Intel® Select Solutions for Microsoft Azure Stack*

Deploy a hybrid cloud with all-flash performance on optimized infrastructure based on Azure Stack.

Intel® Select Solutions for Microsoft Azure Stack* provide a convenient way to implement a flexible and consistent hybrid cloud solution. With Azure Stack, developers can build applications using a set of tools they are already familiar with from Azure, and IT organizations gain the agility and control they need to balance the delivery of Azure services between on-premises deployments and the cloud.

Despite those benefits, businesses sometimes hesitate to implement new solutions out of concerns that they might not meet all the needs of their businesses' critical applications. To compete in the age of digital transformation, businesses require integrated systems that can support an Azure Stack deployment with high performance and low latencies for modern cloud-based and containerized apps.

Intel Select Solutions for Microsoft Azure Stack deliver all-flash, preconfigured solutions optimized by Microsoft and Intel that are designed to provide high performing infrastructure for modern computing needs. The solutions offer optimized infrastructure built on Intel® Solid State Drives (SSDs) for the data center, Intel® Xeon® Scalable processors, Intel® Ethernet Network Adapters with Internet Wide Area Remote Direct Memory Access (RDMA) Protocol (iWARP) technology, and other Intel® technologies designed to accelerate performance and reduce latency.

Azure Stack Accelerates Deployment of Hybrid Cloud Applications

Modern businesses are increasingly turning to cloud app deployments for greater speed and agility. Developers can design and deploy apps quickly in the cloud, and businesses can adjust to changing market conditions faster in order to better serve customers.

Enterprise businesses also have requirements beyond agility that might hinder or block the move to a public cloud. For example, companies need to support legacy apps that might require costly redevelopment work before they can be deployed as cloud apps. Businesses need to support apps at edge locations where reliance on continuous Internet access could be a liability. And companies need to ensure security and regulatory compliance requirements are met, but that can be challenging in a public cloud environment.

Azure Stack offers a compelling complement to public clouds because it is a hybrid cloud solution that gives organizations the flexibility to choose the right applications to run in the cloud or on premises, with a single, consistent application development process for both. With Azure Stack, organizations can more easily secure sensitive information in the data center, support legacy apps, and provide better support for locations with limited Internet connectivity, while still providing the benefits of a public cloud for fast, flexible app deployments, bursting, and other needs. Azure Stack also appeals to modern businesses because it offers a consistent DevOps environment and tools for a unified experience, from the data center to the public cloud.

Intel Select Solutions for Microsoft Azure Stack

Enterprise organizations need to ensure that their integrated Azure Stack deployments have been designed, optimized, and verified to fully support modern apps and services. Legacy infrastructure is typically unable to provide the high performance, low latency processors, storage, and networking that businesses require to accommodate highly scalable workloads and applications that are latency-sensitive.

Intel Select Solutions for Microsoft Azure Stack offer an all-flash configuration that is well suited to the high scalability requirements of modern enterprises. By investing in an all-flash infrastructure, businesses can experience the benefits of higher performance, lower latency, and more reliable storage. In addition, the hyper-converged infrastructure of Azure Stack uses resources more efficiently than solutions built with traditional storage. That helps provide a lower total cost of ownership (TCO) over time because the hyper-converged solution provides greater price/performance, along with scalability and agility to respond quickly to changing needs.

Hardware Selected for Azure Stack

Intel and Microsoft collaborated to build a cloud-inspired Intel Select Solutions reference design to meet the needs of a range of workloads running on Azure Stack. The development of this reference design will help Intel server OEM partners provide high-performance Azure Stack integrated systems that can meet IT organizations' requirements for a wide range of workloads.

Intel Select Solutions for Microsoft Azure Stack are tuned and optimized to deliver balanced performance. The solutions feature an all-flash storage architecture built on Intel SSDs, which provide high throughput with low latencies and much higher reliability than spinning hard drives. The solutions are also built with servers powered by Intel Xeon Scalable processors, high-bandwidth Intel Ethernet Network Adapters, and other Intel technologies to enhance performance, security, and manageability.

By choosing Intel Select Solutions for Microsoft Azure Stack, IT managers can reduce the time to deploy and provision new infrastructure and services that are already optimized for Azure Stack hybrid cloud deployments. These solutions use Azure Stack reference architectures on Intel optimized hardware and drivers, which can reduce the validation time required by OEMs to implement their Azure Stack design.

Verified Performance through Benchmark Testing

All Intel Select Solutions are verified to meet a specified minimum level of workload-optimized performance capabilities. For Intel Select Solutions for Microsoft Azure Stack, Intel and Microsoft chose the IOStorm* and SPECjbb2005* benchmark method to evaluate overall system performance (including CPU, network, and storage) within the Azure Stack architecture by measuring network latency and overall input/output (I/O) operations per second (IOPS).

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 deep Intel experience with industry solution providers, in addition to extensive collaboration with the world's leading data center and service providers.

