

# Veritas™ Storage Foundation Cluster File System by Symantec

Concurrent data access and fast failover for unstructured data and Oracle® databases

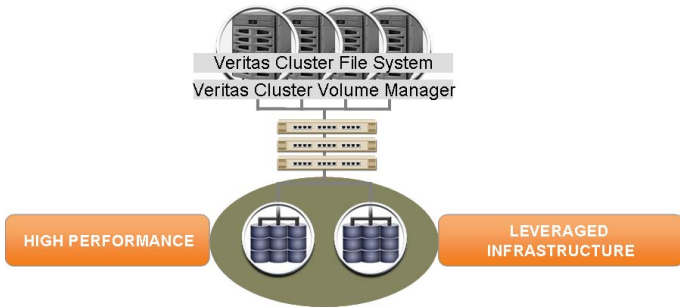


Figure 1. Veritas Storage Foundation Cluster File System Architecture

## Overview

Veritas™ Storage Foundation Cluster File System significantly reduces application downtime and improves data access compared to traditional single-instance file system implementations. It provides the cornerstone of a highly available environment, delivering fast failover in the event of server failure. Cluster File System's POSIX-compliant cache-coherent single file system schema assures data integrity across the configuration. The integrated Cluster Volume Manager simplifies management by presenting every node in the cluster with the same logical view of shared device configurations.

## Highlights

- **Minimize application downtime** - Utilize faster application failover to reduce planned and unplanned downtime
- **Ensure data consistency** - Maintain cache and storage coherency with atomic writes throughout the cluster
- **Ensure data integrity** - Prevent data corruption in the event of a "split brain" condition with I/O fencing
- **Provide fast Oracle® failover** - Get near-minute

recovery at a fraction of the cost of Oracle RAC

- **Improve application performance and scalability** - Get parallel processing and add servers dynamically to improve service levels and performance
- **Reduce costs with storage consolidation** - Enable storage consolidation by allowing multiple applications access to a single storage pool
- **Improve NFS file serving** - Scale NFS file servers for performance and active/active failover

## Improving Operations with Cluster File System

Service level requirements are getting more and more stringent as the cost of downtime increases and system unavailability becomes intolerable to business managers. Traditional single-instance file systems, as supplied by most server vendors, simply cannot deliver high availability without costly add-ons. High availability (HA) products for databases are available, but often prohibitively expensive. Moreover, implementing HA for unstructured data and databases can require different products that lead to complexity, difficult recovery and unnecessary expense.

Veritas Storage Foundation Cluster File System simultaneously supports fast server failover and near-linear scalability to deliver availability and performance. Information can be shared across the cluster, meaning that organizations can have improved data access as well. Veritas Storage Foundation Cluster File System can simplify storage management by standardizing tools heterogeneously across the data

center, create a common storage pool and manage multiple nodes centrally.

Veritas Storage Foundation Cluster File System is part of, and tightly integrated with, the industry-leading Veritas Storage Foundation family of products. It is a critical component of the Veritas Storage Foundation HA solution and brings high availability to the Storage Foundation Scalable File Server environment. Veritas Storage Foundation Cluster File System gives IT organization storage management breadth and depth unmatched by any other vendor.

