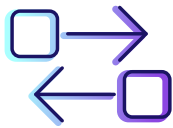# Improve database performance with Intel® Xeon® Platinum 8180 and 8160 processors

Servers with these two processors supported more Oracle® Database 12*c* and PostgreSQL™ online transaction processing database activity and more Apache® Cassandra™ distributed database work than servers with AMD EPYC™ 7601 processors
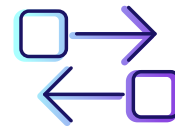
A study commissioned by Intel Corp.

Process
up to 60% more
Oracle Database 12c
transactions per minute*

Handle
66% more Apache
Cassandra operations
per second*

Manage
up to 51% more
PostgreSQL
transactions per minute*

Servers in your data center run the transactional database applications that drive your organization. Processors that are inside these servers affect how those applications handle continuous, fluctuating applications in areas such as e-commerce, financial services, and health care record keeping. Choosing Intel Xeon Platinum 8180 and 8160 processors for these database applications can improve performance, which could help an organization generate more revenue, grow customer or client bases, or operate more efficiently.

In the Principled Technologies data center, we evaluated servers powered by Intel Xeon Platinum 8180 and 8160 processors and servers using AMD EPYC 7601 processors. We tested an online transaction processing (OLTP) workload against two different databases (Oracle Database 12*c* and PostgreSQL). Transactional database applications are used across many industries, including retail companies, financial services organizations, and health care providers. We also tested an Apache Cassandra distributed database workload. Some companies with large, web-based applications where data grows rapidly use Cassandra. The Intel Xeon Platinum 8180 and 8160 processor-powered servers delivered higher performance than the servers with AMD EPYC 7601 processors by handling more transactions per minute and operations per second, respectively, in each workload. Processing more database work allows applications that rely on the database to support more users and more queries, edits, and other common transactional database activities, which can help generate more revenue for your organization and support more clients or customers in your user base.

Whether your organization uses Oracle Database 12*c*, PostgreSQL, or Cassandra databases, our results indicate that servers powered by Intel Xeon 8180 and 8160 processors can offer better database performance than AMD EPYC 7601 processor-based servers.

*Intel Xeon Platinum 8180 processor-powered servers compared to servers with AMD EPYC 7601 processors

Why a faster server matters for enterprise-level databases

Simply put, people and organizations need results as close to "real-time" as possible. A 2016 BBC article notes, "just a half second difference in page load times can make a 10% difference in sales for an online retailer."[1] Servers that can do more database work, speed application response, and lower user wait time are the key to making your users happy.

Imagine you're ordering a set of car tires from the online store of a big-box retailer. There's a brick-and-mortar location close to where you live, and you'd like to have the store install the tires. Now imagine 20,000 other people are ordering tires from their laptops or phones at the same time you are, and they all need to schedule an appointment as well.

Neither you nor any other customer needs to wait too long. The servers that run those ordering and appointment systems of the big-box retailer must complete your requests at nearly the same time as everyone else's and without error. Servers powered by Intel Xeon Platinum 8180 or 8160 processors can help handle these kinds of database challenges.

About Intel Xeon Scalable processors

Intel Xeon Scalable processors are available in four feature configurations (Platinum, Gold, Silver, and Bronze) to match the varied needs of enterprises operating at many different levels. According to Intel, Xeon Scalable processors are "workload-optimized to support hybrid cloud infrastructures and the most high-demand applications."[2]

Intel Xeon Platinum processors offer up to 28 CPU cores, come in more than eight socket configurations, and support up to 12 TB of memory, which can help speed the computational work of the CPUs.

To learn more about Intel Xeon Scalable processors, visit https://www.intel.com/content/www/us/en/processors/xeon/scalable/xeon-scalable-platform.html.

About HammerDB

We tested each server with an OLTP workload from the HammerDB suite of benchmarks. HammerDB is an open source, enterprise-grade database benchmarking application that supports Oracle Database, SQL Server, IBM Db2, MySQL, MariaDB, PostgreSQL and Redis.[3] Their TPC-C-like benchmark gives results in two metrics: transactions per minute (TPM) and new orders per minute (NOPM).

