

Intel® Select Solutions for Sangfor HCI & SDS



“We were thrilled to work with Intel. By integrating our software and hardware, we were able to deliver more value to our users. The Intel® Select Solutions for Sangfor HCI & SDS are now an industry best practice for optimizing software and hardware for more agility, efficiency, and security. We hope these solutions will help more users build optimized data centers to accelerate digital transformation and realize the business value maximization.

- **Chen Yanbin**
Vice President

Sangfor Technologies Co., Ltd.

With the rapid pace of digital transformation, the world's most successful businesses are constantly seeking new ways to apply technology to meet needs that are ever more demanding and complex. More and more organizations are transitioning from steady-state systems to flexible and powerful "dual-mode" systems in which steady-state and agile-state systems co-exist.

Against this backdrop, steady-state core business systems, such as office automation (OA), mail, and enterprise resource management systems (ERP), must meet mounting demand for data access. This means that systems need to be highly available and high performing with low latency. Meanwhile, developments in agile-state services, such as Web, mobile apps, and big data, have introduced more complexity due to an increase in data calls and interactions. Finally, organizations are also dealing with rapidly growing volumes of unstructured data, and are therefore facing more demanding requirements for data storage and processing capability in data centers.

While updating existing data center infrastructure or building new systems, organizations are faced with a number of pain points, such as high maintenance costs, scalability issues, short life cycles, inefficiencies in processing massive volumes of data, and data silos. With Sangfor technologies as core components, Intel Select Solutions for Sangfor HCI & SDS tackle these issues with a solution based on 2nd Gen Intel® Xeon® Scalable processors, Intel® Optane™ persistent memory, Intel® Optane™ SSD DC P4800X Series, Intel® SSD D3-S4510 Series, and Intel® Ethernet Network Adapter X710-DA2.

Intel Select Solutions for Sangfor HCI & SDS allows organizations to accelerate digital transformation for data center modernization. Not only are these solutions able to satisfy the more rigorous processing performance capabilities needed for digital transformation, they also reduce TCO and improve IT agility and innovation through automation and resource integration. The performance of Intel Select Solutions for Sangfor HCI & SDS has been verified and optimized, providing an important reference for customers seeking to deploy software-defined data centers in industries such as government, education, manufacturing, radio and television, healthcare, and finance.

Sangfor Software-defined Data Center Architecture for Steady-state and Agile-state Applications

Sangfor software-defined data center architecture includes products such as cloud management platforms, virtualization products, and PaaS. The key products implemented in these Intel Select Solutions are Sangfor Hyper-Converged Infrastructure (HCI) and Sangfor Enterprise Distributed Storage (EDS).

Sangfor HCI

Sangfor HCI uses virtualization technology to create standard hyper-converged units that integrate computing, storage, network, and security functions into a standard X86 server. Multiple hyper-converged units are then networked into an overall data center IT infrastructure, which is then managed through a unified web platform for visualized central operation and maintenance. This enables users to build a secure, reliable, easy-to-use, and seamless new IT architecture that saves time, remains flexible, and provides a wide range of services.

Users may choose to build their private clouds in different ways depending on existing infrastructures, budgets, and needs. With this in mind, Sangfor uses a hybrid cloud platform with unified architecture. Specifically, Sangfor provides a solution combining a hyper-converged platform with a hybrid cloud management center for users who intend to build cloud platforms that incorporate legacy resources, a full set of hyper-converged hybrid cloud solutions for users who intend to build new cloud platforms, and a cloud management center that is actively compatible with and can be incorporated into legacy platforms for users with existing cloud platforms.

