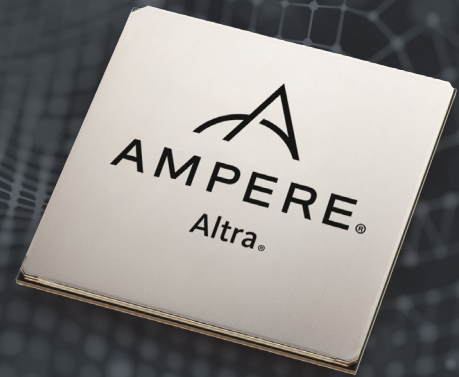




Workload Brief

MySQL Sysbench OLTP on Ampere® Altra® Max



Ampere®—Empowering What's Next

The Ampere® Altra® Max processors are complete system-on-chip (SOC) solutions built for cloud native applications. Ampere Altra Max supports up to 128 cores. In addition to incorporating a large number of high-performance cores, the innovative architecture delivers predictable high performance, linear scaling and high energy efficiency.

MySQL is the most popular Open-Source Relational Database Management System ("RDBMS"), is developed, distributed, and supported by Oracle Corporation. It is used by most modern websites and web-based services as a convenient and fast-access storage and retrieval solution for large volumes of data. MySQL Database Server is very fast, reliable, scalable, and easy to use.

In this workload brief, we compare Ampere Altra Max M128- 30 to Intel® Xeon® 8380 and AMD EPYC™ 7763 processors running MySQL while measuring the throughput and latencies on each of these processors.

MySQL on Ampere® Altra® Max

Ampere Altra Max are designed to deliver exceptional performance for cloud native applications like MySQL. With an innovative architectural design, operating at consistent frequencies, and using single-threaded cores applications will be more resistant to noisy neighbor issues. This allows workloads to run in a predictable manner with minimal variance under increasing loads.

The processors are also designed to deliver exceptional energy efficiency. This translates to industry leading performance/watt capabilities and a lower carbon footprint.

Benefits of running MySQL on Ampere Altra Max

- **Cloud Native:** Designed from the ground up for 'born in the cloud' workloads like MySQL, Ampere Altra Max can deliver up to 36% higher performance than the best x86 servers
- **Energy Efficiency:** With up to 128 energy-efficient Arm cores, Ampere Altra Max can consume up to 32% lower power while maintaining competitive levels of performance.
- **Lower Carbon Footprint:** Industry-leading performance and high energy efficiency result in Ampere Altra Max demonstrating up to 2.8x higher Performance/watt, leading to lower TCO and a smaller carbon footprint.
- **Consistency & Predictability:** Single-threaded cores running at fixed maximum frequencies ensure linear scaling under stringent SLAs and at high loads while running MySQL

Benchmarking Configuration

Sysbench is a multi-threaded benchmark tool. The tool can for example create a simple database schema, populate database tables with data, and generate multi-thread load (SQL queries) towards the database server.

The Sysbench OLTP load consists of the following seven basic SQL queries:

- 1) POINT_SELECT
- 2) SELECT_SIMPLE_RANGES
- 3) SELECT_SUM_RANGES
- 4) SELECT_ORDER_RANGES
- 5) SELECT_DISTINCT_RANGES
- 6) UPDATE_KEY
- 7) UPDATE_NO_KEY

We are running six tests which use above SQL queries as follows:

- sb11-OLTP_RO_10M_8tab-uniform-dst_ranges1-notrx : 5
- sb11-OLTP_RO_10M_8tab-uniform-notrx : 1+2+3+4+5
- sb11-OLTP_RO_10M_8tab-uniform-p_sel1-notrx : 1
- sb11-OLTP_RO_10M_8tab-uniform-s_ranges1-notrx : 2
- sb11-OLTP_RW_10M_8tab-uniform-notrx : 1+2+3+4+5+6+7
- sb11-OLTP_RW_10M_8tab-uniform-upd_idx1-notrx : 6

Sysbench benchmark is deployed on different CPU socket with MySQL Server and database connection is through TCP/IP socket interface over loopback IP address.

