

# AMD OPTERON™ 6300 SERIES PROCESSOR, CODENAMED "ABU DHABI", SALES-IN PRESENTATION

For OEMs, ODMs, System Builders

Speaker Notes Included

July 2012



### AMD OPTERON™ 6300 SERIES PROCESSOR

Next generation of AMD Opteron processors offering...





Next generation "Piledriver" core extends the benefits of "Bulldozer"

**Ecosystem for "Piledriver" is already in place** 

Uniquely beneficial for web/cloud, hosting, and SMB



### AMD SERVER PLATFORM STRATEGY

Performance-

per-watt and Expandability

2P Platforms ~75% of Market\* **Highly Energy** Efficient and **Cost Optimized** Low cost, low 1P Platforms power for dedicated ~20% of Market\* web hosting and small business server \* Based on AMD estimates.

4P/8P Platforms

~5% of Market\*

AMD Opteron™

6000 Series Platform

2010-2011

AMD Opteron 6100 Series processor 8 and 12 cores AMD Opteron 6200 Series processor 4, 8, 12 and 16 cores AMD Opteron 6300 Series processor 4, 8, 12 and 16 cores

2011-2012

- 2/4 socket; 4 memory channels
- For high core density

OPTERON

"Hydra"

"Bulldozer"

"Piledriver"

**SR5600 Series Chipsets** 

AMD Opteron™ 4000 Series Platform AMD Opteron 4100 Series processor 4 and 6 cores AMD Opteron 4200 Series processor 6 and 8 cores AMD Opteron 4300 Series processor 4, 6, and 8 cores

- 1/2 socket; 2 memory channels
- · For low power per core

AMD Opteron™ 3000 Series Platform AMD Opteron 3200 Series processor 4 and 8 cores AMD Opteron 3300 Series processor 4 and 8 cores

AMD

- 1 socket; 2 memory channels
- For low cost per core

### EASIER TRANSITION

Easier transition for OEMs and System Builders

- Fits into existing platform
- Socket and chipset compatible
- Much simpler qualification





Customers using AMD Opteron™ 6200 Series-based servers can quickly qualify their next generation server

- Compatibility reduces qualification time
- Saves money and resources
- Get quickly online with AMD Opteron 6300 Series processor enhancements



### AMD OPTERON™ 6300 SERIES PROCESSORS WITH "PILEDRIVER" CORE



Up to 15% higher performance<sup>1</sup>



Same SE, Standard, and HE power band

Reflects expected generational uplift based on preliminary AMD engineering estimates for SPECint®\_rate2006 performance as of 7/17/12 and subject to change.



### THE ECOSYSTEM FOR "PILEDRIVER" IS ALREADY IN PLACE

With the architectural change to "Bulldozer", all of the ecosystem work has already been done

Apps will just run and will run best with optimized OS and hypervisors. Some apps that are being optimized include: LS Dyan, MatLab, Abaqus, Hadoop, Mahout

Tools

• GCC 4.6.3, 4.7

- ACML 5.1
- Oracle JDK 7.4

- Open64 4.5.1, 4.5. 2
- libM 3 IBM JAVA 7

• PGI 12.3 +

• MSFT Visual Studio 2010 R2, 2012

Windows 2008 R2 SP1

- RHEL 5.8, RHEL 6.1
- vSphere 4.1u2

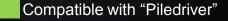
- Windows Server 2008 R2 SP1 with patch; Windows Server 2012
- RHEL 6.2, 6.3 and derivatives like CentOS and Scientific Linux
- vSphere 5.0 +

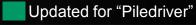
CPU

## **AMD Opteron 6000 Series Platform**

Platform

AMD Opteron 6100 Series Processors AMD Opteron 6200 Series Processors **AMD Opteron 6300 Series Processors** 







## AMD OPTERON™ 6300 SERIES IS UNIQUELY BENEFICIAL FOR VIRTUALIZATION

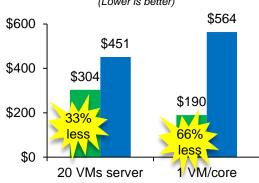


Addressing Customer Needs

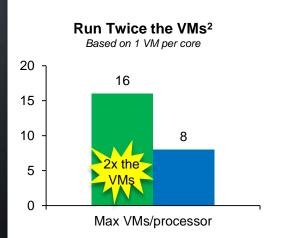
Require low server acquisition cost to help minimize CAPEX and improve power efficiency in web serving environments to help minimize OPEX

#### Lower Cost Per VM<sup>1</sup>

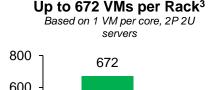
AMD-based Server vs. Intel-based Server using top bin processors (Lower is better)

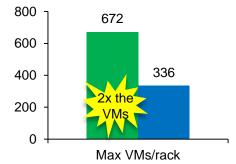


Maximize server density to reduce server sprawl, minimize the number of under-utilized servers, and simplify server management



"Room to grow" to quickly support the addition of IT services



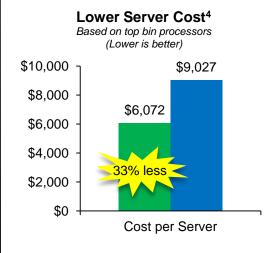




# AMD OPTERON™ 6300 SERIES IS UNIQUELY BENEFICIAL FOR WEB/CLOUD Addressing Customer Needs



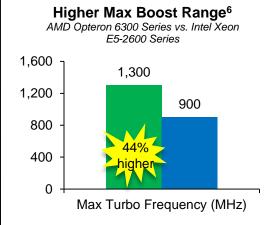
Require low server acquisition cost to help minimize CAPEX and improve power efficiency in web serving environments to help minimize OPEX



