AMD
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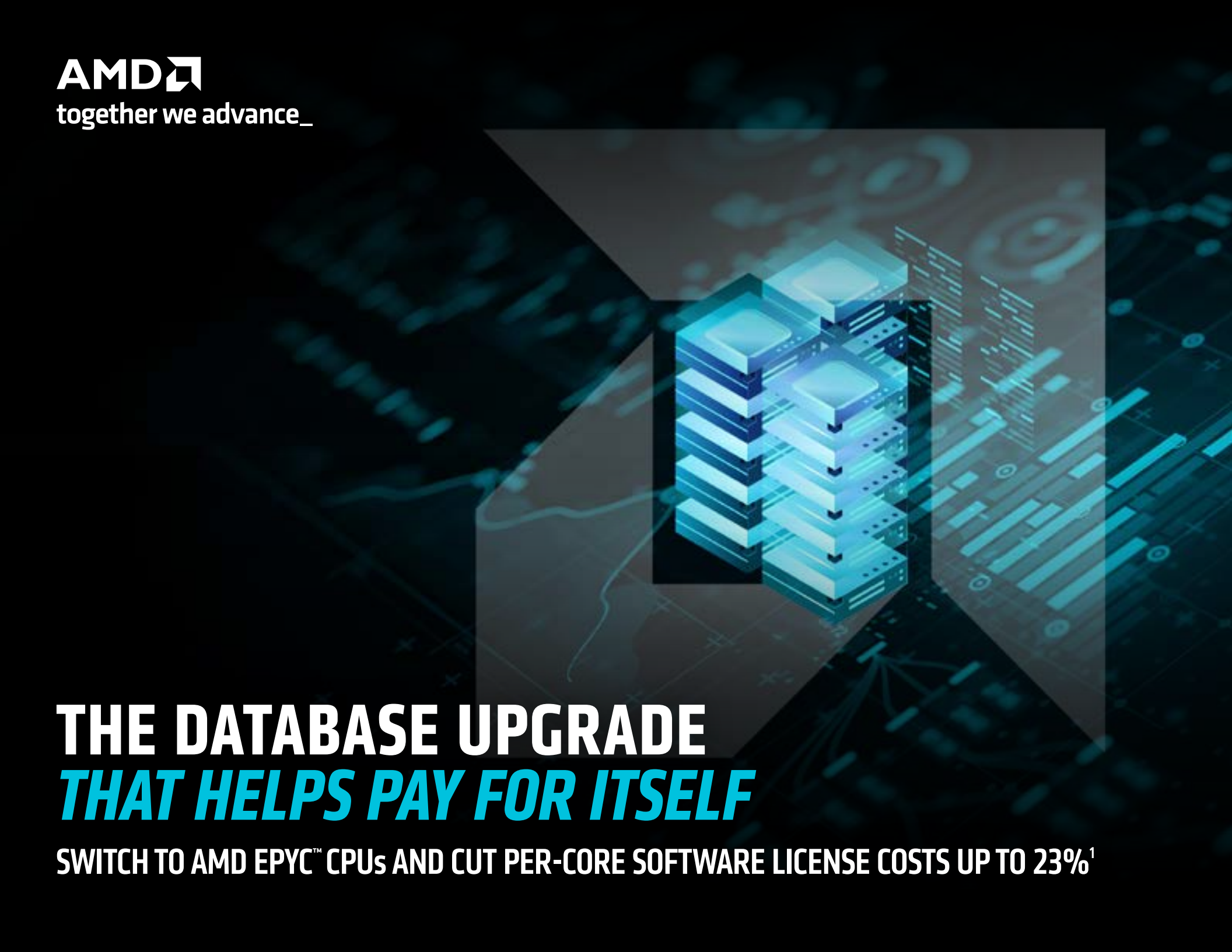


THE DATABASE UPGRADE
THAT HELPS PAY FOR ITSELF

SWITCH TO AMD EPYC™ CPUs AND CUT PER-CORE SOFTWARE LICENSE COSTS UP TO 23%[1]

INTRODUCTION

ONE DECISION CAN BOOST DATABASE PERFORMANCE AND SAVE MONEY

Database software is a major and essential cost of doing business. When licensed by the CPU core – as Microsoft SQL Server®, Oracle Database®, and IBM® DB2® do – one-time licensing fees can easily reach tens of millions of dollars for large enterprise customers. Since annual support contracts are indexed to the initial license fee, those one-time costs compound over the years.

Reducing database licensing costs can be simple. Upgrade to high-frequency 5th Gen AMD EPYC™ CPUs. They deliver more work per core, which means you can maintain service levels with fewer software licenses.[1]

THE RIGHT CPUs CAN CUT SOFTWARE LICENSE COSTS

Up to

23%[1]

