Servers powered by Intel Xeon Platinum 8160 processors yielded better performance on a mixed cloud workload than those powered by AMD EPYC 7601 processors

In a virtualized environment, they executed more simultaneous WordPress, Cassandra, and Apache Spark work using fewer VMs

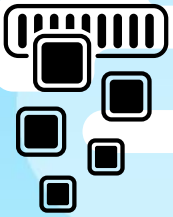
A study commissioned by Intel Corp.

As applications of all varieties move to the cloud, the options and technologies available are proliferating rapidly. Whether your organization is hosting sensitive applications in a private cloud, taking advantage of the flexibility of public cloud server providers, utilizing hybrid cloud, or combining these approaches, selecting servers that deliver strong mixed workload performance is critical.

At Principled Technologies, we set up two environments, one with three servers powered by Intel® Xeon® Platinum 8160 processors and the other with three AMD EPYC™ 7601 processor-based servers. We executed simultaneous WordPress,® Apache® Cassandra,® and Apache Spark™ workloads. The Intel-powered servers delivered greater overall server performance than the AMD processor-based systems, despite using 25 percent fewer virtual machines. These findings could translate to savings for organizations looking to grow their presence in the cloud.

Up to 9.9% more WordPress transactions per second

Intel Xeon Platinum 8160 processor-powered server group vs. AMD EPYC 7601 processor-powered server group



Up to 28.8% more Cassandra operations per second

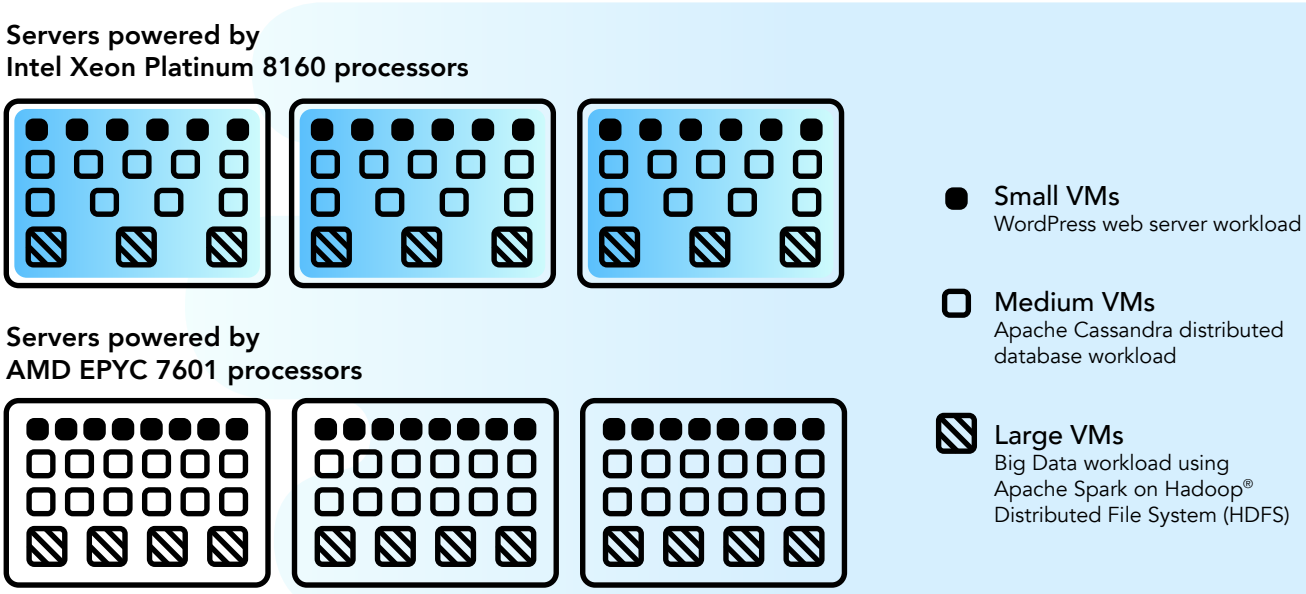
Intel Xeon Platinum 8160 processor-powered server group vs. AMD EPYC 7601 processor-powered server group

Process a HiBench Kmeans workload in up to 5.3% less time

Intel Xeon Platinum 8160 processor-powered server group vs. AMD EPYC 7601 processor-powered server group

Putting the processors to the test

Enterprises use cloud applications to perform a wide range of workloads. To gain insight into the performance differences between servers powered by Intel Xeon Platinum 8160 processors and those powered by AMD EPYC 7601 processors, we set up three of each type of server. We used out-of-box settings to reflect the kind of performance a cloud user would see when deploying a VM for the first time. Using Kernel-based Virtual Machine (KVM) as a hypervisor, we created a number of different-sized virtual machines and executed a simultaneous mixed workload.



