June 22, 2009 -**By Frank J. Ohlhorst**

From Shanghai to Instanbul--Upgrading to AMD's Six Core Opteron

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AMD hopes to fuel server upgrades with their latest Opteron CPU, code named Istanbul. Istanbul is designed to be a drop in replacement for previous generation Opteron CPUs and brings six cores and a 50% performance boost to the table. Follow along as we upgrade a server from a four-core Shanghai to a six-core Istanbul and determine if there is any "bull" in AMD's Istanbul claims.

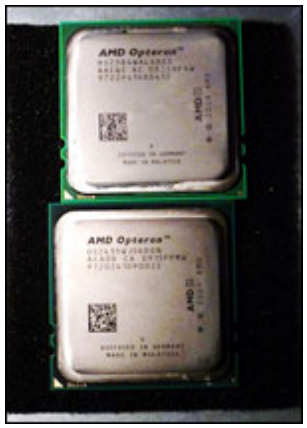
Virtualization, cloud computing, thin client computing, and telepresence technologies are becoming common place as services delivered by datacenters. While that is good news for users of advanced technologies, there is a dark side—the costs and hassles of replacing servers to handle the load generated by those applications.

That situation drove AMD to ask a simple question: "What if you could just increase performance with a CPU change?" AMD's answer comes in the form of a Six Core Opteron processor, code-named Istanbul. While both Intel and AMD have offered the ability to upgrade CPUs in the past, other hardware was usually required to gain any significant performance improvement, sometimes necessitating a cooling fan or power supply upgrade as well.

Istanbul is different, the CPU has the same power and thermal profile as previous Opterons (such as the four-core Shanghai and four-core Barcelona), which makes upgrading a much simpler endeavor. Those

performing Opteron upgrades will not have to change cooling fans, power supplies, motherboards, or anything else for that matter—all that may be needed is a simple BIOS upgrade.

Keeping the power and thermal envelopes the same creates a big advantage for those upgrading data centers. Simply put, a Shanghai (or Barcelona) to Istanbul upgrade will not affect the power used by a server rack, nor will it affect how a server rack is cooled. That simple notion eliminates the need for additional electrical load planning, cooling assessments, and vastly reduces the time an upgrade would normally take in the data center. *Continued...*



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About Istanbul

There is a lot more to Istanbul than two additional cores, AMD has incorporated several other enhancements that will boost performance even more. AMD has decoupled the north bridge and HyperTransport clocks in Istanbul, allowing higher HyperTransport frequencies. Istanbul features a HyperTransport clock of 2.4GHz, resulting in a 4.8 GT/s transaction rate. The north bridge clock now runs at 2.2Ghz, which maintains the speed of Istanbul's larger L3 Cache, preventing errors.

Another innovation comes in the form of AMD's HT Assist, a new feature designed to improve the synchronization of cache data across multiple cores and multiple CPUs. HT Assist works by reserving space in each processor's L3 cache for an index of where that CPU's cache lines are being used. That way if any CPU needs an update about a particular cache line, it will most likely know which CPU to probe for the information. AMD claims that HT Assist can replace broadcast probe requests (sent to all sockets) with directed requests 72% of the time, a reduction in probe traffic offers big gains in available system bandwidth. AMD was able to demonstrate stream bandwidth increased from roughly 25GB/s to 42GB/s with the addition of Istanbul processors with HT Assist on a 4P system.

Creating the baseline

To judge how these improvements translate into the real world, we went through the process of upgrading a SuperMicro 2U dual processor server from a pair of Shanghai CPUs to a pair of Istanbul CPUs. The goal was to step through the upgrade process and measure the results, without changing any components or software, other than flashing the server's BIOS with the latest version.

The SuperMicro server featured a SuperMicro H8DMU+ motherboard, 16GB of DDR2 memory, and a pair of AMD 2.7Ghz Quad-Core AMD Opterons (model 2384), running Windows Server 2008 R2 (release candidate).

We first upgraded the BIOS to the latest version (R3.5) and then we ran some performance utilities to create a baseline for our "pre-upgrade" numbers.

Our baseline and post upgrade benchmarking was done with Performance Test v7.0 (64 Bit) from PassMark software, SpecJBB2005 from Spec.org, and CPU-Z from CPUID.COM. *Continued...*

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Thats not very cost effective unless you're limited on space...
5 servers to upgrade (as you mention in your conclusion) means downtime for BIOS upgrades and the CPU swapping, plus $1100 times 10 (assuming dual socket for each server) means $11000. Sure you could spend as much or more buying a server but most wouldn't plus with the addition of a server you've got more resources to spread (Storage space and server resources which you might be able to run 4-20 additional virtual servers) I'd rather have the new server but I suppose there are cases where it would be cost effective to upgrade rather than add... special application or database servers maybe...

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