

Powering the Cloud with AMD Opteron™ Processors

Delivering a Unique Balance of Performance, Scalability, and Efficiency

- > Predictable performance that scales easily to handle peak traffic
- > High core count and memory density allows you to deploy new cloud services quickly and easily
- > The most scalable x86 processors deliver unmatched flexibility to keep up with changing business
- > Advanced power efficiency to help reduce power and cooling costs
- > Cost-effective, consistent building blocks for scale-out server environments

AMD Opteron™ platforms for Cloud Computing

AMD Opteron™ Platform	Ideal for
AMD Opteron™ 6000 Series The world's first 16-core x86 processor, delivering a rich mix of performance, scalability, and efficiency for today's highly threaded computing environments.	Scale compute capability and performance on demand with massive core density and large-scale memory addressability
AMD Opteron™ 4000 Series The world's lowest power processor, at fewer than 5 watts per core ¹ — while designed for challenging workloads	Low power processor options that allow for more flexible platform design, maximizing density for the next generation of modular cloud platforms, breaking the traditional data center models and allowing for greater performance per watt per square foot than existing AMD Opteron 4100 Series processors ² Ideal for cloud, infrastructure, SMB, and other cost/power constrained applications

Gartner and IDC list cloud computing as a top IT trend for 2011. The foundation of cloud computing is a scale-out server cluster that uses economies of scale to provide computing services to the user. With cloud, you can provision compute capability from pools of resources, gaining more flexibility and agility. Cloud services include the delivery of applications, platforms, and infrastructure.

To deliver cloud services efficiently, you need power-efficient, scalable, well-performing, and cost-effective servers powered by multi-core AMD Opteron™ processors. These servers are designed to deliver:

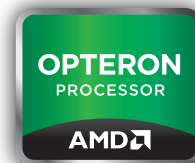
- > **I/O Throughput** – memory and I/O capabilities for fast transaction throughput to help maximize the user experience
- > **Power Efficiency** – low power consumption with energy-efficient platforms for large “scale-out” server environments and dense private cloud deployments
- > **Scalability** – predictable performance for demanding workloads and peak transaction times
- > **Consistent Platforms** – multiple generations of servers for seamless coexistence in the data center

AMD for Cloud Computing

Multi-Core Processors – Fueling the Cloud

The AMD Opteron™ processors and AMD chipsets provide cloud architects with a powerful foundation to build installations that are energy efficient and easy to manage with all the performance needed to deliver a great user experience. AMD has redesigned our core architecture to optimize execution paths that help reduce the total power consumption. With the new architecture, featuring 4-core through 16-core processors, web and cloud deployments that can benefit from more core density can handle growing numbers of transactions, and can have up to 60-160% more real cores per server than the competition.³

- > **Direct Connect Architecture 2.0** offers superior memory bandwidth, scalability, and I/O performance
- > **AMD Turbo CORE technology** provides faster clock speeds for improved performance of CPU intensive workloads
- > **Greater core density** allows you to scale out cloud deployments with fewer nodes, saving floor space and power without compromising on scalability



Energy Efficiency – Key Requirement of the Cloud

An essential component of any cloud computing environment is the ability to balance performance with low energy consumption, and cutting-edge energy efficiency can be a competitive advantage for cloud infrastructures. AMD Opteron HE and EE processor models provide the low power consumption you need, without sacrificing key features such as cache and memory speed. Additionally, lower power DDR3 memory brings 7% lower memory voltage⁴ for workloads, like web and cloud, that are extremely power-focused and for platforms, like blades and twins, where density is a key driver.

AMD Opteron processors also include new AMD-P 2.0 technology, a suite of advanced features that can help to significantly reduce energy usage. Among these features are:

- > C6 power state that reduces processor power consumption by up to 46%⁵ during low utilization periods adding the capability to handle peak workloads and stay within established service level agreements.
- > TDP Power Cap which gives users the ability to dial-in their processor power consumption, allowing them to maximize system density at the rack level, making the most of floor space and power budgets.

New power efficiency features allow for 33% more cores⁶ in the same power and thermal footprint, resulting in better efficiency for applications like web and cloud where power is a critical component.

Virtualization – Engine Driving the Cloud

Virtualization is a fundamental technology that enables the economies of scale necessary for delivering cloud services. New AMD Opteron™ processors include enhanced AMD Virtualization™ (AMD-V™) technology to heighten virtualization efficiency. The higher core counts of these products allow you to load 33% more VMs per server⁷, optimizing data center rack space and helping to minimize management tasks.

- > Helps optimize complex IT resources in a scalable and efficient manner
- > Isolates resources and services from their underlying physical environment
- > Enable servers to reach high levels of efficiency and Cloud Clusters to achieve desirable service levels

AMD-V™ technology 2.0 features:

- > Rapid Virtualization Indexing offers hardware-based virtual machine memory management
- > AMD Extended Migration enables live migration of virtual machines between all available AMD Opteron™ processor generations
- > AMD-VI™ - I/O Virtualization enables hardware isolation of virtual machine memory and reduced overhead through enhanced I/O functionality



For more information about AMD Opteron, please visit www.amd.com

1 As of November 14, 2011, AMD Opteron™ processor Models 4200 EE have the lowest known power per core of any x86 server processor, at 35W TDP (35W/8 = 4.375W/core). Intel's lowest power per core server processor, L5630, is 40W TDP (40W/4 = 10W/core). See <http://www.intel.com/Assets/PDF/prodbrief/323501.pdf>. Previous record held by AMD Opteron™ processor Models 4100 EE at 35W TDP / 6 cores = 5.83 W/core. SVR-58

2 Based on AMD performance estimates comparing 8-core AMD Opteron™ 4200 Series processor with 6-core AMD Opteron™ 4100 Series processors operating in the same general power envelopes.

3 Comparison of 16-core AMD Opteron™ 6200 Series processor with 6-core Intel Xeon 5600 series processor and 10-core Intel Xeon E7 Series processor. SVR-30

4 1.25V low voltage memory compared to 1.35V low voltage memory on AMD Opteron™ 6100 Series processors.

5 Based on testing in AMD Performance Labs as of August, 2011, an AMD Opteron™ processor model 6174 (12-core 2.2GHz) consumes 11.7W in the active idle C1E power state while an AMD Opteron™ processor model 6276 (16-core 2.3GHz) consumes only 6.4W in the active idle C1E power state with new C6 power gating employed. System configuration: "Drachma" reference design kit, 32GB (8 x 4GB DDR3-1333) memory, 500GB SATA disk drive, Microsoft® Windows Server® 2008 x64 Enterprise Edition R2. SVR-60

6 Comparison of 12-core AMD Opteron™ 6100 Series processors 16-core AMD Opteron™ 6200 Series processors. SVR-5

7 Based on 8-core AMD Opteron™ 4200 Series processors at 35W, 65W and 95W TDP compared to 6-core AMD Opteron™ 4100 Series processors at 35W, 65W and 95W TDP when utilizing the 1 VM per core loading rule. SVR-59

