PERFORMANCE BRIEF: NetApp SnapMirror

TEST SUMMARY

- **Steelhead appliances improve the performance of SnapMirror up to 45x**
- **Incremental updates are 8x faster**
- **Bandwidth utilization is reduced by up to 89%**

Riverbed Steelhead® Appliances Accelerate NetApp SnapMirror®

To provide maximum protection and ease of management, many enterprises choose to perform SnapMirror operations across the wide-area network. However, WAN links are often costly. Furthermore, the performance of SnapMirror is often severely degraded by the limited bandwidth and high network latency typical of a WAN.

Due to the large amount of data to be transferred, a task such as mirror initialization may take days to complete over a WAN. Applications that use filers for storage typically touch large numbers of storage blocks as files are added, deleted, and modified during a typical workday. This results in the marking of many blocks on the filer for mirroring, which means that incremental updates to remote mirrors may take hours to complete, and often cannot be completed during the available backup window.

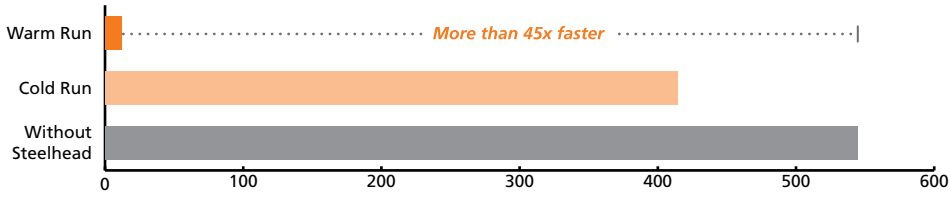
Steelhead-Enhanced SnapMirror

The network traffic associated with both mirror initialization and updates contains a large amount of compressible, repetitive data, even accounting for SnapMirror's powerful differencing algorithms. The Steelhead's SDR, VWE, and compression features can normally remove a huge amount of additional repetitive data from the WAN during these operations, which dramatically reduces the time to complete mirror initialization, updates, and recovery. Typical backup times can often be reduced by 90% (see graphs).

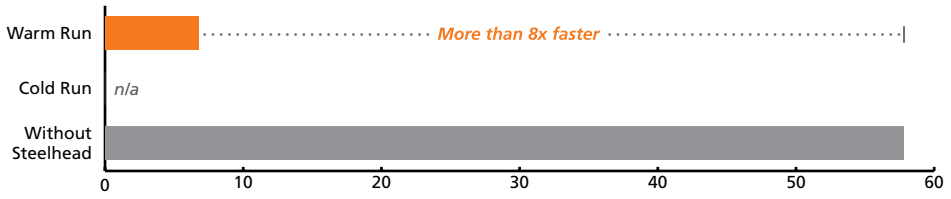
Performance Improvements

Lab tests show that Steelhead appliances significantly improve the performance of SnapMirror over the wide area network. Cold mirror backup is approximately 30% faster, while warm mirror backup or recovery is a dramatic 45 times faster. Incremental backup is 8 times faster. In production environments, incremental updates are the most critical, as they are representative of the bulk of information traversing the network. Bandwidth utilization is reduced by up to 89% during incremental updates, implying that Steelhead appliances eliminate approximately 9 out of every 10 bytes that previously crossed the WAN.

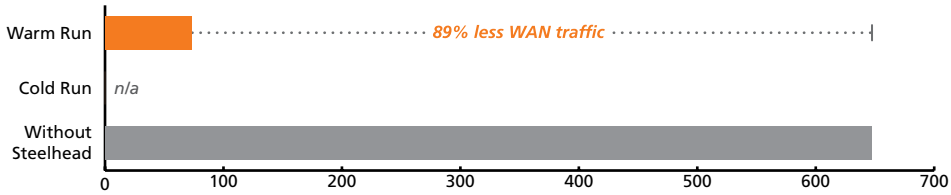
Full Datastore Initialization or Recovery (5GB Directory Tree) – Time to Complete (in minutes)



Incremental Update (10% change to 5GB Directory Tree) – Time to Complete (in minutes)



Bandwidth Utilization – Incremental Update (in megabytes)



These results are based on the testing scenario presented in this paper. Your results may vary based on the conditions of your own network and the specifics of your own use cases.

