



第二世代 EPYC プロセッサ “ROME” のご紹介

世界最先端の技術を1チップに搭載した
第二世代EPYC (ROME) を発表！

日本AMD株式会社 コマーシャル営業本部

関根 正人



AMD はテクノロジーリーダーです



世界初のCPU コア
クロック 1GHz
を突破

2000



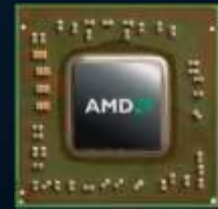
▲ 世界初のx86デュアル
コアCPU

2004



世界初のクアッド
コアCPU

2007



世界初のクアッドコア
搭載APU

2013

2003

世界初の64-bit x86 プロセッサー



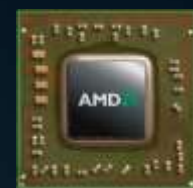
2006

世界初の1GHz GPU



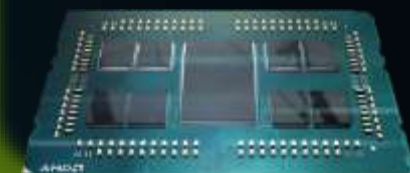
2011

世界初のCPU & GPU 1
チップ化
(APU)



2019

世界初の7nm ベース
x86 CPU + PCIe®4



AMD グラフィクス製品の展開

RADEON™ IS EVERYWHERE



PCs

Radeon VII and
RX 5700 series



Macs

Radeon Pro Vega II
Duo



Consoles

Next generation
consoles with
“Zen 2” and RDNA



Cloud

Google Stadia



Mobile

Samsung graphics
IP licensing and
joint development



HPC

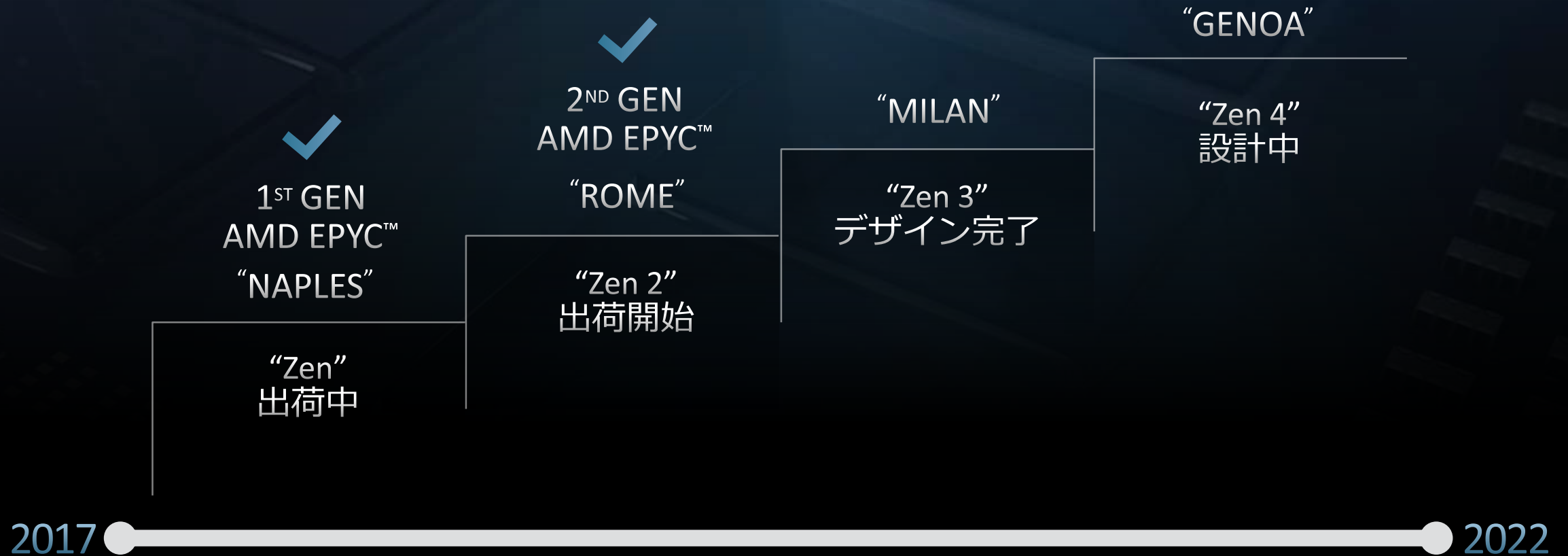
Frontier
supercomputer

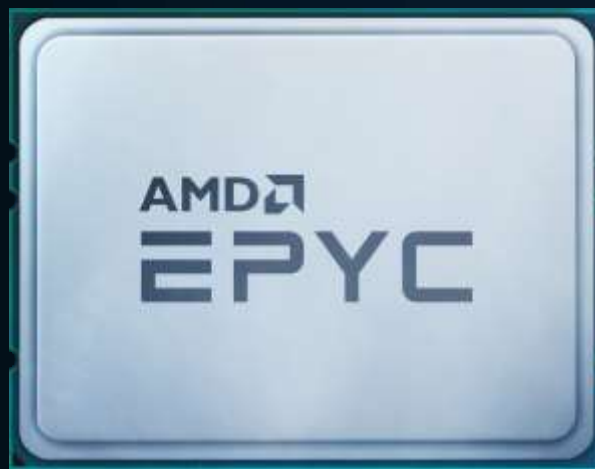
AMD
RADEON

AMD
RADEON
INSTINCT

データセンターロードマップ

リーダーシップ 長期コミットメント





第二世代 AMD EPYC™

最高性能の x86 プロセッサ

64
コア

128
スレッド

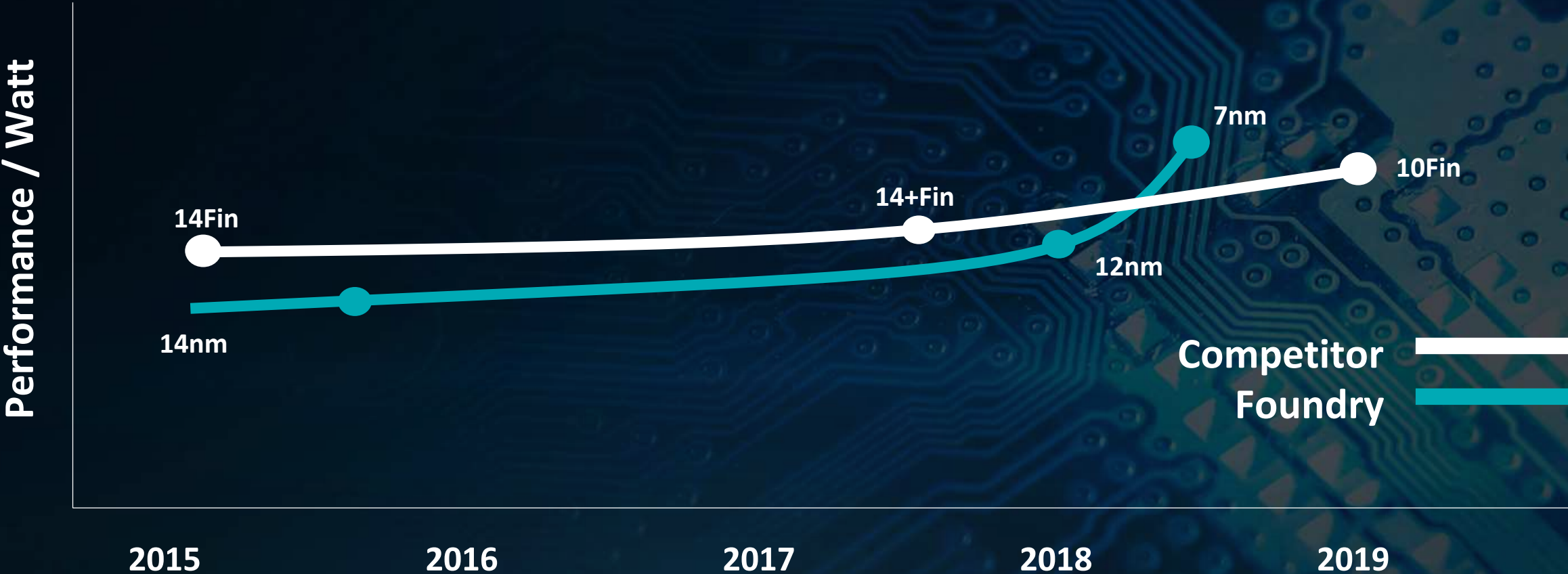
128 以上
PCIe® 4.0 レーン

225
ワット TDP

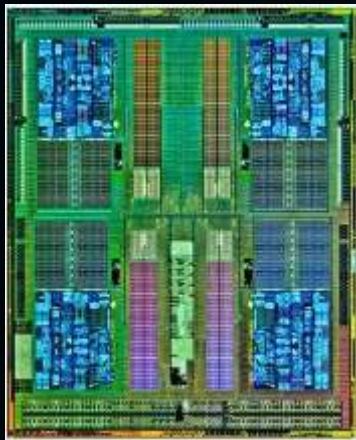
3.4 GHz
最大ブースト周波数

どうしてこれ程までに圧倒的な第二世代
EPYC “ROME” を作る事ができたのか？

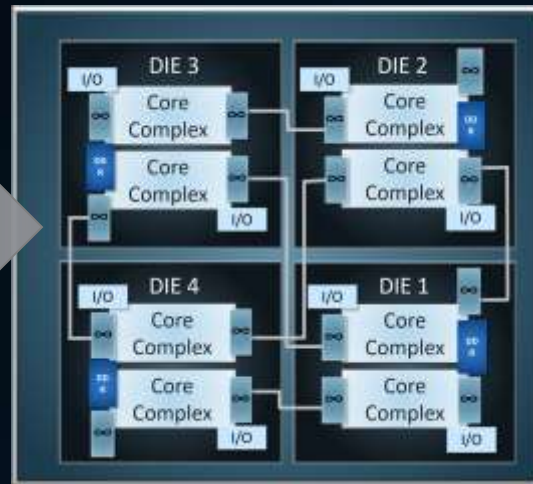
7nm LEVELS COMPETITIVE PLAYING FIELD



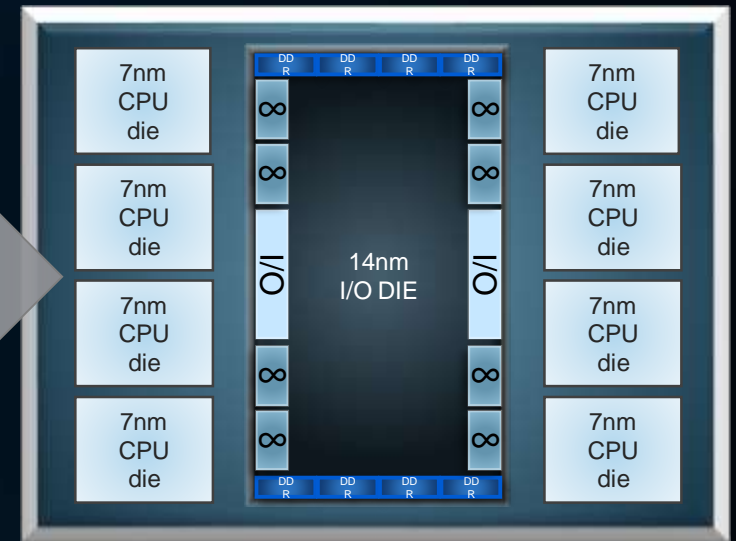
マルチチップ・アーキテクチャが解です



Monolithic die

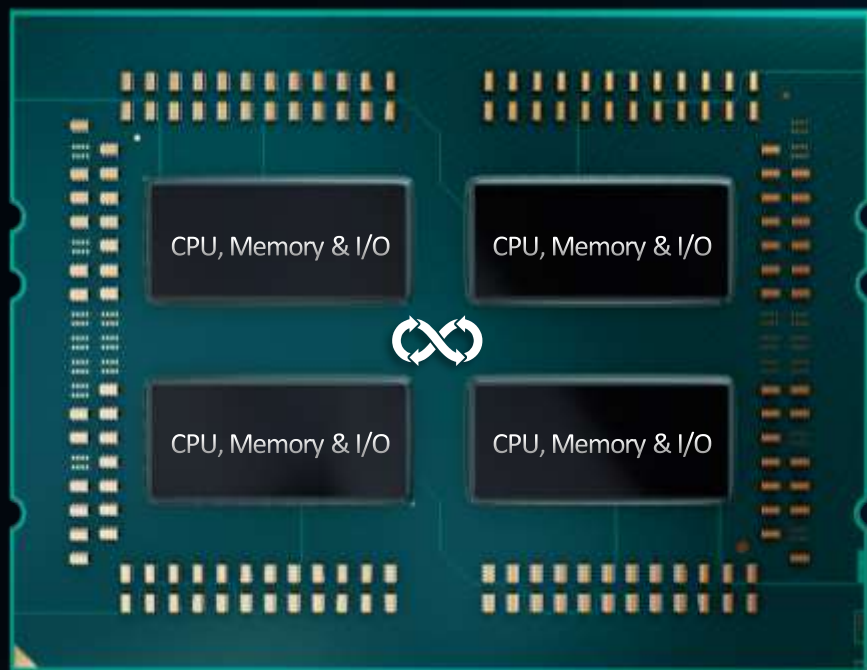


Multi-die MCM



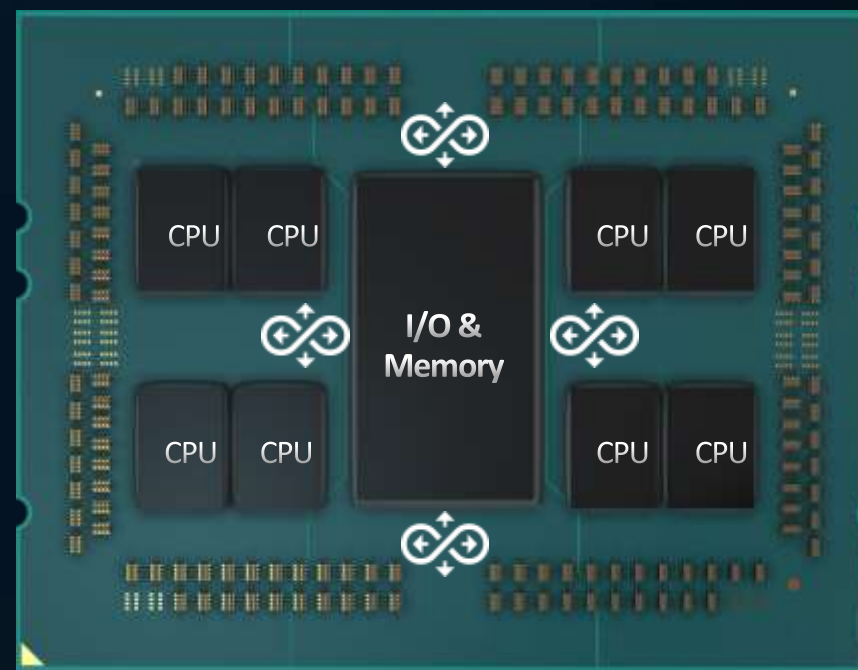
Chiplet

第1世代 | AMD EPYC



第1世代AMD Infinity アーキテクチャ
を介して接続された4つの SOC

