

## SOLUTION BRIEF

Intel® Select Solutions | Version 2  
Enterprise Data Center Infrastructure  
2nd Generation Intel® Xeon® Scalable Processors  
July 2019



# Intel® Select Solutions for VMware vSAN\*

**Simplify deployment of a scalable hyperconverged solution designed specifically for demanding workloads.**



Modern businesses need infrastructure designed to handle the needs of data-hungry workloads in the data center. In-memory databases, complex analytics applications, and high density virtual desktop infrastructure (VDI) deployments all require infrastructure that provides scalability, performance, security, and manageability. Many enterprise workloads also require large amounts of system memory to provide peak performance; but for most businesses, simply expanding DRAM is not viable due to cost and capacity limitations.

Intel® Select Solutions for VMware vSAN\* deliver preconfigured solutions, optimized by VMware and Intel, that are built on high-performing infrastructure designed to handle demanding, latency-sensitive use cases. In 2019, Intel and VMware created a second version of Intel Select Solutions for VMware vSAN that goes beyond the capabilities of the prior-generation of Intel Select Solutions for VMware vSAN by specifically facilitating performance for memory-constrained workloads.

These Intel Select Solutions power VMware vSAN and VMware vSphere\* deployments with Intel® Optane™ DC Solid State Drives (SSDs), Intel® 3D NAND SSDs, 2nd Generation Intel® Xeon® Scalable processors, Intel® Ethernet Network Adapters, and other Intel® technologies. In addition, solutions are available with Intel Optane DC persistent memory with VMware\* approval, which can help overcome the cost and capacity limitations of DRAM for performance-critical use cases.

### **VMware vSAN**

VMware vSAN is a powerful storage platform that serves as a critical building block for the software-defined data center and for private and public cloud deployments. vSAN offers organizations high availability, security, and performance, and it seamlessly integrates with VMware vSphere as a native hyperconverged infrastructure solution for business-critical apps, consolidated VDI, mixed-workload infrastructure, and more.

VMware vSAN can also simplify operations and reduce operational costs because administrators can use the same familiar tools to manage both compute and storage at the virtual machine (VM) level without the need for additional, specialized expertise.

## VMware vSAN ReadyNode\* Certification

The VMware vSAN ReadyNode\* certification program provides assurance to data-center infrastructure 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 the additional verification of 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 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 2nd Generation Intel Xeon Scalable processors, Intel Optane DC persistent memory, Intel Optane DC SSDs, Intel 3D NAND SSDs, and the Intel® Ethernet 700 Series, so your business can quickly deploy reliable, comprehensive VMware vSAN hyperconverged infrastructure built on a performance-optimized platform that offers higher capacity memory for demanding applications and workloads.

### 2nd Generation Intel® Xeon® Scalable Processors

Intel Select Solutions for VMware vSAN feature the performance and capabilities of 2nd Generation Intel Xeon Scalable processors, which are designed for the most demanding data-centric and in-memory database workloads. These processors incorporate a performance-optimized multi-chip package that delivers up to 48 cores per CPU, 12 DDR4 memory channels per socket, and support for Intel Optane DC persistent memory DIMMs, which provide large capacity memory to the system.

For the “Base” configuration, the Intel Xeon Gold 6230 processor provides an optimized balance of price and performance in a mainstream configuration. The Intel Xeon Gold 6252 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® Optane™ DC Technology

Intel Optane DC technology fills critical gaps in the storage and memory hierarchy, enabling data centers to accelerate

## What Are Intel® Select Solutions?

Intel Select Solutions are pre-defined, workload-optimized solutions designed to minimize the challenges of infrastructure evaluation and deployment. Solutions are validated by OEMs/ODMs, certified by ISVs, and verified by Intel. Intel develops these solutions in extensive collaboration with hardware, software, and operating system vendor partners and with the world's leading data center and service providers. Every Intel Select Solution is a tailored combination of Intel® data center compute, memory, storage, and network technologies that delivers predictable, trusted, and compelling performance.

