White Paper

4th Gen Intel® Xeon® Processors
Google Cloud
SUSE Linux Enterprise Server (SLES)

Easing Cloud Migration of Enterprise Analytics

Google Cloud c3 instances running SUSE Linux Enterprise Server deliver significant performance and performance/dollar benefits for Microsoft SQL Server, enabling companies to unify their cloud infrastructure for analytics.

Executive Summary

As companies move their on-premises business-critical applications, such as SAP, to cloud, other critical applications will follow. With wide choices of where to host cloud infrastructure, operational costs, and operating systems to run it, optimizing for the greatest benefit to the small business or enterprise becomes a key driver for IT decisionmakers.

Microsoft SQL Server is a widely deployed, on premises, business-critical application driving enterprise decisionmaking and business innovation. In the traditional perception among engineers, Microsoft SQL Server has been closely linked to the Windows operating system. However, this paradigm shifted quite some time ago with Microsoft's groundbreaking announcement of the availability of MS SQL Server for Linux. This significant development now empowers the ecosystem with a versatile array of deployment configurations to choose from.

As companies migrate more workloads to cloud, to build a unified cloud infrastructure, they can benefit from the recent collaboration Intel and SUSE have done to optimize Microsoft SQL Server on SUSE Linux Enterprise Server (SLES) and 4th Gen Intel® Xeon® processors, including some performance optimizations.

Within this white paper, our focus centers on the utilization of small-sized GCP instances, specifically those with 4 and 8 vCPUs. These configurations are notably popular for small and medium-sized deployments, constituting a substantial portion of the overall Microsoft SQL deployment statistics.

Intel benchmarked the optimized configurations as shown below in Table 1 on Google Cloud c3 instances. Google Cloud was the first Cloud Service Provider to offer 4th Gen Intel Xeon processors on their platform. The optimizations along with competitive pricing for SUSE on Google Cloud allow Microsoft SQL Server to achieve up to a 1.5x performance boost at as much as a 52 percent better performance/dollar ($) on Google Cloud c3 instances with 4th Gen Intel Xeon processors compared to Google Cloud n2 instances.[1]

As companies consider their cloud migration strategy, they can take advantage of moving Microsoft SQL Server applications to Google Cloud running on SUSE Software. Optimizations and performance/$ make Google Cloud an attractive solution for enterprise cloud migration.

The Move to Cloud—Microsoft SQL and Beyond

The cloud continues to have a significant impact on how companies will operate going into the future. The move to the cloud is often a key strategic decision for

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businesses from the smallest to the largest enterprises. Thus, many companies are migrating, for example, their SAP workloads to cloud service providers.

As part of their cloud journey, companies are engaging hybrid cloud solutions and moving more workloads beyond SAP to hyperscaler infrastructures, such as Google and others. Grandview Research forecasts the global cloud migration services market will grow 25.9 percent from 2023 to 2030.[2] That means many other data and analytics services, such as SQL database applications will eventually be hosted in the cloud.

Among the many distributions of SQL is Microsoft SQL Server, which runs on the Microsoft OS and several Linux distributions, including SLES. Microsoft SQL Server is among the top three leading enterprise SQL database systems used across industries.[3]

SUSE for Your Google Cloud Applications

Major cloud platforms—like Google Cloud, offer SLES in their infrastructures. But for some company IT operations, choosing which cloud and which operating system to go with can have long-term cost impacts.

To help companies optimize the costs of migrating their services, in 2022, SUSE became Google's first partner in Google Cloud's Committed Use Discounts (CUDs), helping customers to save significantly on OS licensing on Google Cloud.[4] Google CUDs also includes 24/7 support to CUD customers.

Choosing a CUD plan with SLES can benefit customers migrating to cloud, both from a support and cost perspective. When migrating applications to Google Cloud, as issues arise, the collaborative support efforts between Google and SUSE mean problems are solved in the background—without finger pointing—to help ensure a successful launch of the cloud application on the SLES/Google Cloud platform. The discounted services help offset other licensing costs by some application software vendors that charge higher fees to run their applications on particular cloud providers.

