

Business and technology benefits of converged I/O networking infrastructures

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Background and Issues

There is no such thing as a data or information recession. IT organizations continue to be faced with supporting increased information services needs while working within budget limitations without compromising Quality of Service (QoS) or Service Level Objectives (SLOs). In order to support demand while maintaining QoS and SLOs in a cost effective manner, innovation is required.

One form of innovation is the use of converged technologies that enable the reduction of complexity and, subsequently, cost from information services delivery. As an example, converged I/O and networking technology brings together the best of traditional server and storage I/O connectivity with LAN networking. The business challenge that converged I/O network addresses is to remove complexity from a technology as well as from management and acquisitions perspective. Complexity adds cost by supporting multiple technologies that should be complimentary but are often leveraged to perform similar functions.

An important aspect of convergence is to avoid introducing aggravation in the course of aggregating or consolidating such as performance bottlenecks or other QoS issues. One of the reasons for having separate LAN and SAN environments in the past has been to avoid intermix of different types of traffic that could result in QoS or performance challenges.

As a result, a key enabler for the next step in the I/O networking convergence journey is for solutions that can protect against performance bottlenecks while enabling low latency, high availability with flexibility and resiliency in a cost effective manner while using industry standard components.

Value Proposition

Business benefits of innovating by using converged networking technologies include:

- Do more with available resources
- Support growth and enhance service delivery
- Remove complexity and thereby costs
- Optimize for specific QoS and SLOs
- Investment preservation to maximize TCO
- Select servers independent of SAN & LANs
- Leverage industry standard components
- Preserve staff skill sets and processes
- Enable dynamic and flexible infrastructures

Consider history to see the future

To help understand where as an industry we are going let's take a quick look at where we have been. Historically server and storage I/O connectivity¹ have been separate from general purpose LAN and voice or datacom networks.

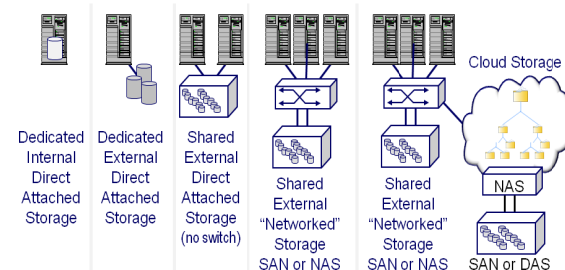


Figure 1 – Server and storage I/O continuum

Convergence has been occurring over the past couple of decades for server storage I/O interconnect (Figure 1) and LAN networking. Server and storage I/O connectivity has evolved from proprietary physical direct connect or point to point interconnects to storage area networks (SANs).

Convergence has occurred with the shift from early generation proprietary SANs to open heterogonous standards leveraging Fibre Channel (FC).

¹ Refer to "Resilient Storage Networks: Designing Flexible and Scalable Data Infrastructures" (Elsevier) to learn more

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FC SANs enabled multiple upper level protocols (ULPs) to converge; for example, open systems (SCSI_FCP) and IBM zSeries mainframes FICON traffic on the same SAN. On the LAN networking side, convergence has resulted in a shift from early generation proprietary protocols and physical interfaces to standard Ethernet and ULPs including TCP/IP. In addition to FC based SANs, Ethernet based storage is another area where convergence has occurred over the past decade, with Network Attached Storage (NAS) supporting Windows CIFS and NFS file sharing, iSCSI (SCSI protocol mapped to TCP/IP) Fibre Channel on IP (FCIP) for distance enablement.

What is needed?

On the left side of Figure 2 are two separate SAN and LAN environments each with their own core networking switching infrastructures. The LAN and SAN networking infrastructures consist of separate edge access along with core switches, optical transceivers, and diagnostics and management tools as well as adapters.

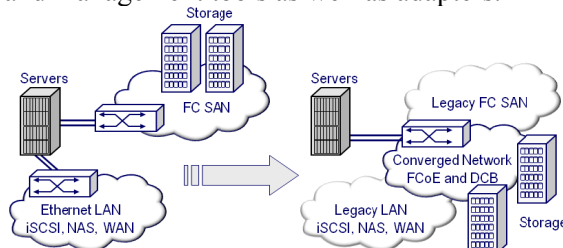


Figure 2 - I/O and networking continuum²

The next step in the I/O networking convergence journey is shown on the right side of Figure 2, is converged networking environment. At the core of figure 2 are converged networking (LAN and SAN) switches or directors supporting Fibre Channel over Ethernet (FCoE) along with traditional Ethernet TCP/IP traffic. In addition to supporting different protocols and common physical interfaces, converged networking switches provide agility and flexibility for enabling dynamic environments.

