BUSINESS BRIEF

Enterprise Storage
Databases

Speed Response Times to Increase Customer Satisfaction

Add Intel® Optane™ DC SSDs with Intel® Memory Drive Technology to reduce bottlenecks for enterprise databases

Intel® Optane™ SSD DC P4800X Series offers flexible options for optimizing your data center.

Industry Strategic Challenges

Customer satisfaction is at the heart of any business, whether those customers are external or part of the organization. And satisfaction is often linked with responsiveness, which can suffer when a business' relational database is not optimized, causing I/O bottlenecks.

Across industries, the need to process transactions quickly without lag time is critical. This is particularly true in retail, where transactions mean purchases and direct revenue to the business. Customers now expect instant gratification and will go elsewhere when they don't get it. If retailers can't keep up, they often lose buyers in the moment and lose potential customer loyalty for the future. In fact, research has found that for each second a website takes to load, the cart abandonment rate climbs by seven percent.[1] And according to Google* engineers, even a 400 millisecond lag is too long for site visitors.[2]

Internally, enterprise IT must deliver fast response time to user queries if they are to capitalize on sharply rising data volumes that yield insights to keep the business competitive. And they must do it while containing costs. This means doing more with their existing infrastructure. When they do add hardware or software, it must prove itself with measurable performance increases and lower total cost of ownership.

Intel® Optane™ DC SSDs with Intel® Memory Drive Technology more than meet these requirements. These game-changing technologies optimize Microsoft SQL Server* for Linux*, a relational database management system (RDBMS) used to support a significant amount of online transaction processing, as well as business intelligence and analytics applications.

Adding Intel Optane DC SSDs to existing infrastructure boosts Microsoft SQL Server response times, enabling better performance from the company's current investment.[3] The SSDs also offer high endurance,[4] helping to reduce the frequency of replacing storage infrastructure[4] which can help to decrease the total cost of ownership.

Intel Optane SSDs with Intel Memory Drive Technology deliver even more performance gains. Intel Optane SSDs and memory subsystems merge transparently, enabling some of the SSD capacity to be used as memory instead of storage. In recent testing, Intel Optane SSDs with Intel Memory Drive Technology delivered 17 percent more transactions per minute than an all-DRAM solution.[5]

Business Drivers and Desired Outcomes

Enterprises are always looking to optimize relational database management systems like Microsoft SQL for Linux so they can meet their business goals, which include

- Improve customer satisfaction with faster response times
- Speed transactions at the point of sale
- Enable internal users to work more efficiently and productively
- Optimize data value
- Contain IT costs

Business Value

Intel Optane DC SSDs with Intel Memory Drive Technology offer a flexible solution that allows companies to selectively swap out current storage devices to address the most problematic I/O bottlenecks. Benefits for companies running Microsoft SQL Server platform include:

- Processing more transactions in less time[6]
- Eliminating bottlenecks when accessing large amounts of data[7]
- Expanding and speeding up storage[8]

Digital Transformation and Business Innovation

Today's businesses are seeking ways to modernize their data centers to optimize operations and provide better and new services to their customers. This includes improving infrastructure—but not at the cost of profitability. Adding Intel Optane SSDs with Intel Memory Drive Technology to get the best from Microsoft SQL Server for Linux is an innovative solution that helps companies use the latest technologies to improve user experience and compete in a highly competitive marketplace.

Driving Transformation

Intel has been pioneering technologies to enable data center modernization—a major goal for most enterprises today. New memory and storage solutions are a key component. Intel Optane DC SSDs with Intel Memory Drive Technology enable companies to modernize at their own pace within their own budget requirements.

Where to Get More Information

- Intel® Optane™ SSD DC P4800X Series
- Intel® Memory Drive Technology
- System Memory at a Fraction of the DRAM Cost paper

[1] $4 Trillion & Counting: 2017 Shopping Cart Abandonment Statistics https://www.readycloud.com/info/4-trillion-and-counting-2017-shopping-cart-abandonment-statistics

[2] The Google Gospel of Speed https://www.thinkwithgoogle.com/marketing-resources/the-google-gospel-of-speed-urs-hoelzle/

[3] Performance results based on Intel testing March 19, 2019. **Configuration 1:** CPU-Intel ® Xeon ® E5-268W (2 processors) with 48 HT cores; 384GB DRAM (377GB usable); . BIOS 01.01.0015. (11/08/2018). One 1TB Intel® SSD DC P4500 (930 GB usable). Running Windows Server* 2016; and Microsoft SQL Server* 2017 Enterprise Edition; **Configuration 2:** CPU: Intel ® Xeon ® E5-268W (2 processors) with 48 HT cores; 128 GB DRAM . BIOS 01.01.0015 (11/08/2018). One 375GB Intel® Optane™ SSD DC P4800X + Intel® Memory Drive Technology; Running Windows Server* 2016; and Microsoft SQL Server* 2017 Enterprise Edition. Workload: HammerDB* 3.1 – MS-SQL-TPC-C.