To refer to a solution as an Intel Select Solution, a vendor must:

1. Meet the software and hardware stack requirements outlined by the solution's reference-design specifications
2. Replicate or exceed established reference-benchmark test results
3. Publish a solution brief and a detailed implementation guide to facilitate customer deployment

Solution providers can also develop their own optimizations in order to give end customers a simpler, more consistent deployment experience.

their access to data. This technology also disrupts the memory and storage tier, delivering persistent memory, large memory pools, fast caching, and storage in a variety of products and solutions.

### Intel Optane DC Persistent Memory

Intel Optane DC persistent memory offers high density—up to 512 GB per module—for a lower cost per gigabyte of memory than that of traditional DRAM DIMMs. Organizations can use Intel Optane DC persistent memory for VMware vSAN deployments, with VMware approval, to cost effectively expand the capacity of memory available to support more or larger VMs in VDI deployments, or higher quantities of “hot” data available for processing with in-memory databases, analytics, and other demanding workloads.

### Intel Optane DC SSDs and Intel® 3D NAND SSDs

VMware vSAN performs best when 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 are used to power the cache tier in these 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.<sup>1</sup> The capacity tier is served by Intel 3D NAND SSDs, delivering optimized read performance with a combination of data integrity, performance consistency, and drive reliability.

## 25GbE + 2nd Generation Intel Xeon Gold Processors and 10GbE + 2nd Generation Intel Xeon Gold Processors

The 10Gb and 25Gb Intel Ethernet 700 Series Network Adapters accelerate the performance of Intel Select Solutions for VMware vSAN. The Intel Ethernet 700 Series delivers validated performance ready to meet high-quality thresholds for data resiliency and service reliability with broad interoperability.<sup>2</sup> All Intel Ethernet products are backed by worldwide pre- and post-sales support and offer a limited lifetime warranty.

### Verified Performance through Benchmark Testing

Intel Select Solutions are verified to meet a specified minimum level of workload-optimized performance capabilities. With the emergence and increased deployment of larger and more mission-critical VMs on VMware vSAN, Intel and VMware have tested against a range of benchmarks. The current VMmark 3.1\* benchmark is CPU intensive and was not designed to benchmark larger

memory configurations, so Intel and VMware created a new test methodology (modified VMmark 3.1) for incremental memory for VMmark. This methodology was used to build and optimize the Intel Select Solutions for VMware vSAN configurations. If a configuration contains Intel Optane DC persistent memory, it is recommended that the solution be verified using the modified VMmark 3.1 benchmark.

### 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. Customers can upgrade or expand on either of these configurations for additional capacity or performance.

**Table 1. Hardware and firmware components for version 2 of 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 6230 processor (2.10 GHz, 20 cores/40 threads), or a higher number Intel Xeon Scalable processor	2 x Intel Xeon Gold 6252 processor (2.10 GHz, 24 cores/48 threads), or a higher number Intel Xeon Scalable processor
MEMORY	384 GB or higher (12 x 32 GB 2666 MHz DDR4 DIMM)	512 GB or higher (4 x 128 GB Intel® Optane™ DC persistent memory) 128 GB (8 x 16 GB 2666 MHz DDR4 DIMM)
BOOT DRIVE	2 x Intel® SSD DC S4510 or higher, 480 GB or larger**	2 x Intel SSD DC S4510 or higher, 480 GB or larger**
STORAGE	<b>Cache tier:</b> 2 x Intel Optane SSD DC P4800X or higher, 375 GB or larger <b>Capacity tier:</b> 6 x Intel SSD DC P4510 or higher, 2 TB or larger	<b>Cache tier:</b> 2 x Intel Optane SSD DC P4800X or higher, 375 GB or larger <b>Capacity tier:</b> 6 x Intel SSD DC P4510 or higher, 2 TB or larger
DATA NETWORK	10Gb Intel® C620 Series Chipset with integrated Intel® Ethernet Connection X722 and Intel® Ethernet Network Connection OCP X527-DA2**  or 2 x 25Gb Intel® Ethernet Converged Network Adapter XXV-DA2 (Intel® Ethernet CNA XXV-DA2)**	2 x 25 Gb Intel Ethernet CNA XXV-DA2**
MANAGEMENT NETWORK	1 gigabit Ethernet (GbE) management network	1 GbE management network
TOP-OF-RACK (TOR) SWITCH	10 GbE, 25 GbE, or 40 GbE SFP+ switch with redundancy**	25 GbE or 40 GbE SFP+ switch with redundancy**
MANAGEMENT SWITCH	1 GbE switch**	1 GbE switch**
DISK GROUPS	Minimum 2 per node	Minimum 2 per node
SOFTWARE		
VMWARE VSAN	6.7 U1 or higher	6.7 U1 or higher
VMWARE ESXI*	6.7 U1 or higher	6.7 U1 or higher
VMMARK*	3.1	3.1
WINDOWS SERVER*	2016/2019**	2016/2019**