The solution

Leverage converged technology that supports both storage I/O (e.g. SAN) and LAN traffic without compromise for either environment. Converged networking technologies enable a shift in focus from beyond the networking cable to support different protocols optimized for various functionality and characteristics. Flexibility comes in the form of being able to redeploy technology to meet changing business and technology needs. Shift from separate SAN and LAN environments with unique adapters, edge or access as well as core networking switches to a converged paradigm shown on the right hand side of Figure 2. From a SAN perspective this means maintaining best practices of minimizing hops with flat networks however leveraging multi-protocol converged switches and adapters. From a LAN perspective this means moving towards flatter networks also leveraging converged adapters and switches.

Strategies and recommendations

Your initial deployment may involve using converged I/O and networking switches in a traditional LAN and SAN modes. The next step would be to evolve from treating converged networking switches as separate storage I/O and networking boxes into platforms where LAN and SAN traffic co-exists. For some environments, converged I/O and networking technologies including CNAs and switches can be deployed initially as access layers for both LAN and SAN traffic co-existing with existing infrastructures. Regardless of how you initially leverage converged I/O and networking technologies, the objectives should be to enable flexibility, scalability, resiliency and remove complexity from acquisition through deployment.

In addition to preparing from a technology standpoint, it is important to consider how your organizational structure, workflow, best practices and processes are prepared to leverage the next step in convergence networking technologies.

² Chapter 9 "I/O and Networking" The Green and Virtual Data Center (CRC)

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Closing comment

The question should not be if, but when, where, and how converged networking is in your future. You are most likely already on the convergence journey (Figure 3). Now prepare to take the next step in the I/O networking convergence journey which is centered on FCoE and DCB enabled solutions. Converged networking technology should work you and adapt to your needs instead of you working for the technology.

Where to learn more

See the companion to this Industry Trends and Perspective Solution Brief “Removing organizational barriers for technology convergence” at storageio.com/brief. Learn more about converged I/O networking along with associated Cisco technology tools at cisco.com/go/unifiedfabric.

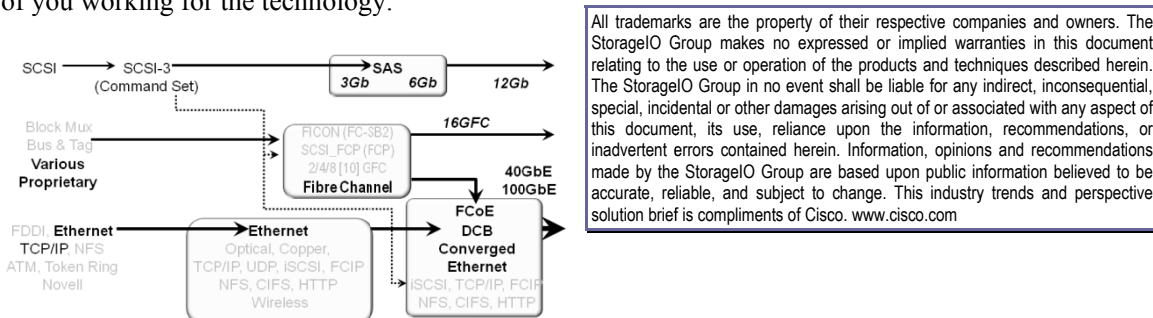


Figure 3 – I/O and networking industry trends

Converged I/O and networking check list:

- ✓ Interoperability and standard components
 - CNAs and on board chips or mezzanines
 - Converged access and core switches
- ✓ End to End (E2E) IRM³ management tools
- ✓ Training and continuing education
- ✓ Cross technology management teams
- ✓ Shift from cable to protocol management

Don't be scared however look before you leap!

³ IRM focuses on managing resources (servers, storage, and networks) including backup, data protection, re-tiering, security, optimization, provisioning, reporting and capacity planning. Refer to "The Green and Virtual Data Center" (CRC)