SUSE + Intel + Google—The Easy and Performant Enterprise Cloud Platform for Business Solutions

Google was the first to offer 4th Gen Intel Xeon processors on their new c3 instances. This latest generation of Intel data center CPUs offers significant improvements in performance and performance/$ with more cores, built-in accelerators, and additional power-saving features integrated into the new CPU. Those benefits can extend across many applications for business, analytics, artificial intelligence (AI), High-Performance Computing (HPC), and other application domains when the application is optimized for these features.

Google Cloud pricing for their new c3 instances remains competitive compared to n2 instances, delivering higher performance and improved price/performance for workloads, such as enterprise analytics. With Microsoft

Server VM				
Google Cloud Instance us-central1 Region	**n2-standard-4**	**c3-highcpu-4**	**n2-standard-8**	**c3-highcpu-8**
CPU type	3rd Gen Intel® Xeon® processors	4th Gen Intel® Xeon® processors	3rd Gen Intel® Xeon® processors	4th Gen Intel® Xeon® processors
vCPU	4	4	8	8
Memory	16 GB	8 GB	32 GB	16 GB
OS	SLES 15 Service Pack (SP) 4 (sles-15-sp4-v20230322-x86-64)			
Disk type—all with balanced persistent disk	SSD	NVMe	SSD	NVMe
Disk Size	500 GB Boot + 3x 2 TB (Data, Logs, TempDB)		1000GB Boot + 3x 4TB (Data, Logs, TempDB)	
R/W IOPS per Disk	15k			
R/W Throughput per Disk	240			
MSSQL Version	Microsoft SQL Server 2022 (RTM-CU5) KB5026806 – 16.0.4045.3 (X64)			
Optimized	Yes (Standard Optimizations)[5,6]			
Client VM				
Google Cloud Instance	n2-standard-32	n2-standard-32	n2-standard-32	n2-standard-32
vCPUs	32	32	32	32
Memory	128 GB	128 GB	128 GB	128 GB
Workload				
HammerDB Warehouses	20	20	40	40
HammerDB Virtual Users	1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20		1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28	
HammerDB Use All Warehouses	True			
HammerDB Version	V4.6			

Table 1. Microsoft SQL benchmarking on Google Cloud instances configuration.

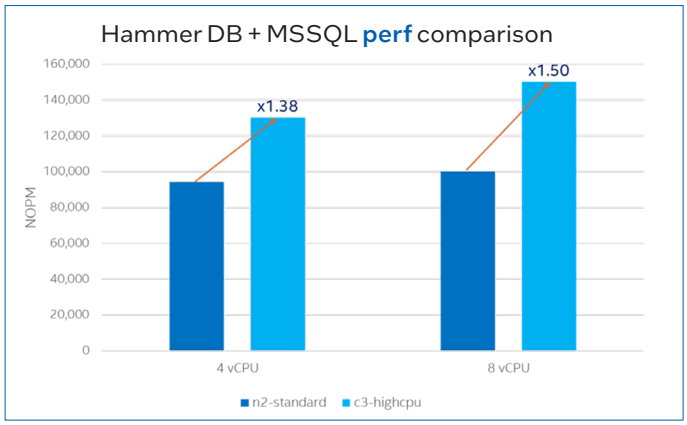

Figure 1. Performance comparison of HammerDB with Microsoft SQL on SLES using Google Cloud instances

SQL Server, Intel optimizations combined with Microsoft recommended best practices result in a tuned deployment of Microsoft SQL Server on SUSE Linux Enterprise Server (SLES), so customers can get the most benefit from running their database solutions on the OS.

