intel® OPTANE™ DC PERSISTENT MEMORY

BREAK THROUGH DATA CHALLENGES

RAMP UP ACTIONABLE INSIGHTS ACROSS YOUR MOST DEMANDING WORKLOADS

Combine large capacity and near-DRAM speeds with support for data persistence with Intel® Optane™ DC persistent memory, fueled by 2nd Generation Intel® Xeon® Scalable processors.

TOP WORKLOADS

- **Advanced Analytics**
- **In-Memory Databases**
- **Virtualized & Hybrid Cloud Workloads**

REAL WORLD BENEFITS

Deliver exceptional performance across a broad ecosystem of data-center applications.

UP TO

25%

LARGER DATASETS

compared to DRAM alone (estimated)[1]

SAP HANA*

- Up to **25%** larger datasets compared to DRAM alone (estimated)[1]
- System restarts: Minutes → Seconds[2]
- In-place upgrades—replace with larger-capacity DIMMs as databases grow

UP TO

36%

MORE VMs PER NODE

compared to DRAM alone[3]

Microsoft SQL Server*

- Up to **36%** more VMs per node compared to DRAM alone[3]
- Support large databases with up to **33%** more memory per VM[3]
- Reduce memory subsystem cost for multi-tenant virtualization

UP TO

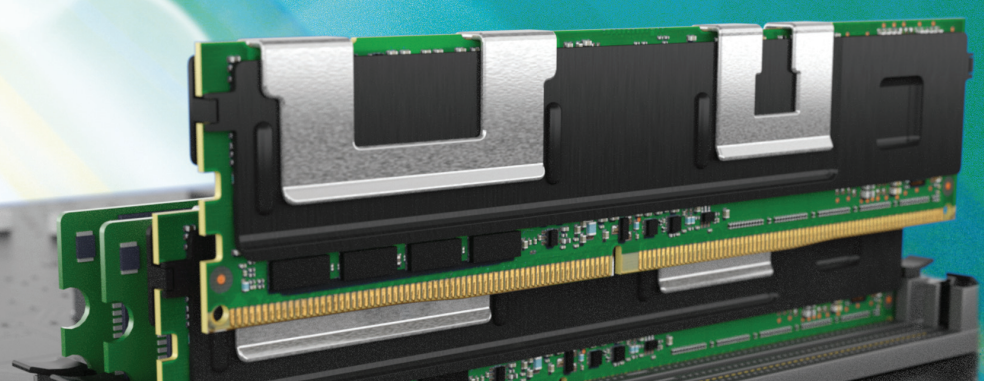
26%

LOWER COST PER VM

compared to alone (estimated)[4]

Intel® Select Solutions for Microsoft Azure Stack HCI*

- Up to **26%** lower hardware cost per VM compared to DRAM alone (estimated)[4]
- Fast time to value with a validated solution for compute and software-defined storage
- Memory Mode allows DDR4 to act as cache to Intel Optane DC persistent memory



Extract actionable insights from your data with Intel® Optane™ DC persistent memory, powered by 2nd Generation Intel® Xeon® Scalable processors.

FIND OUT MORE AT INTEL.COM/OPTANE

intel® XEON® GOLD inside™

intel® XEON® PLATINUM inside™

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For more complete information about performance results and benchmarks, visit intel.com/benchmarks.

Performance results are based on testing as of the date 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.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Performance varies depending on system configuration. No product or component can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.

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.

1. Baseline Config (DRAM): System: Lightning Ridge (4S); CPU: Intel® Xeon® 8280M B0 (28C/S); Memory: 6TB (48x 128GB DDR4 2666MHz); Storage: 60x Intel SSD DC S4600 SATA 480GB; BIOS: WW48'18; SUSE 15; Intel IT WL; 5.83 TB DB; Tested 3/15/2019. AD 2-2-2 Config: Lightning Ridge (4S); CPU: Intel Xeon 8280M B0 (28C/S); Memory: 7.5TB (24x 256GB AEP QS; 24x 64GB DDR4 2666 MHz); Storage: 75x Intel SSD DC S4600 SATA 480GB; BIOS: WW48'18; SUSE 15; Intel IT WL; 7.3 TB DB; Tested 3/15/2019.

