IT Modernization – Microsoft Windows Server* & Microsoft SQL Server* + Intel® Xeon® Scalable Processors: Competitive Selling Guide (1/4)

BENEFITS OF IT MODERNIZATION

Microsoft and Intel® are jointly focused on increasing the pace of it transformation. Modernization is the first step to transforming IT from a cost center to a profit-driving engine for modern, data-driven businesses.

Decrease "Technical Debt" – Modernize legacy applications & infrastructure, lower TCO, improve efficiencies, reduce unplanned downtime

Improve Data Security – Security and Compliance, GDPR ready, root of trust and multi-layer security, faster data recovery, SDN for improved network security out to edge

Easier Path to Hybrid Cloud with HCI – Highly scalable performance, centralized management and orchestration, faster deployment of services, gain agility with control

Support Expanding Workloads and DevOps – Faster insights from data, support data intensive workloads, speed time to market of new apps and service, deliver self-service & Dev-friendly tools

FAST FACTS

Outdated infrastructures result in a **6X** slower rate for product innovation and time to market.[1]	**At 4 years**, server performance lags **33%**[3] and maintenance costs climb **148%**[2]	**Over 20 million** server instances of 2008/R2 globally[4] with an average server age of 7 years in 2017[5]
60% of customers say SQL Server is most used database platform[6]	**Over 900** businesses migrated from other vendor DB to SQL Server since 2012[6]	Databases are the **top workload** in cloud computing[6]

QUALIFICATION QUESTIONS

- Is your IT infrastructure able to deploy new services and scale fast enough?
- Do you have quick access to your data or are you dealing with many data silos?
- Do you have an IT modernization strategy?
- How do you reduce your maintenance costs and achieve better data TCO?
- Is your IT infrastructure in compliance current standards and regulations?
- Is your data encrypted at rest, in-flight, and in memory to deliver maximum security?
- Is your network able to handle the dynamic demands of today's modern workloads?
- Do you have a plan to accelerate deployment of a hybrid cloud infrastructure?

SALES OPPORTUNITIES WITH MICROSOFT

- Hyperconverged Infrastructure (HCI) solutions are maturing
  - HCI units up 80% YOY (IDC)
  - Forecast to be a $10.4B market by 2022 (IDC)
- GDPR Ready Solutions
- SQL Server is only commercial DB with AI built in
- Apache Pass Enabled – disruptive technology
- Better Together Sale – WS + SQL + Intel® Xeon® Scalable + Intel® Optane™ Technology – or the Intel® Select Solution for WS or SQL!

1. ESG 2017 (https://www.emc.com/collateral/analyst-reports/esg-dellemc-it-transformation-maturity-report.pdf) ; **2.** IDC 2015 (https://www.emc.com/collateral/analyst-reports/idc-why-upgrade-server-infrastructure.pdf) **4.** Microsoft source. **5.** CMR: Server Market Insights, 02/2018. **6.** http://download.microsoft.com/download/9/7/5/975E84D2-3257-4F66-B83E-F8636B098858/FINAL%20-%20SQL2016-%20Sales%20Training%20Deck.pptx ; *Other names and brands may be claimed as the property of others.

IT Modernization – Microsoft Windows Server* & Microsoft SQL Server* + Intel® Xeon® Scalable Processors: Competitive Selling Guide (2/4)

UPGRADE PATHS / VALUE PROPOSITIONS

Software Modernization ▲ New

SW ONLY UPGRADE

- ☒ Performance:
  - Slower Storage & Network
  - Reduced Memory Footprint
  - CPU Constrained
- ☒ Platform Security
  - UEFI, Secure Boot, AVX512, AES-NI for TDI, etc. unavailable
- ☑ SW In Compliance
- ☑ Hybrid Cloud
- ☑ HCI / S2D
- ☑ Application Modernization (Containers)
- ☑ Security Hardened (SW Only)

Summary: Workload(s) will run, but slower. Risk from lack of HW level security.

HW+SW Upgrade

- ☑ SW Compliance
- ☑ TCO (60% Savings from consolidation[1].)
- ☑ Performance (4x Performance over 4-5yr old servers[2])
- ☑ Hybrid Cloud Ready (Efficient Workload Offload)
- ☑ HCI / Software Defined Storage (S2D)
- ☑ App Modernization
- ☑ SW & HW Level Hardened Security

Summary: Combined SW & HW refresh essential for Modernization

CURRENT HW & SW – DO NOTHING

- ☒ Increased Risk (Vulnerable to Security threats; SW Non-Compliance)
- ☒ Increased TCO – Additional IT Spend for Security Updates.
- ☒ May fail to meet industry standards & regulations (i.e. GDPR, etc.)
- ☒ Higher Maintenance Costs / Unplanned downtime.
- ☒ Network Bottlenecks

HW ONLY UPGRADE

- ☒ SW Non-Compliance
- ☒ Increased TCO – Additional IT Spend for Security Updates.
- ☒ Security vulnerability

Summary: Workload will run, but slower. Risk from lack of SW level security. SW not able to leverage modern HW (Compute, Storage & Network)

