



THE  
RULE BOOK  
FOR  
DATACENTERS

# RULEBOOK 0 EPYC™ 1

Switch to AMD EPYC™  
Processors With Confidence.



AMD EPYC™ processors bring welcome choice and competition to the server market, offering compelling value hand in hand with advanced security features that can help keep your data better protected against many of today's threats.

If you're considering refreshing or switching onto servers or cloud services powered by AMD EPYC processors, it's inevitable that you'll have lots of questions about the potential impact of working with a new provider – not least because it can seem like a daunting change.

This eBook is designed to illustrate how servers and clouds powered by AMD EPYC processors can meet your exacting standards, so you can choose to deploy AMD EPYC easily and with confidence. This eBook covers general topics such as compatibility and certifications, plus specific considerations for software-defined data center (SDDC) environments, cloud services, and High Performance Computing (HPC) workloads.

## This Is EPYC™

AMD EPYC x86 processors are created from the ground up to redefine server performance and value, offering up to 32 multithread cores per processor, support for up to 2TB of RAM per socket, and 128 PCIe®3 lanes. So you can strike the right balance of capabilities – like memory and I/O – for every workload, and overcome the processor constraints that limit application performance, while optimizing value for money.

## A Refreshingly Different Approach

At AMD, we've approached the server processor market with a spirit of openness and a commitment to forging rewarding partnerships. It's been gratifying to hear all kinds of customers and partners welcome this approach. As passionate believers in open source, we're demonstrating our commitment by collaborating with hardware and software partners to make AMD innovation as widely accessible as possible. In turn, this can enable and accelerate innovation throughout the vendor ecosystem and for our customers.

## Sharing Software Advances

- We work to optimize open source code in areas like compiler instruction sets with the goal of rolling enhanced code back into the ecosystem for the benefit of all.
- Industry leaders within AMD have joined forces with researchers in academia to optimize open source CPU instruction libraries.
- AMD security capabilities like Secure Encrypted Virtualization (SEV) are deployed using open source code. AMD has contributed code necessary for implementation in Linux and works with others in the ecosystem for integration into their environments.

## Driving Hardware Innovation

- We actively promote openness through a standards based approach to hardware that increases access to new capabilities at OEM and component manufacturer levels.
- In collaboration with industry partners, we work to integrate IP advances into all the diverse platforms in which AMD EPYC processors are available – from cloud to SDDC to HPC.

## Enabling Innovation for Today and Tomorrow

AMD EPYC processors are designed to enhance the performance of the applications that are shaping our digital world – from Big Data analytics to cutting edge scientific research, and from digital transformation to hybrid clouds in the enterprise. AMD technology will continue to evolve to help further life-enhancing advancements – from the world's first 7nm 64-core server processor that's anticipated to spur innovation in life sciences research and beyond.

“The increased competitive landscape [created by AMD EPYC] will enable OEMs to add their innovation into the server platform. End users should benefit from a competitive environment that will foster innovation and provide customer choice.”

**Jag Bolaria, Linley Group<sup>1</sup>**

## Straightforward to Integrate

AMD EPYC is designed to fit seamlessly into your existing infrastructure with little or no disruption. As a standard x86 architecture instruction set, AMD EPYC server processors are compatible with most existing environments. No need to worry about unexpected compatibility issues or having to undertake extensive recoding across your established infrastructure software and applications. In fact, switching to AMD EPYC needn't be more complex or demanding on your resources than a Xeon-to-Xeon server upgrade or refresh.

## Extensive Ecosystem Support

AMD EPYC powered servers are available from over 14 OEM/ODM system partners with over 60 server platforms, plus a full ecosystem of integrated, certified, and supported independent software vendors (ISVs) and independent hardware vendors (IHVs) (see page 6, figure 1). These alliances mean that AMD EPYC processors are able to address the needs of today's critical enterprise, cloud, and HPC workloads.

The AMD EPYC ecosystem means you can choose servers powered by AMD EPYC processors from your preferred server brands and still expect compatibility with your existing hardware infrastructure. In addition, AMD EPYC processors are trusted by the world's leading public clouds, like Amazon Web Services (AWS) and Microsoft Azure, to help fulfill their stringent SLAs and help meet the high expectations of their customers around the world.

