

Fibre Channel over Ethernet

Overview

Fibre Channel over Ethernet (FCoE) is the proposed industry standard being developed by an ecosystem of Fibre Channel and networking product vendors to drive network convergence in the enterprise data center. The technology will map native Fibre Channel traffic onto Ethernet frames, and be capable of benefiting from proposed enhancements to Ethernet. FCoE's Ethernet compatibility will leverage the ubiquity and economics of Ethernet networks while preserving the infrastructure, strengths, and tools of the existing Fibre Channel storage management framework.

Evolutionary Path for Network Convergence

Conventional data centers have maintained two sets of disparate networks, one for local area networking (LAN) based on Ethernet and the other for storage area networking (SAN) based on Fibre Channel. Converging the individual networks on to a common Ethernet infrastructure gives rise to new set of requirements that include emulating lossless characteristics of Fibre Channel networks in Ethernet environments, maintaining a non-disruptive approach towards storage management processes. FCoE takes an evolutionary approach towards addressing these requirements.

A major drawback of today's Ethernet technology is that Ethernet frames are prone to be discarded under network congestion. The Ethernet 'pause' frame was designed for flow control but is rarely implemented today because it pauses the entire traffic on the link. Enhancements to Ethernet are emerging in the form of extensions to 'pause' frames to handle multiple priorities. The 'priority pause' enhancements when combined with enhanced congestion management will provide the foundation for lossless Ethernet fabrics. FCoE will fully utilize these Ethernet enhancements to provide a transport service that mimics the low latency, lossless characteristics of Fibre Channel

fabrics. This evolutionary approach also retains existing SAN management practices through the continued use of the Fibre Channel software stack in the servers.

By encapsulating complete Fibre Channel frames (including checksum, framing bits) directly within the Ethernet payload, FCoE avoids the overhead of any intermediate protocols. This light-weight encapsulation approach also ensures that Fibre Channel forwarders are less compute intensive, thus ensuring high levels of end-to-end performance. In addition, FCoE will enable isolation and prioritization between storage and other traffic types, providing flexibility in assigning bandwidths based on the changing needs of SAN and LAN traffic loads.

BENEFITS

- Increased SAN Adoption in the Data Center
- Fibre Channel Investment Protection
- Unified Management Framework
- Enabling Data Center 'Green' Initiatives

Benefits

FCoE enables more efficient use of network resources through consolidation and will provide the following benefits:

Increased SAN Adoption in the Data Center:

FCoE will expand the opportunity for servers to use networked storage cost effectively. FCoE enables this by using fewer adapters and fewer cables than conventional dual network topology. With initial network convergence driven by FCoE, mid-tier and front-end servers will be able to take advantage of external storage and migrate from a direct attached storage (DAS) model to a SAN infrastructure.

Fibre Channel Investment Protection:

Enterprises have made significant investments in Fibre Channel SANs. FCoE will enable a seamless extension and protection of existing Fibre Channel investments by enabling servers connected to a converged network to be forward compatible and tap into these resources (see Figure 1) using high performance Fibre Channel forwarders.

Unified Management Framework:

FCoE seamlessly extends the Fibre Channel storage management framework into the converged network. Since the servers on the converged network will continue to use the Fibre Channel software stack, the existing storage resource management (SRM) software, personnel, storage management policies and processes are easily extended across the entire data center which in turn lowers the operating cost of managing the data center.

Enabling Data Center 'Green' Initiatives:

By avoiding the need for multiple network infrastructures, FCoE enables network consolidation that will potentially reduce the overall power consumption required for data center connectivity.

Converged Ethernet Fabric

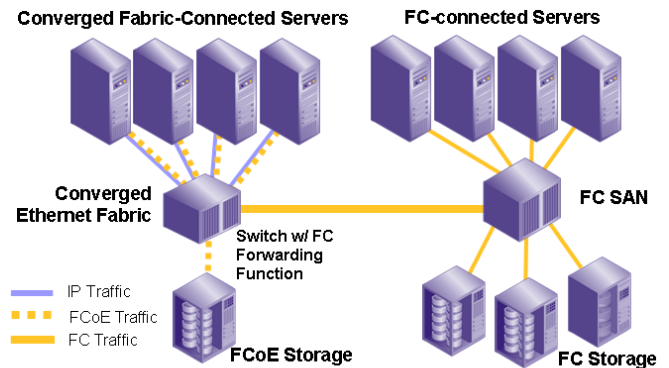


Figure 1: Deployment of Converged Fabric along side an existing Fibre Channel

Standardization and Product Availability

The INCITS T11 FC-BB-5 committee is in the process of drafting an FCoE standard. As a major milestone in the standardization process, the committee agreed upon the FCoE frame format in August 2007, paving the way for FCoE hardware development. The initial release of the standard is expected to be in April 2008. With this foundation, standards-based FCoE products are expected to begin shipping in 2008.

More information on FCoE is available at www.fibrechannel.org
www.t11.org/FCoE