



iSCSI - Ready for the new enterprise

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New application requirements and an increase in performance and functionality are positioning Ethernet as a high performing data center fabric for not only traditional local area network (LAN) duties, but also to service other traffic types such as voice, video, and storage area networks (SAN). And what may be surprising to some, the internet small computer system interface (iSCSI)-based storage solutions could be the biggest beneficiary of this technology transition.

The transition to Ethernet storage is contributing to increased adoption of iSCSI not only among small and medium businesses, but more and more iSCSI is being deployed in the enterprise to support new data center architectures commonly referred to as private clouds, service oriented infrastructures, or IT as a Service (ITaaS). The networking capabilities of Ethernet and iSCSI as a storage protocol support ITaaS in the enterprise with enablement of virtualization, high performance and quality of service, and economic viability.

The Virtualisation revolution

The core technology supporting ITaaS is virtualization. Virtualization at all layers in the data center stack (compute, networking, storage) improves resource utilization and improves operational efficiency. In order to deliver the benefits of virtual servers and storage, the storage network must provide the mobility and flexibility features to support the dynamic nature of virtual machines (VM).

Mobility. One of the many benefits of server virtualization is the ability to non-disruptively migrate applications from one physical server to another to support load balancing, failover, and servicing of hardware. The ability to migrate applications is best achieved with networked storage and a network

technology capable of migrating or reassigning network addresses from one physical device to another. iSCSI leverages the built in capabilities of TCP/IP over Ethernet which offer virtual IP addressing as an efficient and effective way to migrate network port addresses without interruption to applications.

Flexibility. Most data centers require a mixture of applications that access either file or block data. With virtual servers, it is likely that access to file and block data types may be required on the same physical server for either the guest- or parent-OS. The ability to use a common network infrastructure for both the guest and parent can reduce cost and simplify management. Ethernet offers support for multiple IP storage protocols. In addition to support for iSCSI, Ethernet supports NFS and CIFS/SMB resulting in greater choice to optimize application performance within your budget.

Performance and quality of service

10 Gigabit Ethernet. Server virtualization places new requirements on the storage network. With a single application running on a server; dual- and quad-port network adapters

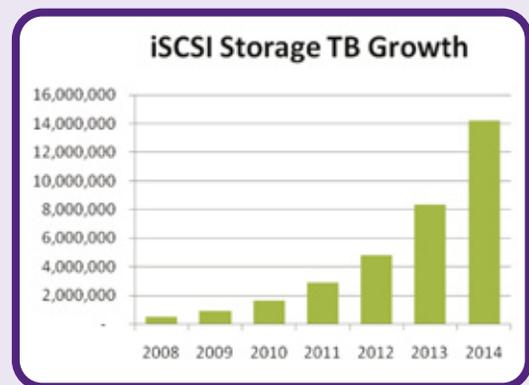


Figure 1. IDC WW Forecasted Sum of iSCSI TB (Q1 2010)



may be sufficient to handle network I/O. But, in a virtual server environment it is not uncommon to see 10, 20 or more VMs hosted on a physical server. Increasing the number of ports on a server by a factor of 10 or more to address highly dense virtual server deployments is unrealistic. For obvious reasons this does not scale. Greater bandwidth density is required to address the performance requirements of dense virtual server applications.

10 Gigabit Ethernet (10GbE), ratified by the IEEE in 2002, delivers 10 times the bandwidth of Gigabit Ethernet (GbE). Since most individual applications sit idle for much of the time, network loads at the host are typically below capacity. Increases in I/O efficiency are achieved by moving applications off underutilized GbE ports onto consolidated, highly utilized 10GbE ports. Additionally, moving to 10GbE reduces cabling and switch ports and increases airflow and environmental efficiency. iSCSI leverages the increased performance of 10GbE and will take advantage of future speed increases on the roadmap, such as 40GbE and 100GbE.

Data Center Bridging (DCB). To support increased use of 10GbE and virtualization new Ethernet standards that deliver a single converged network for connecting SAN, LAN, and high performance computing (HPC) clustering are needed to ensure mission critical applications get the bandwidth and priority they need on the wire. A new set of IEEE standards called Data Center Bridging (DCB) delivers increased quality of service for mixed traffic data on a shared network. DCB is enabled through enhanced Ethernet switches, server network adapters, and storage target devices.