2. Faster Restart Time: Baseline Config (DRAM Only): System: Lightning Ridge (4S): CPU: Intel® Xeon® 8280M; CPUs/N: 4S @ 28C/S; Memory: 6TB (48x 128GB DDR4 @ 2666 MT/s; Network: 10 GbE Intel X520NIC; Storage: 60x Intel® SSD DC S4600 SATA 480GB TB; BIOS: WW48'18; SUSE 15; Intel IT workload; SAP HANA* database size: 3TB; Security mitigations: Variants 1,2,3 enabled; Date: 3/1/19. Intel® Optane™ DC persistent memory & DRAM Config: System: Lightning Ridge (4S); CPU: Intel® Xeon® 8280L; CPUs/N: 4S @ 28C/S; Memory: 9TB (248x 256GB Intel® Optane™ DC persistent memory, 24x 128GB DDR4 @ 2666 MT/s; Network: 10 GbE Intel X520NIC; Storage: 90x Intel® SSD DC S4600 SATA 480GB TB; BIOS: WW48'18; SUSE 15; WL Version: Intel IT workload; SAP HANA* database size: 3TB; Security mitigations: Variants 1,2,3 enabled; Date: 3/1/19.

3. Baseline Config (DRAM): Tested 1/31/19. CPU: Cascade Lake B08272L; C/T: 26/52; HT: ON; Turbo: ON; BIOS: WW42'18; Intel® Optane™ DC persistent memory FW version: 5253; System DDR Mem Config: slots/cap/run-speed; 24/32GB/2666MT/s; Total Memory/Node (DDR, Intel Optane DC persistent memory) 768 GB, 0; Storage – boot: 1x Samsung PM963 M.2 960GB; Storage app drives: 7x Samsung* PM963 M.2 960GB, 4x Intel SSD S4600 (1.92TB); OS: Windows Server* 2019; OLTP* Cloud Benchmark. Intel Optane DC persistent memory & DRAM Config: Tested 1/31/19. CPU: Cascade Lake B08272L; C/T: 26/52; HT: ON; Turbo: ON; BIOS: WW42'18; Intel Optane DC persistent memory FW version: 5253; System DDR Mem Config: slots/cap/run-speed; 12/16GB/2666MT/s; System Intel Optane DC persistent memory Config: slots/cap/run-speed: 8/128GB/2666MT/s; Total Memory/Node (DDR, Intel Optane DC persistent memory) 192GB, 1TB; Storage – boot: 1x Samsung PM963 M.2 960GB; Storage app drives: 7x Samsung PM963 M.2 960GB, 4x Intel SSDs S4600 (1.92TB); OS: Windows Server 2019; OLTP Cloud Benchmark. Running 4 vCPUs per VM, 32GB memory per VM.

4. Pricing guidance as of 6/30/19. Baseline Config (DRAM Only): Relevant Value Metric: 166.00; CPU Cost: 2x6230 (CLX, Gold 20core): $3,788; Memory subsystem: Total Capacity: 384GB (192GB/Socket): $3,936; Storage: # of HDD/SDDs: $8,338; RBOM: Chassis; PSUs; Bootdrive, etc: $1,300; SW Costs: $15,415; Total System Cost: $32,777. Total Cost: 4 Sts x $32,777: $131,108. VMs per Node: 41.50. Cost per VM: $789.81. Intel Optane DC persistent memory & DRAM Config: Relevant Value Metric: 224.00; CPU Cost: 2x6230 (CLX, Gold 20core): $3,788; Memory subsystem: Total Capacity: 512GB (256GB/Socket): $3,624; Storage: #of HDD/SDDs: $8,338; RBOM: Chassis; PSUs; Bootdrive, etc: $1,300; SW Costs: $15,415; Total System Cost: $32,465. 4 Sys x $32,465: $129,860. VMs per node: 56.00. Cost per VM: $579.73.