



# Reduce Performance Bottlenecks of Microsoft SQL Server\* Database

## Improve Performance of Existing Microsoft SQL Server\* Database Deployments with Intel® Solid State Drive Data Center P3700 Series and Intel® Cache Acceleration Software



### Accelerating Microsoft SQL Database Performance

#### Executive Summary

Traditional Microsoft SQL Server\* database deployments require large data storage typically composed of arrays of rotating hard disk drives (HDD) configured in a storage array network (SAN) over a network connection. As data volume increases, the database performance quickly degrades due to increased I/O and network bottlenecks.

Replacing slower HDDs with faster solid state drives (SSD) instantaneously relieves I/O bottlenecks and improves performance, but the cost of upgrading a SAN storage can be significant. Using Intel® Cache Acceleration Software (Intel® CAS) with an Intel® Solid State Drive Data Center P3700 Series as a caching medium

improves storage performance without the traditional cost of upgrading a SAN to SSD storage.

#### Challenge

Performance degradation is one of the biggest challenges that existing database deployments face as the volume of data and number of users rapidly increase. If performance is degraded due to bottlenecks caused by back-end HDD storage and/or network traffic, replacing all the HDDs with SSDs would dramatically improve I/O performance.

Intel® Solid State Drives (Intel® SSDs) offer compelling benefits to enterprise applications such as improved reliability, lower power usage, lower latency, greater throughput, and larger concurrent I/O, as compared to HDDs. In cases where the bottleneck is primary storage, the faster speed and lower latency of Intel SSDs easily address performance issues by providing a large increase in speed and throughput.

However, such a solution entails significant immediate expense, including the cost to purchase SSDs to replace existing HDD capacity, downtime and cost of the database upgrade, as well as losing the initial investment of the HDD infrastructure. This upgrade can be cost prohibitive for many companies with tight budget constraints.

