Sun StorEdge™

5210/5310 NAS STORAGE CONSOLIDATION AND DATA DISASTER RECOVERY

White Paper
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Introduction

This paper discusses the capabilities of Sun Microsystems FileReplicator software when deployed on the Sun StorEdge™ 5000 NAS Appliance.

This document's intended audience is system and/or storage administrators; a working knowledge of UNIX®, Network Bandwidth, NFS, CIFS/SMB and of the Sun StorEdge 5000 NAS Appliance is assumed throughout.

Data Disaster Recovery

Disaster Recovery (DR) is an implementation that is often cost prohibitive and reserved only for the Fortune 1000 data center. Many organizations struggle with the idea and expend large amounts of budget to insure their computing and storage infrastructures will be up and available after flood, fire, earthquake, or some other catastrophic event.

At the highest level and scope, the two essential elements of disaster recovery are preserving and/or duplicating the computing infrastructure as well as protecting and providing up-to-date versions of mission-critical, if not all stored data and content. The basic concept of DR is that essential minimal IT services can be provided until the production capability has been completely restored either at the primary or the backup site. Typically, this minimal approach can work for the computing infrastructure but more often than not, complete and up to the transaction level data is often required for a business to survive a catastrophic event.

Data Disaster Recoverability

The easiest approach is to duplicate a minimal computing infrastructure at the alternate site as well as provide a capability where the data at the alternate site is as up-to-date as possible and ready for use by production applications in case of a disaster scenario. However, other steps must be taken first to minimize the cost to be expended in a disaster recovery implementation.

The approach to disaster recoverability (DR) for the computational infrastructure is far different from the storage infrastructure – it is far easier to duplicate processing capability than to duplicate up-to-date – and usable – mission-critical data. As such, both of these infrastructure elements must be separated in a survivable DR implementation. A storage consolidation effort must be undertaken as the first step in this process; if production data is separated from the computing infrastructure, less dependency exists between the two elements. This allows the data to become, essentially, interoperable, allowing the computing DR infrastructure the flexibility it needs to minimize DR costs as well as simplifying the engineering associated with providing a DR application sensitive infrastructure.

Once the data has been moved to a purpose-built storage infrastructure, duplicating the computing ability is a relatively straight forward process.

Mission critical data can be handled separately with a variety of toolsets available. The Sun StorEdge 5000 NAS Appliances provide both storage consolidation tooling as well as reliable data disaster recovery (DDR) capabilities that can be deployed in a DR implementation.

As illustrated in Figure 1, the Sun StorEdge 5000 NAS Appliance provides both storage consolidation tooling as well as reliable data disaster recovery (DDR) capabilities that can be deployed in a DR implementation.

Storage Consolidation

Sun StorEdge 5000 NAS Appliances have many purpose-built capabilities that can be used to easily facilitate a storage consolidation effort. The built-in capability to provide a network storage-based Home Directory (e.g. Autohome) capability for both Microsoft Windows and Solaris™/UNIX environments is a simple and effective way of implementing a storage consolidation effort. IDC has estimated that as much as 60 percent of mission related data found in any computing infrastructure is stored in a distributed paradigm: either on desktop, laptop, or other workstation computing devices. Moving all home directory data to a centralized Network Attached Storage (NAS) device such as a Sun StorEdge 5000 NAS Appliance is essential to protecting this data. With a storage consolidation architecture in place, the Sun StorEdge FileReplicator software can provide not only replication capabilities, which duplicate complete file systems in place, but also provide an up to the transaction level mirror of these same file systems. There are server-based replication products available, but rarely do they provide up-to-date data coherency without a large budget and bandwidth expenditure.