Also, support 1.25 ULV memory to

reduce memory voltage by 17%<sup>5</sup>

Want enough performance and scalability to address peak user demand and minimize latency while still being able to drive power efficiency when demands are down



Also, twice the core density<sup>2</sup>

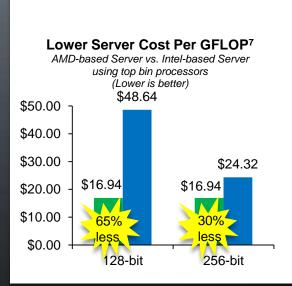


## AMD OPTERON™ 6300 SERIES IS UNIQUELY BENEFICIAL FOR HPC

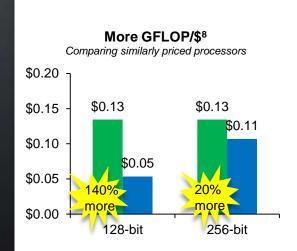
### Addressing Customer Needs



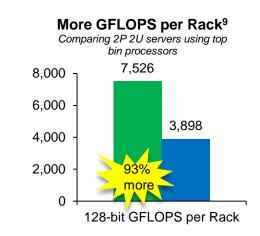
Face demands for system expansion and have to manage the growth



Need to maximize compute resources within their budget



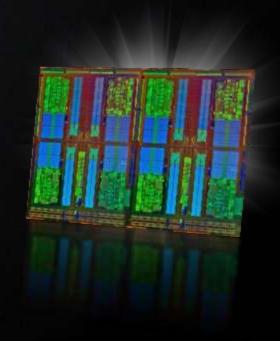
Need a high-density HPC solution that does not compromise on performance





### AMD OPTERON™ 6300 SERIES PROCESSOR

- Easier transition to new platform
- Next generation "Piledriver" core extends the benefits of "Bulldozer"
- Software ecosystem already in place
- Uniquely beneficial for virtualization, cloud, and HPC





# **BACKUP AND CONFIGURATION INFORMATION**



### SHARING RESOURCES

Helping to maximize power efficiency and cost

The "Piledriver" module has shared and dedicated components

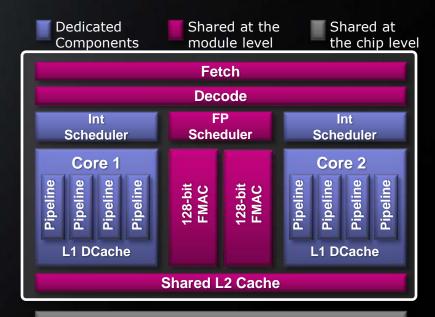
### The shared components:

- Help reduce power consumption
- Help reduce die space (cost)

### The dedicated components:

 Help increase performance and scalability

"Piledriver" dynamically switches between shared and dedicated components to maximize performance per watt

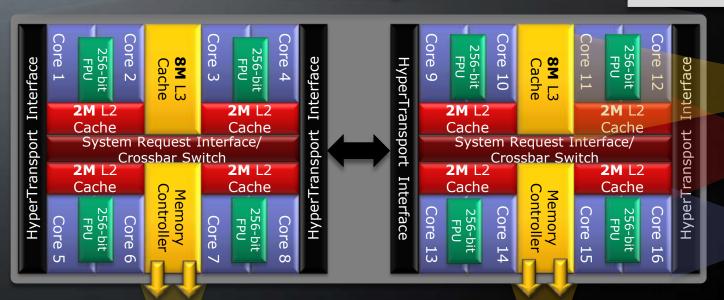


Shared L3 Cache and NB



### AMD OPTERON™ 6300 SERIES PROCESSOR ("ABU DHABI")

Multi- Chip Module (MCM) Package Same platform as AMD Opteron™ 6200 Series processor.



16M L3 cache

(Up to 32M L2+L3 cache)

4, 8, 12, & 16 core models

4 DDR3 memory channels supporting LRDIMM, ULV-DIMM, UDIMM, & RDIMM



### **MODEL NUMBERS AND SPECS**

Model	Base Clock Freq / NB Freq	Turbo CORE P1*	Turbo CORE PO	L2 Cache	L3 Cache	Cores	Power	Socket	System Bus Speed	Max DDR3 MHz <sup>1</sup>	
AMD Opter	AMD Opteron™ 6300 Series SE processors										
6386 SE	2.8/2.0	3.2GHz	3.5GHz	8x2M	16M	16	140W	G34	6400MT/s	1600	
AMD Opteror	n™ 6300 Series	processors	•	•							
6380	2.5/2.0	2.8GHz	3.4GHz								
6378	2.4/2.0	2.7GHz	3.3GHz	8x2M	16	16	_				
6376	2.3/2.0	2.6GHz	3.3GHz								
6348	2.8/2.0	3.1GHz	3.4GHz	6x2M		12					
6344	2.6/2.0	2.9GHz	3.2GHz	)	16M		115W	G34	6400MT/s	1600	
6328	3.2/2.0	3.5GHz	3.8GHz		_						
6320	2.8/2.0	3.1GHz	3.3GHz	4x2M		8					
6308	3.5/2.0	NA	NA	2x2M		4	-				
AMD Opteror	n™ 6300 Series	HE processors									
6366 HE	1.8/1.8	2.3GHz	3.1GHz	8x2M	16M	16	85W	G34	6400MT/s	1600	

<sup>\*</sup>AMD Opteron 6300 Series processors experience all core boost of up to 500 MHz (P2 base to P1 boost state) and up to 1.3 GHz max turbo boost (half or fewer cores boost from P2 to P0 boost state.

