SOLUTION BRIEF

Intel® Builders
Enterprise Data Center Infrastructure

Intel® Select Solutions for Microsoft SQL Server* Business Operations

Flexible, easy-to-deploy, scalable solutions optimized for performance enable organizations to achieve their needed results.

The quantity, size, and complexity of data center workloads increases almost every day. It's crucial that those workloads run on compute, network, and storage infrastructure that is ideally tuned—and tested—to deliver optimized performance. Intel® Select Solutions for Microsoft SQL Server* Business Operations are optimized for online transaction processing (OLTP) to provide that assurance.

Intel Select Solutions are hardware and software stacks optimized for specific workloads. Intel and data center solution providers tune the configurations using Intel® Xeon® Scalable processors and Intel® technologies to help ensure enterprises receive their needed performance.

Intel Select Solutions for SQL Server Business Operations

SQL Server is one of the world's most popular relational database management systems (RDBMSs). Intel Select Solutions for SQL Server Business Operations can help minimize the time, cost, and complexity required for an enterprise to evaluate hardware and software integrations. Intel Select Solutions are tested to deliver optimum performance, improved security, reliability, and agility.

Intel Select Solutions for SQL Server Business Operations are not only optimized to meet current performance needs, they also include technologies ready to help reduce the complexity of meeting evolving data center needs.

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.

Inside Intel Select Solutions for SQL Server Business Operations

Configuration options for Intel Select Solutions for SQL Server Business Operations include "Base" and "Plus." To create these solutions:

1. Intel defined the Base and Plus configurations for the hardware, operating system, firmware, and adjacent Intel technologies.
   - The Base configuration offers mainstream performance, whereas the Plus configuration is intended for the most intensive environments. The two configurations help ensure scalability across different performance needs for different users and data center solution providers.
2. Intel performed initial stress testing.
3. Intel tuned each of the configurations.
   - This tuning included adjustments to the chosen hardware components, software, BIOS, drivers, driver version control, and firmware components.
4. Intel tested the configurations to meet the performance goals for the Intel Select Solutions Base and Plus configurations.

The result is two configurations that provide balanced solutions tuned to deliver optimum performance for SQL Server.

The benchmark test used to optimize the configurations was the HammerDB* benchmark for online transaction processing (OLTP) testing, which is based on the TPC-C* specification.[1] This OLTP benchmark simulates a medium to large wholesale supplier with multiple warehouses and a large number of users and transactions, but it can represent any business in any industry that needs to manage, sell, or distribute products or services. The OLTP workload was processed using SQL Server 2016 Enterprise edition running on the Windows Server 2016* Datacenter edition operating system.

The Intel Select Solutions for SQL Server Business Operations Hardware, Operating System, Firmware, and Technology Stack

Table 1 shows the hardware and software stacks for the Intel Select Solutions for SQL Server Business Operations. To refer to a solution as an Intel Select Solution, a data center solution provider must use these or better configurations.

Table 1. The Base and Plus configurations for Intel® Select Solutions for Microsoft SQL Server* Business Operations, optimized for OLTP

