SOLUTION BRIEF

Intel® Select Solutions
SMB Data Center Infrastructure
2nd Generation Intel® Xeon® Scalable Processors
June 2020

Intel Select Solutions for Microsoft SQL Server Standard Edition

Improve SQL Server performance and capacity for your small-to-medium-sized business.

If you're a database administrator (DBA) or an IT administrator at a small-to-medium-sized business (SMB), you probably have more responsibilities than time. One of your challenges is ensuring your company has the right Windows Server software and infrastructure to meet fundamental data processing needs, including online transaction processing (OLTP), decision support system (DSS) analyses, and other reporting and analytics workloads.

At the same time, you face the reality of a limited budget and the struggle of trying to find the optimum balance between capability, features, price, and performance—especially when you don't have enough hours in your day to research, test, deploy, configure, and optimize database infrastructure and software.

That is where Intel Select Solutions can help. Over the last few years, Intel and Microsoft have collaborated to develop a suite of workload-optimized solutions for Microsoft SQL Server that cover Windows Server Datacenter edition, the Linux operating system, and now Windows Server Standard edition. All of these Intel Select Solutions showcase the advanced capabilities of Microsoft software paired with, and optimized to run with, key Intel technologies.

The latest of these offerings, Intel Select Solutions for Microsoft SQL Server Standard Edition, provide SMBs a way to reach their database price/performance goals more quickly and easily. The solutions reduce the time required to evaluate, choose, and purchase the necessary hardware components. They also minimize the time required to deploy new infrastructure, while delivering performance optimized to a specific threshold across compute, storage, and network on trusted Intel architecture.

These Intel Select Solutions offer blueprints for a better price/performance balance by using Intel® Optane™ Solid State Drives (SSDs) or Intel Optane persistent memory (PMem) to reduce database query response times by 43 percent.[1] In addition, customers and developers can make full use of Intel Optane PMem in conjunction with the SQL Server hybrid buffer pool feature. This combination increases addressable memory capacity beyond the traditional limitations when DDR memory is used.

Intel Select Solutions for Microsoft SQL Server Standard Edition help improve performance for small-to-medium-sized businesses (SMBs) by providing:

- A preconfigured, validated solution
- Optimized performance for both online transaction processing (OLTP) and decision support systems (DSSs)
- An affordable way to increase capacity for SQL Server databases
- An appropriate balance between SQL Server processing capabilities and licensing costs

SQL Server 2019 Standard edition on Windows Server

Compared to the enterprise edition, SQL Server 2019 Standard edition is a more attractive offering for SMBs that don't need enterprise-level scalability, because it provides the same programming surface area, features, and security as its higher-performing counterpart, but with a more affordable licensing cost. The standard edition also appeals to SMBs because it is ideal for mid-tier applications and data marts running on Windows Server 2019.

But what about cases where smaller organizations need fast access to larger quantities of data? SQL Server 2019 Standard edition supports the same overall 524 PB storage limit as the enterprise edition, but it limits physical CPU cores to 24 and buffer pool memory to 128 GB per database instance, which can be constraining in cases where fast access to large quantities of data is required. For some businesses, that memory limitation might be a showstopper. However, SQL Server 2019 provides a way to overcome this limit because it adds native support for Intel Optane PMem. That means organizations can make full use of the persistence, low-latency performance, and larger capacities offered by Intel Optane PMem to add an additional high-performance storage tier that lets you expand hybrid buffer pool memory beyond the inherent 128 GB limit.

Intel Select Solutions for Microsoft SQL Server Standard Edition

Intel Select Solutions for Microsoft SQL Server Standard Edition feature a popular and proven system architecture optimized for both OLTP and DSS workloads and for a range of business and data warehousing operations. The solutions provide an ideal resource balance between SQL Server 2019 data processing performance and overall infrastructure and licensing costs.

Intel Select Solutions are not only optimized to meet current performance needs, but they also include technologies ready to help reduce the complexity of meeting evolving data center needs. They can help lower the time, cost, and complexity required for an enterprise to evaluate hardware and software integrations.

Intel Select Solutions Base and Plus configurations

Intel Select Solutions for Microsoft SQL Server Standard Edition are showcased in two reference configurations, "Base" and "Plus," that have been verified to deliver high performance. These two configurations have been specially designed and pre-tested to demonstrate exceptional value, performance, security, and user experience. End customers can work with system builders, system integrators, or solution and service providers to customize these configurations to best fit their organizational needs and budgets.

