Riverbed WAN Acceleration for EMC Isilon Sync IQ Replication

Introduction

EMC Isilon Scale-Out NAS storage solutions enable the consolidation of disparate pools of storage into a single highly reliable and scalable storage system. To guarantee the availability of mission critical data, EMC Isilon also provides a host of backup and recovery solutions designed to meet the organization’s business continuance requirements. For disaster recovery purposes, EMC Isilon provides asynchronous replication using SyncIQ software application. The EMC Isilon OneFS® operating system provides the intelligence behind all Isilon scale-out storage systems.

Riverbed Steelhead complements EMC Isilon’s OneFS operating system providing leading wide area network (WAN) and application acceleration (WAAS) technologies that, deployed along with EMC Isilon Scale-Out NAS storage systems, greatly accelerates data transfers over wide area networks to further consolidate and protect data. Riverbed Steelhead complements EMC Isilon’s SyncIQ replication by accelerating data transfers over wide area networks. This helps SyncIQ deliver high performance, asynchronous replication of data over WAN (Wide Area Networks) to address a broad range of recovery point objectives (RPO) and recovery time objectives (RTO). In addition to disaster recovery, SyncIQ can also facilitate the distribution of content between regional sites as organizations expand geographically.

This performance brief is designed to study the performance enhancements brought to the Isilon asynchronous replication solution offered by the Riverbed Steelhead WAN optimization appliance when deployed in conjunction with the Isilon Scale-Out Platform nodes.

EMC Isilon SyncIQ

SyncIQ leverages EMC Isilon’s OneFS operating system to transfer data over multiple streams between remote EMC Isilon IQ clusters, fully utilizing the available bandwidth and computing resources. Additionally, only changed files are transferred in subsequent replications, reducing data redundancy of multiple copies. SyncIQ replication serves the following purposes:

- **Disaster recovery**: High performance, asynchronous replication to address a broad range of RPO and RTO, enabling customers to make an optimal tradeoff between infrastructure cost and potential for data loss in the event of a disaster. SyncIQ supports both LAN and WAN networks to replicate over short or long distances, providing protection from both site-specific and regional disasters.

- **Disk-to-Disk backup**: Backups to tape are traditionally slow and hard to manage as they grow, compounded by the size and rapid rate of growth of digital content and unstructured data. When combined with Isilon IQ clustered storage, SyncIQ delivers a superior disk-to-disk backup and restore solution that delivers unmatched performance and simplicity, enabling IT organizations to reduce backup and restore costs, eliminate complexity and minimize risk.

- **Online delivery of content**: As enterprises want to deliver digital content to more people and more geography faster, having a solution in place that can ensure that the right data is located in the right location is critical to ensure maximum revenue opportunities and to achieve...
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A superior end-user experience. SyncIQ enables businesses to improve bandwidth utilization, minimize costs, and increase speed of end-user access by distributing content across multiple networks, datacenters, and geographic locations.

Riverbed WAN Acceleration

With its award winning data reduction, WAN optimization, and application-level latency optimizations, along with remote office file and management functionality, Riverbed provides a comprehensive solution for enterprises looking to simplify IT, consolidate infrastructure, and accelerate their applications. In addition to offering the best performing solution available, Riverbed delivers the single solution that scales across the broadest range of applications and network topologies. The Riverbed Optimization System (RiOS™) is the software platform that powers its award-winning line of Steelhead™ appliances. Riverbed WAN optimization and application acceleration technology can provide the following gains:

- **Data streamlining:** eliminates redundant bytes from transfers of all TCP traffic, including SSL. WAN bandwidth utilization is reduced by 60% to 95%.
- **Application acceleration:** bandwidth is optimized for specific applications, including latency sensitive applications like VoIP, video, and Citrix. Applications are typically accelerated by 5x to 50x, and often up to 100x, even SSL-encrypted traffic.
- **Disaster Recovery Acceleration:** Building upon data streamlining and transport streamlining functionality, RiOS combines its advanced optimization with a new set of behavioral traffic recognition features to enable adaptive acceleration based on the size and type of the data to be transferred. This dynamically enabled acceleration automatically recognizes disaster recovery operations, such as data replication and backup jobs, to achieve even faster performance for large-scale data transfers.
- **Central management:** Enables transparent deployment and centralized management of Steelhead appliances requiring fewer IT resources for deployment and management.

