

## AMD EPYC™ 7002 SERIES PROCESSORS AND MongoDB: THE INTELLIGENT OPERATIONAL DATA PLATFORM

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### High Performance

Performance demands are increasing; datacenter space is not. Built on 7nm technology, AMD EPYC™ 7002 Series processors pack more power into the same space as the previous generation. Incredibly high core counts and memory capacity, ample memory bandwidth, and massive I/O combine in the right ratios to help enable breakthrough performance.

### Standards Based

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 your x86 based applications on AMD EPYC processors.

### Broad Partner Ecosystem

AMD's broad partner ecosystem and collaborative engineering provide tested and validated solutions that help lower your risk and total cost of ownership.

### Dedicated Security Processor

AMD EPYC's dedicated security processor manages secure boot, memory encryption, and secure virtualization directly on the SoC. Encryption keys never leave the processor where they can be exposed to intruders.

### The Natural Way to Work with Data

MongoDB works with data in a natural and intuitive way while providing ACID guarantees to ensure data integrity.

### AMD EPYC: Certified with MongoDB

The MongoDB Partner Program is designed to help reduce risk and implementation cost through joint testing and validation ensuring the optimal functioning of MongoDB products.

## Next Gen AMD EPYC™ 7002 Processors: Architectural Innovations Continue to Deliver Exceptional Performance

The second generation of the AMD EPYC™ processor extends AMD's innovation leadership while continuing the philosophy of choice without restriction.

Built with leading-edge 7nm technology, the AMD EPYC™ SoC offers a consistent set of features across a range of choices from 8 to 64 cores, including 128 lanes of PCIe® Gen 4<sup>2</sup>, 8 memory channels and access to up to 4 TB of high-speed memory.

7 nm	PCIe® Gen 4	DDR4 3200
64 Cores per socket	128 PCIe® Gen 4 lanes per socket	8 Memory channels per socket
World's first 7 nm x86 server CPU Highest available core count <sup>1</sup> to maximize parallelism	World's first PCIe® Gen 4 ready x86 server CPU Doubles the bandwidth of the previous generation	World's first x86 architecture with DDR4 3200 <sup>2</sup> Up to 4 TB of memory capacity per socket

AMD EPYC™ 7002 Series processors are offered in single and dual socket configurations.

**Single socket** enables you to right size the system to your workload needs, such as massive scale-out data management systems, software defined storage, branch office applications, among others.

**Dual socket** systems offer exceptional performance and density for high-performance computing, virtualization and consolidation, and a variety of private and public cloud applications.

## MongoDB: The Intelligent Operational Data Platform

MongoDB is built around an intelligent distributed systems architecture that enables developers to place data where their apps and users need it. MongoDB can be run within and across geographically distributed data centers and cloud regions, providing levels of availability, workload isolation, scalability and data locality unmatched by relational databases.

MongoDB is designed to meet the demands of modern applications with a technology foundation that implements a natural and intuitive document data model that allows developers to work with data in the same way and with the same structures as in their application code. This in turn helps make them more productive compared to traditional RDBMS development.

## Better, Faster, Leaner

Organizations spend enormous amounts on databases and the resources required to maintain them. Technology does not stand still – the infrastructure, applications and even the data have evolved while the underlying data management tools, based on relational database management systems, have remained the same.

Traditional relational database management systems have struggled to adapt to the rapid pace of change. Data volumes have grown. Every chart showing data growth looks the same: up and to the right at a very steep angle.

Storage and compute costs have declined. The rise of commodity servers and storage has driven down infrastructure costs, and new data management software has been developed that takes advantage of commodity infrastructure.

### The EPYC Advantage

**Performance** - The AMD EPYC SoC brings new balance to the datacenter. The highest core count yet in an AMD x86-architecture server processor, large memory capacity, bandwidth and I/O density are all brought together with the right ratios to help performance reach new heights.

