



iSCSI Questionnaire

Coming on the heels of the release of last year's SCSI over IP (iSCSI) standard from the Internet Engineering Task Force, 2004 is seeing a modest increase in the number of iSCSI products entering the market. Questions abound over the fit for this protocol and for storage topologies based on it.

The following questions are intended to identify your company's view of the market for iSCSI technology.

QUESTION 1

In its early development years, iSCSI had several prominent champions within the vendor community, including IBM and Cisco Systems. The early position of iSCSI advocates was that it would replace Fibre Channel as an interconnect for building storage area networks. With the delays in standards development, the party line seemed to change: FC would be used to build "core" fabrics, while iSCSI would be used to connect outlying servers to FC fabrics.

What is your position on the technical fit for the burgeoning technology?

It's a matter of evolution not so much revolution. Many enterprises today already have "core" fabrics that consist of Fiber Channel. The investment made will continue to produce an attractive rate of return over the five to eight years. Today the promise of iSCSI is that it offers a more cost effective means to extend the value of the Fibre Channel SAN to outlying servers however, as 10Gb Ethernet matures and comes down in price the technical advantages that Fibre Channel has today will start to diminish quickly.

Initial attempts to implement iSCSI were hamstrung by the lack of industry standards, appropriate operating system and application support, and optimized hardware. As these roadblocks are gradually removed, iSCSI will become practical as a storage network technology. Neither protocol has a deep technical advantage over the other, so practical and business concerns at the solution level will determine the relative positioning of the two.

QUESTION 2

As an IP-based protocol, iSCSI is limited in terms of speeds to available bandwidth less overhead, which is generally interpreted to mean that the technology is capable of delivering roughly 75 percent of the rated speed of the TCP/IP network pipe in Mb/s or Gb/s. FC advocates have leveraged this as a major differentiator between FCP and iSCSI solutions.

How meaningful is this speed difference today? How meaningful will it be next year with the introduction of 10 GB/s IP nets?

Be careful when comparing speeds, as the measurement methods differ between the two protocols. While some applications and businesses environments truly benefit from the increased speed that Fibre Channel provides (example, a stock exchange), most applications have a hard time making full use of today's Fibre Channel speeds. Should it be required iSCSI can make use of multiple parallel connections to increase performance. All of which reduces speed as a legitimate decision factor. In many situations the need for speed based more on perception than fact.

With 10Gb Ethernet, the playing field between FC and IP starts to level out with regards to high bandwidth application demands.

QUESTION 3

Related to the above, how important is interconnect speed to applications? Haven't we made do with much slower storage interconnects in the recent past?

Yes. Few real-world applications make full use of the available performance of Fibre Channel or Ethernet networks.

QUESTION 4

Both FC fabrics and iSCSI SANs utilize IP-based applications for management. In the case of iSCSI, management (or control path) is handled in the same network pipe as data and SCSI command traffic. In FCP, the control path and data path use different wires.

From the standpoint of scaling, simplified infrastructure, and design elegance, iSCSI would seem to have the advantage over Fibre Channel's "dual network" design. What do you think?

This really isn't a big deal. FC also has some in-band management functions that are more advanced than those currently available in iSCSI. For example, HBA microcode can be updated using in-band tools. iSCSI could provide management over the same pipe that it provides data or over a dedicated IP management pipe. Although management applications don't produce large

amounts of traffic, there may be beneficial reasons to separate data and management traffic onto different pipes. As iSCSI products come to market, we'll probably see different vendors taking different approaches.

Eventually iSCSI will have comparable capabilities, so this is not a critically important differentiator.

QUESTION 5

Both iSCSI and Fibre Channel use a serialization of SCSI, a channel protocol for storage I/O. The key technical difference is the transport used by each interconnect (TCP for iSCSI, FCP for FC fabrics).

If the two are more similar than dissimilar, why should a company field separate channel interconnect rather than use existing investments in networks to interconnect storage and servers?

To use an existing network or a dedicated storage network depends on many factors. In some environments putting storage traffic on the same network as other traffic may suffice. It really depends on what the total network load is at peak times. If users are pretty demanding of existing network resources, the need for a dedicated storage network will make a lot of sense. Security is also another strong reason for a dedicated storage network.

Typical general purpose networks are unsuitable for use with iSCSI, except for the smallest configurations. Typical corporate networks provide 10/100 Megabit per second connectivity with only moderate performability: Outages and congestion are commonplace. Storage networks provide 100 MegaByte per second connectivity (about ten times as much) with considerably better reliability and availability. As iSCSI becomes viable as a competitor to Fibre Channel in mission critical storage deployments, a dedicated redundant network--comparable to today's Fibre Channel networks--will be required.

QUESTION 6

FC SANs are increasingly seen behind NAS heads, which are said to act as gateways to SANs and provide hosting for SAN management utilities.

Taking this design choice to the next level, what is your opinion about using NAS gateways to support both NFS/CIFS and iSCSI on the front end in order to aggregate storage traffic?

