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Network-Centric IP SAN:

A New Approach to Unleashing the Full Potential of Your IP Network

By Doug Rainbolt

We are in the midst of the next evolution of Storage Area Networking (SAN). Enterprises have long recognized the advantages associated with SANs. Improvements in storage utilization and much improved management, especially when compared to Direct Attached Storage (DAS), have been well documented. Storage companies and connectivity vendors alike have capitalized on the opportunity while customers have reaped the benefits, with both sides maintaining some sense of contentment. Fibre Channel, up until now, has been the primary means for connecting SANs, especially in mid-range and enterprise end user environments.

Fortunately or unfortunately, depending upon one's perspective, Fibre Channel enabled SANs have not earned the much needed stripes to become the defacto standard across all segments, including what many have postulated to be a very large SMB opportunity. iSCSI, the emerging protocol, has come of age and has taken root not only in "SMB use cases," defined as small, relatively self-contained workgroups or departmental SANs, but also is finding its way into enter-

prise settings. Often it is first used as a means for storing data backed up from primary storage, challenging the dominance of tape, and increasingly, primary storage itself. Why? Because the economics are so compelling, because many enterprises have the skills already in-house to manage a SAN built around iSCSI, as it leverages standard IP networking, and because the performance is very good. Furthermore, with the advent of 10GbE, expected to be brought to market in late 2005 to early 2006, most, if not all, of the performance advantages associated with Fibre Channel will be eliminated, forcing many CIOs to push their organizations to leverage IP SANs as much as possible.

What is a True IP SAN?

First, what is a SAN? A SAN is a network designed to provide connectivity between servers and shared storage, greatly simplifying data management and assuring much higher asset utilization. To date, most SANs will utilize storage virtualization implemented on a host, in the storage controller or embedded in the fabric. The SAN connectivity options, connecting servers to controllers, and controllers managing disks, are relatively few. We have

witnessed the choices evolve in increments, from SCSI to Fibre Channel, and now, iSCSI. Fibre Channel had been the dominant means for SAN connectivity because competing technologies did not offer the performance or resiliency that Fibre Channel offers. Over the last few years iSCSI has emerged as an attractive alternative, not to fully replace Fibre Channel, but to be the future dominant means for connecting a huge proportion of an enterprise's servers to networked storage. Simply put, iSCSI encapsulates SCSI so that it can be effectively and efficiently transported across a standard IP network.

Just as the networking protocols between servers and storage controllers have included SCSI, Fibre Channel and now iSCSI options, so should the very same options be applied to connectivity between controllers and disks. For the first time, iSCSI is a viable choice for controller-to-disk connectivity, in a switched topology, creating a true IP SAN throughout.

To understand the value of a true IP SAN one should first review the advantages of IP networking. The client server networking model has been with us for some time, however, not fully extended

to storage services. Application servers accessing a homogenous GbE network naturally "serve" clients. Because of all the benefits associated with IP networking, the optimal means for serving storage to these clients is through the same GbE network, providing IP connectivity down to the disk-level. The benefits inherent in this network-centric approach include supreme scalability, in terms of capacity and performance, increased manageability, in terms of human administration and data management, and the most flexible architecture available.

Furthermore, given the ubiquitous nature of IP and the associated downward trending cost curves, it can be implemented at a fraction of the cost of a legacy Fibre Channel infrastructure. To be truly network-centric and take full advantage of the IP network, the storage controllers must be capable of supporting "in-band" storage management at the front-end and the back-end.

The Advantage of IP Networking Throughout

The advantages of providing IP connectivity down to the disk-level are notable. Whenever it is possible to connect as a node in the net-

work there is immediate addressability. While storage companies have evolved connectivity on the back-end from SCSI to Fibre Channel Arbitrated Loops, no one, until now, has cracked the code of delivering truly affordable networked connectivity down to the individual drive level. Simply put, the drives are part of the network. There is no arbitration to worry about. This is especially important as customers scale to larger and larger networks, which will clearly be the case for IP. A network-centric architecture, which takes full advantage of IP to the disk, makes adding additional disks to the network extremely simple – new IP addresses are dynamically assigned, connectivity is made and the network is expanded and made immediately available.

Supreme Scalability

True network connectivity requires ease of scalability, reacting to emerging business requirements with great flexibility. SANs utilizing Fibre Channel are bound in complexity and often limited in scalability. With IP, IP addresses are dynamic; equipment can be moved or reconfigured to the customer's changing requirements, without major effort. Despite the moves to evangelize Fibre Channel routing between SAN islands, the actual implementations have been extremely limited, and still leave customers per-

plexed as to how to integrate islands from different vendors. This lack of integrated routing standards between Fibre Channel vendors is a huge detriment to Fibre Channel's prospects of being the defacto standard storage networking protocol for the masses. A true IP SAN provides extremely simple connectivity and scalability. The imposed limitations of Fibre Channel do not exist. True networkability means that one can scale performance and storage capacity, on independent planes. The monolithic approach, be it IP or FC based, translates into customers being forced to scale capacity and controller function in single "monolithic chunks" where performance as one scales can be negatively impacted, and the expense per incremental TB added rises. The network-centric approach is designed to drive incremental performance up while driving incremental cost per TB down, as customers scale up and out.

The network-centric approach to data storage is very simple. By using industry standard servers to create an N-Way storage controller cluster – termed a Realm – capable of creating one-to-many volumes, virtualizing IP disks, housed in enclosures on the back-end, everything is networked. Customers are able to truly scale performance, via the cluster, and capacity, through the networked disk enclosures, independently. The result is super-

ior scalability, manageability and reduced costs.

Superior Manageability

Most customers are very familiar with IP. If you had a storage network that offered all of the performance and scalability you desired and also took advantage of the same topologies that your team is used to working with, wouldn't you take advantage of it? At first we witnessed the early adopters dabbling, but more and more enterprise customers are quickly making the migration to IP enabled SANs and a primary reason for doing so is the standard tools and practices already mastered.

Superior Cost Savings

It stands to reason that an architecture that is built within the IP cloud has tremendous benefits, especially as customers scale. When compared, for example, to a legacy monolithic array (although it might well be termed to be "modular" by storage suppliers when compared to traditional Fibre Channel monolithic storage), the network-centric approach has proven to be as much as 50 percent cheaper than a comparable array. This is for just the array hardware. This does not even take into account the extra costs associated with HBAs and fabric switches, where Fibre Channel is deployed, or the savings in management costs associated with staff using standard IP tools.

The time for the IP SAN

has come. OS vendors such as Microsoft, Sun, HP and RedHat Linux are already IP SAN enabled, shipping iSCSI support out of the box, for free. Early adopters are making way for enterprise users who see the superior advantages of a networked approach to IP SANs. It's not only about iSCSI, although this is an important element. It's about building a true IP network that delivers storage services to more servers than was previously possible, in the most scalable and cost effective means. Realizing the dream of on-demand computing is made easier with a common, standard underlying infrastructure, matching applications to the right storage at the right time, with maximum efficiency.

While Fibre Channel and the legacy array technology that served us well will continue to have a rightful place within legacy applications, IP will work its way up the food chain, step-by-step, and earn its rightful place as the dominant means for building storage area networks. The technology is proven. The performance is good and will only get better. The management story is very compelling. The cost savings, not only in upfront costs, but TCO, are significant. It's time to make the move.

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