SQL Server Scalability

SQL 2016 new innovations

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## Mission-critical performance

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<td>Enhanced auditing for OLTP with ability to track history of record changes</td>
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Windows Server support
Windows Server Scalability

Massive scale for in-memory performance
Simple, flexible HA and DR

Unparalleled security

Fine-grained security controls
Built-in anti-malware

Unparalleled scalability with Windows Server 2016

12 TB of memory  +  WS 2016 max cores

No domain join needed
Support for Windows Server Core

Windows Server edition with smallest footprint
  Reduced memory and disk requirements
  Fewer running processes and services: greater stability
  Simplified management

Requires less maintenance and fewer OS patches, greatly reduced downtime

50–60 percent less patching and fewer OS reboots
Microsoft Storage Spaces Direct

Hyper-V cluster with local storage

What is Storage Spaces Direct?
Evolution of Storage Spaces
Servers with local storage
Highly available and scalable
Storage for Hyper-V virtualization and private cloud

Why Storage Spaces Direct?

New device types
Lower-cost flash storage with SATA SSDs
Better flash performance with NVMe SSDs

Simplicity
Ethernet/RDMA network as storage fabric
No need for complex multi-initiator fabric
Seamless capacity and performance expansion
Domain-independent Availability Groups

New feature in Windows Server 2016

**Environments supported:**

- Cross domains (with trust)
- Cross domains (no trust)
- No domain at all

Windows 2016 clusters use certificates for intra-cluster authorization

Uses certificate-secured endpoints like DBM
Live migration

Simultaneous migration of multiple SQL Server virtual machines

- Maintain availability of SQL Server while decreasing downtime
- Migrate many virtual machines (using priority settings) in a clustered environment
- Use up to 10 GB of network bandwidth

Live migration for non-clustered virtual machines

- Centrally shared and non-shared virtual machine storage scenarios
- Reduced cost and complexity of SQL Server deployments in virtualized environments, with availability during planned downtime
Clustering enhancements

Cluster-aware updating

Applies updates automatically to host operating system—or to other system components in a clustered SQL Server environment—while maintaining availability.

Increases SQL Server availability during update process in both virtualized and non-virtualized environments.

Dynamic Quorum

Enables AlwaysOn cluster to dynamically adjust number of required quorum votes.

Increases availability of cluster in failover scenarios with ability to recalculate quorum as needed and still maintain working cluster.
Encryption enhancements

Hardware accelerated encryption/decryption for TDE

- Implements next generation of Microsoft cryptography
- Takes advantage of specialized microprocessor instructions
- Improves performance as much as 3x to 10x

Parallelizable decryption

- Decryption now supported as parallelizable (used to be sequential only)
- Dramatically improved response times for queries with encrypted data columns
Distributed Replay

SQL Server Distributed Replay

- Use multi-threaded replay utility
- Simulate and test production workload scenarios
- Protect production performance during changes
- Integrate with Microsoft SQL Server Upgrade Assistant to help assess impact of future SQL Server upgrades
TempDB optimization

Scale up databases with enhanced data caching

- Enables multiple TempDB files per instance for multi-core environments
- Reduces metadata and allocation contention for TempDB workloads
- Improves performance and scalability
- Specifies multiple volumes for TempDB files
Core engine scalability

Dynamic partitioning of thread-safe memory objects by non-uniform memory access (NUMA) node or by CPU

- Enables greater scalability of high-concurrency workloads running on NUMA hardware
- Dynamically promotes CMemThread to be partitioned by NUMA node or by CPU based on workload characteristics and contention factors
- Eliminates need for trace flag, but also dynamically determines partition based on contention
Summary: Scalability

Windows Server

12 TB RAM, WS2016 max cores
Server Core supported
Storage Spaces Direct
Domain-independent Availability Groups
Improved live migration

Enhanced scalability

Hardware acceleration for TDE
Distributed Replay
TempDB optimization