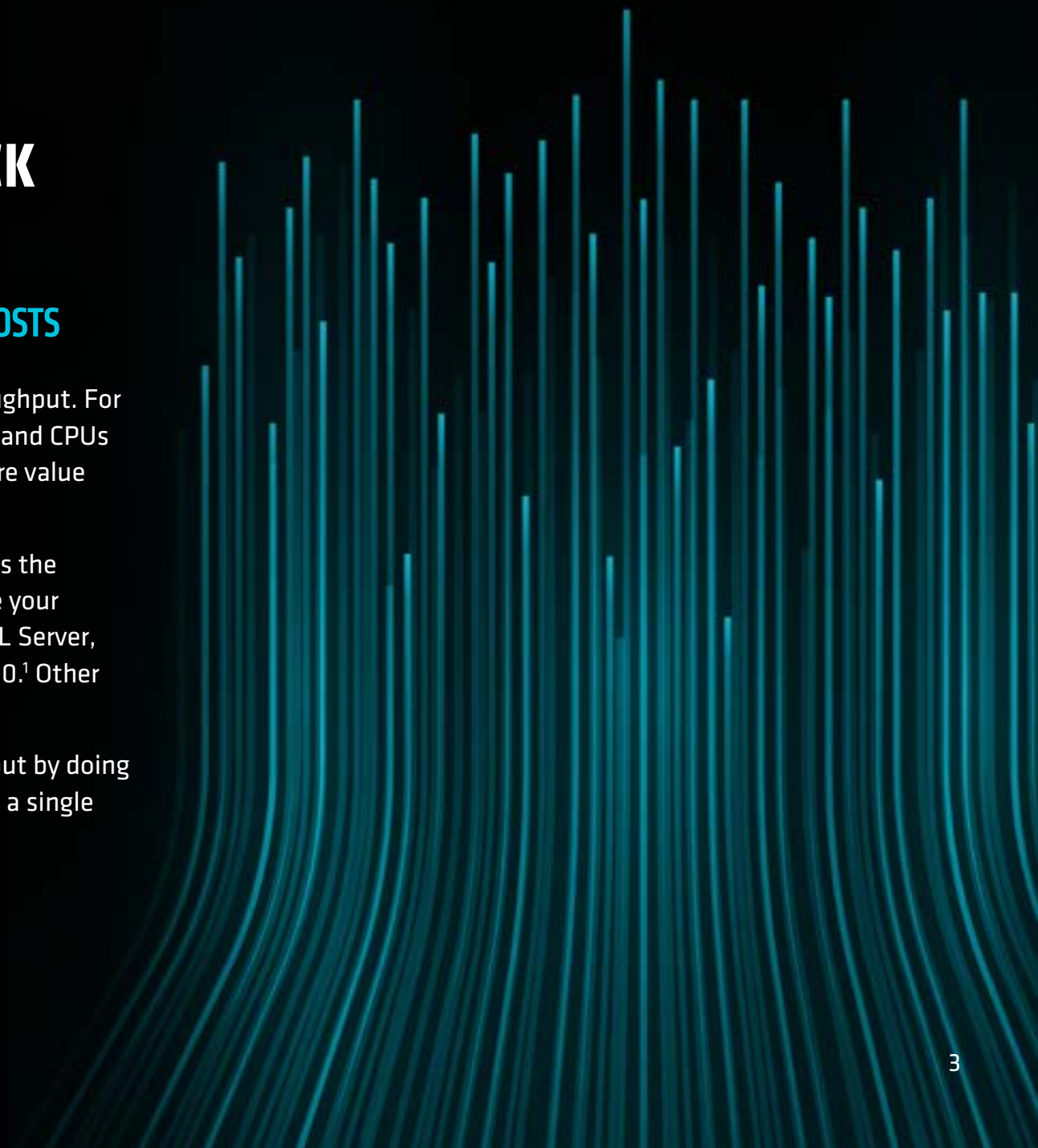
HOW FASTER CPUs UNLOCK SOFTWARE SAVINGS

HIGH-FREQUENCY CPUs CAN IMPROVE PERFORMANCE AND REDUCE LICENSING COSTS

Virtually every workload benefits from higher throughput. For many enterprise applications, adding more servers and CPUs is the usual way to boost workloads and create more value for the organization.

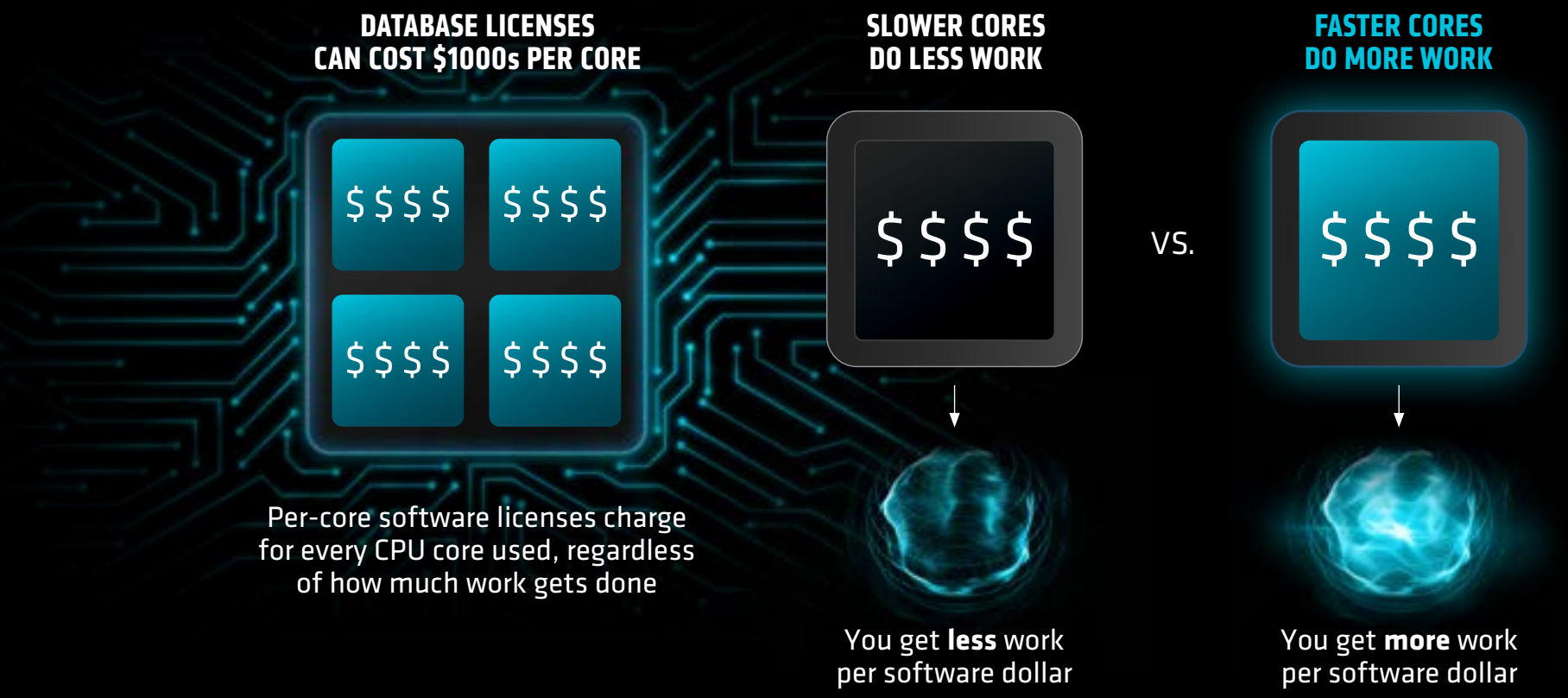
Per-core-based licensed database software changes the equation because every core you use could increase your software bill. For businesses that run Microsoft SQL Server, every additional core usually costs more than $7,500.[1] Other database vendors charge even more.

High-frequency AMD EPYC CPUs increase throughput by doing more work per hour, which means a single core and a single license can do more for the same software cost.



HIGH-FREQUENCY CPUs GET MORE VALUE FROM EACH SOFTWARE LICENSE

Fewer, faster cores do more work per software dollar



Graphic for illustration purposes only. Actual performance varies across workloads and CPU specifications.