第2世代 | AMD EPYC



第2世代 AMD Infinity アーキテクチャで接続された
8個の7nm CPUチップレット と1個の14nm I/Oチップレット

各IPを適切なプロセステクノロジーで

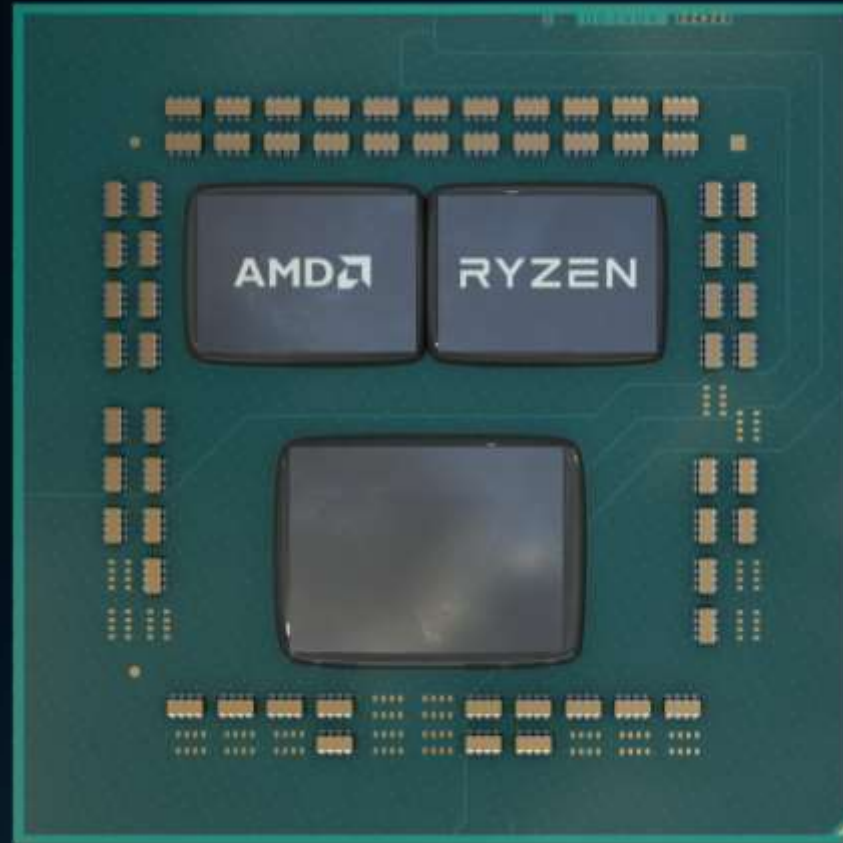
分散化されたコントロール

I/O ダイとCPUダイの分割によりレイテンシーと消費電力の最適化

柔軟でより統合化されたメモリアーキテクチャ

デスクトップ向け第三世代RYZEN

同様にハイブリッド・マルチダイ・デザイン





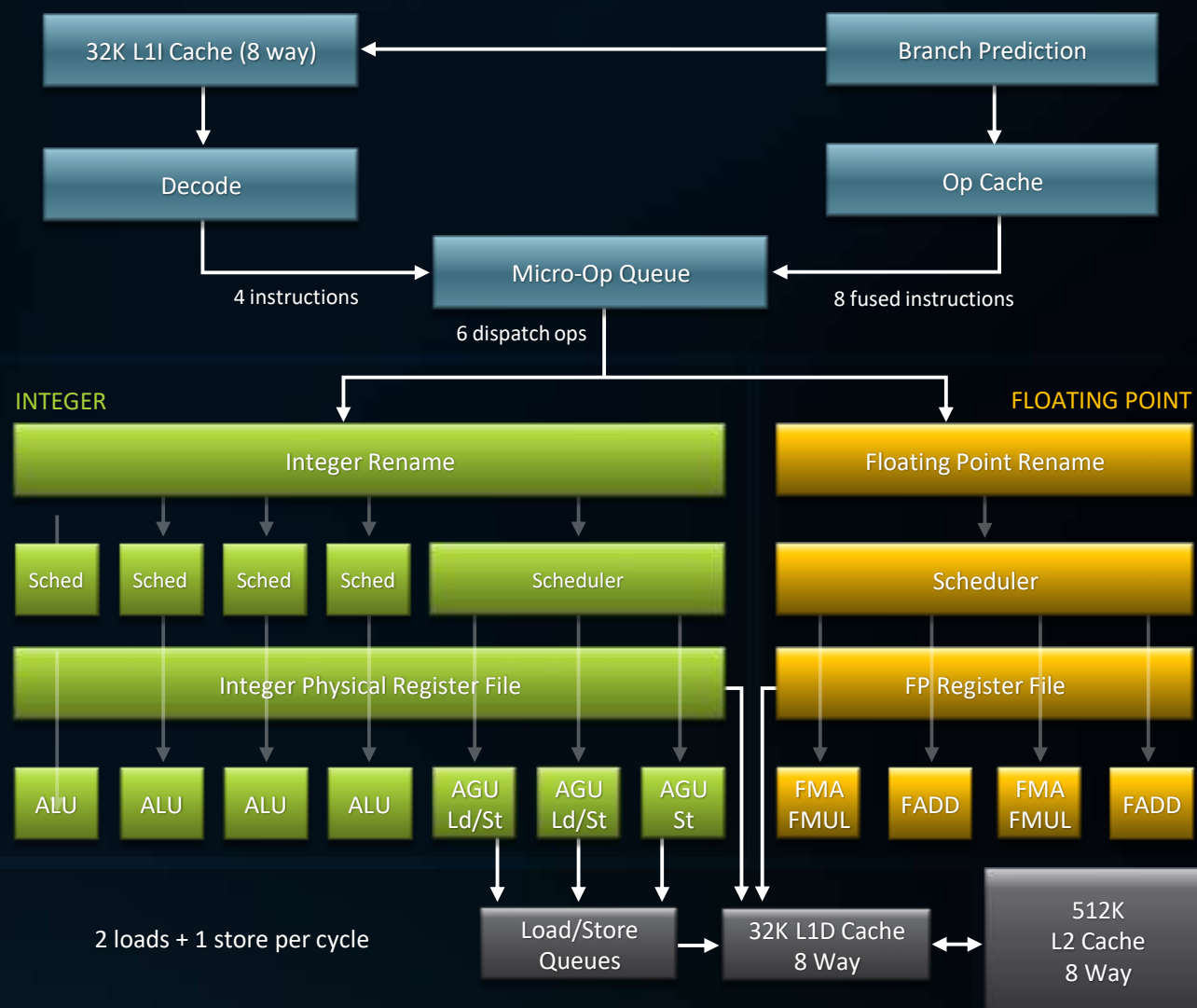
ZEN 2 コアのまとめ

“ZEN 2”によりコア性能をより強化*
(~ 15% IPC 向上)

- ▲ TAGE 分岐予測の採用
- ▲ オペレーションキャッシュ容量 x2倍
- ▲ L1 キャッシュの強化 帯域 x2倍
- ▲ アドレスジェネレーションユニットを3基に強化
- ▲ 浮動小数点演算機 データ幅 x2倍 (256bit幅)
- ▲ L3 キャッシュ容量 x2倍 (1CCD当たり32MB)
- ▲ プリフェッチスロットリング強化

そして、低消費電力化も

- ▲ 7nm プロセステクノロジー採用
- ▲ オペレーションキャッシュヒット率の向上
- ▲ クロック、データのゲーティング機能強化



*vs original “Zen” core

AMD EPYC™ 7002 シリーズプロセッサの特徴

- 7001 シリーズを基礎として性能、機能、セキュリティを向上

コンピュータ

最大 **2倍** AMD “Zen” x86 コア
(最大 **64** コア/**128** スレッド)

最大 **4X** 共有L3キャッシュ (256MB)
最大 **2X** コア当たりL3キャッシュ
(4コア当たり16MB)

削減された システム半径
(NUMA ドメイン)

TDP レンジ: 120W-**225W**

メモリ

ECC対応 8 チャンネル DDR4
最大 **3200** MHz

RDIMM, LRDIMM, 3DS, NVDIMM

2 DIMM/チャンネル **4TB**/ソケットの容量¹



パフォーマンス

~**4x** ピーク TFLOPS/ソケット²
~**2X** パフォーマンス/ソケット³

内蔵 I/O – チップセット不要

128 レーン PCIe® 3 & 4⁴

- PCIe, SATA, コヒーレント・インターコネクタに使用
- 最大 32 SATA 又は NVMe デバイス

セキュリティ

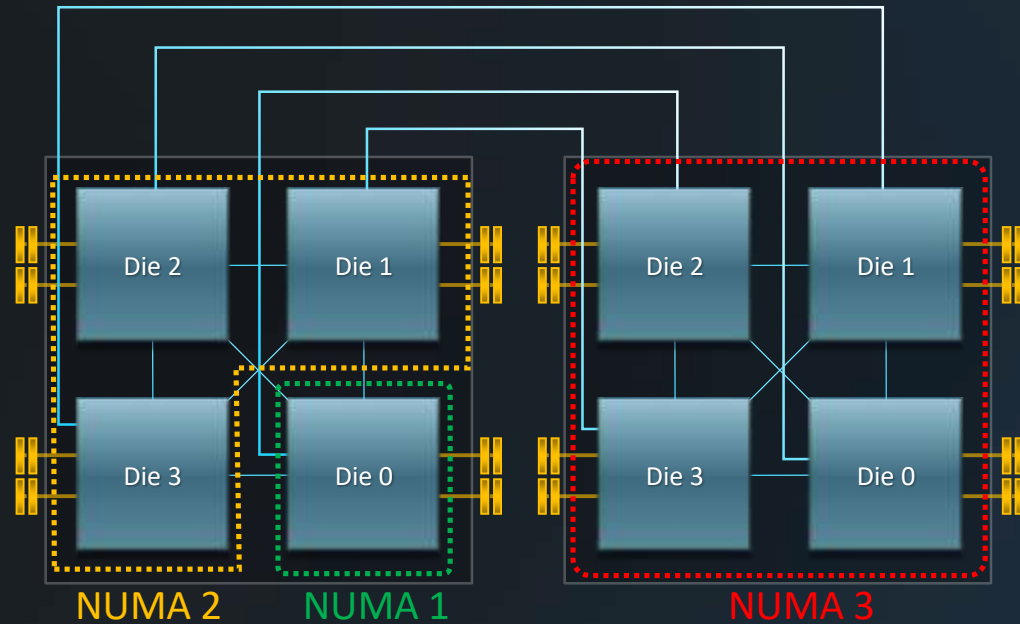
専用のセキュリティ サブシステム

ハードウェアルート・オブ・トラスト

追加の セキュリティ機能

EPYC™ 7002 シリーズ NUMA の構成

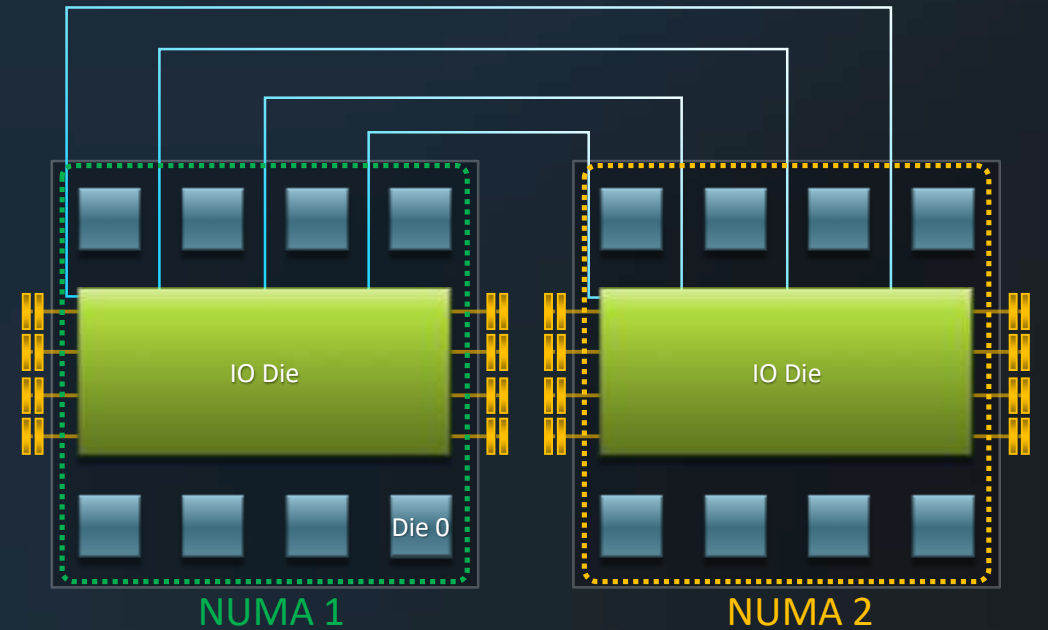
EPYC™ 7001 シリーズプロセッサ



| Domain | Latency ⁴ (ns) |
|-------------------------|---------------------------|
| NUMA1 | 90 |
| NUMA2 | 141 |
| NUMA3 | 234 |
| Avg. Local ² | 128 |