The benchmark has evolved over time to stress more types of databases, but databases record TPM differently. TPM is still important, however, because it directly relates to metrics captured from databases. In addition, TPM values are from in-memory tables, which means testers can view and select TPM without affecting test results.[4]

To learn more about HammerDB, visit https://www.hammerdb.com/.

Process more OLTP transactions per minute

An OLTP workload can be the cornerstone of an essential business-critical application. The Intel Xeon Platinum 8180 and 8160 processor-powered servers delivered higher performance than the AMD EPYC 7601 processor-based server in OLTP workloads running on two of the currently most popular database management systems,[5] Oracle Database 12*c* and PostgreSQL.

Oracle licensing agreements prohibit publishing benchmark scores, so we report only relative performance for the relational database management system. To get the relative performance numbers, we designated the lowest median performance output as the baseline (the servers with AMD EPYC 7601 processors for this study), assigned the median baseline output a value of 1, divided the median outputs of the Intel Xeon Platinum 8180 and 8160 processor-powered servers by the median baseline output, and assigned the results of the division to the respective configurations.

With servers processing additional TPM for either database management system (or both), your organization could see more revenue from your e-commerce workloads or allow more users (employees, customers, or clients) to search, update, or edit data for multiple workloads.

Relative transactions per minute

Oracle Database 12*c* workload

Intel Xeon Platinum 8180	1.60
Intel Xeon Platinum 8160	1.39
AMD EPYC 7601	1.00
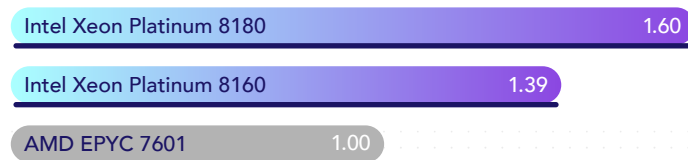
Up to **60%** more transactions per minute

Transactions per minute

PostgreSQL 9.6 workload

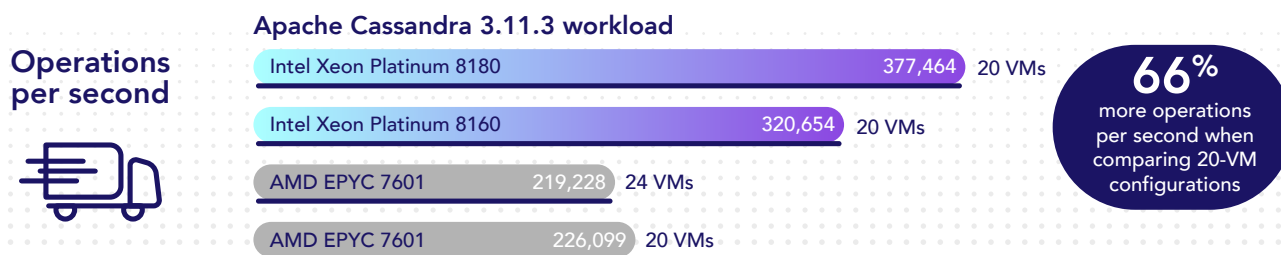|	
Intel Xeon Platinum 8180	1,757,375
Intel Xeon Platinum 8160	1,471,016
AMD EPYC 7601	1,156,705
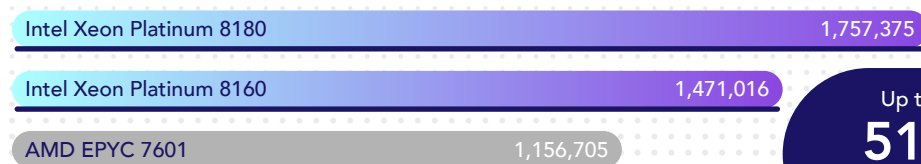
Up to **51%** more transactions per minute

Handle more operations per second for Cassandra workloads

Many businesses use demanding NoSQL applications to provide scalable, high-access performance. Apache Cassandra, a distributed NoSQL database management system, offers a highly reliable architecture well suited to these applications, which include e-commerce, media streaming, social media, and more.

We started with 10 VMs on each node (20 total) of the Intel Xeon Platinum 8180 and 8160 processor-powered solutions and the AMD EPYC 7601 processor-based solution. To reflect a period of high usage, we wanted CPU utilization for each solution to be above 70 percent. We had to increase the number of VMs on the AMD processor-based server nodes to 24 to achieve this goal. To quantify the performance each group of servers could achieve, we used the cassandra-stress test tool, which delivers results in terms of operations per second (OPS). We ran the tool three times for each solution and report the median run.