Old — Hardware Modernization ▶ — New

1. The benchmark results may need to be revised as additional testing is conducted. The results depend on the specific platform configurations and workloads utilized in the testing, and may not be applicable to any particular user's components, computer system or workloads. The results are not necessarily representative of other benchmarks and other benchmark results may show greater or lesser impact from mitigations. 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. Configuration details:
2. Per node 4X higher integer throughput performance: estimate based on SPECrate*2017_int_base on Intel internal platforms as of June 2018: 1x node, 2x Intel® Xeon® Processor E5-2690, 128GB total memory, 16 slots / 8 GB/ 1600MT/s DDR3 RDIMM, Benchmark: SPEC CPU2017 V1.2, Compiler: Intel® Compiler IC17 update 2, Optimized libraries / versions: IC18.0_20170901, Other Software: MicroQuill SMART HEAP. uCode: 713, OS: Red Hat Enterprise Linux* 7.4, Kernel: 3.10.0-693.11.6.el7.x86_64 x86_64, Score 65.5 vs. 1x Node, 2x Intel® Xeon® Platinum 8180 Processor, 384GB total memory, 12 slots / 32 GB / 2666 MT/s DDR4, Benchmark software: SPEC CPU® 2017, Compiler: Intel® Compiler IC18 OEM, Optimized libraries: AVX512, ucode:0x043, Red Hat Enterprise Linux* 7.4, 3.10.0-693.11.6.el7.x86_64, Score: 281. 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

IT Modernization – Microsoft Windows Server & Microsoft SQL Server + Intel® Xeon® Scalable Processors: Competitive Selling Guide (3/4)

WHY MICROSOFT WINDOWS SERVER* ON INTEL

Intel® Xeon® Scalable Platform

- up to 56 cores/112 threads on 2 socket system
- Up to 6TB of memory
- Support for 100Gb NICs
- Platform Security (UEFI, TPM 2.0, Secure Boot)
- Support for Advanced Flash (NVMe, NVDIMM, Intel® Optane™ SSD)
- MSFT Storage Spaces Direct w/NVME, Intel® Optane™ technology

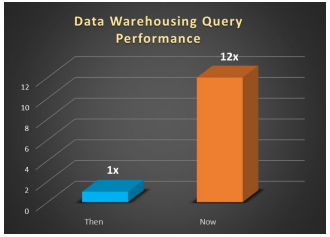
Windows Server* 2019

- Unique Hybrid datacenter platform
- Enhanced security capabilities
- Faster innovation for applications
- Unprecedented hyper-converges infrastructure

BETTER TOGETHER

Then vs Now

- Data Warehousing queries running on legacy 2-socket server with an older software stack are compared to the latest 2-socket server on the latest software stack
- We see the performance of an industry standard DW workload improve by 12x[1]



	Windows Server[4] 2008 R2	Windows Server[4] 2012 R2	Windows Server[4] 2016	Windows Server[4] 2019
Hardware Scale	1 TB RAM/64 LPs	4 TB RAM/320 LPs	24 TB RAM/512 LPs	24 TB RAM/512 LPs
Virtualization Scale	Up to 4 VPs per VM Up to 1 TB RAM per VM	Up to 64 VPs per VM Up to 1 TB RAM per VM	Up to 240 VPs per VM Up to 12 TB RAM per VM	Up to 240 VPs per VM Up to 12 TB RAM per VM
Hyper-Converged Infrastructure	-	-	Yes	Yes
Software Defined Storage	-	Shared SAS	Storage Spaces Direct (HCI)	Storage Spaces Direct (HCI)
Software Defined Networking	-	SDN v1	SDN v2	SDN + Container Networking
Containers	-	-	Windows Server Containers	Windows & Linux Containers
Shielded VMs	-	-	Windows Only	Windows & Linux
iWARP[3]/RDMA	-	Storage Only	Yes Storage & Hyper-V	Yes Storage and Hyper-V
Virtualization Based Security	-	-	Yes	Yes
Advanced Flash Support	-	-	NVMe	NVMe, NVDIMM, Intel® Optane™ SSD
Memory	DDR3-800 to 1333MHz	DDR3-800 to 1600MHz	Up to DDR4-2666	Up to DDR4-2933 + Intel® Optane™ DC Persistent Memory (est. 2019)
Server Core	3.0GB	5.2GB	3.8GB	1.6GB
Nano Server	-	-	410MB	< 100MB
System Insights	-	-	-	Yes

1. Performance results are based on testing as of 8/6/2018, 8/7/2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product 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 information go to http://www.intel.com/performance/datacenter. Configuration: Test by Intel as of 8/6/2018 - 1-node 2x Intel(r) Xeon(r) Platinum 8180 cpu, ucode 0x0043, 768GB total DDR4-2400 memory, 2x P4608 Intel NVMe, OS: Windows* Server 2019 with SQL Server 2017 RTM vs. test by Intel as of 8/14/2018 - 1-node 2x Intel(r) Xeon(r) processor E5-2699 v3, ucode 0x003D, 1.5TB total DDR4-1866 memory, 2x P4608 Intel NVMe, OS: Windows* Server 2008 R2 with SQL Server **2008** R2. 3. http://www.prowesscorp.com/what-is-iwarp-and-why-does-it-matter/; 4. https://www.microsoft.com/en-us/cloud-platform/windows-server-comparison; *Other names and brands may be claimed as the property of others.

