



VERITAS™

VERITAS Volume Replicator™

**Successful Replication and
Disaster Recovery**

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Table of Contents

Introduction	1
Replication: Some Basic Issues	2
Synchronous Replication	2
Asynchronous Replication	2
VERITAS Volume Replicator: An Optimal Disaster Recovery Tool	3
Conclusion	5

Introduction

Companies today rely to an unprecedented extent on online, frequently accessed, constantly changing data to run their businesses. Unplanned events that inhibit the availability of this data can seriously damage business operations. In addition, any permanent data loss, from disaster or any other source, will likely have serious negative consequences for the continued viability of a business. Therefore, when disaster strikes, companies must be prepared to eliminate or minimize data loss and recover quickly with usable data.

Even with the most well-executed backup strategy, restoring from tape usually results in several hours of lost data. For many environments, this kind of data loss is unacceptable and real-time replication is a requirement. Real-time replication not only minimizes or eliminates data loss, but also enables rapid recovery when compared to conventional bulk data transfer from sequential media. The replica data is available and ready for use on disk at a disaster-safe location.

A successful replication solution would allow operations to continue without a significant break in continuity. To keep the recovery data removed from the impact of a disastrous event, it should be stored in a different geographical location than the primary data. Depending on business requirements, this could be across campus, across town or across continents*. In addition to having data at a disaster-safe location, the ideal replication solution would ensure that the replica volumes are current (fully up-to-date), complete (including all applications, logs, configuration data, etc.), and recoverable (consistent data that is free from errors).

Whether motivated by disaster, site failure or simply a planned site migration, VERITAS Volume Replicator™ provides the foundation for seamless availability and site migration. Based on the de facto industry-standard VERITAS Volume Manager™, VERITAS Volume Replicator reliably, efficiently and consistently replicates data to remote locations over a standard IP network for maximum business continuity. Volume Replicator provides a robust storage-independent disaster recovery solution when data loss and prolonged downtime cannot be tolerated. This paper discusses the key concepts of data replication, explains the features and strengths of Volume Replicator, and shows how it can be used as part of a successful disaster recovery plan.

*Most failures concern less than an entire site. It is critical to combine any disaster recovery solution with local data mirroring and clustering technologies to handle local failures in the data center.

Replication: Some Basic Issues

Replication, as the term is used in the context of disaster recovery, is an automated and rules-based method for the geographical distribution of identical data. This reduces the opportunity for human error and minimizes the need for administrator intervention. Replication should make efficient use of resources and, after an initial synchronization, keep WAN network traffic down by replicating only the data blocks that actually change.

The two main types of replication are synchronous and asynchronous. Both have their advantages and should be available options for the IT administrator. Each uses a different process to arrive at the same goal, and each deals somewhat differently with network conditions. The performance and effectiveness of both depend ultimately on business requirements such as how soon updates must be reflected at the target location. Performance is strongly determined by the available bandwidth, network latency, the number of participating servers, the amount of data to be replicated and the geographical distance between the hosts.

Synchronous Replication

Synchronous replication ensures that a write update has been posted to the secondary node(s) and acknowledged by the primary application before the write operation completes at the application level. This way, in the event of a disaster at the primary location, data recovered from any surviving secondary server is completely up-to-date because all servers share the exact same data state. Synchronous replication produces full data currency, but may affect application performance in high-latency or limited-bandwidth situations. Synchronous replication is most effective in application environments with low update rates, but has also been effectively deployed in write-intensive environments where high-bandwidth, low-latency network connections are available. Asynchronous replication with adequate bandwidth available can be used to remove latency from a replication solution, but still provide near real-time updates. The application is immediately acknowledged during write operations, and the data is sent at nearly the same time to the remote site.

Asynchronous Replication

During asynchronous replication, application updates are written at the primary and persistently queued for forwarding to each secondary host as network bandwidth allows. When the writing application experiences temporary surges in update rate, this queue may grow. Unlike synchronous replication, the writing application does not suffer from the response-time degradation caused by each update's incurring the cost of a network round-trip. During periods when the update rate is less than the available network bandwidth, this queue drains faster than it grows, allowing the secondary data state to catch up rapidly with that of the primary. Asynchronous replication with adequate bandwidth available can be used to remove latency from a replication solution, but still provide near real-time updates. The application is immediately acknowledged during write operations, and the data is sent at nearly the same time to the remote site.

It is worth noting that in both asynchronous and synchronous replication the managed volumes at each secondary faithfully track those at the primary. This is called "write order fidelity." Without write order fidelity, no guarantee exists that a secondary will have consistent recoverable data. In a database environment, updates are made to both the log and data spaces of a database management system in a fixed sequence. The log and data space are usually in different volumes, and the data itself can be spread over several additional volumes. A well-designed replication solution needs to consistently safeguard write order fidelity. This may be accomplished by a logical grouping of data volumes so the order of updates in that group is preserved within and among all secondary copies of these volumes.

