

iSCSI vs. Fibre Channel SANs:  
Three Reasons Not To Choose Either

*White Paper*



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## Introduction

Over the past five years storage costs have soared to more than 40% of the IT budget, and data growth is only accelerating. Fibre Channel and iSCSI storage systems are not delivering the price-performance and agility at the storage layer required to keep up with the new virtualized compute layer. IT organizations are forced to make tradeoffs between price-performance and complexity based on their application requirements. The following paper explores a third storage networking technology, Ethernet SAN. Ethernet SAN is based on the ATA over Ethernet (AoE) protocol. It provides a way forward for storage that is less complex, optimized for virtualization and delivers 5-8x the price-performance of Fibre Channel and iSCSI.

## The Traditional Argument: Tier Your Storage

Faced with a number of choices for block level storage including Fibre Channel, Fibre Channel over Ethernet (FCoE), and iSCSI, companies are forced to make tradeoffs between price-performance and complexity based on their application requirements. Some storage vendors are promoting what they call “unified” or “hybrid” SANs that support all of the above protocols. Since Fibre Channel is expensive but provides better performance and reliability while iSCSI is easy to use and less expensive, these vendors claim the best solution is one that lets you use both. The idea is to tier your storage, deploy some Fibre Channel where it is needed for performance and some iSCSI to save on overall cost.

While this strategy makes sense for the vendors, whose business models depend on selling Fibre Channel and iSCSI solutions, it does not make good business sense for the companies that have to deploy and use the storage. This strategy, “don’t choose use both” mainly serves to add more complexity and expense to an already complex and expensive storage network.

Fortunately, there is an alternative storage networking protocol that can replace the above networking technologies called Ethernet SAN. Ethernet SAN eliminates the tradeoffs that force storage tiers by offering the performance of Fibre Channel, but with the lower acquisition and operational costs of Ethernet.

## Ethernet SAN: One Tier for All

Ethernet SAN leverages the low overhead, highly parallel protocol called ATA over Ethernet (AoE) to provide Fibre Channel performance over standard Ethernet with less complexity and lower cost. It was developed as an efficient, cost-effective alternative to Fibre Channel and iSCSI block storage protocols. It uses ATA technology, the standard way a computer communicates with a disk drive, and Ethernet, the ubiquitous networking technology for local area networks.

Figure 1 shows a sample Ethernet SAN configuration with virtualized servers and multiple Ethernet SAN storage arrays.

Ethernet SAN technology uses the ATA over Ethernet (AoE) protocol to encapsulate disk commands and send them over Layer 2 Ethernet. Packets are addressed to devices using their MAC addresses. Unlike iSCSI, it does not use the high-level TCP and IP protocols with their associated high overhead, so it is streamlined and fast.

Ethernet SAN is not something new. It has been a standard part of the Linux kernel since 2005. Today, customers are taking advantage of Ethernet SAN technology with vSphere, Windows, Solaris, Linux, and as the storage behind a wide range of high performance filesystems.

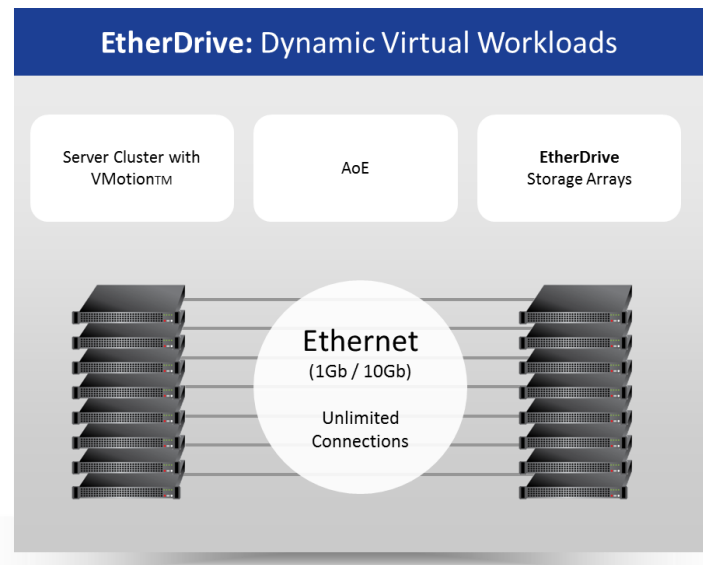


Figure 1: Ethernet SAN

## Reason One: Ethernet SAN is Less Complex

Ethernet SAN is simpler and less complex than Fibre Channel and iSCSI to configure and manage. By leveraging layer 2 Ethernet, Ethernet SAN has virtually eliminated many management issues that exist with Fibre Channel and iSCSI. For example, users do not have to configure multi-path, switch logins, or target to port mapping.

