Integrating iSCSI Deployments with Existing SAS-based SANs

EXECUTIVE SUMMARY

As corporations continue to deploy new iSCSI servers and SANs, they are faced with the challenges on how to best integrate them into their existing environments with a special emphasis on backup and long term archiving. IT managers need to extend the advantages and benefits offered by their archiving infrastructure to their new iSCSI SANs deployments to minimize the associated costs and complexity. As many corporations currently use SAS-based SANs as their most effective and lowest cost backup solution, combining existing SAS-based SANs with iSCSI deployments becomes critical. The Chelsio USR-1100 is the perfect solution for such environments. It integrates seamlessly into existing SAS-based SANs to:

- Create a unified backup solution using SAS-based tape drives and archiving systems to service both SAS-based SANs and iSCSI SANs
- Enables larger SAS-based SANs extending over longer distances and providing access to centralized storage that can be scaled & allocated as needed
- Substantially reduce backup and archiving OpEX and CapEX

INTRODUCTION

According to the Data Mobility Group[i], tape is the hot new storage technology for 2011 and it will become even more important in the years ahead. Thanks to its energy efficiency and massive capacity, plus significant advances in technology and functionality, tape is more relevant than ever. The rampant growth in the amount of data generated worldwide (estimated to be almost 8000 Exabytes in 2015[ii]) combined with increased data retention periods per government regulations and the constant downward pressure on IT budgets match up perfectly with the strengths and advantages of tape-based storage. A recent study by the San Diego Supercomputing Center[iii] (SDSC) shows that tape storage has a 3x cost advantage factor over disk for enterprise storage. Tape also remains the greenest available storage option; it doesn't take any power to store or maintain data once the data has been written to tape. This is why it is expected that tape is still the preferred medium for more than 80 percent of all data in electronic archives.

Recent trends show that SAS-based (SCSI-Attached-Storage) tape drives and archiving systems are continuing to gain market share. At the same time, more and more corporations are migrating towards iSCSI SANs but they are concerned about leaving iSCSI arrays separated from the most efficient and lowest cost backup scenario. Such environments require the capability to bridge the iSCSI array into the SAS-based SAN and backup infrastructure.

INTRODUCING THE ISCSI-TO-SAS UNIFIED STORAGE ROUTER

The Chelsio's 10G iSCSI-to-SAS Unified Storage Router (USR-1100) extends the SAS storage investments with the ability to integrate low-cost Ethernet-connected servers into the SAN, without requiring additional storage arrays or management costs.

Figure 1 Chelsio's Unified Storage Router (USR-1100 SAS)

The Chelsio's USR is a half-wide 1U system with two 3/6G SAS ports and two 10GbE ports with iSCSI hardware acceleration and offload. The USR acts as a gateway and offers high-performance iSCSI-to-SAS mapping. It enables any server to attach to SAS SANs using Ethernet connectivity. Up to eight 6Gb SAS tape drives can be attached to the iSCSI SAN using a 1 to 4 SAS fan out cable for each SAS port. It is recommended that a Chelsio 10GbE adapter be used in the server as the iSCSI initiator, however any other industry-standard 1GbE or 10GbE iSCSI initiator can also be used. Two USR units can be combined into a single 1U rack-mountable chassis.

Figure 2 Two USR Units in a single 1U Chassis

UNCOMPROMISED PERFORMANCE, SCALABILITY AND HIGH AVAILABILITY: The USR sustains an aggregate bandwidth of 200K IOPS (simultaneous support for 100K IOPS / port) to provide the

applications with the data they need in real time. It supports a maximum throughput of 1130MBps Reads or Writes with 6G SAS ports. The USR supports up to 32K iSCSI connections, large enough to address the needs of even the largest storage networks. Customers gain SAN-like benefits by taking advantage of low-cost Ethernet switches, avoiding the need for more expensive DCE or CEE switches. Built-in High Availability (HA) is provided through the hot-swappable dual router blades when used in the full wide 1U chassis. The USR also supports multi-path options and load balancing. To enhance security on an Ethernet network, the USR support both ACLs and CHAP authentication.