VERITAS Volume Replicator: An Optimal Disaster Recovery Tool

VERITAS Volume Replicator is part of an integrated solution that provides maximum business continuity. Volume Replicator works as a fully integrated module within VERITAS Volume Manager, the industry-leading, highly popular online data storage management solution used in more than 100,000 enterprises worldwide. Volume Replicator will be effective in any volume management-based application environment using raw partitions or a file system. It was built to be the optimal replication tool for deployment in an effective disaster recovery strategy.

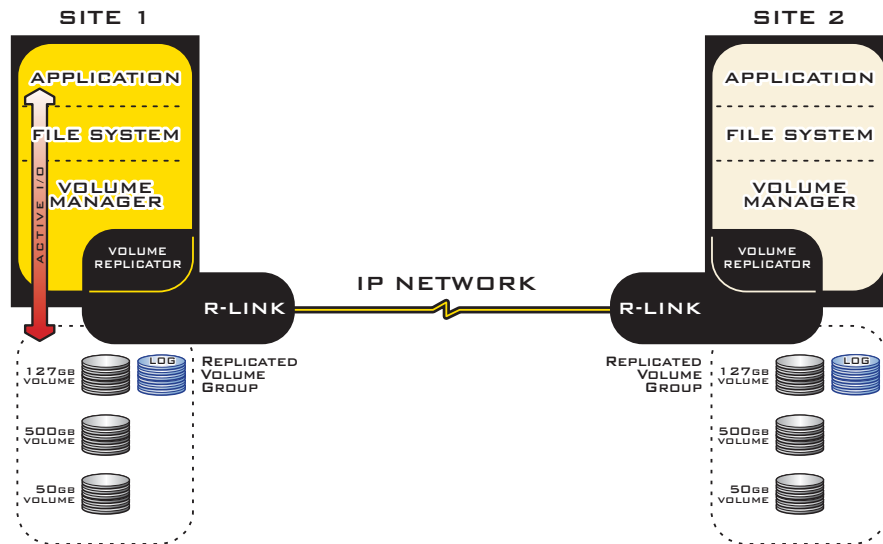


Figure 1 – VERITAS Volume Replicator

Unlike proprietary, inflexible hardware approaches, VERITAS Volume Replicator is not dependent on any specific storage hardware platform. VERITAS Volume Replicator's software-based replication provides a reliable, efficient and cost-effective solution for geographically mirroring data sets. It also has complete database management system support, including Oracle, Sybase, SQL Server, DB2, etc.

VERITAS Volume Replicator can scale to support up to 32 secondary data storage sites. Volume Replicator is able to work with symmetric configurations on a network, where one single machine can function as a primary site for some data sets and as a secondary data site for other data sets. Volume Replicator elegantly handles one-to-one, one-to-many and many-to-one data replication configurations.

VERITAS Volume Replicator gives the IT administrator a high level of control and transparency. All administrative tasks, such as installation or modification of primary or secondary volumes, can be performed online. Recovery after a failure event can be automated, but the administrator has complete control. The continuity of business operations and availability of data will not be negatively affected while adjustments are made to replication policies or while secondary servers are added.

A temporary outage or transient failure is very different from a full failure or disastrous event. A wide-area failover under the wrong conditions may seriously affect enterprise productivity. VERITAS Volume Replicator seamlessly integrates with both VERITAS Cluster Server™ and VERITAS Global Cluster Manager™ to give the administrator complete control over failover policies when migrating an application to a hot site.

VERITAS Volume Replicator can replicate over any standard IP network, LAN or WAN. It does not specifically require a network dedicated to itself, is resilient to temporary network outages and includes error-handling capabilities to alert the administrator of critical events.

During dynamic replication, the replica data at the secondary site is constantly undergoing change outside the control of any application at the secondary that may be attempting to read it. In order to have an application read and write data at the secondary, Volume Replicator is fully integrated with VERITAS Volume Manager and VERITAS FlashSnap™ to provide the ability to break off a point-in-time copy of the replicated data. The detached mirror can then be mounted at the secondary to perform off-host processing (backup, reporting, data mining etc.).

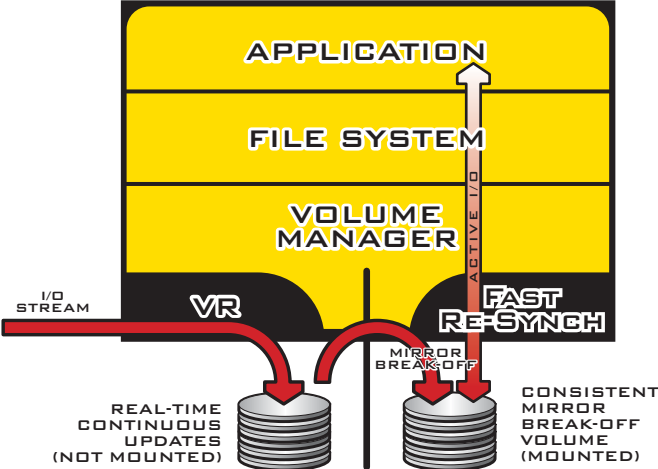


Figure 2 – Given its tight integration with VERITAS Volume Manager and VERITAS FlashSnap, VERITAS Volume Replicator leverages point-in-time mirror volumes at a secondary site for performing off-host processing (such as backup, data analysis, testing and reporting).

