Quad-Core AMD Opteron™ Processor with Direct Connect Architecture
2P Server and Workstation Architecture Comparison

**Optimal Virtualization**
- Silicon-assisted AMD Virtualization™ (AMD-V™) with Rapid Virtualization Indexing offers leading-edge performance, security, and application support
- Rapid Virtualization Indexing is designed to improve performance on many virtualized applications by enabling memory management in hardware, allowing for a higher-performing, more flexible environment
- Direct Connect Architecture for excellent scalability and performance on I/O and memory-intensive virtualized application environments; enabling more virtual machines to run per server
- Integrated memory controller offers leading-edge x86 capabilities, helping improve performance while efficiently enforcing security between virtual machines

**Industry-Leading Performance Per-Watt**
- Highly efficient computing cores with Enhanced AMD PowerNow!™ technology can reduce CPU power consumption to CPU frequency to application needs, to help reduce power consumption without compromising performance
- AMD CoolCore™ technology reduces power to unused sections of the CPU to save on power and cooling costs
- Dual Dynamic Power Management™ helps maximize the power saving capabilities of AMD PowerNow!™ technology while maintaining memory throughput for superior application performance
- Uses low-power, high-bandwidth DDR2 memory for excellent performance and greater efficiency than competing memory technologies

**Balanced Performance with AMD Direct Connect Architecture**
- AMD64 technology enables simultaneous high performance on 64-bit and 32-bit applications
- Addresses and helps reduce the real challenges and bottlenecks of traditional front-side bus architectures by directly connecting the processors, memory, and I/O
- Integrated DDR2 memory controller: low-latency, high-bandwidth interface enables high performance on memory intensive applications while the performance is designed to provide enterprise class reliability for your datacenter
- HyperTransport™ technology links: At up to 8GB/s bandwidth per link, with up to 3 links per processor connecting CPUs-to-CPUs and CPUs-to-I/O, provides bandwidth and scalability for supporting I/O intensive server and workstation applications
- AMD Balanced Smart Cache and AMD Memory Optimizer Technology are designed for exceptional performance on highly-threaded applications and multi-tasking environments

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**Front-Side Bus (FSB) Based Architectures Can Limit Performance and Scalability**
- Passage through memory controller hub (MCH) can delay memory reads
- Memory and I/O must share FSB bandwidth, which can further reduce the efficiency of the FSB
- Hardware-assisted VT must run memory-intensive virtualization applications over a shared front side bus
- With one MCH per system, PCI Express® interface integration can limit expansion options
- Workstation systems limited to a single PCIe® x16 link with 5000X chipset
- Intel SpeedStep technology and demand-based switching lacking on several processors

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1. AMD-6132™ HyperTransport™ technology PCI-X® interface
2. AMD-8132™ HyperTransport™ technology PCI-X® interface
3. AMD-8132™ HyperTransport™ technology PCI-X® interface
4. Intel-5000P, 5000V and 5000X Chipset
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<table>
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<tr>
<th>SYSTEM COMPARISON</th>
<th>QUAD-CORE AMD OPTERON™ PROCESSOR (45NM)</th>
<th>QUAD-CORE INTEL XEON PROCESSOR 5400 SERIES¹</th>
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<tbody>
<tr>
<td>Modular, glueless scalability</td>
<td>Yes</td>
<td>Requires Northbridge</td>
</tr>
<tr>
<td>SMP Capabilities</td>
<td>Up to 2 Sockets/8 Cores</td>
<td>Up to 2 Sockets/8 Cores</td>
</tr>
<tr>
<td>Direct Connect Architecture</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Native Multi-Core Technology</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>High-Performance 32-bit and 64-bit computing</td>
<td>AMD64</td>
<td>EM64T</td>
</tr>
<tr>
<td>HyperTransport™ technology</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Integrated DDR2 memory controller</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hardware-Assisted Virtualization</td>
<td>AMD-V™ with Rapid Virtualization Indexing</td>
<td>VT</td>
</tr>
<tr>
<td>Memory support</td>
<td>RDDR2 400/533/667/800</td>
<td>FBDIMM 533/667/800</td>
</tr>
<tr>
<td>Maximum Memory bandwidth 2P System</td>
<td>25.6GB/s¹</td>
<td>25.6GB/s</td>
</tr>
<tr>
<td>Maximum I/O bandwidth with 2P System</td>
<td>16.00GB/s¹</td>
<td>14GB/s</td>
</tr>
<tr>
<td>Maximum total bandwidth with 2P System</td>
<td>41.60GB/s¹</td>
<td>25.60GB/s</td>
</tr>
<tr>
<td>Maximum Graphics Support</td>
<td>Dual PCIe® x16</td>
<td>PCIe® x16</td>
</tr>
<tr>
<td>L1 cache size (max)</td>
<td>64KB (Data) + 64KB (Instruction) per core</td>
<td>32KB (Data) + 32KB (Instruction) per core</td>
</tr>
<tr>
<td>L2 cache size (max)</td>
<td>512KB per core</td>
<td>6MB (shared) x 2</td>
</tr>
<tr>
<td>L3 cache size (max)</td>
<td>6MB (shared)</td>
<td>N/A</td>
</tr>
<tr>
<td>SIMD Instruction Set Support</td>
<td>SSE, SSE2, SSE3</td>
<td>SSE, SSE2, SSE3, SSE4</td>
</tr>
</tbody>
</table>

¹ AMD 2P System – AMD Opteron™ 2000 Series processor with 1 HyperTransport™ technology bus and 2 HyperTransport™ technology I/O Buses with DDR2 800 memory

² With Intel 5400 chipset (http://www.intel.com/Products/Server/Chipsets/5400/5400-technicaldocuments.htm)

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