In-Memory Storage Virtualization

AMD EPYC™ 7002 Series Processors and Formulus Black FORSA™ Deliver Superior Performance and TCO for Database Applications

JULY 2020

Memory Capacity Per Socket

AMD EPYC™ 7002 Series Processors offer up to 4TB of memory capacity per socket.

In-Memory Storage Virtualization

Formulus Black's FORSA™ enables up to 3.875TB of memory per socket to be virtualized and provisioned as high-performance block storage devices.

Massively Parallel Processing

Taking advantage of up to 64 cores per socket, the AMD EPYC™ 7002 series enables massively parallel data processing performance for I/O intensive workloads.

Optimal CPU Utilization

For transaction heavy and real-time analytics workloads, traditional SSD-based storage can often become a bottleneck, preventing optimal CPU utilization. FORSA In-Memory Storage minimizes CPU idle time by shortening the distance between data from storage and the CPU.

Standards-Based Architecture

Continuing AMD's commitment to industry standards, AMD EPYC™ 7002 Series processors offer you a choice in x86 architecture. x86 compatibility means you can run most popular applications on AMD EPYC processors. FORSA is POSIX compliant, enabling a wide range of databases to run on its storage devices. FORSA™ 3.0 is supported on AMD EPYC processors on select OEM systems. Please contact Formulus Black sales for more information at sales@FormulusBlack.com or online at www.FormulusBlack.com. *

FORMULUS BLACK™

AMD EPYC™ Processors: More Cores, Memory Channels, and PCIe® Gen 4 Lanes Per Socket

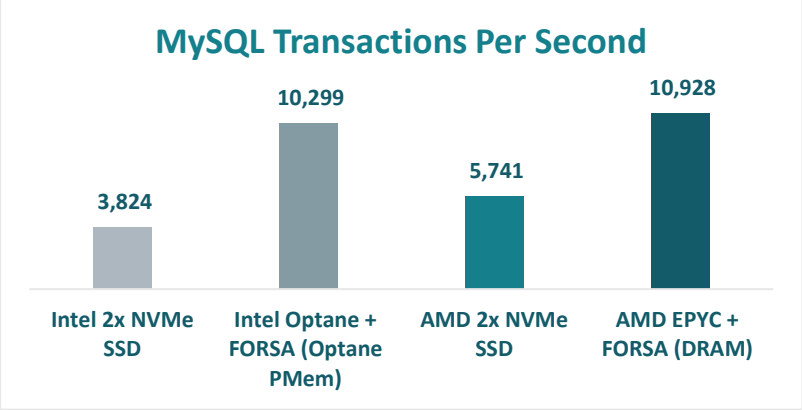
EPYC™ 7002 Series Processors are ideally suited for I/O intensive applications with support for up to 64 cores, 8 memory channels, and 128 PCIe® Gen 4 lanes per socket. With high core count coupled with an impressive number of memory and I/O channels per socket, EPYC System-on-Chip (SoC) performance scales for the most demanding workloads.

Formulus Black FORSA™: In-Memory Storage

FORSA™ is an In-Memory Storage solution that enables memory to be provisioned and managed as ultra-low latency, high throughput, block storage for acceleration of I/O intensive and latency sensitive applications such as OLTP databases and real-time analytics. FORSA can be quickly installed and provides a suite of software-based data persistence, data protection, and data management features. Users can access FORSA management console via a browser-based GUI or RESTful API.

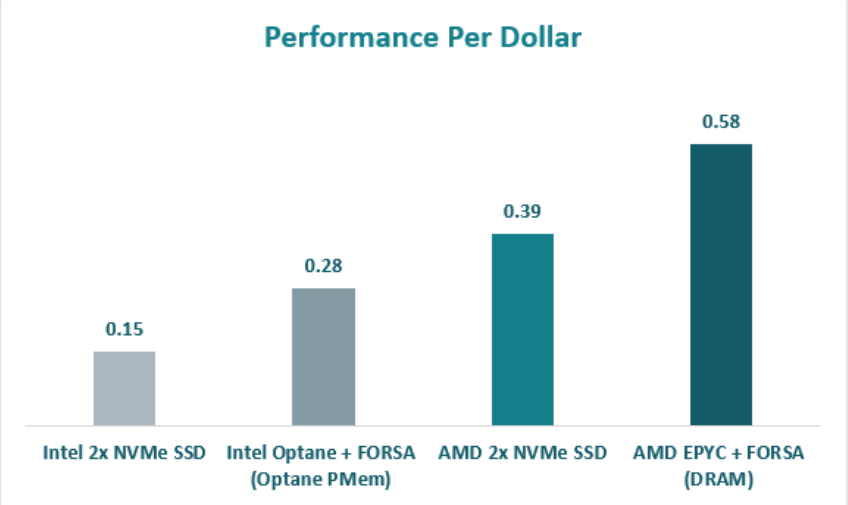
FORSA Enables More Transactions Per Second at Lower Latency for MySQL®

MySQL™ is an open source Relational Database Management System (RDBMS) based on the industry standard Structured Query Language (SQL). MySQL handles large databases well and is considered one of the most popular open source databases with a large and thriving ecosystem. Refer to Table 1 for system configurations and pricing. A TPC-C™ workload for Sysbench[3] 1.0.11 scripts were utilized to generate reads/writes and the average Transactions Per Second were recorded over a sustained period of 15 minutes.



