Overland Storage SnapScale X2
Network Attached Storage Performance and Scalability Evaluation

EXECUTIVE SUMMARY
A traditional scale-up Network Attached Storage (NAS) architecture uses a single head unit to control and protect a number of disk arrays. Although popular, this approach introduces a single point of failure and potentially creates bottlenecks as additional capacity is added. Scale-out architectures, on the other hand, leverage multiple head units (nodes) that work together to protect data, and can expand easily to spread processing power and bandwidth to maximize performance and redundancy.

Overland Storage commissioned Tolly to evaluate the scalability and performance of their new SnapScale X2 clustered NAS solution. Tolly evaluated the SnapScale X2 platform in sequential and random read/write test scenarios. Tolly validated that the SnapScale X2 can scale to 50 nodes seamlessly, with no disruption. Adding nodes increased the capacity and also improved cluster-wide performance as additional nodes were added to the cluster.

THE BOTTOM LINE
The Overland Storage SnapScale X2:
1. Delivers an average throughput of over 5,000 MBps of sequential/random read CIFS when scaled to a 50-node, 1GbE cluster
2. Streams over 3100 MBps of CIFS throughput over 10GbE with a 10-node cluster
3. Scales seamlessly from 3 to 50+ nodes, providing linearly-increasing performance with no downtime
4. Provides a simple and consistent storage management experience as capacity is added

Overland Storage SnapScale X2 1GbE and 10GbE Node Scaling
Common Internet File System (CIFS) Sequential and Random Read/Write Performance
(As reported by SwiftTest TDE 3.2)

Source: Tolly, June 2013

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Background

Traditional storage can create choke points that can slow file access as bandwidth dwindles due to increases in concurrent access. Even with an increase of spindles, traditional storage servers are bottlenecked due to limited I/O ports and the daisy chaining of external expansion chassis.

The SnapScale X2 mitigates these bottlenecks by spreading data between multiple nodes and balances user connections to the cluster.

Tolly benchmarked the scalability of the SnapScale X2 in CIFS and NFS file-serving scenarios for 3, 5, 10 and 50 nodes with 1GbE and 10GbE connectivity.

Tolly validated that the SnapScale X2 was able to successfully scale up to 50 nodes, without impacting performance in sequential and random read/write scenarios and can provide up to 3100 MBps of throughput on 10 10GbE nodes. See Figure 1.

![Graph showing scalability of SnapScale X2](image)

Source: Tolly, June 2013

Figure 2
Test Results

Scalability and Performance

3/5/10 Node Scalability

Through leveraging a scale-out architecture, the SnapScale X2 is able to evenly and automatically distribute data to prevent single points of failure.

The capability to allow traffic to flow unrestricted, even as more nodes are added was demonstrated by Tolly engineers in a total of four tasks for each protocol: sequential read, sequential write, random read and random write.

CIFS

Tolly engineers evaluated the throughput for 1GbE and 10GbE connectivity when passing CIFS traffic as the nodes scaled from 3 to 5 to 10 nodes.

Tolly found that in both CIFS and NFS scenarios, the throughput increased linearly.

On average, (average meaning that the percent increase per task when scaling from 3 to 5 or 5 to 10 nodes was averaged across all tasks: sequential and random read/write) the throughput for 1GbE CIFS tasks increased 68% when scaling from 3 nodes to 5 nodes. When scaling from 5 nodes up to 10 nodes, the increase in 1GbE throughput averaged 50%.

In 10GbE scenarios, the average percent increase in throughput when scaling from 3 nodes to 5 nodes was 41%. When scaling from 5 nodes up to 10 nodes, the average increase in throughput was approximately 65%. See Figure 1.

NFS

The NFS scenarios showed similar linear increases in throughput with the addition of storage nodes. When scaling from 3

According to Overland Storage, the SnapScale X2:

- Has the potential to keep administrative costs down with the “Best-in-class” RAINcloud OS interface
- Can manage hundreds of petabytes through a local or remote client
- Can enable configuring a cluster or adding storage in 5 minutes
- Provides software features that allow administrators to manage and monitor usage and capacity
- Expands storage by adding hard drives or nodes to clusters with no downtime
- Improves storage utilization with thin provisioning and flexible volume management
- Balances data across the cluster to ensure the best performance available
- Scales performance and storage capacity simultaneously

Source: Overland Storage. Claims not validated by Tolly.

