodes where you plan to run the fire drill.
- If the cluster is secured, the login you use to run the Fire Drill Wizard must have the appropriate permissions to make changes in the cluster.
- If a firewall exists between the wizard and any systems it needs access to, the firewall must be set to allow both ingoing and outgoing TCP requests on port 7419.
- Ensure the SQL Server 2008 FILESTREAM is disabled on all the cluster nodes.

In addition, for testing purposes, you may want to create and populate a new table from the active node at the primary site. After you run the fire drill to bring the fire drill service group online and create the fire drill snapshots, you can check that the table and its data were replicated and are available from the fire drill service group. You can automate this process with a script and when preparing to run the fire drill, specify it as a post-fire drill script.

You can run the Fire Drill Wizard from any node in the domain of the cluster, as long as the SFW HA client is installed on that node.

Fire Drill Wizard actions

While running the Fire Drill Wizard, you select from a menu of fire drill wizard actions on the Fire Drill Mode Selection panel. The actions are listed in the order they are usually performed.

After an action is complete, if you proceed in the wizard, the action menu is displayed again. You can select the next action or exit the wizard and perform the next action later.

The actions consist of the following:

Prepare for Fire Drill	Creates the configuration required to run a fire drill. This step can take some time since the wizard prepares the mirrors for the snapshots. If this option is unavailable, a fire drill configuration already exists on the specified system. See “Preparing the fire drill configuration” on page 304. This option is also displayed while the wizard is recreating a fire drill configuration that has changed. See “Recreating a fire drill configuration that has changed” on page 309.

Run Fire Drill	Runs the fire drill. The wizard creates the volume snapshots and brings the fire drill service group online. Optionally you can specify a script to be run once the fire drill is complete. If a fire drill has been run, you must restore the fire drill configuration to a prepared state before the wizard re-enables this option. See "Running a fire drill" on page 307. **Note:** If a fire drill configuration exists for the selected service group, the wizard checks for differences in resource names. If differences are found, the wizard can recreate the fire drill configuration before running the fire drill. See "Recreating a fire drill configuration that has changed" on page 309. **Note:** After completing the fire drill testing, run the wizard again as soon as possible and select the option to restore the configuration. Otherwise the fire drill service group remain online. Be sure to restore one fire drill service group to a prepared state before running a fire drill on another service group.
Restore to Prepared State	Restores the fire drill configuration for another fire drill or to prepare the fire drill configuration for deletion. This option becomes available once a fire drill has been run. The wizard snaps back the snapshot mirrors to reattach to the original volumes and takes the fire drill service group offline. See "Restoring the fire drill system to a prepared state" on page 311.
Delete Fire Drill Configuration	Deletes the fire drill configuration to free up disk space. The wizard deletes the service group on the secondary site and performs a snap abort to delete the snapshot mirrors created on the secondary site for use in the fire drill. If a fire drill has been run, this option is disabled until you first restore the fire drill configuration to a prepared state. This ensures that mirrors are reattached and the fire drill service group is offline before the configuration is deleted. See "Deleting the fire drill configuration" on page 312. This option is also displayed while the wizard is recreating a fire drill configuration that has changed. See "Recreating a fire drill configuration that has changed" on page 309

Preparing the fire drill configuration

Preparing the fire drill configuration creates a fire drill service group and snapshot mirrors of production data at the specified node on the secondary site. You specify the application service group and the secondary system to use. Only one service group can be prepared for a fire drill at one time.

Note: Preparing the snapshot mirrors takes some time to complete.

Before you prepare the fire drill configuration, you should verify that you meet the prerequisites.

See "Prerequisites for a fire drill" on page 300.

To prepare for the fire drill

1. Open the Solutions Configuration Center (**Start > All Programs > Symantec > Veritas Cluster Server > Solutions Configuration Center**).
2. Start the Fire Drill Wizard (expand **Solutions for Microsoft SQL**, expand **Fire Drill**, expand **Configure or run a fire drill**, and click **Fire Drill Wizard**).
3. In the Welcome panel, review the information and click **Next**.
4. In the System Selection panel, specify a system in the primary site cluster and click **Next**.
   All systems containing online global service groups are available to select. The default system is the node where you launched the wizard (localhost) if a global service group is online on that system. When selecting a system you can specify either a fully qualified host name or IP address.
5. In the Service Group Selection panel, select the service group that you want to use for the fire drill and click **Next**. (You can select only one service group at a time for a fire drill.)
6. In the Secondary System Selection panel, select the cluster and the system to be used for the fire drill at the secondary site, and then click **Next**.
   The selected system must have access to the replicated data and to disks for the snapshots that will be created for the fire drill.
7. If the Recreate Fire Drill Configuration panel is displayed, a fire drill configuration already exists but is not up to date. You can choose whether to run a fire drill or to recreate the configuration first to bring it up to date. If this panel is displayed, see the following procedures:
   - "Recreating a fire drill configuration that has changed" on page 309.
   - "Running a fire drill" on page 307

   Otherwise, continue with the next step.

