
# The Benefits of Internet Fibre Channel Protocol (iFCP) for Enterprise Storage Networks

A Storage Networking Industry Association and SNIA IP Storage Forum White Paper

## *Introduction*

As companies struggle with the ever-growing burden of mission-critical data, storage networks have become a strategic component of business planning. Storage networks are the enabling technology for high availability, server clustering, storage consolidation and data security via backup and disaster recovery. Storage area networks (SANs) based on Fibre Channel are being deployed for a variety of business needs, primarily as departmental or application-specific 'SAN islands'. Fibre Channel standards and product implementations have created robust, high-speed interfaces for disk arrays and tape subsystems. These stable SAN end systems now represent billions of dollars of investment by enterprise networks.

Connecting Fibre Channel end systems together into coherent networks, however, has initially been difficult. Consequently, some customers have not been able to easily build enterprise-wide SANs. The challenge for many customers is to leverage their substantial investment in Fibre Channel end systems and find new ways to link them into coherent and manageable storage networks. The vendor community has addressed this need by enhancing the standards for Fibre Channel switch interoperability and management tools and through the development of Internet Fibre Channel Protocol (iFCP) and a suite of standards-based IP storage switches.

## *Leveraging the Best from Fibre Channel*

Analogous to the OSI Model for networking, Fibre Channel is a layered architecture. At the highest layer, Fibre Channel Protocol (FCP) provides a serial SCSI interface to the operating system. This allows Fibre Channel end systems to be addressed as standard SCSI devices with no modification to the operating system itself. Development of the FCP layer protocol has required years of engineering effort and thousands of hours of interoperability testing.

As shown in Figure 1, the FCP interface to the operating system can be carried by native Fibre Channel transport or other networking infrastructures such as TCP/IP.

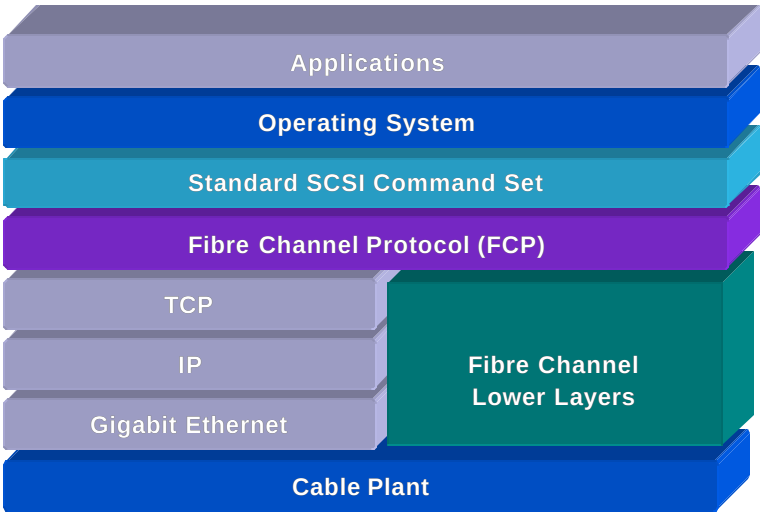


**Figure 1: Fibre Channel Protocol over TCP/IP**

The iFCP implementation leverages the standards development, engineering investment and well-documented interoperability that has gone into Fibre Channel Protocol and replaces the lower layer Fibre Channel transport with TCP/IP and Gigabit Ethernet. The advantages of this approach are many.

## *Accelerated Time to Market*

By using the FCP version of serial SCSI, iFCP can leverage much of the work in the Fibre Channel community regarding development efforts, standards requirements generation, and interoperability verification. iFCP enables a rapid deployment of IP-based SANs linking Fibre Channel devices or Fibre Channel SANs and allows customers to implement enterprise-class solutions today.

In addition, many backup software vendors have optimized their applications by communicating directly to the FCP layer. iFCP, by maintaining the FCP compatibility, can run seamlessly with existing backup and storage management programs.

## *Interoperability with Today's Storage Products*

iFCP's utilization of FCP serial SCSI also facilitates interoperability with a wide range of Fibre Channel Host Bus Adapters, disk arrays and tape subsystems. A customer deploying a SAN can now select the best of breed Fibre Channel hosts, storage arrays and tape devices on the market and connect them via an integrated IP network. These products are mature and widely interoperable and represent the state of the art in storage devices.