[4] Based on 20X higher endurance when Intel® Optane™ SSD DC P4800X is compared with Intel® SSD DC P4600. Endurance ratings available at https://www.intel.com/content/www/us/en/solid-state-drives/optane-ssd-dc-p4800x-brief.html compared with https://www.intel.com/content/www/us/en/products/docs/memory-storage/solid-state-drives/ssd-dc-p4600-brief.html?wapkw=p4600

[5] see endnote 3

[6] see endnote 3

[7] More transactions per minute at varying # virtual users (1-256). Performance results are based on testing by Intel as of March 19, 2019 and may not reflect all publicly available security updates. Source: Online transaction processing (OLTP) workload with two configurations: one where all files—data, logs, and TempDB—were on a single Intel SSD DC P4500, and one where the data files were stored on the Intel SSD DC P4500 but the logs and TempDB were placed on an Intel® Optane™ SSD DC P4800X. **Configuration 1:** CPU-Intel ® Xeon ® Gold 6254 CPU @2.60 GHZ 2.59 GHZ (2 processors) with 72 HT cores; 192GB DRAM (191GB usable); . BIOS 2.8. (11/23/2018). One 1TB Intel® SSD DC P4500 (930 GB usable). Running Windows Server* 2019; and Microsoft SQL Server* 2017 Enterprise Edition. **Configuration 2:** CPU: Intel ® Xeon ® Gold 6254 CPU @2.60 GHZ 2.59 GHZ (2 processors) with 72 HT cores; 192 GB DRAM (191 GB usable); . BIOS 2.8. (11/23/2018). One 750GB Intel® Optane™ SSD DC P4800X; Running Windows Server* 2019; and Microsoft SQL Server* 2017 Enterprise Edition. Workload: HammerDB* 3.1 – MS-SQL-TPC-C. HAMMERDB Settings: 500 Warehouses, Auto-Pilot – 1,2,4,8,16,32,48,64,128,256 virtual Users. Rampup Time – 2 minutes, TestTime – 5 minutes.

[8] Claim:16% more relative throughput on row store (185/215) and Column store (371/430). Source: DWFT Solution is a pre-built solution offered by OEM's to customers. The values are hypothetical scores compared by the tool itself against a based validated configuration. The values assume the following: Compression rate: 5:1. The throughput values are percentage of the reference hardware assumed by the tool. Test configuration: http://download.microsoft.com/download/F/8/6/F8654654-6784-48F5-83C0-2D46186EEC66/Data_Warehouse_Fast_Track_Reference_Guide_for_SQL_Server_2016_EN_US.pdf.

The reference architecture can be found on the design principles from Intel Select Solution. https://www.intel.com/content/www/us/en/products/solutions/select-solutions/analytics/microsoft-sql-server-enterprise-data-warehouse.html. Performance results are based on testing by Intel as of November 2018 and may not reflect all publicly available security updates. Base Configuration: 2x Intel® Xeon® Gold 6132 processor (2.60 GHz, 14 Cores. 384 GB RAM), BIOS SE5C620.86B.00.01.0012.021320180053; 4x Intel® SSD DC P4500 (1.6 TB for data, logs, and TempDB) Software: Windows Server* 2016, Microsoft SQL* 2017 Enterprise Edition; Base Configuration plus Optane: 2x Intel® Xeon™ Gold 6132 processor, 2.60 GHz, 14 Cores, 384 GB RAM), BIOS SE5C620.86B.00.01.0012.021320180053 ; 6x Intel® SSD DCP4500 (3.8 TB for data), 2x Intel® SSD DC P4800X (375 GB for logs and TempDB). Workload: Microsoft SQL Data Warehouse Fast Track (DWFT)

Notices and Disclaimers

See configuration disclosure for details. No product can be absolutely secure.

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.

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 complete information, visit intel.com/benchmarks.

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 computer system can be absolutely secure. Check with your system manufacturer or retailer, or learn more at intel.com/optane.

Performance results are based on testing dates cited in previous endnotes and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure.

 Printed in USA 0519/JGAL/MIM/PDF ♻ Please Recycle 340303-001US