- **Supporting a wide variety of services:** In addition to focusing on traditional, steady-state services (i.e. SAP, ERP, Oracle, etc.), Sangfor HCI also supports new agile-state applications (i.e. GPU, K8s, big data, etc.) to ensure business stability, security, and flexibility.
- **Performance optimization:** AI-based performance optimization technology reduces network jitter in databases, message queues, and other applications operating in virtual environments.
- **Global security capabilities:** Sangfor HCI is designed to provide comprehensive security for platforms, virtual machines, services, and data, so that applications running on the platform meet security and other compliance requirements. Sangfor HCI also features visualized global management and linkage with security awareness systems.
- **Data reliability and backup:** Sangfor HCI employs a range of technologies, including CDP, multiple replications of data (dual or triple), virtual machine backup, application data backup, and network behavior management, to increase data reliability and ensure cross-regional data backup.

- **Simple, visualized operation and maintenance:** The platform features comprehensive resource management capabilities in line with the principle of "what you draw is what you get" to accelerate deployment of applications, shorten fault location and repair times, and enable users to intuitively understand how to use the platform with minimal training.
- **Smooth cloud evolution:** Built with hyper-converged architecture, this new IT infrastructure supports a smooth evolution to future cloud data centers. This means that organizations can easily leverage existing IT resources and architecture in the transition to a private cloud or hybrid cloud model.

Sangfor EDS

Sangfor EDS enterprise-level distributed storage platforms supports the development of agile-state services. Powered by a cloud storage engine, Sangfor EDS adopts a fully symmetrical distributed architecture, and supports the deployment of clusters, EB-level storage space, and high-performance IOPS. With built-in AI cloud brain technology, Sangfor EDS can sense service data and achieve full lifecycle data management. This solution has fully realized the storage of blocks, files, and objects on one platform, offering users cloud data storage resources for the new IT era. Not only does Sangfor EDS deliver outstanding data management capabilities, it also leverages software design to support continuous hardware development and the continuous excavation of value from user data.

- **Unified storage supports multiple service loads:** With its cloud storage engine, Sangfor EDS provides storage services for blocks, files, and objects simultaneously in order to meet the needs of multiple service loads in both structured and unstructured data scenarios. It has also built up four capabilities for handling multi-service loads - complex storage, core business processes, multi-center data storage, and visualized operation and maintenance management.