## Easy to Choose, Upgrade, and Scale

AMD EPYC processors enable you to balance the capabilities you need with the demands of your workload. It's a simple offering that can help you to achieve an easy server procurement:

1. Decide if you want a 1P or 2P processor model.
2. Choose how many cores you want in each processor: 8, 16, 24, or 32.

All AMD EPYC processors support 128 PCIe® lanes, eight channels of memory bandwidth, and up to 2TB of memory, so there are fewer variables to compare and assess before you choose the best product for your workloads.

With well under 20 models throughout the AMD EPYC processor range, compared with over 80 Xeon models, it's quick to identify the AMD EPYC SoC (system on chip, aka AMD EPYC processor) that can bring you the greatest performance advantage – a big plus when you're pushed for time to evaluate your next generation of servers as part of a refresh or scale-out in your data center.

From reducing complexity to help streamline your decision-making, to easing your management burden, servers and clouds powered by AMD EPYC processors are designed to make your life easier across their ownership lifecycle.

## Now take a closer look at the reasons to choose AMD EPYC with confidence for:



**Virtualized Infrastructure for Enterprise**



**High Performance Computing Workloads (HPC)**



**Cloud and Hosted Services**





# For Enterprise



Given that physical or cloud-based servers are the engine on which global IT runs, you may be surprised that the average time spent researching servers prior to purchase is just five to six hours, with 70% of US buyers taking under five hours to reach a decision.<sup>2</sup> That figure includes the time spent evaluating server processors, but – if you choose to find out more about AMD EPYC processors – you’ll discover the advantages you could potentially achieve in your next server procurement.

## Why AMD EPYC for SDDC and Virtualized Infrastructure?

Software-defined data center environments with a high concentration of virtualized compute and storage typically need significantly more resource density than traditional infrastructures, which creates new demands on physical infrastructure. Server virtualization requires greater resource density, while software-defined storage (SDS) needs high speed networking access and access to disk storage.

With AMD EPYC processors, potential hardware and software licensing cost savings can cut TCO by up to 45%<sup>5</sup> over three years compared to other solutions available today.

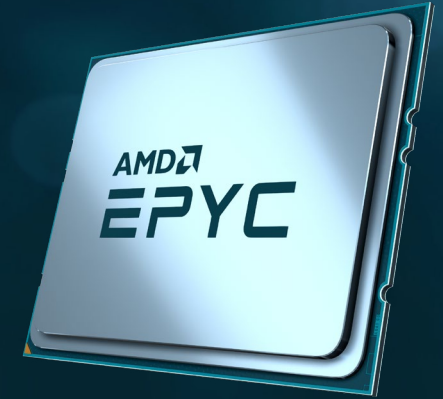
- AMD EPYC processors enable greater virtual machine (VM) density than competitor offerings<sup>3</sup> so you can run more VMs per physical server and reduce your physical server count.
- More memory capacity<sup>4</sup> for richly configured VMs means less latency and support for larger on-memory databases.
- 128 PCIe<sup>®</sup> lanes support high bandwidth network interfaces, hard disk, and solid-state storage drives (SSD).

## Balance Workloads

Servers powered by AMD EPYC processors can deliver more computing flexibility and value because they enable you to match processor capabilities to workload demands; for example, you can choose up to 32 cores for more VM capability per socket. Alternatively, if you choose an 8-core AMD EPYC processor you can still get the same features, like up to 2TB of memory, 8 memory channels, and 128 PCIe<sup>®</sup>3 lanes of I/O. This flexibility is ideal if you’re running software with processor-based licensing, because more cores per processor equals more value for money!

## “It Just Works”

AMD EPYC processors are standard x86 design so there’s no need to worry about unexpected compatibility issues. You can continue to use your existing management tools for your favorite OEM products, like Dell PowerEdge and HPE ProLiant, helping you to maintain consistency and minimize disruption.



## FIRST GEN AMD EPYC PROCESSORS PROVIDE:

- Up to 32 cores on a 1P processor or 64 on a 2P server.
- 33% more memory throughput (8 channels of DDR4 2666Mhz memory on a 1P and 16 channels on a 2P).
- 128 PCIe<sup>®</sup>3 lanes for highly parallel access to disk storage.

For example, compare an AMD EPYC™ 7601 CPU to an Intel Xeon 8180, and you get 14% more cores, 33% more memory bandwidth, and 33% more I/O.<sup>6</sup>



# For Enterprise (Cont.)



## Reliable and Stable Operation

You can implement servers powered by AMD EPYC processors safe in the knowledge that they are designed to recognize and correct errors, and remain operational, even under the most intensive workloads. Resilience is built into every layer of processor architecture for optimum reliability. Meanwhile, onboard system failure avoidance capabilities can prevent unplanned downtime by detecting potential issues and helping contain errors should they occur.