EASE OF USE AND MANAGEMENT: While the USR performance, availability and connectivity characteristics allow it to address the requirements of large enterprises, a number of other features make it a good solution for small to medium enterprises (SMEs) as well. In its 1U form factor, the USR is both compact and power efficient. It can be very easily set up and configured using either Web-based GUI or a CLI management interface. Chelsio provides a centralized management tool - the Chelsio Unified Manager (UM) – that is used to manage all of Chelsio's products in a data center (including the Chelsio 10GbE network adapters and the USR). UM can be also be used with portable devices and tablets to remotely manage the infrastructure from anywhere. The USR supports automatic and remote upgrade of the firmware.

EXTENDING SAS-BASED BACKUP TO ISCSI SERVERS

In recent years, the number of SAS-based tape drives has constantly increased. A recent report from HP[iv] showed that in 2010 more than 30% of its tape drive systems shipped supported a native SAS interface. This represented a 200% increase from 2008. It is expected that this trend will continue in the future and across the broader market segments because of the costs, power and management simplification advantages that SAS bring. Similarly, there is a substantial increase in the number of new server deployments supporting iSCSI connectivity, either 1GbE or 10GbE. In these environments, it is not practical to have two separate backup infrastructures. IT managers want to leverage the advantages and benefits of their existing SAS-based tape archival systems and extract the maximum from the years of investments in resources, equipment and know-how. This is why there is a need to bridge SAS SANs to iSCSI SANs. The USR is the perfect solution.

The USR seamlessly connects servers with iSCSI connectivity to SAS SANs. Figure 3 shows the network topology for connecting iSCSI servers on the LAN that are isolated from the SAS SAN. In this deployment, IT managers configure the Ethernet ports on the USR as targets (the servers are the initiators) and the SAS ports as initiators (into the SAS SAN). In this case, all data stored within the SAS-based tape drives and archival systems is fully available to the iSCSI servers. Depending on the requirements, either 1GbE or 10GbE can be used as the iSCSI connectivity between the servers and the USR. The iSCSI servers can use the Chelsio T4 10GbE adapters with iSCSI off-load as the initiator for the highest performance, or use any other 1GbE or 10GbE NIC with software iSCSI initiator.
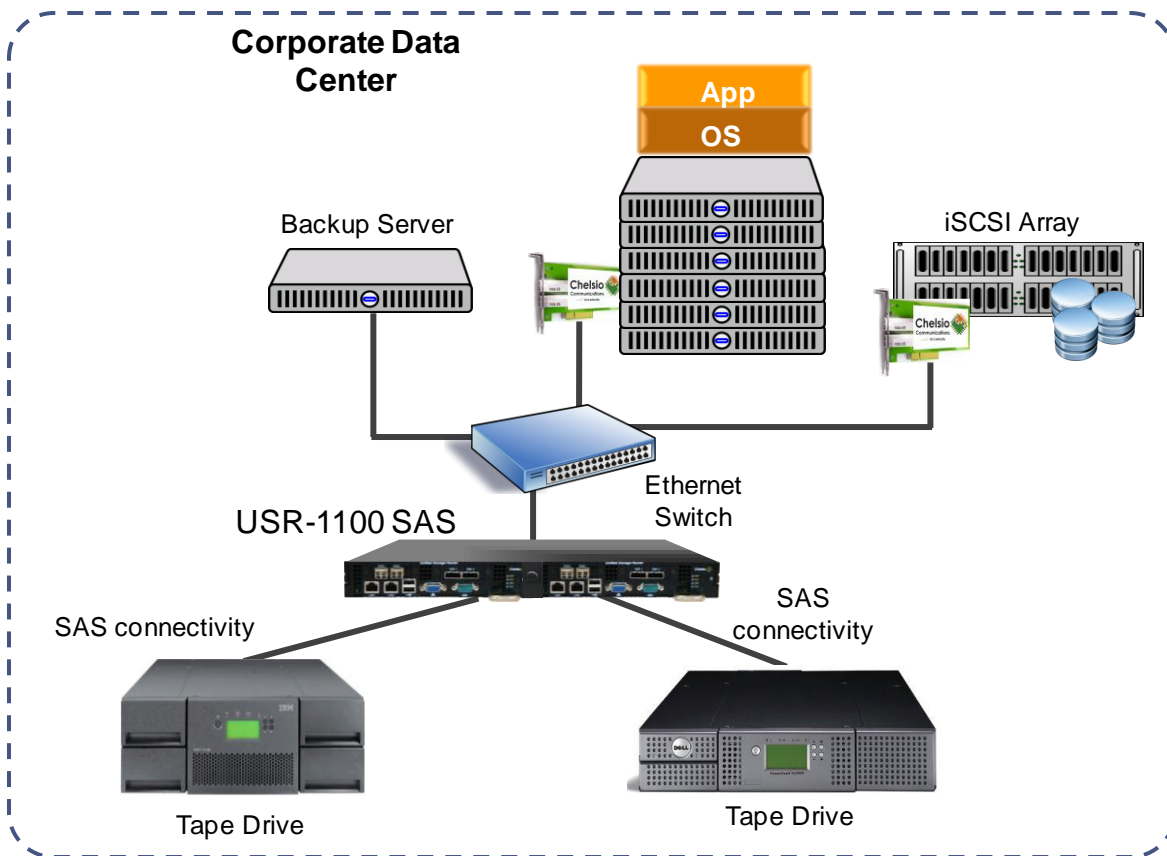
**Figure 3 Unified SAS-based Archive across SAS-based SANs and iSCSI SANs**