Fibre Channel and iSCSI complexity stems from the fact that both are connection-based protocols, built around a storage design that goes back to the FICON and ESCON mainframe era. To deploy Fibre Channel or iSCSI storage, every connection from each physical and virtual server to each storage system has to be mapped and configured. Because of this connection complexity it can take hours to configure new storage for multiple virtual servers.

Ethernet SAN is a connectionless protocol that connects servers and storage directly across layer 2 Ethernet. It does not require configuration of each connection between servers and storage like Fibre Channel and iSCSI. This means that Ethernet SANs can be configured in minutes with just a few clicks.

Ethernet SAN is also less complex than iSCSI. iSCSI requires TCP/IP in order to transmit data, but this design makes the server work harder to handle the added overhead and impairs iSCSI

performance. When storage packets simply need to go from a server to the storage in the next rack, like in most data centers, the heavyweight TCP/IP protocol is really overkill. So why not remove it altogether? This is exactly what Ethernet SAN does. Since an Ethernet SAN does not need TCP/IP, it has less complexity, lower latency and delivers higher performance.

Storage deployments are growing in capacity and complexity within organizations of all sizes and IT managers are increasingly being asked to manage more storage capacity with flat, or shrinking, budgets and staffing. An Ethernet SAN addresses these challenges by providing simple to manage scale-out storage in a cost-efficient flexible solution.

## Reason Two: Price/Performance

IT budgets are constrained. The mantra inside IT departments today is “do more with less”. IT organizations are looking for SAN technologies that deliver performance, price, and scalability. When it comes to price and performance Ethernet SAN beats Fibre Channel and iSCSI hands down. Ethernet SAN storage arrays provide customers with an unprecedented 5-8x price performance advantage over legacy storage, while simplifying deployment of virtualization and cloud projects.

The reasons for this include the cost of components, networking technologies and software complexities used in each type of SAN technology. Fibre Channel is a specialized network requiring expensive switches, array controllers, host bus adapters, and complicated software, such as multi-path drivers. iSCSI runs on Ethernet but is singled threaded, sending data over one path at a time. To improve performance iSCSI requires expensive TCP off load engine (TOE) adapter cards that cost as much as Fibre Channel adapters.

Ethernet SAN sends data simultaneously over all available data paths, uses commodity Ethernet switches, does not require complicated multi-path software and leverages industry standard networking components and disk drives.

Ethernet SAN technology can deliver up to 1800 MB/sec<sup>1</sup> of throughput for bandwidth-intensive applications using cost-optimized, high capacity SATA disk drives (SSD and SAS drives are supported as well) and users can scale up to a petabyte of high performance capacity in only two racks at a cost of storage and connectivity far below Fibre Channel and iSCSI.

In a study conducted by ESG Labs the cost of acquisition for a petabyte of storage and SAN connectivity for iSCSI, Fibre Channel and Ethernet SAN was compared. Each storage technology was configured to support the same class and quantities of storage, and SAN connectivity was calculated to support 200 physical servers with redundant connections.

The cost of storage and SAN connectivity hardware was obtained from a combination of publically available sources, including reseller websites, GSA pricing schedules, and online

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<sup>1</sup> ESG Lab Review, Coraid EtherDrive, March 2011

pricing available directly from vendors. The cost was calculated for modular dual controller Fibre Channel, iSCSI and Ethernet SAN arrays from major vendors. The solution with the lowest overall price in each category was used for the comparisons. The results are summarized in Figure 2.