## How to Take Advantage

AMD EPYC processors are certified on a wide range of leading server OEMs and platforms, including Cisco, Dell, HPE, and Supermicro (see page 6, figure 1), to support easy integration with your existing x86 infrastructures. Just as important, they are certified on leading operating systems, hypervisors, and virtual storage platforms from Microsoft, Red Hat, and VMware:

### MICROSOFT >>

Windows 10 1709, Windows Server 2012 R2, WS 2016 and Windows Server 2019; Storage Spaces Direct.

### RED HAT >>

Enterprise Linux (RHEL) 7.4.

### VMWARE >>

VMware vSphere Hypervisor ESXi 5.5 and all subsequent releases, VMware vSAN.

You can also take advantage of ready-to-deploy data center solutions like VMware ReadyNodes, which are available on AMD EPYC processor powered servers from major OEMs like Dell, HPE, and Supermicro. VMware ReadyNodes give you a complete virtual infrastructure solution, including compute, memory, networking, I/O controller, and storage, to help you accelerate your journey to a software-defined data center.

[Learn more here »](#)

If your enterprise is running Big Data and analytics tools like Cloudera or Hadoop, AMD EPYC is certified on a great choice of these platforms.

## The vendor perspective

IT organizations supporting the needs of digitally transformed businesses should take a look at the new HPE ProLiant DL385 Gen10 server, based on the AMD EPYC™ System on a Chip (SoC). The combination of performance, security and cost constitutes a server platform well-suited for virtualization and memory intensive applications.

**Moor Insights & Strategy<sup>7</sup>**

## The analyst perspective

The OS vendors, along with AMD, validate the EPYC platform on not only the current release of the OS, but also the previous release of that OS. The company also works with the leading OS suppliers to validate EPYC on the pre-release of next-generation OS to ensure compatibility on the first day of commercial release.

**Jag Bolaria, Linley Group<sup>1</sup>**

AMD EPYC processors are supported by over 60 hardware manufacturers to ensure reliable integration with your existing infrastructure.

## System Partners

ASUS  
 CISCO  
 CRAY  
 DELL EMC  
 GIGABYTE  
 H3C  
 HPE  
 INSPUR  
 INVESTEC  
 LENOVO  
 QCT  
 SUGON  
 SUPERMICRO  
 TYAN  
 WISTRON

## Networking

 BROADCOM®  
 Chelsio Communications  
 Accelerate  
 MARVELL  
 Mellanox TECHNOLOGIES  
 Microsemi  
 NETRONOME

## Storage and Memory

 IDT  
 Integrated Device Technology  
 Micron  
 NETLIST  
 Rambus  
 SAMSUNG  
 SEAGATE  
 SK hynix  
 TOSHIBA  
 Leading Innovation >>>  
 Western Digital.

## Accelerators

 AMD RADEON INSTINCT  
 NVIDIA  
 XILINX®

Figure 1: AMD EPYC Processor OEM, ODM and IHV Ecosystem

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## Why AMD EPYC for HPC?

Today's engineering, research, and scientific innovators face ever-expanding challenges. As the definition of HPC extends to include Big Data analytics as well as academic and scientific HPC, a more scalable, powerful, and secure architecture is required to meet these ever increasing demands. AMD EPYC server processors can deliver the performance organizations need to power the next wave of HPC advances.

By establishing close relationships with leading software providers within the HPC community, we've optimized AMD EPYC processors to help both businesses and research establishments achieve new levels of performance.

## Advancing Today

First-generation AMD EPYC™ 7001 processors are ideal for environments that need high floating-point performance and memory bandwidth. They offer strong value in memory bandwidth-sensitive workloads like computational fluid dynamics, atmospheric research and weather modeling, oil and gas exploration, crash simulation, finite element analysis, and multibody dynamics. While more cores, memory, and processing throughput support high performance applications in environments like modeling, video encoding, dataset generation, and 3D rendering.

## Powering Tomorrow

Doubling down on the first generation of AMD EPYC processors, the second generation provides up to four times more floating-point resources.<sup>8</sup> These additional processor capabilities are ideal for HPC workloads like life sciences applications, including biology, chemistry, and physics simulations, and can dramatically accelerate university and government research. Second-generation AMD EPYC processors feature up to 64 cores per processor, alongside PCIe® gen 4 I/O that enables high performance devices, including Mellanox HDR, 200Gbps InfiniBand connectivity, AMD Radeon Instinct™ accelerators, GPUs, Xilinx Alveo FPGAs, and NVMe SSDs.