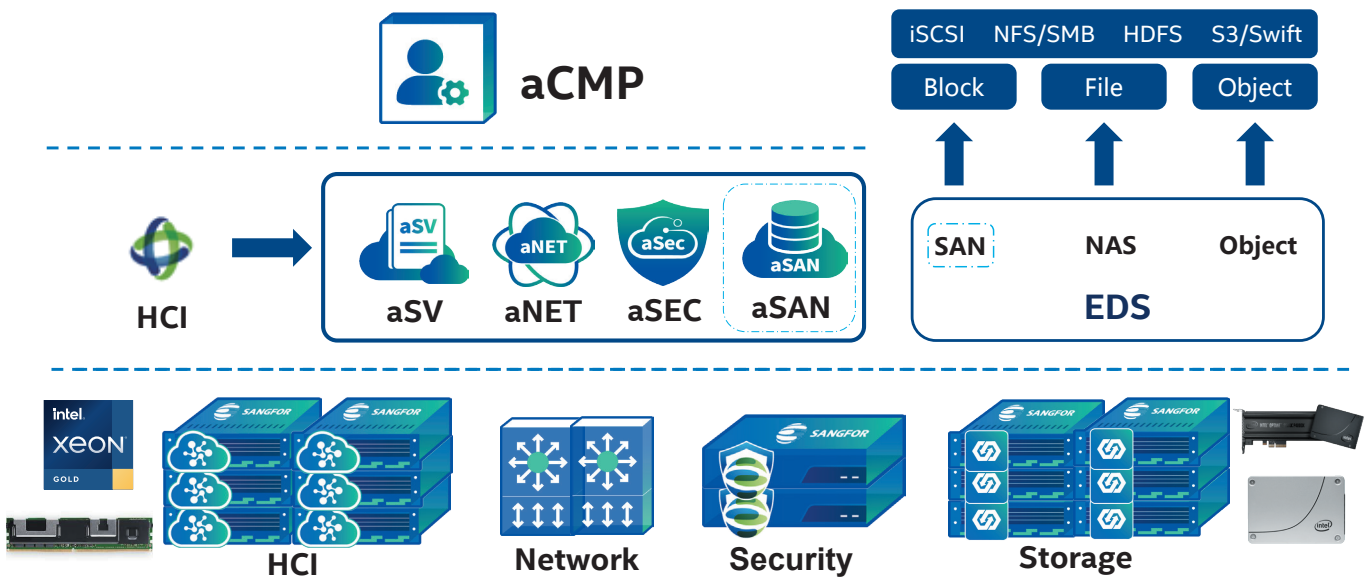


Figure 1. Sangfor software-defined data center solution architecture

- **Simplified data management:** With a built-in AI cloud brain, EDS automatically improves storage performance by enabling upward service perception and automatic configuration of data processing methods. At the same time, intelligent downward storage status monitoring enables performance planning, fault diagnostics, and data management, which maximizes storage capability while reducing complexity of operation and maintenance.
- **Multidimensional data protection and security:** By considering how data is stored and used, EDS realizes data security at the source -- through management of user permissions. Encryption deters theft of data by rendering it unusable, while access auditing ensures traceability of lost data.
- **Maximizing the value of data:** EDS provides a single platform for multi-level data copy management, meeting new deployment needs such as big data mining and analysis, while satisfying new architecture requirements, such as disaster recovery, hybrid cloud, and cloud backup. Copied data can be backed up to the public cloud, backed up for disaster recovery, used in big data mining, and more.

Intel Select Solutions for Sangfor HCI & SDS

Intel Select Solutions for Sangfor HCI & SDS are workload-optimized solutions comprising hardware and software infrastructure. With tailored designs for the construction of software-defined data centers, these solutions help users in multiple sectors quickly deploy Sangfor HCI and Sangfor EDS to build high performance software-defined data centers that are highly available, agile, and scalable, while also simplifying the decision-making process.

Designed for Sangfor HCI & SDS, these solutions feature 2nd Gen Intel Xeon Scalable processors, Intel Optane persistent memory, and Intel Ethernet Network Adapter X710-DA2. Specifically, Intel Select Solutions for Sangfor HCI & SDS feature the following advantages:

- Built on a unified storage engine with a pre-verified infrastructure platform, compatibility and stability are fully verified. Platform operation is stable and reliable, while systems are brought online more quickly.
- By integrating HCI and SDS, these solutions meet the application requirements of software-defined data centers, integrating multiple resources such as computing, storage, and network, while performing resource orchestration through a unified cloud management platform.
- 2nd Gen Intel Xeon Scalable processors and Intel SSDs deliver powerful performance that surpasses benchmarks in multiple scenarios, such as high-performance computing, mass storage of small files, and EB-level large-capacity storage.
- Intel Optane technology built in the "Plus" configuration features both memory and storage attributes, bringing data throughput performance of HCI servers and EDS to new heights. This enables high-speed processing of tens of billions of small files, provides comprehensive support for core business processes and steady-state services.

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 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.

Hardware Selections

Intel Select Solutions for Sangfor HCI & SDS include 2nd Gen Intel Xeon Scalable Processors, Intel Optane persistent memory, Intel Optane SSD DC P4800X Series, Intel SSD D3-S4510 Series, and Intel Ethernet Network Adapter X710-DA2. This will help to accelerate organizations to build or transform their data centers.

