

# SOLUTION BRIEF

Intel® Select Solutions  
Enterprise Data Center Infrastructure  
May 2019



## Intel® Select Solutions for Microsoft SQL Server\* Enterprise Data Warehouse for Linux\*

**Extract powerful insights from big data using validated data warehouse solutions.**



The need to digitally transform is a given in today's business world. What isn't always so obvious is that digital transformation requires organizations to grow and make use of their data assets. This requirement, in turn, necessitates an infrastructure that can handle exponential growth in datasets and that can make data available for analysis within seconds of creation. Ideally, organizations need an infrastructure that can scale and grow with their data volumes and their ongoing needs. Companies that meet these requirements are ready to digitally transform, uncover new ways to create and capture value, and expand into new customer segments.

A key to unlocking the value of company data more quickly and easily is available with Intel® Select Solutions for Microsoft SQL Server\* Enterprise Data Warehouse for Linux\*, optimized for hybrid transactional/analytical processing (HTAP). Microsoft SQL Server, running on Linux, offers outstanding performance for data warehouse solutions, both for small to mid-sized businesses (SMBs) and for enterprise organizations.<sup>1</sup> And Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux ensure that a company has validated hardware and software stacks that provide a fast path for taking advantage of big data—both structured and unstructured—massive data volumes, and rapid data analysis.

### **Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux**

Organizations of all sizes, and across all vertical industries, are awash in data. The data warehousing capabilities in SQL Server allow these organizations to take advantage of big data assets. SQL Server offers support for a range of business needs, from small data marts to large enterprise data warehouses, while reducing storage needs with enhanced data compression. It can easily scale for enterprise-grade relational data warehousing—and it can integrate with non-relational sources. By using SQL Server for data warehousing, organizations can gain fast, actionable insights and predictions from structured and unstructured data while protecting their data with layers of security.

Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux are approved under the Microsoft Data Warehouse Fast Track\* for SQL Server program. The Data Warehouse Fast Track program is a joint effort between Microsoft and hardware partners. Its goal is to help enterprise customers deploy data warehouse solutions with a recommended hardware configuration appropriate for the requirements of the workload with reduced risk, cost, and complexity.

Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux can help reduce the amount of time IT organizations spend evaluating, selecting,

and purchasing optimized combinations of hardware components. They can also minimize the time required to deploy new infrastructure and deliver data warehousing performance that is optimized to a specific threshold across compute, storage, and networking resources on trusted Intel® technologies. Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux are optimized by Intel, Microsoft, and the server vendor, so IT organizations can deploy them with confidence.

### Hardware Selections

Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux, available in two configurations, combine the Intel® Xeon® Scalable processor platform, Intel® Optane™ DC solid state drives (SSDs), the Intel® SSD Data Center Family, and the Intel® Ethernet 700 Series, so your business can quickly harness a reliable, comprehensive SQL Server Enterprise Data Warehouse deployment built on a performance-optimized infrastructure.

Intel and Microsoft chose Intel Xeon Gold processors for the solutions because they provide an optimized balance of price and performance.

Low latency is paramount in a data warehouse solution; for this reason, both configurations use all-flash drives. The solutions feature the Intel SSD DC P4500 for the data drive and the Intel SSD DC P4600 with NVMe Express\* (NVMe\*) for the log drive. The higher performing solution exclusively features NVMe drives, with the Intel SSD DC P4500 for the data drive and the Intel Optane SSD DC P4800X for the log drive.

Intel chose the Intel Ethernet 700 Series as the network interface for the Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux. The Intel Ethernet 700 Series of products delivers validated performance, is ready to meet high-quality thresholds for data resiliency and service reliability for most media types and port speeds, and is backed by extensive testing, validation, and worldwide product support.<sup>2,3,4,5</sup>

### 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 SQL Server Enterprise Data Warehouse for Linux, Intel and Microsoft chose the HammerDB 3.0\* benchmark running a DSS workload to validate the solutions' performance. 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.

