AMD
EPYC

HIGHLIGHTS

- A MULTI-DIE DESIGN THAT ALLOWS FOR INDEPENDENT DEVELOPMENT PATHS

- ARCHITECTURE LEADERSHIP THAT DELIVERS EFFICIENCY, PERFORMANCE, THROUGHPUT, AND SECURITY FEATURES

- BUILT ON 2ND GENERATION AMD INFINITY FABRIC™ LINK TECHNOLOGY

- OPTIMIZED FOR SCALE, PERFORMANCE, AND PERFORMANCE PER WATT FOR DATA CENTERS OF ALL SHAPES AND SIZES

- SUPERIOR MEMORY BANDWIDTH AND I/O TO SUPERCHARGE APPLICATIONS AND PRODUCTIVITY

- SECURITY THAT IS 'HARDENED AT THE CORE' WITH A SILICON EMBEDDED SECURITY PROCESSOR

AMD Infinity Architecture:
The Foundation of the Modern Datacenter

Modern datacenters require new thinking. The AMD Infinity Architecture ushers in a new era. Featuring leadership architecture, performance, and security, our approach to processor design allows you to turbocharge applications, transform datacenter operations, and help secure your critical data.

A BETTER APPROACH

Accelerated computation. Fast access to data. Workload mobility. Ever-changing security vulnerabilities. Tackling these challenges is difficult, especially with an outdated approach to IT infrastructure or one that offers only incremental technology improvements. That's why we started on a journey to change the nature of how processors and their systems are designed, built, and used today and enhanced tomorrow. In our return to the server processor market with 1st Gen EPYC™ Processors, we laid the foundation for a new design approach. Today we've expanded, accelerated, and elevated the design, resulting in a forward-looking AMD Infinity Architecture that forms the core of technology to come.

LEADING EFFICIENCY

With an all-new approach to CPU architecture, and a leadership interconnect that accelerates performance, the AMD Infinity Architecture supports extraordinary levels of scale at every layer. Our revolutionary multi-die design, which uses both 7nm and 14nm processes, allows independent paths for innovation. For 2nd Gen EPYC Processors this means leapfrogging the industry by using a 7nm process for the CPU cores combined with a 14nm process for I/O, memory access, and security functions. By moving away from a monolithic design and decoupling development, we can use the best process and improve each part of the system in a way and a pace that helps ensure you always get the newest technology into your datacenter first.

Within the architecture, components communicate using AMD Infinity Fabric Technology—a connection that is used within cores, between cores, and with off-chip components—to connect "Zen 2" processor cores, memory, bandwidth, and security mechanisms. As a result, the architecture offers breakthrough performance, throughput, and efficiency and supports continual improvement of process technology to deliver on the promise of next-generation computing.
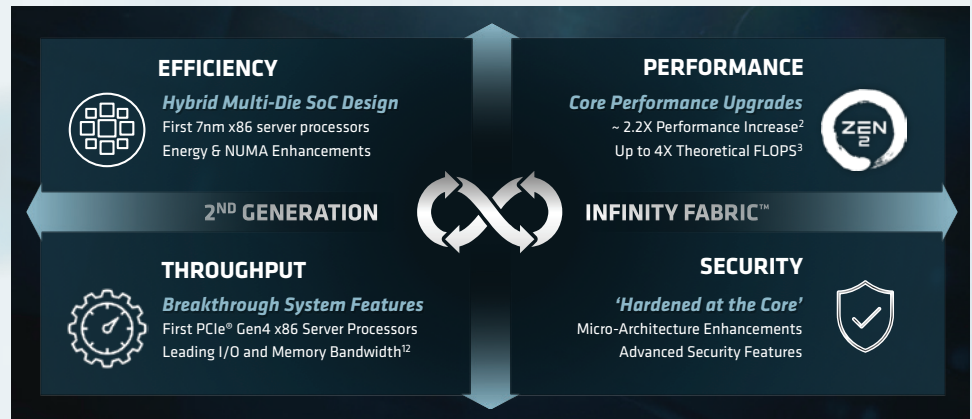
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SURPASSES 1ST GEN EPYC PROCESSORS

- 2X DENSITY[1]
- UP TO 128 THREADS PER SOCKET
- ~2.2X THE INTEGER PERFORMANCE[2] AND ~4X THE FLOATING-POINT PERFORMANCE[3]
- UP TO 15% MORE INSTRUCTIONS PER CYCLE (IPC)[4]