The Base configuration is optimized to provide an ideal price/performance ratio for the mainstream needs of SMBs. The Plus configuration uses higher performing Intel Xeon Gold processors with Intel Optane SSDs to support higher workload density and performance. Based on Intel benchmark testing, the Plus configuration of Intel Select Solutions for Microsoft SQL Server Standard Edition can provide 43 percent faster query response times, compared to the Base configuration.[1] These same performance gains can also be achieved with alternative configurations using Intel Optane PMem to supplement DRAM.

Hardware and software selections

These Intel Select Solutions feature SQL Server 2019 Standard edition running on servers powered by 2nd Generation Intel Xeon Scalable processors, Intel Optane technology, Intel SSDs with NVM Express (NVMe), and Intel Ethernet Converged Network Adapters. This combination can help you quickly and easily deploy a SQL Server 2019 solution built on a performance-optimized platform, designed for reliability, scalability, and high security.

Intel Xeon Scalable processors

Intel Select Solutions for Microsoft SQL Server Standard Edition feature the performance and capabilities of 2nd Generation Intel Xeon Scalable processors, which provide outstanding performance across a broad range of database workloads.

For the Base configuration, the Intel Xeon Silver 4214R processor provides an optimized balance of price and performance in a mainstream configuration. A higher-number processor can also be used. The Plus configuration features the Intel Xeon Gold 6246 processor, or higher, and is optimized to support more demanding use cases. Both configurations are offered as 2 x 12-core solutions, designed to provide the maximum core count supported by SQL Server 2019 Standard edition.

Table 1. Intel Select Solutions for Microsoft SQL Server Standard Edition

COMPONENT	BASE CONFIGURATION	PLUS CONFIGURATION
CPU	Intel Xeon Silver 4214R processor	Intel Xeon Gold 6246 processor
MEMORY/STORAGE (DATA)	DDR4 DRAM	DDR4 DRAM Alternative: Intel Optane PMem (in App Direct Mode) + DDR4 DRAM
STORAGE (BOOT)	Intel SSD D3-S4510	Intel SSD D3-S4510
STORAGE (DATA)	Intel SSD DC S4510	Intel SSD DC P4510 (NVMe) Alternative: Intel SSD DC S4510
STORAGE (LOG)	Intel SSD DC P4610	Intel Optane SSD DC P4800X
NETWORK FABRIC	10 gigabit Ethernet (GbE) Intel Ethernet Converged Network Adapters	10 GbE Intel Ethernet Converged Network Adapters
SOFTWARE	Windows Server 2019 Microsoft SQL Server 2019 Standard edition	Windows Server 2019 SQL Server 2019 Standard edition

Intel Optane SSDs

Intel Optane SSDs, used in the Plus configuration, accelerate applications with low-latency transaction logging to increase transactions per minute (TPM) and decrease database query times. They provide high endurance with high performance for data center or edge-based SQL Server 2019 deployments. To provide more-reliable database performance in the data center, the Plus configuration uses the Intel Optane SSD DC P4800X for the log drive.

Intel Optane persistent memory

The Plus configuration can also be deployed using Intel Optane PMem. SQL Server 2019 Standard edition supports Intel Optane PMem through the hybrid buffer pool feature. A hybrid buffer pool allows server applications to access pages in database files directly in Intel Optane PMem, instead of referencing copies of the data pages in volatile DRAM. Because there is no capacity limitation on the amount of Intel Optane PMem used by the hybrid buffer pool, the 128 GB DRAM buffer pool limit becomes less of a constraint for your application, freeing up your ability to analyze more data, with exceptional low-latency performance and persistence.

Intel 3D NAND SSDs

Intel 3D NAND SSDs are optimized for 2nd Generation Intel Xeon Scalable processors and are designed to provide high capacity with optimal performance to accelerate access to data. Both the Base and Plus configurations use the Intel SSD D3-S4510 for the boot drive. For the data drives, the Base configuration uses the Intel SSD DC S4510, while the Plus configuration uses either the Intel SSD DC S4510 or the Intel SSD DC P4510. The Base configuration uses the Intel SSD DC P4610 for the log drive.