Each of the servers powered by Intel Xeon Platinum 8160 processors had two sockets, 48 physical CPU cores, and 384 GB of memory. Each of the servers powered by AMD EPYC 7601 processors had two sockets, 64 physical CPU cores, and 512 GB of memory. We chose memory amounts that reflected the number of memory channels available (Intel Xeon Platinum 8160 processors support six memory channels, while AMD EPYC 7601 processors support eight). The processors were roughly comparable in terms of price.[1] (See the science addendum to this report for complete server specifications.)

We created enough VMs to utilize 75 percent of the CPU and memory resources on each server. In other words, for every four VMs we created on the servers in the AMD processor-powered group, we created three VMs on the servers in the Intel processor-powered group. Despite having fewer VMs across its three servers, the Intel Xeon Platinum 8160 processor-powered group accomplished greater overall performance than the AMD EPYC 7601 processor-powered group because performance per VM was greater.

This finding has important implications for organizations analyzing their public cloud options. If you selected instances hosted on the Intel Xeon Platinum 8160 processor-powered servers we tested, you could potentially meet the needs of your workloads with fewer instances than if you used ones hosted on the AMD EPYC 7601 processor-powered servers we tested. Purchasing fewer instances can lead to savings.

About Intel Xeon Scalable processors

The Intel Xeon Scalable processor series includes many upgrades over previous-generation processors. They have as many as 28 cores, which enables greater performance and scalability, six memory channels, and up to 1.5 TB of memory per socket.[2]

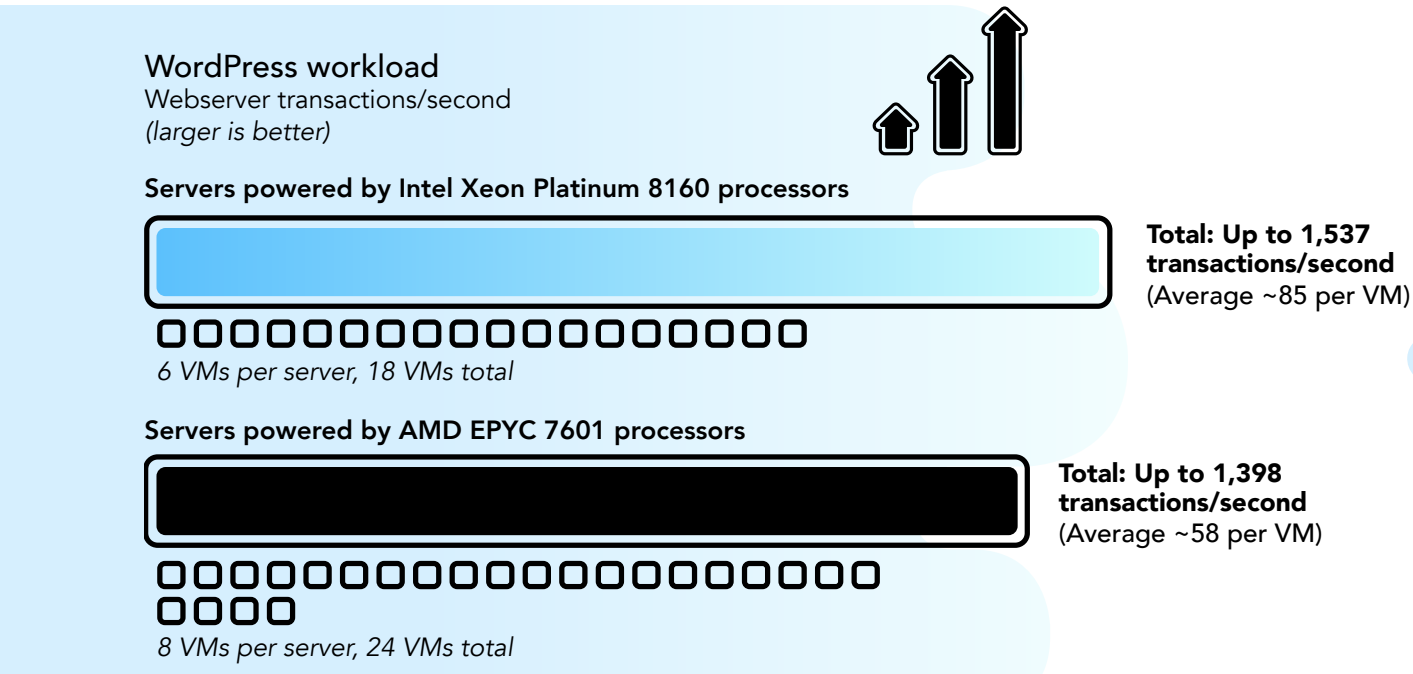
The series includes four feature configurations: Platinum, Gold, Silver, and Bronze. The Intel Xeon Platinum 8160 processor in the servers we tested has a 33MB L3 cache, 24 cores, 48 threads, and 3.70 GHz max turbo frequency.

