AMD OPTERON™ 4200 AND 6200 SERIES PROCESSORS

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“BULLDOZER” TECHNOLOGY SOFTWARE VISIBLE FEATURES

Optimizations for “Bulldozer” Module Architecture:
Identifies “Bulldozer” architecture to OS or hypervisor

New “Bulldozer” Instructions:
For data level parallelism and hardware assist for encryption and fused multiple-add operations

Performance Monitoring and Profiling:
Provides info that can be used to improve system and application performance

C6:
“Bulldozer” module goes into a very low power sleep state when both core pairs are idle

New Virtualization Functions:
For use by hypervisors to help reduce overhead and achieve near-native application performance

AMD Opteron™ 4200 and 6200 Series processors are built on “Bulldozer” technology
Building a Modular Processor

Each processor die is composed of multiple “Bulldozer” modules

Module divisions are transparent to shared hardware, operating system or application

The modular architecture speeds chip development and increases product flexibility

Server:
4200 – 8 cores (1 die)
6200 – 16 cores (2 die)
same platform as AMD Opteron™ 4100 Series processor.

Available in standard, HE and EE power bands.

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

8M L3 cache
(Up to 16M L2+L3 cache)
AMD OPTERON™ 6200 SERIES PROCESSOR

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

Note: Graphic may not be fully representative of actual layout
AMD approach gives you “straight through” computing with dedicated pipelines for each integer thread, full speed memory on all models and full speed between processors on all models.
Computing Without Compromises

**Same Features Across Power Bands**

- No artificially limited features
- Full memory speed on all models
- Full I/O speed on all models
- Same chipset on all platforms

**Consistent Images and Software**

- Same Die, Chipset and Memory enable:
  - Same API
  - Same BIOS Code
  - Same Drivers

**Easier To Buy**

- No tradeoffs of performance & core functionality

**Easier To Qualify**

- Full consistency across the entire processor stack

**Easier To Manage**

- Seamlessly move virtual machines, easily migrate software between systems
## THE NEW “BULLDOZER” INSTRUCTIONS | A CLOSER LOOK

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Applications/Use Cases</th>
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</thead>
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<tr>
<td>SSSE3, SSE4.1, SSE4.2</td>
<td>• Video encoding and transcoding</td>
</tr>
<tr>
<td>(AMD and Intel)</td>
<td>• Biometrics algorithms</td>
</tr>
<tr>
<td></td>
<td>• Text-intensive applications</td>
</tr>
<tr>
<td>AESNI PCLMULQDQ (AMD and</td>
<td>• Application using AES encryption</td>
</tr>
<tr>
<td>Intel)</td>
<td>• Secure network transactions</td>
</tr>
<tr>
<td></td>
<td>• Disk encryption (MSFT BitLocker)</td>
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<tr>
<td></td>
<td>• Database encryption</td>
</tr>
<tr>
<td></td>
<td>• Cloud security</td>
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<tr>
<td>AVX (AMD and Intel)</td>
<td>Floating point intensive applications:</td>
</tr>
<tr>
<td></td>
<td>• Signal processing / Seismic</td>
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<tr>
<td></td>
<td>• Multimedia</td>
</tr>
<tr>
<td></td>
<td>• Scientific simulations</td>
</tr>
<tr>
<td></td>
<td>• Financial analytics</td>
</tr>
<tr>
<td></td>
<td>• 3D modeling</td>
</tr>
<tr>
<td>FMA4 (AMD Unique)*</td>
<td>• Vector and matrix multiplications</td>
</tr>
<tr>
<td></td>
<td>• Polynomial evaluations</td>
</tr>
<tr>
<td></td>
<td>• Chemistry, physics, quantum mechanics and digital signal processing</td>
</tr>
<tr>
<td>XOP (AMD Unique)*</td>
<td>• Numeric applications</td>
</tr>
<tr>
<td></td>
<td>• Multimedia applications</td>
</tr>
<tr>
<td></td>
<td>• Algorithms used for audio/radio</td>
</tr>
</tbody>
</table>

XOP and FMA4 instruction set extensions are AMD unique 128-bit and 256-bit instructions designed to:

- Improve performance by increasing the work per instruction
- Reduce the need to copy and move around register operands
- Allow for some new cases of automatic vectorization by compilers

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**AMD OPTERON™ 4200 AND 6200 SERIES PROCESSORS**