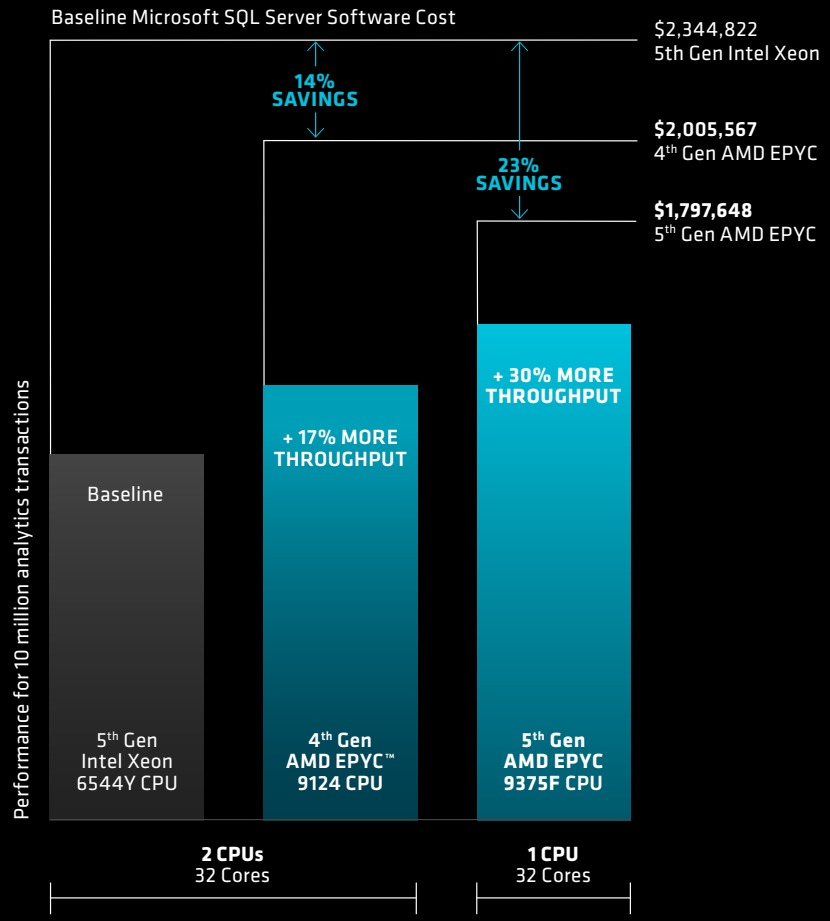
IMPROVE PERFORMANCE AND REDUCE COSTS

THROUGHPUT AND SOFTWARE SAVINGS INCREASE WITH CPU FREQUENCY

To see how higher-performing cores can boost performance and increase database software savings, compare 4th Generation AMD EPYC 9124 CPUs with 5th Gen Intel® Xeon® 6544Y CPUs in dual socket servers. Even though the AMD EPYC CPU is a generation older, its 32 cores deliver up to 17% more throughput and reduce software license costs up to 14%.[1]

5th Gen AMD EPYC 9375F CPUs – the "F" indicates high frequency – offer increased performance and higher clock speeds. A single AMD EPYC 9375F CPU produces up to 30% more throughput than two Intel Xeon 6544Y CPUs and lowers software licensing costs up to 23%, which can add up to more than $547,000 in savings.[1]

With core counts ranging from 16 to 64 cores, high-frequency F-series AMD EPYC CPUs provide multiple options for balancing performance, database license costs, and server consolidation.



AMD EPYC CPUs give you multiple options for improving performance, reducing database software costs, and consolidating servers.

Chart compares performance and per-core licensing costs for 10 million analytics transactions. For details, see note 1.

ACHIEVE COST SAVINGS THROUGH CONSOLIDATION

FASTER CORES MEAN SMALLER DATA CENTERS

AMD EPYC CPUs can save millions in software fees and dramatically shrink your data center footprint by consolidating older, slower servers into fewer modern servers. Because AMD EPYC CPUs are typically more power-efficient than competing x86 processors, refreshing data centers with AMD EPYC CPUs often results in lower energy bills.

The AMD combination of server consolidation, increased efficiency, and software license fee savings can free up budgets for investments in additional capacity and AI accelerators.

391,000 SPECRATE®2017_INT_BASE SCORE DATA CENTER[2]

	Current Intel servers	High-performance AMD servers
	347	131
	2P 5th Generation Intel® Xeon® 8592+ CPUs	2P 5th Generation, high-performance AMD EPYC™ 9965 CPUs
Core count		
	44,416	50,304
Energy consumption		
	~4744 KWH PER YEAR	~2627 KWH PER YEAR

Up to **62%** **FEWER SERVERS[2]**

Up to **45%** **LESS POWER[2]**

Up to **44%** **LOWER TCO OVER 3 YEARS[2]**

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Illustration compares the number of dual-socket servers required to deliver a 391,000 SPECrate®2017_int_base score using 5th Gen (Emerald Rapids) Intel Xeon Platinum 8592+ CPUs and 5th Generation (Turin) AMD EPYC™ 9965 CPUs. For details, see endnote 2.

PREPARE FOR SMARTER DATABASES

DESIGNING FOR AI WORKLOADS IS ESSENTIAL

As database software providers integrate machine learning and generative AI into their database applications, organizations that intend to run AI at scale must plan for dramatically higher demands on their computing resources.

With the right CPUs, a data center designed for database performance can handle AI inference workloads including generative AI assistants, agentic AI workloads, and complex, end-to-end AI pipelines.

Up to
3.8X
the throughput for end-to-end AI compared to a competing x86 CPU[3]

Up to
93%
faster throughput ranking and classification using XGBoost compared to a competing x86 CPU[4]

Up to
79%
faster Facebook AI Similarity Search (FAISS) compared to a competing x86 CPU[5]

UPGRADE ON PREMISES AND IN THE CLOUD

AMD EPYC CPUs DELIVER EXCEPTIONAL PERFORMANCE FOR MICROSOFT SQL SERVER

Major OEMs and cloud providers rely on AMD EPYC CPUs for high-performance, high-density servers tuned specifically for high-volume database workloads.

EXPLORE ONSITE SOLUTIONS FOR MICROSOFT SQL SERVER

AMD partners offer a wide range of on-premises solutions for Microsoft SQL Server. Explore these reference architectures and solution briefs for more information and technical details from solution manufacturers.