8 In the Fire Drill Mode Selection panel, the available options depend on whether the fire drill service group already exists on this system and whether it is online or offline. Choose one of the following and click **Next**:

If the Prepare for Fire Drill option is available, a fire drill service group does not exist on this system.	Click **Prepare for Fire Drill** and continue with the remaining steps in this procedure.
If the Run Fire Drill option is available, a fire drill service group has already been prepared and is up to date.	You can run the fire drill with no further preparation. Click **Run Fire Drill** and follow the procedure for running a fire drill. See "Running a fire drill" on page 307.
If the Restore to Prepared State option is available, the fire drill service group remains online from a previous fire drill.	Click **Restore to Prepared State** and follow the procedure for restoring the fire drill configuration to a prepared state. See "Restoring the fire drill system to a prepared state" on page 311.

9 In the Fire Drill Service Group Settings panel, assign the virtual IP address and virtual name (Lanman name) to be used for the fire drill service group that will be created on the secondary site. These must be an address and name not currently in use.
If the service group contains more than one IP and Lanman resource, this panel does not display. After the fire drill service group is created, the wizard notifies you to manually update the IP and Lanman resources in the fire drill service group.

10 In the Disk Selection panel, review the information and make the selections as follows and click **Next**:

Volume	Select the volumes for the fire drill snapshots. By default all volumes associated with the service group are selected. If you deselect a volume that might result in the fire drill service group failing to come online, the wizard displays a warning message. **Note:** The Disk Selection panel also appears if the wizard is recreating a fire drill service group to which volumes have been added. In that case, only the new volumes are shown for selection.
Disk Group	Shows the name of the disk group that contains the original volumes. This field is display only.

Fire Drill DG	Shows the name of the fire drill disk group that running the fire drill will create on the secondary system to contain the snapshots. This field is display only. For the fire drill disk group name, the wizard prefixes the original disk group name with FD*nn*.
Disk	Click the plus icon to the right of the Disk column and specify the disk to be used for the snapshot volume. Repeat for each row that contains a selected volume. You can store multiple snapshot volumes on the same disk, if the production volumes reside on disks in the same disk group. If there is not enough disk space, you can use the Veritas Enterprise Administrator to add disks to the disk group. Then click the **Refresh** button in the wizard.
Mount Details	Shows the mount details for the snapshot volumes on the secondary system, which match the mounts for the production volumes. This field is display only.

11 Wait while the wizard completes the preparation tasks. First the fire drill service group is created on the secondary site (but remains offline). Next the snapshot mirrors for the volumes are prepared; this can take some time. You may want to minimize the wizard while the task runs in the background. You can also track the mirror preparation progress in the VEA. When done, the wizard displays a message that the fire drill preparation is complete.

12 To run the fire drill now, choose **Next**, or click **Finish** to exit the wizard.
If you choose **Finish** the fire drill preparation remains in place. The next time you run the wizard, you choose the primary and secondary systems and service group and then can continue with running the fire drill.

Running a fire drill

After you complete the initial fire drill preparation step using the Fire Drill Wizard, you can run the fire drill immediately without exiting the wizard or run the wizard later to run the fire drill. Running the fire drill does the following:

- Creates the snapshots
- Splits the fire drill disk group
- Enables the firedrill resources
- Brings the fire drill service group online
- Optionally, executes a specified command to run a script
  For example, if you earlier created and populated a test table at the primary site, you could create a script to verify replication of the data. For the wizard to run the script, the script must exist on the secondary system that you are specifying for the fire drill.
  Optionally you can specify a Windows PowerShell cmdlet rather than a script.

  Note: The wizard does not support using script commands to launch a user interface window. In such a case, the process is created but the UI window does not display.

If a fire drill has been run previously, you must restore the fire drill configuration to a prepared state before the wizard enables the option to run another fire drill.

Warning: After running the fire drill, the fire drill service group remains online. After you verify the fire drill results, remember to take the fire drill service group offline as soon as possible. You do this by running the wizard and selecting the option to restore the system to the prepared state. If the fire drill service group remains online, it could cause failures in your environment. For example, if the application service group were to fail over to the node hosting the fire drill service group, there would be resource conflicts, resulting in both service groups faulting.
See “Restoring the fire drill system to a prepared state” on page 311.