3 NUMA Distances
8 NUMA Domains

EPYC™ 7002 シリーズプロセッサ



| Domain | Latency ⁴ (ns) |
|--------------------------------|---------------------------|
| NUMA1 ³ | 104 |
| NUMA2 | 201 |
| Latency Reduction ¹ | 19%/14% |

2 NUMA Distances
2 NUMA Domains

NUMA ドメイン数を減らして距離も縮めました: 一般的なワークロードで扱い易い

1: EPYC 7002 Series NUMA 1 vs EPYC 7001 Series Avg. Local; EPYC 7002 Series NUMA2 vs EPYC 7001 Series NUMA 3

2: 75% NUMA 2 + 25% NUMA 1 traffic mix; 3: NPS=1 Default Setting; 4: DRAM Page Miss

ロードマップ製品一覧

| モデル番号 | コア数 | スレッド数 | ベース周波数 (GHz) | 最大ブースト周波数(GHz) ^a | TDP (W) | L3 キャッシュ (MB) | DDR チャンネル数 | 最大DDR周波数 (1DPC) | ソケット当たり理論メモリバンド幅 (GB/s) | PCIe Gen 4 レーン数 |
|---------------|-----------|------------|--------------|-----------------------------|------------|---------------|------------|-----------------|-------------------------|-----------------|
| 7742 | 64 | 128 | 2.25 | 3.4 | 225 | 256 | 8 | 3200 | 204.8 | 128 |
| 7702 7702P | 64 | 128 | 2.0 | 3.35 | 200 | 256 | 8 | 3200 | 204.8 | 128 |
| 7662 | 64 | 128 | 2.0 | 3.3 | 225 | 256 | 8 | 3200 | 204.8 | 128 |
| 7642 | 48 | 96 | 2.3 | 3.3 | 225 | 256 | 8 | 3200 | 204.8 | 128 |
| 7552 | 48 | 96 | 2.2 | 3.3 | 200 | 192 | 8 | 3200 | 204.8 | 128 |
| 7542 | 32 | 64 | 2.9 | 3.4 | 225 | 128 | 8 | 3200 | 204.8 | 128 |
| 7532 | 32 | 64 | 2.4 | 3.3 | 200 | 256 | 8 | 3200 | 204.8 | 128 |
| 7502 7502P | 32 | 64 | 2.5 | 3.35 | 180 | 128 | 8 | 3200 | 204.8 | 128 |
| 7452 | 32 | 64 | 2.35 | 3.35 | 155 | 128 | 8 | 3200 | 204.8 | 128 |
| 7402 7402P | 24 | 48 | 2.8 | 3.35 | 180 | 128 | 8 | 3200 | 204.8 | 128 |
| 7352 | 24 | 48 | 2.3 | 3.2 | 155 | 128 | 8 | 3200 | 204.8 | 128 |
| 7302 7302P | 16 | 32 | 3.0 | 3.3 | 155 | 128 | 8 | 3200 | 204.8 | 128 |
| 7282 | 16 | 32 | 2.8 | 3.2 | 120 | 64 | 8 | 3200 | 85.3 ^b | 128 |
| 7272 | 12 | 24 | 2.9 | 3.2 | 120 | 64 | 8 | 3200 | 85.3 ^b | 128 |
| 7262 | 8 | 16 | 3.2 | 3.4 | 155 | 128 | 8 | 3200 | 204.8 | 128 |
| 7252 | 8 | 16 | 3.1 | 3.2 | 120 | 64 | 8 | 3200 | 85.3 ^b | 128 |
| 7232P | 8 | 16 | 3.1 | 3.2 | 120 | 32 | 8 | 3200 | 85.3 ^b | 128 |

New

New

BREAKTHROUGH SYSTEM PERFORMANCE

ENABLED BY AMD INFINITY ARCHITECTURE

Leadership Memory Density

Up to 4TB RAM Per Socket Support
Up to 64GB/Core Capacity

Leadership I/O Capacity

128 PCIe® 4.0 Lanes in a Single Socket
Peak 512 GB/s PCIe® Bandwidth

Leadership Memory Bandwidth

8 Memory Channels Per Socket
Peak 204 GB/s DRAM Bandwidth

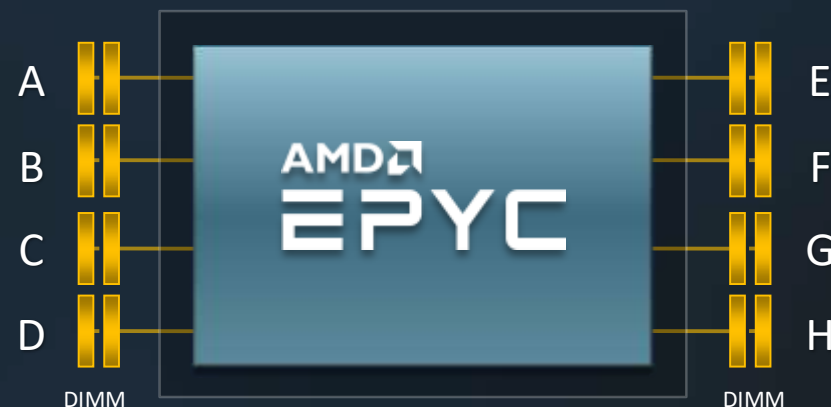
メモリスピードとバンド幅の性能向上

AMD EPYC™ 7002 シリーズ

DDR4 1DIMM per Channel Server*

DR RDIMM: 3200 MHz

LRDIMM: 3200 MHz



| | Intel® Xeon® 2 nd Gen Scalable ("Cascade Lake SP") | AMD EPYC™ 7001 Series | AMD EPYC™ 7002 Series |
|---|--|--------------------------|---------------------------|
| Max Theoretical Memory BW per 2P server (1 DR DPC) | 12 x DDR4-2933 = 282GB/s | 16 x DDR4-2666 = 340GB/s | 16 x DDR4-3200* = 410GB/s |
| AMD EPYC™ Advantage | | +21% | +45% |

広帯域メモリーがパフォーマンスのスケールングに貢献します

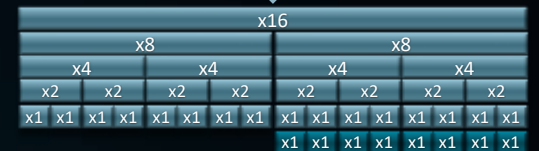
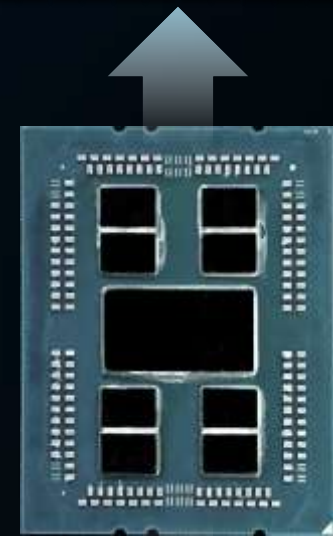
Not supported on all motherboards – see endnotes ROM-06 for details.

*AMD POR memory speeds in a one DIMM per channel system implementation

EPYC™ 7002 シリーズ I/Oサブシステム

- ▲ 8 x16 レーン 全てにおいて、PCIe® Gen4 対応
 - 1レーン当たり 64GB/s 双方向バンド幅, ソケット当たり512GB/s
- ▲ 8 x16 レーン全てにおいて、IOMMU サポート
- ▲ レーン分割のサポート、x16あたり最大8個の PCIeデバイス
- ▲ フル PCIe P2P サポート、ソケット内, ソケット間ともに
 - 最大P2P ペイロードサイズ: 256B
 - 最大 DMA ペイロードサイズ: 512B
- ▲ I/O ダイ上の AMD Infinity Fabric™ は DMA and P2P に対して最適化されています
- ▲ 1 ソケットプラットフォームにおいては、全てのレーンをI/Oとして利用可能
- ▲ 2 ソケットプラットフォームにおいては、最大162レーンをI/Oとして利用可能