**OS AND HYPERVISOR SUPPORT SUMMARY**

**Assumes** latest updates/patches are installed

<table>
<thead>
<tr>
<th>Enabled</th>
<th>Compatible</th>
<th>Not Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optimized to support some or all of “Bulldozer’s” new features</strong></td>
<td><strong>Will boot and run but not take advantage of “Bulldozer’s” new features outside of new instructions</strong></td>
<td><strong>Will not run on “Bulldozer” platforms and/or will not be supported by OSV</strong></td>
</tr>
</tbody>
</table>

**Includes new instruction support:**
- Linux kernel 2.6.37 +, 3.0 +
- Novell SLES 11 SP2 (includes Xen)
- RHEL 6.2 with KVM (with latest z-stream patches)
- Windows Server 2008 R2 SP1 (optional scheduler patch available)
- Windows Server 2012/Hyper-V (in development)
- Xen 4.1 +
- Ubuntu 11.04 (w/ KVM)
- VMware vSphere 5.0

**Includes new instruction support:**
- Linux kernel 2.6.32 – 2.6.36
- Novell SLES 11 SP1
- RHEL 6.1
- Ubuntu 10.10

**Does not support new instructions for either Bulldozer or Sandy Bridge:**
- Hyper-V R1
- Hyper-V R2, Hyper-V R2 SP1
- Novell SLES 10 SP4 and higher
- RHEL 5.7 (included KVM)
- Solaris 10u9, 11
- VMware vSphere 4.1u2
- Windows Server 2003 R2 SP2
- Windows Server 2008 R2
- Windows Server 2008 SP2
- Xen 3.4.2

**Will run but not necessarily provide performance uplift**

- Linux kernel 2.6.31 or earlier
- Novell SLES 10 thru SP3
- Novell SLES 11
- RHEL 4.x
- RHEL 5.0 – 5.5
- RHEL 5.6 (can run with patches but is not supported by Red Hat)
- RHEL 6.0
- Solaris 10 – 10u8
- VMware ESX 3.5
- VMware ESX 4.0 – 4.1u1
- Windows Server 2003 versions prior to R2 SP2

**Versions in this category also include latest software advances**

* Please note: For proper support of available features/processors, the latest updates/patches always needs to be installed
REFERENCES

- AMD APP SDK Documentation
  http://developer.amd.com/sdks/AMDAPPSDK/documentation/Pages/default.aspx

- x86 Compiler Quick Reference Guide for “Bulldozer” processors

- Using the x86 Open64 Compiler Suite
  http://developer.amd.com/tools/open64/Documents/open64.html

- x86 Open64 4.2.5.2 Release Notes
  http://developer.amd.com/tools/open64/assets/ReleaseNotes.txt

- ACML 5.0 Information

- Software Optimization Guide for “Bulldozer” processors

### model numbers and frequency

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Core Count</th>
<th>Core Speed</th>
<th>All-Core Turbo Frequency</th>
<th>Max Turbo Core Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>6282 SE</td>
<td>16</td>
<td>2.6GHz</td>
<td>3.0GHz</td>
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<tr>
<td>6276</td>
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<tr>
<td>6274</td>
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<td>2.5GHz</td>
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<tr>
<td>6272</td>
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<tr>
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<td>2.6GHz</td>
<td>2.9GHz</td>
<td>3.2GHz</td>
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<tr>
<td>6234</td>
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<td>2.7GHz</td>
<td>3.0GHz</td>
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<tr>
<td>6220</td>
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<td>3.3GHz</td>
<td>3.6GHz</td>
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<tr>
<td>6212</td>
<td>8</td>
<td>2.6GHz</td>
<td>2.9GHz</td>
<td>3.2GHz</td>
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<tr>
<td>6204</td>
<td>4</td>
<td>3.3GHz</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>6262 HE</td>
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<tr>
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<td>4228 HE</td>
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<td>2.8GHz</td>
<td>3.1GHz</td>
<td>3.6GHz</td>
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<tr>
<td>4256 EE</td>
<td>8</td>
<td>1.6GHz</td>
<td>1.9GHz</td>
<td>2.8GHz</td>
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</tbody>
</table>
structure of the future

- **Compute core arrangement**
  - Future generational core
  - Improved x86 performance
  - Improved AMD Technology; -V, RAS, boost

- **Flexible Memory Support**
  - Speeds up to DDRx at time of delivery
  - Support for lower power and denser configurations

- **Multiple configurations**
  - Up to 20 core and 40 GB of L2
  - Multiple SIMD configurations
  - PCIe3 support at industry adoption

- **Enhanced Software infrastructure**
  - Next generation OpenCL, DirectCompute
  - Operating System and Hypervisor support
  - Open Compilers and Libraries

- **Enhanced display support**
  - Remote pixel streaming

Optimized for high performance at TDP
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