Intel® Select Solutions for VMware vSAN*

Intel Select Solutions provide proven performance on verified infrastructure.

VMware vSAN* is a powerful platform that delivers hyper-converged infrastructure and serves as a critical building block for the software-defined data center. Organizations want to deploy VMware vSAN to take advantage of the solution's distinctive scalability, security, and performance features for today's most demanding, storage-intensive data center workloads.

However, it can be difficult for organizations to know what underlying infrastructure they need to best support VMware vSAN, and existing VMware vSphere* deployments in many cases, with adequate performance and scalability for modern workloads.

Intel® Select Solutions for VMware vSAN deliver preconfigured solutions optimized by VMware and Intel that are designed to provide high performing infrastructure for modern computing needs. The solutions are built on Intel® Solid State Drives (SSDs) for the data center, Intel® Xeon® Scalable processors, Intel® Ethernet Network Adapters, and other Intel® technologies designed to accelerate performance and reduce latency.

VMware vSAN

The VMware vSAN ReadyNode* certification program provides assurance to data center buyers that their vSAN provider of choice has undergone VMware's rigorous certification process. Intel Select Solutions for VMware vSAN, offered by a variety of solution providers, are certified for vSAN ReadyNode and tightly specified by Intel and VMware to deliver out-of-the-box high performance. With Intel Select Solutions for VMware vSAN, IT teams can rest assured that their solutions are already verified for balanced and optimized performance—from the hardware up through the firmware stack to the VMware vSAN software. IT teams can get right to work providing VMware vSAN services to customers rather than wading through multiple component options or conducting extensive, system-level testing.

Proven configurations are within reach with Intel Select Solutions for VMware vSAN, available from a wide variety of data center solution providers. Intel Select Solutions for VMware vSAN:

- Are performance-optimized specifically for VMware vSAN

- Reduce the time required to evaluate, select, and purchase the necessary hardware components

- Minimize the time required to deploy new infrastructure

- Deliver performance optimized to a specific threshold across compute, storage, and network on trusted Intel architecture

Hardware Selections

Intel Select Solutions for VMware vSAN combine the Intel Xeon Scalable processor platform, Intel® Optane™ DC SSDs, Intel® 3D NAND SSDs, and the Intel® Ethernet 700 Series, so your business can quickly deploy reliable, comprehensive VMware vSAN software-defined storage (SDS) built on a performance-optimized infrastructure.

Intel® Xeon® Scalable Processors

Intel Select Solutions for VMware vSAN feature the performance and capabilities of Intel Xeon Scalable processors. For the "Base" configuration, the Intel Xeon Gold 6130 processor provides an optimized balance of price and performance in a mainstream configuration. The Intel Xeon Gold 6152 processor powers the "Plus" configuration, which is designed for high-density deployments or more demanding, latency-sensitive environments. Higher-number processors can also be used in either configuration.

Intel® SSD Data Center Family

VMware vSAN performs best when its hot-data tier—the cache tier—is on fast SSDs with low latency and high endurance. Workloads that require high performance can benefit from empowering the cache tier with the highest-performing SSDs rather than mainstream Serial ATA (SATA) SSDs. Intel Optane DC SSDs with NVM Express* (NVMe*) are used to power the cache tier in Intel Select Solutions. Intel Optane DC SSDs offer high input/output (I/O) operations per second (IOPS) per dollar with low latency, coupled with 30 drive-writes-per-day endurance, so they are ideal for write-heavy cache functions.[1] The capacity tier is served by Intel 3D NAND SSDs with NVMe, delivering optimized read performance with a combination of data integrity, performance consistency, and drive reliability.

Intel® Ethernet Connections and Intel® Ethernet Adapters

The Intel Ethernet 700 series accelerates the performance of VMware vSAN platforms powered by Intel Xeon Scalable processors, delivering validated performance ready to meet high quality thresholds for data resiliency, service reliability, and ease of provisioning.[2,3,4,5] VMware vSAN requires 10 gigabit Ethernet (GbE), which is provided in the Base configuration by an Intel® Ethernet Connection X722, an Intel® Ethernet Converged Network Adapter X710, or an Intel® Ethernet Network Connection OCP X527-DA2/DA4. In the Plus configuration, additional options include a 25 Gb Intel Ethernet Converged Network Adapter XXV710 or a 40 Gb Intel Ethernet Converged Network Adapter XL710 to address the needs of VMware vSAN in more demanding workloads by providing rich features for virtualization and proven performance.