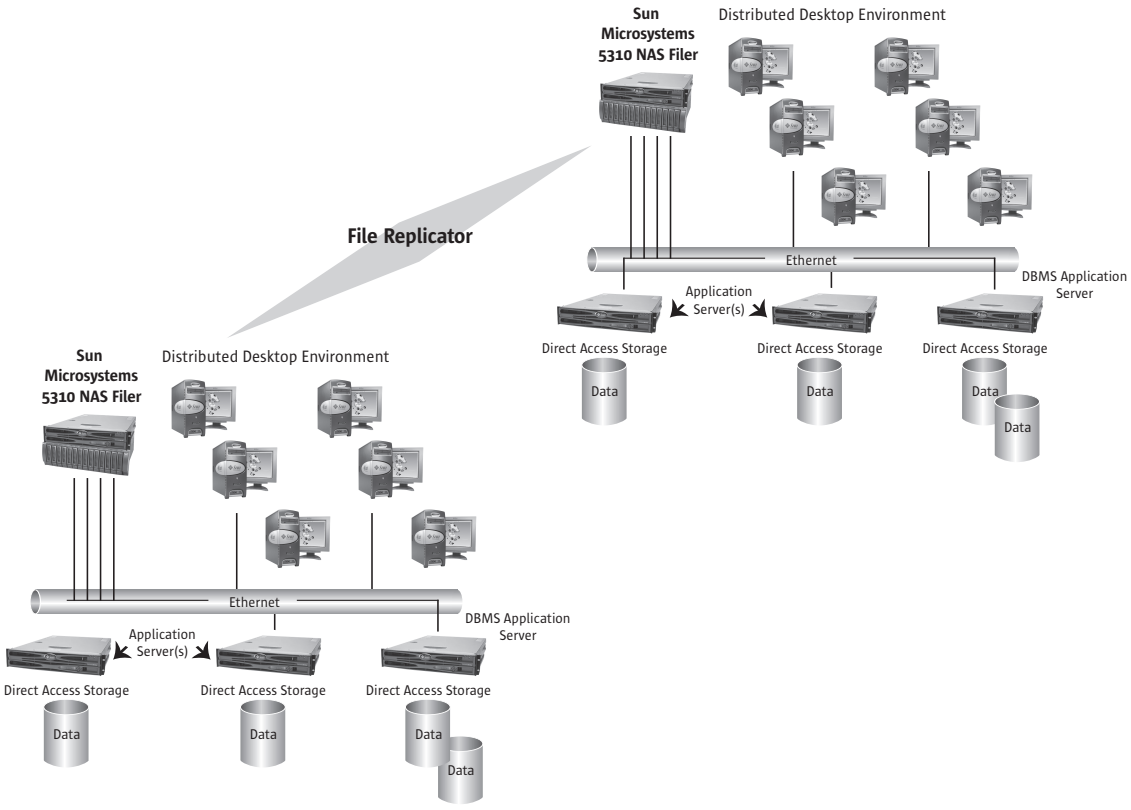

Figure 1: Sun StorEdge 5000 NAS Appliances in a Storage Consolidation environment with FileReplicator.

Replication and Mirroring

The objective of this storage consolidation effort is to provide a storage capability that allows for replicating mission-critical data to an alternate DR site. Sun StorEdge FileReplicator software is an add-on capability to the Sun StorEdge 5000 NAS Appliances that provides two capabilities. First, it replicates all data stored on selected storage volumes to a DR site using IP based technology, and second, it provides for an up-to-date, near-real time mirroring capability. During the replication phase, a mirror journal is allocated based on administrator input, and an exact duplicate of the logical volume is created on the mirror Sun NAS appliance. The replication then ensues which as in all replication products is a time consuming and network bandwidth dependent process. Care must be taken during the engineering phase of the disaster recovery project to insure that enough bandwidth is provisioned to provide replication as well as the follow on mirroring process. Important data points to consider are logical volume size, amount of data on the logical volume, end to end network infrastructure as well as line bandwidth depicted in Figure 2 below.

Typical Leased Line	Expected Bandwidth Specification
T1	1/5 MB/Sec
T3	4.7 MB/Sec
OC-3	19 MB/Sec

Figure 2: Leased Line Bandwidth(s)

Once the replication of the logical volume is complete, the Sun StorEdge 5000 NAS Appliance, using FileReplicator, extends the journal component of the filesystem such that all Input/Output(I/O) Write transactions are also extended asynchronously in real-time to the Sun StorEdge 5000 Appliance that is acting as the NAS Mirror Filer. Care must be taken so that the Write I/O workload taking place on the primary NAS Filer can also be supported by the bandwidth that is provisioned between the primary NAS Filer and the Mirror NAS Filer. When this is properly configured, a DDR capability can be successfully deployed. Now, true benefit can be seen from the storage consolidation phase in that all Home Directory, eligible mission-critical, and collaborative data can be replicated and kept up-to-date at the DR site by utilizing the FileReplicator feature on Sun StorEdge 5000 NAS Appliances.

Note – For a mirrored filesystem to remain coherent, LAN, Campus WAN or Leased Line Bandwidth must be able to support the overall update rate that is occurring on the primary NAS Filer.

Multiple Mirrors

Often in multiple distributed data centers, it is useful to implement a multiple mirrored approach to data disaster recovery. A good example of this is a 911 data center; typically, there are data centers in each particular sector within a geographic area. Each data center has the particular dispatch and emergency data for its respective area. As is often the case, each area data center is designated the DR site for one of the other data centers. Thus, each of the area data centers mirrors its respective mission critical data to another area data center.