Source: Tolly, June 2013

Figure 3
nodes to 5 nodes, the average throughput increased approximately 36% for 1GbE traffic and 45% for 10GbE traffic. When scaling from 5 nodes to 10 nodes, the average throughput increased 65% for 1GbE traffic and 42% for 10GbE traffic. See Figure 2.

Scalability for 50 Nodes

To further demonstrate the performance scalability of the SnapScale X2, Tolly engineers performed a set of similar tests on a 1GbE cluster consisting of 50 nodes. Utilizing two additional SwiftTest chassis and switches, the SnapScale X2 was able to provide over 5,000 MBps of stateful CIFS read throughput when spread across 50 nodes.

Similarly, 50 SnapScale X2 nodes delivered nearly 3,000 MBps of NFS throughput in all scenarios. See Figure 3.

This demonstrates not only the feasibility of large deployments, but also the high correlation between throughput levels at different scale points. This means that performance will increase linearly and predictably as the number of nodes increase, unlike many traditional storage solutions.

Management/Usability

Using the scale-out architecture provided by the SnapScale X2, companies can add performance and capacity as needed, as opposed to provisioning it up front.

The distributed nature of the solution allows for multiple concurrent node failures by automatically protecting against the loss of data and with little impact on performance.

In addition, Tolly observed that there is no complex setup needed when scaling. The process is simple: when the new node is powered on, the SnapScale X2 system will automatically detect it and prompt the administrator to add it to an existing deployment. It then begins migrating data into the newly available space.

Test Setup & Methodology

Test Setup

Testing consisted of a varying number of Overland Storage SnapScale X2 nodes running RainCloud OS version 3.2.051. All nodes were connected to 2 Netgear XSM72245 switches, one for both the client network and one for the storage network.

For both the 10GbE and 1GbE testing, 4 SwiftTest 5000 Chassis (running 0.32.24064 software) were used to generate stateful storage traffic during testing. The SwiftTest Test Development Environment (TDE) version 3.2 was used to administer tests and collect results.

Each SnapScale X2 node was connected via two ports to the storage network, and via two ports to the client network. Link aggregation was enabled on both pairs of interfaces.
The SnapScale X2 platform works by creating peer sets (groups of disks) across physical nodes, allowing for complete node failure without compromising data. Multiple peer sets exist on a single node, such that deployments can be scaled by either adding nodes or adding spindles to different nodes.

For any given node count under test (N), with two spares defined, there are \((12N)-2\)/2 total peer sets with a dual-disk redundancy setup. For the lowest configuration (3 nodes), this equated to 17 peer sets available for data. Because of the massive parallelism of the system, Tolly used varying numbers of emulated clients per SwiftTest port as the number of nodes increased. See Table 1.

**Test Methodology**

Engineers used the SwiftTest Test Development Environment (TDE) to configure a set of tests to demonstrate the throughput scalability of the Overland SnapScale X2 platform. Testing was performed on multiple scale configurations.

To create the files needed for testing, engineers used a shell utility provided by Overland to create a filesystem from existing blocks on the disk, thus shortening the time needed to re-provision the arrays for the different capacity points.

SwiftTest was configured to simulate a client logging into the array, and from there read/write files in specific directories.

Each 1GbE SnapScale X2 was equipped with 16Gb of RAM (10GbE models are equipped with 32Gb), which was used as a collective cache by the cluster. As Tolly scaled the deployment to 50 nodes, the amount of cache available became 800Gb. To minimize cache hits on the systems, four directories were created, each with 2,000, 1Gb files as source data, and separate directories were created for the clients to write new files. This equated to 8TB of disk, (10X the available cache in the highest node capacity configuration).

While a varying number of SwiftTest ports and emulated clients were used for each density, the test procedure remained static. Each one of the client ports emulated a different network, and targeted one of the four folders, to avoid concurrent reading/writing across ports. SwiftTest was configured to loop through the 2,000 large files, assigning them sequentially to each one of the emulated clients. The “sequential” and “random” file access occurred within this assigned file.

SwiftTest was used to generate sequential read, sequential write, concurrent sequential read/write, random read, random write and concurrent random read/write traffic, in that order, for ten minutes apiece, with 5 minutes between each test. This procedure was repeated twice.

**CIFS Traffic**

For CIFS scalability testing, Tolly engineers used the built-in CIFS full duplex test, modifying it to read 60KB portions and to write in 1MB portions. There were different access specifications for sequential and random testing.
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