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New Workloads Demand Flexible Approach to Storage Networking

March 2015

Adapted from *Market Analysis Perspective: Worldwide and U.S. Storage Industry, 2014* by Eric Burgener, Liz Conner, Laura DuBois, et al., IDC #253171

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Introduction

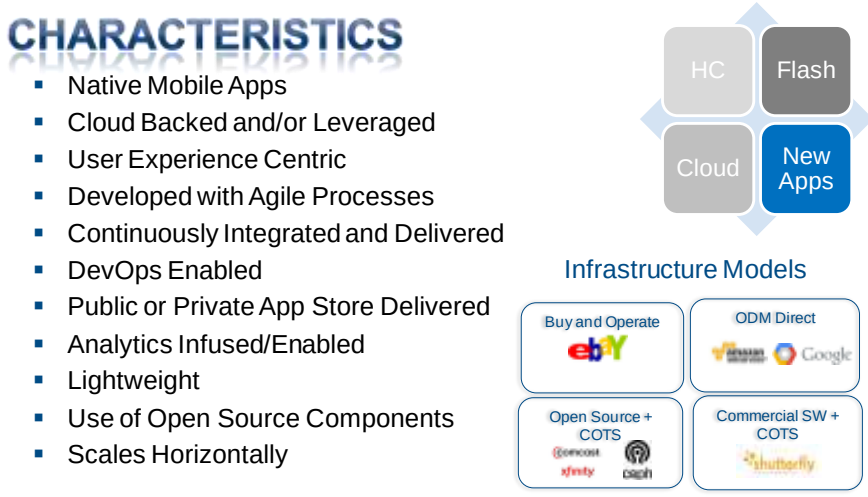
According to IDC, more than 22% of storage growth will be driven by 3rd Platform workloads such as mobile computing, Big Data/analytics, business-oriented social media, virtualization, and cloud computing. As a result, the 3rd Platform will drive several key requirements for storage infrastructure, including the need to scale out easily and quickly, leverage disparate information sources (and pull data in and out of those sources), and support applications that are geographically distributed.

In this context, virtualization is a major driver of new requirements. Storage networking in virtual environments is evolving in ways that contrast sharply with legacy storage models. Even as legacy applications are migrated to virtual infrastructure, newer virtualized applications that have never run on physical infrastructure are requiring performance, agility (flexibility), and scale that exceed the limitations of traditional storage networking products, technologies, and architectures.

New custom applications, most of them virtualized, are driving significant changes to storage infrastructure, including storage networks. These applications are developed through agile processes and are often DevOps oriented and built to support advanced analytics (see Figure 1).

Figure 1

New Custom Applications Drive Infrastructure Changes



Source: IDC, 2015

Indeed, Big Data is another major driver of new storage requirements. Revenue attributable to the storage-related aspects of Big Data (including systems, software, cloud, and services) will grow at a compound annual growth rate (CAGR) of 32.7% to reach nearly $16.9 billion in 2018.

This is to say nothing about the impact that the Internet of Things (IoT) will have on datacenter storage infrastructure, including the underlying network. Though IoT is still a nascent market, its eventual impact on storage networking is likely to be substantial, especially in relation to a number of vertical markets such as utilities, transportation, manufacturing, retail, and consumer technologies.

The challenge for the enterprise IT buyer is to consider the impact of existing and future storage workloads on the storage network, taking into account not just the need for additional bandwidth but also how the shift in workloads might represent an opportunity to overhaul the storage network and imbue it with protocols, technologies, and operational practices that can confer greater business agility as well as cost savings.

Forces and Trends Affecting Storage Networks

Datacenters are undergoing a major transition to meet higher performance, scalability, and resiliency requirements with fewer resources, smaller footprints, and simplified designs. These rigorous requirements, coupled with major datacenter trends such as virtualization, datacenter consolidation, and data growth, are putting a tremendous amount of strain on the existing infrastructure and adding complexity. Storage infrastructure should provide line-rate, nonblocking, high-speed throughput to effectively power applications such as VDI, high-performance computing, high-frequency trading, and Big Data, among others.

Massive virtualization, datacenter consolidation, and the ability to deploy a growing number of virtualized applications on powerful multicore CPUs have increased the risk profile within the datacenter. These datacenter trends require renewed focus on storage network availability. In this regard, hardware design and architecture provide no assurance of high availability. At the same time, it's not just about hardware; it's also about a holistic approach with hardware, software, management, and the right architecture.

Let's now give further consideration to how the new workloads, as well as legacy workloads, will affect the data deluge swamping storage networks. In particular, let's consider how increasing levels of virtualization have influenced storage networks.

In virtualized application environments today, direct-attached storage (DAS) is the most common protocol, with Fibre Channel (FC) a close second. The large presence of DAS is attributable to the inclusion of storage contained in server enclosures. That said, Ethernet-based storage protocols like Fibre Channel over Ethernet (FCoE), Internet Small Computer Systems Interface (iSCSI), and network-attached storage (NAS) have significantly outgrown both DAS and FC (by more than two times) in recent years.

Indeed, Ethernet-based storage protocols offer attractive cost profiles through their ability to leverage existing network infrastructure and management expertise. In virtual environments, NAS also offers an intuitive, virtual machine (VM)–centric storage management orientation that fits well with the growing trend — particularly evident in small and medium-sized enterprises — of storage administration responsibilities migrating to IT generalists rather than to storage experts.

NAS, iSCSI, and FCoE are expected to demonstrate ongoing year-over-year growth, remaining popular with highly virtualized businesses as well as with enterprises deploying 10GbE to servers and 40GbE uplinks in a bid to streamline and simplify datacenter operations.