Learn more about Intel Xeon Scalable processors at https://www.intel.com/content/www/us/en/processors/xeon/scalable/xeon-scalable-platform.html.

WordPress workload with small VMs

WordPress is a popular open-source content management system based on PHP and MySQL databases. Companies of all sizes use WordPress to manage their web content. To learn how our two sets of servers handled a WordPress workload, we created six webserver VMs on each server in the Intel group, and eight webserver VMs on each server in the AMD group. We installed a LAMP stack[3] and WordPress on each VM and configured the default WordPress test page as a target website. To quantify the performance that each of the two groups of servers achieved, we used Apache JMeter™ to send webpage requests to our webserver VMs.

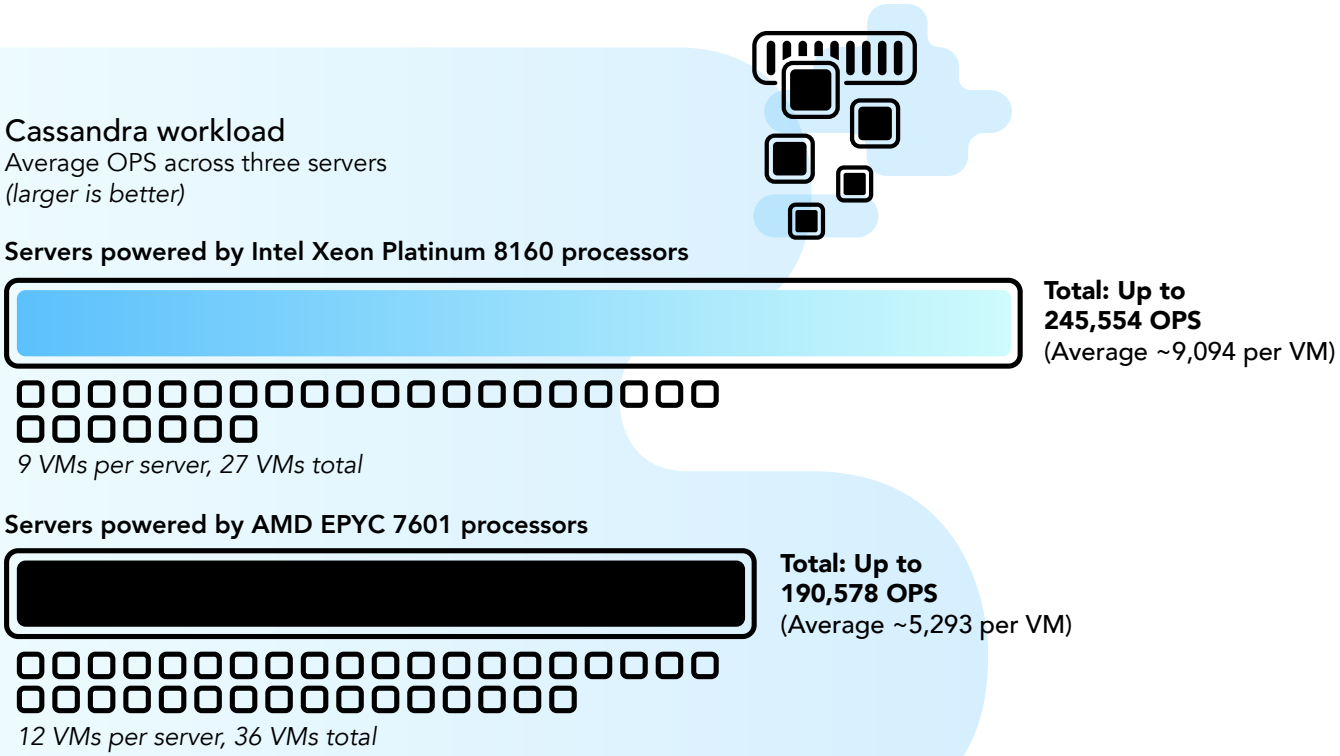
As the chart below shows, the Intel Xeon Platinum 8160 processor-based server group delivered up to 9.9 percent more total webserver transactions per second than those in the AMD EPYC 7601 group did. It accomplished this greater total performance with 18 VMs (six per server) as compared to the 24 VMs across the AMD processor-powered group (eight per server). This is because the VMs in the Intel Xeon Platinum 8160 processor-powered group delivered up to 46.6 percent more webserver transactions per second per VM than those in the AMD EPYC 7601 group did. More transactions per second mean your business could save money by deploying fewer public cloud instances.