IT Modernization – Microsoft Windows Server & Microsoft SQL Server + Intel® Xeon® Scalable Processors: Competitive Selling Guide (4/4)

WHY MICROSOFT WINDOWS SERVER* ON INTEL XEON SCALABLE PROCESSORS

Hardware Innovation

- **Up to 4X Performance[1] over 4-5 year old servers**
- Many-Core Server (8-28 cores per socket)
- NVMe, NVDIMM, Intel® Optane™ Technology
- Secure Platform, TPM 2.0, UEFI
- RDMA enabled

WHY MICROSOFT SQL SERVER* ON INTEL XEON SCALABLE PROCESSORS

Industry Leading Performance – Processing workloads for all types at breakthrough speeds, in memory OLTP, in-memory column store, runs Linux and Docker Containers, in-database advanced analytics, end-to-end mobile BI, AI built-in

Consistent Experience – Most consistent on premises to cloud, Intel® Xeon® Scalable processors available in Azure*, easy migration to cloud

Better Security – Microsoft* TDE and Intel® AES-NI accelerate encryption[1], Microsoft SQL Server* named least vulnerable database for 7 years[2]

LEGACY PLATFORM VS. MODERN[1]

	5-8 year Old Server + Windows Server 2008 R2	Intel® Xeon® Scalable Platform + Windows Server[3] 2019
Compute	2 sockets/4C/8T = 8C/16T total	2 sockets/28C/56T = 56C/112T total
Memory	64-128 GB	256 GB – 6 TB
Max Memory Support	2TB	>=24TB
Data Storage	8Gb FCoE SAN	Microsoft* Storage Spaces Direct with NVME, Intel® Optane™ Technology
NICs	4-6 1Gb/E NICs 2 10 Gb NICs (no offloads)	10/25/40/50/100 Gb NICs (numerous offloads/iWARP*RDMA)
Platform Security	-	UEFI, TPM 2.0, Secure Boot
Shielded VMs	-	Windows & Linux
Advanced Flash Support	-	NVMe, NVDIMM, Intel® Optane™ SSD
Antivirus	-	Windows Defender Antivirus
Credential Guard	-	Windows Defender Credential Guard
In-place upgrades	-	Windows Server 2012 R2 & Windows Server 2016*
Disaster Recovery for Volumes	-	Storage Replica
HCI management	-	Windows Admin Center

MICROSOFT SQL SERVER COMPARISONS

Features		SQL server 2008/R2	SQL server 2016	SQL Server 2017
Performance	In-Memory OLTP	No		Yes
	In-Memory columnStore	No		Yes
	Column store indexing for data warehouse	No		Yes
	Real time Operational Analytics	No		Yes
	Buffer Pool extension to SSD	No		Yes
	Adaptive Query processing	No		Yes
Availability	Always On	No		Yes
	Basic Availability groups	No		Yes
Security	Backup encryption support	No		Yes
	Dynamic Data Masking and Row Level Security	No		Yes
	Encryption at rest and in motion	No		Yes
	Separation of duties	No		Yes
Manageability and Programmability	Runs on Linux and Docker Containers	No		Yes
	Policy - based management	No		Yes
	Enhanced Programmability	No		Yes
BI and Analytics	In-database advanced analytics	No		Yes
	Graph data support	No		Yes
	PolyBase for T-SQL query across Hadoop	No		Yes
	Runs on Linux and Docker containers (In addition to Windows)	No		Yes

1. Per node 4X higher integer throughput performance: estimate based on SPECrate*2017_int_base on Intel internal platforms as of June 2018: 1x node, 2x Intel® Xeon® Processor E5-2690, 128GB total memory, 16 slots / 8 GB/ 1600MT/s DDR3 RDIMM, Benchmark: SPEC CPU2017 V1.2, Compiler: Intel® Compiler IC17 update 2, Optimized libraries / versions: IC18.0_20170901, Other Software: MicroQuill SMART HEAP. uCode: 713, OS: Red Hat Enterprise Linux* 7.4, Kernel: 3.10.0-693.11.6.el7.x86_64 x86_64, Score 65.5 vs. 1x Node, 2x Intel® Xeon® Platinum 8180 Processor, 384GB total memory, 12 slots / 32 GB / 2666 MT/s DDR4, Benchmark software: SPEC CPU® 2017, Compiler: Intel® Compiler IC18 OEM, Optimized libraries: AVX512, ucode:0x043, Red Hat Enterprise Linux* 7.4, 3.10.0-693.11.6.el7.x86_64, Score: 281. 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. **2.** Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) requires a computer system with an Intel AES-NI-enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. Intel AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. 3. https://blogs.windows.com/windowsexperience/2018/04/10/announcing-windows-server-2019-insider-preview-build-17639/#8MquW2pog9ZDc6xS.97