- Cisco Microsoft SQL Server 2022 UCS rack server solutions (cisco.com) ›
- Dell Solution Insight: SQL Server 2022 (dell.com) ›
- HPE Microsoft SQL Server 2022 on HPE ProLiant reference architecture (hpe.com) ›
- Lenovo Microsoft SQL Server 2022 on ThinkSystem reference architecture (lenovo.com) ›
- Supermicro Microsoft SQL Server 2022 brief (supermicro.com) ›

TAP INTO AMD EPYC™ CPU-BASED INSTANCES IN THE CLOUD

Powering over 1,000 instances in the public cloud, AMD EPYC CPUs give you multiple options for flexible, high-performance database infrastructure. AMD works closely with cloud providers and database software producers to help ensure optimum performance across single, hybrid, and multi-cloud architectures.

Microsoft Azure VMs Advanced by AMD EPYC™ Processors (amd.com) ›

Amazon EC2 Instances Advanced by AMD EPYC Processors (amd.com) ›

Google Cloud Advanced by AMD EPYC™ Processors (amd.com) ›

LEAP AHEAD WITH ORACLE EXADATA MACHINES

Oracle uses AMD EPYC CPUs exclusively for their X10 and X11M Oracle Exadata Database Machines. Since migrating to AMD EPYC CPUs, Oracle reports better performance, more cost-effectiveness, and higher availability for Oracle databases.

Exadata combines a modern cloud-enabled architecture with scale-out servers and intelligent storage for low-latency, high-volume transactions. It is available on premises, as Exadata Cloud@Customer, in Oracle Cloud Infrastructure, and in Azure, Google Cloud, and AWS.

Learn more on oracle.com ›

EXADATA X11M DELIVERS MAJOR GAINS WITH AMD EPYC™ CPUs[6]

Up to
30% FASTER AI WORKLOADS DUE TO VECTOR SEARCH OPTIMIZATIONS

Up to
4.6X FASTER QUERIES

Up to
25% MORE CONCURRENT TRANSACTIONS

Up to
25% FASTER SERIAL TRANSACTIONS

EMIRATES NBD CUTS SOFTWARE COSTS, IMPROVES SERVICE WITH AMD EPYC™ CPUs

Emirates NBD transformed its banking services using cloud-native, container-based software deployed on servers powered by high-performance AMD EPYC CPUs. By modernizing its infrastructure, Emirates NBD created a flexible technology stack that can scale while reducing costs and improving performance.[7]

42% FASTER PROCESSING

20% LOWER LICENSING COSTS

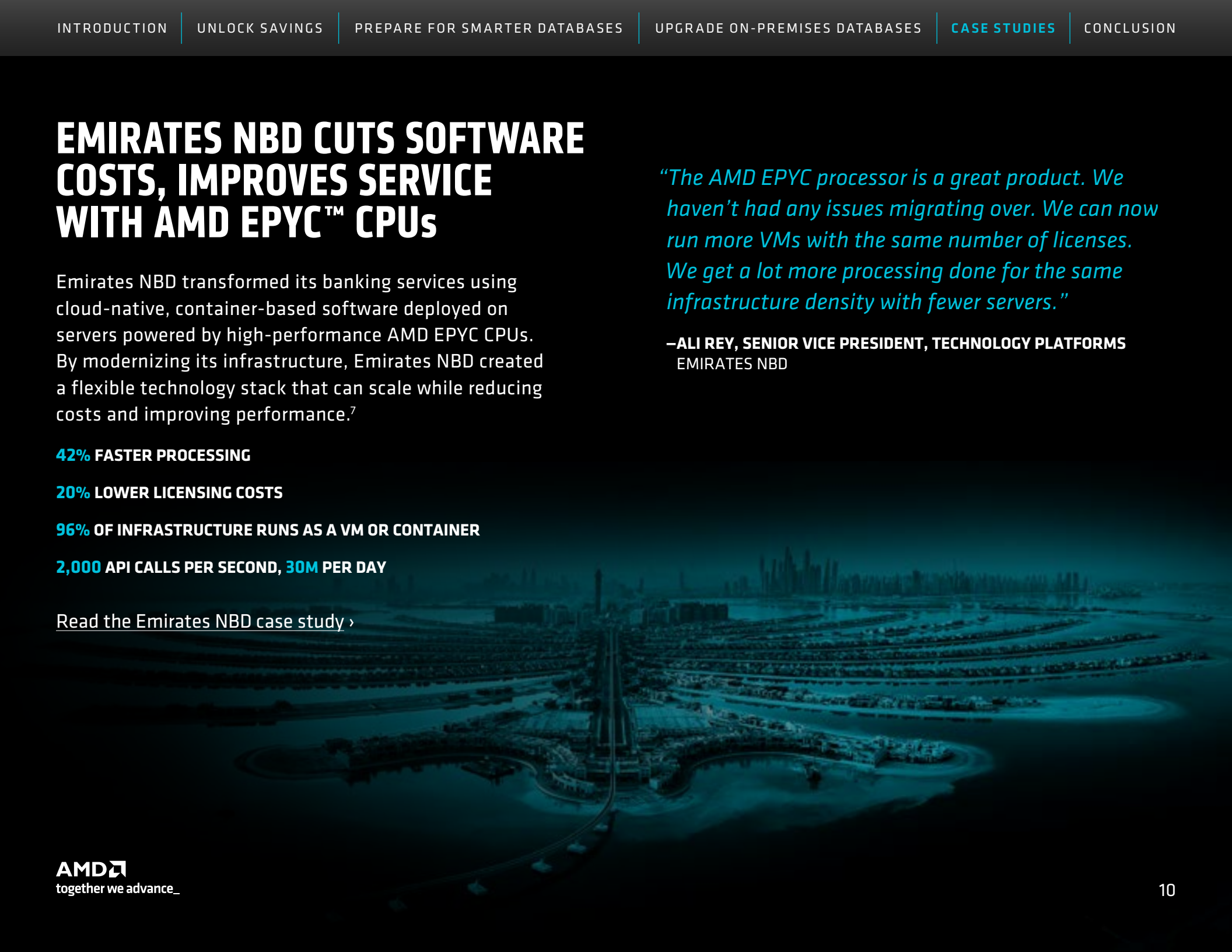
96% OF INFRASTRUCTURE RUNS AS A VM OR CONTAINER

2,000 API CALLS PER SECOND, 30M PER DAY

Read the Emirates NBD case study ›

"The AMD EPYC processor is a great product. We haven't had any issues migrating over. We can now run more VMs with the same number of licenses. We get a lot more processing done for the same infrastructure density with fewer servers."