OTHER

TRUSTED PLATFORM MODULE (TPM)	TPM 2.0	TPM 2.0
FIRMWARE AND SOFTWARE OPTIMIZATIONS	<p>ESXi power-management configuration: high performance</p> <p>Intel® Volume Management Device (Intel® VMD): NVMe Express* (NVMe*) SSD management</p> <p>Intel® Hyper-Threading Technology (Intel® HT Technology) enabled</p> <p>Intel® Turbo Boost Technology enabled</p> <p>Intel® Speed Shift Technology, hardware P-states (HWP) native</p> <p>Power-management settings optimized for performance</p>	<p>ESXi power-management configuration: high performance</p> <p>Intel VMD: NVMe SSD management</p> <p>Intel HT Technology enabled</p> <p>Intel Turbo Boost Technology enabled</p> <p>Intel Speed Shift Technology, HWP native</p> <p>Power-management settings optimized for performance</p>

**MINIMUM PERFORMANCE STANDARDS (GENERALLY AVAILABLE VMARK 3.1 SCORES)**

Verified to meet or exceed the following minimum performance capabilities:<sup>3</sup>

GENERALLY AVAILABLE VMARK 3.1 SCORE	7.0 or higher	7.0 or higher
GENERALLY AVAILABLE VMARK 3.1 TILE COUNT	8	9
BUSINESS VALUE OF CHOOSING A PLUS CONFIGURATION OVER A BASE CONFIGURATION	With the Plus configuration of Intel Select Solutions for VMware vSAN shown above, businesses can achieve at least 60 percent higher VM density and up to 5 percent cost reduction per VM, as measured by the modified version of VMmark 3.1 benchmark scores. <sup>3</sup>	

\*\*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 Express\* (NVMe\*) SSDs from the 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.
- Trusted Platform Module (TPM) 2.0:** Protects the system start-up process by ensuring it is tamper-free before releasing system control to the operating system. TPM 2.0 also provides secured storage for sensitive data, such as security keys and passwords, and performs encryption and hash functions. Intel® Trusted Execution Technology (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® Xeon® Scalable Processors**

2nd Generation Intel Xeon Scalable processors:

- Offer high scalability that is cost-efficient and flexible, from the multi-cloud to the intelligent edge
- Establish a seamless performance foundation to help accelerate data's transformative impact
- Support breakthrough Intel® Optane™ DC persistent memory technology
- Accelerate artificial-intelligence (AI) performance and help deliver AI readiness across the data center
- Provide hardware-enhanced platform protection and threat monitoring



- **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® 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 Hyperconverged 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 and additional memory capacity that hyperconverged infrastructures need and demand—without the time and hassle required to tune the stack. (Visit [intel.com/selectsolutions](https://intel.com/selectsolutions) for more information on Intel Select Solutions.)