The USR can connect to the SAS SANs using 3 or 6Gbps mini-SAS ports. Using a single mini-SAS to mini-SAS cable to each port would limit the USR to having two tape drive connections. The optimal setup to achieve the greatest density of tape drive connectivity is to use external 1x4 mini-SAS to mini-SAS fan out cables to expand the number of tape drives which can be utilized. This setup allows up to four SAS tape drive connections per SAS port and up to a total of eight SAS drives per USR. Additionally, with an x4 mini-SAS cable the full effective 6Gbps bandwidth is replicated on each lane of the cable and is never split between the lanes. There is then an additional gain in drive capacity without any significant degradation in tape drive performance by using a 1x4 mini-SAS to mini-SAS fan out cable.

Unifying the storage backup infrastructure for both SAS and iSCSi SANs into a single SAS-based tape and archiving systems offer a lot of advantages:

- There are no changes or additional costs required as the USR fits transparently into the existing SAS-based backup infrastructure.
- All the advantages and benefits of SAS-based backups are now available to the iSCSI servers at a fraction of the cost.
- Considerable reduction in CapEX, OpEX and overhead complexity by managing a single SAS-based backup and archiving infrastructure.

INCREASE THE SCALABILITY OF THE SAS STORAGE INFRASTRUCTURE: In many mid-range and enterprise business, direct attached storage (DAS) is still the primary storage infrastructure. Direct-attached and server-dedicated storage is often underutilized and doesn't scale very well with the increased number of servers. In these environments, it is much better to deploy a SAS infrastructure using SAS switches and external JBODs. But again, the scalability in these deployments is limited by several factors:

