Special Report

SAN Basics
Fibre Channel vs. iSCSI

In this quick reference guide, we examine the key differences between Fibre Channel and iSCSI to help you choose the best SAN technology for your organization.

Choosing a SAN Technology: Fibre Channel vs. iSCSI

In part three of our series, we examine several misconceptions about FC vs. ISCSI SANs and how to choose the right SAN technology for your SMB.

What you will learn in this tip: *Part one and part two of our series discussed the specific features of Fibre Channel storage area networks (SANs) and iSCSI SANs. Part three of our series will discuss Fibre Channel vs. iSCSI SAN misconceptions. We clear up the myths about Fibre Channel vs. iSCSI to help you choose the best SAN technology for your organization.*

There are a many misconceptions about Fibre Channel and iSCSI SAN technologies. Several are perpetuated by the vested interest of specific storage vendors. Some of these SAN technology misconceptions have a grain of truth but are tainted by the past, not the present. Other misconceptions are correct on a technical basis but have no relevance in the real world. This article clears up some of the most common misconceptions about Fibre Channel vs. iSCSI SANs and also helps you choose which technology is best suited for your small- to medium-sized business (SMB) environment.

Misconception #1: Fibre Channel SANs are faster than iSCSI SANs

Although it's true that 4 Gbps Fibre Channel has a higher throughput than 1 Gbps iSCSI, it's also true that aggregating four 1 Gbps Ethernet ports gets the same bandwidth. And 8 Gbps FC has slightly less bandwidth than 10 Gbps iSCSI. So from a throughput perspective, this misconception has a small kernel of truth based on the low-end bandwidth specs.

Misconception #2: Latency IOPS play a big role in SAN technology

Intuitively, iSCSI latency should be significantly greater than Fibre Channel, because of TCP latency. As latency increases so does response time. Higher latency generally means fewer IOPS. But VMware's fall 2009 testing of NFS, iSCSI, and FC revealed some surprising results. Published in the white paper titled: "VMware vSphere 4: Exchange Server on NFS, iSCSI, and Fibre Channel" , the test results showed that iSCSI latency is definitively higher than Fibre Channel, especially on initial load. But it also showed that IOPS were considerably higher on Fibre Channel than iSCSI with the greatest differences coming at initial load. Oddly, as the load over time leveled off, the latency IOPS differences narrowed. There was still a measurable difference, but it was much smaller

than expected. So unless it is a very high transaction-oriented application, the latency differences will not matter very much for your small business application.

Misconception #3: iSCSI SANs are always less expensive than Fibre Channel SANs

iSCSI SANs are often seen to be less expensive than Fibre Channel SANs. And when you compare 1 Gbps iSCSI vs. 4 Gbps Fibre Channel, iSCSI is less expensive in terms of acquisition and maintenance costs. The iSCSI hardware, especially at the port level where no TCP/IP offload is required, is also less expensive than Fibre Channel. However, one misleading argument is that iSCSI can also run on current infrastructure. Although iSCSI can be run over existing switching and IP infrastructure, it is not recommended. Performance is likely to be severely degraded, unpredictable, and less secure if not operated on a dedicated network or subnet (LAN or VLAN).

But comparing the costs on a per gigabits-per-second basis narrows the cost differences between iSCSI and Fibre Channel considerably. Often, a 10 Gbps iSCSI SAN costs more than a 8 Gbps Fibre Channel. This is even true for the initiator ports, target ports, and switch ports. Performance levels also make a difference in costs. At lower performance levels (1 Gbps iSCSI vs. 4 Gbps Fibre Channel), iSCSI requires considerably less CapEx than Fibre Channel. At higher performance levels (10 Gbps iSCSI vs. 8 Gbps Fibre Channel), iSCSI actually requires somewhat more CapEx. OpEx differences are more pronounced.

Furthermore, training costs differ between iSCSI and Fibre Channel as well. Fibre Channel SAN technology is new for most storage administrators and therefore requires more training costs and a relatively long learning curve. It is not intuitive. Add this to the deterministic manually intensive nature of Fibre Channel and the OpEx costs are considerably higher than iSCSI.

Overall, the costs for Fibre Channel and iSCSI SANs differs for each company. An iSCSI SAN can be more expensive than a Fibre Channel SAN and vice versa, but keep in mind that the difference in cost is often much narrower than expected.

Misconception #4: iSCSI SANs simpler to operate vs. Fibre Channel SANs

Few dispute this fact that iSCSI SANs are easier to operate than Fibre Channel SANs because of the non-deterministic, discoverability, and routing of TCP/IP Ethernet networks. Also, network implementation, operations, management and change management is far more automated and forgiving on iSCSI SANs than FC SANs. But this conventional wisdom is based on information from the past, not the present.

Recent advances in small and medium Fibre Channel SANs have made implementations, operations and management on an ease of use parity with iSCSI. Larger environments are still far more complicated than iSCSI, but even change management for Fibre Channel SANs can be handled on a more simplified automated basis with products from Aptare Inc., NetApp Inc., SANpulse Technologies Inc. and TekTools (now part of SolarWinds). And boot from SAN is actually simpler on a Fibre Channel SAN vs. an iSCSI SAN (which requires at least one separate DHCP server and usually two for HA, offering up a PXE or boot up image.)

So which SAN is right for your SMB?

There is no "right" SAN technology for your SMB environment. Both Fibre Channel and iSCSI SAN are up to the task. Generally, the iSCSI SAN tends to be a bit simpler with somewhat lower costs; whereas the FC SAN tends to be somewhat faster with lower latencies/higher IOPS. But after going through common misconceptions, these statements aren't always true. The right choice boils down to your organization's unique requirements, knowledge, experience and comfort level.