- Intel Optane SSD DC P4800X Series combines the attributes of memory and storage. Innovatively combining Intel® 3D XPoint™ memory media with Intel's advanced system memory controller and interface IP (hardware and software), this solution delivers an industry-leading combination of high throughput, low latency, high QoS, and high endurance. In terms of extended memory, this solution supports Intel Optane SSD and DRAM memory pool sharing in operating systems or applications, increasing memory while reducing cost.
- Intel Optane persistent memory delivers industry-leading throughput, low latency, high QoS, and high endurance, as well as near-memory latency, fast cache and fast storage for outstanding performance and application acceleration. Compared with DRAM-only systems, Intel Optane persistent memory offers higher memory capacity and more software service instances under the same service level agreement (SLA).
- Intel SSD D3-S4510 Series solid state drives meet demanding service level requirements while increasing server efficiency. Innovative SATA firmware and the latest generation of Intel 3D NAND make SSD D3-S4510 compatible with existing SATA setups for an easy storage upgrade. This not only improves the efficiency of read-intensive workloads, it also maintains compatibility of basic infrastructure.

- 2nd Gen Intel Xeon Scalable processors are fully workload-optimized to deliver industry-leading performance, achieving innovations across compute, network and storage while offering enhanced hardware virtualization features. 48 lanes of PCIe 3.0 bandwidth and throughput for demanding I/O-intensive workloads accelerate the transformative impact of data. In addition, built-in resource orchestration technology ensures flexible resource scheduling. The latest resource allocation technology features control and orchestration of resources, which can be used for cache and memory bandwidth management to deliver optimal QoS on specified applications.
- Intel Ethernet Converged Network Adapter X710-DA2 delivers professional network performance, and supports intelligent offloads such as virtual machine device queues (VMDq), single-root I/O virtualization (SR-IOV). It also features broad compatibility, a wide range of options and accelerators, simple installation, reliability, and a global market with world-class product support.

Technology Selections

The Intel technologies integrated in 2nd Gen Intel Xeon Scalable processors can further improve performance and reliability of Intel Select Solutions for Sangfor HCI & SDS:

- **Intel QuickAssist Technology (Intel QAT):** Chipset-based hardware acceleration for compression and cryptographic workloads that offers greater efficiency while delivering enhanced data transmission and protection for server, storage, and network infrastructures.
- **Intel Ultra Path Interconnect (Intel UPI):** Four Intel UPIs (9200 Series) and up to three Intel UPIs (8200 Series) increase platform scalability by up to two sockets (9200 Series) and up to eight sockets (8200 Series), striking the perfect balance between improved throughput and energy efficiency.
- **Intel Infrastructure Management Technologies (Intel IMT):** A type of resource-management framework that combines multiple Intel capabilities and supports platform-level detection, reporting, and configuration. Intel IMT can perform enhanced hardware monitoring, management, and control, and it can help to improve data center resource efficiency and utilization.
- **Intel Security Libraries for Data Center (Intel SecL-DC):** A set of libraries and components that enable Intel hardware-based security features. These open-source libraries are modular and provide standard APIs. Users and developers can easily integrate these APIs with cloud infrastructure for improved security.
- **Storage Performance Development Kit (SPDK):** SPDK is a set of tools, modules, and solutions for writing high performance, scalable, and user-mode storage applications. High performance and scalability are achieved through a number of key techniques, such as user mode, zero-copy, asynchronous polling, and lockless connections. SPDK uses a block device to manage various forms of back-end storage, enhancing the performance of Intel hardware, including processors, network cards, and storage

2nd Gen Intel Xeon Scalable Processors

2nd Generation Intel Xeon Scalable Processors:

- Offer high scalability to corporate data centers
- Provide higher performance for virtual infrastructures compared to previous generation of processors
- Implement outstanding resource utilization and agility
- Improve data and workload integrity for data center solutions and ensures regulatory compliance

Intel Select Solutions for Sangfor HCI & SDS recommends using 2nd Gen Intel Xeon Scalable Gold processors.



devices, and enabling high performance and scalable storage through virtualization and cross-network storage solutions.

Performance Verified through Benchmark Testing

Intel Select Solutions for Sangfor HCI & SDS have rigorous performance testing to meet a specified minimal level of workload-optimized performance capabilities.

To verify performance, Iometer, VDBench, and COSBench were used to evaluate HCI cluster block storage, EDS cluster file storage, and object storage, respectively.