Test Setup and Methodology

Riverbed appliance integrates seamlessly with EMC Isilon clusters by connecting to the same local area network the EMC Isilon cluster network is connected to. The data transferred between the two EMC Isilon clusters is accelerated through the Steelhead appliances connected to the WAN.

Riverbed provides TCP streamlining and data streamlining optimization for SyncIQ data replication. In addition to standard WAN acceleration, EMC Isilon data replication jobs are further accelerated when redundant data is sent across.

The test lab network is comprised of two data centers connected over a simulated WAN. Each data center has an EMC Isilon System with SyncIQ policies configured to sync data from cluster 1 to cluster 2. The SyncIQ job is started manually and the replication data goes through the two Steelhead 7050 appliances.

<table>
<thead>
<tr>
<th>TESTING PARAMETERS</th>
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<tbody>
<tr>
<td>To collect the performance data, the test bed has been configured with the following parameters</td>
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<tr>
<td>• The WAN Simulator is set to 45 Mbps with 80ms round-trip latency and 0.01% packet loss</td>
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<tr>
<td>• The Riverbed Steelhead appliances in data center 1 and data center 2 are running RiOS 6.5.2 with compression enabled</td>
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<tr>
<td>• The EMC Isilon Systems are running OneFS 6.5.3</td>
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<tr>
<td>• Isilon SyncIQ Replication feature is licensed and configured</td>
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<tr>
<td>• Data Replication set 1 (2.57 GB Email Archive Folder) to disaster recovery cluster node Test</td>
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<tr>
<td>• Data Replication set 2 (10 GB VMware VM data file) to disaster recovery cluster node Test</td>
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**Network Topology**

The figure below shows the network topology used for disaster recovery sync replication testing. A windows client is used to populate test data to EMC Isilon FS Cluster 1 in Data Center 1. There are two Steelhead 7050 appliances running RIOS 6.5.2 installed in the two data centers. The EMC Isilon system is running OneFS 6.5.3. A WAN simulator is connected between the two data centers that simulate a 45 Mbps link with 80ms round-trip delay between the data centers.

**Note:** The Riverbed Steelhead appliances are powered off during the initial phase of baseline testing, during which performance results are collected for non-optimized topology, referred as “Baseline no optimization” in the performance graphs.

How to read the test results

A ‘Baseline no optimization’ run is where SyncIQ is performing data sync operation to the target cluster Isilon storage array in absence of Steelhead appliances. A ‘Steelhead cold’ run is where Steelhead appliances are configured in the setup and the data is seen by the Steelhead appliances for the very first time. Subsequent runs of the same data between the clients and the Isilon storage array are referred to as ‘Steelhead warm’ runs. First time SyncIQ replication job with Steelhead also referred to as ‘Steelhead cold’ run shows incremental performance and subsequent replication jobs with Steelhead referred to as ‘Steelhead warm’ show dramatic data reduction and performance improvement when compared to the baseline performance.

**Email Archive Replication Test**

The chart below shows the Email Archive Replication time (in seconds) taken by SyncIQ to perform data replication from Cluster 1 to target Cluster 2. With Steelheads in the network the file transfers are always faster than when no Steelheads are present. It is important to note here that with warm cache on Steelheads it took 37 seconds to transfer 2.57 GB data over a 45 Mbps 80ms round-trip time WAN link with 0.01% packet loss. The same run took 1582 seconds to complete the same operation with Steelhead optimization.
The next chart shows the Email Archive Replication Bandwidth usage by SyncIQ to perform data replication from Cluster 1 to target Cluster 2. With Steelheads in the network data transferred over WAN is always less than when no Steelheads are present. It is important to note here that only 9.63 MB of data was transferred over a 45 Mbps 80 ms round-trip time WAN link with 0.01% packet loss with warm cache on Steelheads. The same test required 2.80GB of data transfer to complete the same operation with Steelhead optimization.