NAS is best for some applications, and block storage for others. It seems reasonable to expect that some combination of gateways or flexible ports on storage devices (NAS filers or RAID arrays) would be the most efficient way to implement a solution that could support a mixture of the two protocols.

For application specific, very moderate block movement needs in less demanding environments an iSCSI enabled NAS device may suffice. In a more dynamic storage environment, a SAN will provide the user with more flexibility to meet changing storage demands. NAS heads can be added to better handle file services and host SAN management utilities while taking advantage of the storage resources of the SAN.

QUESTION 7

iSCSI standards do not seem to have been “held hostage” to proprietary vendor interests the way that FCP standards have been at ANSI (it is an established fact that vendors can develop FC switches that fully comply with ANSI standards, yet fail to be compatible with one another).

From the consumer’s perspective, do you feel it's smarter to go with iSCSI-based technologies because of product interoperability?

iSCSI product interoperability has not been broadly demonstrated --because there are so few products! Ethernet networks have interoperability problems just like Fibre Channel, but with over two decades of experience, the Ethernet community seems to have a better handle on the problem. It remains to be seen whether the interoperability problems stem from the protocol or from the storage network business environment.

The promise of better interoperability will become more apparent when more iSCSI products from various vendors start getting used in actual production environments.

QUESTION 8

At one point, vendors touted iSCSI as the foundational technology for building “SANs for the rest of us” – that is, companies that are not necessarily Fortune 500 status.

Do you embrace this view? And if so:

Qualified, yes.

- What do “the rest of us” require a SAN for? What is the killer application for iSCSI SANs?

Not everyone requires a SAN but there are a lot of enterprises that can greatly benefit from a SAN. To date the cost of implementing a SAN has been prohibitive to many companies. The majority of benefits that an iSCSI SAN offers are the same as that of a Fibre Channel SAN but at a much lower cost. It's a simple trade off of dollars to performance.

- What is the advantage of iSCSI over burgeoning protocols for large-scale device interconnection like Serial Attached SCSI (SAS), which, with expanders, offers connectivity for up to 16,000 nodes?

Distance is the biggest.

SAS is not a network protocol – more of a device interconnect

- With burgeoning drive capacity improvements, already at 200 GB for SATA and SCSI, can arrays be built with adequate capacity to meet the needs of SMBs without resorting to SANs?

Having larger disk in a direct attached storage environment does little to solve issues that a SAN can address. For example, things like efficient storage utilization, automated data movement (ILM), effective backup and disaster recovery solutions.

- With removable/exchangeable disk/tape hybrids, such as Spectra Logic's RXT platforms, can SMBs achieve capacity scaling requirements without deploying SANs at all?

Solutions like these are point solutions aimed at addressing a single issue. SANs on the other hand are much more flexible and capable of addressing multiple solutions.

This is a huge set of questions. In summary there is a clear overall requirement to be able to store data in a distributed fashion, and a clear requirement to be able to access data from multiple locations. That means that networking is needed, and IP is clearly the universally accepted base networking technology. In the long run, IP based networking will be used to move data from storage devices to users, and what's up for discussion is the pauses and detours we make along the way

QUESTION 9

What has happened to TCP Offload Engine (TOE) technology, once touted as a prerequisite for iSCSI SANs? Was it simply hype intended to keep Host Bus Adapter vendors from losing market share to vendors of simple NIC cards in an iSCSI world? Or, has TOE development proved more daunting than originally thought? Why aren't we hearing more about TOE?

It depends.

TOE is still considered a basic requirement for high-performance iSCSI solutions however the number one factor driving iSCSI is lower cost. Perhaps less noise is

being made as everyone gets TOE technology into their product catalogs, making it less of a differentiator.

To achieve cost goals many end users are opting to use free iSCSI software drivers rather than purchasing TOE enabled hardware devices. The determining factor is the storage workload driven by the application and the expected performance. Add the fact that server CPUs are becoming more and more powerful the need to implement a TOE enabled HBA has diminishes. There will be servers and applications that will require TOE technology but as noted these will be for high performance applications.

QUESTION 10

FC fabric advocates claim that FC fabrics are more secure than iSCSI SANs. What do you think?

SANs deployed in a secure machine room are secure. Once you go outside the machine room, IP solutions can be more secure because IPsec and related network security technology is commonplace.

It depends on how an iSCSI SAN is implemented. The key security difference between FC and IP is the fact that IP-based block storage connections could potentially span the entire enterprise.

- How is an FC fabric any more secure than an IP-based iSCSI SAN if it uses an out-of-band, IP-based, connection for fabric management?

Anytime IP-based management is used there is a security risk of someone entering and changing configurations or deleting data. However, to siphon, change or delete packets of data in-flight over a network requires physical access to that network. Packets of data in a FC network cannot be rerouted to an IP network without a physical router device in place but IP networks could unless strict security measures are in place.

