

Solution Brief

Intel® Select Solutions
Multi-cloud
2nd Generation Intel® Xeon® Scalable processors
August 2020



Intel Select Solutions for Google Cloud's Anthos

Simplify deployment of an optimized, tested, scalable hybrid and multi-cloud hyperconverged solution.



In today's increasingly competitive landscape, enterprise businesses face a stark choice: transform or get left behind. Digital transformation means providing the best experience for customers, along with flexibility, security, and affordability. But legacy infrastructure can hinder change through siloed apps, slow deployments, and network bottlenecks. Legacy systems are also more vulnerable to security issues from larger attack surfaces and the growing number of sophisticated threats designed to outsmart older technologies.

The need for modernization is clear, but how do you get there with limited budget, staff, and time? The pressures are strong to do more with less and to reduce total cost of ownership (TCO). Most organizations see hybrid clouds as the optimal way to provide the flexibility needed for digital transformation, but they don't know how to get there quickly and affordably with the security and scalability they need. Intel Select Solutions for Google Cloud's Anthos can simplify your move to a hybrid or multi-cloud solution by offering pre-tested, validated solutions that make use of your existing VMware vSphere and VMware vSAN environment. The solutions allow you to quickly and easily deploy and manage apps and workloads using virtual machines (VMs) or Kubernetes containers across your on-premises environment, on your hybrid cloud, or to your preferred cloud provider.

Anthos on VMware vSAN and Intel architecture

Anthos comprises a Google Cloud managed software stack powered by industry-leading application-modernization technologies. Intel has architected a hardware stack optimized for running Anthos, and it is designed to help transform IT operations and enable DevOps to more easily build applications on premises and in the cloud. Anthos provides:

- **Flexibility:** Enables unified cloud-resource management, seamless application portability, and data mobility across cloud environments, on premises, and with public cloud providers (including Google Cloud, Amazon Web Services [AWS], and Microsoft Azure), all powered by Intel architecture.
- **Ease of app deployment:** Lets you deploy new and existing applications with containers, microservices architecture, and a service mesh delivered and managed by Google Cloud and built on Intel architecture. Enables faster time to market and reduces administrative overhead.
- **Scalability:** Helps you securely and reliably scale, manage, and extend workloads from enterprise to cloud, without the need for reconfiguration, application changes, or testing.

Google Cloud's Anthos works with a new or existing VMware environment, which simplifies deployment and management. In addition, you can make use of VMware vSAN hyperconverged infrastructure, which can help lower your TCO, compared to converged solutions. VMware vSAN offers organizations high availability, improved security, and performance, and it seamlessly integrates with VMware vSphere as a native hyperconverged infrastructure solution for business-critical apps, consolidated virtual desktop infrastructures (VDIs), mixed-workload infrastructures, and more.

Intel Select Solutions for Google Cloud's Anthos

To simplify deployment and configuration of Google Cloud's Anthos, Intel has developed Intel Select Solutions for Google Cloud's Anthos—hyperconverged solutions built on a familiar VMware stack and tools, and designed to integrate seamlessly with Google Cloud. Intel Select Solutions for Google Cloud's Anthos allow users to run concurrent database and analytics jobs without sacrificing application responsiveness and job throughput. The solutions include Google Kubernetes Engine (GKE) On-Prem on VMware vSphere using the VMware ESXi private cloud deployment model. They also make use of vSAN storage, but they can support remote storage as an alternative to a hyperconverged infrastructure deployment.

Intel Select Solutions for Google Cloud's Anthos are built with Intel hardware technologies that are part of the VMware hardware-compatibility list. In addition, the solutions are built using Intel-verified platforms and reference designs for vSAN, following tight specifications from Intel and VMware. Intel Select Solutions for Google Cloud's Anthos are also tested and verified by Intel for balanced and optimized performance—from the hardware up through the firmware stack to the vSAN software and GKE On-Prem.

The solutions, available from a variety of data center solution providers, allow you to quickly implement a hybrid cloud without wading through multiple options or conducting extensive, system-level testing. Intel Select Solutions for Google Cloud's Anthos:

- Are performance-optimized specifically for 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
- Combine the freedom of an open platform with optimized performance on Intel hardware
- Benefit from years of engineering partnership between Intel and Google

Hardware selections

Intel Select Solutions for Google Cloud's Anthos combine 2nd Generation Intel Xeon Scalable processors, Intel® Optane™ persistent memory (PMem), Intel Optane Solid State Drives (SSDs), Intel 3D NAND SSDs, and

the Intel Ethernet 700 Series, so your business can quickly deploy reliable, comprehensive VMware hyperconverged infrastructure with the Anthos software stack, built on a performance-optimized platform that offers high-capacity memory for demanding applications and workloads.