EPYCがサポートする 広帯域 PCIE GEN4 はパフォーマンスの
スケーリングに貢献します



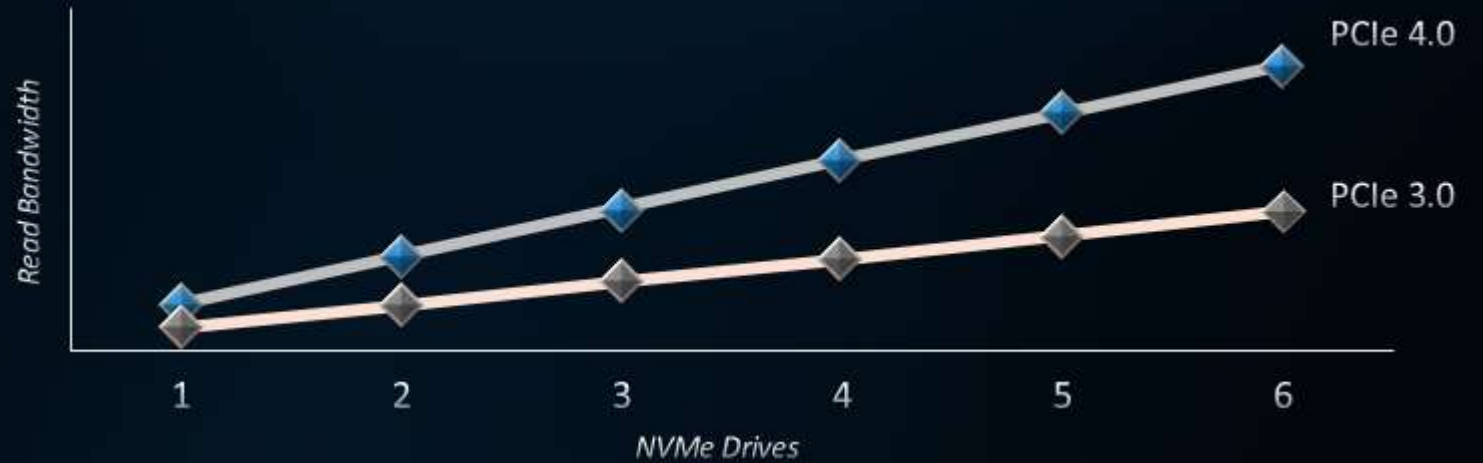
システム性能のボトルネックから解放されましょう

PCIe[®] 4.0 が問題を解決します



NVME PERFORMANCE

2X Read/Write Bandwidth | Linear Scaling



NETWORK PERFORMANCE

2X Infiniband Read Bandwidth



AMD RADEON INSTINCT™ MI50

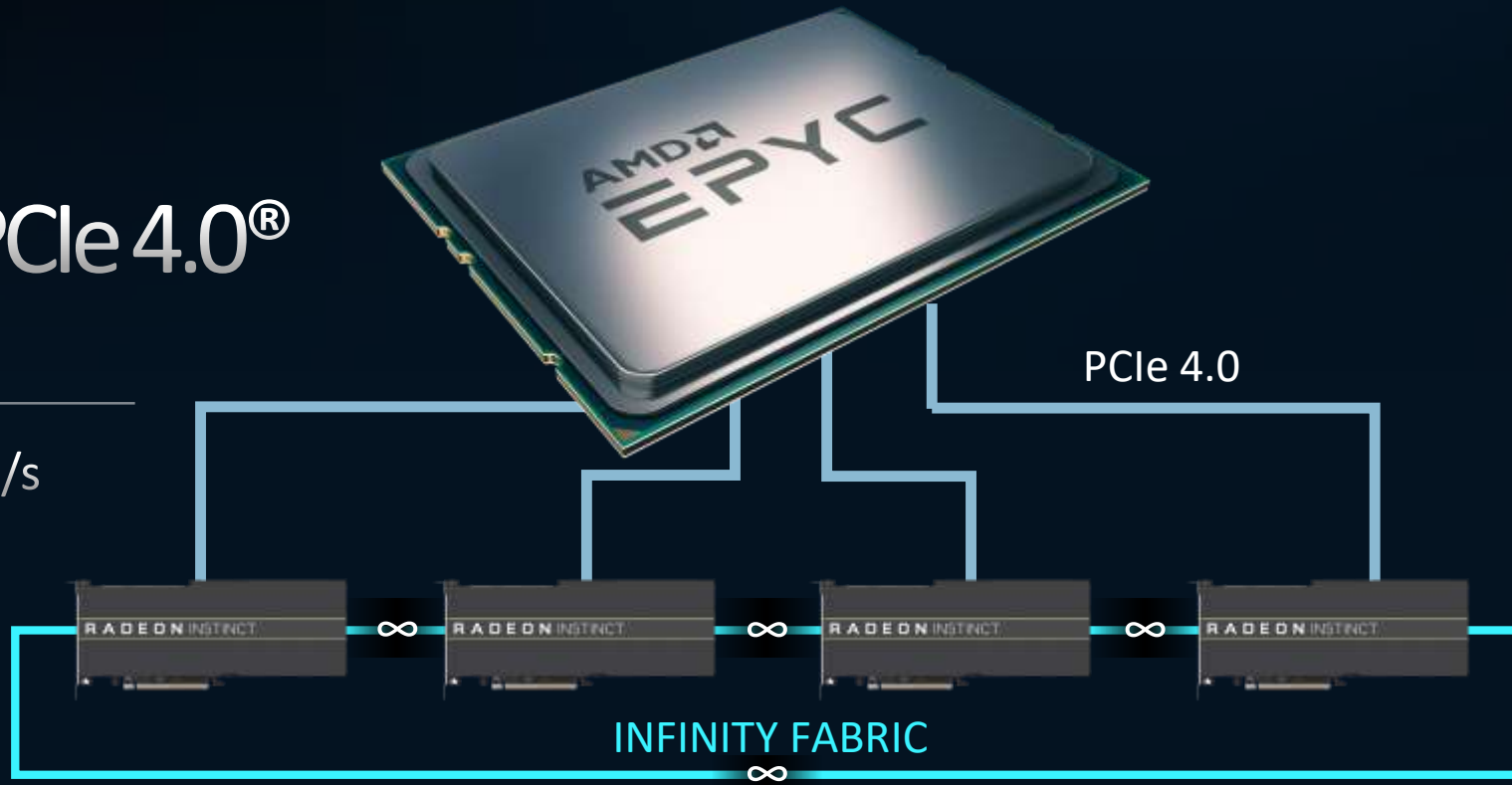
Product Details



| | MI50 |
|-----------------------------------|---------------|
| Compute Units (Stream Processors) | 60 (3840) |
| Peak FP64 (TFLOPS) | Up to 6.6 |
| Peak FP32 (TFLOPS) | Up to 13.3 |
| Peak FP16 (TFLOPS) | Up to 26.5 |
| Peak INT8 (TOPS) | Up to 53.0 |
| Peak INT4 (TOPS) | Up to 106 |
| Memory Size | 32/16GB HBM2 |
| Memory Bandwidth | 1 TB/s |
| ECC (Full-chip) | Yes |
| RAS Support | Yes |
| PCIe® Gen 4 Capable** | Yes |
| Infinity Fabric™ Link | Yes – 2 links |
| Max Power | <300W TDP |

業界初のPCIe 4.0[®] 対応GPU

双方向帯域 64 GB/s
のCPU-GPU間接続



INFINITY FABRIC LINKS

リンク当たり帯域
100 GB/s のGPU-
GPU間接続

先進のインターコネクト

AMD EPYC™ プロセッサはシンプルさの力を発揮

簡素化された製品スタックにわたって先進的な機能を一律に提供



シングルソケット

AMD EPYC™ 7232P

AMD EPYC™ 7302P

AMD EPYC™ 7502P

AMD EPYC™ 7702P

AMD EPYC™ 7402P

以下の全ての機能が含まれます:

8 チャンネル DDR4-3200¹

4TB メモリ容量

128 レーン PCIe4^{®1}

SMT & ターボブースト

18G インフィニティ・ファブリック

セキュア・メモリ・エンクリプション

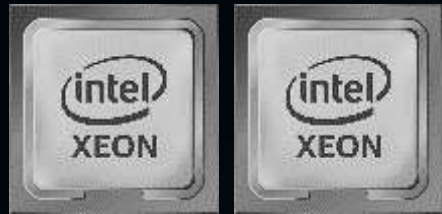
セキュア・エンクリプテッド・バーチャライゼーション



ROMEの性能

2ソケットでの優位性

2S INTEL® XEON® vs. 2S AMD EPYC™ SPEC CPU® 2017 PERFORMANCE



2S Intel® Xeon®
PRODUCT STACK



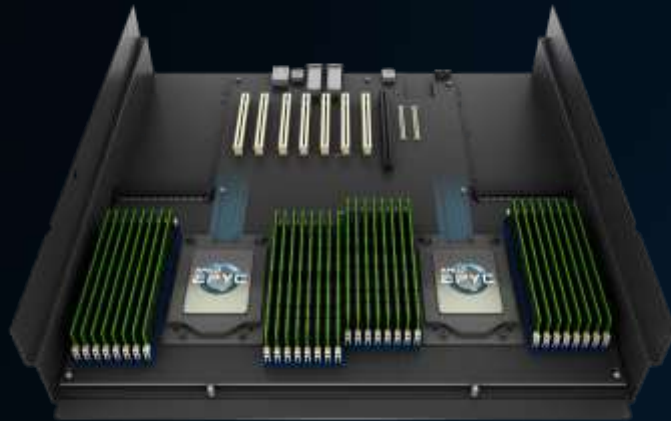
2S AMD EPYC™
PRODUCT STACK

*ESTIMATED; SEE ENDNOTE ROM-258 | SPEC RATE® 2017_INT_PEAK

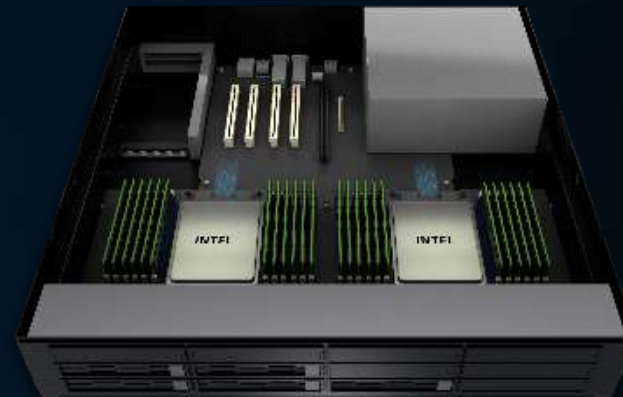
究極の2ソケットサーバ

世界最高性を提供する x86 サーバ CPU

最上位製品での比較: AMD EPYC 7742 x2 プロセッサ vs. Intel Platinum 8280L x2 プロセッサ



AMD EPYC 7742(64core) x2



Intel Platinum 8280L(28core) x2

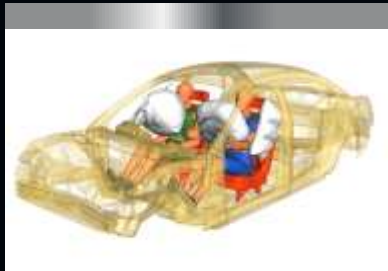
130% より多くの
コア数¹

45% ^{UPTO} 広いメモリ
帯域²

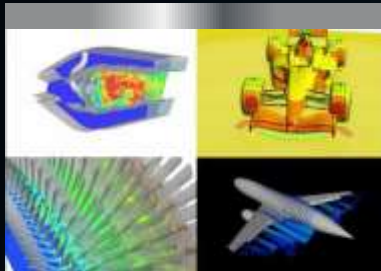
84% ^{UPTO} より高性能³

2ND GEN AMD EPYC Performance Leadership

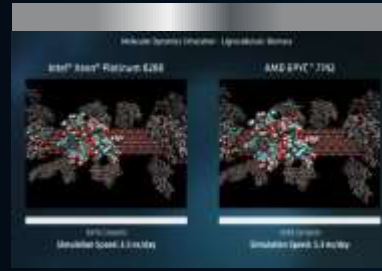
HPC, SDI, Big Data and Cloud



Altair® Radioss™
~1.7X



ANSYS® Fluent®
~2X



GROMACS
~1.6X



Blender®
~1.9X



SPECvirt®
1.6X



BEAMR
First Ever HEVC Live
8K Video Encoding



Docker® Containers
1.8X



Apache Spark®
~1.5X



Microsoft SQL
Server®
~1.5X



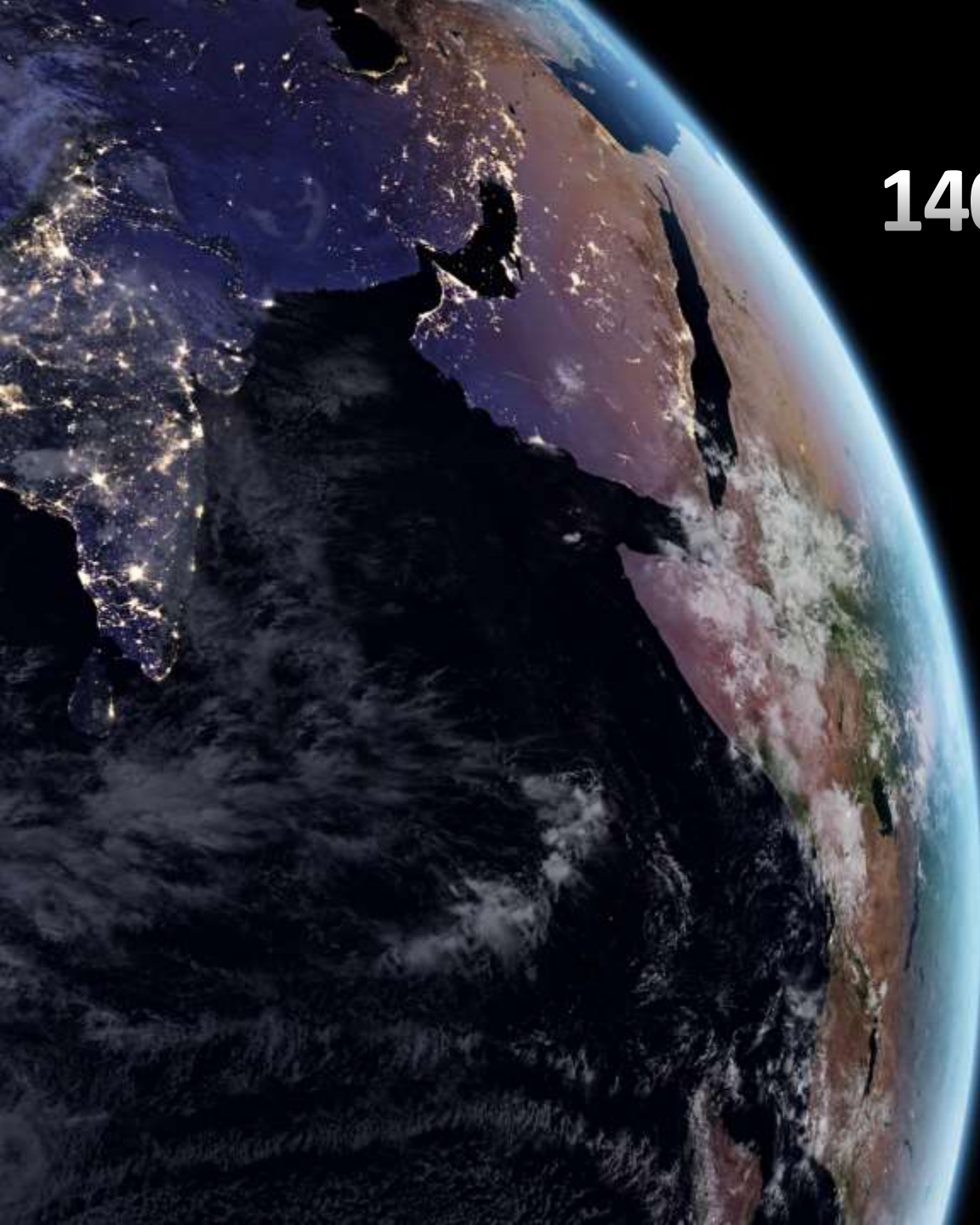
VMmark® 3.0
1.4X



PCIe® 4.0
~2X



Azure® Cloud
HBV2, D & E Series
and Virtual
Desktop



NEW LEADER, NEW RULES

140+ WORLD RECORDS AND COUNTING

HPC

6 High Performance Computing Apps

6 Floating Point Performance

12 Floating Point Performance

M&E

4 Rendering

4 Integer Performance

42 Java® Based Performance

7 DB/ERP Business Applications

19 Energy Efficiency

SDI/ENTERPRISE

BIG DATA

32 Big Data and Analytics







CLOUD

9 Cloud and Virtualization

See AMD.com/worldrecords for details

OS & HYPERVISOR サポート

ROME : OS & HYPERVISORS サポート

| | N - 1 | Launch (N) |
|---|----------------------|-------------------|
|  Microsoft | Server 2016 | Server 2019 |
|  vmware® | vSphere 6.5x | vSphere 6.7x |
|  redhat. | RHEL 7.6 | RHEL 8.0 |
|  SUSE. | SLES 12 SP4 | SLES 15.x |
|  CANONICAL | Ubuntu 16.04.x | Ubuntu 18.04.x |
|  CITRIX® | XenServer 7.1 LTS | XenServer 2019 |

Note: Essential Rome Support (including X2APIC/IOMMU patches to utilize 256T) available with Linux Kernel 4.19