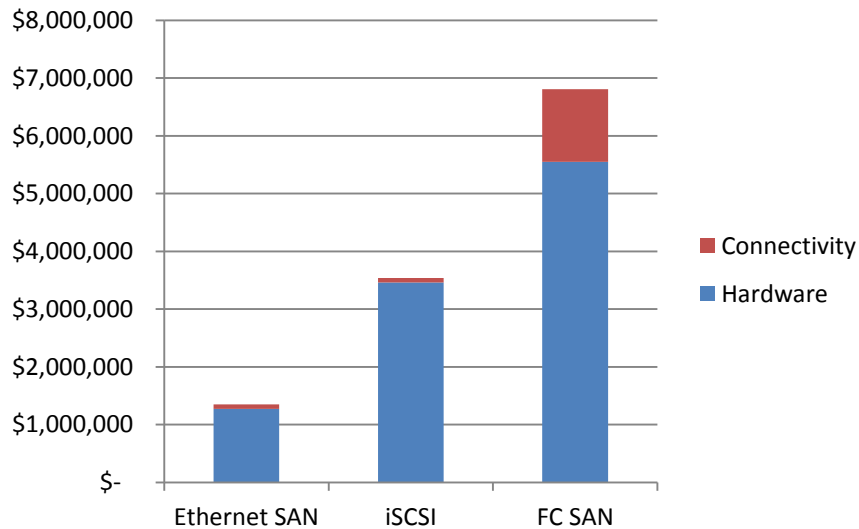


Figure 2: CAPEX Costs for 1 PB of Networked Storage

The costs of FC SAN and iSCSI solutions are significantly higher than a comparable Ethernet SAN solution. In fact, the relative cost of acquisition of alternative technologies ranges from roughly 2.6x for iSCSI to more than 5x for FC SAN.

With storage costs consuming at least 40% of IT budgets today, companies are under constant pressure to find ways to meet increasing demand while holding or reducing expenses. Adopting new technologies that reduce storage capital and operational costs makes sense and so today, more than ever, IT organizations need to consider Ethernet SAN with a clear focus on doing more with less.

### Reason Three: Optimized for Server Virtualization

Virtualization has brought undeniable benefits to enterprise IT—reduced costs, server consolidation, increased flexibility, automated management and more. Coupled with powerful, scale-out x86 servers, virtualization enables enterprises of all sizes to move toward cloud architectures that achieve massive scale using commodity hardware, multi-tenant segmentation, elastic expansion, and automated self-service.

Ethernet SAN storage arrays integrate with VMware virtualization software via a simple driver that enables vSphere to mount the storage arrays as if they were local drives; this means a VMware administrator can provision and manage virtual machine storage without the need

for FC SAN administration or iSCSI client configuration. In addition, when new storage is provisioned on the array, all vSphere hosts are notified via simple Ethernet broadcast and the storage is immediately accessible across the cluster without requiring a manual rescan. Likewise, the entire virtual storage infrastructure and mappings to Ethernet SAN storage devices are visible through the vSphere client further simplifying the installation process.

A good example of this is Atlantic Media Company. Like many companies, Atlantic Media found that the cost and complexity of shared storage threatened to derail their VMware vSphere project. By turning to Ethernet SAN they found a solution that out-performed their Fibre Channel alternative at a fraction of the cost. More importantly, they could configure and deploy new storage in minutes while adding only the storage they needed to scale out exactly in line with virtual machine growth. "One of the easiest deployments I have done in my life," said Dave Mouyal, Network Systems Administrator for Atlantic Media Company. "Ethernet SAN is straight forward; vSphere sees the storage right away."

This ability to take advantage of networked storage as if it were locally attached storage allows common storage functions to be performed quickly and easily, enabling self-service storage for virtualized data centers. IT organizations can provision storage for virtual machines without the need for a storage administrator to complete the task.

Also, Ethernet SAN enables businesses of all sizes to easily and affordably leverage key features of vSphere including thin provisioning, snapshots, DR, volume management and storage motion without duplication of these functions in the storage array, reducing complexity and cost even more.

As virtual infrastructures grow, the requirement for storage space grows exponentially. According to market research, over half (54%) of current server virtualization users estimate their organization has experienced a net increase in total storage volume since their organization implemented a server virtualization solution<sup>2</sup>.

The ability of Ethernet SAN to take advantage of networked storage as if it were locally attached storage allows common storage functions to be performed quickly and easily, reducing deployment times for new storage. As virtualized environments grow and more critical applications are placed on virtualized servers, the need for highly available networked storage becomes essential.

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<sup>2</sup> ESG Lab Validation, Coraid EtherDrive SAN, August 2010



## Conclusion

The high capacity and performance requirements of today's applications including backup to disk, content delivery, server and desktop virtualization, video, and un-structured big data are taxing the budgets and infrastructure of companies of all sizes. Traditional storage networks like Fibre Channel and iSCSI are forcing companies to make tradeoffs between price-performance and complexity based on their application requirements.

Ethernet SAN technology offers companies an alternative storage network that dramatically simplifies storage for virtualized environments while enhancing performance and providing incredible cost efficiency. If your organization is struggling to keep up with exponential data growth while providing ever higher levels of performance and availability, consider Ethernet SAN storage as the foundation for your virtualized data center.

### Cited Resources:

1. ESG Lab Review, Coraid EtherDrive, March 2011
  - a. <http://san.coraid.com/ESGLabReviewMarch2011.html>
2. ESG Lab Validation, Coraid EtherDrive SAN, August 2010
  - a. <http://san.coraid.com/ESGLabReport2010.html>