The Intel Xeon Platinum 8180 and 8160 processor-powered servers delivered more OPS than the AMD EPYC 7601 processor-based server did with 20 and 24 VMs. More OPS can allow your business to meet database performance requirements without having to purchase additional hardware or public cloud virtual instances, which can, in turn, lead to savings.

Operations per second

Apache Cassandra 3.11.3 workload

Intel Xeon Platinum 8180	377,464	20 VMs
Intel Xeon Platinum 8160	320,654	20 VMs
AMD EPYC 7601	219,228	24 VMs
AMD EPYC 7601	226,099	20 VMs

66% more operations per second when comparing 20-VM configurations

About the databases

Oracle Database 12*c*

Oracle Database 12*c* is an enterprise-grade multi-model database management system available for cloud-based and on-premises workloads. It is often used for OLTP, data warehousing (DW), and mixed (OLTP and DW) database workloads. Web-based used vehicle supplier Carfax is an example of a company that uses or has used Oracle Database 12c.[6]

PostgreSQL

PostgreSQL is an "open source object-relational database system that uses and extends the SQL language."[7] It runs on all major operating systems, and Australian enterprise software company Atlassian is an example of a company that uses or has used the database.[8]

Apache Cassandra

Apache Cassandra is an open-source NoSQL distributed database management system designed for large amounts of structured data. An example of a company that uses or has used the database is music-streaming platform Spotify.[9]

What's different about the processors

If applications or workloads require more than 28 cores, meeting that demand may require multiple Intel Xeon Platinum 8180 processors. The cost of these may be higher than the cost of multiple AMD EPYC 7601 processors, but as we demonstrated, the Intel Xeon Platinum 8180 processors delivered greater performance in our Oracle, PostgreSQL, and Cassandra scenarios. For our reasoning on why we chose these processors, see the Science behind this report.

	Intel Xeon Platinum 8180	Intel Xeon Platinum 8160	AMD EPYC 7601
Core count (per processor)	28	24	32
Thread count (per processor)	56	48	64
Core frequency (GHz)	2.5	2.1	2.2
Stepping	4	0	2
Hyperthreading	On	On	On
Turbo	On	On	On

Conclusion

When it comes to transactional database workloads, servers powered by Intel Xeon Platinum 8180 and 8160 processors outperformed those with AMD EPYC 7601 processors in our tests. We found Intel Xeon Platinum 8180 and 8160 processor-powered servers supported more transactions per minute for OLTP workloads on two relational database management systems and delivered more operations per second for Cassandra-distributed database workloads. For businesses looking for servers that can run these database systems well, our testing shows that Intel Xeon Platinum 8180 and 8160 processors can deliver higher performance than those powered by AMD EPYC 7601 processors.

1   Wall, Matthew, "How long will you wait for a shopping website to load?," accessed November 26, 2018, https://www.bbc.com/news/business-37100091

2   Intel, Intel Xeon Scalable processors, accessed November 20, 2018, https://www.intel.com/content/www/us/en/processors/xeon/scalable/xeon-scalable-platform.html

3   "HammerDB," accessed January 21, 2018, https://www.hammerdb.com/

4   "About," accessed January 21, 2019, https://www.hammerdb.com/about.html

5   "Why both TPM and NOPM Performance Metrics?," accessed January 20, 2019, https://www.hammerdb.com/blog/uncategorized/why-both-tpm-and-nopm-performance-metrics/

6   "Oracle Database 12c: Plug Into the Cloud," accessed January 21, 2019, http://www.oracle.com/us/corporate/features/database-12c/index.html

7   "About," accessed January 21, 2019, https://www.postgresql.org/about/

8   "Case Study: How Atlassian and pganalyze are optimizing Postgres query performance," accessed January 21, 2019, https://pganalyze.com/customers/how-atlassian-and-pganalyze-are-optimizing-postgres-query-performance

9   "Case Study: Spotify," accessed January 21, 2019, https://www.datastax.com/resources/casestudies/case-study-spotify

Read the science behind this report at http://facts.pt/dv9jc7p ▶

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This project was commissioned by Intel.