## Performance Benchmarks vs. Performance Value

You'll often refer to industry benchmarks to determine the relative performance of CPUs. Now, more than ever, you have a lot to compare because there is a choice of processor brand to power your servers. AMD EPYC server processors provide superior performance for many HPC workloads.<sup>9</sup> Additionally, AMD EPYC™ 7601 processors deliver up to 44% better performance on WRF than an Intel Xeon 8180 processor.<sup>10</sup>

## Optimized HPC Ecosystem Partners

ABACUS

ATIPA

ATOS

BROADBERRY

CISCO

COLFAX

CRAY

DELL EMC

EXXACT

GIGABYTE

HP ENTERPRISE

MAZDA COMPUTING

MICROWAY

NEC

PENGUIN COMPUTING

SUGAN

SUPERMICRO



## Ready to Integrate With Your HPC Environment

AMD EPYC server processors are fully compatible with x86 environments and are designed to fit seamlessly into your existing HPC hardware and software infrastructure with little or no disruption or risk. They have been certified for a number of applications from leading HPC ISVs, including Altair, ANSYS, Dassault Systemes, ESI Group, LSTC, MSC, OpenCFD Ltd., and Siemens PLM. In addition, AMD collaborates closely with open source software communities providing support for the broad software ecosystem.

## How to Take Advantage

**HPC servers powered by AMD EPYC processors help you tackle HPC workloads with leading performance and expandability on HPC applications, including:**

- Computational fluid dynamics (ANSYS FLUENT, STAR-CCM+, OpenFOAM)
- Weather modeling (WRF, MPAS)
- Crash simulation (LSTC LS-DYNA)
- Oil and gas reverse time migration and reservoir modeling
- Molecular Dynamics (NAMD)

Optimize and accelerate your own HPC code with tools, resources, and communities designed to increase productivity. For example, AMD develops compilers, libraries, and tools to optimize the performance of AMD EPYC™ processor based servers. These resources include the **AMD Optimizing C/C++ Compiler Suite**, **AMD CPU libraries**, and the **AMD uProf performance and power profiling tool suite**. In addition, AMD provides software optimization guides and performance tuning guidelines through [developer.amd.com](https://developer.amd.com).

## AMD EPYC for HPC in The Cloud

**Microsoft Azure offers services on AMD EPYC that are tailor-made for HPC workloads:**

- HB-series instances with leading memory bandwidth are ideal for applications like fluid dynamics, explicit finite element analysis, and weather modeling.
- Lv2-Series instances with high I/O designed for storage intensive workloads.

**The Oracle Compute Standard E2 platform is available in both bare metal form and as 1, 2, 4, and 8 core VMs:**

- With up to 64 cores per server, and 33% more memory channels than comparable instances,<sup>11</sup> Oracle Cloud Infrastructure offers more than 269Gb/s.
- This is ideally suited to HPC workloads that depend on memory bandwidth, like fluid dynamics, and for Big Data analytics where higher core counts are important.

**Learn more about our HPC software ecosystem, including ANSYS FLUENT, and get access to tuning guides, optimization guides, and more here »**

## The analyst perspective

“[AMD] has a broad and deep validation program to ensure compatibility to the installed base of applications and third party add-on hardware. In addition, it has worked with leading equipment vendors to ensure that their software stacks and board adapters are compatible and interoperable on EPYC platforms... Thus, customers can easily migrate their existing workloads and software images to the new EPYC platforms and have the peace of mind for future compatibility.”

**Jag Bolaria, Linley Group<sup>1</sup>**





## EDUCATION

### CHALLENGES

Increase high-performance computing (HPC) capacity and performance, in a high-density environment delivering robust computational infrastructure across a broad range of data-rich scientific applications.

### SOLUTION

AMD EPYC processor-based HPE ProLiant DL385 Gen10 servers providing HPE Silicon Root of Trust security and up to 32 cores and 2TB of memory per processor.

### RESULTS

Achieved excellent results that delivered on savings per performance, while reducing latency, as well as I/O card and switch cost.

### AMD TECHNOLOGY AT A GLANCE

AMD EPYC™ 7000 series-based 2-socket server solution with up to 64 cores.

“This chipset [AMD EPYC] was different than anything we’d seen before. This was a major architectural upgrade and change, across the board.”