### AMD OPTERON™ 6300 SERIES PROCESSOR SPECIFICATIONS

### **Number of Processors per Server**

- 1, 2, and 4 socket support

#### **Frequency**

- Up to 3.5 GHz base frequency
- Up to 1.3GHz boost over base frequency using AMD Turbo CORE technology\*

#### **Cores**

- 4, 8, 12, and 16 core options

#### **Memory**

- 4 memory channels of up to 1600 MHz memory
- Supports R/U DDR3, LV DDR3, ULV DDR3 and LR DDR3
- Up to 1.5 TB memory capacity, supports up to 12 DIMMs per CPU

#### **Cache Size**

- Total Cache: 32MB (16 core), 28MB (12 core), 24MB (8 core), 20MB (4-core)
- L1 Cache: 16KB Data per core + 64KB Instruction (per module)
- L2 Cache: 1MB (per core)
- L3 Cache: 16MB (per socket)

### **HyperTransportTM 3.0 technology (HT3) Links**

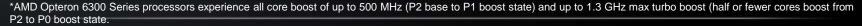
Four x16 links @ up to 6.4GT/s per link

#### **Power**

85W to 140W TDP



Ideal for cloud, virtualization, and HPC applications





### GENERATIONAL COMPARISONS

	AMD Opteron™ 6200 Series Processors	AMD Opteron™ 6300 Series Processors			
Cores	4, 8, 12 or 16 core	4, 8, 12 or 16 core			
Cache (L2 per core / L3 per die)	2MB (shared between 2 cores) / 8MB	2MB (shared between 2 cores) / 8MB			
Memory Channels and speed	four; up to 1600MHz	four; up to 1600MHz			
Floating point capability	128-bit dedicated FMAC per core or 256-bit AVX shared between 2 cores	128-bit dedicated FMAC per core or 256-bit AVX shared between 2 cores			
Integer Issues Per Cycle	4	4			
Turbo CORE Technology	Yes (+500MHz with all cores active and up to 1.3GHz max turbo state)	Yes (+500MHz with all cores active and up to 1.3GHz max turbo state)**			
Power (TDP)	85W, 115W, 140W	85W, 115W, 140W			
New Instruction Sets		FMA3, F16c, BMI, TBM			
Power Gating	AMD CoolCore™, C1E, C6	AMD CoolCore™, C1E, C6			
5 (5) (6)	32nm SOI	32nm SOI			
Process / Die Size	321111 301	321111 301			

The above reflect current expectations regarding features and performance and is subject to change.

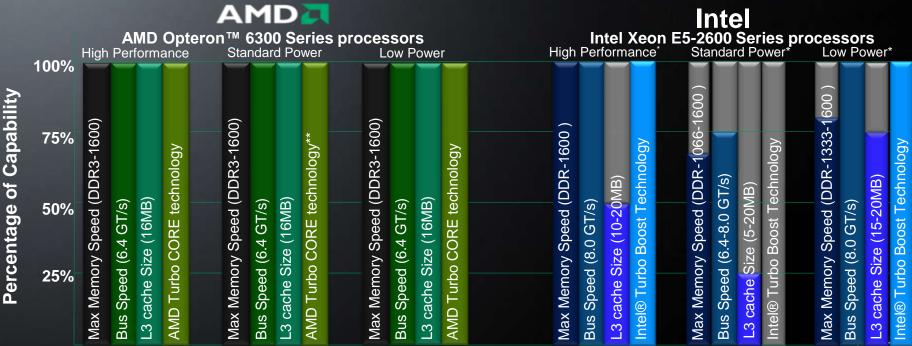
\*Reflects expected generational uplift based on preliminary AMD engineering estimates for SPECint®\_rate2006 performance as of 7/17/12 and subject to change.

\*\*AMD Opteron 6300 Series processors experience all core boost of up to 500 MHz (P2 base to P1 boost state) and up to 1.3 GHz max turbo boost (half or fewer cores boost from P2 to P0 boost states-in Presentation | July 2012 | AMD Confidential -- NDA Only Until Launch



### AMD OPTERON PROCESSORS - NO COMPROMISE

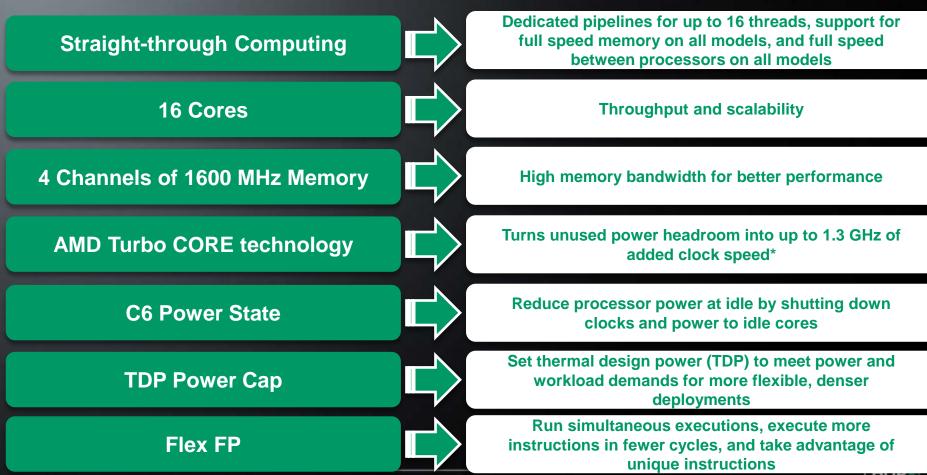
Only AMD offers consistency across processors – same features, cache, memory, and bus speed. Consistency helps capacity planning, software image deployment, and validation efforts.



