The Trusted Foundation for Storage

FCIA

FIBRE CHANNEL INDUSTRY ASSOCIATION

Executive Summary

Data access speeds for enterprise applications are becoming more critical; as is the need to support real-time business requirements, which in turn is driving the deployment of flash for tier-1 storage. In order for enterprise data centers to keep pace with data-intensive workloads, the right network architecture must be implemented to prevent IO from becoming a bottleneck. Fibre Channel helps to alleviate IO discrepancies and unleash the full potential of flash-optimized storage.

Why Fibre Channel to Support Flash Optimized Storage?

- Realize the true performance of flash solution with the lowest latencies and unmatched IOPS

- Combined performance enables the deployment of more servers, applications and VM workloads

- Simplistic management to reduce operational expenses through advanced monitoring, network management, and diagnostics

- Minimize risks of application and network disruptions through the Fibre Channel's highest resilient and scalable network

Why Fibre Channel Fabrics to Support Flash Storage?

In a computing era defined by high-density virtualization, big data analytics and cloud infrastructures, unprecedented advancements in storage networks are called upon to respond to the strains of increased complexity. Data access speeds of enterprises' applications are becoming more critical as is the need to support real-time business requirements, which in turn is driving the switch to flash memory based solid state storage for tier-1 storage. As the industry leading storage networking solution, Fibre Channel does not simply meet requirements of these increasingly difficult conditions; it excels in them. With high IO and low latency performance, complemented by optimum scalability and reliability, it is clear why Fibre Channel is the storage infrastructure best-suited to capitalize on emerging trends and the attachment of choice for flash-based storage devices. Flash arrays can be considered one of the most important storage innovations of the last decade. They enable faster block storage performance for high-density virtualized workloads and tier-1 applications, and speed data-intensive application response times while reducing costs. Yet, while the rewards they offer enterprises are immense, flash optimized storage also heightens demand on the network for accelerated IO. Flash storage may deliver top speed, but if the network infrastructureis not performing at the same level, that speed advantage may not be realized in real-world business transactions.

Latency and Deterministic Behavior

In today's data storage environments that include high performance storage options, latency is more important than ever. Connections to low latency storage such as SSDs and hybrid arrays are on the rise. Flash-based storage requires a networking infrastructure that is extremely deterministic with low latencies. By utilizing cut-through network architecture, and combining low latency and high performance to maximize IOPS (Input/Output

Figure 1: Workload Latency Comparison of 8GFC and 16 GFC

operations per second), Fibre Channel stands alone among storage networking solutions in its ability to consistently deliver the vigorous performance storage networks need to keep pace with the accelerated IO flash-based storage can accommodate. Fibre Channel's low-latency makes for ultra-responsive storage connectivity that eliminates the costly delays in lesser-performing, higher-latency storage networking solutions. Excessive latency can be particularly threatening to a storage networking environment due to it creating bottlenecks that cause further delays or prevents data packets from reaching their final destination. When this occurs, additional packets must be sent, creating even more data traffic and ultimately network congestion. Credit-based flow control makes Fibre Channel well suited for flash storage. Data can be delivered as fast as the destination buffer is able to receive it, without dropping frames or losing data. These features also ensure that uptime is maximized and SAN operations remain robust in the face of network demands that will only continue to grow.
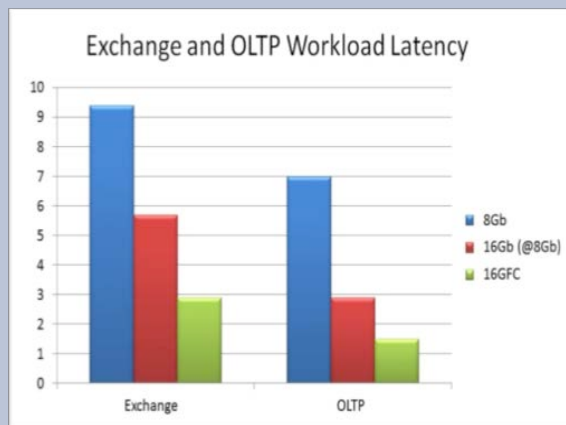
Efficiency to Deliver Value

