SQL Server Scalability

SQL 2016 new innovations

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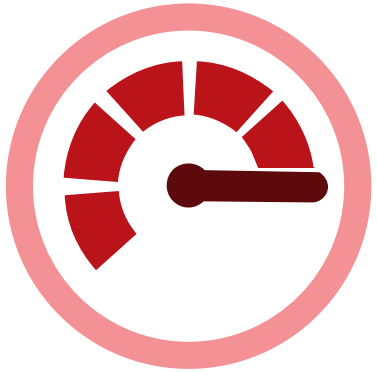
Mission-critical performance

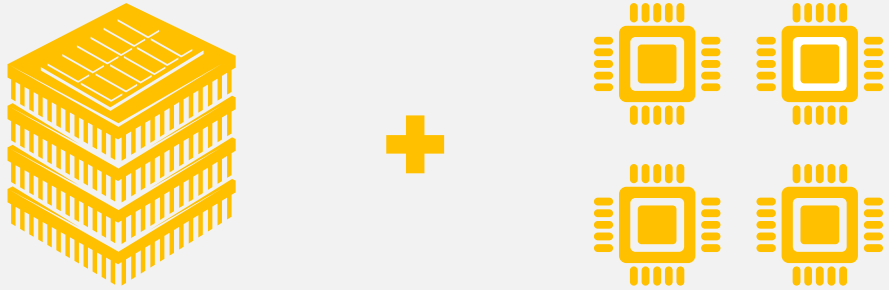
Performance	Security	Availability	Scalability
In-Memory OLTP enhancements Greater T-SQL surface area, terabytes of memory supported, and higher number of parallel CPUs	**Always Encrypted** Sensitive data remains encrypted at all times, with ability to query	**Basic Availability Groups** With SQL 2016 Standard Edition	**Windows Server support** Support for Windows Server 2016 Scalability Enhancements
Operational analytics Insights on operational data; works with In-Memory OLTP and disk-based OLTP	**Dynamic Data Masking** Real-time obfuscation of data to prevent unauthorized access	**Enhanced AlwaysOn** Distributed availability groups, automatic replica seeding, distributed transactions, automatic failover, load balancing, manageability	**Live migration** Faster live migration, live migration for non-clustered VMs
Query Data Store Monitored, optimized query plans	**Row-Level Security** Fine-grained access control for table rows	**Backup enhancements** Managed backup to Azure, Database Recovery Advisor	**Scalability enhancements** Hardware acceleration for TDE, parallelized decryption, TempDB optimization, and more
Temporal database support Query data as points in time	**Other enhancements** Audit success/failure of database operations TDE support for storage of In-Memory OLTP tables Enhanced auditing for OLTP with ability to track history of record changes		

Windows Server support



Windows Server Scalability

Unparalleled scalability
with Windows Server 2016



12 TB of memory

WS 2016 max cores

Massive scale for in-memory performance

Simple, flexible HA and DR

No domain join needed

Unparalleled security

Fine-grained security controls

Built-in anti-malware

Support for Windows Server Core

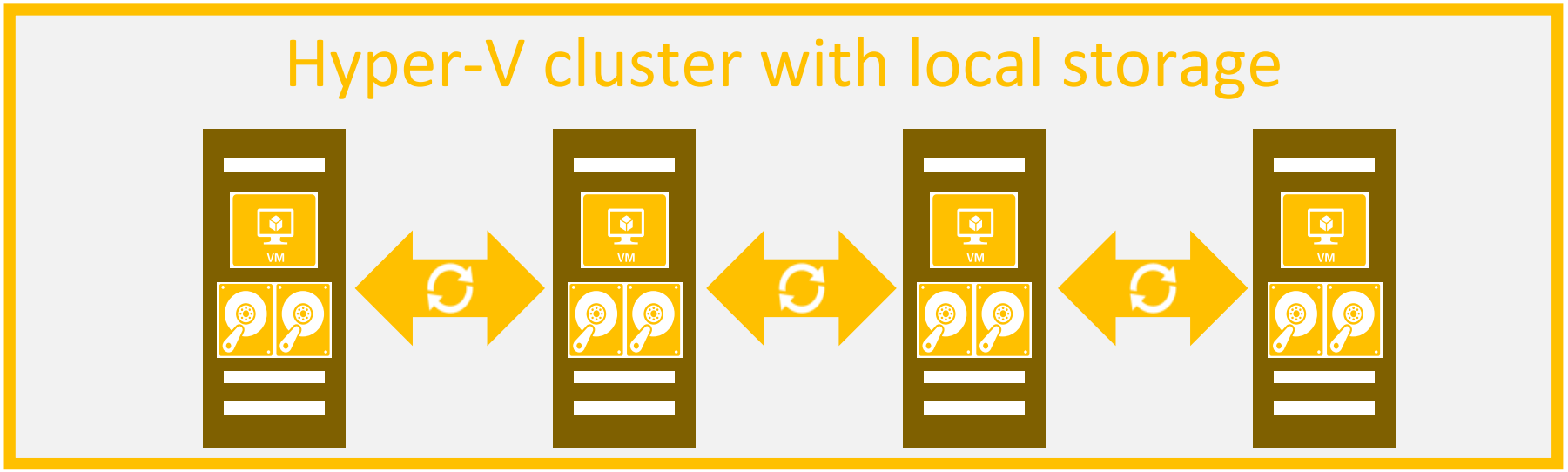
Windows Server edition with smallest footprint

- 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



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

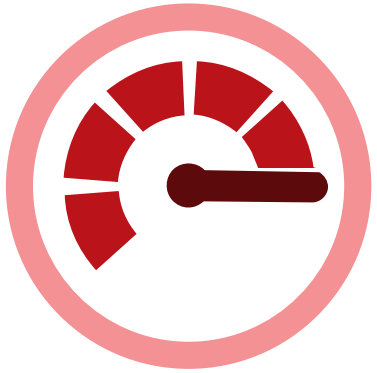
Increases SQL Server availability during update process in both virtualized and non-virtualized environments

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

SQL Server scalability enhancements



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

Microsoft