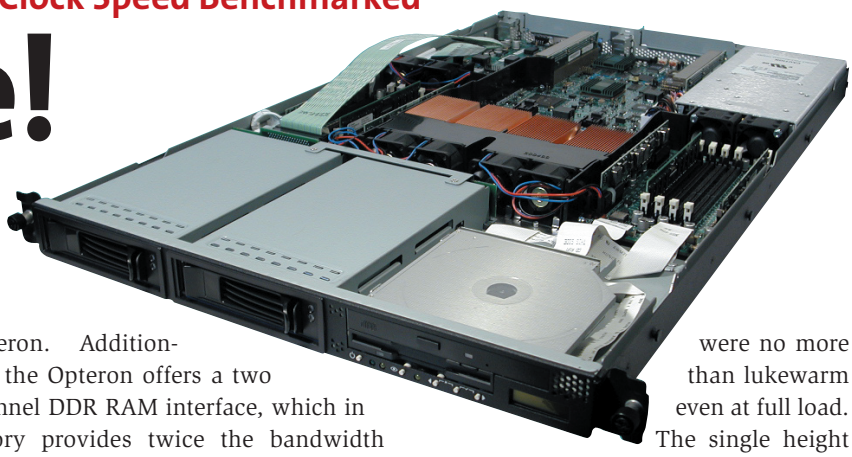
AMD Opteron 244 with 1.8 GHz Clock Speed Benchmarked

Hardcase!



AMD's new 64-Bit processor was released at the end of April. Together with colleagues from Tom's Hardware Guide we tested the Opteron, alias Sledgehammer, on 32 and 64-Bit Linux. BY DANIEL COOPER

The AMD Opteron is obviously targeted to compete with Intel's Itanium 2, although its technological approach is quite different. The Itanium 2 is more or less 100% a 64-bit processor and runs 32-bit applications in an emulation mode with considerable performance loss. The Itanium 2 is completely at a loss in the case of 16-bit code, as used by some Windows drivers.

32-bit software will be around for a while; there are no 64-bit x86 versions of current commercial software packages at present. This is why AMD chose to retain a high level of 32-bit performance, despite useful 64-bit processing speeds. This is also the reason why we chose to benchmark both systems for 32-bit and 64-bit performance.

Inside Information

The Opteron is based on 0.13 micron SOI (Silicon on Insulator) process technology and will initially run at clock speeds between 1.8 and 2.2 GHz. The processor has a 12 stage core pipeline (Itanium 2: 8 stage), 64 Kbytes of L1 cache memory (Itanium 2: 16 Kbytes) and 1 Mbyte of L2 cache (Itanium 2: 256 Kbytes). Although the Opteron has only three integer and MMX units (Itanium 2: 6), it does offer multiple floating point and address units. The Opteron also supports SSE2, whereas the Itanium 2 only supports SSE.

Just like Transmeta's Crusoe, AMD has integrated the Northbridge into the Opteron. Additionally the Opteron offers a two channel DDR RAM interface, which in theory provides twice the bandwidth running at 166 MHz. To provide support for multi-processor systems AMD has equipped the Opteron with no less than three 16-bit HyperTransport links.

But AMD has two strings to its bow as the Athlon 64 is another 64-bit CPU due for release in summer. The Athlon 64 is the Opteron's kid brother and sports 256 Kbytes of L2 cache, a single memory interface and only one HyperTransport link. The Athlon 64 is intended for use in desktop PCs and will replace the 32-bit Athlon.

Test Environment

The Opteron system was supplied in a single height case (see Figure 1) and came straight from AMD. The 1.8 GHz Opteron 244 is cooled by two copper heatsinks with two 4 cm fans each (see Figure 2). The Opteron is by no means a hothead – the heatsinks were no more than lukewarm even at full load. The single height case showed no tendency whatsoever to heat up, which is indicative of good thermal design characteristics.

The test system was equipped with 2 GBytes of DDR RAM (registered as ECC, timing 3,3,3) and two Seagate U320 SCSI hard disks. We took out 1 GByte of RAM just to countercheck our test results, but this had no noticeable effect. AMD had installed a beta version of SuSE's Linux Enterprise Server 8 (SLES 8) for 32 and 64-bit.

An Intel Itanium 2 System was not available for comparative tests at short notice; instead we used the 32-bit Xeon flagship product.