- The port density of the SAS switches limit the number of servers that can be connected
- The maximum distance supported by SAS cable is 10m, limiting the physical size of the deployment
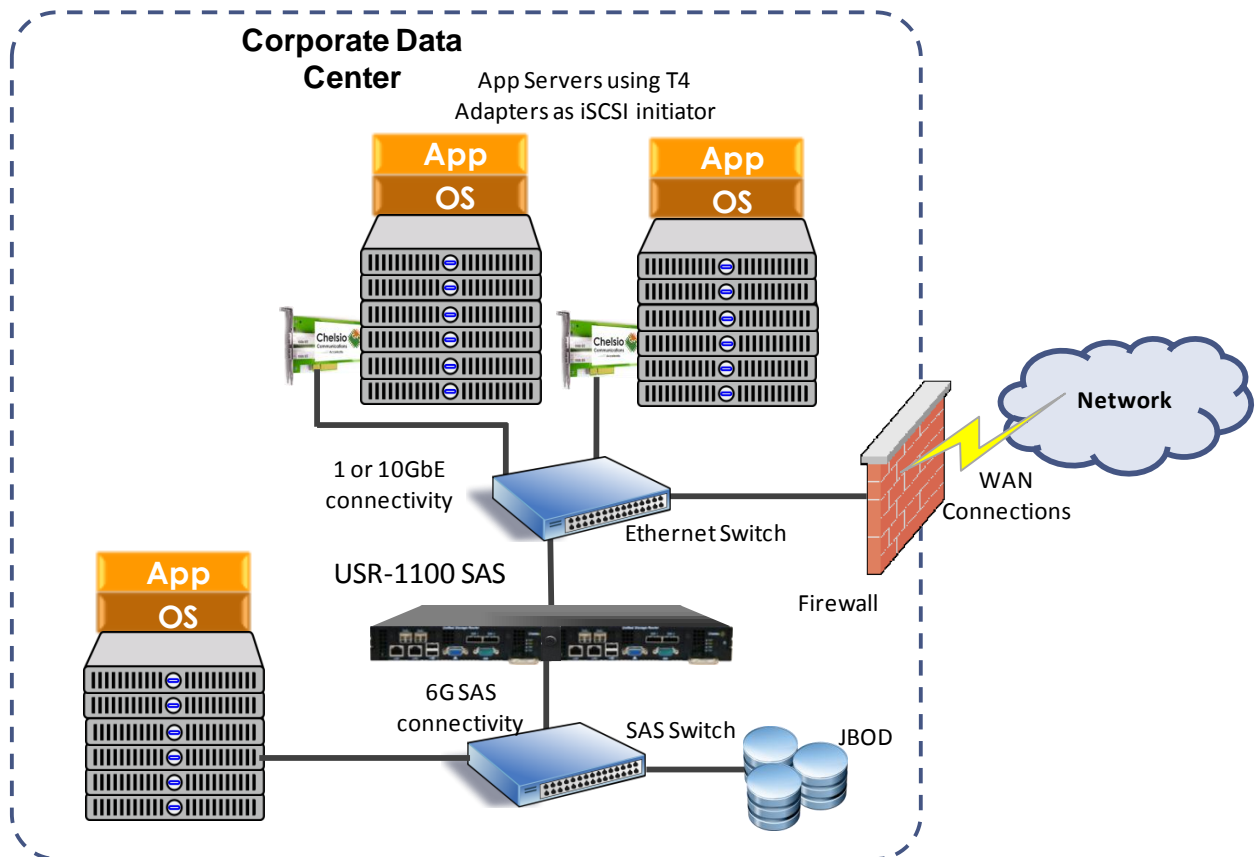
Figure 4 The USR-1100 SAS extends the SAS-based SAN to larger deployments

The USR is the perfect solution for these environments. It supports up to 16K iSCSI connections and enable IT managers to leverage SAS storage with low cost IP networks across large number of servers. The USR enables storage consolidation storage by creating larger SAS SANs extending over longer distances providing access to storage that can be scaled and re-allocated when needed. The USR offers

high performance iSCSI-to-SAS mapping and fits into the already deployed SAS storage infrastructure without any requiring changes, or new storage arrays or SAS switches.

CONCLUSION

The Chelsio USR-1100 SAS is the perfect solution to enable very cost effective SAS-based storage consolidation and provide access to storage that can be scaled and re-allocated when needed. The USR can be deployed immediately with the existing SAS SAN and tape drive infrastructure. It doesn't require any changes to the installed base and protects all the investments in resources, equipment and know-how. It provides a solution for building a modular multi-protocol SAS SAN design with increased scalability, stability and ROI.

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[i] http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA2-4770ENW.pdf

[ii] http://idcdocserv.com/1142
[iii] http://users.sdsc.edu/~mcdonald/content/papers/dt_cost.pdf
[iv] http://www.oraclehplto.com/media/HP%20OEM%20Tape%20Newsletter_August10.pdf