- Iometer is a benchmarking and troubleshooting tool originally developed by Intel to evaluate system I/O performance, including disk and network performance. It tests hard drive performance by simulating actual application environments. Iometer provides several preset configurations that simulate actual operating environments, and also allows users to configure their own operating environments.
- VDBench is an I/O workload generator used for verifying data integrity and measuring the performance of directly attached and network attached storage.
- COSBench is a benchmarking tool used to measure the performance of Cloud Object Storage services.

Table 1 shows results of tests run on Base and Plus configurations (see Appendix 1 for detailed configurations) ¹. Results of the HCI block storage test show that the IOPS of Plus configuration is 1.86 times that of Base configuration, and data bandwidth performance under Plus configuration is 3.68 times that of the Base configuration. In the EDS file storage test, bandwidth performance of the Plus

Benchmark	HCI Block (Rand 8K 7R/3W) (IOPS)	HCI Block (B/W - Seq 1M 5R/5W) (MB/s)	EDS File (B/W - 4M 7R/3W) (MB/s)	EDS Object (4K) (Op/s)		EDS Object (B/W - 4M) (MB/s)	
				Upload	Download	Upload	Download
Intel Select - Base	32475	1633	1098	17942	23747	1386	1976
Intel Select - Plus	60446	6014	4702	36629	63696	4234	7081
Plus/Base Rate	1.86	3.68	4.28	2.04	2.68	3.05	3.68

Table 1. Results of “Base” and “Plus” configuration benchmarking

configuration is 4.28 times that of the Base configuration. In the EDS object storage (Ops-4K) test, the upload and download performance of Plus configuration is more than twice that of the Base configuration. Lastly, in the EDS object storage (B/W-4M) test, upload/download performance of the Plus configuration is more than 3 times that of the Base configuration.

The Base configuration is mainly suited to light workloads, such as running office applications and file sharing. It is ideal for organizations that are building software-defined data centers for lighter performance loads and prioritizing cost efficiency. The Plus configuration is designed for the core services of OA, ERP, and CRM, as well as agile-state services. It provides higher performance for organizations processing larger volumes of data and supporting more complex applications.

Intel Select Solutions for Sangfor HCI & SDS help enterprises build Bimodal IT to accelerate digital transformation

Sangfor and Intel have laid a solid hardware foundation for Sangfor's software-defined data center solution. Intel Select Solutions for

Sangfor HCI & SDS meet users' demand for hyper-converged architecture and enterprise distributed storage, and enable a unified, converged and fully-virtualized resource pool based on software-defined IT architecture. The solutions optimize customer investments by leveraging legacy hardware resources for a simple, on-demand new IT architecture that evolves seamlessly into cloud data centers.

Users can now access flexible and efficient infrastructure solutions to build or transform legacy resources into software-defined data centers. With Sangfor's highly scalable and easily accessible software-defined data center, they can implement the recommended configurations for pre-tested and pre-verified hyper-converged servers and enterprise storage servers. A software-defined data center based on Intel Select Solutions for Sangfor HCI & SDS will not only be capable of simple and efficient integrated delivery, it will also support convenient and unified data center management and control, thereby driving smooth implementation of traditional services while providing infrastructure support for timely data access in emerging agile-state systems.

Appendix 1: Intel Select Solutions for Sangfor HCI & SDS Base and Plus Configurations (6 Nodes, 3 HCI Nodes / 3 EDS Nodes)