**Prof. Paul Brenner, Associate Director**

# SPINVFX

## MEDIA AND ENTERTAINMENT

### CHALLENGES

Increase processing power to meet escalating demands to cut rendering times while enhancing creativity and reducing costs.

### SOLUTION

Deployed Dell PowerEdge R7425 powered by the AMD EPYC™ 7501 processor.

### RESULTS

Dramatically reduced rendering times by up to 50% over SpinVFX’s existing Intel Xeon hardware, saving an estimated 85 hours on a typical 200-frame effects job and fueling greater creative productivity with significantly lower cost.

### AMD TECHNOLOGY AT A GLANCE

AMD EPYC™ 7000 Series Processors with up to 32 cores.

“With AMD EPYC processors, we got double the performance. The AMD EPYC processors are not only more powerful, they were significantly more affordable as well.”

**Colin Davies, Chief Technology Officer & Partner**



Oregon State University

## GENOMICS RESEARCH

### CHALLENGES

Deploy servers with capacity to scale thread count and take on thousands of daily compute-intensive jobs while driving down total cost of ownership.

### SOLUTION

Deploy AMD EPYC™ based 7501 and 7601 processors.

### RESULTS

Increased job count productivity, extended life of server room, reduced total operating costs and complexity.

### AMD TECHNOLOGY AT A GLANCE

AMD EPYC™ 7000 series processors with up to 32 cores.

“With AMD EPYC I’ve reduced my management, I’ve reduced my cost...”

**Chris Sullivan, Assistant Director of Biocomputing**

The flexibility and value of the cloud gives organizations powerful new opportunities to self-serve IT services as required, scale services up and down on demand, pay only for what's required, and ensure workload resilience. Today, it's never been easier to move workloads between a choice of different clouds to take advantage of cost savings and new services.

IDG estimates that 90% of organizations already run some part of their infrastructure or applications in the cloud and predicts that every organization will be doing so by 2021.<sup>12</sup> That's why we've prioritized making it convenient to take advantage of AMD EPYC processor performance and value on a wide range of cloud platforms. In fact, it's just as easy to take advantage of AMD EPYC powered services in the cloud as it is to deploy them in a physical server.

Selected cloud services on AMD EPYC will enable organizations to achieve optimized performance while realizing cost savings of up to 66%.<sup>11</sup>

## How to Take Advantage

We recognize that your choice of cloud provider is influenced by many factors. These may include physical proximity to your business, national and regional data compliance demands, the level of service and support you need, and more. That's why we're working with all types and tiers of cloud provider to offer you the greatest choice – from leading hyperscale public clouds to a great choice of regional and solution specialists – to make it easy for you to get the services that fulfill your business needs.

## Public Clouds

Hyperscale public clouds offer exceptional value for money and optimal flexibility for a wide choice of workloads, from dedicated platforms for business-critical enterprise applications to bare metal IaaS for HPC.

### Amazon Web Services (AWS)

For secure, resizable compute capacity in the cloud, Amazon EC2 instances are available powered by AMD EPYC processors, offering cost and performance optimization for your workloads. With three services to choose from, Amazon EC2 instances can deliver optimized compute and memory at a 10% lower cost<sup>13</sup> than comparable instances:

- **Amazon EC2 M5a:** for business-critical applications, web and application servers, back-end servers for enterprise applications, gaming servers, caching fleets, and app development environments.
- **Amazon EC2 R5a:** for high performance databases, distributed web scale in-memory caches, mid-size in-memory databases, real-time Big Data analytics, and other enterprise applications.
- **Amazon EC2 T3a:** Ideal for virtual desktops, development environments, code repositories, and business-critical applications. Baseline level of CPU performance that's burstable at any time for as long as required.

Migrating workloads to AMD EPYC powered Amazon Web Services (AWS) instances can be accomplished with a simple instance type change in your Amazon EC2 console, so it's easy and non-disruptive to start realizing potential savings.