To run a fire drill

1. If you completed the initial preparation and have not exited the wizard, or if you are returning to this procedure after recreating a fire drill service group, go to step 8. Otherwise, if you need to restart the wizard, continue with the next step.
2. From the Solutions Configuration Center, start the Fire Drill Wizard (expand **Solutions for Microsoft SQL**, expand **Fire Drill**, expand **Configure or run a fire drill**, and click **Fire Drill Wizard**).
3. In the Welcome panel, click **Next**.
4. In the System Selection panel, specify a system in the primary site cluster and click **Next**.
5. In the Service Group Selection panel, select the service group and click **Next.**
6. In the Secondary System Selection panel, specify the system previously prepared for the fire drill at the secondary site and click **Next**.
   If the fire drill configuration is in a prepared state, the wizard compares the resources of the fire drill service group with the resources of the application service group.
7. If the application service group changed since the fire drill configuration was prepared, the wizard displays the Recreate Fire Drill Service Group panel, showing the differences. Choose one of the following:
   - Leave the option checked to recreate the configuration before running the fire drill and click **Next**. You complete additional steps in the wizard before running the fire drill.
     For more information, see "Recreating a fire drill configuration that has changed" on page 309.
   - Clear the option to recreate the fire drill service group and click **Next**.
8. In the Fire Drill Mode Selection panel, click **Run Fire Drill** and click **Next**.
9. In the Post Fire Drill Script panel, optionally specify the full path to a script for the wizard to run on the secondary system right after running the fire drill. The script must already exist on the secondary system. Click **Next**.
   For more information on post fire drill scripts, see "About post-fire drill scripts" on page 299.
10. In the Fire Drill Implementation screen, wait until all fire drill tasks are performed and the Fire drill ran successfully message is displayed.
11. Click **Finish**.
12. Run your own tests to verify the fire drill results.

Warning: You should always restore the fire drill system to a prepared state immediately after completing fire drill testing on a service group.

13 Run the wizard again to restore the fire drill configuration to the prepared state.
See "Restoring the fire drill system to a prepared state" on page 311.

Recreating a fire drill configuration that has changed

When you run the Fire Drill wizard, a fire drill service group may already exist for the selected application service group. However, the application service group may have changed since the fire drill service group was created. Therefore, the wizard compares the resource names of the two service groups. If differences are found, the wizard lists them on the Recreate Fire Drill Service Group panel.

You have the following choices from the Recreate Fire Drill Service Group panel:

- Leave the option checked to recreate the fire drill service group.
  Proceed with using the wizard to recreate the configuration to match the application service group.
  The wizard deletes the fire drill configuration but does not delete the mirrors for volumes that still exist. It then recreates the fire drill configuration, preparing new mirrors only for new volumes.
  If volumes have been removed, the wizard displays an additional option to snap abort the obsolete snapshot volumes to free up disk space.
- Clear the option to recreate the fire drill service group. You can then proceed with using the wizard to do either of the following:
  - Run the fire drill, ignoring the differences.
  - Delete the entire fire drill configuration. Then start over with preparing the fire drill configuration.

Note: The wizard does not check for changes in volume attributes, such as the MountPath attribute. For example, if you have a MountV resource with an attribute that points to drive Y and you change that attribute to point to drive X, the wizard does not identify this change and does not give the option to recreate the fire drill service group.
You can choose whether to manually edit the fire drill service group for such changes and then run the fire drill, ignore the differences, or delete the configuration and start over.

The following procedure describes the choice of recreating the fire drill configuration.

To recreate the fire drill configuration if the service group has changed

1. In the Recreate Fire Drill Service Group panel, leave the option checked to recreate the configuration before running the fire drill. If volumes have been removed, optionally select to snap abort the volumes. Click **Next**.
2. In the Fire Drill Mode Selection panel, Delete Fire Drill Configuration is selected. Click **Next**, and click **Yes** to confirm the deletion.
3. The Fire Drill Deletion panel shows the progress of the deletion. The wizard leaves the existing fire drill snapshot volumes so that those snapshot mirrors do not have to be prepared again. If volumes were removed and you selected the option to snap abort, the wizard snap aborts the snapshots of those volumes. When all tasks are complete, click **Next**.

   Warning: If you close the wizard after deleting the fire drill configuration without continuing on to the fire drill preparation step, the information on the existing snapshot volumes is lost.