<sup>\*</sup> Colored columns equal the lowest max value among the SKUs in a given power band and dividing them by highest max value across all three power bands. Transparent columns equal the highest max value among the SKUs in a given power band and dividing them by highest max value across all three power bands. Specs as of 4/3/12 for the Intel Xeon E5-2600 Series can be found at <a href="http://www.intel.com/content/www/us/en/processors/xeon/xeon-processor-5000-sequence/Xeon5000Specifications.html">http://www.intel.com/content/www/us/en/processors/xeon/xeon-processor-5000-sequence/Xeon5000Specifications.html</a> and <a href="http://ark.intel.com/products/series/47915">http://ark.intel.com/products/series/47915</a>

<sup>\*\*</sup> AMD Opteron processor Model 6308 is the only SKU among the AMD Opteron 6300 Series that does not have AMD Turbo CORE technology 17 | AMD Opteron™ 6300 Sales-in Presentation | July 2012 | AMD Confidential -- NDA Only Until Launch

### "PILEDRIVER": ALL THE FEATURES AND BENEFITS OF "BULLDOZER"



\*AMD Opteron 6300 Series processors experience all core boost of up to 500 MHz (P2 base to P1 boost state) and up to 1.3 GHz max turbo boost (half or fewer cores boost from P2 to P0 boost state | AMD Opteron | 6300 Sales-in Presentation | July 2012 | AMD Confidential -- NDA Only Until Launch

### MANY OPTIONS TO REDUCE POWER WITH AMD-P



# OPEX Management Features

- TDP Power Cap
- AMD PowerCap Manager
- Advanced Platform Management Link

# Fail-Safe Operating Mode

AMD CoolSpeed Technology

# Compute Power Management

- Dual Dynamic Power Management
- AMD PowerNow!™ Technology with Independent Dynamic Core Technology
- AMD CoolCore<sup>™</sup> Technology
- AMD Smart Fetch Technology
- C6 power state
- C1E

# Low Power Memory Support

- Support DDR3 ULV 1.25 DIMMs
- Support DDR3 LV 1.35 DIMMs



### AMD OPTERON™ 6300 SERIES LEADS IN 128-BIT PERFORMANCE

Differentiation	Intel Xeon E5-2600 Series	AMD Opteron™ 6200 Series	Benefits
Execute two 128-bit SSE or AVX ADD instructions in 1 cycle		✓	Faster processing
Execute two 128-bit SSE or AVX MUL instructions in 1 cycle		✓	Faster processing
Execute FMA operations FMA3 or FMA4 (A=B+C*D)		✓	Improve performance by increasing the work per instruction
Supports XOP		✓	<ul> <li>Reduce the need to copy and move around register operands</li> <li>Allow for some new cases of automatic vectorization by compilers</li> </ul>
FLOPs per cycle (128-bit FP)	32	64	Run more floating point operations
FLOPS per cycle (128-bit AVX)	32	64	<ul> <li>Run more floating point operations</li> </ul>



### AMD OPTERON™ FUTURE CORE TECHNOLOGY

# Delivering multiple generations of greater functionality and improved performance

"Piledriver"

2<sup>nd</sup> generation modular core

Improved IPC and frequency





"Steamroller"

3<sup>rd</sup> generation modular core

 Greater parallelism



4<sup>th</sup> generation modular core

• Greater performance

"Abu Dhabi" processors are based on "Piledriver" modular core architecture

Performance



"Bulldozer"

1<sup>st</sup> generation

modular core

128/256-bit AVX,

XOP and FMA4

Flex FP



### "ABU DHABI" ECOSYSTEM OVERVIEW

- The software visible feature differences between AMD Opteron™ 6200 and upcoming "Abu Dhabi" products are minor
- OS's, hypervisors, and tools that are enabled for "Abu Dhabi" will include support for their new software instructions
- Software that has been optimized for AMD Opteron 6200 processors should experience a performance uplift (up to 15%\*) with "Abu Dhabi" processors due to IPC and frequency improvements



<sup>\*</sup>Reflects expected generational uplift based on preliminary AMD engineering estimates for SPECint®\_rate2006 performance as of 7/17/12 and subject to change.

### "PILEDRIVER" TECHNOLOGY SOFTWARE VISIBLE FEATURES

# **Optimizations for Module Architecture:**

Identifies "Piledriver" CPU to OS or hypervisor

### **F16C Instructions:**

IEEE half precision floating point conversion instructions

### **FMA3 Support:**

Bulldozer"

Compatibility with Fused Multiply Add (FMA) technology that will be available in future Intel processors

### **BMI and TBM Instructions:**

Trailing bit manipulations with BMI instructions compatible with Intel and TBM instructions added by AMD

Next generation "Piledriver" core extends the benefits of "Bulldozer"



### A CLOSER LOOK AT NEW "PILEDRIVER" INSTRUCTIONS

Instructions	Application/Use Case
FMA3 – Floating point Fused Multiply Add instructions (AMD and Intel)	Used for vector and matrix multiplications, polynomial evaluations and chemistry, physics, quantum mechanics and digital signal processing. This instruction provides compatibility with Intel, which will add FMA3 to "Haswell" and "Broadwell" processors.
BMI – Bit Manipulation Instructions (AMD and Intel) TBM - Trailing Bit Manipulation instruction (AMD)	Simplifies bit manipulation operations and is useful for compressed database, hashing, large number arithmetic, and a variety of general purpose
F16c - Floating point value conversion (AMD and Intel)	Used to convert floating point values between 32-bit single precision and 16-bit half precision formats and is useful for multi-media. This instruction provides compatibility with Intel, which will add F15c to "Ivy Bridge" processors.

