Microsoft SQL Server 2022 on 4th Gen Intel® Xeon® Scalable Processors

The Challenge

What's Driving Database Deployments?

- Real-time decision-making requires faster analytics
- Exposure of data loss from security vulnerabilities
- Business goals that require the modernization of infrastructure and software

#1	DBAs saw **performance** as their most important issue[1]
57%	of organizations have experienced a security breach and **couldn't recover any data**[2]
79%	of organizations are already embarking on digital transformation **initiatives**[3]

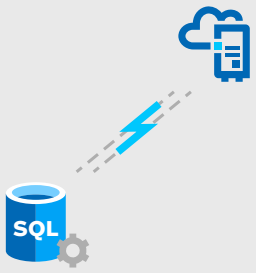
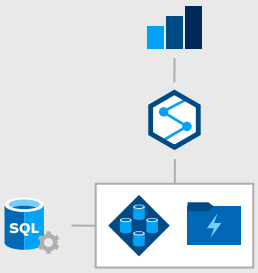
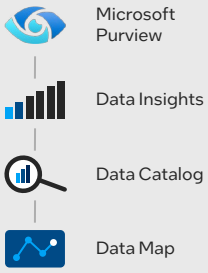
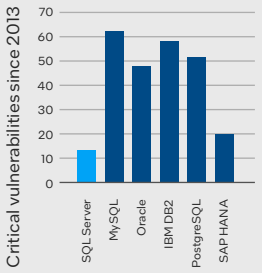
SQL Server 2022 Overview & Benefits

Turning data into value in today's environment highlights the growing importance of databases. Organizations now must deal with cloud migration, more expensive management tools, outdated operational workloads, disaster recovery strategies at risk, dealing with a larger data estate, and complex deployments.

SQL Server 2022 has many new capabilities that focus on connecting fully to the cloud, achieving near real-time latencies, accelerating query performance, and tuning to deliver the full power of scalable warehouse solutions. The database engine is getting more secure with new granular role enhancements to the Always Encrypted feature, secure connections, and increased interoperability with access to object storage and other file systems.

Compared with 3rd Gen Intel® Xeon® Scalable processors, 4th Gen Intel® Xeon® Scalable processors deliver faster workload performance and backups, increased security, and are more power efficient. SQL Server with Intel® QuickAssist Technology maintains mission-critical OLTP (online transaction processing) and OLAP (online analytical processing) applications, while also ensuring that data recovery service level agreements (SLAs) are met.

The diagram below gives a high-level overview of the new functionality in SQL Server 2022.

	Business continuity through Azure	Seamless analytics over on-prem operational data	Visibility over your entire data estate	Most secure over the last 10 years[1]	Industry-leading performance and availability
					
Hero Capabilities	**Bidirectional DR to Azure SQL**	**Azure Synapse Link**	**Microsoft Purview integration**	**SQL Server ledger**	**Built-in query intelligence Multi-write replication**

#1 OLTP performance[2]

#1 Non-Clustered DW performance on 1TB[3], 1TB[4], 10TB[5], 30TB[6], and 100TB[7]

Most consistent data platform

Edge to Cloud

Azure SQL Edge

Azure Arc-enabled data services

Azure SQL

Why Run SQL Server 2022 on 4th Gen Intel® Xeon® Scalable Processors?

Faster Database and Analytics Performance

- Lower latency queries for decision support workloads (DSS)[6]
- Increase in order processing rate for online transactional processing (OLTP)[5]
- Accelerate query performance and tuning with no code changes with updated Query Store and Next-Gen Intelligent Query processing[6]

More Cloud-Connected Capabilities

- Easier to move data between on-prem and Azure cloud
- Online disaster recovery

Industry-Leading Security

- SQL Server offers leading security database protections
- Security capabilities like Intel® Secure Guard Extension (SGX) for confidential computing

Significantly Easier Administration

- Up to 114% faster backup times with Intel® QuickAssist Technology (QAT)[4]
- Unified data governance and management

Greater Power Efficiency[8]

- Reduce data center operating costs[8]
- Balance performance with power consumption — achieve 52% lower TCO by deploying fewer 4th Gen Intel® Xeon® processor-based servers and meet the same performance requirement[7]
- Up to 9.6% wall power savings and 11% higher performance per watt on 4th Gen Intel® Xeon® Scalable processors[8]

SQL Server Use Cases

Connect SQL Server with Cloud

The Azure SQL Managed Instance (MI) combines the best of SQL Server with a managed instance for easier cloud migration and PaaS management. Azure Arc provides a unified way to manage an environment with non-Azure or on-premises resources alongside Windows and Linux physical servers outside Azure. Azure Active Directory can be used as an alternative for authentication of SQL and Windows domains.