Cloud is mainstream. Traditional on-premise architectures are being supplemented, and in some cases supplanted, by private and public cloud infrastructures that provide significant benefits in cost-effectiveness, elasticity and time-to-market.

People, and things, are always online. Ubiquitous mobile devices and internet connectivity have made continuous online presence and activity the norm. The number of simultaneous users has exploded and users want access to increasing volumes and types of information, and they expect seamless, high-quality experiences across all devices, all the time.

New types of applications are now a requirement. Traditional business applications are no longer sufficient. Mobile, social, IoT and real-time analytical applications with AI and machine learning are now a requirement to stay relevant.

Data types continue to change. Applications now require a wide variety of data: rich text, user comments, images, sensor and geospatial data, video and social media. All are used to create a rich user experience.

AMD has partnered with leading software and server vendors to create certified reference architectures for customers to demonstrate strong performance, lower risk and to help reduce implementation cost.

## Why MongoDB?

MongoDB is designed to meet the demands of modern applications with a technology foundation that implements a versatile method to work with data, allows you to intelligently put the data where it's needed, and provides the freedom to run anywhere.

## Data Versatility

Traditional relational databases struggle in key areas that are now commonplace with modern systems. They require that the data, data types and the relationships between the data be clearly understood before any data is loaded or applications developed. Thus, these systems are rigid, and difficult to enhance or change as business requirements evolve.

Less obvious is the disconnect between how the data is stored and how it used in applications. Relational databases use a tabular data model, storing data across many tables – hundreds to thousands of tables is not uncommon. Applications, on the other hand, perform their function by creating objects, including their associated data, that resemble real-world entities like customers, orders or products.

The impact is two-fold: application development is slower as developers must translate between the data model and the objects that use data; and performance is slower as many tables have to be accessed to build the objects the application needs to perform its function.

MongoDB solves these problems by using a document data model. Documents are a much more natural way to describe data. They present a single data structure with related data embedded as sub-documents and arrays. This means how the data is stored is closely aligned to how it is used making application development simpler and faster.



MongoDB is a distributed system that handles the complexity of maintaining multiple copies of the data via replication. Data consistency is tunable (down to the level of individual queries) based on the application's requirements.

MongoDB also supports multi-document ACID transactions providing a consistent view of data, and enforcing all-or-nothing execution to maintain the highest levels of data integrity.

## Query Data Any Way You Want

With an expressive query language and rich secondary indexes data can be queried in many ways to support diverse application and analytical requirements – from simple lookups and range queries through to creating sophisticated processing pipelines for data analytics and transformations, to faceted search, JOINS, geospatial processing, and graph traversals.

## Intelligent Data Placement

MongoDB is built around an intelligent distributed systems architecture that enables developers to place data where their apps and users need it. MongoDB can be run within and across geographically distributed data centers and cloud regions providing high availability, workload isolation, scalability and data locality. In this way, operational applications can be isolated from analytics, ad hoc queries, machine learning modeling, etc.

## Freedom to Run Anywhere

MongoDB can be deployed anywhere: on-premise, private cloud, public cloud or any combination. Application development is completely unaffected by the deployment model. Installation, maintenance and optimization all use a unified set of tools.

Using MongoDB, organizations can adopt cloud at their own pace by moving select workloads as needed. For example, they may run the same workload in a hybrid environment to manage sudden peaks in demand or use the cloud for services in regions where they don't have a physical datacenter.

### The EPYC Advantage

**Outstanding performance and scalability** – both scale-up and scale-out. AMD and its ecosystem partners offer high-performance network connectivity options for massive scale-out systems.

## Security

Securing customer data is a must-have from both a compliance and basic data access perspective. MongoDB features extensive capabilities to defend, detect and control access to data including Kerberos, x.509, LDAP and Active Directory for authentication. Role Based Access Control is configurable at a granular level, and MongoDB's native audit log can be used for regulatory compliance and auditing. Lastly, data can be encrypted on disk, on the wire and in backups.