Base Configuration of Intel Select Solutions for Sangfor HCI & SDS

	6 Nodes	3 x HCI Nodes	3 x EDS Nodes
Processor		2x Intel Xeon Gold 5218 processor @ 2.30GHz 16C or higher	2x Intel Xeon Silver 4210R processor @ 2.20GHz 10C or higher
Memory		192 GB or higher (12 x 16GB DDR4-2666)	64 GB or higher (4 x 16GB DDR4-2400)
Boot Drive		1x Intel SSD DC S4510 or higher series at 480 GB or larger capacity drives	1x Intel SSD DC S4510 or higher series at 480 GB or larger capacity drives
Storage Cache		2 x Intel SSD DC S4510 or higher series at 960GB or larger capacity drives	2 x Intel SSD DC S4510 or higher series at 960 GB or larger capacity drives
Storage Drive		6 x SATA HDD 7200RPM at 2 TB or higher	10 x SAS/SATA HDD at 2 TB 7200RPM or higher
Date Network		2x 10GB Dual-Port Intel Ethernet Converged Network Adapter X710-DA2 SFP+ or better	2x 10GB Dual-Port Intel Ethernet Converged Network Adapter X710-DA2 SFP+ or better

Plus Configuration of Intel Select Solutions for Sangfor HCI & SDS

	6 Nodes	3 HCI Nodes	3 EDS Nodes
Plus Config	Processor	2x Intel Xeon Gold 6226R CPU at 2.90 GHz, 16C or higher	2x Intel Xeon Gold 5218 CPU at 2.30 GHz, 16C or higher
	Memory	128 GB or higher	128 GB or higher
	Persistent Memory	512GB (4 x 128GB) Intel Optane persistent memory or higher	N/A
	Boot Drive	1x Intel SSD DC S4510 or higher series at 480 GB or larger capacity drives	1x Intel SSD DC S4510 or higher series at 480 GB or larger capacity drives
	Storage Cache	2 x Intel Optane SSD DC P4800X or higher series at 375GB or larger capacity drives	2 x Intel Optane SSD DC P4800X or higher series at 375GB or larger capacity drives
	Storage Drive	6 x SAS/SATA HDD at 2TB 7200RPM or higher	10 x Intel SSD DC S4510 or higher series at 1.92 TB or larger capacity drives
	Data Network	2x 25GB Dual-Port Intel Ethernet Converged Network Adapter XXV710-DA2 SFP28 or better	2x 25GB Dual-Port Intel Ethernet Converged Network Adapter XXV710-DA2 SFP28 or better



¹ Configuration 1 - Base: 6 nodes: 3 x HCI nodes, 2 x Intel Xeon Gold 5218 processor @ 2.30GHz, 16C, 192 GB total memory (12 x 16GB DDR4-2666), 1 x 480 GB Intel SSD DC S4510, 2 x 960 GB Intel SSD DC S4510, 6 x 2TB SATA HDD 7200RPM, 2 x 10GB Dual-Port Intel Ethernet Converged Network Adapter X710-DA2 SFP+; 3 x EDS nodes, 2 x Intel Xeon Silver 4210R processor @ 2.20GHz, 10C, 64 GB total memory (4 x 16GB DDR4-2400), 1 x 480 GB Intel SSD DC S4510, 2 x 960 GB Intel SSD DC S4510, 10 x 2TB SATA HDD 7200RPM, 2 x 10GB Dual-Port Intel Ethernet Converged Network Adapter X710-DA2 SFP+.

Configuration 1 - Plus: 6 nodes: 3 x HCI nodes, 2 x Intel Xeon Gold 6226R processor @ 2.90GHz, 16C, 128 GB total memory, 512 GB (4 x 128 GB) Intel Optane persistent memory, 1 x 480 GB Intel SSD DC S4510, 2 x 375 GB Intel Optane SSD DC P4800X, 6 x 2TB SATA HDD 7200RPM, 2 x 25GB Dual-Port Intel Ethernet Converged Network Adapter XXV710-DA2 SFP28; 3 x EDS nodes, 2 x Intel Xeon Gold 5218 processor @ 2.30GHz, 16C, 128 GB total memory, 1 x 480 GB Intel SSD DC S4510, 2 x 375 GB Intel Optane SSD DC P4800X, 10 x 2TB SATA HDD 7200RPM, 2 x 25GB Dual-Port Intel Ethernet Converged Network Adapter XXV710-DA2 SFP28.

Performance varies by use, configuration and other factors. Learn more at www.intel.com/PerformanceIndex

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