Combine iSCSI with DCB and you've got a Storage Area Network running over Ethernet that provides a network infrastructure that virtually eliminates packet loss in congested environments, enabling improved data networking and management. DCB offers the benefits of increased priority levels for more granular levels of data traffic, end-to-end congestion management, guaranteed minimum levels of bandwidth, and lastly, a discovery protocol to make it easier to negotiate with peers.

iSCSI over DCB improves transmission reliability, application responsiveness, and server efficiency. In fact, you could say

that because DCB makes the entire network more efficient. DCB prioritizes traffic based upon function (SAN, LAN, inter processor communication or IPC), which improves overall traffic management. For example, storage traffic can be configured a higher priority than web traffic. Network administrators can allocate 60% of bandwidth to storage traffic, SAN or NAS, and 40% to web, ensuring operations and predictable performance for where they need it most. Devices in a data center that support standard 10GbE and DCB interoperate easily based upon the switch settings on the network ports. For example, an iSCSI storage device that supports DCB connected to a DCB switch can communicate with all devices on the network without re-configuration or intervention. Components communicate ubiquitously, since iSCSI networks can go into and out of DCB portions of the network without packet conversion. In iSCSI data center environments administrators can start with a small DCB implementation and expand as desired.

Economies of scale

Volume. Increased adoption of 10GbE is having a positive impact on deployments of iSCSI in the enterprise. The

According to a recent Dell'Oro Group forecast, 10GbE ports are projected to grow to over five million by 2014 from approximately 250 thousand ports in 2009 (Figure 2) – resulting in a Compounded Annual Growth Rate (CAGR) greater than 80%.

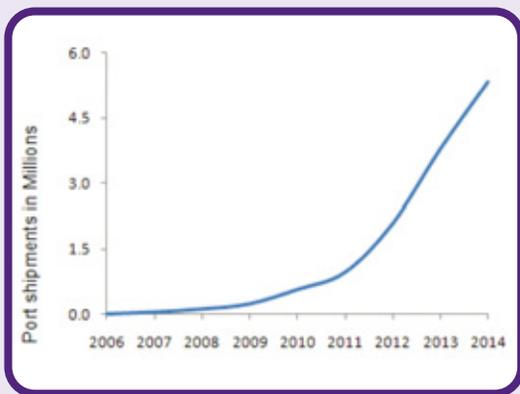


Figure 2. Dell'Oro Group Forecast of Adapter Port Shipments

growth in high performance Ethernet networks is providing the infrastructure necessary to effectively use iSCSI for enterprise applications. As evidence, port shipments of 10GbE have more than doubled year-over-year and rapid growth is expected to continue. According to a recent Dell'Oro Group forecast, 10GbE ports are projected to grow to over five million by 2014 from approximately 250 thousand ports in 2009 (Figure 2) – resulting in a Compounded Annual Growth Rate (CAGR) greater than 80%.

Results from the 10GbE Network Interface Card (NIC) Survey of IT managers, conducted by IT Brand Pulse in May 2010, indicate that the transition to 10GbE from Gigabit Ethernet is well underway with 22% of data centers having already deployed 10GbE and another 45% in the process of doing so. This growth and adoption of 10GbE is not only driven by network requirements associated with the adoption of server Virtualization and network convergence, but also by a significant increase in affordability.

Price. Over the last several years, port prices for 10GbE have dropped from as high as \$10,000 per port to less than \$400 per port. On a cost per unit of bandwidth, 10GbE offers increased value, especially taking into account the efficiency and performance benefits described above.

Further adoption and price-per-port improvements are anticipated with copper solutions including Direct-Attach-

Cable (DAC) and 10GBASE-T. DAC is an appealing solution growing in deployment due to its low cost and the ability to plug directly into Small Form-Factor Pluggable (SFP+) housings.

10GBASE-T, or 10GbE over twisted-pair copper; is another low cost solution that is designed to leverage existing premises cabling further contributing to increased deployment and lower price points of 10GbE. As was the case with Gigabit Ethernet or 1000BASE-T, wide-spread adoption occurred when newer networking technology worked with existing premises cabling.

Further adoption of 10GbE with iSCSI will occur as we experience the transition to 10GbE LAN on Motherboard (LOM) designs. Server manufacturers are now beginning to ship products with embedded 10GbE. Server shipments with 10GbE LOM designs are expected to grow to over 13 million units by 2014.

Summary

Ethernet as a technology has evolved to deliver the foundation required for these dynamic changes in the data center. Along with operational changes to deliver more service oriented IT access – driven largely by server virtualization – requires a scalable, flexible and high performing network.

With the enhancements to Ethernet (DCB) and an increasing need to virtualize resources in the data center, Ethernet has matured along with the data center into an enterprise class storage area networking technology that delivers 10 Gigabit per second performance, increased quality of service, and economic value. And what was once a cost effective storage networking protocol for the small to medium business, iSCSI has grown with Ethernet to be an effective if not ideal storage area network protocol for the new enterprise.

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