The Anatomy of a SAN: Fibre Channel SAN Explained

What you will learn in this tip: *[Fibre Channel SANs](#) are a popular choice for many organizations. In part one of our series on Fibre Channel vs. iSCSI SANs, we examine the components of a Fibre Channel SAN to help you decide if it's the best [SAN technology](#) for your organization.*

There are lots of questions about which [storage area network (SAN)](#) technology makes the most sense for small- to medium-sized businesses (SMBs). The most commonly asked question is which SAN technology is better: [Fibre Channel (FC) SAN technology or iSCSI SAN](#)? There is no correct single answer. Neither Fibre Channel or iSCSI fits all types of SMBs. Each technology has its supporters and detractors and there are definitive differences between these two SAN technologies. But those differences have narrowed considerably with the latest generations of iSCSI and Fibre Channel technology. Most of the debate is derived from out-of-date information or misconceptions.

Before you decide on whether or not to use Fibre Channel or iSCSI SANs for your SMB data storage environment, you must first understand today's current SAN level setting and the features of Fibre Channel and iSCSI SANs. This tip outlines today's SAN technology and the features of Fibre Channel SANs.

Current SAN level setting

A SAN is essentially a switch-based technology that interconnects and switches multiple physical servers, virtual machines (VMs), and applications to external storage. Storage administrators are often confused and think that the SAN storage array is the SAN. In reality, the SAN storage array is just one piece of the SAN. A SAN allows more hosts to access that SAN storage array than the array has physical ports.

The anatomy of a Fibre Channel SAN

Fibre Channel technology is one SAN technology you can choose for your SMB. Fibre Channel is an extremely stable mature layer-2 switching SAN technology, and the predominant SAN variant today in the enterprise. It preceded the iSCSI standard by nine years, and the Fibre Channel protocol (FCP) is the only commercially utilized protocol on Fibre Channel. FCP is the standard storage SCSI storage protocol wrapped in Fibre Channel frames.

There are three physical components to a Fibre Channel SAN. The first piece is the Fibre Channel host bus adapter (HBA), otherwise known as the initiator. An HBA is either a PCIe card or chip residing on the host motherboard. It embeds the FC standard into silicon, minimizing host resources. A software driver resides on the host as well.

The second piece is the Fibre Channel switch. The FC switch is a non-blocking (no internal oversubscription of bandwidth) layer-2 switch with extensive management capabilities that conform to the FC standard. The variation of the FC switch is the FC director. The FC director is a large port count non-blocking switch; it has high-availability (HA) with no single point of failure and enterprise class feature functions (such as encryption, virtualized SANs, gateways to other networks, etc.).

The third piece is the objective of the HBAs called the FC storage target port, or target. It is the external storage connection to the Fibre Channel SAN (FC fabric.) The target storage port provides the address (which is built into the silicon) or worldwide name (WWN) address of each target storage port. The hosts each have their own unique WWN address that allows them to connect to target storage for each read or write session. One key piece of software is Fibre Channel SAN multipathing code that resides on each host accessing the external storage. This allows each host to have multiple paths to its target storage for primarily path failures and in some cases, load balancing and performance aggregation.

FC initiator, target, and switch port bandwidth are currently available as 8 Gbps or 4 Gbps interoperable variants. They're also interoperable with previous 2 Gbps but not 1 Gbps variants.

In the next part of our series on Fibre Channel vs. iSCSI SANs, we'll look at the components of an iSCSI storage area network.

11 iSCSI Technology Shortfalls to be Aware of

Over the past decade, storage area network (SAN) has evolved greatly in terms of its scalability and performance. The fiber channel (FC) SAN and Internet Small Computer System Interface (iSCSI) SAN are being deployed by enterprises around the globe. Although iSCSI technology has been around for almost a decade, FC SAN dominates the storage domain due to the following reasons:

• iSCSI technology uses local area network (LAN) for connectivity between servers and storage systems and is more cost effective than FC SAN. However, due to latency associated with LAN, iSCSI SAN is not recommended for applications that rely on low response times.

• An iSCSI SAN is not recommended for enterprises than do not have a dedicated LAN infrastructure for connectivity between servers and storage systems.

• iSCSI technology does not support connectivity between the islands of SAN due to network latency.

• A SAN using iSCSI technology is not recommended for disaster recovery (DR) setups, where the recovery point objectives and recovery time objectives are almost zero. Also, many DR applications do not support iSCSI technology.

• iSCSI technology cannot be used in areas where boot from SAN is required, unless every server's network interface controller card is replaced by iSCSI host bus adapter, which is costlier than FC host bus adapter.

• Storage systems that leverage iSCSI technology have capacity limitations, and cannot be used for requirements exceeding hundreds of Petabytes.

• SAN setups based on iSCSI technology could face blockages in the case of input/output extensive applications; hence, iSCSI SAN should be avoided for billing and banking applications.

• The iSCSI SAN should not be deployed for applications having high data throughput requirements such as batch processing.

• An iSCSI SAN is unable to connect servers to storage in a local data center.

• iSCSI technology cannot be used to merge to SAN.

• The iSCSI SAN cannot be used where the application server memory and central processing unit (CPU) resources are highly utilized. This is due to the fact that in iSCSI technology, system interconnects move from classical bus to a network structure; iSCSI technology has to be mapped to network transport protocols, therefore requiring CPU cycles for encapsulation.

It is because of the aforementioned factors that iSCSI technology is not widely used in a SAN, but is being utilized by small enterprises due to its cost effectiveness. However, FC over Ethernet is being touted as a technology to look forward to in the SAN domain and one that can overcome the limitations of iSCSI technology.

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