Software Optimization Guide for AMD Family 15h Processors
<a href="http://support.amd.com/us/Processor\_TechDocs/47414\_15h\_sw\_opt\_guide.pdf">http://support.amd.com/us/Processor\_TechDocs/47414\_15h\_sw\_opt\_guide.pdf</a>



### "ABU DHABI" OS AND HYPERVISOR SUPPORT

### **Proposed Enabled**

Optimized for Modular Core Architecture with support for some or all of "Abu Dhabi/Seoul" software visible features

### **Proposed Compatible**

Will boot and run but not take advantage of "Abu Dhabi/Seoul" new software visible features

### **Not Supported**

Will not run on "Bulldozer" and "Piledriver" platforms and/or will not be supported by OSV

- Citrix XenServer 6.1 (in development)
- Novell SLES 11 SP2 with Xen (with updates)
- RHEL 6.4 with KVM (in development) and RHEL derivatives including CentOS and Scientific Linux
- Ubuntu 12.10 with KVM (in development)
- VMware vSphere 5.0u1 (includes ESX)
- VMware MN.Next (in development)
- Windows Server 2008 R2 SP1 (optional scheduler patch available)
- Windows Server 2012 Release Candidate (includes Hyper-V 2012)

# Incudes some optimizations for Bulldozer architecture and support for Interlagos/Valencia instructions

- Citrix XenServer 6
- · Novell SLES 11 SP1 (with updates)
- RHEL 6.1, 6.2, 6.3 with KVM (in development) and RHEL derivatives including CentOS and Scientific Linux
- Ubuntu 12.04
- VMware vSphere 4.1u2 (includes ESX)
- VMware vSphere 5.0 (includes ESX)
- Xen 4.2

#### Does <u>not</u> support new instructions for Interlagos/Valencia, Abu Dhabi/Seoul, or Sandy Bridge:

- Hyper-V R1, Hyper-V R2, Hyper-V R2 SP1 (must be patched)
- RHEL 5.8 (includes KVM) and RHEL derivatives including CentOS, Scientific Linux
- Windows Server 2003 R2 SP2
- Windows Server 2008 R2
- Windows Server 2008 SP2

- · Linux kernel 2.6.31 or earlier
- Novell SLES 10 thru SP4
- Novell SLES 11
- RHEL 4.x
- RHEL 5.0 5.7
- RHEL 6.0
- VMware vSphere 3.5 (ncludes ESX)
- VMware vSphere 4.1u1 (includes ESX)
- Windows Server 2003 versions prior to R2 SP2

- OS and hypervisor version release dates need to come directly from ISVs
- Will add Linux kernel versions in all category as we approach launch



# "ABU DHABI" AND AMD OPTERON™ 6200 SERIES PROCESSORS COMPILER SUPPORT

	Status	SSSE3, SSE4.12, AVX	FMA4, XOP	FMA3 , TBM, BMI, F16C	Auto Generate Code	Comments
CAPS HMPP Workbench	Available	✓	<b>√</b>	<b>√</b>	✓	OpenACC source-to-source compiler providing GCC, PGI, MSFT C/C++ with OpenCL backend
GCC 4.6.3	Available	✓	✓	No	✓	Available via download from gcc.gnu.org web site
GCC 4.7	Available	✓	✓	✓	✓	Adds Abu Dhabi/Seoul instruction support
ICC 12.1	Available	msse3 mavx flag	No		<b>√</b>	msse3 provides support for SSE2/SSE3 for AMD; reports are that the mavx flag also works with AMD
LLVM (OpenCL compiler)	Available	✓	✓	No	No	Available in AMD APP SDK 2.7 with OpenCL 1.2
Microsoft Visual Studio 2010 SP1	Available	✓	<b>✓</b>	No	No	Supports new instructions but does not auto generate code; not highly threaded
Microsoft Visual Studio 2012 Release Candidate	Available	✓	<b>√</b>		No	Is more threaded. Provides C++ AMP implementation for GPU compute, Direct3D based
Open64 4.5.1	Available	✓	✓	No	✓	Highly tuned for "Bulldozer architecture
Open64 4.5.2	Q3	✓	✓	✓	✓	Adds Abu Dhabi/Seoul instruction support
PGI 12.5	Available	✓	<b>√</b>		✓	PGI Unified Binary™ technology combines into a single executable optimized for AMD and Intel CPU
RHEL 6.2 System Compiler (GCC 4.4.6)	Available	✓	<b>✓</b>	No	✓	GCC included in RHEL 6.2 know has been back ported to support "Bulldozer" architecture

AMD Opteron 6200 Series Processor Compiler Options Quick Reference Guide <a href="http://developer.amd.com/Assets/CompilerOptQuickRef-62004200.pdf">http://developer.amd.com/Assets/CompilerOptQuickRef-62004200.pdf</a>
Abu Dhabi" Compiler Optimization Guide <a href="http://developer.amd.com/Assets/CompilerOptQuickRef-AbuDhabi.pdf">http://developer.amd.com/Assets/CompilerOptQuickRef-AbuDhabi.pdf</a>