OUTPERFORMS THE COMPETITION

- 87% BETTER PERFORMANCE ON SPECint® BENCHMARKS[5]
- WORLD RECORD PERFORMANCE ON SPECfp® BENCHMARKS[6]
- ~91% FASTER RENDERING[7]
- TOP PERFORMANCE FOR 1-SOCKET DATA WAREHOUSES ON THE TCP-H BENCHMARK[8]
- TOP VMWARE VMMARK® BENCHMARK RESULT FOR 2-SOCKET/4-NODE[9] SERVERS
- 100% HIGHER ANSYS® FLUENT® PERFORMANCE[10]

EFFICIENCY
Hybrid Multi-Die SoC Design
First 7nm x86 server processors
Energy & NUMA Enhancements

PERFORMANCE
Core Performance Upgrades
~ 2.2X Performance Increase[2]
Up to 4X Theoretical FLOPS[3]

ZEN2

2ND GENERATION   INFINITY FABRIC™

THROUGHPUT
Breakthrough System Features
First PCIe® Gen4 x86 Server Processors
Leading I/O and Memory Bandwidth[12]

SECURITY
'Hardened at the Core'
Micro-Architecture Enhancements
Advanced Security Features

The use of multiple dies and a fast fabric interconnect allows for a system-on-chip (SoC) design that eliminates the need for many external support chips and the I/O latencies they induce. This balanced system approach gives you an abundance of resources so that you can match workloads and resources and make the best use of capital. You'll find that 1- and 2-socket servers with AMD EPYC processors satisfy most of your workload needs, helping you increase density and reduce capital, power, and cooling expenses. You can also optimize your software licensing costs. Whether you need 8 cores per processor or 64, you'll get the same "all in" feature set—I/O, memory, memory bandwidth, and security capabilities—to accelerate workloads and help safeguard information.

PERFORMANCE OPTIMIZED

The AMD Infinity Architecture is what helps make everything run better on servers with AMD EPYC processors. That's true whether you run enterprise applications, virtualized and cloud computing environments, software-defined infrastructure, high-performance computing, or data analytics applications. With double the core density, higher frequencies, improved execution pipelines, up to four times the size of the shared L3 cache, and more, the AMD Infinity Architecture helps 2nd Gen EPYC Processors surpass previous-generation processors to deliver exceptional performance.

We didn't stop there. AMD is the first vendor to create a pair of matched CPUs and GPUs. Both 2nd Gen AMD EPYC Processors and AMD Radeon Instinct™ MI50 and MI60 GPU accelerators feature 7nm process technology and PCIe Gen 4 support. These impressive devices communicate with each other with a stunning 64 GB/s of bandwidth, with an additional 368 GB/s aggregate bandwidth for peer-to-peer communication between GPUs among a hive of four GPUs. Up to 8 GPUs can be directly connected to the processor and use this fast connection to help ensure that even your most GPU-intensive applications are never starved for data.

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LEADING THROUGHPUT

- 2X I/O PERFORMANCE OF PREVIOUS-GENERATION SERVERS[11]

- 128+ LANES OF PCIe GEN 4 CONNECTIVITY

- PCIe GEN 4 CONNECTS HIGH-SPEED GPU ACCELERATORS AND FAST NVME DRIVES

- INTEGRATED DISK CONTROLLERS ACCESS DISK DRIVES WITHOUT THE BOTTLENECK OF A PCIe RAID CONTROLLER

SECURITY

- EXTENSIVE SET OF SECURITY TOOLS

- PERFORMANCE-OPTIMIZED TRUSTED ARCHITECTURE

- UP TO 509 UNIQUE ENCRYPTION KEYS THAT NEVER LEAVE THE PROCESSOR

- BUILT-IN ENCRYPTION FOR VIRTUAL MACHINE MEMORY AND I/O

- SCRUTINIZE SOFTWARE BOOTS FOR CORRUPTION

Performance means nothing if applications can't take advantage of it. We work with the open source community and major software vendors to help ensure their applications work with and take advantage of our architecture. With a broad ecosystem of open tools and libraries and x86-application compatibility, you can have confidence that your software will work and perform.

THROUGHPUT TO ACCELERATE RESULTS

Maximizing system throughput is the hallmark of the modern server. The AMD Infinity Architecture and 2nd Gen AMD EPYC processors take your performance beyond conventional constraints with superior memory and I/O throughput to supercharge your applications and IT productivity. It's possible with a new standard for memory bandwidth, continued leadership in memory bandwidth per socket, and a system that is the first to support PCIe Gen 4 in an x86-architecture CPU.