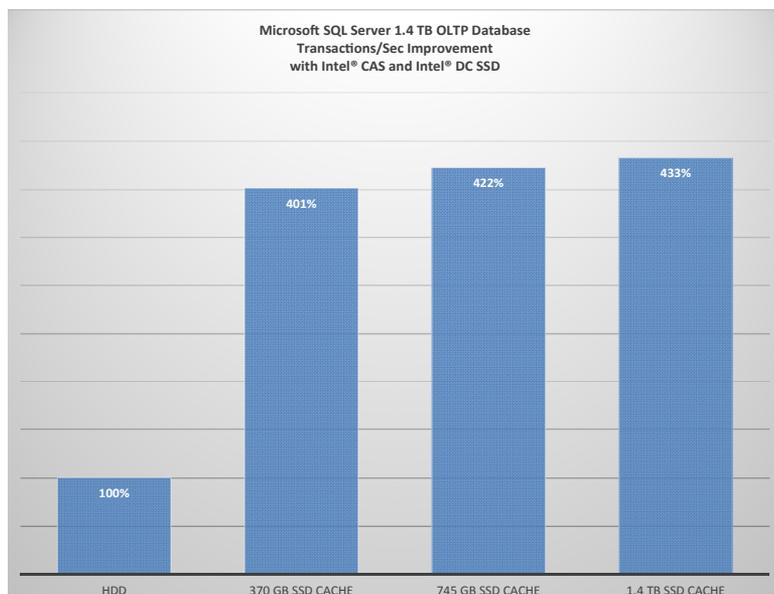


Figure 1<sup>1</sup>

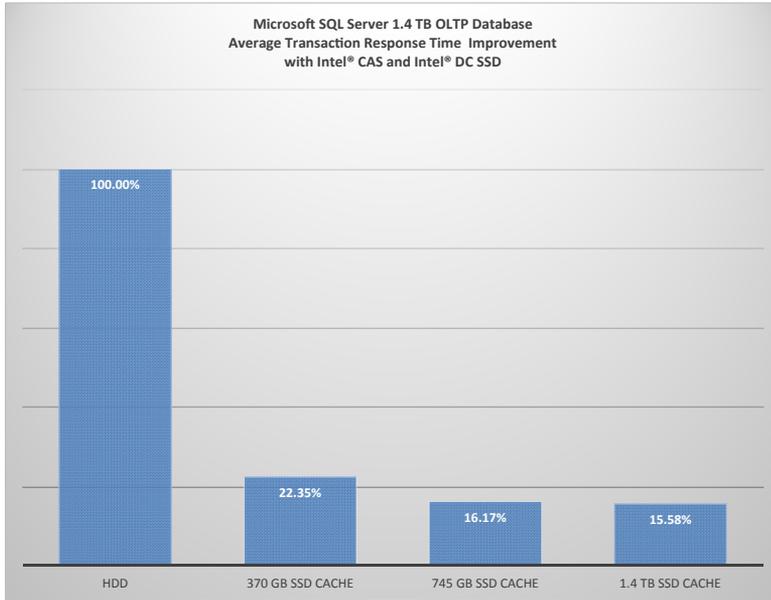


Figure 2<sup>1</sup>

## Solution

*Intel CAS accelerates application performance without modifying application or back-end storage infrastructure.*

Intel CAS is a drop-in solution to accelerate applications; it requires no modification to the existing applications or back-end storage media. An Intel SSD with Intel CAS enables the SSD to cache the hottest data, from existing database

back-end storage media (HDD, SAN, NAS), on the compute server node. Additionally, in bypassing the network and storage controller to access the hottest data, performance bottlenecks caused by network traffic are greatly reduced. This makes Intel CAS a cost effective solution that quickly and easily provides a boost to read and write performance of applications and their databases.

For details on how to download and use Intel® Cache Acceleration Software visit [www.intel.com/content/www/us/en/software/intel-cache-acceleration-software-performance.html](http://www.intel.com/content/www/us/en/software/intel-cache-acceleration-software-performance.html)

Find the Intel Solid State Drive that's right for you. For product information, visit [www.intel.com/ssd](http://www.intel.com/ssd)

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## Results

Using an OLTP (On-Line Transaction Processing) workload to measure performance of a Microsoft SQL Server database, our results showed that adding Intel CAS and using Intel SSD DC P3700 Series as the caching medium yields performance improvement of four-fold over HDD (Figure 1).

In our test setup, Intel CAS was configured to cache all database files. When the database files grow in size and become larger than the cache drive, it necessitates data in the cache to be evicted. Intel CAS utilizes an eviction policy that intelligently manages the hot data in the cache drive with minimal performance hit.

As shown in our test results (Figure 2), when the database fits in the cache drive (1.4 TB cache) the transactions per second increased to 433% of the HDD's and average transaction response time was cut down to 15.58% of the HDD's. In the case where the database is twice the size of the cache drive (745 GB cache), there was a 422% transactions per second improvement with response time down to 16.17% of the HDD's. Finally, in the extreme case where the database size is 4x the size of the cache drive (370 GB cache), the transactions per second improvement was still very impressive at 401% of the HDD's and response time cut to less than a quarter of that of the HDD's.

## Conclusion

Using an Intel Data Center SSD with Intel Cache Acceleration Software is a cost effective solution to immediately improve performance of existing Microsoft SQL Server OLTP-like database deployments slowed down by back-end storage and network bottlenecks.

<sup>1</sup> **Database Server Configuration:** Intel® Xeon® CPU E5-2690 v2 @ 3 GHz (2 processors), 128 GB RAM, Windows® Server 2012 R2 Standard 64-bit, Intel® Gigabit 4P X520/I350 NIC, Back-end Storage: Raid 5 6.4TB (24x 300GB 15K RPM SAS Drives), Intel® SSD DC P3700, Intel® Cache Acceleration Software v3.0

**Clients Host Simulator System Configuration:** Intel® Xeon® CPU E5-2690 v2 @ 3 GHz (2 processors), 128 GB RAM, Windows® Server 2012 R2 Standard 64-bit, Broadcom® NetXtreme Gigabit NIC, 30 users, 8 Customer Emulator Instances, 8 Market Emulator Instances

**OLTP Workload Database Configuration:** Microsoft SQL Server 2014 Enterprise Edition; Database Size 1.4 TB setup with 1.2 Million Customers; OLTP Transactions Breakdown: 4.9 % Broker-Volume, 13% Customer-Position, 1% Market-Feed, 18% Market-Watch, 14% Security-Detail, 8% Trade-Lookup, 10.1% Trade-Order, 10% Trade-Result, 19% Trade-Status, 2% Trade-Update

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