IP storage switches running iFCP free the user from the often-cited interoperability and management issues associated with fabric switches. By simultaneously supporting Fibre Channel end devices and Fibre Channel hubs and switches, while allowing the replacement of Fibre Channel switches with IP storage switches, an iFCP SAN can take full advantage of the greater degree of interoperability and manageability that Gigabit Ethernet technology provides. This

allows enterprise-class SANs supporting hundreds or thousands of devices to be built. Other Fibre Channel areas, such as new and emerging management tools, routing capabilities, and difficulty in spanning beyond 10km in native mode are also overcome once FCP is supported on a TCP/IP infrastructure.

As shown in Figure 2, an iFCP-based SAN enables customers to take advantage of the best of Fibre Channel storage without the accompanying concerns. Fibre Channel hosts and targets are integrated by iFCP-based storage switches into a more familiar and manageable IP/Ethernet network. iFCP can also front-end a Fibre Channel SAN to allow for communication with other Fibre Channel devices throughout the network.

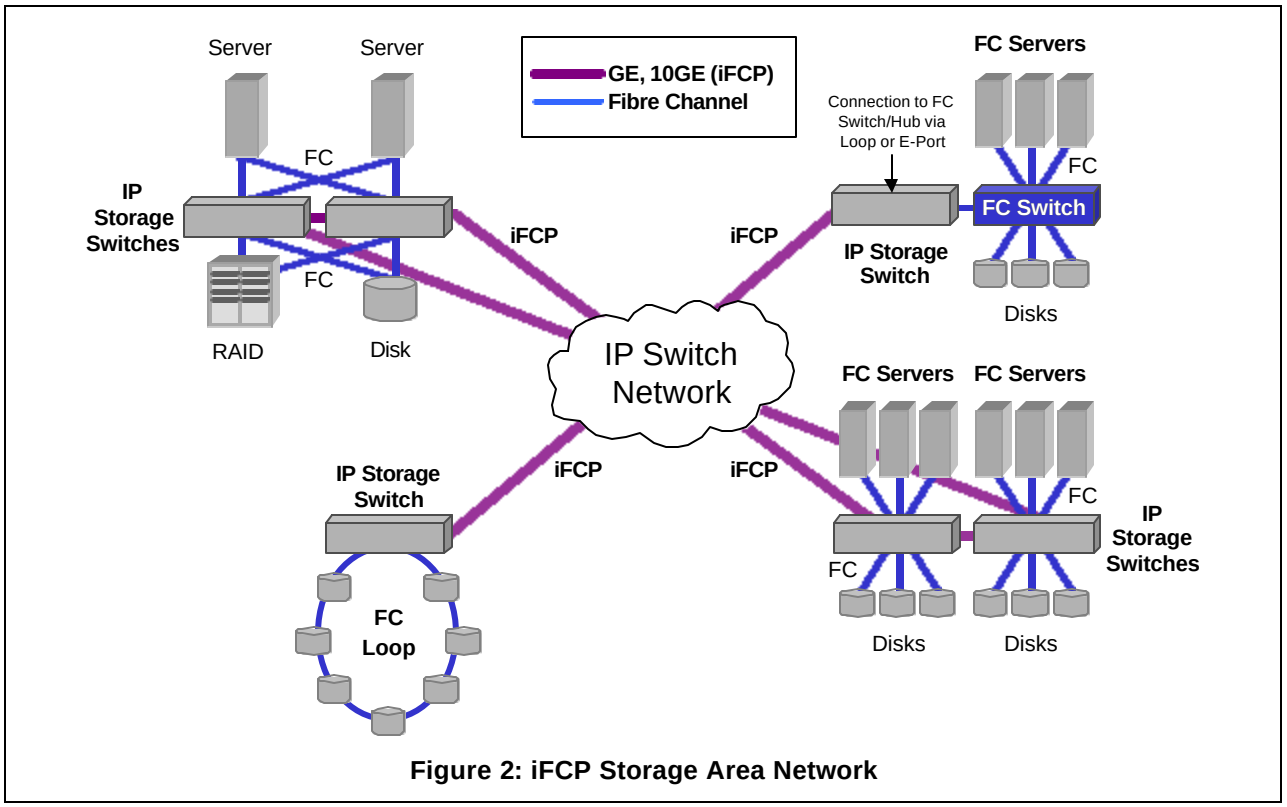


**Figure 2: iFCP Storage Area Network**

Since Gigabit Ethernet switch vendors supply high port density and high availability switches at about half the per port cost of Fibre Channel switches, it is possible to cost-effectively extend the SAN infrastructure as requirements increase.