### The EPYC Advantage

**Security** – AMD developed a suite of processor-based encryption and security features designed to guard the processor from internal and external attacks. This data encryption limits risks and provides protection from data breaches.

## Reference Architecture for AMD EPYC and MongoDB

The reference architectures for AMD EPYC processors and MongoDB provide options for the performance and scalability requirements needed to maximize an organization's investment.

AMD EPYC's ability to provide a no compromise single-socket solution ensures you are only paying for the processing power the application needs. A single-socket server has all the I/O and memory bandwidth available in a dual-socket server without the extra cost. For high-performance applications, AMD EPYC-based dual-socket servers offer phenomenal core density.

### The EPYC Advantage

**Flexibility** - Match core count with application needs without compromising processor features. EPYC's balanced set of resources means more freedom to right-size the server configuration to the workload.

These reference architectures offer the foundation for creating custom configurations that meet unique application demands with the various storage and connectivity options to choose from our leading server OEM partners.

NO COMPROMISE SINGLE-SOCKET		VERSATILE DUAL-SOCKET	
MongoDB Nodes: scalable to hundreds		MongoDB Nodes: scalable to hundreds	
CPU	1 x AMD EPYC 7502P, 7552, or 7702P*	CPU	2 x AMD EPYC 7402, 7452, or 7552*
Cores	32/48/64	Cores	24/32/48 per CPU, 48/64/96 per node
Threads	64/96/128	Threads	48/64/96 per CPU, 96/128/192 per node
Memory	128/256 GB (supports up to 4 TB)	Memory	128/256 GB (supports up to 4 TB/CPU)
Network	10/25/40/100 Gigabit Ethernet	Network	10/25/40/100 Gigabit Ethernet
Storage: OS	2 x SSDs or 2 x HDDs	Storage: OS	2 x SSDs or 2 x HDDs
Storage Data		Storage Data	
High Performance	4-8 x NVMe drives or 8-12 x SAS/SATA SSDs	High Performance	4-8xNVMe drives or 8-12 SAS/SATA SSDs
Performance	24 x SAS/SATA HDDs (SFF)	Performance	24 x SAS/SATA HDDs (SFF)
Capacity	12-16 x SAS/SATA HDDs (LFF)	Capacity	12-16 x SAS/SATA HDDs (LFF)

\*other AMD EPYC 7002 series processors are also supported

## Conclusion

Versatility and agility are among the most important requirements in modern datacenters. The AMD EPYC system-on-a-chip (SoC) enables organizations to deploy systems that precisely meet today's needs while positioning themselves for tomorrow's requirements.

MongoDB has grown to become one of the most popular modern databases in the industry<sup>3</sup>, and has been named in stackoverflow.com research for two consecutive years by developers as the database they most want to work with<sup>4</sup>. We believe this is because:

1. **The document data model** – presents developers with the best way to work with data.
2. **A distributed systems design** – allowing developers to intelligently put data where they want it.
3. **A unified experience** that gives them the freedom to run anywhere.

Together, AMD and MongoDB empower the development of modern data applications that implement solutions to a diverse set of business problems with high-performance processing and cost-effective solutions that are perfectly sized for current needs and easily scalable as your business grows.

For more information about AMD's EPYC line of processors visit: <http://www.amd.com/epyc>

For more information about MongoDB visit: <http://www.mongodb.com/>

For more information about the MongoDB Partner Program visit:

<https://www.mongodb.com/partners/partner-program>

### FOOTNOTES

1. Best-in-class based on industry-standard pin-based (LGA) X86 processors. NAP-166.
2. 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 processor. A motherboard designed for "Rome" processors is required to enable all available functionality. ROM-06.
3. DB-Engines.com ranking. As of 10/16/2018: <https://db-engines.com/en/ranking>
4. Stackoverflow.com survey. Most Loved, Dreaded and Wanted Database [Wanted tab]. As of 10/16/2018: <https://insights.stackoverflow.com/survey/2018/#most-loved-dreaded-and-wanted>

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