# "ABU DHABI" AND AMD OPTERON™ 6200 SERIES PROCESSORS LIBRARY SUPPORT

	Library Description	Comments
		Comments
ACML 5.1 (CPU)	<ul> <li>Full implementation of Level 1, 2 and 3 BLAS</li> <li>Full suite of LAPACK routines with a key set of routines further optimized to achieve higher performance</li> <li>Comprehensive suite of FFTs in both single-, double-, single-complex and double-complex data types</li> <li>Random Number Generators in both single- and double-precision.</li> </ul>	Supported Compilers:  Absoft Pro Fortran  GFortran (Linux)  Intel Fortran (Linux, Windows)  NAG Fortran  Open64 (Linux)  PGI Fortran (Linux, Window)
ACML 5.2 (CPU)	<ul> <li>Workload analysis and improvements for key apps and benchmarks (HPL, HPCC)</li> <li>Small GEMM, LU, sparse perf improvements,</li> <li>FFTW wrappers</li> </ul>	In development with anticipated release Q3 2012
AMD LibM 3.0.2 (CPU)	C library containing a collection of basic math functions optimized for x86-64 processors and supporting the new "Bulldozer" instructions	Supported Compilers  GCC 4.6 + (Linux)  MSFT Visual Studio 2010 (Windows)
APPML 1.8 Beta (GPU, APU)	<ul> <li>Full implementation of Level 2 and 3 BLAS</li> <li>Single and double precision FFTs; Complex-to-Complex and Real-to-Complex</li> </ul>	Supported Compilers: GCC 4.4+ MSFT Visual Studio 2008, 2010 ICC 11
clMAGMA Beta (GPU, APU)	<ul> <li>Solvers for general and symmetric dense matrices and for main two-sided matrix factorizations - basis for eigenproblem and SVD solvers</li> <li>Least squares solver</li> <li>Multiple precision support for the LU factorization</li> <li>Support for s/d/c/z precision arithmetic for all routines provided</li> <li>Reduction to upper Hessenberg form, upper/lower bidiagonal form, and tridiagonal form by similarity orthogonal transformations</li> </ul>	Components needed to build an application with OpenCL MAGMA:  • MAGMA  • APPML clBLAS 1.8 beta  • ACML 5.1

ACML downloads: <a href="http://developer.amd.com/libraries/acml/downloads/pages/default.aspx">http://developer.amd.com/libraries/acml/downloads/pages/default.aspx</a> APPML Information <a href="http://developer.amd.com/libraries/appmathlibs/Pages/default.aspx">http://developer.amd.com/libraries/appmathlibs/Pages/default.aspx</a> cIMAGMA information <a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/Pages/default.aspx</a> cIMAGMA information <a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/Pages/default.aspx</a> cIMAGMA information <a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/<a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/<a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/<a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/<a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/<a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs/<a href="http://developer.amd.com/libraries/appmathlibs/">http://developer.amd.com/libraries/appmathlibs



# "ABU DHABI" AND AMD OPTERON™ 6200 SERIES PROCESSORS OTHER TOOLS AND SDKS

	Version	Comments
AMD CodeAnalyst	3.6 (Windows) 3.3 (Linux)	<ul> <li>Profiling Suite, includes Time Based, Event Based and Instruction Based Sampling</li> <li>Supports C, C++, Fortran, Java &amp; .NET code</li> <li>Finds Thread Affinity &amp; Core Utilization Problems.</li> </ul>
APP SDK	2.7	<ul> <li>OpenCL 1.2</li> <li>Trinity/South Islands GPU support</li> <li>Static C++ Kernel language support</li> <li>Performance &amp; stability updates</li> <li>VCE Encode &amp; OpenEncode Update</li> </ul>
HPL for AMD Opteron™ 6200 Series processors	White Paper and Toolkit	Tools to help build and run High Performance Linpack (HPL) benchmark on servers using AMD Opteron 6200 Series processors using AMD Opteron™ 6200 Series processors
Linux Tuning Guide	White Paper	This guide provides configuration, optimization, and tuning information and recommendations for AMD Opteron™ 6200 Series processors (formerly code-named "Interlagos" and built on AMD's new core architecture) running in a Linux environment

AMD CodeAnalyst Documentation <a href="http://developer.amd.com/tools/codeanalyst/pages/default.aspx">http://developer.amd.com/tools/codeanalyst/pages/default.aspx</a>

AMD APP SDK Documentation <a href="http://developer.amd.com/sdks/AMDAPPSDK/documentation/Pages/default.aspx">http://developer.amd.com/sdks/AMDAPPSDK/documentation/Pages/default.aspx</a>

HPL White Paper <a href="http://developer.amd.com/Assets/linpack">http://developer.amd.com/Assets/linpack</a> wp bd 2.pdf

HPL Toolkit download <a href="http://developer.amd.com/Downloads/hplbinbd2.tgz">http://developer.amd.com/Downloads/hplbinbd2.tgz</a>

Linux Tuning Guide <a href="http://developer.amd.com/Assets/51803A">http://developer.amd.com/Assets/51803A</a> OpteronLinuxTuningGuide <a href="https://developer.amd.com/Assets/51803A">SCREEN.pdf</a>



# "ABU DHABI" AND AMD OPTERON<sup>TM</sup> 6200 SERIES PROCESSORS JAVA SUPPORT

	Version	Comments
Oracle JVM (CPU)  JDK7u4 (Linux, Windows)		Includes basic optimizations for "Bulldozer" technology, including scheduling, NUMA, and micro-architectural awareness. Workload optimizations for SPECjbb with work in progress for Hadoop and Mahout.
IBM JVM (CPU)	Java7 SRI (Linux, Windows)	Includes basic optimizations for "Bulldozer" technology, including scheduling, NUMA, and micro-architectural awareness. Workload optimizations for SPECjbb with work in progress for Hadoop and Mahout.
APARAPI (GPU, APU)	Open Source API that supports Windows, Linux	Allows Java developers to take advantage of the compute power of GPU and APU devices by executing data parallel code fragments on the GPU