Newer network storage architectures like all-flash arrays (AFAs) and hybrid flash arrays (HFAs) are also heavily focused on virtual environments, contributing to the overall growth of storage in virtual infrastructure.

The flash-based array market, which includes both AFAs and HFAs, has been booming. IDC estimates that the HFA segment reached $10 billion in 2014, while the AFA segment reached $1.3 billion. Vendors tend to target their all-flash HFAs for application workloads requiring millisecond latencies, whereas their AFAs often are targeted at those that require sub-millisecond latencies. For both, the storage network must be able to provide high bandwidth, low latency, high reliability, and minimal data loss.

Meanwhile, the overall file- and object-based storage (FOBS) market will continue to grow at a higher pace than the disk storage systems market. IDC forecasts that from 2013 to 2018, the overall FOBS market will grow at a CAGR of 13.0% compared with a CAGR of 4.25% for the disk storage systems market. The comparatively high growth is attributed to the shift toward software-based storage deployed on commodity off-the-shelf hardware.

Within the datacenter, the primary reason for FOBS growth is being supported by Ethernet as the datacenter fabric — and the extension of Internet Protocol (IP) as the transport mechanism for storage traffic as well as application (data) traffic. Use cases such as virtual server and desktop infrastructure, analytics, and unstructured and semistructured content power this growth.

IDC forecasts that the FOBS market revenue will grow at a CAGR of 13.0% from 2013 to 2018, translating to capacity growth of 44.3% for the same period. This growth rate is higher than the growth rate for the disk storage systems market — a 4.25% CAGR for 2013–2018. The higher rate of growth in the FOBS market is a culmination of the shift from traditional block-based storage to scale-out file- and object-based solutions delivered mainly through the cloud.

Cisco's Approach to Storage Area Networking

Cisco's approach to storage area networking involves providing storage infrastructure for new applications and existing applications, ensuring that customers can carefully plan and implement the right technologies to meet their requirements for flexibility, performance, and scale. Regardless of protocol (IP, Ethernet, FC, FCoE, iSCSI, FiCON, FCIP), Cisco seeks to provide storage infrastructure that can provide highly available, secure data access.

To provide the highest reliability, scalability, and performance, organizations have traditionally deployed FC storage networks, and many will continue to do so. Cisco's MDS 9700 Series Directors were recently introduced to meet the performance and scalability requirements of Fibre Channel customers, providing storage connectivity for business-critical application workloads, large pools of data, and cloud-based environments.

The new 16G Cisco MDS multiprotocol platform allows customers to preserve investments in Fibre Channel storage, in addition to providing an option to deploy FCoE if desired. This enables the consolidation of LANs and SANs into a single high-performance network over lossless Ethernet, therefore reducing the total cost of ownership (TCO) of server network adapters, cables, and switches while improving operations agility.

The Cisco Unified Fabric portfolio, which runs Cisco's NX-OS network operating systems, brings consistent networking across physical, virtual, and cloud environments for both LANs and SANs. Meanwhile, the Cisco Prime Datacenter Network Manager (DCNM) provides single-pane-of-glass management for the MDS, Nexus, and UCS product lines, simplifying operations and enhancing administrator productivity.

Cisco offers customers bandwidth choices that range from 10Gbps and 40Gbps to 100Gbps in Ethernet and from 8Gbps to 16Gbps in Fibre Channel, with plans to support 32Gbps Fibre Channel. Cisco switches now supporting 16Gbps Fibre Channel include the 97xx series, the 9148s, and the 9250i.

Given the varying workloads that storage networks must support, Cisco understands the need for multiprotocol flexibility and choice, as well as the requirement for storage networking to deliver

scalable support to both physical and virtual resources, reduce operational costs, and allow for decreased capital expenditures.

Challenges and Opportunities

Cisco's prodigious installed base of SAN customers presents the company with substantive opportunity as well as a few notable challenges.

A notable challenge is represented by the shifting nature of application workloads that are contributing to the growing data deluge. Enterprise customers are currently in the midst of transitioning from client/server applications to the 3rd Platform, which comprises virtualization, cloud, mobility, data analytics, and social business. Cloud, both private and public, is a particularly salient consideration, affecting where and how enterprises run their applications and where and how they store data associated with them. Some storage workloads will migrate to the public cloud, whereas others will remain in the enterprise datacenter, in either a private cloud environment or a more traditional context.

Amid this workload and storage heterogeneity, Cisco must ensure that its product portfolio takes a resolutely pragmatic and agnostic approach to storage product and technologies. Like other vendors that provide storage networking products and technology, Cisco must eschew any sort of "religious" stance relating to storage networking protocols. At the same time, however, Cisco must stay apprised of storage-related technology trends that affect storage networking protocols and related technologies.

Competitively, Cisco will have to ensure that its storage networking product portfolio remains well positioned and appropriately aligned with enterprise adoption of the latest standards and protocol enhancements.

Conclusion

As storage networking accommodates new requirements — cloud, mobility, Big Data, and social business, as well as IoT looming on the horizon — it must adapt and evolve.

Similarly, enterprise IT buyers must assess how current and future storage workloads will affect their storage networks, taking into account not just the need for additional bandwidth but also whether emerging workloads present an opportunity to overhaul the storage network and invest it with protocols, technologies, and operational models that can confer greater business agility and cost savings.

By planning ahead, enterprise IT buyers can implement a storage infrastructure that accommodates legacy block-and-file storage and satisfies forward-looking requirements for Big Data and object storage. Fortunately, given the range of protocols and technologies that are supported by today's storage networking offerings, these objectives can be met without sacrificing flexibility, performance, security, or scale.