–ALI REY, SENIOR VICE PRESIDENT, TECHNOLOGY PLATFORMS
EMIRATES NBD



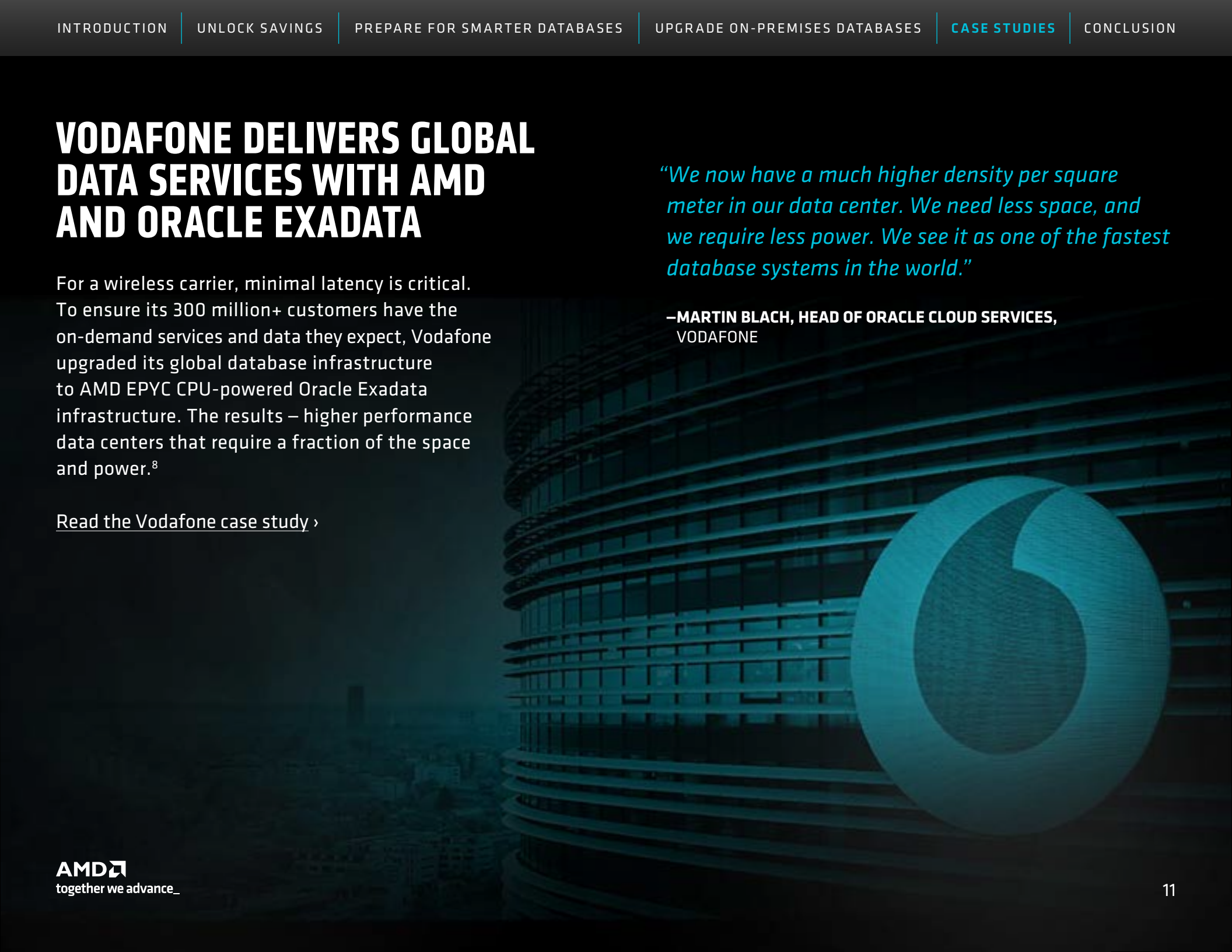
VODAFONE DELIVERS GLOBAL DATA SERVICES WITH AMD AND ORACLE EXADATA

For a wireless carrier, minimal latency is critical. To ensure its 300 million+ customers have the on-demand services and data they expect, Vodafone upgraded its global database infrastructure to AMD EPYC CPU-powered Oracle Exadata infrastructure. The results – higher performance data centers that require a fraction of the space and power.[8]

Read the Vodafone case study ›

"We now have a much higher density per square meter in our data center. We need less space, and we require less power. We see it as one of the fastest database systems in the world."

–MARTIN BLACH, HEAD OF ORACLE CLOUD SERVICES, VODAFONE



DNSE SECURITIES DOUBLED SERVER DENSITY, HALVED POWER CONSUMPTION WITH AMD EPYC CPUs

Vietnam-based DNSE Securities is a neo-brokerage with global ambitions. The FinTech startup runs a complex mix of workloads in a cloud-native, microservice architecture. Due to government regulations, all their applications must reside in an on-premises data center.

To ensure high availability and horizontal scaling, the company upgraded to AMD EPYC CPU-powered servers with a mix of high core count for cost-effective capacity and scaling and high-frequency CPUs for critical, low-latency workloads like market data feeds, orders, and risk management.

By choosing AMD EPYC CPUs, DNSE doubled core counts in half the rack space, increasing mixed-workload performance while using far less power.[9]