**EMC Isilon SyncIQ Email Archive Replication**

<table>
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<tr>
<th>Data in MB</th>
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<tr>
<td>Baseline no optimization (3000 MB)</td>
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<tr>
<td>Steelhead cold (30 MB)</td>
</tr>
<tr>
<td>Steelhead warm (3 MB)</td>
</tr>
</tbody>
</table>

- **Email Archive Size**: 2.57 GB
- **Steelhead cold**: 80% reduction
- **Steelhead warm**: 99% reduction

**VMware Virtual Machine Replication Test**

The third chart below shows the VMware Virtual Machine Archive Replication time (in seconds) taken by SyncIQ to perform data replication from Cluster 1 to target Cluster 2. Again, file transfer results with Steelhead optimization were impressive. It is important to note here that with warm cache on Steelheads it took 161 seconds to transfer 10 GB data over a 45 Mbps 80 ms round-trip time WAN link with 0.01% packet loss. The same run took 9997 seconds to complete the same operation with Steelhead optimization.

**EMC Isilon SyncIQ VMware VM Replication**

<table>
<thead>
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<th>Time in seconds</th>
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<tr>
<td>Baseline no optimization (9000 seconds)</td>
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<tr>
<td>Steelhead cold (600 seconds)</td>
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<tr>
<td>Steelhead warm (120 seconds)</td>
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</tbody>
</table>

- **VMware VM Files**: 10 GB
- **Steelhead cold**: 14x faster
- **Steelhead warm**: 62x faster
The final chart below shows the VMware VM Files Replication Bandwidth usage by SyncIQ to perform data replication from Cluster 1 to target Cluster 2. The data transfer result showed significant bandwidth savings with Steelhead optimization. It is important to note here that only 24.89 MB of data was transferred over a 45 Mbps 80 ms round-trip time WAN link with 0.01% packet loss with warm cache on Steelheads. The same test required 11.00 GB of data transfer to complete the same operation with Steelhead optimization.

Steelhead Data Reduction Report

The Steelhead Optimization Reports below shows the Total Data Reduction % achieved for SyncIQ to complete data sync from one cluster to the other. The screenshot on the left shows 89% Data Reduction achieved with cold optimization on the Steelhead appliance. The screenshot on the right show 99% Data Reduction achieved with Steelhead appliances using warm optimization.
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Summary
The combination of the scalability of EMC Isilon Scale-Out NAS storage solutions with Riverbed WAN acceleration provides the means to maintain an always-on architecture giving remotes users fast access to centralized storage. EMC Isilon SyncIQ with Riverbed WAN acceleration also enables businesses to improve bandwidth utilization, minimize costs. Enterprises can replicate more data over longer distances without investing in costly WAN upgrades. The results show dramatic improvements in recovery point objectives (RPO) and recovery time objectives (RTO) to replicate data across two Data Centers over a DS3 45 Mbps link with 80ms RTT latency Wide Area Network (WAN): up to 100 times faster replication and using up to 100 times less WAN Bandwidth.

About EMC Isilon Systems
Isilon, a division of EMC, is the global leader in scale-out NAS. We deliver powerful yet simple solutions for enterprises that want to manage their data, not their storage. Isilon’s products are simple to install, manage and scale, at any size. And, unlike traditional enterprise storage, Isilon stays simple no matter how much storage is added, how much performance is required or how business needs change in the future. We’re challenging enterprises to think differently about their storage, because when they do, they’ll recognize there’s a better, simpler way. Learn what we mean at www.isilon.com.

About Riverbed Technology
Riverbed delivers performance for the globally connected enterprise. With Riverbed, enterprises can successfully and intelligently implement strategic initiatives such as virtualization, consolidation, cloud computing, and disaster recovery without fear of compromising performance. By giving enterprises the platform they need to understand, optimize and consolidate their IT, Riverbed helps enterprises to build a fast, fluid and dynamic IT architecture that aligns with the business needs of the organization. Additional information about Riverbed (NASDAQ: RVBD) is available at www.riverbed.com

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