IBM JVM documentation

http://www.ibm.com/developerworks/java/jdk/docs.html

Oracle JVM download and documentation

http://www.oracle.com/technetwork/java/javase/downloads/java-se-jdk-7-download-432154.html

APARAPI download and documenation

http://code.google.com/p/aparapi/



### REFERENCE DOCUMENTS

 "Abu Dhabi" Compiler Optimization Guide http://developer.amd.com/Assets/Compile

ACML 5.1 Information

http://developer.amd.com/libraries/acml/features/pages/default.aspx

 AMD64 Architecture Programmer's Manual Volume 6: 128-Bit and 256-Bit XOP and FMA4 Instructions http://support.amd.com/us/Embedded TechDocs/43479.pdf

AMD APP SDK Documentation

http://developer.amd.com/sdks/AMDAPPSDK/documentation/Pages/default.aspx

AMD Code Analyst Performance Analyzer Information http://developer.amd.com/tools/codeanalyst/pages/default.aspx

 AMD Opteron 6200/4200 Series Processors Compiler Options Quick Reference Guide http://developer.amd.com/Assets/CompilerOptQuickRef-62004200.pdf

APPML Information

http://developer.amd.com/libraries/appmathlibs/Pages/default.aspx

**HPL White Paper** 

http://developer.amd.com/Assets/linpack wp bd 2.pdf

LibM Information

http://developer.amd.com/libraries/libm/pages/default.asp

Linux Tuning Guide

http://developer.amd.com/Assets/51803A OpteronLinuxTuningGuide SCREEN.pdf

Open64 Compiler Documentation

http://developer.amd.com/tools/open64/Pages/default.aspx#one

Software Optimization Guide for "Bulldozer" processors

http://support.amd.com/us/Processor TechDocs/47414.pdf



### PLANNED BOARDS TO SUPPORT AMD OPTERON™ 6300 SERIES PROCESSORS

	Partner	Model	Form Factor	DIMM Slots	SR56xx	URL with Board Specifications
Asus						
	Asus	KGPE-D16	2P eATX	8+8	SR5690	KGPE-D16 Specs
	Asus	RS920A-E6/RS8	4P/1U	8+8+8+8	SR5690	RS920A-E6/RS8 Specs
	Asus	KGMH-D16/QDR KGNH-D16	2P Twin	8+8	SR5650	KGMH-D16/QDR Specs
Supermicro						
	Supermicro	H8QG6/i(+)-F	4P Proprietary	8+8+8+8	SR5690 (2)	H8QG6/i(+)-F Specs
	Supermicro	H8DGU(-F)	2P Proprietary	8+8	SR5690	H8DGU(-F) Specs
	Supermicro	H8DG6/i(-F)	2P E-ATX	8+8	SR5690 (2)	H8DG6/i(-F) Specs
	Supermicro	H8QGL-6F/iF(+)	4P Proprietary	4+4+4+4	SR5690 (2)	H8QGL-6F/iF(+) Specs
	Supermicro	H8DGG-QF	2P Proprietary	8+8	SR5690 (2)	H8DGG-QF Specs
	Supermicro	H8DGT-H(IBQ)F	2P/2U Twin	8+8	SR5670	H8DGT-H(IBQ)F Specs
	Supermicro	H8SGL(-F)	1P ATX	8	SR5650	H8SGL(-F) Specs
	Supermicro	H8DGU-LN4+	2P Proprietary	12+12	SR5690	H8DGU-LN4+ Specs
	Supermicro	H8DGT-HL(IBQ)F	2P/2U Twin	4+4	SR5690	H8DGT-HL(IBQ)F Specs
Tyan						
	Tyan	S8236-IL	2P EATX	8+8	SR5690	S8236-IL Specs
	Tyan	S8812	4P MEB	8+8+8+8	SR5690	S8812 Specs
	Tyan	S8230	2P EATX	8+8	SR5690	S8230 Specs
	Tyan	S8232	2P EEB	12+12	SR5690 (2)	S8232 Specs
	Tyan	S8238	2P Twin	8+4	SR5670	S8238 Specs

List is based on AMD Opteron 6200 Series and is subject to change based on board validation testing



