SOLUTION BRIEF

Improving Storage Agility with VMware Virtual SAN* and Intel® Architecture

Software-Defined Data Center / Software-Defined Infrastructure
Intel® Xeon® Processor E5-2600 v4 Product Family
Intel® Solid-State Drive Data Center Family
Intel® Ethernet 10Gb/40Gb Converged Network Adapters
Intel® Server Products for Cloud - VSAN Ready Node

Scarce resources and budgets are shifting away from IT, while business units demand innovation. Manual processes can make the provisioning of new applications and resources sluggish, impairing the ability to keep business nimble and ahead of the competition. Moreover, rigid, complex topologies based on specialized infrastructure can hamper flexibility and agility, while fostering a patchwork of management approaches and security postures across the enterprise.

Virtualization has helped in overcoming these challenges. Server consolidation has reduced capital requirements in the data center by requiring fewer physical hosts, while automation of management functions and simplification of the environment helps lower operating expense. VMware Virtual SAN* extends the value of virtualization, by providing software-defined storage as an element of VMware Hyper-Converged Software (VMware HCS), which also includes VMware vSphere* and VMware vCenter* Server. Decoupling hardware from software, Virtual SAN is ready for any app, any scale. The full VMware HCS stack is highly optimized for Intel® architecture and takes full advantage of existing IT skill sets.

IT Transformation

Software-defined storage based on Virtual SAN is a component of a broader vision of the software-defined data center (SDDC) and software-defined infrastructure (SDI), which is illustrated conceptually in Figure 1.

In the SDDC/SDI model, all infrastructure—including compute, network, and storage—is delivered as a set of virtualized services on general-purpose servers based on Intel architecture. Eliminating special-purpose hardware reduces acquisition and maintenance costs. It also opens up the procurement of servers to all major server providers, for more freedom of choice. Provisioning, configuration, and de-provisioning of compute and storage are handled together, on a per-VM basis, with just a few clicks.

By enabling SDDC with SDI, Virtual SAN and Intel architecture help IT organizations deliver the following capabilities and benefits:

- **Optimized use of resources**, running both compute and storage workloads on the same server node (hardware) to provide storage resources as needed, as well as pooling and centrally managing distributed local storage into a shared data store.
- **Accelerated operations with high agility**, based on infrastructure that is easy to scale and automatically responds to changing business needs, allowing for rapid deployment of new services and applications.
- **Enhanced resilience and security**, with intelligent VM replication and placement, as well as optimization for reliability, availability, and serviceability (RAS) and security features of Intel architecture plus vSphere's high-availability features.

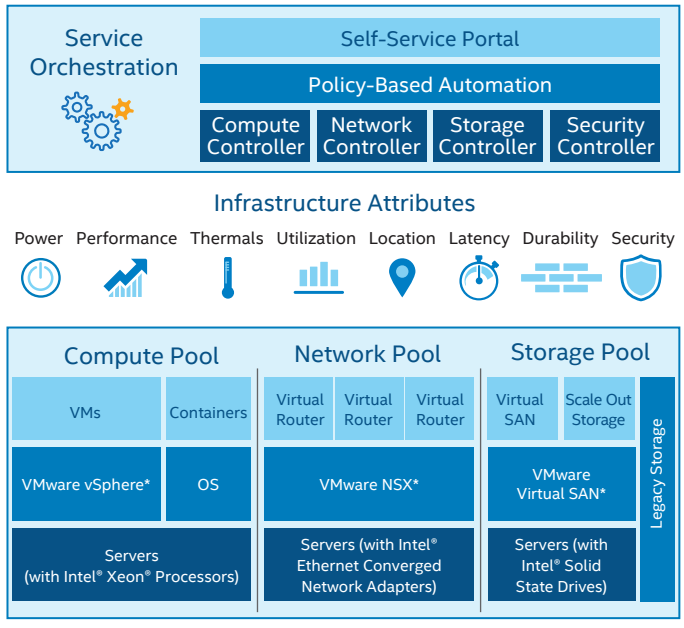

Figure 1. Solution architecture of the software-defined data center and software-defined infrastructure.

VMware and Intel Storage Solution

VMware Virtual SAN and Intel architecture enable a storage solution that is tailored to the needs of SDDC/SDI. It is designed to address common limitations associated with traditional storage, in terms of architecture, hardware, and the overall operational approach, as illustrated in Figure 2.