開発ツール環境

EPYC™ プロセッサー・コンパイラーサポート

オープンソース戦略

パフォーマンス
コンパイラー

AOCC

AMD 最適化 C/C++ コンパイラー – LLVMに統合、
EPYC プロセッサー最適化済



Java コンパイラー、ランタイム – オラクルから提供されます。
AMDはOpenJDKの最適化やリリースに協力しています。

プラットフォーム
コンパイラー



AMD はLLVMコミュニティに対して活発に貢献しています。
EPYC プロセッサに最適化を行ったAOCCを公開します。

広く使われているオープンソース・コンパイラーです。
AMDは EPYCプロセッサ向けの最適化を行い公開します。



広く使われているWindowsコンパイラーです。
AMDは EPYCチューニングやプロセッサの対応を行います。

エコシステム
コンパイラー

PGI、その他

EPYC対応サポート、ソフトウェア最適化ガイドや
推奨フラグなどの提供を行います。

EPYC™ プロセッサー・コンパイラーロードマップ

| Current Release | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 |
|-----------------|--|------|--|------|------|
| AOCC v1.3.0 | | | AOCC v2.0 <ul style="list-style-type: none"> • AMD “Rome” Enhancements • FLANG becomes native Fortran compiler • LLVM v8 Enhancements | | |
| LLVM v7.0 | | | LLVM v8 ¹ <ul style="list-style-type: none"> • AMD “Rome” Enhancements | | |
| GCC v8.2 | GCC v9 (Stage) <ul style="list-style-type: none"> • Initial AMD “Rome” Enablement | | GCC v9 <ul style="list-style-type: none"> • Further AMD “Rome” tuning | | |

EPYC™ プロセッサ・ライブラリーサポート

オープンソース、ポータビリティ戦略

| Library | AMD インプリメンテーション |
|-------------------------|---|
| Core Math | libM - EPYC プロセッサ最適化済 |
| Linear Algebra | LibFLAME - EPYC プロセッサ最適化済 |
| Basic Linear Algebra | BLIS - EPYC プロセッサ最適化済 |
| Fast Fourier Transforms | FFTW – GPU/APU によるヘテロジニアス・コンピュータと OpenCL™ のサポート |
| Random Number Generator | RNG – 単精度と倍精度 |

EPYC™ プロセッサー・ライブラリーロードマップ

オープンソース、ポータビリティ戦略

<https://developer.amd.com/amd-cpu-libraries/>

| Current Release | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 |
|------------------------|---|------|---|------|------|
| AMD CPU Libraries v1.0 | v1.5 <ul style="list-style-type: none">Library Enhancements | | v2.0 <ul style="list-style-type: none">AMD “Rome” Enablement” | | |
| | <ul style="list-style-type: none">BLIS MT optimizations and bug fixes for scalingLibm scalar: Optimized pow, powfLibm vector: optimized functions (pow) | | <ul style="list-style-type: none">Rome enablementBLIS MT upgradesLibm scalar: faster versions (less accurate) for log, pow, exp | | |

AMD UPROF プロファイラーロードマップ

<https://developer.amd.com/amd-uprof/>

| Current Release | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 |
|---------------------|---|------|--|------|------|
| AMD μ Prof v1.2 | V2.0 <ul style="list-style-type: none">Initial Top down profiling, Remote profiling, improved performance | | v3.0 <ul style="list-style-type: none">AMD "Rome" Enhancements | | |



HOME

TOOLS & SDKS

RESOURCES

COMMUNITY

ECOSYSTEM



- EPYC Resources ▲
- Google Project Zero / Spectre Resources ▲
- Developer Guides, Manuals & ISA Documents

- Performance Tuning Guides
- Reference Architectures
- Solution Briefs
- Specs and Manuals
- White Papers

Developer Center

Doing what is possible.

Welcome to Developer Central

EPYC ユニークなセキュリティ機能

強固なセキュリティをさらに強固に

“ZEN” 脆弱性への対応

| |  |  |
|--|---|---|
| Spectre | ファームウェアと OS/VMM | ハードウェアと OS/VMM |
| Speculative Store Bypass (Spectre V4) | OS/VMM | ハードウェアと OS/VMM |
| Meltdown, Foreshadow, Spoiler, Lazy FPU, MDS | 該当せず | 該当せず |

第2世代 AMD EPYC™ セキュリティ機能

セキュアルート・オブ・トラスト
テクノロジー

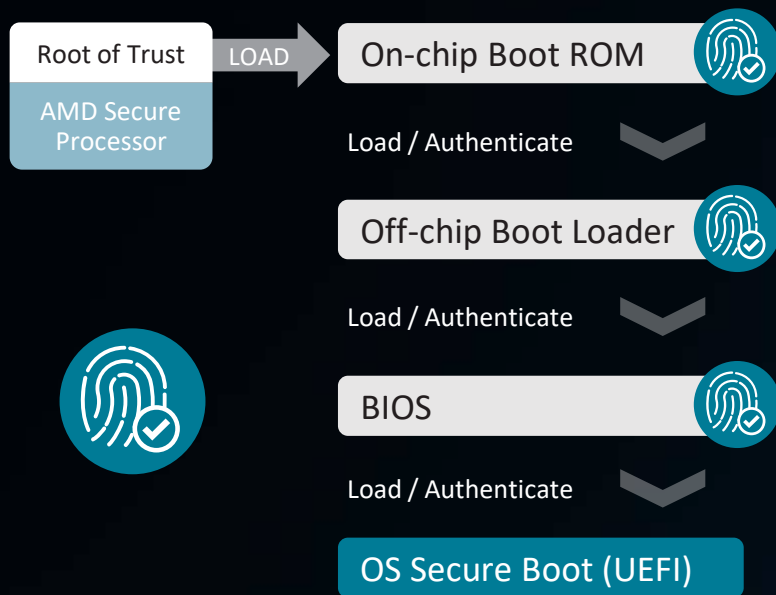
セキュアエンクリプテッド
バーチャライゼーション (SEV2)

AMDだけが提供するセキュア
メモリエンクリプション(SME)

AMD EPYC™ の先進的なセキュリティ機能

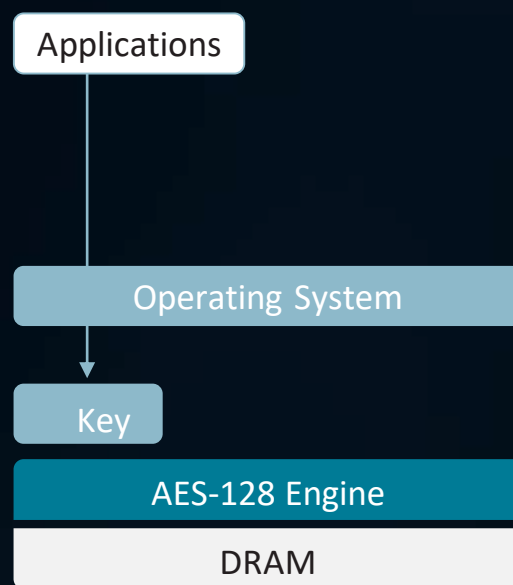
第2世代 AMD EPYC™ プロセッサは509個のSEVメモリーキーに対応 エコシステムでのサポートが拡大

AMD セキュア・ルート・オブ・トラストテクノロジー



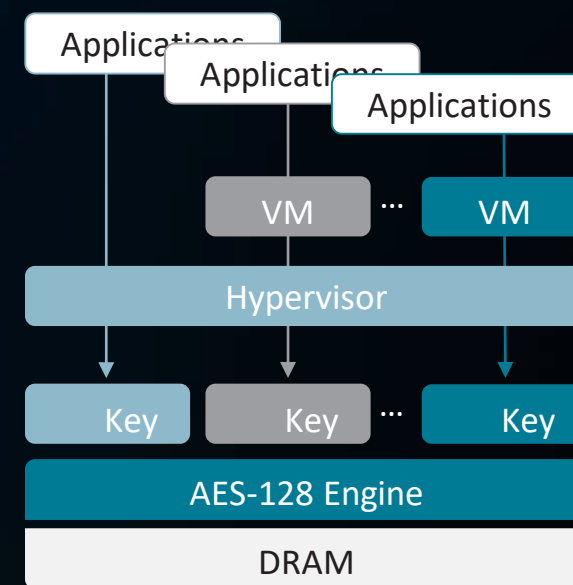
悪意のあるファームウェアやBIOSの改ざんに対するプラットフォームセキュリティの基盤を提供

AMD セキュア・メモリ・エンクリプション (SME)



侵入者が物理的にサーバーにアクセスした場合のコールドブート攻撃や直接メモリアタックに対する防御をサポート

AMD セキュア・エンクリプテッド・バーチャライゼーション (SEV)



VM毎に暗号化し隔離することで管理者権限での改ざんや信頼できないハイパーバイザーから保護

アプリケーションの変更は必要ありません

セキュア・エンクリプデット・バーチャライゼーション (SEV) OS サポートについて

| | | EPYC™ 7001 | | EPYC™ 7002 |
|--|-----------------------|-----------------------------|-------------------------------------|--------------------------------------|
| | | SEV Guest (VM) | SEV Host (Hypervisor, 15 Guests) | SEV Host+ (Hypervisor, 509 Guest) |
| Linux® 4.15 | | Y | | |
| Linux® 4.16 | | Y | Y | Y |
| RHEL 7.6 | 11/2018 | Y | | |
| Ubuntu 18.04 | 4/2018 | Y | | |
| Fedora 28 | 5/2018 | Y | Y | Y |
| Oracle Linux UEK 5 | 6/2018 | Y | Y | Y |
| SLES 15 | 7/2018 | Y | Y | Y |
| Ubuntu 18.10, 19.04 | 10/2018 | Y | Y | Y |
| RHEL 8 | 5/2019 | Y | Y | Y |
| | <i>(more planned)</i> | Y | Y | Y |
| Proprietary OS (Windows®, Vmware®, XenServer®) | | Contact Vendor For Schedule | | |

サーバのご紹介

※ サーバ紹介、企業名 アルファベット順

ASUS AMD Rack Server Products

With AMD EPYC 7002 Processors

Performance, Balance

TWO SOCKET

Leading performance and versatility for multi-workload in 2U/1U chassis



RS720A-E9 V2 Series

- RS720A-E9-RS24V2



RS700A-E9 V2 Series

- RS700A-E9-RS12V2
- RS700A-E9-RS4V2

NEW ROME base GPU Server

ESC4000A-E10 is under development

- One socket , 2U, 4GPU
- Coming in July 2020

Value, Essential

One SOCKET

Entry-level 1U server ideal for growing business with affordable price



RS500A-E10 Series

- RS500A-E10-RS12U
- RS500A-E10-RS4
- RS500A-E10-PS4

12 NVMe
Drives in 1U Rack Server

x16 OCP Link ready
for the future

3200 MHz
8 channel DDR4

Gen4 PCIe faster I/O
*(RS500A-E10 and ESC4000A-E10)



Virtualization



Software-defined
storage



Data Center



SMB print/file/
mail/exchange

RIVER Standard 19" Rack

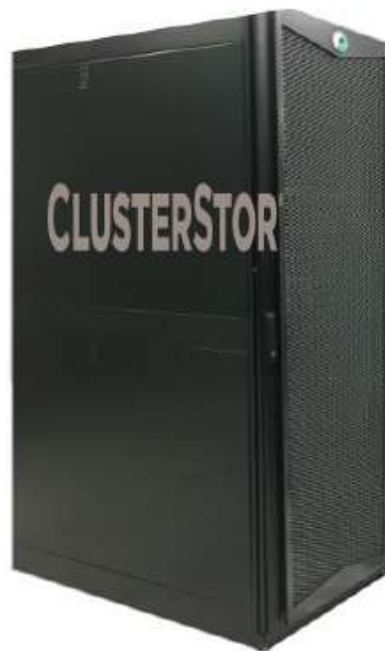


Rosetta Top-of-Rack Switch



Compute Nodes

ClusterStor E1000 (ストレージコントローラCPUは、AMD/ROME)



HPE Apollo 2000 Gen10 System



HPE Apollo r2200 | 12 LFF



HPE Apollo r2600 | 24 SFF or 16 SFF + 8 NVMe Drives

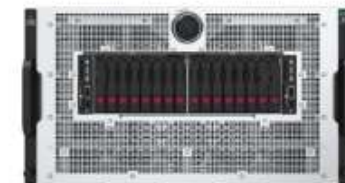


HPE Apollo r2800 | 24 SFF w/ expander or 16 NVMe drives

HPE Apollo 6500 Gen10



HPE Apollo 6500 Gen10 Plus



AMD Processor Support

Shasta River Components

第2世代AMD EPYC搭載PowerEdge サーバー 新製品

PowerEdge R6415

PowerEdge R7415

PowerEdge R7425



R6515

R7515

R6525

C6525

R7525

1ソケット

2ソケット

2S × 4ノード

2ソケット

- EPYC 7002 (~ **TDP225W**)
- 16 × DDR4 (**3200 MT/s**)
- 10 × NVMe / SSD / HDD
- 2 × PCIe x16 スロット
(1 × **PCIe Gen4**)
- **OCP 2.0** Mezz (PCIe x8)
- PERC 9/10

- EPYC 7002 (~ **TDP225W**)
- 16 × DDR4 (**3200 MT/s**)
- 24 × NVMe / SSD / HDD
- 4 × PCIe x16 スロット
(2 × **PCIe Gen4**)
- **OCP 2.0** Mezz (PCIe x8)
- PERC 9/10

- EPYC 7002 (~ **TDP225W**)
- 32 × DDR4 (**3200 MT/s**)
- 12 × NVMe / SSD / HDD
- 3 × PCIe x16 スロット
(すべて**PCIe Gen4**)
- **OCP 3.0** Mezz (PCIe x16)
- **PERC 10.5**

- EPYC 7002 (~ **TDP225W**)
- 16 × DDR4 (**3200 MT/s**)
- 6 × NVMe / SSD / HDD
- 2 × PCIe x16 スロット
(すべて**PCIe Gen4**)
- **OCP 3.0** Mezz (PCIe x16)
- **PERC 10.5**