### Minimize application downtime

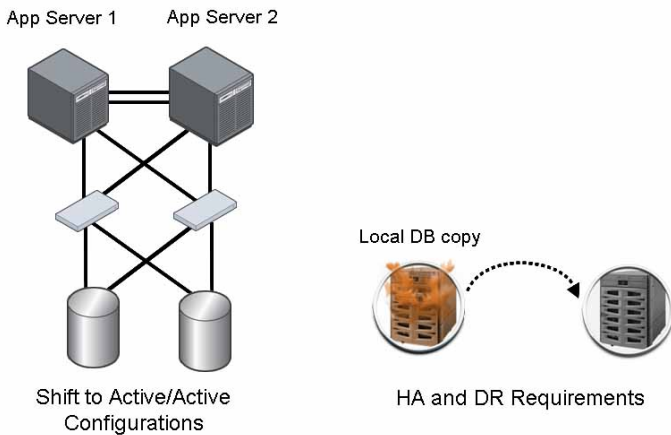


Figure 2. Industry trend toward disaster recovery

Veritas Storage Foundation Cluster File Server is tightly integrated with Veritas Cluster Server by Symantec, providing a comprehensive failover solution that minimizes both planned and unplanned downtime across all nodes in the cluster. In the event of an application or node failure, the application is dynamically migrated to an available node within the cluster, without business interruption. An additional benefit to a clustered file

system architecture is that, as all nodes in the cluster have visibility to a shared storage pool, there is no need to manually mount storage to unique nodes in the event of application or node failures - minimizing downtime, both planned and unplanned.

Without a clustered file system, application failover can require numerous steps: detect failure, unmount the file system, deport the disk group, import the disk group on the new server, mount the file system, start the application and reconnect the clients. With Veritas Storage Foundation Cluster File System the process is quite simple: detect the failure, start the application on the new server and reconnect the clients. Failover time is dramatically reduced.

### Ensure data consistency

In an application architecture where multiple server nodes have access to the same storage pool, cache coherency is paramount to ensuring data consistency and integrity. There must be a single version of all files in a cluster that are visible to all nodes in the cluster; if each node has "its version" of the file (particularly during writes), the result can be data corruption. Veritas Storage Foundation Cluster File System uses the Veritas Global Lock Manager (GLM) to make writes throughout the cluster atomic. In doing so, even though application performance is maximized by having files cached at the local node level, GLM ensures that during any application write there is only a single version of that file, preventing data corruption.

### Ensure data integrity

When multiple servers/nodes have access to data via shared storage, the integrity of the data depends upon internode communication to ensure that each node is aware when other nodes are writing data. When the coordination between the nodes fail, it results in a "split brain" condition - a situation in which two servers try to independently control the storage, resulting in application failure and data corruption. I/O fencing ensures data integrity and Veritas Storage Foundation Cluster File System's implementation uses the industry-standard SCSI-3 persistent group reservation technology. This allows a set of systems to have temporary registrations with the disk and coordinate a write exclusive reservation with the disk containing the data. With I/O fencing, the errant nodes are "fenced" and do not have access to shared storage, while eligible nodes continue to have access to the data.

### Provide fast Oracle failover

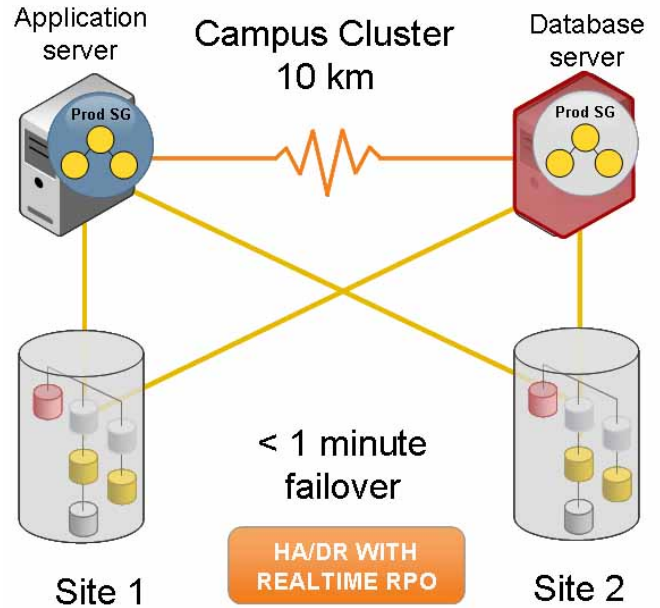


Figure 3. Oracle fast failover in stretch-cluster configuration

Veritas Storage Foundation Cluster File Server's benefits are not limited to just file system data. Databases that require high service levels can reduce failover times from 30 minutes to under a minute, even in a stretched-campus cluster, by hosting the database on Veritas Storage Foundation Cluster File System. This can be achieved without investing in expensive, database-specific tools such as Oracle RAC.