## 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 a solution brief and a detailed implementation guide to facilitate customer deployment

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

### Base and Plus Configurations

Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux are available in two configurations: "Base" and "Plus," as shown in Table 1. The Base configuration specifies the minimum required performance capability for Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux, 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. For example, businesses can realize up to 24.7 percent faster DSS query performance, which translates to up to 32.8 percent more query throughput when using the Plus configuration compared to using the Base configuration.<sup>6</sup>

**Table 1.** The Base and Plus configurations for Intel® Select Solutions for Microsoft SQL Server\* Enterprise Data Warehouse for Linux\*, optimized for HTAP

COMPONENT	INTEL® SELECT SOLUTIONS FOR MICROSOFT SQL SERVER* ENTERPRISE DATA WAREHOUSE FOR LINUX* <b>BASE CONFIGURATION</b>	INTEL SELECT SOLUTIONS FOR MICROSOFT SQL SERVER ENTERPRISE DATA WAREHOUSE FOR LINUX <b>PLUS CONFIGURATION</b>
PROCESSOR	2 x Intel® Xeon® Gold 6132 processor at 2.60 GHz, 14 cores, 28 threads, or a higher number Intel Xeon Scalable processor	2 x Intel Xeon Gold 6150 processor at 2.70 GHz, 18 cores, 36 threads, or a higher number Intel Xeon Scalable processor
MEMORY	384 GB (24 x 16 GB 2,666 MHz DDR4 RDIMM)	768 GB (24 x 32 GB 2,666 MHz DDR4 RDIMM)
BOOT DRIVE	1 x Intel® SSD DC S4510, greater than or equal to 240 GB M.2 or 2.5-inch**	1 x Intel SSD DC S4510, greater than or equal to 240 GB M.2 or 2.5-inch**
LOG DRIVE	2 x Intel SSD DC P4600, 1.6 TB, NVMe Express* (NVMe*)	2 x Intel® Optane™ SSD DC P4800X, 750 GB, NVMe
DATA DRIVE	6 x Intel SSD DC P4510, 2 TB, NVMe	10 x Intel SSD DC P4510, 4 TB, NVMe
DATA NETWORK	10Gb Intel® Ethernet Connection X722 with Intel Ethernet Connection OCP X527-DA2/DA4	10Gb Intel Ethernet Connection X722 with Intel Ethernet Connection OCP X527-DA2/DA4
MANAGEMENT NETWORK	Integrated 1 gigabit Ethernet (GbE)	Integrated 1 GbE
SOFTWARE	Red Hat* Enterprise Linux 7.3 SQL Server 2017	Red Hat Enterprise Linux 7.3 SQL Server 2017
TRUSTED PLATFORM MODULE (TPM)	TPM 2.0 or Intel® Platform Trust Technology (Intel® PTT)	TPM 2.0 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 Serial ATA (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 RSTe for SATA** Intel NVMe drivers C-states disabled Operating system power management and plan set for performance
MINIMUM PERFORMANCE STANDARDS	DSS Workload: 950 seconds average query set response time per user at 1 TB database size and 7 users <sup>6</sup>	DSS Workload: 715 seconds average query set response time per user at 1 TB database size and 7 users <sup>6</sup>
BUSINESS VALUE OF CHOOSING A PLUS CONFIGURATION INSTEAD OF A BASE CONFIGURATION	Compared to the Base configuration, the Plus configuration delivers up to 24.7 percent faster DSS query performance, which translates to up to 32.8 percent more query throughput <sup>6</sup>	

\*\*Recommended, not required

## Intel® Xeon® Scalable Processors

Intel Xeon Scalable processors:

- Offer high scalability from the multi-cloud to the intelligent edge
- Deliver platform innovations and hardware-enhanced virtualization across compute, network, and storage
- Provide cost-efficient, flexible, and scalable infrastructure to consistently deliver amazing business-to-business and business-to-consumer customer experiences
- Enable improved data and workload integrity and regulatory compliance

## Fast Track Your Data Warehouse with Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux

Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux, optimized for HTAP, are designed to simplify and accelerate the extraction of value from corporate data by using a modern data warehouse. Proven to scale with Intel Xeon Scalable processors, these pre-tuned and tested configurations are workload-optimized and let organizations deploy the optimum data warehouse infrastructure quickly and with less tuning.

Visit [intel.com/selectsolutions](https://intel.com/selectsolutions) to learn more, and ask your infrastructure vendor for Intel Select Solutions.

## Technology Selections for Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux

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

- **Intel® Platform Trust Technology (Intel® PTT) or a discrete 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.
- **Power-management settings:** Operating system power-management settings are tuned for performance in Intel Select Solutions for SQL Server Enterprise Data Warehouse for Linux.