## Microsoft Azure

Microsoft Azure L and H Series instances on AMD EPYC are purpose-built for HPC workloads:

- **Microsoft Azure Lsv2:** Optimized for high throughput and high IOPS workloads with large in-memory requirements. Perfect for SQL and NoSQL databases, data warehousing, and large transactional databases. Up to 3.7M read IOPS on WS2019 and 3.6M read IOPS on Ubuntu 18.04/16.04.<sup>14</sup>
- **Microsoft Azure Standard\_HB60rs:** Optimized for applications driven by memory bandwidth, such as fluid dynamics, explicit finite element analysis, and weather modeling. These instances deliver more than 260 GB/sec of memory bandwidth, which is 33% more than x86 alternatives and 2.5x faster than what most HPC customers have in their data centers today.<sup>15</sup>

## Oracle Cloud Infrastructure

Oracle IaaS services are available as both bare metal services and a choice of VMs with up to 64 cores per server:

- **Oracle Cloud Standard E2** instances on AMD EPYC are ideal for general-purpose workloads for organizations seeking the best blend of price and performance, or wishing to run Oracle applications, including E-Business Suite, JD Edwards, and PeopleSoft, with full Oracle support.
- **Oracle bare metal IaaS** is ideally suited for HPC workloads demanding high memory bandwidth and Big Data analytics workloads that rely on higher core counts and higher memory bandwidth.

## Independent Cloud and Hosting Providers

Choose from a fast-growing selection of global and regional cloud and hosting providers to get the performance and value gains of AMD EPYC processors hand-in-hand with specialist managed services support. Cloud Service Providers of all varieties are using AMD EPYC processors as the basis of new and differentiated customer offers that deliver superior performance and value.

Take a look at how AMD is powering innovative and appealing new services for these independent providers:

### MyLoc: Server hosting based in Germany

MyLoc use AMD EPYC powered servers from HPE as the basis for a completely new dedicated server product on its **webtroipia.com** platform. The new service is 50% more popular with MyLoc's customers than the preceding product.

[Watch the case study »](#)

### HiveLOCITY: Global server, colocation, and cloud hosting based in the US

AMD EPYC processors are enabling HiveLOCITY to meet customer demand for high-capacity storage, including read-write speeds that are six times faster than two Xeon processors.

[Read the case study »](#)

“When we think about our compute platforms, there are a couple of things that are important to our customers. The very first thing is security, reliability and performance, and AMD is great on all of those fronts.”

**Matt Garman, VP Computing Services, AWS<sup>16</sup>**

## EPYC Processors in the Cloud

[AWS](#)

[BAIDU](#)

[DROPBOX](#)

[HETZNER](#)

[HIVELOCITY](#)

[MICROSOFT](#)

[MYLOC](#)

[ONLINE BY SCALEWAY](#)

[PACKET](#)

[TELEWEB](#)

[TENCENT](#)



ulm university universität  
**uulm**

## CLOUD COMPUTING AND IT SERVICES

### CHALLENGES

To improve performance and application scalability within the bwCloud infrastructure, helping drive better outcomes for students, teachers and researchers.

### SOLUTION

Deployment of AMD EPYC processor-powered single socket servers.

### RESULTS

Improved scalability and performance at a lower price point.

### AMD TECHNOLOGY AT A GLANCE

AMD EPYC™ 7351P processor with up to 16 cores.

“In our analysis AMD was clearly the best option.”

**Dr. Stephan Wesner, Director of Communications for IT Services**



## DEDICATED SERVER AND CLOUD HOSTING

### CHALLENGES

Provide hosting clients with high powered yet cost-effective solution for resource-intensive data storage, processing and serving needs.

### SOLUTION

Deploy AMD EPYC based Tyan servers for clients with data storage and database server requirements.

### RESULTS

AMD EPYC servers are a game changer. With a single AMD EPYC processor the Hivelocity client is experiencing read/write speeds six times faster than that of two Xeon processors. With resource-rich EPYC, Hivelocity can deliver performance and capacity to its clients with less hardware and reduced power costs.

### AMD TECHNOLOGY AT A GLANCE

AMD EPYC™ 7000 series processors with up to 32 cores.

“With a single AMD EPYC processor the Hivelocity client is experiencing read/write speeds six times faster than that of two Xeon processors.”

**Steve Eschweiler, COO**



## BARE METAL CLOUD SERVERS

### CHALLENGES

Provide Enterprise and SaaS clients with a cutting edge yet cost-effective solution for scaling up compute-heavy applications.

### SOLUTION

Deploy AMD EPYC based Dell PowerEdge R6415 as the basis for a new class of service.

### RESULTS

Clients can reduce costs by 50% using AMD EPYC based Packet bare metal platform. Packet clients gain single socket 24-core chip performance with perfect balance of compute and memory at lower TCO.

### AMD TECHNOLOGY AT A GLANCE

AMD EPYC™ 7000 series processors with up to 32 cores.

“Our users represent an especially demanding group of customers, and we want them to identify with Packet as the source for leading hardware. That’s why the AMD EPYC processor is a perfect match for us.”