Apache Cassandra distributed databases running in medium-sized VMs

Many businesses use NoSQL implementations such as Apache Cassandra to power applications that require scalable, high-access performance, such as ecommerce, media streaming, social media, and more.

To learn how our two server groups handled a Cassandra workload, we created nine VMs on each server powered by Intel Xeon Platinum 8160 processors, and twelve VMs on the AMD EPYC 7601 processor-based servers. To quantify the performance each of the two groups of servers could achieve, we used the cassandra-stress test tool, which delivers results in terms of operations per second (OPS).



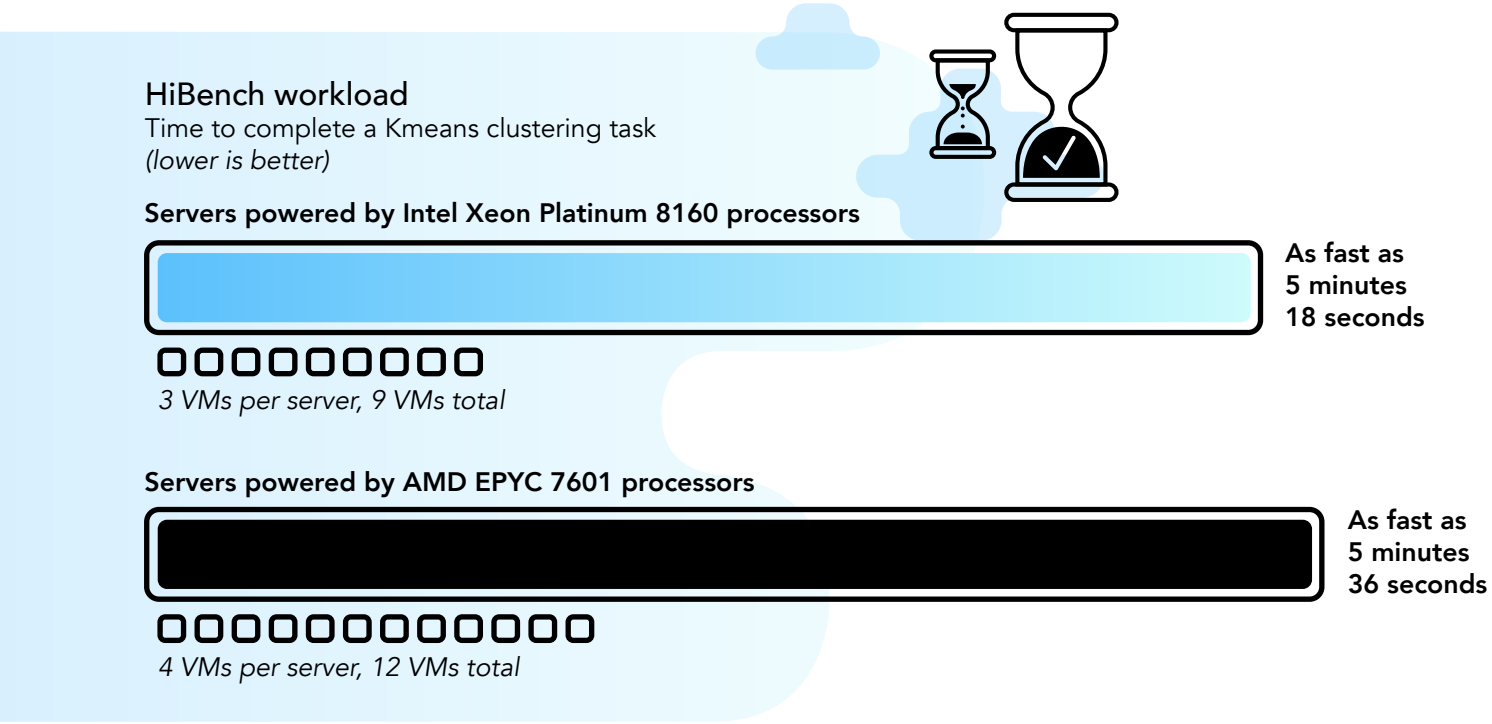
As the chart above shows, the Intel Xeon Platinum 8160 processor-based group delivered up to 28.8 percent more total OPS than the three AMD EPYC 7601 processor-based servers did. It achieved this greater total performance with 27 VMs (nine per server) rather than the 36 VMs across the AMD processor-powered group (12 per server). This is because the VMs in the Intel Xeon Platinum 8160 processor-powered group delivered up to 71.7 percent more OPS per VM than those in the AMD EPYC 7601 group did.

