

Thought Leadership Discussion on Does Converging the LAN and SAN Make Sense

With Arista, Avaya, Brocade, Cisco, Extreme Networks and HP
The Data Center LAN Evolution Series

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• Introduction



Dr. Jim Metzler, Moderator, Ashton, Metzler & Associates

There is considerable discussion in the trade press about the value of converging the data center LAN and SAN. The typical argument that is raised is that it is notably more efficient to run one network than it is to run two networks. That argument sounds very familiar. That is the same argument that was made as part of the justification for converging voice and data networks. So, one could conclude that since that argument worked for voice and data networks it will work for the LAN and SAN. While that may be a valid conclusion, it took several years before a converged voice and data network became mainstream. Will that be the case with the convergence of the LAN and SAN or is this situation different enough that adoption will occur more rapidly?

This month's discussion will focus on the convergence of the data center LAN and SAN. We will explore some fundamental issues such as why exactly would an IT organization want to converge their LAN and SAN and, if they do, how should they best go about doing it? As we saw with VoIP, converging related technologies can result in significant benefits, but can also present some significant challenges.



• Q&A



Dr. Jim Metzler, Moderator, Ashton, Metzler & Associates

What advice can you give to IT organizations that are trying to plan for the possible convergence of the LAN and the SAN in their data centers?



Customers should carefully characterize SAN/LAN consolidation and simplification opportunities as they consider technologies like FCoE, NAS, DAS and iSCSI all as potential viable approaches.

HP recommends customers start **at the server edge where the real-world savings are most substantial and then extend the solution over time.** An evolutionary approach

reduces cost, complexity and risk in the near term while maintaining continuity of operations and maximizing investments over the long haul.


Gartner data point:

When considering FCoE to simplify the server rack, look first to server vendors for complete integrated solutions that include not just the FCoE components, but also cable management, and software that merges control of I/O virtualization in with application management.

Storage networks can be independently designed and tuned to address unique storage traffic patterns, giving storage network designers more freedom to manage network congestion compared to a completely shared network infrastructure.

This allows customers to remove expense and complexity, and improve network performance without impacting the installed LAN/SAN infrastructure or disrupting existing management practices.


The end result is reduced risk and management complexity in the short term with a solid foundation for transitioning from dedicated Fibre Channel-based networking to Ethernet-based networking over the long term.

 Top of mind in LAN/SAN convergence is FCoE. In order to provide an open and converged alternative to traditional Fibre Channel, the key challenges of lossless and multi-hop must be solved in a practical, real-world sense. A key milestone will be the standardization of a suite of technologies that are broadly grouped together as Data Center Bridging in the IEEE. Quite simply, without the luxury of an upper-layer protocol compensating for packet loss with retransmission, the underlying network must transition from best-effort to now become truly lossless. However, even when this is practical, the management of LAN and SAN are not converged and new networking hardware is required.

Best practice would include:

- Avoid unnecessary expansion of existing FC infrastructure
- Evaluate solutions for openness, flexibility, and ability to integrate
- Trial first with selective proof-of-concept deployments
- Transition progressively and as-appropriate from pure FC to FCoE

However, many Enterprises are actively pursuing alternatives to the cost and complexity of FC/FCoE: iSCSI, NAS, and particularly ATA-over-Ethernet (AoE) are seen as genuine alternatives, delivering greater flexibility, easier scale-out, lower cost, and overall simplification. Ethernet-based SAN is an extremely effective method for sharing disk drives through a low latency network.

 Keeping SAN/LAN convergence objectives – namely, reduced complexity and lower costs combined with improved performance, productivity and profitability -- in mind, our advice for convergence customers falls into three main areas:

- **Maintain Design Principles**

Customers looking to converge their networks need to ensure their **implementation** does not denigrate critical aspects of their environments - it is ***not*** a converged network if you break one of your networks in order to accomplish convergence.

- **Review Convergence Teams**

No question, LAN and SAN teams may be anything but converged as to their day-to-day operations and best practices. However, with guidance from IT management and clear operational policies, the “Law of Unintended Consequences” can be averted, and the benefits of convergence realized far sooner. Because team transition takes far longer than infrastructure transition, customers are urged to review their IT personnel and perspectives with **due diligence**.

- **Select Convergence Platform**

Storage- admins have long thought they can meet rigorous storage requirements only with FC switches, but new director-class Multiprotocol Ethernet Storage switches not only provide more flexibility & scalability than FC alternatives, their reliability is without parallel. Instead of force-fitting a specific box that may be inappropriate for their converged design, it's important to use the **correct platform** for the job.



The adoption of 10GBE opens the door for LAN-SAN convergence.

Converged LAN-SAN takes advantage of the price/performance curve of Ethernet. The open and interoperable nature of Ethernet also provides an opportunity to deploy best-of-breed solutions without the proprietary nature (and vendor lock-in) associated with other SAN technologies. A converged Ethernet fabric can drive costs down significantly –cost of adapters, switches, cabling, along with the simplicity associated with a single fabric.