### SUBSTANTIATION

- ¹ The price per VM range is established based on two different calculation methods: 1) server price divided by a set number of VMs and 2) server price divided by the number of cores assuming a 1VM per core load model (1) Server price divided by a set number of VMs: HP ProLiant DL385p Gen8 with 2 x 16-core, AMD Opteron™ processor Model 6284 SE (1ku price \$1265) with 32GB RAM, 72 GB 15K hdd, DVD, and 3yr base warranty is \$5,818 as of 7/1/12 at www.hp.com. The 1kU list price for the 16-core, AMD Opteron™ processor Model 6386 SE is expected to be \$1,392, making the top bin predicted server price \$6,072. Assuming 20 VMs per server, the cost per VM is \$304. HP ProLiant DL380p Gen8 with 2 x 8-core, Intel Xeon processor Model E5-2690 with 32GB RAM, 72 GB 15K hdd, DVD, and 3yr base warranty is \$9,027 as of 7/1/12 at www.hp.com. Assuming 20 VMs per server, the cost per VM savings. (2) server price divided by the number of cores assuming a 1VM per core load model: based on the same configuration and pricing above, the cost per VM for the HP DL385p Gen8 is \$190 assuming 1VM/core. The cost per VM for the HP DL385p Gen8 is \$190 assuming 1VM/core.
- <sup>2</sup> Based on a 1 VM/core model, AMD Opteron™ 6300 Series-based servers have up to 16 cores per processor. Intel Xeon E5-2600-based servers have up to 8 cores per processor as of 4/6/12 at www.intc.com/pricelist.cfm. SVR-137
- <sup>3</sup> Based on a 1 VM/core model, AMD Opteron™ 6300 Series-based servers have up to 16 cores per processor. 672 VMs equals a 42U rack of (21) 2P 2U servers. Intel Xeon E5-2600-based servers have up to 8 cores per processor as of 4/6/12 at www.intc.com/pricelist.cfm, which yields up to 336 VMs in a 42U rack of (21) 2P servers. The square footage of a standard rack is 6 ft (2ft x 3ft). SVR-136
- <sup>4</sup> AMD Opteron™ 6300 Series processor-based servers are expected to match or exceed the cost advantage that AMD Opteron 6200 Series processor-based servers have over Intelbased servers.
- HP ProLiant DL385p Gen8 with 2 x AMD Opteron™ processor Model 6284 SE (1ku price \$1265) with 32GB RAM, 72 GB 15K hdd, DVD, and 3yr base warranty is \$5,818 as of 6/26/12 at www.hp.com. The 1kU list price for the AMD Opteron™ processor Model 6386 SE is expected to be \$1,392, making the top bin predicted server price \$6,072. HP ProLiant DL380p Gen8 with 2 x Intel Xeon processor Model E5-2690 with 32GB RAM, 72 GB 15K hdd, DVD, and 3yr base warranty is \$9,027 as of 6/26/12 at www.hp.com. SVR-142
- <sup>5</sup> AMD Opteron™ 6300 Series processors support ultra low voltage (1.25V) memory and they also support standard memory (1.5V). SVR-141
- <sup>6</sup> As of 4/2/12 AMD Opteron™ 6300 Series processors are expected to have a max boost of 1.3 GHz over base frequency. Intel Xeon E5-2600 Series processors have a max boost of 0.9 GHz over base frequency according to http://ark.intel.com/compare/64592,64588,64594,64593,64586,64598,64591,64587,64590,64585,64584,64597,64589,64595,64583,64596 as of 4/2/12. SVR-143
- <sup>7</sup> HP ProLiant DL385p Gen8 with 2 x AMD Opteron™ processor Model 6284 SE (1ku price \$1265) with 32GB RAM, 72 GB 15K hdd, DVD, and 3yr base warranty is \$5,818 as of 6/26/12 at www.hp.com. The 1kU list price for the AMD Opteron™ processor Model 6386 SE is expected to be \$1,392, making the top bin predicted server price \$6,072. HP ProLiant DL380p Gen8 with 2 x Intel Xeon processor Model E5-2690 with 32GB RAM, 72 GB 15K hdd, DVD, and 3yr base warranty is \$9,027 as of 6/26/12 at www.hp.com. AMD Opteron processor Model 6386 SE is expected to have a max theoretical GFLOPS per processor (179) in 128-bit bit mode equal to 2.8GHz (expected frequency) x 8 core modules x 8 FLOPS per clock per core module, translating to \$16.94 server cost per GFLOP. AMD Opteron processor Model 6386 SE is expected to have a max theoretical GFLOPS per processor and (179) in 256-bit bit mode equal to 2.8GHz (expected frequency) x 8 core modules x 8 FLOPS per clock per core module, translating to \$16.94 server cost per GFLOP. Intel Xeon processor Model E5-2690 has a max theoretical GFLOPS per processor (93) in 128-bit bit mode equal to 2.9GHz x 8 cores x 8 FLOPS per clock per core, translating to \$48.64 and a max theoretical GFLOPS per processor (186) in 256-bit bit mode equal to 2.9GHz x 8 cores x 8 FLOPs per clock per core, translating to \$24.32 server cost per GFLOP. SVR-203

AMD

### SUBSTANTIATION (CONT.)

<sup>8</sup> AMD Opteron processor Model 6386 SE (planned 1ku pricing \$1,392) is expected to have a max theoretical GFLOPS per processor (179) in 128-bit bit mode equal to 2.8GHz (expected frequency) x 8 core modules x 8 FLOPS per clock per core module and (179) in 256-bit bit mode equal to 2.8GHz (expected frequency) x 8 core modules x 8 FLOPS per clock per core module. Intel Xeon processor Model E5-2665 (\$1,440) has a max theoretical GFLOPS per processor (77) in 128-bit bit mode equal to 2.4GHz x 8 cores x 4 FLOPs per clock per core and a max theoretical GFLOPS per processor (154) in 256-bit bit mode equal to 2.4GHz x 8 cores x 8 FLOPs per clock per core. Pricing as of 6/30/12 at www.intc.com/pricelist.cfm. SVR-145

<sup>9</sup> In 128-bit mode, the AMD Opteron™ processor Model 6386 SE is expected to have a max theoretical GFLOPS per rack equal to (21) 2P 2U servers per rack x 2 processors per server x 2.8GHz x 16 floating point processing unit per processor x (4) 32-bit operations/cycle. This equates to 7,526 GFLOPS/rack. In 128-bit mode, the Intel Xeon processor Model E5-2690 has a max theoretical GFLOPS of (21) 2P 2U servers per rack x 2 processors per server x 2.9GHz x 8 floating point processing units per processor x (4) 32-bit operations/cycle. This equates to 3,898 GFLOPS/rack. Intel spec info available at www.intc.com/pricelist.cfm as of 4/6/12. SVR-139



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