**Jacob Smith, SVP Engagement**

## Press GO on an AMD EPYC Implementation

### Know your cloud options

If you're buying a public cloud instance to stand up a server, bare metal infrastructure, or a hosted service from a CSP, check if they offer equivalent services on AMD EPYC, and take a moment to compare performance and value.

### Three questions to ask your vendor the next time you invest in servers:

- How could choosing a server powered by AMD EPYC processors give me better performance?
- How could AMD EPYC processors help me optimize my server investments?
- How could AMD EPYC SoCs help keep my data protected?

### Commitment, vision, and innovation

AMD EPYC processors are a sustainable proposition you can choose with confidence because they are:

- Built on the award-winning "Zen" architecture and its breakthrough Infinity Fabric design.
- Making the next great leap in silicon engineering with the world's first 7nm data center processor.
- The latest milestone in AMD's 50-year history of extending the frontiers of high-performance computing, spanning data center processors, gaming cards, and visualization technologies, which have come to define industry standards for consumer level computing, immersive experiences, and the data center.

## Learn More About AMD EPYC Server Processors From a Product Expert.

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## ENDNOTES

1. Source: EPYC Offers x86 Compatibility, By Jag Bolaria Principal Analyst, Linley Group, June 2017.
2. Source: AMD internal research [Internal ref, Servers Brand Equity Research, Sep 2018]
3. The EPYC 7551P processor has 2.8 greater density/63% Less Space than the Intel Xeon Gold 5118 processor. 2.8 greater density: 80 2RU Intel servers = 160 RU. 60 1RU AMD EPYC servers is 60RU. 63% Less Space and 2.7X greater VM density. NAP-107.
4. A 2P AMD EPYC™ 7601 processor offers up to [2.6X the / 160% greater] memory capacity than a 2P Intel Xeon Platinum 8180-based system. A single AMD EPYC™ 7601 processor offers up to 2TB/processor (x 2 = 4TB), versus a single Xeon Platinum 8180 processor at 768Gb/processor (x 2 = 1.54TB). NAP-44.
5. Compares 3-year Total Cost of Ownership (TCO) for 320 virtual machines provisioned with 1 core and 8GB of DRAM per virtual machine, having similar performance. Example only, actual results may vary.
  - (14) Dell PowerEdge R740 servers with (2) Intel® Xeon® Gold 5118 processors, (12) 16GB RDIMM, 2666MT/s, Dual Rank DIMMs, Hard Drives including (1) 120GB SSD SATA, 2.5in Boot drive & (6) 480GB SSD SAS Mix Use 12Gbps 512n 2.5in Hot-plug Drives, No Operating System, 3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite Deployment Services, No Installation. Configuration priced on 8/30/2018 at www.dell.com for \$14,271 per server; \$199,794 total Hardware Acquisition Cost. Facilities and administration costs include \$16,004 for power and cooling, \$540 for space, and \$42,880 for IT administration costs for a total of \$59,424 over 3 years - calculated based on AMD EPYC™ TCO calculator at <https://uatfast.valuestoryapp.com/AMD/sales>. SW Licensing costs include (14) vSphere with Ops Manager Ent Plus, 2 CPU License, 5Yrs ProSupport + Subscription for \$12,163 each for a total SW licensing costs of \$170,282. Pricing obtained at www.dell.com on 8/30/18. Total 3 yr. Cost of Ownership of \$429,500. Total cost per VM per year: \$447.
  - (10) Dell PowerEdge R7425 servers with (2) AMD EPYC™ 7351 processors, (16) 16GB RDIMM, 2666MT/s, Dual Rank DIMMs, Hard Drives including (1) 120GB SSD SATA, 2.5in Boot Drive & (6) 480GB SSD SAS Mix Use 12Gbps 512n 2.5in Hot-plug Drives, No Operating System 3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite Deployment Services, No Installation. Configuration priced on 8/30/2018 at www.dell.com for \$16,351 per server; \$163,510 total Hardware Acquisition Cost. Facilities and administration costs include \$5,438 for power and cooling, \$540 for space, and \$34,304 for IT administration costs for a total of \$40,282 over 3 years - calculated based on AMD EPYC™ TCO calculator at <https://uatfast.valuestoryapp.com/AMD/sales>. SW Licensing costs include (10) vSphere with Ops Manager Ent Plus, 2 CPU License, 5Yrs ProSupport + Subscription for \$12,163 each for a total SW licensing costs of \$121,638. Pricing obtained at www.dell.com on 8/30/18. Total 3 yr. Cost of Ownership of \$325,430. Total cost per VM per year: \$339.