- How can FC advocates justify the claim that FCP remains a mystery to hackers, but also argue that the protocol is becoming more familiar and less of a training hurdle for customers?

Because to date there are still a lot more people with in-depth IP knowledge compared to those with in-depth knowledge of Fibre Channel.

- Why have no FC switch vendors implemented the FCP security standards from ANSI in their products?

Switch vendors have implemented feature in line with the needs of the customer.

QUESTION 11

Microsoft's iSCSI initiator seems to be winning mindshare among vendors (Cisco recently opted to use the Microsoft initiator in place of its own in Windows shops).

Do you support the Microsoft iSCSI initiator with your products? Does a target device also need to utilize Microsoft target definitions to work with a Microsoft initiator? (Microsoft says it does, some target vendors say it doesn't.)

Yes, our products do support the MS iSCSI initiator.

QUESTION 12

Some vendors seem to be suggesting that Fibre Channel is superior to iSCSI because of its end-to-end support of "native Fibre Channel drives."

Is there such a thing as a "native Fibre Channel drive" or are we really talking about SCSI drives with integral Fibre Channel to SCSI bridges in the electronics of the controller or disk?

Yes.

Native FC drives use FC-AL as the connecting protocol. The mechanical part of FC drives tends to be at the high end of the range, with enterprise-class performance and reliability.

QUESTION 13

Fibre Channel fabrics do not seem to respond to Metcalfe's Law of networks, which states that the value of a network should increase and cost per node should decrease as more nodes are deployed. Fibre Channel fabrics seem, in fact, to become more difficult to manage as they scale (in many cases eliminating many of the value gains promised by vendors) and, in general, remain the most expensive platform for data storage. FC fabric per port costs have been extremely slow to decline.

By contrast, per port costs of GigE switches and GigE NICs have fallen dramatically in only a two to three year time frame. 10GbE is expected to follow this pattern as well.

From a cost standpoint, does iSCSI have a better story to tell than Fibre Channel to price-sensitive consumers?

Today it's true that iSCSI is less expensive to deploy compared to FC. Ethernet switches are much lower in price than FC. Add in the fact that the user can get by without an HBA or TOE enabled NIC and the cost of implementation really comes down. However, it is not unreasonable to expect that FC switch and HBA prices will start declining rapidly with the emergence of iSCSI. For applications and environments where software drivers will not suffice, the cost difference between the two technologies will become narrower.

QUESTION 14

The industry has given mixed messages about the fit for iSCSI: Is it a data center technology because that is where the big switches are located, or is it an “edge technology” because workgroups and departments do not require the speeds and feeds of data centers? What is your take?

Right now it's an emerging technology. The trick is to figure out how the market will develop.

Like any new technology, there will be an evolutionary development cycle to iSCSI. It is a safe assumption that iSCSI will start as an edge technology where critical storage demands are not as great and over time, as the technology matures, iSCSI will penetrate the data center and co-exist with Fibre Channel, acting as a second tier infrastructure. The ultimate success of iSCSI is predicated on the technology continuing to mature and the historical price declines in Ethernet staying on track.

QUESTION 15

With Simple Network Management Protocol (SNMP), Dynamic Host Communications Protocol (DHCP), and other established protocols in the IP world, it would seem that iSCSI will hit the ground running with services that were missing altogether from FCP. Is this an advantage in your opinion?

Fibre Channel is tuned for today's storage environment. DHCP, SNMP, and other general purpose network features solve problems that are less important in storage networks. There is an advantage to having these technologies ready "on the shelf" for when they will be needed, but Fibre Channel solves today's problems in other ways.

QUESTION 16

Some vendors are “dumbing down” their Fibre Channel products to facilitate their deployment in SMBs. Is this your strategy and what do you see as the benefits and drawbacks of such an effort?

A range of products to solve a range of customer needs is always needed. Just like Ethernet where there are cheap "unmanaged" switches and expensive "managed" switches, there will be a range of Fibre Channel products.

It's not so much dumbing down as it is right sizing products to address the needs of SMBs. Just like the enterprise market a section of this market also has a need for storage area networks but at different capacity and functionality points and price ranges. Naturally the benefit we see is giving the customer the right product at the right price. We don't see any drawbacks in servicing multiple markets.

QUESTION 17

Does iSCSI offer anything that FC fabrics do not to facilitate storage virtualization?

Storage virtualization is independent of the protocol, and could be implemented with either one.

QUESTION 18

Describe the products that your company is developing that support iSCSI.

We reserve the right to not comment on future product development at this point.

QUESTION 19

Compare key pricing and capability differences for your iSCSI solutions versus comparable FC solutions.

Please refer to published information. Data on unannounced products not available unless under NDA.

QUESTION 20

Does iSCSI contribute to data protection in a networked storage world? If so, what?

With regards to data protection, iSCSI because of its use of Ethernet minimizes the cost associated with distance. The same is true of FCIP and iFCP.