SECURITY THAT IS 'HARDENED AT THE CORE'

Physical and virtual threats pose a risk throughout your organization and extend to your customers. Putting up safeguards requires a comprehensive security foundation that isn't an afterthought but is an integral part of your infrastructure. Powered by an industry-leading embedded co-processor, AMD EPYC helps maintain a secure compute environment from power-on to run time.

The architecture is hardened at the core, with security features within the chip and system. An industry-leading co-processor on the SoC scrutinizes the boot process and helps manage up to 509 unique encryption keys known only to the processor. Combined, these technologies help keep your software and data safe as it boots, runs, and as virtual machines move between AMD EPYC SoC-powered servers.

BUILD YOUR FUTURE WITH AMD

As an IT practitioner, you know how important it is to keep your workloads and IT infrastructure operating at peak efficiency and within budget constraints. With the revolutionary AMD Infinity Architecture that delivers efficiency, performance, throughput, and security features, AMD can help you guard your most important assets, power your workloads, and modernize your datacenter so that you can move at the speed of your business.

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LEARN MORE

To learn more about AMD EPYC, visit amd.com/epyc.

FOOTNOTES

1   7nm technology used in Zen 2 provides 2x the density as 14nm technology used in Zen. EPYC-07

2   SPECrate®2017_int_base. EPYC 7742 score of 682, https://spec.org/cpu2017/results/res2019q3/cpu2017-20190722-16242.html. Intel Platinum 8280L score 364, http://spec.org/cpu2017/results/res2019q2/cpu2017-20190429-12779.pdf, July 28, 2019. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information ROM-38

3   Based on standard calculation method for determining FLOPS. ROM-04

4   AMD "Zen 2" CPU-based system scored an estimated 15% higher than previous generation AMD "Zen" based system using estimated SPECint®_base2006 results. SPEC and SPECint are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org. EPYC-09

5   SPECrate®2017_int_base. EPYC 7742 score of 682, https://spec.org/cpu2017/results/res2019q3/cpu2017-20190722-16242.html. Intel Platinum 8280L score 364, http://spec.org/cpu2017/results/res2019q2/cpu2017-20190429-12779.pdf, July 28, 2019. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. ROM-38

6   A 2P EPYC 7742 powered server has SPECrate®2017_fp_base score of 524, http://spec.org/cpu2017/results/res2019q3/cpu2017-20190722-16241.html as of August 7, 2019. The next highest base score is a 2P Intel Platinum 9282 server with a score of 522, http://spec.org/cpu2017/results/res2019q2/cpu2017-20190318-11208.pdf as of July 28, 2019. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. ROM-94

7   AMD Internal testing as of 30 July 2019 of a 2P AMD EPYC 7742 powered reference platform versus a 2P Intel Platinum 8280 powered production server, both using Radeon™ RX 580 graphics cards, on Blender version 2.8RC3. Results may vary. ROM-112.

8   Results as of 8/7/2019. 8-node EPYC™ 7702 result published at TPC website http://www.tpc.org/3341. Previous #1 published result on the TPC website at: http://www.tpc.org/3306. Product availability 8/7/2019. TPC and TPC Benchmark are registered trademarks of the Transaction Processing Performance Council. ROM-139

9   Results as of 8/7/2019 based on VMmark 3.1 SAN. An EPYC 7702 powered server delivered a VMmark 3.1 SAN storage score of 12.88 with 14 tiles on Aug 7, 2019. https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/vmmark/2019-08-07-HPE-ProLiant-DL385Gen10.pdf. Product available Aug 7, 2019. The next highest 2 node 4 socket score of 9.02 @ 9 tiles with Platinum 8280, https://www.vmware.com/products/vmmark/results3x.0.html, July 28, 2019. VMware VMmark 3.0 and 3.1 results can be found at https://www.vmware.com/products/vmmark/results3x.html. ROM-100

10 Based on AMD internal testing of ANSYS FLUENT 19.1, lm6000_16m benchmark, as of July 17, 2019 of a 2P EPYC 7742 powered reference server versus a 2P Intel Xeon Platinum 8280 powered server. Results may vary. ROM-42

11 AMD 2nd Generation EPYC processors support PCIe®4 which has 2 times the throughput of PCIe3 on 1st Gen EPYC processors. ROM-33

12 EPYC™ 7002 series has 8 memory channels, supporting 3200 MHz DIMMs yielding 204.8 GB/s of bandwidth vs. the same class of Intel I Scalable Gen 2 processors with only 6 memory channels and supporting 2933 MHz DIMMs yielding 140.8 GB/s of bandwidth. 204.8 / 140.8 = 1.454545 1.0 = .45 or 45% more. AMD EPYC has 45% more bandwidth. Class based on industry-standard based (LGA) X86 processors. ROM-11