What Are Intel® Select Solutions?

Intel Select Solutions are verified hardware and software stacks that are optimized for specific software workloads across compute, storage, and network. The solutions are developed from Intel experience with industry solution providers, in addition to collaboration with the world's leading data center and service providers.

To qualify an Intel Select Solution, solution providers must:

1. Follow the software and hardware stack requirements outlined by Intel

2. Replicate or exceed Intel's reference benchmark-performance threshold

3. Publish a detailed implementation guide to facilitate deployment

Solution providers can develop their own optimizations to add further value to the solutions.

Verified Performance through Benchmark Testing

All Intel Select Solutions are verified to meet a specified minimum level of workload-optimized performance capabilities. Intel and VMware chose VMmark 3.0*—a web-scale multi-server virtualization platform benchmark—to meet stringent performance standards for this virtualized storage solution.

VMmark 3.0 consists of multiple hosts, diverse multi-tier workloads, and infrastructure operations. The workload applications in VMmark 3.0 have been updated to reflect modern, multi-tier application design standards and technologies and to take better advantage of today's larger and more powerful server hardware. The results are not comparable to previous VMmark 2.x scores.

VMmark 3.0 combines commonly virtualized applications into predefined bundles called "tiles," and it measures the capacity (the number of tiles a virtualization platform can support), in addition to the cumulative performance score of those applications running simultaneously. (See vmware.com/products/vmmark.html for more information.)

Base and Plus Configurations

Intel Select Solutions for VMware vSAN include two configurations. The Base configuration specifies the minimum required performance capability for Intel Select Solutions for VMware vSAN, and the Plus configuration provides one example of how system builders, system integrators, and solution and service providers can further optimize to achieve higher performance and capabilities. For example, customers can support 29 percent more tiles at 26 percent faster performance when using the Plus configuration, compared to using the Base configuration, as shown in Table 1.[6]

Table 1. Hardware and firmware components for the Intel® Select Solutions for VMware vSAN* Base and Plus configurations

INGREDIENT	INTEL® SELECT SOLUTIONS FOR VMWARE VSAN* **BASE CONFIGURATION**	INTEL SELECT SOLUTIONS FOR VMWARE VSAN **PLUS CONFIGURATION**
MASTER/HEAD NODE	4-node configuration	4-node configuration
PROCESSOR	2 x Intel® Xeon® Gold 6130 processor, 2.10 GHz, 16 cores, or a higher number Intel Xeon Scalable processor	2 x Intel Xeon Gold 6152 processor, 2.10 GHz, 22 cores, or a higher number Intel Xeon Scalable processor
MEMORY	384 GB (12 x 32 GB 2,666 MHz DDR4 DIMM)	512 GB (16 x 32 GB 2,666 MHz DDR4 DIMM)
STORAGE	**Cache tier:** 2 x 375 GB Intel® Optane™ SSD DC P4800X Series with NVM Express* (NVMe*), or larger **Capacity tier:** 4 x 2 TB Intel® SSD DC P4500 Series with NVMe, or larger	**Cache tier:** 2 x 375 GB Intel Optane SSD DC P4800X Series with NVMe, or larger **Capacity tier:** 4 x 2 TB Intel SSD DC P4500 Series with NVMe, or larger
DATA NETWORK	10 Gb Intel® Ethernet Connection X722 with Intel® Ethernet Network Connection OCP X527-DA2/DA4 or 10 Gb Intel® Ethernet Converged Network Adapter X710-DA2/DA4 or 40 Gb Intel Ethernet Converged Network Adapter XL710-QDA2	10 Gb Intel Ethernet Connection X722 with Intel Ethernet Network Connection OCP X527-DA2/DA4 or 10 Gb Intel Ethernet Converged Network Adapter X710-DA2/DA4 or 25 Gb Intel® Ethernet Network Adapter XXV710-DA2 or 40 Gb Intel Ethernet Converged Network Adapter XL710-QDA2
MANAGEMENT NETWORK	Integrated 1 gigabit Ethernet (GbE) or better	Integrated 1 GbE or better
DISK GROUPS	Minimum 2 per node	Minimum 2 per node
OTHER		
TRUSTED PLATFORM MODULE (TPM)	TPM 1.2	TPM 1.2
FIRMWARE AND SOFTWARE OPTIMIZATIONS	Intel® Volume Management Device (Intel® VMD)** Intel® Trusted Execution Technology (Intel® TXT) enabled Intel® Hyper-Threading Technology (Intel® HT Technology) enabled Intel® Turbo Boost Technology enabled Intel® Speed Shift Technology, Hardware P-states (HWP) native C-states disabled Power-management settings optimized for performance LLC prefetch enabled Uncore frequency scaling enabled	Intel VMD** Intel TXT enabled Intel HT Technology enabled Intel Turbo Boost Technology enabled Intel Speed Shift Technology, HWP native C-states disabled Power-management settings optimized for performance LLC prefetch enabled Uncore frequency scaling enabled