Seamless Analytics Over On-Prem Operational Data

Azure Synapse Link for SQL Server helps break silos between operational and analytics stores. There are now near real-time latencies while Spark and SQL runtimes are reduced. Azure Synapse is an analytics service that brings together the best of SQL Server, Apache Spark, and Azure Data Explorer.

Business Continuity for Mission-Critical Workloads

Organizations can now remain operational for customer applications while concurrently performing backups. Intel® QuickAssist technology in SQL Server 2022 provides hardware acceleration and CPU offload capabilities for enhanced compression and decompression functions. This means faster backups, reduced CPU usage, and storage consumption. Disaster recovery is available in the cloud with Azure SQL Managed Instance link feature that enables near real-time data replication from SQL Server to Azure.

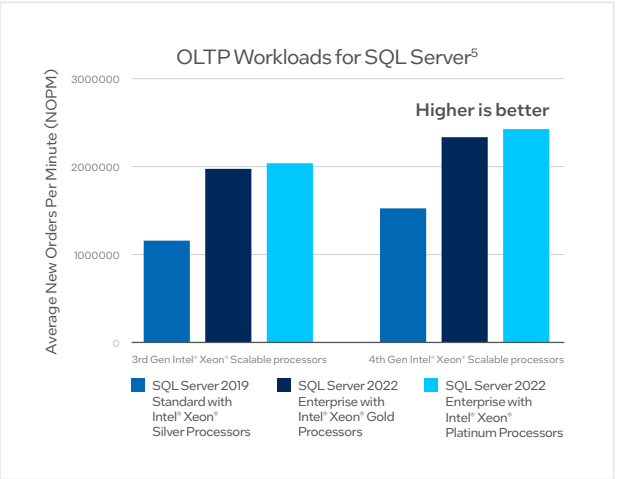
Security, Visibility, and Governance Over Entire Data Estate

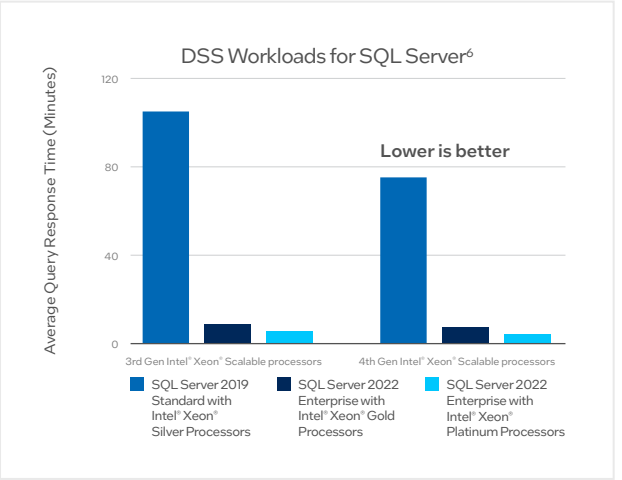
Security is strengthened by connecting Azure Active Directory directly to SQL Server, centralized blockchain to protect data from tampering, and fine-grained control for permissions and access rights. Integration with Microsoft Defender protects databases anywhere. Enhancements to Linux security and the ability to perform non-SQL authentication like Kerberos without using a domain further secures SQL Server. Integration with Microsoft Purview safeguards your data across platforms, apps, and clouds.

Data Lake Virtulization and Backup/Restore to Object Storage

Access and work with other storage systems based on new, native support for S3, Parquet, and JSON file formats. This compatibility means more storage options like MinIO or Ceph can be used. Users can backup to these other systems and then restore to SQL Server storage. There are also new data lake capabilities for querying unstructured data with known formats and joining that with SQL Server without moving the data.