  - (10) Dell PowerEdge R6415 servers with (1) AMD EPYC™ 7551P processor, (8) 32GB RDIMM, 2666MT/s, Dual Rank DIMMs, Hard Drives including (1) 120GB SSD SATA, 2.5in Boot Drive & (6) 400GB SSD SAS Mix Use 12Gbps 512n 2.5in Hot-plug Drives, No Operating System 3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite Deployment Services, No Installation. Configuration priced on 8/30/18 at www.dell.com for \$13,585 per server; \$135,850 total Hardware Acquisition Cost. Facilities and administration costs include \$5,438 for power and cooling, \$540 for space, and \$34,304 for IT administration costs for a total of \$40,282 over 3 years - calculated based on AMD EPYC™ TCO calculator at <https://uatfast.valuestoryapp.com/AMD/sales>. SW Licensing costs include (10) vSphere with Ops Manager Ent Plus, 1 CPU License, 5Yrs ProSupport + Subscription for \$6,081 each for a total SW licensing costs of \$60,810. Pricing obtained at www.dell.com on 8/30/18. Total 3yr Cost of Ownership of \$236,942. Total cost per VM per year: \$247. NAP-122 (NAPT-2).
6. Source: 'AMD EPYC: A better balance of resources for software defined infrastructure', see <http://developer.amd.com/wordpress/media/2013/12/AMD-EPYC-for-Software-Defined-Infrastructure-Dec-2017.pdf>
7. HPE ACCELERATES DIGITAL TRANSFORMATION: HOW THE NEW HPE PROLIANT DL385 GEN10 SERVER INCREASES IT AGILITY AND ENABLES LOWER TCO, Moor Insights and Strategy, Nov 2017.
8. Estimated generational increase based upon AMD internal design specifications for “Zen 2” compared to “Zen 1”. “Zen 2” has 2X the core density of “Zen 1”, and when multiplied by 2X peak FLOPs per core, at the same frequency, results in 4X the FLOPs in throughput. Actual results with production silicon may vary. ROM-04.
9. The EPYC 7601 processor has the highest SPECrate®2017\_fp\_peak scores for both 1P and 2P. 1P at <https://www.spec.org/cpu2017/results/res2018q2/cpu2017-20180426-05035.html>. 2P at <https://www.spec.org/cpu2017/results/res2018q2/cpu2017-20180319-04087.html>. SPECrate®2017\_fp\_peak as of Oct 30, 2018. <https://www.spec.org/cpu2017/results/>. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See [www.spec.org](http://www.spec.org) for more information. NAP-106.
10. AMD EPYC™ 7601 delivers up to 44% better performance on WRF than an Intel® Xeon® 8180 processor. Internal AMD testing using the WRF v.3.9.1.1 benchmark, 12km model size, compiled with gcc 7.3.0, using OpenMPI v.3.1.1 and NetCDF v.1.1.3 comparing a Supermicro AS-1123US-01-AM036 configured with 2x EPYC 7601 CPUs, 16x16GB DDR4 2666MHz DIMMs and Ubuntu 18.04 vs a Supermicro SYS-1029U-TRTP configured with 2x Intel Xeon Platinum 8180 CPUs, 24x16GB DDR4 2666MHz DIMMs and Ubuntu 18.04. NAP-103.
11. Source: <https://blogs.oracle.com/cloud-infrastructure/announcing-the-launch-of-amd-epyc-instances>
12. Source: <https://www.infoworld.com/article/3297397/cloud-computing-2018-how-enterprise-adoption-is-taking-shape.html>
13. Source: [https://aws.amazon.com/about-aws/whats-new/2018/11/introducing\\_amazon\\_ec2\\_instances\\_featuring\\_amd\\_epyc\\_processors/](https://aws.amazon.com/about-aws/whats-new/2018/11/introducing_amazon_ec2_instances_featuring_amd_epyc_processors/)
14. Source: Azure Lsv2 L80s\_v2 - <https://azure.microsoft.com/en-us/blog/announcing-the-general-availability-of-lsv2-series-azure-virtual-machines/>
15. Source: <https://azure.microsoft.com/en-us/blog/introducing-the-new-hb-and-hc-azure-vm-sizes-for-hpc/>
16. Source: <https://www.itpro.co.uk/amazon-web-services-aws/32315/amd-launches-on-aws-and-instantly-undercuts-intel-by-10>