Better Storage Management for Data Growth

Intel and VMware deliver software-defined storage solutions

Solution Brief

Intel® Xeon® Processors

VMware® Virtual SAN™

The era of massive data growth presents serious challenges to IT professionals, among them the need for faster, more scalable, and more cost-effective data storage options that respond to changing business requirements. To address these storage challenges, Intel and VMware have a vision for the data center that includes software-defined infrastructure, which can optimize the utilization of data center assets, reduce the cost of data center operations, and speed the time to delivery of new services to the business. Software-defined infrastructure can transform the data center from systems deployed in silos with limited scalability and inefficient utilization to a dynamic, fully automated, and flexible infrastructure that encompasses servers, storage, and network components.

Intel and VMware are working together to provide foundational technologies that deliver on this vision for customers' data centers. These technologies include intelligent storage solutions based on Intel® Solid-State Drive (SSD) Data Center Family, 10 Gigabit Intel® Ethernet Converged Network Adapters, Intel® Xeon® processor technologies, and VMware® Virtual SAN™ (VSAN) software-defined storage.

Meeting the Data Challenge with Software-Defined Storage

"Big data" is a familiar phrase in the IT industry, but the real magnitude of today's data growth is often unappreciated. Eric Schmidt, former CEO of Google, noted that 5 exabytes of data are produced every two days—about the same volume of information created between the dawn of human civilization until 2003.[1] According to IDC, by the year 2020 there will be more than 40 zettabytes of digital information worldwide.[2]

Storing and subsequently accessing this volume of data is a huge challenge for IT professionals. As storage demands grow exponentially, IT departments need storage solutions that are flexible, scalable, and cost effective. Unfortunately, traditional storage architectures often fall short of delivering on these capabilities, causing bottlenecks, underutilization, and application workload inefficiencies. They require significant capital expense, create complex management tasks for IT departments, and lack the scalability required to keep up with data demands. Moreover, traditional storage systems are not easily re-provisioned on the fly, and they don't have the flexibility needed to adapt to fast-changing user and business demands.

Server virtualization further complicates the picture. While virtualization has transformed the way that IT is managed and delivered, it places new demands on storage in terms of input/output (I/O) performance, latency, and scalability.

For IT professionals, there is a new option: Intel technologies that work with VMware VSAN software-defined storage. With Intel and VMware VSAN, IT professionals can create intelligent storage solutions that take advantage of pooled direct-attached storage (DAS) resources to achieve greater data storage agility, scalability, and efficiency at a fraction of the cost of traditional storage architectures.

VMware® Virtual SAN™: A New Storage Technology for Enterprise Data

VMware VSAN provides a software-defined storage tier that pools compute and DAS resources through the server hypervisor. By clustering server direct-attached hard disk drives (HDDs) and solid-state drives (SSDs), VSAN creates a distributed, shared data store at the hypervisor layer that is designed and optimized for virtual machines (VMs). As the needs of virtualized applications change, the hypervisor is uniquely positioned to make I/O optimizations and intelligent data-placement decisions to optimize application performance. VSAN, which is part of the VMware vSphere® kernel, is architected and positioned to deliver a high-performance storage tier via software by taking advantage of SSDs for high performance read caching and write buffering and HDDs for cost-effective data persistence.

VSAN also takes advantage of a highly available architecture that can withstand failures at the disk, server, and network level with no data loss, using built-in redundancy mechanisms that transparently store multiple copies of the data across disks and hosts. VSAN uses a policy-based approach to storage management that allows IT administrators to specify storage attributes—such as capacity, performance, and availability—in the form of simple policies that are associated with individual virtual machines or virtual disks. Storage can then be instantly provisioned and automatically configured according to the assigned policies. VSAN also dynamically self-tunes and load balances to meet the policies of each individual virtual machine, thereby adapting to ongoing workload condition changes and helping to ensure that service-level agreements (SLAs) are met throughout the virtual machine lifecycle.

Core Features of VMware VSAN

- Integration with VMware vSphere: VSAN is implemented inside the VMware vSphere kernel, enabling high performance and scalability through integration with VMware vSphere data services such as VMware vSphere Snapshots, VMware vSphere Clones, VMware vSphere Data Protection, and VMware vSphere Replication. VSAN is managed from the VMware vSphere Web Client for single-pane-of-glass management.
- Read/write I/O caching: VSAN minimizes storage latency by accelerating read/write disk I/O traffic with built-in caching on server side flash.
- Protection from failures: VSAN has built-in distributed Redundant Array of Independent Nodes (RAIN) data protection and synchronous cache mirroring to ensure that data is not lost in case of disk, host, or network failures.
- Non-disruptive scalability: The VSAN data store performance and capacity is increased easily and non-disruptively by adding hosts to a cluster or disks to a host.
- VM-centric policy-based management: Storage requirements are associated with individual virtual machines or virtual disks through policy statements that VSAN automatically translates into system configurations.
- Self-tuning storage and dynamic storage load balancing: VSAN automatically and non-disruptively maintains the specified storage capacity, performance, and availability levels for each individual virtual machine.
- Broad hardware compatibility: VSAN is hardware agnostic and can be deployed on any standard OEM server hardware based on Intel technology.