MINIMUM PERFORMANCE STANDARDS

Verified to meet or exceed the following minimum performance capabilities:

VMMARK 3.0* SCORE	6.61	8.33
VMMARK 3.0 TILE COUNT	7	9
BUSINESS VALUE OF CHOOSING A PLUS CONFIGURATION OVER A BASE CONFIGURATION	With the Plus configuration of Intel Select Solutions for VMware vSAN, businesses can support 29 percent more tiles with 26 percent faster performance.[6]	

**Recommended, not required

Technology Selections for Intel Select Solutions for VMware vSAN

In addition to the Intel hardware foundation of Intel Select Solutions for VMware vSAN, other technologies provide further performance and strengthen security:

- **Intel® Volume Management Device (Intel® VMD):** Enables hot swap replacement of NVMe SSDs from the Peripheral Component Interconnect Express* (PCIe*) bus without shutting down the system, while standardized LED management helps provide much faster identification of SSD status. This standardization brings enterprise reliability, availability, and serviceability (RAS) features to NVMe SSDs, enabling you to deploy next-generation storage with confidence. IT professionals can now service these drives online without an outage, which minimizes interruptions and improves uptime and serviceability. The unique value of Intel VMD is that Intel is sharing this technology across the ecosystem for broad enablement.

- **Intel® Trusted Execution Technology (Intel® TXT):** Provides the foundation for highly scalable platform security in physical and virtual infrastructures. It helps harden servers at the lowest level against threats of hypervisor, BIOS, or other firmware attacks, malicious rootkit installations, and other types of attacks or misconfiguration to firmware and operating systems.

- **Trusted Platform Module (TPM) 1.2:** Protects the system start-up process by ensuring it is tamper-free before releasing system control to the operating system. TPM 1.2 also provides secured storage for sensitive data, such as security keys and passwords, and performs encryption and hash functions. Intel TXT utilizes this technology.

- **Intel® Turbo Boost Technology:** Accelerates processor and graphics performance for peak loads, automatically allowing processor cores to run faster than the rated operating frequency if they're operating below power, current, and temperature specification limits.

- **Intel® Hyper-Threading Technology (Intel® HT Technology):** Enables multiple threads to run on each core, which ensures that systems use processor resources more efficiently. Intel HT Technology also increases processor throughput, improving overall performance on threaded software.

Intel® Xeon® Scalable Processors

Intel Xeon Scalable processors are the future-forward platform for cloud and software-defined infrastructure technologies, such as VMware vSAN*. This processor family offers:

- High scalability to support a wide range of existing and emerging workloads for a modern hybrid cloud business strategy

- The efficiency and density required to deliver strong virtualized infrastructure performance gains

- Intelligence to deliver exceptional resource utilization and agility

- A foundation for more secure data center solutions, enabling improved data and workload integrity and supporting regulatory compliance

- **Intel® Speed Shift Technology:** Allows the processor to quickly select its best operating frequency and voltage for optimal performance and power efficiency without intervention from the operating system.

A Verified Foundation for Hyper-Converged Infrastructure with Intel Select Solutions for VMware vSAN

Intel Select Solutions are a fast path to data center transformation with workload-optimized configurations verified for Intel Xeon Scalable processors. When organizations choose Intel Select Solutions for VMware vSAN, they get the optimized performance that hyper-converged infrastructures need and demand—without the time and hassle required to tune the stack. (Visit intel.com/selectsolutions for more information on Intel Select Solutions.)

