Increase MySQL Database Performance with an Intel® SSD DC P3700 Series and Intel® Cache Acceleration Software

Databases service millions of requests by millions of users every day. The primary storage for these databases is usually arrays of rotational media (hard-disk drives, or HDDs) which typically quickly becomes the largest bottleneck for database application performance. Improving database application performance by replacing slower HDDs with faster solid-state drives (SSDs) and providing a method to cache frequently accessed files can greatly improve application performance and reduce support costs.

CHALLENGE

One of system architects' largest scalability issues occurs when database servers begin losing the ability to meet the demands of Enterprise applications that continue to grow in users and data volume. Replacing the servers is an option but the bottleneck in back-end storage media remains an issue. Furthermore, latency is crucial in database applications, and as system memory misses increase, the performance of the database remains limited by the performance of the primary storage.

Intel® SSDs and Intel® CAS enable databases to scale to the next level, allowing them to handle more requests, more users, and more data.

Intel® SSDs offer compelling benefits to Enterprise applications such as improved reliability, lower power usage, lower latency, greater throughput, and larger concurrent I/O when compared to HDDs. Intel® SSDs easily address performance issues in cases where the performance bottleneck is primary storage; the Intel® SSD's faster speed and lower latency provide a large increase in speed and throughput compared to HDDs.

Replacing all HDDs in the primary data store with SSDs is the optimal solution and results in extreme performance gains. However, for many companies, achieving 100% solid-state storage is not always possible in the short term due to budget constraints. Additionally, many companies are not prepared to modify or replace the existing Network Attached Storage (NAS) or Storage Area Network (SAN) back-end storage infrastructure.

SOLUTION

Intel® Cache Acceleration Software (Intel® CAS) accelerates application performance without modifying the application or back-end storage architecture.

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 software to utilize the SSD to cache the hottest data, from your existing database back-end storage media (HDD, SAN, NAS), on the compute server node. This is a cost effective solution that quickly and easily provides a boost to read and write performance of your application and its database.
RESULTS

Intel completed standardized testing across three different configurations. All systems were configured with the same core system hardware aside from the test changes noted. The test configurations key differences are listed below:

<table>
<thead>
<tr>
<th>Baseline Test: HDD</th>
<th>Test A (better): HDD+Intel® CAS+Intel® SSD</th>
<th>Test B (best): Intel® SSD</th>
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<tbody>
<tr>
<td>6x 15k RPM (300GB – Seagate Savvio® ST930065355) SAS HDDs in RAID 5 using Intel® RAID Controller RS3DC080</td>
<td>6ea 15k RPM (300GB – Seagate Savvio® ST930065355) SAS HDDs in RAID 5 using Intel® RAID RS3DC080 Controller, One Intel® SSD DC P3700 Series as caching drive with Intel® CAS v2.8 enabled</td>
<td>Replaced HDD Storage with two Intel® SSD DC P3700 Series in RAID 0 Linux® mtd v3.2.6</td>
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Comparing the results across the three different configurations demonstrates the performance gains achieved in utilizing Intel® SSDs and Intel® Cache Acceleration Software.

Using an Intel® SSD DC P3700 Series as a cache drive with Intel® CAS can increase your data center’s existing application and database performance immediately, without a modification or change to the existing applications or storage media back-end.

Migrating the entire HDD RAID subsystem to a configuration of two Intel® SSD DC P3700 Series resulted in 7.8x the number of transactions with an 87% latency reduction.

CONCLUSION

Deploying an Intel® SSD with Intel® CAS can increase your data center’s existing application and database performance immediately, without a modification or change to the existing applications or storage media back-end.

Find the Intel® Solid-State Drive that is right for you. Visit www.intel.com/ssd for more product information.


SOLUTION DETAILS

Hardware Configuration and Setup

- Server: Supermicro SuperServer 2028U-TR4+, dual socket Intel Xeon® E5-2699 v3, 128 GB DDR4 RAM (8ea 16GB Crucial® CT16G4FRD4213), Intel® RAID Controller RS3DC080
- Database Storage Configurations:
  - Configuration 1: 6x 15k RPM Seagate Savvio® SAS HDDs in RAID 5
  - Configuration 2: = 6x 15k RPM SAS HDDs in RAID 5 + 1x Intel® SSD DC P3700 Series with Intel® Cache Acceleration Software
  - Configuration 3: 2x Intel® SSD DC P3700 Series 800GB in RAID 0.
- Database: 1.2TB Sysbench database
- Operating System: Redhat Enterprise Linux® 6.5, Intel® x86-64, kernel 2.6.32-431.
- Additional Software: Intel® Cache Acceleration Software v2.8

Software Setup

- Install RHEL® 6.5. Limit the updates to EUS 6.5.z.
- Install remi-release-6 and epel-6 repositories, Percona-XtraDB-Cluster-shared-55-5.5.37-25.10.756.el6.x86_64.rpm, and sysbench-0.5.3.el6.x86_64.rpm.
- Install MySQL® 5.1 with InnoDB® external plugin 1.1, and Sysbench* 0.5.

Drive Configuration

Using the Hardware RAID controller, setup a separate RAID group for each of the two RAID configurations specified above (6x SAS HDDs in RAID5, and 6x SAS HDDs in RAID5). Once the RAID volumes have finished initialization, format each volume as ext4. Use mdadm to create a software RAID0 group for the two Intel® SSD DC P3700 Series. Install Intel® Cache Acceleration Software. Partition the extra Intel® SSD DC P3700 Series to be 20% of the database size. Configure the Intel® Cache Acceleration Software to use that partition as a cache device and one of the 6x SAS RAID 5 volumes as a core device.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance measurements in Sysbench®, *Oracle MySQL® 5.1, 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.

Some results have been estimated based on internal Intel analysis using datasheet comparisons and are provided for informational purposes only. Any difference in system hardware or software design or configuration may affect actual performance. Results in some cases have been simulated and are provided for informational purposes only. Results were derived using simulations run on an architecture simulator or model. Any difference in system hardware or software design or configuration may affect actual performance.

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