- EPYC 7002 (~ **TDP225W**)
- 32 × DDR4 (**3200 MT/s**)
- 24 × NVMe / SSD / HDD
- 8 × PCIe x16 スロット
(すべて**PCIe Gen4**)
- **OCP 3.0** Mezz (PCIe x16)
- **PERC 10.5**

出荷中

出荷中

2020年上旬
販売開始予定

- 7nmプロセスのAMD EPYC™ 7002シリーズ・プロセッサーを搭載し、高性能・コストパフォーマンスを追求した1Uラック型サーバ



| | |
|----------------------|--|
| 形状 | 1U ラックマウント |
| CPUソケット数・種類 | 1, AMD EPYC™ 7002シリーズ・プロセッサー |
| メモリスロット数・種類 | 16, DDR4 3200MHz |
| 内蔵ストレージ数・種類 | 2.5" SATA HDD/SSD x 8 + 2.5" NVMe SSD x2 |
| 拡張バススロット | x16 PCIe Gen4 x1, OCP slot x1 |
| ネットワークインターフェース | 標準搭載 [2ポート (1000BASE-T)] |
| 電源 | 冗長電源 AC100-200V x2台 |
| 外形寸法(W x H x D (mm)) | 438 x 44 x 660 |

■ LX1430 M1 カタログ

- https://jp.fujitsu.com/platform/server/primergy/lx/lx1430m1_catalog.pdf

GIGABYTE™

AMD EPYC™ 7002 Series Server Family



All Roads Lead to ROME

**AMD
EPYC**



30機種

世界一のラインナップ！

2020年春迄に30製品をラインナップ予定です！

既に、2019年12月時点で28機種の製品ラインナップしており、AMD EPYCプロセッサの拡販に全世界で注力してまいります！

AMD on AMD

GPUサーバーもAMDプラットフォームで！

AMD EPYCプロセッサ対応のGPUサーバーを多くラインナップ！

2U8GPUをシングルソケットで対応する製品や

4U8GPUで全てのGPUをCPU直結で対応する製品など！

50cmサーバー

GIGABYTE、新規独自設計！

50センチ奥行き、超ショートタイプ2U4ノードサーバー！

各ノード最大64コア、システム全体で256コアをサポート！

省スペースにハイパフォーマンスコンピューティングを実現します。

2019年9月リリース！ HPE DL325/385 Gen10サーバー 新製品

ラックマウントタイプの売れ筋モデルに、最新AMD EPYCプロセッサを搭載



HPE ProLiant DL325 Gen10

ソケットライセンスもお得に！
8コア～最大**64コア** x 1CPU



HPE ProLiant DL385 Gen10

HPC用途にも最適！
8コア～最大**64コア** x 2CPU

<DL325/385 Gen10共通の特長>

- 優れたエネルギー効率/省電力
- コア課金に強い高クロックプロセッサ
16コア/2.8GHz, 8コア/3.2GHz
- 大容量L3キャッシュ128MB
- 高メモリバンド幅 メモリチャネルx8、
高I/O性能

Lenovo ThinkSystem SR635 / SR655



Lenovo初のAMDプロセッサ搭載サーバー（1ソケット 1U/2Uラック型）

- ・高性能： 1ソケットで2ソケットサーバー相当の処理能力（最大64コア）
- ・高速・広帯域： PCIe Gen4、3200MHz対応メモリー
- ・高拡張性： 大容量HDD、SSD、NVMeを提供
- ・TCO削減： OSやソフトウェアのソケット課金ライセンス低減に貢献

サポートOS

Windows Server 2016 / 2019
Red Hat RHEL 7.6 / 8.0 / 8.1
VMware ESXi 6.5 U3 / 6.7 U3
SUSE Linux ES 12 SP4 / 15 SP1

SR635 1S/1U メインストリーム・ラック型



仕様概要

- ・ 1x AMD EPYC 7002シリーズ
- ・ 16x DDR4 RDIMM –最大1TB
(1DPC 3200MHz/
2DPC 2933MHz)
- ・ 最大4x 3.5型 HDD/SSD
- ・ **最大16x** 2.5型 HDD/SSD
- ・ **最大16x** 2.5型 NVMe SSD
- ・ 3x 75W GPU（1枚厚）
- ・ 3x PCIe Gen4スロット
- ・ 内部M.2モジュール（オプション）
- ・ 冗長電源（Platinum/Titanium）
- ・ BMC（AST2500ベース）
- ・ Lenovo XClarityを一部サポート

想定ワークロード

仮想化（VDI） / ソフトウェア定義型インフラストラクチャー（SDI）
/ クラウド / アナリティクス / データベース / HPC

SR655 1S/2U メインストリーム・ラック型



仕様概要

- ・ 1x AMD EPYC 7002シリーズ
- ・ 16x DDR4 RDIMM –最大1TB
(1DPC 3200MHz/
2DPC 2933MHz)
- ・ **最大20x** 3.5型 HDD/SSD
- ・ **最大32x** 2.5型 HDD/SSD
- ・ **最大32x** 2.5型 NVMe SSD
- ・ **6x** 75W GPU（1枚厚）
- ・ **9x** PCIe Gen4スロット
- ・ 内部M.2モジュール（オプション）
- ・ 冗長電源（Platinum/Titanium）
- ・ BMC（AST2500ベース）
- ・ Lenovo XClarityを一部サポート

想定ワークロード

IT基盤 / Web / エントリー・クラウド / 仮想化 /
データベース / データ・アナリティクス / AI

Transport HX TN83-B8251

COMING SOON!

2U HPC/GPGPU Server
4 DW GPU + 2 PCIe HH x16



2U2S EPYC / 16 DIMMs / 8-LFF / 6 PCIe Gen.4 x16

| Standard SKUs | Networking | Storage | Max. PCIe slot |
|-------------------|-----------------------------|---------------------------|---|
| B8251T83E8HR-2T-N | (2) 10GBase-T + (1) IPMI | (8) NVMe U.2 / SATA 6G | (4) DW PCIe Gen. 4 x16 / (8) SW PCIe Gen. 4 x8 + (2) HH PCIe Gen. 4 x16 |



- **2U2S Rome platform supports for up to 16 DIMMs, 2 10GbE onboard LAN, 4 double-width GPU cards and 2 half-height PCIe Gen.4 x16 slots**
- **Dimension: H87.6mm x W438mm x D830mm (32.68")**
- **AMD EPYC™ 7002 Processor w/ TDP up to 180W**
 - No support for AMD EPYC™ 7001 processor
- **Memory**
 - (8+8) DDR4 DIMM slots (8x memory channels)
 - Support up to 4,096GB RDIMM/LRDIMM DDR4 3200/2933 memory
- **PCI Expansion Slots**
 - (4) FH/10.5"L PCIe Gen.4 x16/x8 slots via 2 risers (MUX pairs with the adjacent x8 slots)
 - (4) FH/10.5"L PCIe Gen.4 x0/x8 slots via 2 risers (MUX pairs with the adjacent x16 slots)
 - (2) HH/HL PCIe Gen.4 x16 slots
- **Network**
 - (2) 10GBase-T LAN ports (Intel® x550-AT2)
 - (1) 1000Base-T dedicated IPMI port (Realtek RTL8211E-VB-CG)
- **Storage**
 - (8) **tool-less**, hot-swap 3.5" SATA 6G / NVMe U.2 devices (from CPU)
 - (1) MicroSD/T-Flash reader (OEM reserved feature)
- **(1+1) 2,200W hot-swap RPSU @ 220Vac, 80+ Platinum**



Penguin Computing Inc. AMD EPYCサーバー製品 Altus (アルタス) ファミリー

EPYCプロセッサの利点をAltus® familyで最大限に活用。Altus XE1111/1112/1212では、EPYCのコア数×クロックスピードを活かした効率的なシングルソケット構成を提供。Altus XE2112/2142/2242/4218では、HPCワークロードに適応する最高性能と高密度を実現するデュアルソケット構成を提供。

さらに、高効率でスケラブルなTundra Extreme Scale Compute (OCPベース) に高性能EPYCプロセッサ搭載ノードとしてインテグレート。PCI-eベースのGPUと組み合わせることにより、AIワークロードに対する強力なプラットフォームとしても提供 (GTシリーズ)。

| Model | #U | AMD EPYC | PCIe | Mem |
|----------|-----|----------|-----------------------------------|-----|
| XE1111 | 1U | 7000 | 2xGen3x16 (FHHL) | 2TB |
| XE1112 | 1U | 7000 | 3xGen3(LP) | 4TB |
| XE1212 | 1U | 7002 | 2xGen4(LP) | 4TB |
| XE2112 | 2U | 7000 | 7xGen3(LP) | 4TB |
| XE2142 | 2U | 7000 | 2xGen3x16(LP) | 2TB |
| XE2242 | 2U | 7002 | 2xGen4x16(LP) | 4TB |
| XE4218GT | 4U | 7002 | 12xGen4x16(LP) | 4TB |
| XO1114GT | 10U | 7000 | 1xGen3x16(FHHL) 2xGen3x16 (LP) | 4TB |
| XO1132g | 10U | 7000 | 1xGen3x16(LP) 1xGen3x8 (LP) | 2TB |

<Altus XE2242>



A subsidiary of SMART Global Holdings, Inc.



AMD EPYC™ 7002 シリーズ・プロセッサをフルサポートし、最適化 新世代 H12 A+ サーバーファミリー

Supermicro A+ H12 サーバーファミリー

- 1U WIO: シングル EPYC プロセッサ **NEW!**
- 2U BigTwin™ (2U 4ノード Twinアーキテクチャ, デュアル EPYC プロセッサ) **NEW!**
- 2U TwinPro™ (2U 4ノード Twinアーキテクチャ, シングル EPYC プロセッサ) **NEW!**
- 4U GPU Optimized **Coming soon!**

High Performance Computing に最適な機能と最適化

- PCI Express Gen 4.0
- InfiniBand HDR ConnectX-6 200Gb/s
- 最大 8 Direct Attached PCIe 4.0 GPU/Accelerators **Coming soon!**
- 水冷オプション