2nd Generation Intel Xeon Scalable processors

Intel Select Solutions for Google Cloud's Anthos 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 56 cores per CPU, 12 DDR4 memory channels per socket, and support for Intel Optane PMem DIMMs, which provide large-capacity memory to the system.

For the “Base” configuration, the Intel Xeon Gold 5218 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 technology

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

Intel Optane PMem 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 PMem for 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. (For more information on using Intel Optane PMem with VMware vSphere, see <https://blogs.vmware.com/vsphere/2019/04/announcing-vmware-vsphere-support-for-intel-optane-dc-persistent-memory-technology-code-named-apache-pass.html>.)

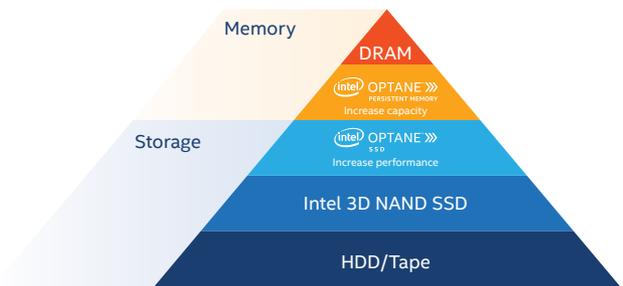


Figure 1. Intel Optane technology fills memory and storage performance gaps in the data center

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 reference-design specifications
2. Replicate or exceed established reference-benchmark test results
3. Publish solution content to facilitate customer deployment

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

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 PMem technology
 - Accelerate artificial-intelligence (AI) performance and help deliver AI readiness across the data center
 - Provide hardware-enhanced platform protection and threat monitoring

Solution powered by:



Intel Optane 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 SSDs are used to power the cache tier in these Intel Select Solutions. Intel Optane 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, delivering optimized read performance with a combination of data integrity, performance consistency, and drive reliability.

25GbE 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 Google Cloud's Anthos. The Intel Ethernet 700 Series delivers validated performance ready to meet high-quality thresholds for data resiliency and service reliability with broad interoperability.² 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.

The configurations selected by Google and Intel are ideal for multi-purpose, multi-tenant virtualized environments. They make use of the hardware and software optimizations initially

done by Intel and VMware for a VMware vSAN environment, and they were tested using VMware VMmark on Intel Select Solutions for VMware vSAN (see [intel.com/content/www/us/en/products/docs/select-solutions/vmware-vsan-ver-2-brief.html](https://www.intel.com/content/www/us/en/products/docs/select-solutions/vmware-vsan-ver-2-brief.html) for details). Because many enterprise and cloud service providers will be running a range of analytics workloads on these solutions, Google and Intel set out to test different databases and analytics workloads to replicate real-world usage situations for multi-clouds and help organizations better size their investments and deployment models. The Intel and Google workload optimization and configuration testing was focused on ensuring low-latency application performance responsiveness, while running both single and multiple concurrent analytics jobs and measuring overall throughput performance.

Intel Select Solutions for Google Cloud's Anthos were initially benchmarked with Redis, an open source, in-memory data structure store, used by many cloud service providers as a database, cache, and message broker. During the development of this solution, Intel and Google solution engineers deployed multiple Redis database instances running over containers to better understand application performance in the types of multi-purpose, multi-tenant environments that allow cloud service providers to enhance business productivity while maintaining high service-level availability.

Intel and Google remain committed to continue testing with other databases to provide additional insights and tools to help both cloud service providers and IT organizations understand how to best configure and deploy scalable, multi-cloud environments for improved business benefits and returns on investment (ROIs).

Base and Plus configurations

Intel Select Solutions for Google Cloud's Anthos include two configurations. The Base configuration specifies the minimum required performance capability for Intel Select Solutions for Google Cloud's Anthos, 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.

This solution has been tested to ensure it meets well-established high performance and reliability standards for single-instance Redis database deployments over containers or bare metal.

Customers can upgrade or expand on either of these configurations for additional capacity or performance. The Plus configuration utilizes higher performance 2nd Generation Intel Xeon Scalable processors, Intel Optane PMem, and the latest VMware software.