To qualify as 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 customer deployment

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

These particular tools were chosen to showcase all three function models in the hyper-converged infrastructure provided by Azure Stack. Hybrid cloud models, like Azure Stack, allow customers to move workloads to the appropriate location on- or off-premises, in order to best meet workload demands. For example, by keeping workloads on-premises, customers can better ensure lower latencies and a quality of service that meets the demands of high-performance workloads.

IOStorm Diskspd* I/O Benchmark

IOStorm is a quick-deploy Azure and Azure Stack template automated within resource groups to create a scaled cluster of virtual machines (VMs) that run the Diskspd* benchmark. The Diskspd function sets the read/write ratios, block size, queue depth, and read/write metrics in order to benchmark the storage subsystem. This is deployed across the VMs to simulate disk operations in scale testing. The results of the test—higher IOPS with lower latency—showcase the benefits of having your workload on-premises by allowing the Azure Stack architecture to run efficiently with high-performance processors, storage, and networking.

SPECjbb2005* Java Server* Benchmark

The SPECjbb2005 benchmark is used to evaluate the performance of CPUs, caches, memory hierarchy, and the scalability of shared memory processors (SMPs) by measuring the number of business operations per second delivered by the solution.[1] The SPECjbb2005 workload measures performance based on the latest Java* application features, and it can highlight the performance differences between specific processor models. Higher throughput in SPECjbb2005 IOPS workloads can numerically show the performance differences of the benchmarked processors. As shown in the specifications in Table 1, the performance can improve by up to 53 percent when using the "Plus" configuration, compared to using the "Base" configuration.

Base and Plus Configurations

Intel Select Solutions for Microsoft Azure Stack include two configurations. The Base configuration specifies the minimum required performance capability for Intel Select Solutions for Microsoft Azure Stack. 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.

Azure Stack configurations start with the basic four-server scale unit with one hardware lifecycle host (HLH). The scale units can scale from four to 12 servers per deployment. All designs are based on certified Microsoft integrated-systems partner solutions: https://azure.microsoft.com/en-us/overview/azure-stack/partners/.

Technology Selections for Intel Select Solutions for Microsoft Azure Stack

Intel chose Intel Xeon Gold processors and Intel Xeon Platinum processors for Intel Select Solutions for Microsoft Azure Stack because they provide an optimized balance of price and performance. The Azure Stack appliance is a hyper-converged model in which each server is an exact replica of the others. This is important to keep in mind when estimating your Azure Stack deployment. You can save on capital expenditure (CapEx) and operational expenditure (OpEx) throughout your Azure Stack support lifecycle by establishing a solid compute footprint for today, while providing extra compute cores so you can grow with your evolving hybrid workloads.

Base Configuration Storage Solution

Throughput and low latency are critical to providing optimized performance for more demanding hybrid cloud apps. To meet the needs of modern apps for the enterprise, Intel Select Solutions for Microsoft Azure Stack recommend high-performing Intel SSD DC S4500 Series drives for the data drive and require the Intel SSD DC P4600 Series for the cache tier. Both of these Intel SSD series offer much lower latencies than traditional spinning hard-disk drives (HDDs), which makes them an ideal fit for Azure Stack hybrid cloud deployments. While the Intel SSDs are recommended, some customers continue to use HDDs for capacity at higher latencies. Augmenting your HDD storage with the Intel SSD DC P4600 Series can help to mitigate latency and enhance throughput.

Plus Configuration Storage Solution

The Plus configuration is designed for customers who require the highest-performance throughput and lowest latency for their most demanding hybrid cloud apps. The Plus configuration of Intel Select Solutions for Microsoft Azure Stack requires an all-flash storage configuration with Serial ATA (SATA)-based Intel SSD DC S4500 Series or higher-performing NVM Express* (NVMe*)-based Intel SSD DC P4500 Series drives for the data drive. Using Intel® Optane™ SSDs for caching helps eliminate data center storage bottlenecks and allows for bigger, more affordable datasets. The Intel Optane SSD DC P4800X Series enables you to realize breakthrough application performance. It is designed

to deliver 5–8 times faster performance at low-queue-depth workloads, exhibiting extremely high throughput for single accesses and extremely low latency.[2]

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

- **Intel® Platform Trust Technology (Intel® PTT) or a discrete Trusted Platform Module (TPM) 2.0**: Protects the system start-up process by ensuring the boot hardware 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.

- **iWARP**: A host-offload, host-bypass technology that allows an application to make secured data transfers directly to and from another application's memory space. iWARP is based on TCP/IP with high data throughput and low latency, and it is ideal for traffic between nodes in software-defined storage solutions. It is also highly scalable and has effective congestion-management capabilities.

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

Microsoft Azure Stack* vs. Windows Server* Software-Defined Solutions

Windows Server Software-Defined (WSSD) solutions are positioned as part of a traditional IT model, with a primary focus on virtualization at scale. Azure Stack, on the other hand, is promoted as the "edge-compute" platform for customers with three primary use cases:

1. Consistent application development that shares a common API core for DevOps solutions between Azure and Azure Stack. This simplifies the development process for launching applications in a hybrid model.