An exceptionally efficient encoding scheme further reduces overhead, adding further to the overall value and reliability of Fibre Channel. Storage protocols that utilize TCP/IP protocol, which is typically processed by the host CPU, are very inefficient for IO processing compared to the Fibre Channel. Additional overhead is added by utilizing the IP layer which creates inefficiencies that appear as lower bandwidth, lower IOPS, higher latency and increased CPU utilization, compared to Fibre Channel. To improve efficiencies, Fibre Channel was designed to use the Layer 2 network protocol. This design requires much less CPU utilization to encapsulate a payload than is required by storage over IP networks. Also, by utilizing an efficient encoding scheme that encapsulates data into Fibre Channel frames instead of IP packets, less overhead needs to be sent across the network. In comparison, a TCP/IP frame adds 80 odd bytes per packet, which is lost bandwidth, and a 10GbE connection will deliver roughly only nine or so gigabits-per-second of storage bandwidth. Native 16Gb Fibre Channel is 40 percent faster than a 10GbE network.
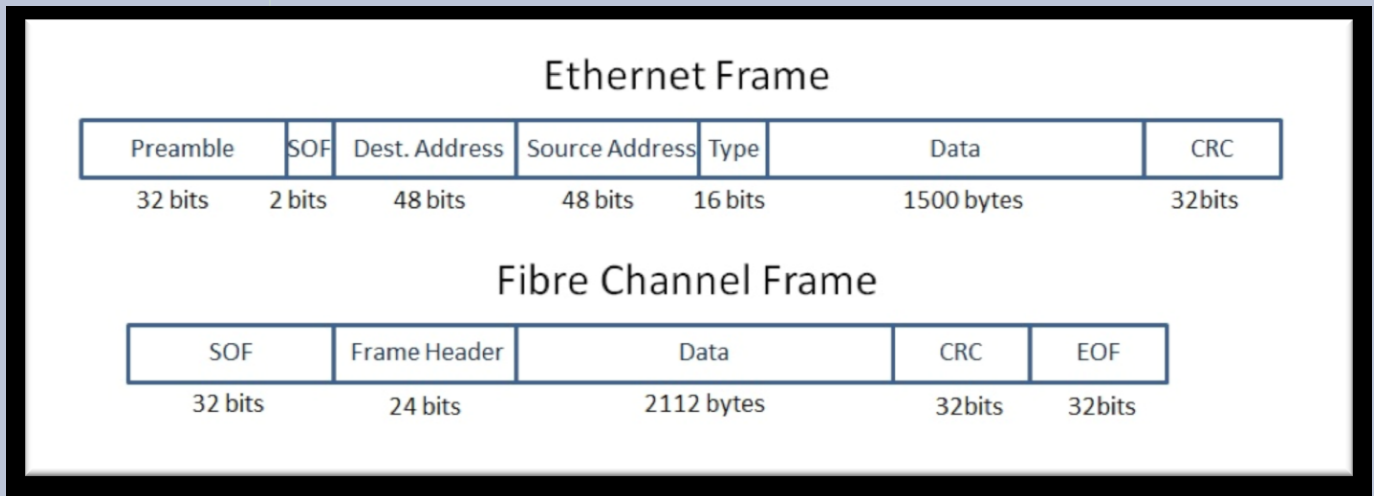
Ethernet Frame

Preamble	SOF	Dest. Address	Source Address	Type	Data	CRC
32 bits	2 bits	48 bits	48 bits	16 bits	1500 bytes	32bits

Fibre Channel Frame

SOF	Frame Header	Data	CRC	EOF
32 bits	24 bits	2112 bytes	32bits	32bits

Figure 2: Fibre Channel is Designed to More Efficiently Deliver Storage Data

Increased Resiliency

The efficient use of flash storage requires more than speed; flash storage also requires a networking infrastructure that is highly resilient, scales easily and is simple to manage. Fibre Channel addresses these requirements through breakthrough innovations. The resiliency of Fibre Channel stems not only from its throughput and low latency performance. It also comes from Fibre Channel's exclusive diagnostic and error-correction capabilities, which monitor, and analyze and identify specific data to avoid errors, reduce bottlenecks and optimize resources. With a broad contingency of self-regulatory mechanisms, no other storage solution guards so aggressively and proactively against the high demands that flash storage can produce. Such effective coordination with flash storage does not come by chance; Fibre Channel was engineered for the likes of flash storage, hence Fibre Channel's massive scalability. Flash storage can pave the way for higher VM densities and increased server utilization if enterprises have capable, optimally scalable SAN infrastructures in place. Fibre Channel's unique, dynamic scalability allows the network to adapt to rising VM densities enabling breakthrough application performance while promoting productive, performance-enhancing consolidation. Extreme performance enables the deployment of more servers, desktops and VM workloads. With the right SAN solution in place, the real values of flash storage can be realized by enterprises. To encourage productivity, customer satisfaction and maximize additional benefits afforded by flash storage, Fibre Channel quickens data-intensive application response times and decreases the backup, replication and recovery window for higher network constancy.

Concluson

Flash storage may deliver top speed, but if the network infrastructure is not performing at the same level, the speed advantage may not be realized in real-world business transactions. For the last decade, Fibre Channel has been the primary choice for the majority of enterprise storage network infrastructures. Specifically, Fibre Channel has been the default storage technology for many medium-to-large enterprise data centers running business-critical applications, with high bandwidth, high transaction and low latency requirements. Businesses want maximum performance and value for their IT investments. Those who have invested heavily in flash storage but not Fibre Channel are most likely not getting all they could be. Enterprises looking to change this should consider the purpose-built SAN solution, Fibre Channel, with its speed, ultra-low latency, high scalability and peerless reliability. It has become the top choice for businesses seeking to leverage advancements in flash-storage. Catch up to flash with Fibre Channel.