### Learn More

Intel Select Solutions for VMware vSAN web page: [intel.com/content/www/us/en/products/solutions/select-solutions/cloud/vmware-vsan.html](https://intel.com/content/www/us/en/products/solutions/select-solutions/cloud/vmware-vsan.html)

Intel Xeon Scalable processors: [intel.com/xeonscalable](https://intel.com/xeonscalable)

Intel Optane DC technology: [intel.com/optane](https://intel.com/optane)

Intel Optane DC persistent memory: [intel.com/content/www/us/en/architecture-and-technology/optane-dc-persistent-memory.html](https://intel.com/content/www/us/en/architecture-and-technology/optane-dc-persistent-memory.html)

Intel SSD Data Center Family: [intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds.html](https://intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds.html)

Intel Ethernet 700 Series: [intel.com/ethernet](https://intel.com/ethernet)

Intel Select Solutions are supported by Intel® Builders: [builders.intel.com](https://builders.intel.com). Follow us on Twitter: [#IntelBuilders](https://twitter.com/IntelBuilders)

VMware vSAN: [vmware.com/vsan](https://vmware.com/vsan)

Intel and VMware alliance information: [intel.com/vmware](https://intel.com/vmware)



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

<sup>2</sup> The Intel® Ethernet 700 Series includes extensively tested network adapters, accessories (optics and cables), hardware, and software, in addition to broad operating system support. A full list of the product portfolio's solutions is available at [intel.com/ethernet](https://www.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®, and VMware ESXi®. Supported connections and media types for the Intel Ethernet 700 Series are: direct-attach copper and fiber SR/LR (QSFP+, SFP+, SFP28, XLPP/CR4, 25G-CA/25G-SR/25G-LR), twisted-pair copper (1000BASE-T/10GBASE-T), backplane (XLAUI/XAUI/SFI/KR/KR4/KX/SGMII). Note that Intel is the only vendor offering the QSFP+ media type. The Intel Ethernet 700 Series supported speeds include 10GbE, 25GbE, 40GbE.

<sup>3</sup> Intel internal testing as of March 31, 2019. **Base configuration:** four nodes, 2 x Intel® Xeon® Gold 6230 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, Intel® Volume Management Device (Intel® VMD) enabled, storage (boot): 1 x 960 GB Intel® SSD 3520 M.2 SATA, storage (cache): 2 x 375 GB Intel® Optane™ SSD DC P4800X PCIe™ with NVM Express® (NVMe™), storage (capacity): 6 x 2 TB Intel SSD DC P4510 PCIe with NVMe; network devices: 1 x 25Gb Intel® Ethernet Converged Network Adapter XX710-DA2, network speed: 10 GbE, OS/software: VMware vSphere 6.7.0\*, build 10764712. **Plus configuration:** four nodes, 2 x Intel Xeon Gold 6252 processor, Intel Server Board S2600WFT, total memory: 512 GB Intel® Optane™ DC persistent memory, 4 slots/128 GB/2,666 MT/s and 128 GB 8 slots/16 GB/2,666 MT/s DDR4 RDIMM, Intel HT enabled, Intel Turbo Boost Technology enabled, Intel VMD enabled, storage (boot): 1 x 960 GB Intel SSD 3520 M.2 SATA, storage (cache): 2 x 375 GB Intel Optane SSD DC P4800X PCIe with NVMe, storage (capacity): 6 x 2 TB Intel SSD DC P4510 PCIe with NVMe; network devices: 1 x 25Gb Intel Ethernet Converged Network Adapter XX710-DA2, network speed: 25 GbE, OS/software: vSphere 6.7.0, build 10764712.

Performance results are based on testing as of the date set forth in the configurations and may not reflect all publicly available security updates. See configuration disclosure for details. No product or component 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](https://www.intel.com/benchmarks).

Cost reduction scenarios described are intended as examples of how a given Intel-based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

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