

How StoneFly's StoneFusion-Powered IP SANs Leverage Windows Volume Shadow Copy Services for Easy Snapshot Management

StoneFly's fully featured IP SANs powered by the StoneFusion Operating System provide centralized storage management, advanced storage services and integration with Microsoft Volume Shadow Copy Services (VSS) to simplify storage provisioning. To enhance data availability and host integration, StoneFly utilizes the core technologies of the Microsoft Windows operating system to interact with IP SAN volumes.

StoneFly IP SANs have offered integrated snapshot technology since StoneFusion version 3, when StoneFly Snapshot was used to implement nearline data recovery and improve system backups. StoneFly Snapshot is designed for recovering critical data quickly with point-in-time images of alive volume, which can be created nearly instantaneously. Snapshot volumes appear as regular read/write volumes to the host, and modifications do not impact the live volume. Unlike full volume copies, snapshots occupy a small fraction of available space. StoneFly Snapshot technology reinforces the focus on data recovery by offering rollbacks to previous valid data in the event of a disk failure, volume indexing, file deletion or virus.

Microsoft enhanced its operating system-wide snapshots with a new technology called Volume Shadow Copy Services (VSS), which offers improved support for snapshots across NAS and SAN volumes in the Windows Server 2003 operating system. StoneFusion-based IP SANs utilize VSS to ensure continuous volume access for Windows-based workstations or servers for snapshots, online backups or other applications.

Initially the only VSS-aware applications were file systems, local volumes, Exchange and SQL. The increased demand for networked storage including IP SANs required this technology to evolve so that snapshots could be supported across the network instead of being limited to the host. As a result of the rapid increase of iSCSI across Windows Server platforms, StoneFly continued to develop its IP SAN offerings to provide more host-level integration and to ensure continuous disk access for mission-critical applications including email, databases and disaster recovery, eliminating the potential for data corruption. The StoneFly VSS agent provides a single snapshot mechanism for the IP SAN and Windows Server environment.

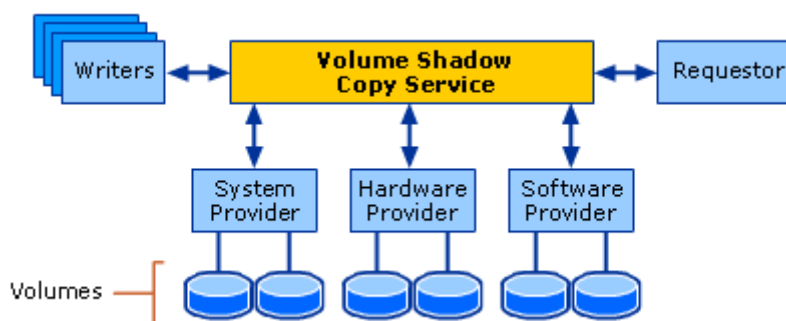
StoneFly IP SAN Options

StoneFly offers a wide variety of IP SANs for Windows environments, ranging from entry-level IP SANs-In-a-Box to modular high-availability, high capacity IP SANs. StoneFusion-powered storage can be easily deployed in environments requiring tiered storage, high availability or scalability.

How Microsoft VSS Works

Microsoft developed the VSS technology to provide snapshot capability (back-ups executed without closing down application I/O) to support VSS-aware applications and back-up software. The VSS utility uses a framework approach, communicating with the application server, a writer, a back-up application and the storage device.

Architecture of Volume Shadow Copy Services



Volume Shadow Copy Services Components

| Component | Description |
|-----------------------------------|---|
| Volume Shadow Copy Service | A service that coordinates various components to create consistent shadow copies of one or more volumes. |
| Requestor | An application that requests that a volume shadow copy be taken. A backup application is an example. |
| Writer | A component of an application that stores persistent information on one or more volumes that participate in shadow copy synchronization. Typically, this is a database application like SQL Server or Exchange Server, or a system service like Active Directory. |
| Provider | A component that creates and maintains the shadow copies. Examples are the system provider included with the operating system and the hardware providers included with storage arrays. |
| Source Volume | The volume that contains the data to be shadow copied. |
| Storage Volume | The volume that holds the shadow copy storage files for the system copy-on-write software provider. |

Volume Shadow Copy Services in 11 Steps

1. The requestor asks the Volume Shadow Copy Service to enumerate the writers, gather the writer metadata, and prepare for shadow copy creation.
2. The writer creates an XML description of the backup components to the Volume Shadow Copy Service, and defines the restore method. The Volume Shadow Copy Service notifies the application-specific writer to prepare its data for making a shadow copy.
3. The writer prepares the data in whatever way is appropriate, such as completing all open transactions, rolling transaction logs, and flushing caches. When the data is prepared for shadow copy creation, the writer notifies the Volume Shadow Copy Service.
4. The Volume Shadow Copy Service initiates the “commit” shadow copy phase.
5. The Volume Shadow Copy Service tells the writers to quiesce their data and temporarily freeze requestor (application) I/O write requests (I/O read requests are still possible) for the several seconds required to create the shadow copy of the volume or volumes. The application freeze is not allowed to take longer than 60 seconds. The Volume Shadow Copy Service flushes the file system buffer and then freezes the file system, which ensures that file system metadata is written and that the data is written in a consistent order.
6. The Volume Shadow Copy Service tells the provider to create the shadow copy (a maximum of 10 seconds).
7. The Volume Shadow Copy Service thaws the file system. After the shadow copy is created, the Volume Shadow Copy Service releases the writers from their temporary inactive phase and all queued write I/Os are completed.
8. The Volume Shadow Copy Service queries the writers to confirm that write I/Os were successfully held during shadow copy creation.
9. If the writes were not successfully held (meaning that the shadow copy data is potentially inconsistent), the shadow copy is deleted and the requestor is notified.
10. The requestor can retry the process (go back to step 1) or notify the administrator to retry at a later time.
11. If the copy is successful, the Volume Shadow Copy Service gives the location information for the shadow copy back to the requestor.

Leveraging Microsoft VSS With StoneFly IP SANs

The StoneFly VSS agent (the VSS hardware provider DLL) allows the VSS function inherent in the Windows operating system to trigger StoneFusion’s integrated snapshot logic. Thus, the snapshots are initiated at the SAN level instead of the host level, providing seamless integration with other systems and programs as well as control over where the snapshot volumes reside in the SAN. The host-level VSS agent supports snapshots in Exchange, SQL and backup server volumes, allowing zero downtime snapshots for testing, development, recovery, system rollback, backups and other applications.

Conclusion

The StoneFly StoneFusion Intelligent Network Storage Platform optimizes the Microsoft VSS functionality to provide more flexibility and simplicity in datacenter management with Windows servers for partial or full-core technology deployments. StoneFly IP SANs communicate directly with the VSS framework to offer a single initiation point for snapshots. The combination of the easy-to-manage Windows Server platform and the advanced intelligent IP SAN from StoneFly offers IT administrators the strategic advantage of implementing a single standard SAN and infrastructure-wide snapshot technology.

About StoneFly

StoneFly Inc. is a pioneer in iSCSI development, offering cost-effective, field-tested IP SAN solutions. The scalable architecture of the intuitive StoneFusion platform makes Stonefly IP SANs ideal for storage deployments for all kinds and sizes of organizations. Headquartered in San Diego, California, StoneFly was founded in April 2000 with the mission to deliver simple and affordable storage optimization through IP SAN solutions. In 2006 StoneFly was acquired by Dynamic Network Factory, Inc. and continues to operate as a wholly owned subsidiary.