Benchmarking Microsoft SQL Server on 4th Gen Intel® Xeon® processors

Intel benchmarked the performance and performance/$ of Microsoft SQL Server on Google Cloud n2 and c3 instances using SLES as the OS. The benchmark used the HammerDB database benchmarking application with the TPROC-C workload implementation, measuring New Orders Per Minute (NOPM) as the key performance indicator (KPI). Table 1 lists the configuration used for the benchmarking on Google Cloud instances located in the United States.

Note that the use of virtual users allows Intel to measure performance scaling. The following performance and performance/$ metrics were achieved at a number of virtual users where Intel found peak performance for the two comparative configurations—n2-standard-4 vs c3-highcpu-4, and n2-standard-8 vs c3-highcpu-8.

Up to 50 Percent Better Performance with 4th Gen Intel Xeon Processors on SLES

At maximum virtual users, c3 instances delivered up to 50 percent more New Orders Per Minute (NOPM) than n2 instances. This significant performance boost comes from the enhanced architecture of the 4th Gen Intel Xeon processor compared to the previous version. 4th Gen Intel Xeon processors offer more cores, the latest IO technologies, and built-in Intel® Accelerator Engines that offload many specialized tasks from the CPU cores, accelerating those tasks while freeing the cores for other work. Additionally, Google Cloud c3 4/8 vCPU instances are always coupled with NVMe disks. Google Cloud n2 instances use SSDs. Although both storage technologies are limited at 15k IOPS, NVMe delivers lower latency, contributing to higher storage performance and overall instance performance.

Up to 53 Percent Better Performance/$ Using Google Cloud c3 Instances

Performance/Dollar ($) was based on Google Cloud instance pricing for the two instances at the time of benchmarking (Table 2). SLES on Google Cloud discounts based on one-year and three-year commitments deliver lower overall costs and, thus, better performance/$ when using these alternative instances. Costs included compute, storage pricing, and SLES subscription.[7] The cost differences between the 4 and 8 CPU instances were mainly due to the storage sizes. Figure 2 charts the performance/$ for all instances based on performance achievements shown in Figure 1.

The benchmarks illustrate the beneficial combination of Google Cloud c3 instances with 4th Gen Intel Xeon processors running SLES. As companies prepare their migration strategy to move critical workloads, such as SAP analytics and Microsoft SQL Server to the cloud, these companies can build a more unified cloud infrastructure with both analytical workloads on the same OS on Google Cloud. The instance/OS combination can lead to a better overall Total Cost of Ownership (TCO) compared to managing multiple infrastructures based on SLES and some other OS.

Summary

The journey to the cloud is a process that most companies will have to face. Choosing which Cloud Service Provider and OS for a company's key enterprise applications are critical to long-term costs and services management. New Google Cloud CUD pricing for SLES and their c3 instances with 4th Gen Intel Xeon processors present an advantage for IT departments to control cloud costs while gaining performance benefits.

Migrating their SAP and Microsoft SQL Server workloads to Google Cloud with SLES as the OS offers significant performance optimizations and performance/$ benefits. Intel's latest generation of data center CPUs brings not only more cores to evolving workloads but also Intel® Accelerator Engines that provide additional acceleration

Instance Configuration	Google Cloud Pricing ($/hour)			
	N2-standard-4	C3-highcpu-4	N2-standard-8	C3-highcpu-8
On Demand	1.21	1.19	2.30	2.26
One Year Commitment	1.08	1.06	2.11	2.08
Three-year Commitment	1.04	1.03	2.03	2.01

Table 2. Google Cloud instance per-hour pricing at the time of benchmarking (us-central1 Region)