## Learn More

Microsoft SQL Server on Linux: [microsoft.com/en-US/sql-server/sql-server-2017-linux](https://microsoft.com/en-US/sql-server/sql-server-2017-linux)

Data warehousing with SQL Server: [microsoft.com/en-us/sql-server/data-warehousing](https://microsoft.com/en-us/sql-server/data-warehousing)

Intel Select Solutions: [intel.com/selectsolutions](https://intel.com/selectsolutions)

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

Intel SSD Data Center Family: [intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds.html](https://intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds.html)

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

Intel and Microsoft alliance: [intel.com/content/www/us/en/big-data/intel-microsoft-partnership.html](https://intel.com/content/www/us/en/big-data/intel-microsoft-partnership.html)

Discover how advanced analytics can help transform your business: [intel.com/analytics](https://intel.com/analytics)

Intel Select Solutions are supported by Intel® Builders: <http://builders.intel.com>. Follow us on Twitter: [#IntelBuilders](https://twitter.com/IntelBuilders)



<sup>1</sup> JobTraQ. "Transform or Die: 30% of Fortune 500 Will Not Exist in 10 Years." 2017. [jobtraq.com/blog/transform-or-die-30-of-fortune-500-will-not-exist-in-30-years.html](https://jobtraq.com/blog/transform-or-die-30-of-fortune-500-will-not-exist-in-30-years.html).

<sup>2</sup> The Intel® Ethernet 700 Series includes extensively tested network adapters, accessories (optics and cables), hardware, and software, along with broad operating system support. A full list of the product portfolio's solutions is available at [intel.com/ethernet](https://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®.

<sup>3</sup> Intel® Ethernet 700 Series network adapters are backed with global support infrastructure for customers pre- and post-sales.

<sup>4</sup> Intel® Ethernet 700 Series network adapters' supported connections and media types are direct-attach copper and fiber SR/LR (QSFP+, SFP+, SFP28, XLPP/CR4, 25G-CA/25G-SR/25G-LR), twisted-pair copper (1000BASE-T/10GBASE-T), and backplane (XLAUI/XAUI/SFI/KR/KR4/KX/SGMII). Note that Intel is the only vendor offering the QSFP+ media type.

<sup>5</sup> Intel® Ethernet 700 Series network adapters' supported speeds include 1 GbE, 10 GbE, 25 GbE, and 40 GbE.

<sup>6</sup> Intel internal testing as of July 7, 2018. **Base configuration:** one node, 2 x Intel® Xeon® Gold 6132 processor, Intel® Server Board S2600WFT, total memory: 384 GB, 24 slots/16 GB/2,666 megatransfers per second (MT/s) DDR4 RDIMM, Intel® Hyper-Threading Technology (Intel® HT Technology) enabled, Intel® Turbo Boost Technology enabled; storage (boot): 240 GB Intel® SSD 540s Series M.2 SATA III, storage (data drive): 4 x 2 TB Intel SSD DC P4500 PCIe\* with NVMe Express\* (NVMe\*), storage (log drive): 2 x 1.6 TB Intel SSD DC P4600 PCIe with NVMe, 2 x 480 GB Intel SSD DC S4600 Serial ATA (SATA); network devices: 1 x dual-port 10Gb Intel® Ethernet Converged Network Adapter X710, network speed: 10 GbE, ucode: 0x043, OS/software: Red Hat® Enterprise Linux® 7.3 with SQL Server 2017® Enterprise edition. **Plus configuration:** one node, 2 x Intel Xeon Gold 6150 processor, Intel Server Board S2600WFT, total memory: 768 GB, 24 slots/32 GB/2,666 MT/s DDR4 RDIMM, Intel HT Technology enabled, Intel Turbo Boost Technology enabled; storage (boot): 240 GB Intel SSD 540s Series M.2 SATA III, storage (data drive): 6 x 4 TB Intel SSD DC P4500 PCIe with NVMe, storage (log drive): 2 x 375 GB Intel® Optane™ SSD DC P4800X PCIe with NVMe; network devices: 1 x dual-port 10Gb Intel Ethernet Converged Network Adapter X710, network speed: 10 GbE, ucode: 0x043, OS/software: Red Hat Enterprise Linux 7.3 with SQL Server 2017 Enterprise Edition.

Performance results are based on testing as of the date set forth in the configurations and may not reflect all publicly available security updates. See configuration disclosure for details. No product or component can be absolutely secure.

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 [intel.com/benchmarks](https://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.

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Printed in USA

0519/CP/PRW/PDF

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