10Gb Intel Ethernet Network Adapters

The 10Gb Intel Ethernet 700 Series Network Adapters accelerate the performance of Intel Select Solutions for Microsoft SQL Server Standard Edition. 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

All Intel Select Solutions are verified through benchmark testing to meet a specified, minimum level of workload-optimized performance. In the case of Intel Select Solutions for Microsoft SQL Server Standard Edition, the following benchmark tests were run using HammerDB:

- Single-tenant, large OLTP[3]
- Single-tenant, large DSS[4]

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.

HammerDB workloads are designed to be reliable and scalable, and they are tested to produce accurate, repeatable, and consistent results, in addition to measuring relative, as opposed to absolute, database performance between systems.

Get more value from your SQL Server 2019 deployment

Intel Select Solutions for Microsoft SQL Server Standard Edition help minimize the time, cost, and complexity required to evaluate hardware and software integrations for SQL Server 2019. The solutions are optimized to provide an ideal price/performance ratio to fit the needs of your SMB. And by making full use of Intel Optane PMem, you can vastly expand your database's analytical capacity to gain richer insights for your business.

Learn more

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

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

Intel Optane technology: **intel.com/optane**

SQL Server 2019: **microsoft.com/en-us/sql-server/sql-server-2019**

SQL Server 2019 eBook: **https://aka.ms/sql19_ebook**

SQL Server 2019 training: **https://aka.ms/sqlworkshops**

Where to buy: **intel.com/content/www/us/en/products/docs/select-solutions/where-to-buy.html**

[1] Performance results are based on Intel internal testing as of April 6, 2020. **Base configuration:** 1-node, 2 x Intel Xeon Silver 4214R processor, 192 GB total memory (12 x 16 GB 2,933 MHz 288-pin DDR4 RDIMM), 1 x Intel Server Board S2600WFT, Intel Hyper-Threading Technology (Intel HT Technology) enabled, Intel Turbo Boost Technology enabled, storage (boot): 1 x Intel SSD D3-S4510 (240 GB, 2.5-in Serial ATA [SATA] 6 Gb/s, 3D2, TLC), storage (data drive): 8 x Intel SSD DC S4510 (960 GB SATA), storage (log drive): 2 x Intel SSD DC P4610 (1.6 TB NVMe, RAID 1), network devices: 1 x Intel Ethernet Converged Network Adapter X722-T2, network speed: 10 GbE, operating system/software: Windows Server 2019 Datacenter edition build 17763 with Microsoft SQL Server 2019 Standard edition RTM CU4. Throughput for OLTP workloads: 4.0M TPM; average query response time at scale-factor 1,000 and 7 users for DSS workloads: 115 minutes. **Plus configuration:** 1-node, 2 x Intel Xeon Gold 6246 processor, 192 GB total memory (12 x 16 GB 2,933 MHz 288-pin DDR4 RDIMM), 1 x Intel Server Board S2600WFT, Intel HT Technology enabled, Intel Turbo Boost Technology enabled, storage (boot): 1 x Intel SSD D3-S4510 (240 GB, 2.5-in SATA 6 Gb/s, 3D2, TLC), storage (data drive): 4 x Intel SSD DC P4510 (2 TB, NVMe), storage (log drive): 2 x Intel SSD DC P4800X 375 GB (NVMe, RAID 1), network devices: 1 x Intel Ethernet Converged Network Adapter X722-T2, network speed: 10 GbE, operating system/software: Windows Server 2019 Datacenter edition build 17763 with SQL Server 2019 Standard edition RTM CU4. Throughput for OLTP workloads: 4.5M TPM; average query response time at scale-factor 1,000 and 7 users for DSS workloads: 80 minutes.

[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. 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, XLPPI/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.

[3] The HammerDB TPC-C benchmark is based on the TPC-C specification for OLTP workloads. It simulates an online ordering system and is not optimized or biased towards any particular database implementation or system hardware. 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.

[4] The HammerDB TPC-H benchmark is based on the TPC-H specification for DSS workloads. It consists of a suite of business oriented ad-hoc queries. The HammerDB benchmark for DSS testing was the benchmark test used to optimize the configurations. This benchmark's DSS workload is derived from TPC-H, and as such is not comparable to published TPC-H results.

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. **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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