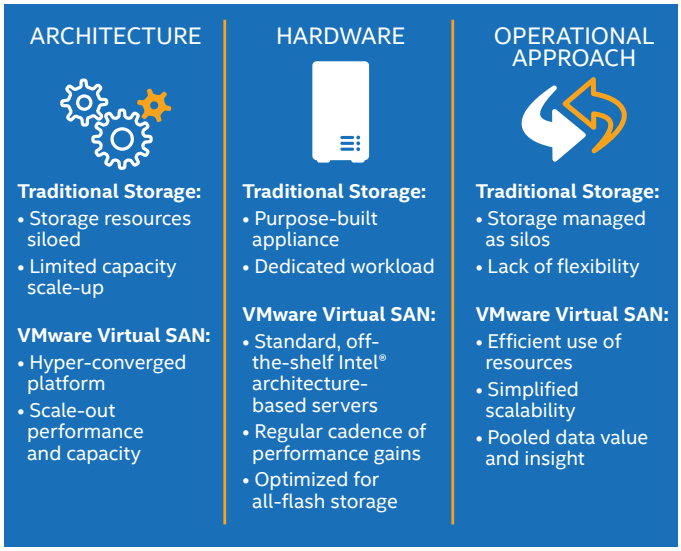

Figure 2. Storage reconceived for the software-defined data center and software-defined infrastructure.

To resolve siloed storage resources and scale-up limitations, Virtual SAN provides software-defined storage, embedded in vSphere for integrated management with the rest of the virtual environment, from a single console pane. The distributed architecture scales from two to 64 hosts per cluster, enabling simple scale-out of performance and capacity by adding more servers. Virtual SAN uses standard, off-the shelf Intel architecture-based servers, taking advantage of years of joint engineering between Intel and VMware to deliver high optimization for the hardware, and Intel's regular cadence of technology updates.

Operationally, Virtual SAN adds flexibility and simplicity, with policy-driven management as part of the vSphere environment, and no additional software installation is required. Geographically dispersed, heterogeneous storage resources are pooled and centrally controlled from the vSphere web client. Routine tasks, including provisioning, configuration, and maintaining storage SLAs, are automated. The solution is optimized for an all-flash architecture for both the cache and capacity tiers of the data center environment and can also be deployed using a hybrid architecture that combines flash-based solid-state drives and magnetic disks. In either case, a flash-based caching tier acts as a read/write buffer to reduce latency to predictable, sub-millisecond levels without compromising processor resources, memory, or VM consolidation.

To help customers accelerate Virtual SAN deployment, Intel and VMware have developed Intel® Server Products for Cloud – VSAN Ready Nodes. VSAN Ready Nodes from Intel have been pre-configured, tested, and certified for VMware Virtual SAN. Based on the VMware VSAN profiles, VSAN Ready Nodes from Intel are optimally configured for each workload with the required amount of CPU, memory, network, I/O controllers, and storage.

The Intel® Server Boards and Chassis, Intel® Xeon® processors, Intel® Solid State Drives (SSDs), and third-party memory included in VSAN Ready Nodes from Intel are optimized for maximum performance with VMware Virtual SAN (see sidebar). Customers also benefit from a simplified procurement model that includes a single order code and a single source of support.

Optimizations for Intel® Architecture

Virtual SAN is highly optimized for Intel architecture, enabling implementations to take advantage of features and benefits throughout the hardware stack:

- **Intel® Xeon® processors**. Intel® Advanced Vector Extensions 2.0 (Intel® AVX 2.0) accelerates storage capabilities, including thin provisioning and tiering, while Virtual SAN optimizations for Intel® Virtualization Technology take advantage of hardware assists that drive up performance.
- **Intel® Solid-State Drive (Intel® SSD) Data Center Family**. Virtual SAN takes advantage of the high performance and low latency of Intel SSDs, which have extended write endurance and capacities of up to 4 TB. Data is safeguarded with end-to-end data protection features, 256-bit Advanced Encryption Standard (AES) encryption and mechanisms to guard against data loss in the event of a power outage.
- **Intel® Ethernet 10Gb Converged Network Adapters**. Compared to traditional storage architectures, Intel® Ethernet adapters offer a 45 percent reduction in power per rack, a significant reduction in infrastructure costs, and twice the server I/O bandwidth,[1] plus compatibility with vSphere teaming and quality-of-service features.