By hosting the database on Veritas Storage Foundation Cluster File System, the file system and volume manager remain persistent across nodes during failover. The only time delay is that needed to restart the database engine on the failover node. In addition to Oracle, these benefits apply to IBM DB2 and Sybase.

In addition to faster failover, Storage Foundation Cluster File System improves overall performance. Using

extensions for Oracle Disk Manager (ODM) and Concurrent I/O, users get OLTP performance equal to raw partitions but with the managability of a file system.

### Improve application performance and scalability

IT organizations have two options when examining application scalability requirements: a scale-up (larger SMP servers) or a scale-out (multiple smaller SMP servers) approach. If an organization selects a scale out approach, a single cluster file system across all nodes is essential to coordinate read/write access to the storage pool and ensure data integrity. Cluster File System does this and also delivers optimum performance with its advanced file-locking capability providing parallel access to the same file from multiple nodes. A critical enabling technology is its load balancing architecture that distributes file ownership across all nodes in the cluster for near-linear performance scalability. The advanced file clustering management of Storage Foundation Cluster File System allows parallel applications to access the same files with assured data integrity and near-linear performance.

### Reduce cost with storage consolidation

Consolidating storage into a single accessible pool also enables standardization of systems and configurations. Configurations can be cloned easily to increase reliability and repeatability. This standardization reduces administrative complexity as well as the time and effort needed to provision new systems.

With the Dynamic Storage Tiering capabilities of Storage Foundation, unimportant data can be moved to less

expensive storage devices transparently to users without downtime. Policies can be created that will dynamically move files based on date created, last time accessed, owner, size or name.

### Improve NFS file serving

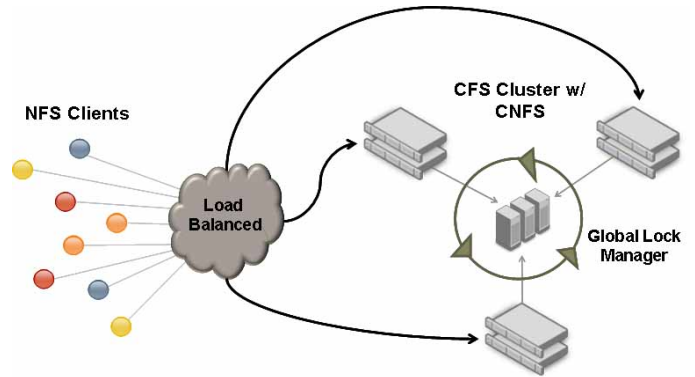


Figure 4. Clustered NFS topology

NFS file services are convenient ways to manage unstructured data, but often do not have the scalability and resiliency necessary to meet the needs of the business.

By building an NFS file server on top of Storage Foundation Cluster File System, data will be available when and where it is demanded by applications. Clustered NFS file services load balance across the cluster and provide active/active failover for rapid recovery in the event of failure.

With this clustered NFS configuration, servers and storage can be independently scaled to meet the specific application needs. Storage Foundation Cluster File Server is tightly integrated with the storage, Dynamic Storage Tiering and Dynamic Multi-pathing. The result is

## Data Sheet: Storage Management

### Veritas™ Storage Foundation Cluster File System by Symantec

significantly better price-to-performance when compared to similar NAS appliances.

#### Supported operating systems

- IBM AIX®
- HP-UX®
- Sun Solaris™ SPARC
- Sun Solaris™ x86
- SUSE Linux®
- Red Hat® Linux

#### Related Products

- Veritas Storage Foundation by Symantec
- Veritas Storage Foundation for Databases by Symantec
- Veritas Storage Foundation for Oracle RAC by Symantec
- Veritas Storage Foundation for Sybase CE
- Veritas Cluster Server by Symantec
- Veritas Storage Foundation Scalable File Server by Symantec

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