FORSA on AMD EPYC Processors Delivers Superior TCO

FORSA In-Memory Storage delivers unmatched performance for database applications such as MySQL™ even when compared to using higher performing NVMe™ SSD based storage. AMD EPYC in a single CPU configuration combined with FORSA™ In-Memory Storage delivered a similar level of performance as an Intel system configured with two CPUs equipped with 12x Optane PMem modules. From a performance per dollar standpoint, the combination of AMD EPYC and FORSA™ delivers both higher performance with a single socket configuration and exceptional value.



Performance is defined as the number of transactions per second and the system cost of each configuration is defined as the dollar value.

Performance Per Dollar = Transactions Per Second ÷ System Cost

The system cost of each configuration is shown below in Table 1.

	Intel + NVMe SSD	Intel + FORSA (Optane PMem)	AMD + NVMe SSD	AMD + FORSA (DRAM)
Part Type	**Part & QTY**	**Part & QTY**	**Part & QTY**	**Part & QTY**
CPU	8260M x2	8260M x2	7552 x1	7552 x1
DRAM	384GB	384GB	384GB	512GB
SSD	NVMe SSD x2	NVMe SSD x2	NVMe SSD x2	NVMe SSD x2
PMEM	N/A	1.536TB	N/A	N/A
Chassis	Dell	Dell	Dell	Dell
FORSA	N/A	2 Instances	N/A	1 Instance
System Cost	**$25,196.00**	**$31,352.00**	**$14,572.00**	**$16,356.00**

Table 1: Test System Configurations and Pricing[2]

AMD EPYC + Formulus Black FORSA: Accelerate Any Workload Easily

Formulus Black's FORSA is a first of its kind In-Memory Storage solution that takes advantage of AMD's EPYC memory channel architecture to unleash exceptional application performance. Best of all, there are no modifications needed for applications to run on FORSA In-Memory Storage devices and with over a dozen data services and data protection features such as BitMarker in-line deduplication, snapshot, clone, high availability block replication, and BLINK backup and recovery, customers can achieve high performance while helping keep data safe.

Supercharge Database and Enterprise Application Performance

Supercharge the performance of any database on FORSA In-Memory Storage.

Deploy In-Memory Storage Powered Cloud Compute

Get the data processing performance of traditional bare metal with the flexibility and economics of private cloud. FORSA can be used to deploy In-Memory Storage powered virtual infrastructure via an intuitive GUI and RESTful API.

High Performance File Storage and Real Time Analytics

Modern analytics workloads can overwhelm traditional filesystems constrained by storage media that is high latency and low throughput. In-Memory Storage deployed as a high-performance storage tier can minimize storage bottlenecks.

Faster Development & Test

FORSA In-Memory Storage devices and virtual machines can be provisioned, cloned, and snapshot in seconds. Even terabytes of data can be backed up and restored in just a few minutes with a patented feature called BLINK. Less time setting up and tearing down development and test infrastructure enables more engineering productivity.

Conclusion

Together, AMD EPYC processors and Formulus Black FORSA In-Memory Storage deliver superior database performance and TCO. EPYC enables more memory to be cost efficiently configured per socket and FORSA takes advantage of both the higher core count and memory channels per socket of the AMD EPYC SoC architecture to deliver ground-breaking application performance per server. Going forward, AMD and Formulus Black plan to continue their collaboration to develop memory-centric reference architectures that deliver exceptional performance.

References

- AMD's EPYC line of processors
- Formulus Black FORSA™ solution*

*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.

FOOTNOTES

1. Some supported features and functionality of second-generation AMD EPYC™ processors (codenamed "Rome") require a BIOS update from your server manufacturer when used with a motherboard designed for the first-generation AMD EPYC™ 7000 series processors. A motherboard designed for 2nd Generation EPYC™ processors is required to enable all available functionality. ROM-06.
2. Pricing in USD as of 5/26/2020, pricing sources: www.cdw.com; www.avadirect.com; www.dell.com. Hardware prices fluctuate with supply and demand.
3. MySQL TPCC Benchmark Scripts: https://github.com/Percona-Lab/sysbench-tpcc.git