Figure 3 has two illustrations of a multiple data center DR configuration ('Triangle Mirror') as well as a four (or more) data center DR configuration ('Circle Mirrors'). Sun StorEdge 5000 NAS Appliances can provide these services when equipped with Sun Storage FileReplicator software.

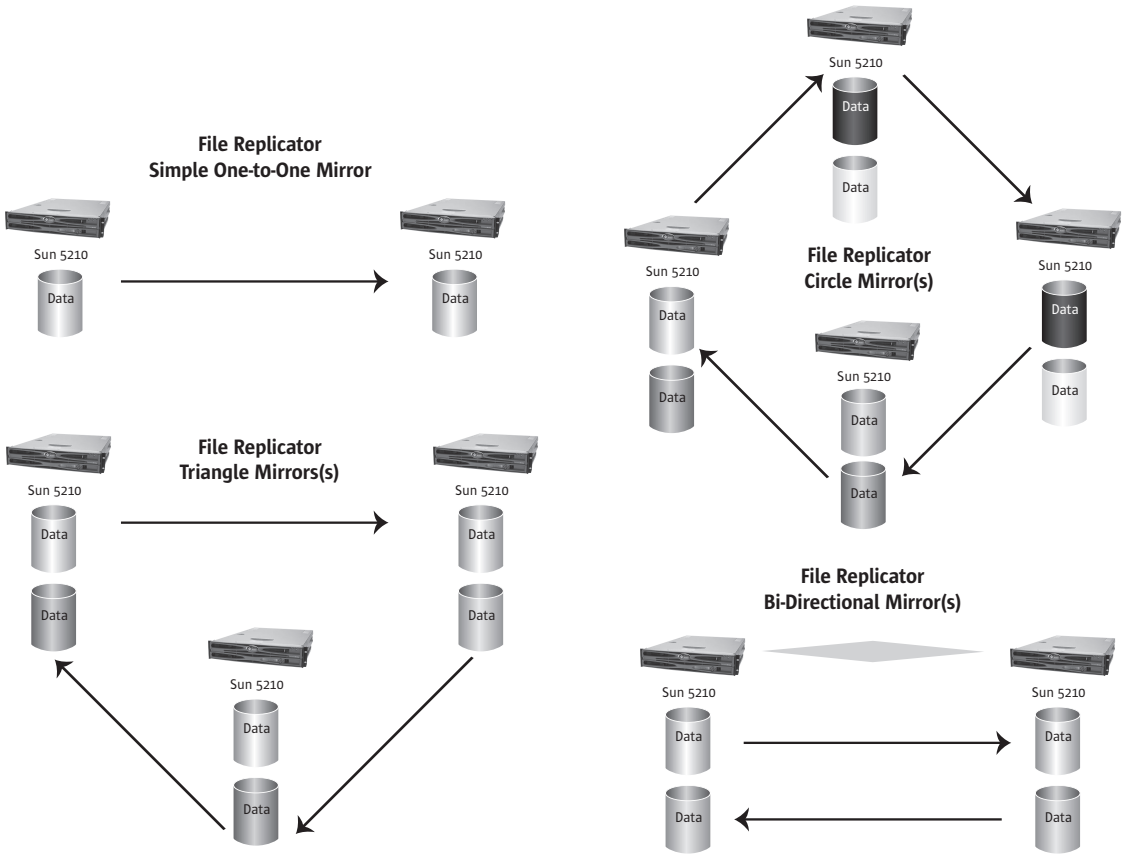

Figure 3: Replication and Mirror Types

One-to-One Mirroring

In its simplest form, a DR implementation can provide for One-to-One replication and mirroring capability. Thus, a Sun StorEdge 5000 NAS Appliance can replicate and mirror data to another Sun StorEdge 5000 NAS Appliance.