A few items should be considered before adopting a converged LAN-SAN. The performance of storage traffic on an Ethernet fabric needs to be ensured in the presence of bursty data traffic. With 10/40GbE, Data Center Bridging (DCB) technology can be deployed for predictability. For 1GbE, techniques like **CLEAR-Flow** can automatically detect, prioritize, and ensure bandwidth guarantees for storage traffic facing congestion. Additionally, traditional architectures with multiple network tiers need to flatten to one or two tiers. Each tier typically adds latency and oversubscription, which can lead to poor performance for storage traffic.

Finally, departmental silos need to be overcome as a converged LAN-SAN fabric involves greater cooperation between network and storage admins, along with the increased usage of common tools and best practices, from both the LAN and SAN worlds.



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How will end to end LAN/SAN convergence benefit customers? What type of ROI can I expect and are there any tools to justify the savings?



End to end SAN/LAN convergence, known as unified fabric, unifies data and storage networking to deliver transparent convergence, scalability, and network intelligence. Deploying unified fabric with FCoE as the 'glue' allows an evolutionary approach to I/O consolidation while preserving essential FC attributes, including low latency, high security, and granular traffic management. Unified fabric also enables investment protection in Fibre Channel tools, training, and SAN infrastructure. Unified fabric simplifies customer environments by using ubiquitous Ethernet while extending Fibre Channel SAN connectivity: 100 percent of network-connected servers can now also be cost-effectively attached to the SAN.

This next-generation approach brings three distinct benefits to the data center:

- **Agility:** converged networks provide more efficient use of network capacity for both LAN and SAN, enabling on-demand agility for resource allocation;
- **Efficiency:** eliminating infrastructure duplication increases ROI; and
- **Simplification:** reducing infrastructure sprawl and device proliferation coupled with the capability to set up, move, and change physical and virtual assets with greater speed and fewer points of failure creates simplified network management.

In this analyst **whitepaper**, IDC estimates businesses with fully converged networks can achieve up to 492% ROI with 11 month payback and 45% CapEx saving. To see how unified fabric would work in your environment, compare the cost of a fully converged multihop FCoE network to the cost of separate LAN and SAN networks using this third-party **TCO** tool which incorporate IDC research of actual customer examples as the basis for its deployment logic.



The convergence of LAN and SAN is not as relevant as the convergence of storage and data traffic onto a common transport - a slightly higher-order statement. Data traffic is almost all IP-based, and increasingly data centers are virtualized meaning the network needs to support mobile workloads for business-continuance and infrastructure maintenance. Storage networks are split - some are based on IP and are also globally addressable, these are storage transports or file systems like NAS, NFS, iSCSI, ZFS, HDFS, GFS, FCIP, etc. On the other hand some legacy storage systems such as FCoE are constrained to a single subnet and do not enjoy the reach, thus the storage can only be used by a small subset of the hosts - this greatly limits VM workload mobility.

The important thing for the business and IT teams to decide first is: what am I trying to solve, and what is the highest priority? And then what ROI am I looking for? For many enterprises the priority has evolved and enabling virtualization is #1- it has enabled better server utilization efficiency, simplified business continuance, and improved infrastructure workflows like network SW upgrades. If this is the case, ensure

your storage decisions and network decisions align with this top priority and do not negatively impact your projects efficacy.

The ROI you receive from any project is always a function of CAPEX acquisition and OPEX. Many companies will try to steer you towards wholesale network upgrades because its best for them, ensure that the CAPEX of this really helps move the overall IT bottom line and isn't just spending for a vendor's sake.



Broad adoption of 10GbE has made LAN/SAN convergence a reality and the result is several benefits, particularly with newer 10GbE CNAs and 10GbE DCB enabled switches. On the infrastructure side several benefits immediately pop out which can immediately lead to tangible ROI:

1. The ability to eliminate separate NICs/HBAs for LAN and SAN, both on the server and target side can drive down costs significantly.
2. Eliminating multiple switching infrastructures or at a minimum dedicated ports for LAN and SAN in the network can significantly reduce costs.
3. Leveraging common cabling for LAN and SAN can also lead to a reduction in cabling costs, and equally important, cabling complexity.
4. Moving to an Ethernet converged fabric allows for leveraging the price-performance curve of Ethernet which compares favorably when compared to other less open dedicated SAN technologies. Over time this will lead to faster performance at lower costs.

Besides the infrastructure and capital costs, there are other operational benefits as well:

1. Managing a single converged infrastructure can reduce the operational headcount required when compared with managing parallel fabrics.
2. The reduced power footprint of a single converged fabric, CNAs and cabling infrastructure, when compared with separate dedicated fabrics for LAN and SAN can also provide a tangible and measurable ROI

However, an end to end LAN-SAN converged infrastructure will require some investment up front, both in term of training and skill set, as well as in bringing together tools and best practices from both the LAN and SAN world.