Proof Points





Key Takeaways

Configuration	SQL Server 2019 Standard with 3rd Gen Intel® Xeon® Silver Processor	SQL Server 2022 Enterprise with 4th Gen Intel® Xeon® Gold Processor	SQL Server 2022 Enterprise with 4th Gen Intel® Xeon® Platinum Processor
Performance improvement for 4th Gen Intel® Xeon® processors over 3rd Gen Intel® Xeon® processors for New Orders per Minute (OLTP) benchmark	Up to **34%** More[5]	Up to **17%** More[5]	Up to **19%** More[5]
Reduction in query response time for 4th Gen Intel® Xeon® processors over 3rd Gen Intel® Xeon® processors for Decision Support System (DSS) benchmark	Up to **28%** Faster[6]	Up to **11%** Faster[6]	Up to **19%** Faster[6]

Want More Information?

Reach out to your Intel account representative to learn more or check out the following resources:

4th Gen Intel® Xeon® Scalable Processors

Microsoft SQL Server 2022

Notices & Disclaimers

1 The Top 5 Challenges Facing DBAs in 2020: https://www.dbta.com/Editorial/Trends-and-Applications/The-Top-5-Challenges-Facing-DBAs-in-2020-139071.aspx

2 Salesforce Data Security Study, 2021: https://www.salesforce.com/content/dam/web/en_us/www/documents/platform/top-data-security-trends.pdf

3 Delivering digital transformation benefits to SMB and midmarket customers, August 2020: https://techaisle.com/blog/421-delivering-digital-transformation-benefits-to-smb-and-mid-market-customers

4 Tested by Intel as of 12/12/2022. 1-node, 2x Intel® Xeon® Gold 8460Y+ Processor, 32 cores, HT On, Turbo On, Total Memory 512 GB (16 slots/ 32GB/ 4800 MHz [run @ 4800MHz]) DDR4 memory, one QAT device enabled, ucode 0x2B000081, Windows 2022 Standard Edition 21H2, 10.0.20348, SQL Server 2022, 16.0.1000.6 (X64), database backup without QAT using Xpress software compression.

5 4th Gen Intel® Xeon® CPU Configuration with Microsoft SQL Server 2022 Standard: Tested by Intel as of 04/12/2023. 1 Node, 2x Intel® Xeon® Gold 6444Y+ processors (12C, 3.6GHz, 225W) CPU, 1x Quanta SDP QuantaGrid D54Q-2U, Total Memory: 256GB (16 x 16 GB 4800MHz DDR5 DIMM), Intel® Hyper-Threading Technology: Enabled, Turbo: Enabled, Storage (boot): 1 x Solidigm DC S4610, 960 GB, Storage (Data drive): 6x Solidigm SATA S4500 Series (3.84TB), Storage (Log drive): 2 x Intel® SSD D7-P5510 3.84TB (NVMe), Network devices: 1 x 25 GbE Intel® Ethernet Network Adapter E810-C-Q2, Network Speed: 25 GbE, 1 x 10 GbE Intel® Ethernet Converged Network Adapter X550-T2, Network Speed: 1 GbE, OS/Software: Windows 2022 Standard Edition with SQL Server 2022 Standard Edition (RTM) – 16.0.1000.6 (x64), HammerDB v4.0

3rd Gen Intel® Xeon® CPU Configuration with Microsoft SQL Server 2019 Standard: Tested by Intel as of 03/19/2021. 1 Node, 2x Intel® Xeon® Silver 4310 processors (12C, 2.1GHz, 120W) CPU, 1x Intel® Server Board M50CYP, Total Memory: 256GB (16 x 16 GB 3200MHz DDR4 DIMM), Intel® Hyper-Threading Technology: Enabled, Turbo: Enabled, Storage (boot): 1 x Intel® D3-S4510, 240 GB, Storage (Data drive): 6x Intel® SATA S4610 Series (960GB), Storage (Log drive): 2 x Intel® SSD DC P4610 1.6TB (NVMe), Network devices: 1 x 10 GbE Intel® Ethernet Converged Network Adapter X550-T2, Network Speed: 1 GbE, OS/Software: Windows 2019 Data Center Edition with Microsoft SQL Server 2019 Standard Edition (RTM-CU10) (KB5001090) - 15.0.4123.1 (X64), HammerDB v4.0