4. In the Fire Drill Mode Selection panel, Prepare for Fire Drill is selected. Click **Next**.
5. If volumes have been added, the Disk Selection panel is displayed for the new volumes. Specify the information for the added volumes. Click **Next**.
   If there is not enough disk space, you can use the Veritas Enterprise Administrator to add disks to the disk group. Then click the **Refresh** button in the wizard.
6. Wait while the wizard recreates the fire drill service group and starts mirror preparation.
   Mirror creation can take some time. You may want to minimize the wizard while the task runs in the background. You can also close the wizard and track the mirror preparation progress in the VEA.

7 Once mirror preparation is complete, click **Next**. Continue with running the fire drill.
See “Running a fire drill” on page 307.

Restoring the fire drill system to a prepared state

After running a fire drill and verifying the results, use the Fire Drill Wizard as soon as possible to restore the fire drill system at the secondary site to a prepared state. A prepared state is the initial fire drill configuration created by the wizard after you select the Prepare for Fire Drill option.

Restoring the fire drill system to a prepared state is required for any of the following:

- Making the secondary system available for failover of the application service group at the primary site.
- Running another fire drill.
- Deleting the fire drill configuration.

When restoring the fire drill system to a prepared state, the wizard completes the following tasks:

- Takes the fire drill service group offline
- Disables the fire drill service group resources
- Imports the fire drill disk group
- Joins the fire drill disk group to the application service group disk group
- Snaps back the snapshot mirrors to reattach to the original volumes

To restore the fire drill system to a prepared state

1 If you completed running a fire drill and have not exited the wizard, go to step 8. Otherwise, continue with the next step.

2 From the Solutions Configuration Center, start the Fire Drill Wizard (expand **Solutions for Microsoft SQL**, expand **Fire Drill**, expand **Configure or run a fire drill**, and click **Fire Drill Wizard**).

3 In the Welcome panel, click **Next**.

4 In the System Selection panel, specify a system in the primary site cluster and click **Next**.
The default system is the node where you launched the wizard.

5 In the Service Group Selection panel, select the service group that was used for the fire drill and click **Next.**

6 In the Secondary System Selection panel, specify the system on which the fire drill was run at the secondary site.

7 In the Fire Drill Mode Selection panel, click **Restore to Prepared State** and click **Next**. Click **Yes** on the confirmation message.
If you have run a fire drill but not yet restored the configuration, this is the only option available. If the option is unavailable, the configuration has already been restored or the fire drill has not yet been run.

8 In the Restore Fire Drill screen, wait until the screen shows the restoration tasks are completed. Then click **Next** if you want to delete the fire drill configuration or click **Finish** to exit the wizard, leaving the fire drill configuration in a prepared state.

Deleting the fire drill configuration

If you no longer need a fire drill configuration you can delete it. Deleting a fire drill configuration deletes the fire drill service group on the secondary site and performs a snap abort of the snapshot mirrors created on the secondary site for use in the fire drill. It frees up the disk space used for the snapshot mirrors for other use.

If you have run a fire drill and want to delete the configuration, you must first restore the fire drill configuration to a prepared state before the wizard enables the option to delete the fire drill configuration.

See “Restoring the fire drill system to a prepared state” on page 311.

To delete a fire drill configuration

1 If you have just used the wizard to restore the fire drill configuration and have not exited the wizard, go to step 8. Otherwise continue with the next step.

2 From the Solutions Configuration Center, start the Fire Drill Wizard (expand **Solutions for Microsoft SQL**, expand **Fire Drill**, expand **Configure or run a fire drill**, and click **Fire Drill Wizard**).

3 In the Welcome panel, click **Next**.

4 In the System Selection panel, specify a system in the primary site cluster and click **Next**.
The default system is the node where you launched the wizard.

5 In the Service Group Selection panel, select the service group that was used for the fire drill and click **Next.**

6 In the Secondary System Selection panel, specify the system on which the fire drill was run at the secondary site.

7 If the wizard detects that the fire drill service group is different from the application service group, it displays the Recreate Fire Drill Service Group panel. Clear the option to recreate the fire drill service group and click **Next**.

8 In the Fire Drill Mode Selection panel, click **Delete Fire Drill Configuration** and click **Next**, and click **Yes** to confirm the deletion.

9 The Fire Drill Deletion panel shows the progress of the deletion. Wait until all tasks are complete and then click **Next**.
If errors occur while deleting the fire drill configuration, the wizard will list any incomplete steps so that you can complete them manually.

Index

N

P

R

S

T

U

V

Z