Capabilities: Virtual SAN and Intel Architecture

The combination of Virtual SAN and Intel architecture is engineered to provide a simple-to-manage environment that delivers high performance and scalability up to 64 nodes and 6400 VMs, TCO savings, and freedom of choice for customers to use their preferred OEM and server vendors. In addition, the Intel® Xeon® processor E5-2600 v4 product family provides up to 1.43x improved virtualization performance over its predecessor.[2]

Enterprise-Class Availability

Virtual SAN can deliver up to six nines of availability (99.9999%),[3] which equates to less than 32 seconds of downtime per year. Availability can be enhanced by replicating components across racks, clusters, or sites, and configuration of the Failures to Tolerate (FTT) value enables customers to further control availability. Virtual SAN manages this configuration automatically, on a per-virtual machine (VM) basis.

VMs are rack-aware, enabling Virtual SAN to intelligently place them across server racks in a manner that maintains high availability even in the event of a complete rack failure. Rack awareness, which customers can set up with simple network policy measures, avoids data loss and downtime despite hardware failures at the disk, host, or network levels.

To support mission-critical workloads, high availability is also facilitated by vSphere HA and maintenance mode.

VMware Hyper-Converged Software

Innovation from VMware delivers a software-defined, distributed, shared storage model with all the data services typically provided by external SAN or NAS – but all delivered as software on the hypervisor.

To transform private data centers, VMware introduces the concept of VMware Hyper-Converged Software (VMware HCS). This suite of software assets—engineered specifically for deployment on Intel® architecture—behaves as a single, tightly integrated layer of software and provides a foundation for hyper-converged infrastructure:

- **VMware vSphere*** is the trusted industry-leading hypervisor for the enterprise.
- **VMware Virtual SAN*** provides high-performance, enterprise-class shared storage.
- **VMware vCenter*** Server unifies management of resources across the stack.

VMware HCS eliminates the need for additional virtual appliances and the associated network hops for read/write operations.

Multi-Site Virtual SAN Clusters

Virtual SAN Stretched Clusters allow a single cluster to span multiple geographic sites, with data replicated synchronously across high-bandwidth, low-latency WAN links. This capability enables uninterrupted operations even in the event of a failure that encompasses a complete site.

A configuration wizard allows customers to easily set up a Virtual SAN Stretched Cluster in just a few minutes, and managing the cluster is identical to managing a standard Virtual SAN cluster.

USE CASES: Virtual SAN and Intel® Architecture

Tier-1 workloads such as databases benefit from the enterprise-class data protection features and availability, the performance benefits of high throughput and low latency, and linear scalability of solutions based on Virtual SAN and Intel architecture.

Virtual desktop infrastructure based on VMware Horizon* with View* and Intel architecture-based servers provides a high-performance, cost-effective approach, with compute and storage that scale efficiently and predictably as user counts grow.

IT operations are enhanced by deploying management clusters on standards-based Intel architecture-based servers, controlled by an automation policy that can be changed on the fly, fully integrated with VMware functionality such as vMotion*, HA, Distributed Resource Scheduler, and Fault Tolerance.

Remote IT is facilitated by simple, powerful storage that can be managed by limited IT staffs without specialized expertise, with storage consolidated from across multiple sites into a centrally managed, shared pool.

Engage with Intel and VMware Today

Together, Intel and VMware are helping pave the way to customer implementations of the software-defined data center and software-defined infrastructure. Through years of joint engineering, Virtual SAN is deeply optimized for Intel architecture throughout the hardware stack, including Intel Xeon Processors, the Intel SSD Data Center Family and Intel Ethernet Converged Network Adapters.

Refer to the resources below to learn how you can take advantage of this optimization through pre-integrated, pre-certified VSAN Ready Nodes from Intel or other Intel-based solutions.

For more information, visit

intel.com/storage
intelserveredge.com/intel-cloud-block-vsan
vmware.com/products/virtual-san
vmware.com/VSAN-ready-nodes
intel.com/vmware

[1] 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.

[2] Source: http://www.intel.com/content/www/us/en/benchmarks/server/xeon-e5-v4/xeon-e5-v4-enterprise-virtualization.html.

[3] Availability based on VMware internal calculations: HDD and SSD MTBF/MTTR=0.99998. Rack*Host*Controller*HDD*SSD = 0.99998*0.9998*0.9996*0.99998*0.99998=0.9993 (best case). Worst case = 0.997. With FTT=1 data availability per object with 10 objects. (1 – (1-0.997)^2)^10 = 0.99991. With FTT=2, (1-(1-0.997)^3)^10 = 0.9999997.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

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