2. Security, data sovereignty, and compliance are critical. The Azure Stack hybrid cloud model allows customers to place data where needed to meet data regulations or governance requirements.

3. On-demand resources are required for some workloads. Intel Select Solutions for Azure Stack excel for workloads requiring high performance and low latency.

Table 1. The Base and Plus configurations for Intel® Select Solutions for Microsoft Azure Stack*

INGREDIENT	INTEL® SELECT SOLUTIONS FOR MICROSOFT AZURE STACK* **BASE CONFIGURATION**	INTEL SELECT SOLUTIONS FOR MICROSOFT AZURE STACK **PLUS CONFIGURATION**
PROCESSOR	2 x Intel® Xeon® Gold 6130 processor at 2.10 GHz, 16 cores/32 threads, or a higher number Intel Xeon Scalable processor	2 x Intel Xeon Platinum 8160 processor at 2.10 GHz, 24 cores/48 threads, or a higher number Intel Xeon Scalable processor
MEMORY	384 GB (12 x 32 GB 2,666 MHz DDR4 RDIMM)	768 GB (24 x 32 GB 2,666 MHz DDR4 RDIMM)
BOOT DRIVE	1 x 480 GB Intel® SSD DC S3520 Series**	2 x 480 GB Intel SSD DC S3520 Series (RAID1)**
CACHE TIER	Intel SSD DC P4600 Series (NVM Express* [NVMe*])	Intel® Optane™ SSD DC P4800X Series (NVMe)
DATA DRIVE	Intel SSD DC S4500 Series (SATA)**	Intel SSD DC P4500 Series (NVMe) or Intel SSD DC S4500 Series (SATA)
DATA NETWORK	Intel® Ethernet Network Connection OCP X527-DA2 (2 x 10 gigabit Ethernet [GbE]) or Intel Ethernet Network Connection OCP X527-DA4 (4 x 10 GbE)**	Intel Ethernet Network Connection OCP X527-DA4 (4 x 10 GbE)**
MANAGEMENT NETWORK	Integrated 1 GbE	Integrated 1 GbE
SOFTWARE	Azure Stack build 1803	Azure Stack build 1803
TRUSTED PLATFORM MODULE (TPM)	TPM 2.0 or Intel® Platform Trust Technology (Intel® PTT)	TPM 2.0 or Intel PTT
FIRMWARE AND SOFTWARE OPTIMIZATIONS	iWARP enabled** Intel® Boot Guard enabled Intel® Hyper-Threading Technology (Intel® HT Technology) enabled Intel® Turbo Boost Technology enabled Intel® Speed Shift technology, Hardware P-states (HWP) native Intel Turbo Boost Technology/HWP energy performance preference (EPP)/energy performance bias (EPB) settings set to performance Power-management settings optimized for performance	iWARP enabled** Intel Boot Guard enabled Intel HT Technology enabled Intel Turbo Boost Technology enabled Intel Speed Shift technology, Hardware P-states (HWP) native Intel Turbo Boost Technology/HWP EPP/EPB settings set to performance Power-management settings optimized for performance
MINIMUM PERFORMANCE STANDARDS	Verified to meet or exceed the following minimum performance capabilities: • IOStorm*: 187K minimum throughput (IOPS) • IOStorm: less than or equal to 540 ms average latency • SPECjbb2005*: 8.3M Java* operations per second	Verified to meet or exceed the following minimum performance capabilities: • IOStorm: 254K minimum throughput (IOPS) • IOStorm: less than or equal to 400 ms average latency • SPECjbb2005: 12.75M Java operations per second
BUSINESS VALUE OF CHOOSING A PLUS CONFIGURATION OVER A BASE CONFIGURATION	With the Plus configuration of Intel Select Solutions for Microsoft Azure Stack shown above, you can achieve up to: • 53% more SPECjbb2005 Java operations per second in the same footprint as the Base configuration • 35% more IOPS using IOStorm • 35% improved latency when using IOStorm	

**Recommended, not required

Deploy an Enterprise-Ready Hybrid Cloud with Intel Select Solutions for Microsoft Azure Stack

When businesses choose Intel Select Solutions for Microsoft Azure Stack, they get all-flash performance in a hybrid cloud–optimized configuration. The solution is designed to deploy quickly, with minimal tuning, and it can scale to meet demanding enterprise computing needs.
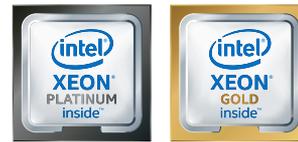
Visit intel.com/selectsolutions to learn more, and ask your infrastructure vendor for Intel Select Solutions.

Intel® Xeon® Scalable Processors

Intel Xeon Scalable processors:

- Offer high scalability for enterprise data centers
- Deliver performance gains for virtualized infrastructure compared to previous-generation processors
- Achieve exceptional resource utilization and agility
- Enable improved data and workload integrity and regulatory compliance for data center solutions

Intel® Select Solutions for Microsoft Azure Stack* feature Intel Xeon Gold processors and Intel Xeon Platinum processors.

Learn More

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