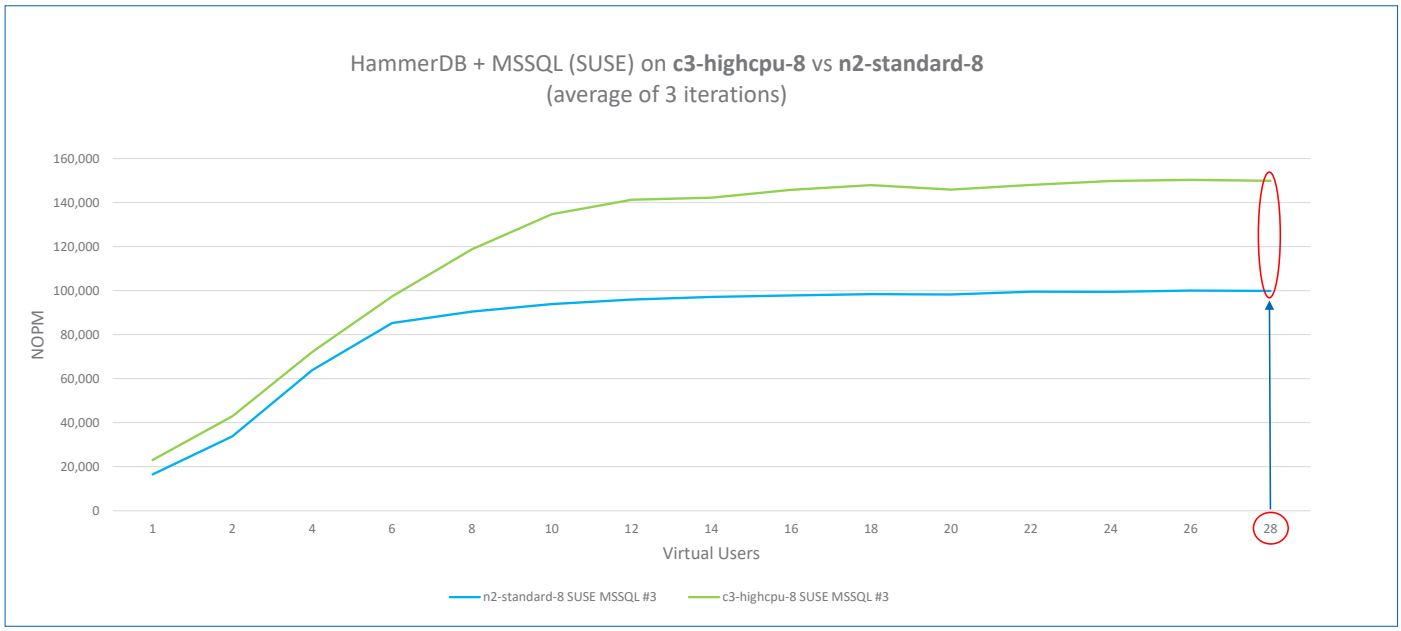

Figure 2. Performance/$ based on current Google Cloud instance pricing at time of benchmarking.

for specific operations across many workloads, including analytics and data streaming.

The benchmarks above show that Google Cloud c3 instances with 4th Gen Intel Xeon processors offer up to 1.5 better performance and price/performance than older n2 instances for Microsoft SQL Server.

For More Information

Find out more about 4th Gen Intel Xeon processors.

Learn about Intel Accelerator Engines.

Learn more about all that SUSE and SLES have to offer for cloud migration.

Visit Google Cloud to learn more about their instance offerings.

[1] See Table 1 for configuration details. Testing was done 11/07/2023.
[2] https://www.grandviewresearch.com/industry-analysis/cloud-migration-services-market-report
[3] https://www.datanyze.com/market-share/databases—272
[4] https://cloud.google.com/blog/products/compute/suse-linux-enterprise-server-committed-use-discount-sles-cud-on-google-cloud
[5] Optimizations based on "Tuning SQL Server for OLTP Workload' section from https://www.intel.com/content/www/us/en/developer/articles/guide/sql-server-tuning-guide-for-otp-using-xeon.html
[6] Performance best practices from https://learn.microsoft.com/en-us/sql/linux/sql-server-linux-performance-best-practices?view=sql-server-ver16
[7] The developer edition of Microsoft SQL was used, which incurred no cost to the benchmarking, but should be considered in any evaluation of applicable deployments. Pricing was captured 5/07/2023.

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