MySQL Server database storage is configured with RAMdisk filesystem and will consume whole socket cpu cores resource to handle request from Sysbench.

Since it is realistic to measure throughput under a specified Service Level Agreement (SLA), we have used a 95th percentile latency (p.95) of 1 millisecond. This ensures that 95 percent of the requests have a response time of 1 ms in the worst case.

We run above benchmark on each platform and collect six test cases' TPS results at P.95 of 1 millisecond and calculate GEOMEAN as platform's final score.

Ampere Altra Max

- 128 Armv8.2+ 64-bit cores at 3.0GHz
- 64KB i-Cache, 64KB d-Cache per core
- 1MB L2 Cache
- 16MB-32MB System Level Cache
- Coherent mesh-based interconnect

Memory

- 8x72 bit DDR4-3200 channels
- ECC and DDR4 RAS
- Up to 16 DIMMs (2 DPC) and 4TB/socket

Connectivity

- 128 lanes of PCIe Gen4
- Coherent multi-socket support
- 4x16 CCIX lanes

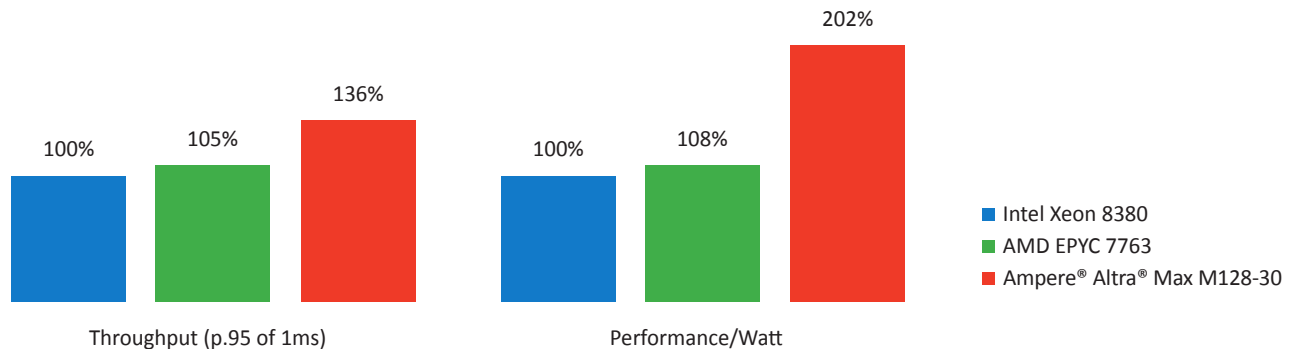
System

- Armv8.2+, SBSA Level 4
- Advanced Power Management

Performance

- SPECrate®2017_int_base:350

MySQL Performance and Energy Efficiency



Benchmarking Results and Conclusions

As can be seen in the chart below, we observed up to 36% advantage in performance on Ampere Altra Max compared to Intel 8380 (see chart).

We observed up to a 29% advantage in performance on Ampere Altra Max compared to AMD 7763 (see chart).

For large-scale cloud deployments, performance/Watt (i.e. energy efficiency) is an important metric in addition to raw performance. Ampere Altra Max processors have 2.02x better performance/Watt under a specified SLA than that on Intel servers and 1.87x higher performance/Watt compared to that on AMD servers.

MySQL is the most popular Relational Database Management System today. MySQL Database Server is very fast, reliable, scalable, and easy to use. Ampere Altra Max are designed to deliver exceptional performance and energy efficiency for cloud native applications. In Ampere's testing, these processors demonstrated up to 36% performance improvements and they achieved up to 2.02x energy efficiency improvements.

For more information on this workload or other workloads our engineers have been working on, please visit:
<https://developer.amperecomputing.com/>.

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