- Interoperability with VMware® Horizon View™ and VMware® vCenter™ Site Recovery Manager™: VSAN can be deployed in conjunction with VMware Horizon View in virtual desktop infrastructure (VDI) environments and VMware vCenter Site Recovery Manager in disaster recovery (DR) environments.

VSAN: Radically Simple Storage for Virtual Environments

VSAN makes it easy to provision and manage storage for virtual machines. IT professionals can quickly provision storage directly from the VMware vSphere Web Client with just a few clicks, taking advantage of a self-tuning system that automatically and non-disruptively optimizes itself to deliver the right SLAs based on the requirements for each virtual machine.

Unlike traditional storage arrays, VSAN does not require large upfront investments to get started. A VSAN data store can be created with as few as three servers and can be used on any standard Intel-based server hardware. VSAN also delivers a lower total cost of ownership (TCO) by reducing storage capital and operational expenses through the use of inexpensive server disks and high-endurance SSDs, with standard VMware vSphere networking, and through reduced power and cooling costs. This means that existing high-dollar SAN devices can be freed up to perform the mission-critical work for which they were originally intended. Meanwhile, VSAN lets organizations increase their storage performance and capacity incrementally and predictably.

Intel: Providing a High-Performance Storage Foundation

Intel technologies and products work with VMware VSAN to deliver the foundation for new software-defined storage solutions. These include the Intel Xeon processor E5 family, 10 Gigabit Intel Ethernet Converged Network Adapters, and the Intel SSD Data Center Family products.

Intel® Xeon® Processor E5 Family

VMware VSAN delivers a shared storage solution as software that is efficient, scalable, and cost effective. However, sufficient processing capability and increased I/O bandwidth is required to integrate storage intelligence into virtualized servers running multiple virtual machine workloads. Intel Xeon processors are designed to meet these requirements with multiple cores that power enterprise storage requirements in addition to compute tasks. These processors deliver energy-efficient performance for the most demanding workloads, support for automated tiering across SSDs and HDDs, and offer Intel® Integrated I/O for up to three times higher bandwidth to minimize performance bottlenecks.[3]

Intel® Ethernet Converged Network Adapters

The most demanding enterprise storage tasks can be addressed with 10 Gigabit Intel Ethernet Converged Network Adapters. Based on Intel's unified networking vision for supporting all LAN data and storage traffic on a common Ethernet infrastructure, 10 Gigabit Intel Ethernet Converged Network Adapters offer significant benefits in the data center over traditional storage architectures, including a 45 percent reduction in power per rack, a significant reduction in infrastructure costs, and twice the server I/O bandwidth.[4] The 10 Gigabit Intel Ethernet Converged Network Adapters provide the scalable, high-throughput features required to meet the demands of combined compute and storage workloads on VSAN systems. Hardware optimizations for I/O virtualization and native VMware vSphere storage networking support deliver outstanding performance while maintaining compatibility with integrated VMware vSphere quality-of-service (QoS) and teaming features.

Intel® SSD Data Center Family

There is fast-growing interest in the use of SSDs in the data center. Intel SSDs offer compelling advantages over HDDs. For example, SSDs have no moving platters or actuator arms that can fail, and they use semiconductor-based, non-volatile memory similar to what is used in USB thumb drives, which means that data is retained even with sudden losses of power. The Intel SSDs can withstand large amounts of data writes, they produce less heat and noise than HDDs, and they typically have about one-third of the power requirements of HDDs. The Intel® SSD 910 Series, Intel® SSD DC S3700 Series, and Intel® SSD DC S3500 Series offer significant advantages for enterprise storage tasks. These include full end-to-end data protection, consistent performance with low latencies, AES 256-bit encryption for excellent data protection, and high capacities for growing storage needs.

Intel and VMware: Delivering Better Data Storage Options

With Intel technology and VMware VSAN, organizations can efficiently manage large and growing data stores using standard, off-the-shelf, Intel-based servers. By dynamically pooling DAS resources using VSAN, enterprises can implement simple and intelligent storage policies at the virtual-machine level to automate storage provisioning and management in tandem with compute functions. The result is lower upfront costs, reduced TCO, and greater flexibility and scalability to respond to shifting business demands.

Additional Resources

Intel: www.intel.com/storage

VMware: www.vsanbeta.com

[1] Eric Schmidt. Speech at Techonomy conference. August 2010.

[2] IDC. Digital Universe Study, sponsored by EMC Corporation. December 2012. http://www.emc.com/collateral/analyst-reports/idc-the-digital-universe-in-2020.pdf.

[3] Source: Intel internal measurements of average time for an I/O device read to local system memory under idle conditions comparing Intel® Xeon® processor E5-2600 product family (230 ns) versus Intel® Xeon® processor 5500 series (340 ns).

[4] Results based on Intel® Ethernet Server Adapter ROI tool: http://www.event-management-online.de/LAD/calculator.aspx. Bandwidth claim based on assumed configuration of ten 1 Gigabit Ethernet (GbE) adapters (10 Gb total bandwidth) or two 10 Gigabit Ethernet adapters (20 Gb total bandwidth). Infrastructure and power consumption figure based on comparison of Blade Networks RackSwitch G8000* and GbE adapter configuration versus Juniper EX2500* and 10 GbE adapter configuration.

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