AMDA × Google Cloud

CONFIDENTIAL COMPUTING PERFORMANCE WITH AMD SEV-SNP

GOOGLE CLOUD N2D VM INSTANCES

Powered by 3rd Gen AMD EPYC[™] Processors | June 2024

Use of Confidential Virtual Machines creates low impact on performance running N2D Machine Types suitable for enterprise applications, web applications, relational databases and bandwidth-sensitive high performance computing workloads.

CONFIDENTIAL COMPUTING

Google Cloud in cooperation with AMD now offers next-level features to strengthen and verify the security of sensitive data on virtual machines (VMs) with AMD Secure Encrypted Virtualization-Secure Nested Paging (SEV-SNP) technology built into the latest, 3rd Gen AMD EPYC[™] processors.

AMD SEV technology encrypts virtual machine memory to ensure data security. AMD SEV-SNP builds on this by adding memory integrity protections, enhancing the overall security posture. These technologies together deliver robust performance for demanding computational tasks, ensuring both security and efficiency.

DETAILED TESTING INFORMATION

AMD engineers tested a variety of applications on Google Compute Engine N2D Virtual Machines. All instances were configured as shown in the Configuration and Run Details sections on page 3 of this brief, with the only difference being whether SEV-SNP was enabled for Confidential Computing.

PERFORMANCE HIGHLIGHTS

Google Cloud's Confidential Virtual Machines leverage AMD Infinity Guard¹ to help protect sensitive data while in use. AMD testing shows that using Google Cloud N2D Confidential VMs has a low impact on performance compared with standard N2D instances when running workloads suitable for this machine type.

MYSQL^{**} SHOWS ~8% PERFORMANCE IMPACT²

NGINXTH SHOWS ~7% PERFORMANCE IMPACT²

FFMPEG® SHOWS COMPARABLE PERFORMANCE²

MYSQL[™] FOR TRANSACTION PROCESSING

MySQL is a popular open-source relational database used for a wide variety of applications ranging from small websites to large-scale enterprise systems. MySQL offers a range of distinctive features such as its efficient query optimizer and indexing mechanisms, replication capabilities and robust support for high availability. AMD evaluated MySQL performance using HammerDB as follows:

BENCHMARK	AVERAGE TEST RESULTS			
TPROC-C	TPC-C architecture performance of Confidential VMs with SEV-SNP averages ~8% lower than standard VMs. ²			

NGINX[™] FOR WEB APPLICATION

NGINX is a popular web server and reverse proxy server that is a powerful tool for optimizing performance and scalability in web applications, transaction processing workloads and a wide range of other systems. It plays a crucial role in handling client requests, distributing them efficiently among worker processes and processing them in a nonblocking, event-driven manner. AMD evaluated NGINX performance as follows:

BENCHMARK	AVERAGE TEST RESULTS			
NGINX	Performance of Confidential VMs with SEV-SNP averages ~7% lower than standard VMs. ²			

VIDEO PROCESSING

FFmpeg[®] is a powerful and widely used open-source software suite for handling multimedia data. Common tasks for FFmpeg are video and audio encoding, decoding, transcoding, streaming and editing. AMD evaluated FFmpeg performance as follows:

OPERATION	AVERAGE TEST RESULTS			
Raw to VP9	Performance of Confidential VMs with SEV-SNP is comparable, on average, to the performance of standard VMs. ²			

HammerDB TPROC-C benchmark, Google Cloud with 3rd Gen AMD EPYC[™] N2D Confidential vs. N2D Standard virtual machines²





NIGINX, Google Cloud with 3rd Gen AMD EPYC™ N2D Confidential vs. N2D Standard virtual machines²

Relative performance-requests per minute (32 vCPUs)



FFmpeg encoding from raw video to VP9, Google Cloud with 3rd Gen AMD EPYC[™] N2D Confidential vs. N2D Standard virtual machines²

Relative performance-frames per minute (32 vCPUs)



CONFIGURATION AND RUN DETAILS

SOFTWARE

Table below shows the operating system and software configurations used for these tests:

OS	Red Hat Enterprise Linux [®] 8.4					
Software	MySQL [™] v8.0.28, NGINX [™] v1.1.9-2 WRK 4.2, FFmpeg [®] v4.4.2-Oubuntu0.22.04.1					

GOOGLE CLOUD N2D VM SPECIFICATIONS

Tables below shows N2D standard and Confidential Virtual Machines used for these tests:

FFmpeg and NGINX				MySQL			
CDU	MEMORY		EGRESS	MEMORY		MORY	EGRESS
VLPUS	STANDARD	CUNFIDENTIAL	BANUWIDIH	VLPUS	STANDARD	CONFIDENTIAL	BANUWIUTH
32	32 GB	32 GB	32 Gbps	32	256 GB	256 GB	32 Gbps

PURPOSE BUILT FOR SENSITIVE GENERAL-PURPOSE WORKLOADS

Google Cloud N2D Confidential Virtual Machines work well for both general-purpose workloads and workloads that require high memory bandwidth. N2D instances are well suited for workloads that require a balance of compute and memory, such as web applications and databases, as well as certain high performance computing workloads that require high memory bandwidth, such as crash analysis, financial modeling and reservoir analysis.

3RD GEN AMD EPYC™ PROCESSORS

3rd Gen AMD EPYC processors can deliver outstanding per-core performance by taking advantage of fast CPU frequencies, low latency memory, and unified cache structure. They also provide high storage bandwidth for PCIe[®] 4.0 storage devices and accelerators that greatly benefit latency-sensitive applications.

N2D POWERED BY 3RD GEN AMD EPYC PROCESSORS

The Google Cloud N2D Virtual Machine series supports high performance capabilities with up to 224 vCPUs and 896 GB of memory, Google Cloud's 100 Gbps high-bandwidth network, and high storage performance with up to 9 TB of local SSD storage. 3rd Gen AMD EPYC processors powering N2D instances feature the "Zen 3" AMD CPU architecture with up to 256 MB of L3 cache.





- > <u>AMD EPYC[™] and Google Cloud Platform Virtual Machines</u>
- > Encrypt Data in-Use with Confidential VMs and Confidential GKE Nodes³
- > YellowDog AMD Confidential VMs at Scale with Google³

TOGETHER WE ADVANCE_CLOUD COMPUTING

- 1 AMD Infinity Guard features vary by EPYC processor generations and/or series. Infinity Guard security features must be enabled by server OEMs and/or cloud service providers to operate. Check with your OEM or provider to confirm support of these features. Learn more about Infinity Guard at <u>amd.com/en/technologies/infinity-guard</u>. GD-183A.
- 2 MySQL comparison of Google Cloud N2D highmem 32 vCPU, 256GB per VM without SEV enabled, with SEV enabled, and with SEV-SNP enabled. FFmpeg (raw video to VP9 encode) and NGINX comparisons of Google Cloud N2D highcpu 32 vCPU, 32GB per VM without SEV enabled, with SEV enabled, and with SEV-SNP enabled, based on AMD testing on 7/25/23, running Ubuntu 22.04.3 LTS. Cloud performance results presented are based on the test date in the configuration. Results may vary due to changes to the underlying configuration, and other conditions such as the placement of the VM and its resources, optimizations by the cloud service provider, accessed cloud regions, cottenats, and the types of other workloads exercised at the same time on the system. SPSC-044.
- 3 Links to third-party sites are provided for convenience and unless explicitly stated, AMD is not responsible for the contents of such linked sites and no endorsement is implied.

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