INGREDIENT	INTEL® SELECT SOLUTIONS FOR MICROSOFT SQL SERVER* BUSINESS OPERATIONS BASE CONFIGURATION	INTEL SELECT SOLUTIONS FOR MICROSOFT SQL SERVER BUSINESS OPERATIONS PLUS CONFIGURATION
PLATFORM	Intel® Server Board S2600WFT	Intel Server Board S2600WFT
PROCESSOR	2 x Intel® Xeon® Gold 6132 processor at 2.60 GHz, 14 cores/28 threads, or a higher number Intel Xeon processor	2 x Intel Xeon Gold 6148 processor at 2.40 GHz, 20 cores/ 40 threads, or a higher number Intel Xeon processor
MEMORY	192 GB (12 x 16 GB 2,666 MHz 288-pin DDR4 RDIMM)	384 GB (24 x 16 GB 2,666 MHz 288-pin DDR4 RDIMM)
BOOT DRIVE	1 x Intel® Solid State Drive (SSD) DC S3520 Series, greater than or equal to 240 GB M.2 or 2.5-inch**	2 x Intel SSD DC S3520 Series, greater than or equal to 240 GB M.2 or 2.5-inch RAID 1**
LOG DRIVE	4 x Intel SSD DC P4600 Series, 1.6 TB NVM Express* (NVMe*)**	2 x Intel® Optane™ SSD DC P4800X Series, 375 GB NVMe, or 2 x Intel SSD DC P4600 Series, 1.6 TB NVMe**
DATA DRIVE	4 x Intel SSD DC S3520 Series, 1.2 TB Serial ATA (SATA), or 4 x Intel SSD DC S4500 Series, 960 GB SATA**	4 x Intel SSD DC P4500 Series, 1.0 TB NVMe**
DATA NETWORK	Intel® C620 Series Chipset Ethernet Connection X722, or 10 gigabit Ethernet (GbE) Intel® Ethernet Converged Network Adapter X710, or Intel® Ethernet Converged Network Connection OCP X527-DA2/DA4, or 40 GbE Intel Ethernet Converged Network Adapter XL710	Intel C620 Series Chipset Ethernet Connection X722, or 10 GbE Intel Ethernet Converged Network Adapter X710, or Intel Ethernet Converged Network Connection OCP X527-DA2/ DA4, or 40 GbE Intel Ethernet Converged Network Adapter XL710
MANAGEMENT NETWORK	Integrated 1 GbE	Integrated 1 GbE
SOFTWARE	Windows Server 2016* Datacenter edition SQL Server 2016 or later	Windows Server 2016 Datacenter edition SQL Server 2016 or later
TRUSTED PLATFORM MODULE (TPM)	Trusted Platform Module (TPM) 2.0 discrete or FW TPM (Intel® Platform Trust Technology [Intel® PTT])	TPM 2.0 discrete or Intel PTT
FIRMWARE AND SOFTWARE OPTIMIZATIONS	Intel® Hyper-Threading Technology (Intel® HT Technology) enabled Intel® Turbo Boost Technology enabled Intel® Speed Shift technology, Hardware P-states (HWP) native Intel® Rapid Storage Technology enterprise (Intel® RSTe) for SATA** Intel NVMe drivers C-states disabled Operating system power management and plan set for performance	Intel HT Technology enabled Intel Turbo Boost Technology enabled Intel Speed Shift technology, HWP native Intel NVMe drivers C-states disabled Operating system power management and plan set for performance

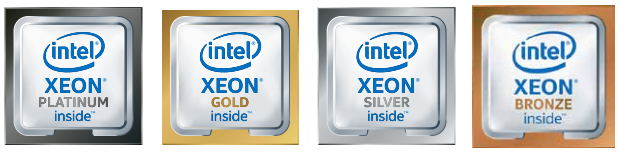
**Recommended, not required

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

The family includes Intel Xeon Bronze processors, Intel Xeon Silver processors, Intel Xeon Gold processors, and Intel Xeon Platinum processors.



Hardware Selections for the Intel Select Solutions for SQL Server Business Operations

Intel chose Intel Xeon Gold processors for the Plus and Base configurations. As part of the Intel Xeon Scalable platform, these processors have the clock speeds and Intel technologies to deliver optimal OLTP performance without relying on high core count processors. Licensing for SQL Server and Windows Server 2016 Datacenter edition is core-based, so a high-performance processor with fewer cores can help an organization manage licensing costs while optimizing performance and value.

Intel chose the Intel® Solid-State Drive (SSD) Data Center (DC) Family with a Non-Volatile Memory Express* (NVMe*) storage interface for the log-tier drives. These drives support write-intensive environments to provide the performance required to achieve high transactions per minute for OLTP. For the boot and data-tier drives, the Intel SSD DC Family provides excellent performance for read-intensive and write-intensive data operations. The Plus configuration utilizes NVMe for all drives to deliver optimal performance gains.

Technology Selections for the Intel Select Solutions for SQL Server Business Operations

In addition to the Intel hardware foundation, additional technologies provide further performance and security gains:

- **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.
- **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.
- **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.
- **Intel® Rapid Storage Technology enterprise (Intel® RSTe) for Serial ATA (SATA) and Intel NVMe drivers** (recommended): Improve data reliability and deliver greater levels of performance, responsiveness, and expandability.

Intel Select Solutions for SQL Server Business Operations Help Ensure Organizations Achieve Their Needed Performance

Intel Select Solutions are a fast path to data center transformation with workload-optimized configurations. They help ensure proven performance and the ability to scale by running on the Intel Xeon Scalable platform. Organizations can request Intel Select Solutions for SQL Server Business Operations from data center solution providers to achieve optimum performance in less time and with less tuning. Visit intel.com/selectsolutions for more information on Intel Select Solutions.

Learn More

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

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

Intel Select Solutions are supported by Intel Builders: **http://builders.intel.com**

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Microsoft SQL Server: **microsoft.com/en-US/sql-server**

[1] The HammerDB* benchmark for OLTP testing was the benchmark test used to optimize the configurations. This benchmark's OLTP workload is derived from TPC-C*, and as such is not comparable to published TPC-C results.

Benchmark results were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown." Implementation of these updates may make these results inapplicable to your device or system.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase. For more complete information about performance and benchmark results, visit 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.

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.

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