H12 Generation WIO
AS -1114S-WTRT



H12 Generation BigTwin™
AS -2124BT-HNTR



H12 Generation TwinPro™
AS -2014TP-HTR



H12 Generation GPU optimized

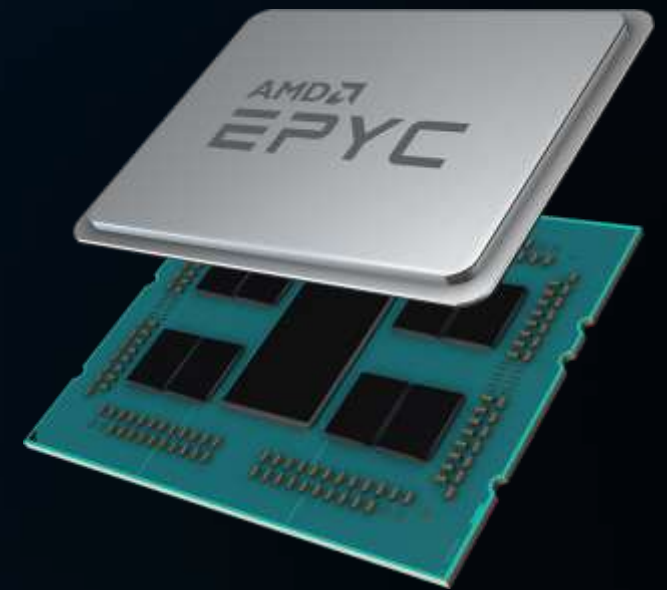


H12 Generation BigTwin™

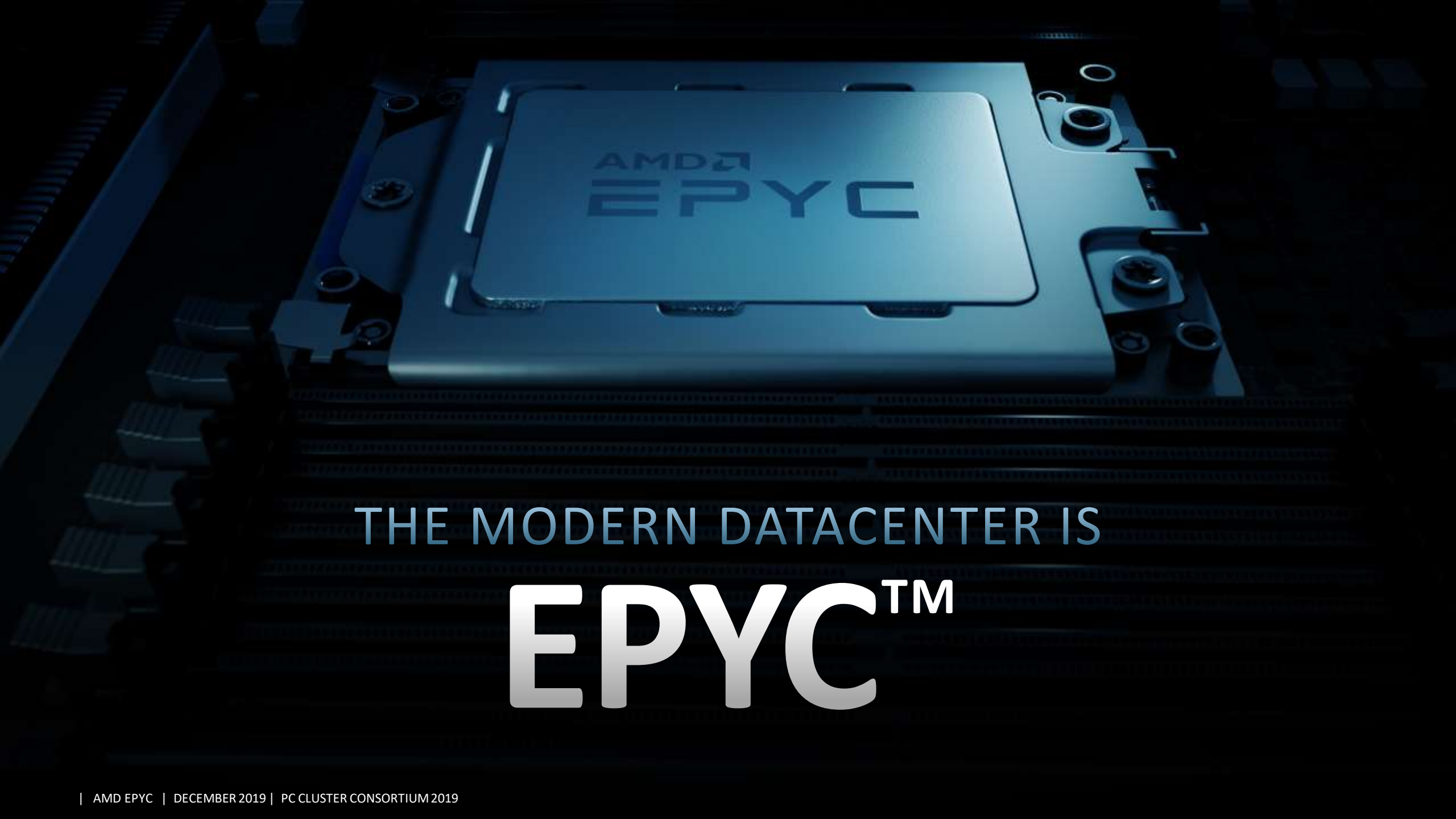


まとめ：第二世代EPYC™ アーキテクチャ

- ▲ “Zen” ベースの第一世代 AMD EPYC プロセッサに対して大幅な性能強化
 - “Zen2” ~15% instructions-per-clock 向上
 - 2x AVX2 浮動小数点演算性能 2倍,
 - L3 キャッシュ コア当たり2倍、ソケット当たり最大4倍
- ▲ 最先端のハイブリッド・マルチダイ・デザイン
 - Breaking the silicon reticle limit
 - Leading-edge 7nm + 14nm technologies
- ▲ NUMA アーキテクチャの強化
- ▲ パフォーマンスのスケラビリティを考慮した最先端のIO性能
 - x86 CPUでは世界初の PCIe® Gen4 サポート, プロセッサ当たり128 レーンサポート
 - 最大18Gbps socket-to-socket AMD Infinity Fabric™
 - DDR4-3200 サポート
- ▲ 第一世代 EPYC™ 7001 シリーズとピンコンパチ
- ▲ データセンター向けに強固なセキュリティ機能
 - Enhanced Secure Encrypted Virtualization (SEV) –アプリケーション側の対応は必要なし
 - サイドチャネルアタックを制限するセキュリティ重視のマイクロアーキテクチャ設計



最新機能盛りだくさんの第二世代のAMD EPYC プロセッサをご検討下さい！



THE MODERN DATACENTER IS

EPYC™

ENDNOTES

TCO-01 Compares delivering 11,550,120 jOPS as measured by SPECjbb2015-MultiJVM Max-jOPS benchmark utilizing 2 socket Intel 8280 servers versus 2 socket AMD EPYC™ 7742 servers. Intel-based server tested to achieve 192,502 jOPS. AMD EPYC server tested to achieve 355,121jOPS. As a result, an estimated 60 Intel based servers versus 33 AMD EPYC™ based servers are needed to meet a jOPS performance of 11,550,120. System Configurations: Intel Xeon based servers include 2U Rack Mount chassis, with (2) Intel® Xeon® Platinum 8280 2.7GHz base frequency, 28 cores/56 threads, (24) 16GB RDIMM DDR4 2933MT/s, Dual Rank DIMMs, (1) 960GB SATA SSD, (1) dual port 10GbE ethernet adapter dual hot swap power supplies w/cables, and OEM standard warranty with a price of \$57,156 each for a total hardware acquisition price of \$3,429,360. AMD EPYC™ servers include Dual Socket 2U Rack Mount chassis, with (2) AMD EPYC™ 7742, 2.25GHz base frequency, 64 cores/128 threads, (32) 32GB RDIMM DDR4 2933MT/s, Dual Rank DIMMs, (1) 1.92TB SSD SAS Mix Use drive, (1) dual port 1GbE ethernet adapter, dual hot swap power supplies w/cables, and OEM standard warranty with estimated price of \$58,553 each for a total hardware acquisition price of \$1,931,589. Estimated System Pricing: Estimated Pricing for Intel Xeon Based Systems based on select OEM system pricing as of 8/5/2019. Estimated Pricing for AMD EPYC™ Based Systems based on projected OEM list price for the most comparable system. Pricing is an AMD estimate only – actual pricing will vary by system and seller. Power cost is an internal AMD estimate based each server consuming 762 watts each input power - electricity cost estimate of \$1,610/server calculated at \$0.12/kw/hr with an assumed PUE of 2.0, resulting in an estimated 3 yr power cost of \$289,800 for Intel-based systems and \$159,390 for AMD EPYC™ systems. Datacenter space costs are based on AMD internal estimate of Data Center space cost of \$19,053 per cabinet per year results in \$171,477 (3 Rack Cabinets) and \$94,312 (1.6 Rack Cabinets) over three years for Intel-based and AMD EPYC-based systems respectively. Server Administration cost is calculated with an estimate of \$85,795 per server administrator with a ratio of one server administrator per 30 servers resulting in \$514,770 (for 60 servers) and \$283,124 (for 33 servers) 3 yr server administration costs for Intel-based and AMD EPYC- based systems respectively. Total estimated 3 Year TCO as a result is \$4,405,407 for Intel-based Systems and \$2,468,415 for AMD EPYC-based systems. As a result, AMD EPYC based systems are estimated to deliver a lower TCO (excluding software costs) of up to 44%. 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. See <https://www.spec.org/jbb2015/results/res2019q2/jbb2015-20190314-00414.html> for Intel Xeon Platinum 8280 score, and see <http://spec.org/jbb2015/results/res2019q3/jbb2015-20190717-00463.html> for the AMD EPYC 7772 score. SPEC® and SPECjbb® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. TCO-1

ENDNOTES

- TCO-02 - Comparison results calculated by AMD based on a hypothetical scenario hosting 2,560 virtual machines on 2-socket Intel Xeon 6242 (32 total cores) based systems versus AMD EPYC™ 7702P (64 total cores) based No Compromise Single Socket Systems, excluding software application costs. Each virtual machine is allocated one core and 8GB of DRAM, resulting in 80 Intel based systems (2,560/32) and 40 AMD EPYC based systems (2,560/64). System Configurations: Intel Xeon based servers in 2U Rack Mount chassis, with (2) Intel® Xeon® Gold 6242 2.8GHz base frequency, 16 cores/32 threads, (16) 16GB RDIMM DDR4 2933MT/s, Dual Rank DIMMs, (1) 480GB SSD SAS Mix Use drive, one dual port 10GbE ethernet adapter, dual hot swap power supplies w/cables, and OEM standard warranty with estimated price of \$21,196 each for a total hardware acquisition price of \$1,695,680. AMD EPYC based servers include - (40) 1U Rack Mount chassis with (1) AMD EPYC 7702P 2.0GHz base frequency, 64 cores/128 threads, (16) 32GB RDIMM DDR4 2933MT/s, Dual Rank DIMMs, (1) 480GB SSD SAS Mix Use drive, one dual port 10GbE ethernet adapter, dual hot swap power supplies w/cables, and OEM standard warranty with estimated price of \$23,696 each for a total hardware acquisition price of \$947,840. Estimated System Pricing: AMD Estimated Pricing based on select OEM list pricing as of 7/30/2019 for Intel based systems and AMD projected OEM list pricing as of 8/7/2019 for AMD EPYC based systems. Pricing is an AMD estimate only – actual system pricing will vary by system and by seller. Power cost estimate is an internal AMD estimate based on Intel Xeon based system input power - 498 watts, AMD EPYC-based system input power - 389 watts electricity cost calculated at \$0.12/kw/hr with an assumed PUE of 2.0. Intel Xeon power cost/server/year is estimated at \$1,047, AMD EPYC power cost/server/year is estimated at \$818 for a three year total power cost of \$251,280 and \$98,040 for an estimated total power savings of 61%. Datacenter space costs include 160 U's for Intel Xeon-based Systems or 4 Rack Cabinets and 40 U's for AMD EPYC-based Systems or 1 Rack Cabinet – AMD internal estimate of Data Center space cost of \$19,053 per cabinet per year results in 3 year space costs of \$228,636 and \$57,159 respectively – a 75% savings. Server Administration cost is calculated with an estimate of \$85,795 per server administrator with a ratio of one server administrator per 30 servers resulting in 3 year estimated administration costs of \$686,360 for 80 Intel Xeon-based Systems and \$343,180 for 40 AMD EPYC-based systems – 50% savings. Licensing costs are calculated using VMware vSphere Enterprise Plus licensed per socket and priced as of 7/28/2019 on www.cdw.com at \$3,612 each for a total 3-year cost of \$577,920 for (80) Intel Xeon-based 2 socket systems and \$144,480 for (40) AMD EPYC No Compromise Single Socket-based Systems. Total estimated 3 Year TCO as a result is \$3,439,876 for Intel-based Systems and \$1,590,699 for AMD EPYC-based systems resulting in an estimated TCO/VM/YR of \$448 and \$207 respectively – a 54% savings including virtualization management software licenses but excluding other software costs. 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. TCO-2

ENDNOTES

- ROM-06 - Some supported features and functionality of 2nd Gen AMD EPYC™ processors require a BIOS update from your server manufacturer when used with a motherboard designed for the 1st Gen AMD EPYC series processor. A motherboard designed for 2nd Gen EPYC processors is required to enable all available functionality.
- ROM-09 - AMD EPYC 7742 has 64 cores vs. Intel Platinum 8280 with 28 cores. $64 / 28 = 2.287 - 1.0 = 1.3$ times (or 130% more). EPYC 7742 has 1.3x more cores.
- ROM-11 - EPYC™ 7002 series has 8 memory channels, supporting 3200 MHz DIMMs yielding 204.8 GB/s of bandwidth vs. the same class of Intel 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 pin-based (LGA) X86 processors.
- ROM-38 Results as of 8/7/2019 using SPECrate(R)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-42 - Based on AMD internal testing of ANSYS FLUENT 19.1, Im6000_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-49 - Based on AMD internal testing of LSTC LS-DYNA R9.3.0, neon benchmark, as of July 17, 2019 of a 2P EPYC 7742 powered reference server versus a 2P Xeon Platinum 8280 powered server. Results may vary.
- ROM-56 - Based on AMD internal testing of Altair RADIOSS 2018, T10M benchmark, as of July 17, 2019 using a 2P EPYC 7742 powered reference server versus a 2P Xeon Platinum 8280 powered server. Results may vary.
- ROM-63 - Based on AMD internal testing of ESI VPS 2018.0, NEON4m benchmark, as of July 17, 2019 using a 2P EPYC 7742 powered reference server versus a 2P Xeon Platinum 8280 powered server. Results may vary.
- ROM-70 - Based on AMD internal testing of Siemens PLM STAR-CCM+ 14.02.009, kcs_with_physics benchmark, as of July 17, 2019 using a 2P EPYC 7742 powered reference server versus a 2P Xeon Platinum 8280 powered server. Results may vary.
- ROM-113 - 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, on GROMACS version 2019.3 benchmark. Results may vary.
- Based on June 8, 2018 AMD internal testing of same-architecture product ported from 14 to 7 nm technology with similar implementation flow/methodology, using performance from SGEMM. EPYC-07
- 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. A 2P Intel Platinum 8280 server has a score of 293, <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190318-11211.pdf> as of July 28, 2019. The 7742 has 79% higher performance. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.