More operations per second 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.

Apache Spark on HDFS running in large VMs

Companies of all kinds and sizes increasingly collect large amounts of data and rely on analytics to inform their business decisions. Apache Spark is a distributed, massively parallelized data processing engine for querying and analyzing large datasets. It is often paired with HDFS for scalable, fault-resilient storage.

To learn how our two groups of servers handled Apache Spark running on HDFS, we created three VMs on each server powered by Intel Xeon Platinum 8160 processors, and four VMs on each of the servers powered by AMD EPYC 7601 processors. We used the HiBench Kmeans workload to quantify the performance of each of the two groups of servers. HiBench delivers a single time-to-complete result.



As the chart above shows, the group of three Intel Xeon Platinum 8160 processor-based servers completed the workload in 5 minutes and 18 seconds, which is 18 seconds, or 5.3 percent, faster than the time the AMD EPYC 7601 processor-based server group needed to finish the task. The Intel Xeon Platinum 8160 processor-based server group achieved this shorter completion time with nine VMs (three per server) rather than the twelve VMs across the AMD EPYC 7601 processor-powered server group, which had four per server.

Conclusion

By testing small, medium, and large VM workloads simultaneously, we showed the performance advantages of Intel Xeon Platinum 8160 processor-based servers in a cloud environment running a mix of various applications, similar to what a private cloud user or public cloud host might expect in their environments. In our testing, the server group powered by Intel Xeon Platinum 8160 processors achieved greater overall server performance than the server group powered by AMD EPYC 7601 processors, despite having 25 percent fewer cores and less memory.

By delivering stronger per-VM performance, the server group powered by Intel Xeon Platinum 8160 processors achieved greater overall server performance with fewer VMs than the AMD EPYC 7601 processor-based server group. If your organization is purchasing public cloud instances, these findings could translate to matching or surpassing the performance of an AMD EPYC 7601 processor-based server while paying for fewer instances.

1 As of February 28, 2019, the AMD website lists the price of the EPYC 7601 processor as "from $4,408.99": https://www.amd.com/en/shop/us/Server%20Processors?keyword=7601&sort_by=vision_date, and the Intel website lists the price of the Intel Xeon Platinum 8160 processor as "from $4,825": https://www.intel.com/content/www/us/en/products/processors/xeon/scalable/platinum-processors/platinum-8160.html

2 "Intel Xeon Scalable processors," accessed February 28, 2019, https://www.intel.com/content/www/us/en/processors/xeon/scalable/xeon-scalable-platform.html.

3 LAMP is an acronym based on the four open-source components that it includes: the Linux operating system, the Apache HTTP Server, the MySQL relational database management system, and the PHP programming language.

Read the science behind this report at http://facts.pt/py2fp7n ▶

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For additional information, review the science behind this report.

This project was commissioned by Intel.