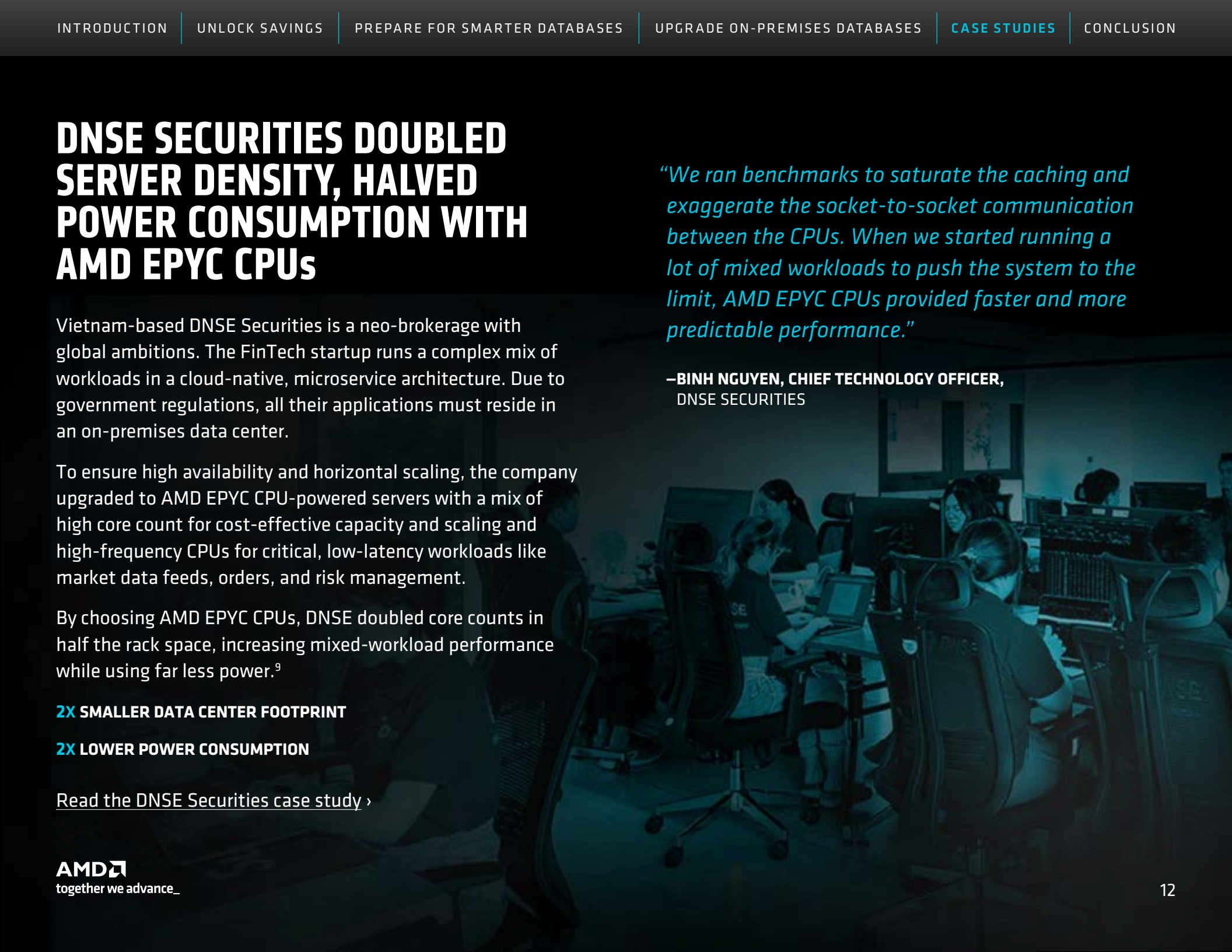
2X SMALLER DATA CENTER FOOTPRINT

2X LOWER POWER CONSUMPTION

Read the DNSE Securities case study ›

"We ran benchmarks to saturate the caching and exaggerate the socket-to-socket communication between the CPUs. When we started running a lot of mixed workloads to push the system to the limit, AMD EPYC CPUs provided faster and more predictable performance."

—BINH NGUYEN, CHIEF TECHNOLOGY OFFICER,
DNSE SECURITIES



CRITEO HANDLES 16X MORE TRAFFIC WITH HALF THE SERVERS

Placing digital advertising happens in less than 100 milliseconds, including the network round trip. This leaves just a few milliseconds for the Criteo platform to place a bid and generate an ad.

In their most recent refresh, Criteo upgraded to 4th Generation AMD EPYC CPUs. Now they're responding to 16X more ad auctions with half the server count.[10]

OVER 5.1 BILLION ADS SERVED EVERY DAY

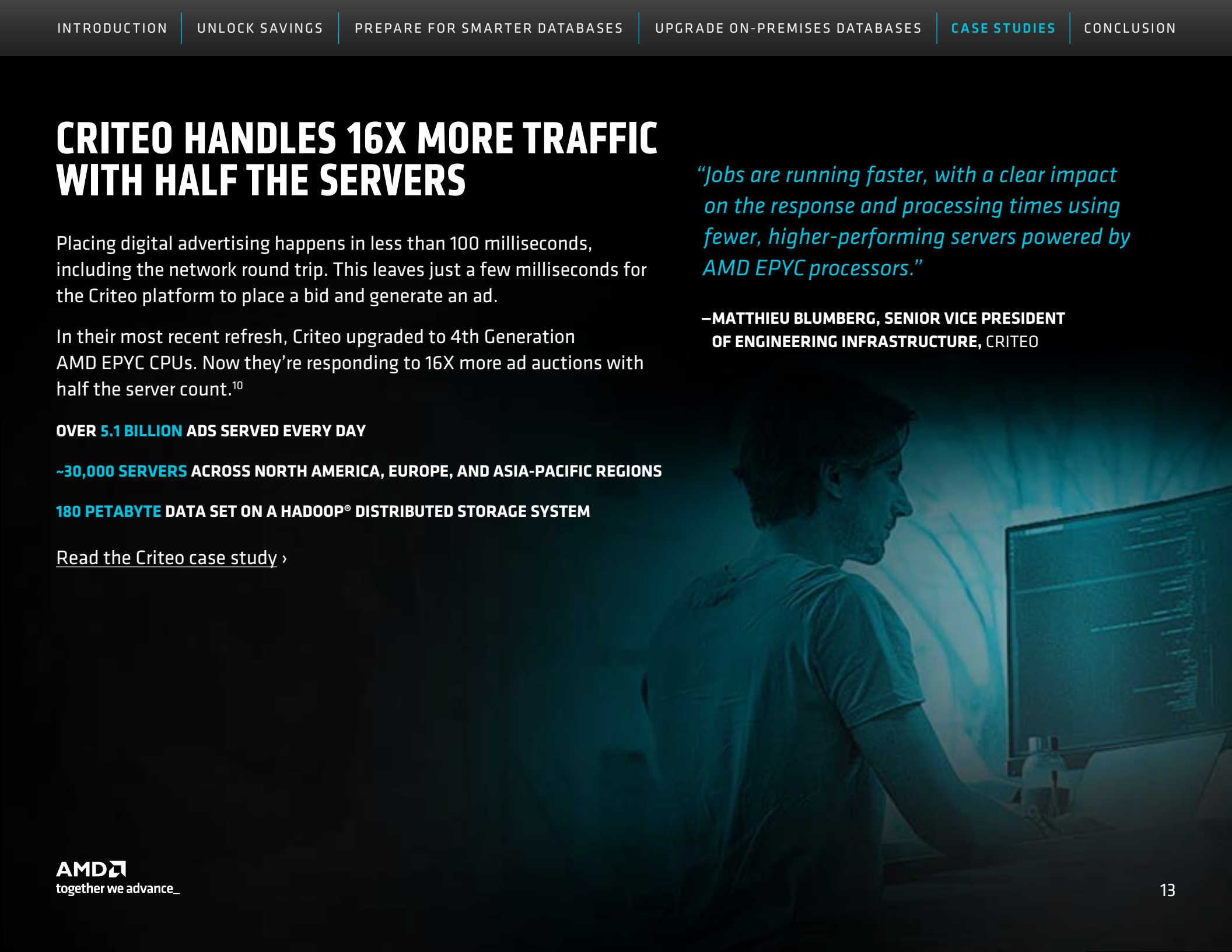
~30,000 SERVERS ACROSS NORTH AMERICA, EUROPE, AND ASIA-PACIFIC REGIONS

180 PETABYTE DATA SET ON A HADOOP® DISTRIBUTED STORAGE SYSTEM

Read the Criteo case study ›

"Jobs are running faster, with a clear impact on the response and processing times using fewer, higher-performing servers powered by AMD EPYC processors."