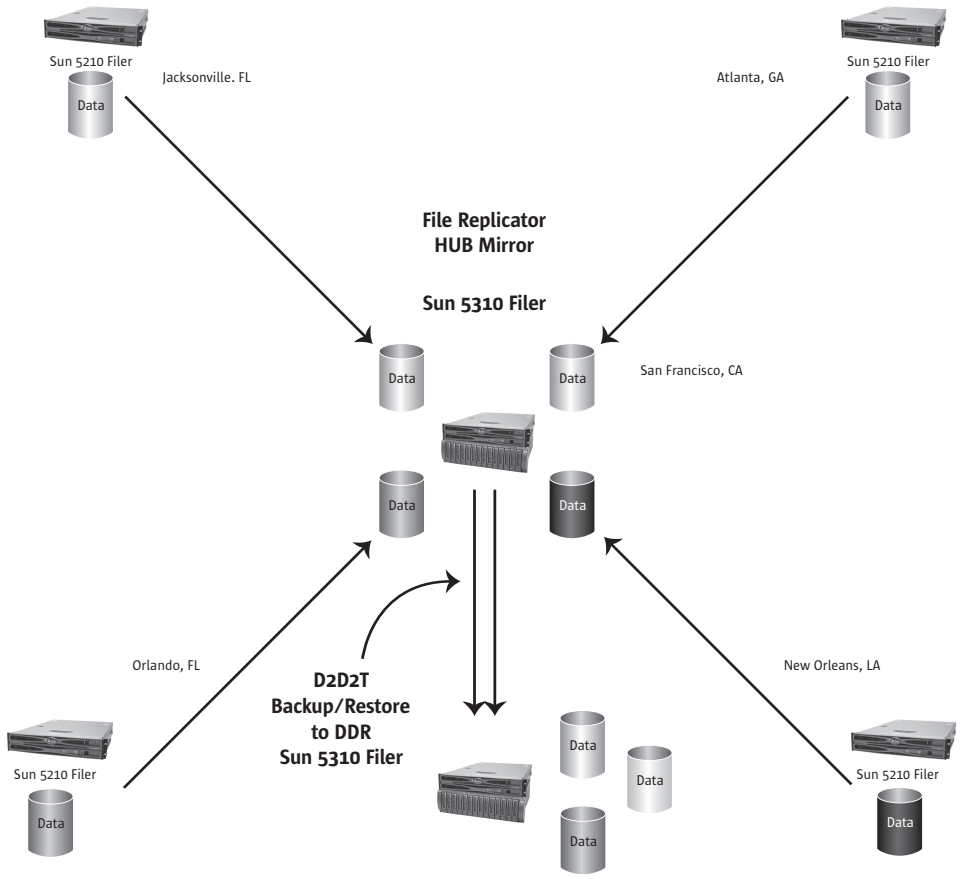

Figure 4: Hub Mirror

Hub Mirroring

Often organizations use a centralized repository for backup/restore data as well as disaster recoverability data. In these scenarios, as illustrated in Figure 4, many edge sites using Sun StorEdge 5000 NAS Filers at remote locations and with FileReplicator, duplicate and keep near real-time mirrors of filesystems at a central site. This affords the flexibility of the central site functioning in a recovery scenario if one or more Sun StorEdge remote NAS Filers experience disaster scenarios as well as providing up to date, multiple, versioned mirrors of mission critical data on demand. Thus, production applications can reference not only up to date data but also, legacy data from previous point in time snapshots (checkpoints) that have been mirrored over time. This is the most powerful and comprehensive FileReplicator type of deployment.

Bi-Directional Mirroring

Often DR sites are not only used in a passive sense, awaiting a catastrophic event, they are used as additional computing/storage capacity for day-to-day operations. As such, Bi-Directional Mirroring is a method commonly deployed that protects data at both sites while providing near-real-time capability.

Recovering Data Availability

When and if a DR event occurs, the Sun StorEdge 5000 NAS Appliance designated as the Mirror Filer can easily be promoted to production status. The NAS OS has functionality that allows the Mirror NAS Filer to be easily promoted to production status by using the Web GUI where by virtue of a mouse click; the Mirror NAS Filer makes all mirrored data available without any adjustment by users or servers that are connected to the data in the infrastructure.

Benefits

1. Affordable Volume Replication and Near Real-Time Volume Mirroring.

2. Easy to Manage NAS based Data Disaster Recovery.

3. Sun StorEdge 5210/5310 NAS Appliance feature rich capabilities to further protect and manage data.

4. Instantaneous Restore via Checkpoint or via the NAS Mirror site.

5. Seamless Integration with Industry Standard Technology.

6. Features that facilitate NAS based storage consolidation.

7. Easy and simple data recoverabilty.

Solution Components

One or more Sun StorEdge 5000 NAS Appliances equipped with Sun StorEdge FileReplicator software.

Conclusion

This document provides information regarding implementing a NAS based data disaster recovery paradigm in a storage consolidation environment utilizing the Sun StorEdge 5000 family of NAS Appliances and FileReplicator, a comprehensive and reliable tool for replication and implementing near real-time mirrors of mission critical data. Please feel free to contact Sun Microsystems, Inc.

Additional Information:

For more information, refer to the following URLs:

http://www.sun.com/storage/5000

http://docs.sun.com/app/docs/prod/storedge#hic

Notes

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