TESTING PARAMETERS

SnapMirror operations were performed on a 5GB volume across a WAN environment that consisted of a T1 connection and 100 milliseconds of delay between locations. This scenario is representative of a standard New York to Los Angeles WAN connection. The tests consisted of three parts, reflecting common use cases:

- Initializing a remote mirror across the network
- Restoring the mirror back across the network
- Backing up the remote mirror after a 10% change to the data in the volume

A "Cold Run" is defined as a data transfer that has never been seen by the Steelhead appliance before (a completely new file).

A "Warm Run" is defined as a data transfer in which the Steelhead appliance has seen most or all of the data before (a mirror recovery or an incremental update).

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DEPLOYMENT BENEFITS

Deploying Riverbed in conjunction with SnapMirror provides multiple benefits, including:

- **More efficient mirror operations** including initialization, update, and recovery from disasters. Significantly reduce backup windows and restoration time for even the largest volumes.
- **More frequent updates**. Given the ability to efficiently mirror incremental data, companies can mirror more frequently.
- **Disaster recovery across low bandwidth links**. Steelhead efficiency allows companies to mirror data from locations that were previously infeasible.

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Steelhead Appliance Features

Steelhead appliances leverage a combination of patented data reduction, TCP optimization, and application-level throughput optimizations, as well as remote office file and management functionality, to provide a comprehensive solution for WDS that scales across a broad range of applications and network topologies.

Scalable Data Referencing (SDR) – Riverbed's SDR algorithms work across all TCP applications including Microsoft Office, Lotus Notes, CAD, ERP, NFS, FTP, and HTTP, to ensure the same data is never sent more than once over the WAN. SDR reduces bandwidth consumption for many applications dramatically, typically by 60% to 95%, and sometimes more.

Transparent Pre-Population – Appliance data stores can be automatically and transparently pre-populated with new file system data or email data to accelerate the initial access to this data by the client.

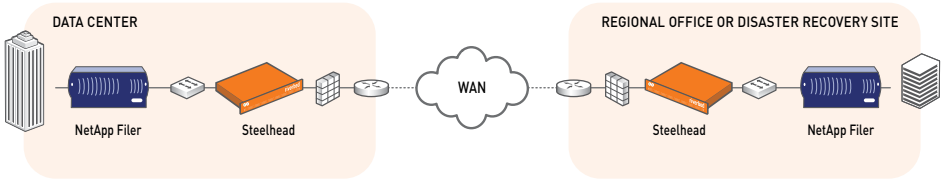
Application-Specific Optimizations – Steelhead appliances minimize the impact of WAN latencies on applications. By minimizing round trips and payloads generated at the application layer, Riverbed provides additional order-of-magnitude throughput increases to applications including Windows file sharing (CIFS), Exchange (MAPI), Web (HTTP), Database (MS-SQL), FTP, and backup and replication.

Virtual Window Expansion (VWE) – VWE enables applications to overcome TCP windowing limitations to dramatically increase the amount of data that can be sent in a single round trip.

High-Speed TCP (HS-TCP) – For high latency, high bandwidth links, unaided TCP often fails to fill the link leaving much of the WAN bandwidth unusable. HS-TCP is available on the Steelhead 5010, and supports up to 750 Mbps per connection for blazing fast data replication and backup.

Proxy File Service (PFS) – PFS enables remote office workers local access to files even when the WAN link to the office goes down. PFS also enables remote office file shares to be replicated automatically to the data center, ensuring reliable backup.

Typical Deployment Architecture



Steelhead Appliances Accelerate a Broad Range of Applications