–MATTHIEU BLUMBERG, SENIOR VICE PRESIDENT OF ENGINEERING INFRASTRUCTURE, CRITEO



CONCLUSION

UPGRADE DATABASE INFRASTRUCTURE WITH AMD

COVER THE COST OF MODERNIZATION WITH SOFTWARE SAVINGS

When you upgrade to high-frequency AMD EPYC CPUs, the increase in performance may cut your per-core software licensing fees up to 23%[1] when you migrate. Plus, you get a modern, high-performance, AI-ready data center that can transform workload performance throughout your business.

Find out how AMD can help

THE WORLD TRUSTS AMD EPYC™ DATA CENTER CPUs

- **Preferred CPU** for hyperscale cloud providers
- **Proven deployments** with Fortune 500 companies across multiple generations
- Installed in **business-critical infrastructure** for finance, automotive, aerospace, technology, telecom, healthcare, and the public sector
- Powering four of the top ten **supercomputers** in the world[11]

1. TPC-H analytics workload based on internal AMD measurements as of 6/16/2025. This workload is derived from the TPC-H Benchmark and is not comparable to published TPC-H Benchmark results, as this implementation does not comply with all requirements of the TPC-H Benchmark. Workload configs: SQL Server 2022 CU 11, 32 Core Node, SF3000, TPC-H Kit MSTPCH 2.18.0-2600 1P 32C AMD EPYC 9375F powered production server (32 total cores, 1.5 TB DDR5 5200Mhz Memory, BIOS 0.2.3 X-Rev, SMT=On, Determinism=Power, mitigations=off; OS Microsoft Windows Server 2022 Standard, 10.0.20348 Build 20348, 10 x 3.49TB storage) with 1,346,026 avg QphH@3000 1P 16C AMD EPYC 9175F powered production server (16total cores, 1.5 TB DDR5 5200Mhz Memory, BIOS 0.2.3 X-Rev, SMT=On, Determinism=Power, mitigations=off; OS Microsoft Windows Server 2022 Standard, 10.0.20348 Build 20348, 10 x 3.49TB storage) with 826,781 avg QphH@3000 2P 16C AMD EPYC 9124 powered production server (32 total cores, 1.5 TB DDR5 4800Mhz Memory, BIOS 1.7.2, SMT=On, Determinism=Power, mitigations=off; OS Microsoft Windows Server 2022 Datacenter, 10.0.20348 Build 20348, 3 x 6.9TB and 3 x 3.4TB storage) with 1,206,427 avg QphH@3000 Versus 2P 16C Intel Xeon 6544Y powered production server (32 total cores, 3 TB DDR5 5600Mhz Memory, BIOS ESE124B-3.11, SMT=On, mitigations=off; OS Microsoft Windows Server 2022 Datacenter, 10.0.20348 Build 20348, 9 x 3.49TB storage) with 1,031,925 avg QphH@3000

   Estimated licensing costs for running 10M queries
   2P Intel Xeon 6544Y platform: $2,344,822
   2P AMD EPYC 9124 platform: $2,005,657
   1P AMD EPYC 9375F platform: $1,797,648
   1P AMD EPYC 9175F platform: $1,463,313
   Microsoft SQL Server 2022 license pricing information: $15,123 per 2 core pack, source: https://www.microsoft.com/en-us/sql-server/sql-server-2022-pricing. Pricing as of 5/2/2025. Results may vary due to factors including system configurations, software versions and BIOS settings. (9xx5-221)

2. This scenario contains many assumptions and estimates and, while based on AMD internal research and best approximations, should be considered an example for information purposes only, and not used as a basis for decision making over actual testing. The AMD Server & Greenhouse Gas Emissions TCO (total cost of ownership) Estimator Tool - version 1.12, compares the selected AMD EPYC™ and Intel® Xeon® CPU based server solutions required to deliver a TOTAL_PERFORMANCE of 391000 units of SPECrate2017_int_base performance as of October 10, 2024. This estimation compares a legacy 2P Intel Xeon 28 core Platinum_8280 based server with a score of 391 versus 2P EPYC 9965 (192C) powered server with a score of 3000 (https://www.spec.org/cpu2017/results/res2024q4/cpu2017-20240923-44837.pdf) along with a comparison upgrade to a 2P Intel Xeon Platinum 8592+ (64C) based server with a score of 1130 (https://spec.org/cpu2017/results/res2024q3/cpu2017-20240701-43948.pdf). Actual SPECrate®2017_int_base score for 2P EPYC 9965 will vary based on OEM publications. Environmental impact estimates made leveraging this data, using the Country / Region specific electricity factors from the 2024 International Country Specific Electricity Factors 10 – July 2024, and the United States Environmental Protection Agency "Greenhouse Gas Equivalencies Calculator." For additional details, see https://www.amd.com/en/legal/claims/epyc.html#q=epyc4#SP9xxTCO-002A. (9xx5TCO-002A)