Learn More

Intel Select Solutions web page: **intel.com/selectsolutions**

Intel Xeon Scalable processors: **intel.com/xeonscalable**

Intel Ethernet 700 Series: **intel.com/ethernet**

Intel Select Solutions are supported by Intel® Builders: **builders.intel.com**. Follow us on Twitter: **#IntelBuilders**

VMware vSAN: **vmware.com/vsan**

1 Intel. "Product Brief: Intel Optane SSD DC P4800X Series." intel.com/content/www/us/en/solid-state-drives/optane-ssd-dc-p4800x-brief.html. Based on internal Intel testing.

2 Intel® Ethernet 700 Series includes extensively tested network adapters, accessories (optics and cables), hardware, and software along with broad operating system support. A full list of the product portfolio's solutions is available at intel.com/ethernet. Hardware and software is thoroughly validated across Intel® Xeon® Scalable processors and the networking ecosystem. The products are optimized for Intel® architecture and a broad operating system ecosystem: Windows*, Linux* kernel, FreeBSD*, Red Hat* Enterprise Linux (RHEL*), SUSE*, Ubuntu*, Oracle Solaris*, VMware ESXi*.

3 Intel® Ethernet 700 Series network adapters are backed with global support infrastructure for customers pre- and post-sales.

4 Intel® Ethernet 700 Series network adapters' supported connections and media types are direct-attach copper and fiber SR/LR (QSFP+, SFP+, SFP28, XLPPI/CR4, 25G-CA/25G-SR/25G-LR), twisted-pair copper (1000BASE-T/10GBASE-T), and backplane (XLAUI/XAUI/SFI/KR/KR4/KX/SGMII). Note that Intel is the only vendor offering the QSFP+ media type.

5 Intel® Ethernet 700 Series network adapters' supported speeds include 1 GbE, 10 GbE, 25 GbE, and 40 GbE.

6 Intel internal testing as of August 10, 2018. **Base configuration**: four nodes, 2 x Intel® Xeon® Gold 6130 processor, Intel® Server Board S2600WFT, total memory: 384 GB, 12 slots/32 GB/2,666 megatransfers per second (MT/s) DDR4 RDIMM, Intel® Hyper-Threading Technology (Intel® HT Technology) enabled, Intel® Turbo Boost Technology enabled, storage (boot): 1 x 240 GB Intel® SSD 540s Series M.2 SATA, storage (cache): 2 x 375 GB Intel® Optane™ SSD DC P4800X Series Peripheral Component Interconnect Express* (PCIe*) with NVM Express* (NVMe*), storage (capacity): 4 x 2 TB Intel SSD DC P4500 Series PCIe with NVMe; network devices: 2 x dual-port 10 Gb Intel® Ethernet Converged Network Adapter X710, network speed: 10 GbE, ucode: 0x043, OS/software: VMware vSphere 6.7.0*, build 8169922. **Plus configuration**: four nodes, 2 x Intel Xeon Gold 6152 processor, Intel® Server Board S2600WFT, total memory: 512 GB, 16 slots/32 GB/2,666 MT/s DDR4 RDIMM, Intel HT enabled, Intel Turbo Boost Technology enabled, storage (boot): 1 x 240 GB Intel SSD 540s Series M.2 SATA, storage (cache): 2 x 375 GB Intel Optane SSD DC P4800X Series PCIe with NVMe, storage (capacity): 4 x 2 TB Intel SSD DC P4500 Series PCIe with NVMe; network devices: 2 x dual-port 10 Gb Intel Ethernet Converged Network Adapter X710, network speed: 10 GbE, ucode: 0x043, OS/software: vSphere 6.7.0, build 8169922.

Performance results are based on Intel internal testing as of August 10, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure.

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. For more complete information visit intel.com/benchmarks.

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.

Intel disclaims all express and implied warranties, including without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non-infringement, as well as any warranty arising from course of performance, course of dealing, or usage in trade.

Intel, the Intel logo, Intel Optane, and Xeon are trademarks of Intel Corporation in the U.S. and/or other countries.

*Other names and brands may be claimed as the property of others.

© 2018 Intel Corporation.

Printed in USA   0818/KM/PRW/PDF   Please Recycle   336177-004US