Table 1. Hardware and firmware components for Intel Select Solutions for Google Cloud's Anthos Base and Plus configurations

INGREDIENT	INTEL SELECT SOLUTIONS FOR GOOGLE CLOUD'S ANTHOS BASE CONFIGURATION	INTEL SELECT SOLUTIONS FOR GOOGLE CLOUD'S ANTHOS PLUS CONFIGURATION
NUMBER OF HYPERCONVERGED NODES	4-node configuration	4-node configuration
PROCESSOR	2 x Intel Xeon Gold 5218 processor (2.30 GHz, 16 cores/32 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	256 GB or higher (8 x 32 GB 2,666 MHz DDR4 RDIMMs)	512 GB or higher (4 x 128 GB Intel Optane PMem) and 128 GB (8 x 16 GB 2,666 MHz DDR4 RDIMMs)
BOOT DRIVE	1 x Intel SSD DC S4510 or higher, 240 GB or larger*	2 x Intel SSD DC S4510 or higher, 240 GB or larger*
STORAGE	Cache tier: 1 x Intel Optane SSD P4800X, 375 GB or larger Capacity tier: 4 x Intel SSD DC P4510 or higher, 2.0 TB or larger	Cache tier: 2 x Intel Optane SSD P4800X, 375 GB or larger Capacity tier: 4 x Intel SSD DC P4510 PCIe with NVMe Express (NVMe) or higher, 2 TB or larger
DATA NETWORK	1 x 10Gb Intel Ethernet Converged Network Adapter X710-DA2, 1 x 25Gb Intel Ethernet Converged Network Adapter XXV710-DA2, or 1 x 10Gb Intel C620 Series Chipset with integrated Intel Ethernet Network Adapter X722 and Intel Ethernet Network Connection OCP X527-DA2*	1 x 25Gb Intel Ethernet Converged Network Adapter XXV710-DA2 or 1 x 40Gb Intel Ethernet Converged Network Adapter XL710-QDA2*
MANAGEMENT NETWORK	1 gigabit Ethernet (GbE) management network	1 gigabit Ethernet (GbE) management switch
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 1 per node	Minimum 2 per node
SOFTWARE		
VMWARE VSAN	6.5.0-3.96.13932383	6.5.0-3.96.13932383
VMWARE ESXI	6.5 U3	6.5 U3
VMWARE VCENTER	6.5.0.30100 (14156547)	6.5.0.30100 (14156547)
VMWARE VSPHERE	6.7 U3 or later	6.7 U3 or later
GOOGLE CLOUD'S ANTHOS	1.4.0 or later	1.4.0 or later
KUBERNETES	1.16.8-gke.6 or later	1.16.8-gke.6 or later
LOAD BALANCER	See recommendations for Google Anthos load-balancer options at https://cloud.google.com/anthos/gke/docs/on-prem/how-to/setup-load-balance	

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 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, 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>

*Recommended, not required

Technology selections for Intel Select Solutions for Google Cloud's Anthos

In addition to the Intel hardware foundation of Intel Select Solutions for Google Cloud's Anthos, 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 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 hybrid cloud hyperconverged infrastructure with Intel Select Solutions for Google Cloud's Anthos

Intel Select Solutions help you modernize your business with optimized configurations verified for 2nd Generation Intel Xeon Scalable processors. Intel Select Solutions for Google Cloud's Anthos offer a fast-track to deploying a hybrid cloud platform with optimized performance and the additional memory capacity that hyperconverged infrastructures need and demand—without the time and hassle required to research, deploy, and tune the stack. (Visit intel.com/selectsolutions for more information on Intel Select Solutions.)

Learn More

Intel Select Solutions web page: [intel.com/content/www/us/en/architecture-and-technology/intel-select-solutions-overview.html](https://www.intel.com/content/www/us/en/architecture-and-technology/intel-select-solutions-overview.html)

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

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

Intel Ethernet products: [intel.com/content/www/us/en/products/network-io/ethernet.html](https://www.intel.com/content/www/us/en/products/network-io/ethernet.html)

Intel blog post: "Data-hungry workloads in your VMware vSAN based data center?" <https://itpeernetwork.intel.com/vsan-optane-scalable/>

Intel Optane persistent memory: [intel.com/content/www/us/en/architecture-and-technology/optane-dc-persistent-memory.html](https://www.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://www.intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds.html)

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

Google Cloud's Anthos: <https://cloud.google.com/anthos/>

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

Where to buy: [intel.com/content/www/us/en/products/docs/select-solutions/where-to-buy.html](https://www.intel.com/content/www/us/en/products/docs/select-solutions/where-to-buy.html)



¹ Based on internal Intel testing. Source: 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).

² 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, XLPP1/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, and 40GbE.

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 www.intel.com/benchmarks.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. **No product or component can be absolutely secure.**

Your costs and results may vary.

Intel technologies may require enabled hardware, software or service activation.

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