3. TPCxAI @SF30 Multi-Instance 32C Instance Size throughput results based on AMD internal testing as of 09/05/2024 running multiple VM instances. The aggregate end-to-end AI throughput test is derived from the TPCx-AI benchmark and as such is not comparable to published TPCx-AI results, as the end-to-end AI throughput test results do not comply with the TPCx-AI Specification. 2P AMD EPYC 9965 (384 Total Cores), 12 32C instances, NPS1, 1.5TB 24x64GB DDR5-6400 (at 6000 MT/s), 1DPC, 1.0 Gbps NetXtreme BCM5720 Gigabit Ethernet PCIe, 3.5 TB Samsung MZWLO3T8HCLS-00A07 NVMe®, Ubuntu® 22.04.4 LTS, 6.8.0-40-generic (tuned-adm profile throughput-performance, ulimit -l 198096812, ulimit -n 1024, ulimit -s 8192), BIOS RVOT1000C (SMT=off, Determinism=Power, Turbo Boost=Enabled) 2P AMD EPYC 9755 (256 Total Cores), 8 32C instances, NPS1, 1.5TB 24x64GB DDR5-6400 (at 6000 MT/s), 1DPC, 1.0 Gbps NetXtreme BCM5720 Gigabit Ethernet PCIe, 3.5 TB Samsung MZWLO3T8HCLS-00A07 NVMe®, Ubuntu 22.04.4 LTS, 6.8.0-40-generic (tuned-adm profile throughput-performance, ulimit -l 198096812, ulimit -n 1024, ulimit -s 8192), BIOS RVOT0090F (SMT=off, Determinism=Power, Turbo Boost=Enabled) 2P AMD EPYC 9654 (192 Total cores) 6 32C instances, NPS1, 1.5TB 24x64GB DDR5-4800, 1DPC, 2 x 1.92 TB Samsung MZQL21T9HCJR-00A07 NVMe, Ubuntu 22.04.3 LTS, BIOS 1006C (SMT=off, Determinism=Power) Versus 2P Xeon Platinum 8592+ (128 Total Cores), 4 32C instances, AMX On, 1TB 16x64GB DDR5-5600, 1DPC, 1.0 Gbps NetXtreme BCM5719 Gigabit Ethernet PCIe, 3.84 TB KIOXIA KCMYXRUG3T84 NVMe, Ubuntu 22.04.4 LTS, 6.5.0-35 generic (tuned-adm profile throughput-performance, ulimit -l 132065548, ulimit -n 1024, ulimit -s 8192), BIOS ESE122V (SMT=off, Determinism=Power, Turbo Boost = Enabled) Results: CPU Median Relative Generational Turin 192C, 12 Inst 6067.531 3.775 2.278 Turin 128C, 8 Inst 4091.85 2.546 1.536 Genoa 96C, 6 Inst 2663.14 1.657 1 EMR 64C, 4 Inst 1607.417 1 NA. Results may vary due to factors including system configurations, software versions, and BIOS settings. TPC, TPC Benchmark and TPC-C are trademarks of the Transaction Processing Performance Council. (9xx5-012)

4. XGBoost (Runs/Hour) throughput results based on AMD internal testing as of 04/08/2025. XGBoost Configurations: v1.7.2, Higgs Data Set, 32 Core Instances, FP32 2P AMD EPYC 9965 (384 Total Cores), 1.5TB 24x64GB DDR5-6400 (at 6000 MT/s), 1.0 Gbps NIC, 3.84 TB Samsung MZWLO3T8HCLS-00A07, Ubuntu® 22.04.5 LTS, Linux 5.15 kernel, BIOS RVOT1004A, (SMT=off, mitigations=on, Determinism=Power), NPS=1 2P AMD EPYC 9755 (256 Total Cores), 1.5TB 24x64GB DDR5-6400 (at 6000 MT/s), 1.0 Gbps NIC, 3.84 TB Samsung MZWLO3T8HCLS-00A07, Ubuntu® 22.04.4 LTS, Linux 5.15 kernel, BIOS RVOT1004A, (SMT=off, mitigations=on, Determinism=Power), NPS=1 2P Xeon 6980P (256 Total Cores), 1.5TB 24x64GB DDR5-8800 MRDIMM, 1.0 Gbps Ethernet Controller X710 for 10GBASE-T, Micron_7450_MTFDKBG1T9TFR 2TB, Ubuntu 22.04.1 LTS Linux 6.8.0-52-generic, BIOS 1.0 (SMT=off, mitigations=on, Performance Bias) Results: CPU Throughput Relative 2P 6980P 400 1 2P 9755 436 1.090 2P 9965 771 1.928 Results may vary due to factors including system configurations, software versions and BIOS settings. (9xx5-162)

5. FAISS (Runs/Hour) throughput results based on AMD internal testing as of 04/08/2025. FAISS Configurations: v1.8.0, sift1m Data Set, 64 Core Instances, FP32 2P AMD EPYC 9965 (384 Total Cores), 1.5TB 24x64GB DDR5-6400 (at 6000 MT/s), 1.0 Gbps NIC, 3.84 TB Samsung MZWLO3T8HCLS-00A07, Ubuntu® 22.04.5 LTS, Linux 5.15 kernel, BIOS RVOT1004A, (SMT=off, mitigations=on, Determinism=Power), NPS=1 2P AMD EPYC 9755 (256 Total Cores), 1.5TB 24x64GB DDR5-6400 (at 6000 MT/s), 1.0 Gbps NIC, 3.84 TB Samsung MZWLO3T8HCLS-00A07, Ubuntu® 22.04.4 LTS, Linux 5.15 kernel, BIOS RVOT1004A, (SMT=off, mitigations=on, Determinism=Power), NPS=1 2P Xeon 6980P (256 Total Cores), 1.5TB 24x64GB DDR5-8800 MRDIMM, 1.0 Gbps Ethernet Controller X710 for 10GBASE-T, Micron_7450_MTFDKBG1T9TFR 2TB, Ubuntu 22.04.1 LTS Linux 6.8.0-52-generic, BIOS 1.0 (SMT=off, mitigations=on, Performance Bias) Results: Throughput Relative 2P 6980P 33.99 1 2P 9755 37.88 1.114 2P 9965 60.8 1.789 Results may vary due to factors including system configurations, software versions and BIOS settings. (9xx5-165)

6. Oracle, Introducing Exadata X11M: Next Generation Intelligent Data Architecture, January 2025. AMD has not independently verified these performance numbers.

7. All performance and cost savings claims are provided by Emirates National Bank of Dubai and have not been independently verified by AMD. Performance and cost benefits are impacted by a variety of variables. Results herein are specific to Emirates National Bank of Dubai and may not be typical. (GD-181)

8. All performance and cost savings claims are provided by Oracle and Vodafone and have not been independently verified by AMD. Performance and cost benefits are impacted by a variety of variables. Results herein are specific to Oracle and Vodafone and may not be typical.

9. All performance and cost savings claims are provided by DNSE Securities and have not been independently verified by AMD. Performance and cost benefits are impacted by a variety of variables. Results herein are specific to DNSE Securities and may not be typical.

10. All performance and cost savings claims are provided by Criteo and have not been independently verified by AMD. Performance and cost benefits are impacted by a variety of variables. Results herein are specific to Criteo and may not be typical.

11. Top500.org, TOP500 LIST - June 2025