## *Leveraging the Best of IP Networking*

Another significant benefit to this architecture is the ability to route storage data across metropolitan or widely dispersed sites. iFCP assigns an IP address to each storage device in the SAN. This allows communication between hosts and storage devices through standard IP switches and routers. iFCP provides flexible routing throughout the network as well as visibility to the network communications. In Figure 3, iFCP routing enables a true peer-to-peer storage network. With appropriate permissions, servers from any locale can access storage resources on

another. This facilitates remote mirroring and data replication applications, as well as centralized backup and disaster recovery.

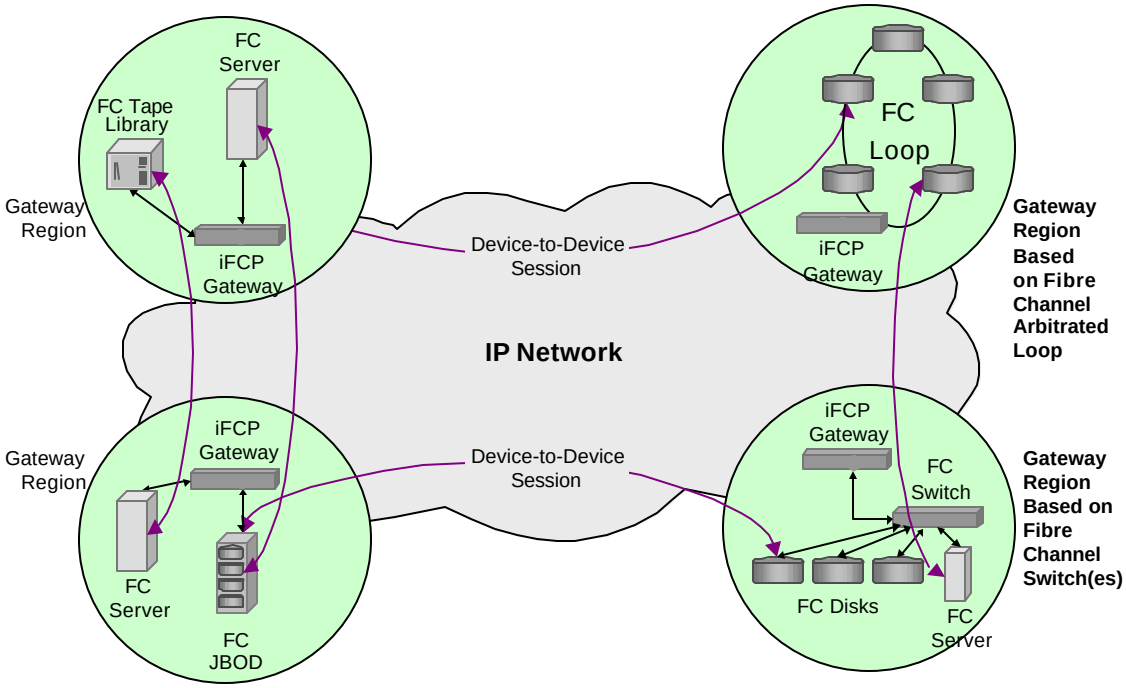


**Figure 3: iFCP for Wide Area Networking**

iFCP removes the barriers imposed by traditional storage and Fibre Channel switching. By leveraging the advances made by both Fibre Channel protocol and switched IP networking, iFCP delivers the simplicity and flexibility of familiar IP networks to SANs.

## *Summary*

iFCP offers gigabit SAN performance, interoperability with current Fibre Channel end devices, and enterprise-wide SAN scalability. IP storage switches based on iFCP can offer:

- High performance IP and Ethernet SAN infrastructure
- Support for Fibre Channel end devices and/or existing Fibre Channel SANs
- Familiar Ethernet and IP management tools
- Multi-point routing for multiple remote data center requirements
- Data integrity with TCP/IP session control over the WAN
- Support for "SAN aware" applications
- Integration with data replication applications

For more information about the iFCP standard, visit www.ietf.org