6 4th Gen Intel® Xeon® CPU Configuration with Microsoft SQL Server 2022 Enterprise: Tested by Intel as of 04/27/2023. 1 Node, 2x Intel® Xeon® Gold 6438Y+ processors (24C, 2.1GHz, 185W) CPU, 1x Quanta SDP QuantaGrid D54Q-2U, Total Memory: 256GB (16 x 16 GB 4800MHz DDR5 DIMM), Intel® Hyper-Threading Technology: Enabled, Turbo: Enabled, Storage (boot): 1 x Solidigm DC S4610, 960 GB, Storage (Data drive): 6x Solidigm SSD D7-P5510 3.84TB (NVMe), Storage (Log drive): 2 x Solidigm SSD D7-P5510 3.84TB (NVMe), Network devices: 1 x 25 GbE Intel® Ethernet Network Adapter E810-C-Q2, Network speed: 25 GbE, 1 x 10 GbE Intel® Ethernet Converged Network Adapter X550-T2, Network Speed: 1 GbE, OS/Software: Windows 2022 Standard Edition with SQL Server 2022 Enterprise Edition (RTM) – 16.0.1000.6 (x64), HammerDB v4.0

3rd Gen Intel® Xeon® CPU Configuration with Microsoft SQL Server 2019 Enterprise: Tested by Intel as of 05/30/2023. 1 Node, 2x Intel® Xeon® Gold 5318S processors (24C, 2.1GHz, 165W) CPU, 1x Intel® Server Board M50CYP, Total Memory: 256GB (16 x 16 GB 2933MHz DDR4 DIMM), Intel® Hyper-Threading Technology: Enabled, Turbo: Enabled, Storage (boot): 1 x Solidigm DC P4101 512GB SSD, Storage (Data drive): 6x Intel® P4510 Series (2 TB), Storage (Log drive): 2 x Intel® SSD DC P4610 1.6TB (NVMe), Network devices: 1 x 10 GbE Intel® Ethernet Converged Network Adapter X550-T2, Network Speed: 1 GbE, OS/Software: Windows Server 2022 Standard Edition with Microsoft SQL Server 2019 Enterprise Edition (RTM-CU20) (KB5024276) - 15.0.4312.2 (X64), HammerDB v4.0

4th Gen Intel® Xeon® CPU Configuration with Microsoft SQL Server 2022 Enterprise: Tested by Intel as of 03/07/2023. 1 Node, 2x Intel® Xeon® Platinum 8460Y+ processors (32C, 2.3GHz, 300W) CPU, 1x Quanta SDP QuantaGrid D54Q-2U, Total Memory: 512GB (16 x 32 GB 4800MHz DDR5 DIMM), Intel® Hyper-Threading Technology: Enabled, Turbo: Enabled, Storage (boot): 1 x Solidigm DC S4610, 960 GB, Storage (Data drive): 6x Solidigm D7 P5510 Series (3.84TB) (NVMe), Storage (Log drive): 2 x Intel® SSD DC P5800X 400GB (NVMe), Network devices: 1 x 25 GbE Intel® Ethernet Network Adapter E810-C-Q2, Network speed: 25 GbE, 1 x 10 GbE Intel® Ethernet Converged Network Adapter X550-T2, Network Speed: 1 GbE, OS/Software: Windows 2022 Standard Edition with SQL Server 2022 Enterprise Edition (RTM) – 16.0.1000.6 (x64), HammerDB v4.5

3rd Gen Intel® Xeon® CPU Configuration with Microsoft SQL Server 2022 Enterprise: Tested by Intel as of 03/07/2023. 1 Node, 2x Intel® Xeon® Gold 6348 processors (28C, 2.6GHz, 235W) CPU, 1x M50CYP, Total Memory: 512GB (16 x 32 GB 2933MHz DDR5 DIMM), Intel® Hyper-Threading Technology: Enabled, Turbo: Enabled, Storage (boot): 1 x Solidigm DC P4101, 512 GB, Storage (Data drive): 6x Solidigm D7 P5510 Series (3.84TB) (NVMe), Storage (Log drive): 2 x Intel® SSD DC P5800X 400GB (NVMe), Network devices: 1 x 25 GbE Intel® Ethernet Network Adapter E810-C-Q2, Network speed: 25 GbE, 1 x 10 GbE Intel® Ethernet Converged Network Adapter X550-T2, Network Speed: 1 GbE, OS/Software: Windows 2022 Standard Edition with SQL Server 2022 Enterprise Edition (RTM) – 16.0.1000.6 (x64), HammerDB v4.5

7 See row E8: https://edc.intel.com/content/www/us/en/products/performance/benchmarks/4th-generation-intel-xeon-scalable-processors/

8 See row E3: https://edc.intel.com/content/www/us/en/products/performance/benchmarks/4th-generation-intel-xeon-scalable-processors/

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

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

Your costs and results may vary.

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