The benefits come in the form of reduced capital expense (equipment, rack space, and cabling) and reduced operational expense (power, cooling, and expertise for multiple infrastructures). These are also the variables that would form the ROI calculation, yet each deployment will be its own specific use case. For example, customers with an existing Fibre Channel infrastructure will find the business case for retro-fitting FCoE tenuous, whereas green-field deployments – without a legacy of FC – will have the luxury of considering more efficient alternatives such as ATA over Ethernet. Too often this subject is confined to a discussion on the feasibility or otherwise of FCoE, and yet there's an entire class of users that have no need or intention to introduce FC/FCoE into their networks.

Of course, one of the other factors that commonly features in a business case for LAN/SAN convergence is a more general transition to 10 Gigabit. If the customer's LAN

is currently Gigabit-centric, then the transition to a converged LAN/SAN will typically involve a corresponding introduction of 10 Gigabit; a single Converged Network Adaptor delivers the high-speed connectivity from Server to Top-of-Rack Switch. With 10Gbps available to support both interactive sessions and storage traffic a converged solution will typically provide a significant capacity and performance boost compared to the separate networks it replaces. In such a scenario, the introduction of 10 Gigabit will probably elongate the ROI period; there may well be supporting justification, including the introduction of newer Server platforms offering greater capacity and lower operational costs.



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How do you manage and operate an end to end SAN / LAN converged network?



To manage a converged network, the first requirement is to deploy a management platform which is also converged; in other words, one that integrates both LAN and SAN elements, including:

- Automated data center provisioning
- Proactive SAN and LAN monitoring
- Performance degradation detection
- Securing data center networks
- Diagnosis and troubleshooting of data center outages
- Simplified operational management of virtualized data centers

The second requirement to manage a converged network is to provide role-based access control (RBAC) so SAN admins can do their jobs while LAN admins administer the LAN. With RBAC, IT achieves end-to-end visibility for both SAN /LAN while enabling tasks and roles to be separate and contained.

The third requirement is Virtual Machine-Aware Management. Converged management software needs to simplify management across of the entire virtual infrastructure path from the physical to the virtual network and across the entire data center environment (LAN/SAN). A VM-aware topology view needs to show all dependencies from the virtual machine out to the physical host, through the fabric, and to the storage array with easy access to a detailed view of the path attributes. The management platform should be able to maps paths from the server to storage to enable tracking of mission-critical workloads across the entire network.

Additional key requirements include scalability to a hundred thousand ports; secure access; and ability to ensure business continuance while still maintaining an easy-to-use interface.



Operating and managing an end-to-end converged LAN/SAN network requires careful planning around technical considerations as well as organizational/process concerns. From a technical perspective, there is increasing consensus that FCoE may have some benefits within and below the access

layer, in terms of reducing server port consumption, although it also assumes an organization is ready to move to more expensive 10G server ports, rather than maintaining their existing 1G installations. Making the case to extend FCoE beyond the access layer then requires a determination as to where to cut over to Fibre Channel-proper: at the core, or all the way to the SAN Director? Technology concerns about stability and reliability still exist in certain quarters, but the bigger question is often who is responsible for the traffic? Do separate networking & storage teams need to be brought together? How do they change their operating policies and procedures, with one switch doing both? Who owns the switch? Who has the rights to management? Who has the rights to make changes? These are a lot of times more important questions than can we do this technically.

These are certainly not unsolvable questions. Brocade has addressed them in two parts: first, Brocade has a portfolio of converged access layer switches and CNAs. The switches come in classic Ethernet and Ethernet fabric "flavors", both with onboard FC ports. One adapter, the Brocade 1860 supports "AnyIO" technology, including Ethernet, Ethernet Fabric, FC, FCoE and iSCSI. This provides a variety of options for managing network convergence at and within the access layer. In addition, Brocade Network Advisor (BNA) provides end-to-end visibility of data center and campus networks of all types, with RBAC to ensure ownership for experts in each area.

AVAYA It may appear to be stating the obvious, but it's worth emphasizing that Ethernet storage area networks run on the same standard Ethernet technology that IT departments have used for decades. Fibre Channel Storage Area Networks utilize a specialized Fibre Channel network and are implemented with arbitrated loops or expensive proprietary infrastructure with a protocol consisting of several complex software layers forcing users through mandatory configuration procedures for each network path on all storage logic units. In contrast, Ethernet storage area networking utilizes connectionless protocols that allow multiple servers to directly access mass storage devices, all across Layer 2 Ethernet. Avaya enhances the proposition by delivering the ability to extend the storage area network over a services-optimized virtual fabric, one that can scale from along the aisle to across the globe, with a portfolio of Data Center-grade Switch products that leverage operations, administration, and management solutions based on the proven and open 802.1ag and Y.1731 standards.

One way to envision this is to consider the converged LAN/SAN as a multi-tenant network; storage is now another application, requiring transit with priority handling, travelling in segregated virtual networks across common infrastructure. With such a solution you actually allow the networking people to do what they do best, tuning the network for differentiated transport, and you also let the compute/storage people manage their storage arrays without having to be concerned with how the data gets there.