ENDNOTES

- EPYC-Each AMD EPYC processor has 8 memory channels. Each Intel Xeon Scalable processor has 6 memory channels. $8 - 6 = 2 \div 6 = 0.33$ AMD EPYC has 33% more memory channels. Class based on industry-standard pin-based (LGA) X86 processors (NAP-166). EPYC-05
- Some supported features and functionality of 2nd Gen AMD EPYC™ processors require a BIOS update from your server manufacturer when used with a motherboard designed for the 1st Gen AMD EPYC series processor. A motherboard designed for 2nd Gen EPYC processors is required to enable all available functionality. ROM-06.
- AMD EPYC 7742 has 64 cores vs. Intel Platinum 8280 with 28 cores. $64 / 28 = 2.287 - 1.0 = 1.3$ times (or 130% more). EPYC 7742 has 1.3x more cores. ROM-09
- ROM-11 - EPYC™ 7002 series has 8 memory channels, supporting 3200 MHz DIMMs yielding 204.8 GB/s of bandwidth vs. the same class of Intel 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 pin-based (LGA) X86 processors.
- Based on processor lanes multiplied by PCIe® bandwidth. PCIe 4 = 16 GB/s link bandwidth vs. PCIe = 8 GB/s. ROM-21
- ROM-149 - A 2P 2U AMD EPYC™ 7702 server scored 18,294 overall *ssj_ops/watt* on SPEC Power® 2008 with the SUSE® Linux Enterprise Server 12 SP4 OS, as published at https://www.spec.org/power_ssj2008/results/res2019q3/power_ssj2008-20190716-00980.html, which is higher than all other 2-socket publications on the SPEC® website as of 7/27/2019. SPEC® and SPEC Power® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. ROM-149
- ROM-259 - Slide represents both published and estimated 1P SPECrate®2017_int_peak performance. Estimates as of July 3, 2019 for AMD EPYC 48C, 32C and 8C processors using computer modeling of preproduction parts and 1P SPECrate®2017_int_peak internal testing results. Results may vary with production silicon testing. Published results for 1P EPYC 64C processor as of August 7, 2019: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190318-11230.pdf>. Intel results as of June 2019: Xeon Platinum: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190318-11230.pdf> Xeon Gold: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190611-15301.pdf> and <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190611-15308.pdf>. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. ROM-259
- ROM-260 - Slide represents both published and estimated 1P and 2P SPECrate®2017_d: int_peak performance. Estimates as of July 3, 2019 for AMD EPYC 48C, 32C and 8C processors using computer modeling of preproduction parts and 1P SPECrate®2017_int_peak internal testing results. Results may vary with production silicon testing. Published results for 1P EPYC 64C processor as of August 7, 2019: <https://spec.org/cpu2017/results/res2019q3/cpu2017-20190722-16242.html>. Intel 1P results as of June 2019: Xeon Platinum: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190429-12779.pdf> Xeon Gold: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190404-11744.pdf> Xeon Silver: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190430-13444.pdf>; Xeon Bronze: <http://spec.org/cpu2017/results/res2019q3/cpu2017-20190624-15468.pdf>. 2P SPECrate®2017_int_peak scores for Intel published June 2019: Xeon Platinum: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190318-11230.pdf> Xeon Gold: <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190611-15301.pdf> and <http://spec.org/cpu2017/results/res2019q2/cpu2017-20190611-15308.pdf>. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. ROM-260

ROM-35:

AMD 7702 score of 12.88@14 tiles on 2 node 4 socket VMmark 3.1, classic SAN. can be found at <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 score, 9.02@9 tiles, with the 8280, can be found at <https://www.vmware.com/products/vmmark/results3x.0.html> VMware VMmark 3.x results can be found at <https://www.vmware.com/products/vmmark/results3x.html>. ROM-35

ROM-36:

The AMD EPYC 7702 server is the only 4 host 4 socket VMmark 3.1 vSAN score of 12.23 @ 13 tiles <https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/vmmark/2019-08-07-HPE-ProLiant-DL325Gen10.pdf>. The current #1 score for 4 node 8 sockets or less is 8.51 @ 9 tiles with the Gold 6152, <https://www.vmware.com/products/vmmark/results3x.0.html>. AMD 7702 score of can be found at <https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/vmmark/2019-08-07-HPE-ProLiant-DL325Gen10.pdf>. ROM-36

ROM-42:

Based on AMD internal testing of ANSYS FLUENT 19.1 as of July 17, 2019. 885 rating on lm6000_16m benchmark using 2 x AMD EPYC™ 7742 processors in AMD "Daytona" Reference Design, 1TB (16 x 64GB DDR4-3200) memory, 256GB SATA (OS), 1TB NVMe (Data), Red Hat® Enterprise Linux v7.6, ANSYS FLUENT 19.1, NPS = NPS4, SMT = OFF, BOOST = ON, X2APIC = ON, Determinism Slider = Performance, Governor = Performance, CC6 = Disabled. 444 rating on lm6000_16m benchmark using 2 x Intel Xeon Platinum 8280 processors in Supermicro SuperServer 2029U-TN24R4T server, 384GB (12 x 32GB DDR4-2933) memory, 240GB SATA (OS), 500GB NVMe (Data), Red Hat® Enterprise Linux v7.6, ANSYS FLUENT 19.1, Power Management = Max Performance, Intel Hyper-Threading Technology = OFF, SNC = ON, ADDDC = OFF. Testing with other AMD EPYC or Intel Xeon processors may result in different performance results. ROM-42

ROM-56:

Based on AMD internal testing of Altair RADIOSS 2018 as of July 17, 2019. 9.75 rating on T10M benchmark using 2 x AMD EPYC™ 7742 processors in AMD "Daytona" Reference Design, 1TB (16 x 64GB DDR4-3200) memory, 256GB SATA (OS), 1TB NVMe (Data), Red Hat® Enterprise Linux v7.6, Altair RADIOSS 2018, NPS = NPS4, SMT = OFF, BOOST = ON, X2APIC = ON, Determinism Slider = Performance, Governor = Performance, CC6 = Disabled. 5.68 rating on T10M benchmark using 2 x Intel Xeon Platinum 8280 processors in Supermicro SuperServer 2029U-TN24R4T server, 384GB (12 x 32GB DDR4-2933) memory, 240GB SATA (OS), 500GB NVMe (Data), Red Hat® Enterprise Linux v7.6, Altair RADIOSS 2018, Power Management = Max Performance, Intel Hyper-Threading Technology = OFF, SNC = ON, ADDDC = OFF. Testing with other AMD EPYC or Intel Xeon processors may result in different performance results. ROM-56

ROM-99:

A 2P EPYC 7702 powered server has SPECvirt_sc2013 score of 5451.2 and 305 VMs, https://www.spec.org/virt_sc2013/results/res2019q3/virt_sc2013-20190726-00122-perf.html as of August 7, 2019. The next highest score is a 2P Intel Platinum 8180 server with a score of 3376 and 189 VMs, https://www.spec.org/virt_sc2013/results/res2017q4/virt_sc2013-20171017-00098-perf.html as of July 28, 2019. SPEC® and SPECvirt® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. ROM-99

ROM-100:

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

ROM-112:

Based on AMD internal testing as of 30July2019 of Blender version 2.8RC3 on Ubuntu 19.04 – kernel 5.0x, rendering a frame from the Blender Open Source Movie Project “Spring” Shot file 02_040_A with 3000 samples, denoising disabled, motion blur disabled and render time added to EXIF data on AMD reference platform configured with 2 x AMD EPYC 7742 processors, 16 x 32GB, 3200MHz DDR4 DIMMs, 128GB drive, AMD Radeon RX 580 graphics card and AGESA 1.0.0.1 BIOS versus an Intel server from a major OEM configured with 2 x Intel Platinum 8280 processors, 12 x 32GB, DDR4 2933MHz DIMMs, 256GB drive, AMD Radeon RX 580 graphics card and 2.2.10 BIOS. The AMD system completed the frame render in an average of 24.90 mins and the Intel system completed the same render in an average of 47.58 mins. $47.58/24.90=1.91-1=91\%$ faster or 1.9X the performance. Results may vary. ROM-112

ROM-113:

Based on AMD internal testing as of 30July2019 of GROMACS 2019.3 lignocellulose3M_rf benchmark. AMD reference platform configured with 2 x AMD EPYC 7742 processors, 16 x 64GB, 3200MHz DDR4 DIMMs, 256GB OS drive, 1TB NVMe data drive and AGESA 1.0.0.1 BIOS versus an Intel server from a major OEM configured with 2 x Intel Platinum 8280 processors, 12 x 64GB, DDR4 2933MHz DIMMs, 240GB OS drive and a 500GB NVMe drive. The AMD platform achieved 5.3 ns/day and the Intel platform achieved 3.3 ns/day of simulation time. $5.3/3.3=1.6-1=60\%$ better or 1.6x the performance. Results may vary. ROM-113

ROM-131:

Based on AMD internal testing as of 30July2019 of HSort test from TPCx-HS benchmark version 2.0.3 on 2 Terabytes of data. 3 x Supermicro AS -1123US-TN10RT servers configured with 2 x AMD EPYC 7542 processors 32c per socket/64c per node 16x 32GB 3200MHz DDR4 DIMMs, 3x 1TB NVMe drives, Mellanox CX-5 NIC and BIOS 2.0 NPS= NPS4; SMT=ON; Determinism Slider= Power; versus an 3 x Intel servers from a major OEM configured with 2 x Intel Platinum 8280 processors, 28c per socket/56c per node, 12x 32GB DDR4 2933MHz DIMMs, 3x 1TB NVMe drives, Mellanox CX-5 NIC and BIOS 3.1 Hyper-Threading=Enable; Power Technology: Custom; Power Performance Tuning: Bios Controls EPB; ENERGY_PERF_BIAS_CFG mode: Extreme Performance. Both systems used RHEL 7.6, openjdkversion1.8.0_212-b04, HDP 3.1, Spark version 2.3.2. The AMD servers achieved an average of 2,301,033,506 b/s and the Intel servers achieved an average of 1,500,587,408 b/s. $2,301,033,506/1,500,587,408 = 1.53-1=53\%$ more throughput or 1.53x the throughput. Results may vary. ROM-131

ROM-132:

Based on AMD internal testing as of 30July2019 of HSort test from TPCx-HS benchmark version 2.0.3 on 2 Terabytes of data. 3 x Supermicro AS -1123US-TN10RT servers configured with 2 x AMD EPYC 7542 processors 32c per socket/64c per node 16x 32GB 3200MHz DDR4 DIMMs, 3x 1TB NVMe drives, Mellanox CX-5 NIC and BIOS 2.0 NPS= NPS4; SMT=ON; Determinism Slider= Power; versus an 3 x Intel servers from a major OEM configured with 2 x Intel Platinum 8280 processors, 28c per socket/56c per node, 12x 32GB DDR4 2933MHz DIMMs, 3x 1TB NVMe drives, Mellanox CX-5 NIC and BIOS 3.1 Hyper-Threading=Enable; Power Technology: Custom; Power Performance Tuning: Bios Controls EPB; ENERGY_PERF_BIAS_CFG mode: Extreme Performance. Both systems used RHEL 7.6, openjdkversion1.8.0_212-b04, HDP 3.1, Spark version 2.3.2. The AMD server finished the test in an average of 870 sec and the Intel server finished the test in an average 1,335 sec. $1-870/1,335 = 35\%$ faster or 1.35x faster. Results may vary. ROM-132

ROM-136:

Based on AMD internal testing as of 02Aug2019 of HammerDB Benchmark v3.1 on Microsoft SQL Server®. AMD reference platform with 2 x AMD EPYC 7742 processors, 16 x 32GB, 3200MHz DDR4 DIMMs, 6 x Micron 9300 2.9TB NVMe drives and BIOS AGESA 1.0.0.1 versus an Intel server from a major OEM configured with 2 x Intel Platinum 8280 processors, 4x64GB and 8x32GB 2933MHz DDR4 DIMMs, 6 x Micron 9300 2.9TB NVMe drives and BIOS 3.1. The AMD server achieved an average of 8,935,583 TPM and the Intel server achieved an average of 6,132,927 TPM. $8,935,583/6,132,927 = 1.46-1=46\%$ more throughput/TPM or 1.5x the throughput/TPM. Results may vary. ROM-136

ROM-137:

Based on AMD internal testing as of 02Aug2019 of HammerDB Benchmark v3.1 on Microsoft SQL Server®. AMD reference platform with 2 x AMD EPYC 7742 processors, 16 x 32GB, 3200MHz DDR4 DIMMs, 6 x Micron 9300 2.9TB NVMe drives and BIOS AGESA 1.0.0.1 versus an Intel server from a major OEM configured with 2 x Intel Platinum 8280 processors, 4x64GB and 8x32GB 2933MHz DDR4 DIMMs, 6 x Micron 9300 2.9TB NVMe drives and BIOS 3.1. The AMD server supported 256 users with an average of 8,935,583 TPM and the Intel server supported 112 user with an average of 6,132,927 TPM. $256/112 = 2.3X$ or 230% the users, 1.3x more or 130% more. Results may vary. ROM-137

ROM-138:

Results as of 8/7/2019 using VMmark(R) 3.1 vSAN. AMD 7702 score of can be found at <https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/vmmark/2019-08-07-HPE-ProLiant-DL325Gen10.pdf>. Product available Aug 7, 2019. The next highest score with an Intel 6152, can be found at, <https://www.vmware.com/products/vmmark/results3x.0.html>. VMware VMmark 3.x results can be found at <https://www.vmware.com/products/vmmark/results3x.html>. ROM-138

ROM-172:

Compares running 8,400 identical Docker containers on Intel 2 Socket Xeon 8280 based systems versus AMD EPYC™ 7702 based. Internal AMD testing performed on each system running from 4 to 256 containers with identical loads, relative performance/throughput in events per second. The Intel based system reached 60% and 100% thread saturation at between 64 to 88 containers and 96 to 128 containers respectively. The AMD based system reached 60% thread saturation at between 140 to 185 containers. 100% of threads on the AMD system were saturated at 256 containers. At the closest measured point to 60% thread saturation, the Intel based system ran 64 containers while the AMD EPYC™ based system ran 140 containers within +/- 3% performance calculated as events processed per second per container. This resulted in the AMD EPYC™ based systems running 2.2X (140 vs 64) the number of containers at nominal (60%) utilization. System Configurations: Intel Xeon based servers with (2) Intel® Xeon® Platinum 8280 2.7G, 28C/56T, (12) 32GB RDIMM, 2933MT/s, Dual Rank DIMMs, Hard Drives including (1) 480GB SSD SAS Mix Use, (1) 1.6TB NVME Drive; AMD EPYC™ servers with (2) AMD EPYC™ 7702, 2.0G, 64C/128T, (16) 32GB RDIMM, 2933MT/s, Dual Rank DIMMs, Hard Drives including (1) 480GB SSD SAS Mix Use, (1) 1.6TB NVME Drive. ROM-172

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