Depending on available bandwidth, excessive lag between primary and secondary, as well as primary log overflow, may be a liability in asynchronous replication. Volume Replicator can easily recover from primary log overflow by sending only net changed blocks. It also provides control of excessive lag between primary and secondary sites. Latency protection guards the network from having a secondary site fall too far behind when updating replicated data. Latency protection gives the network administrator the option to set a high watermark to keep the secondary from an excessive write lag.

VERITAS Volume Replicator extends true high availability into disaster recovery practices. Building upon the VERITAS Volume Manager foundation and integrating with VERITAS Cluster Server and VERITAS Global Cluster Manager, Volume Replicator becomes part of a powerful, integrated and complete solution for local and wide area high availability and disaster recovery.

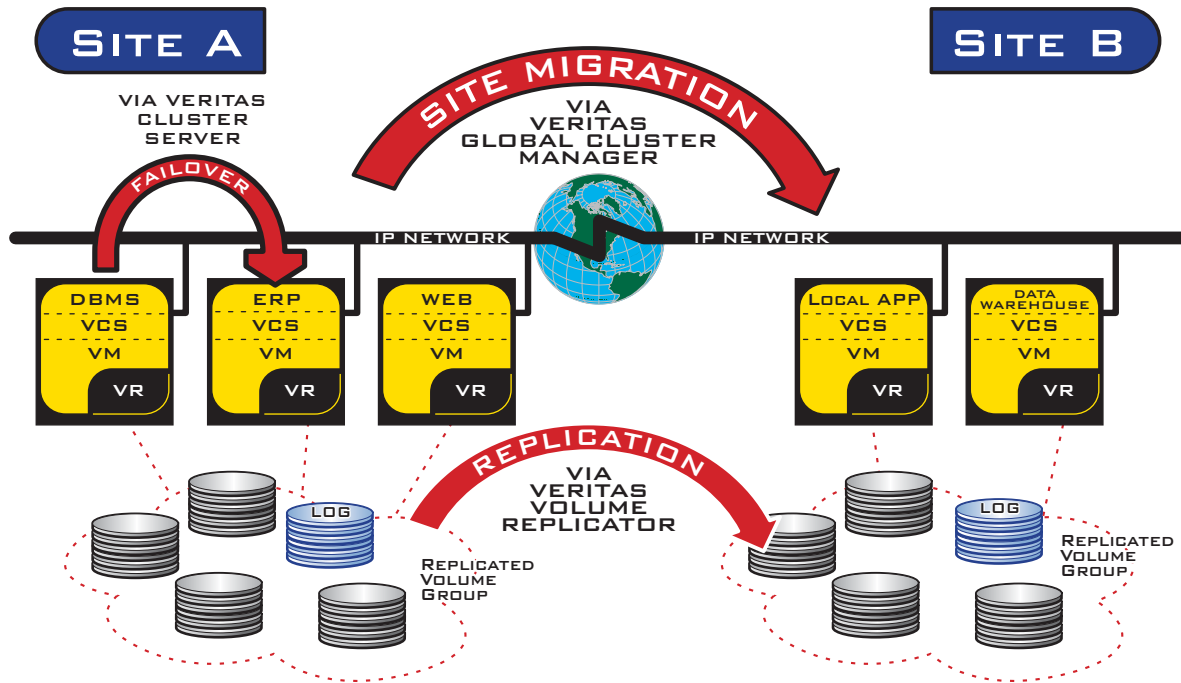


Figure 3 – VERITAS ensures that replication services remain highly available by providing agents for VERITAS Cluster Server to handle both local and wide area (via VERITAS Global Cluster Manager).

The full integration of VERITAS Cluster Server, VERITAS Volume Replicator and VERITAS Cluster Manager provides a powerful disaster recovery solution. VERITAS Cluster Server handles local availability issues. VERITAS Volume Replicator replicates critical data to a remote site and VERITAS Global Cluster Manager monitors and manages the clusters at each site. In the event of a site failure or complete failure of applications at the primary site, Global Cluster Manager will control the shift of replication roles to the secondary site, bring up critical applications and redirect client traffic with a single command or mouse click.

Conclusion

When used in conjunction with the entire suite of VERITAS high availability technologies, VERITAS Volume Replicator delivers the ultimate disaster recovery solution when application availability is paramount.



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