The Xeon system was equipped with 2 P4 based 2.8 GHz CPUs and 1 GByte of dual channel RD RAM (PC 800). We installed SuSE Linux 8.1 Professional and MySQL Bench with appropriate

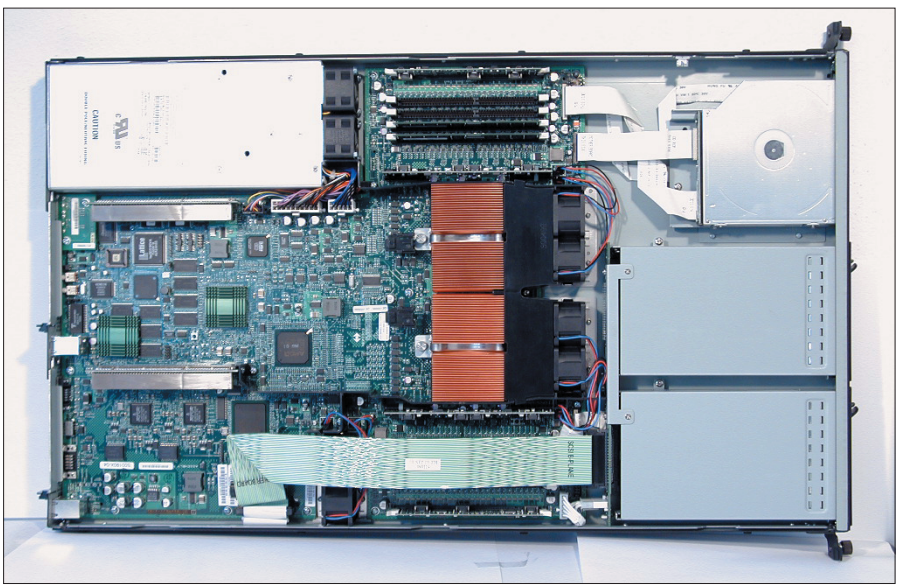


Figure 1: The motherboard of the single height server was patch wired in part, but the thermal design was above criticism

dependencies. As the SuSE Enterprise Server packages are the same version as SuSE Linux 8.1 Professional, differences between the two distributions should not be measurable.

Test Results

The test period was too short for anything apart from MySQL Bench with MySQL 3.23.52, although we will be presenting additional results in later issues.

As SuSE Enterprise Server does not include MySQL Bench, we borrowed the *mysql-bench-3.23.52-17.i586.rpm*, *perl-Msql-Mysql-modules-1.2219-144.src.rpm*, *perl-DBD-Pg-1.13-64.src.rpm*, and *perl-DBI-1.28-21.src.rpm* packages from SuSE Linux 8.1.

We had no trouble compiling and installing the packages, using *rpm -ba* both on the 64-bit and 32-bit SLES, and deliberately avoided optimizations. The MySQL servers themselves were supplied with the SuSE Enterprise versions.

We set the *maxcpus = 1* kernel parameter to restrict the test to only one processor. Hyperthreading was disabled on the Xeons, but this had no impact on our test results. Both Opterons were designated *Engineering Samples* as you can see in Figure 3. In other words they are pre-production just like the patch wired motherboard.

Warming up with MySQL

We selected the *alter-table*, *insert*, and *select* disciplines for the speed test – after all operations that involve manipulation of elements, inserting new records and SQL queries are highly representative of SQL usage. Diagram 1 shows the runtime for each of the benchmarks, with lower values indicating better performance.

The Alter-Table benchmark was a photo finish. This test only generates load on one CPU, multi-processor systems thus have no advantage. As deviations of three to four seconds are to be expected, these measurements are within tolerance thresholds.

The Opteron cannot leverage its second processor in the *select* discipline, the second Xeon provides a mere 10 per cent boost to the Intel system. In contrast, Intel's dual Xeon clearly lost out to an Opteron running at a clock speed a whole Gigahertz slower. The AMD processor has a 13 per cent lead over Intel in 32-bit mode, and a massive 40 per cent for 64-bit operations.

Intel's Xeon lost by a mile in the *insert* discipline. A single CPU system took over 20 minutes to complete the benchmark.

The Opteron running in 64-bit mode completed the same test in half the time, and it was still a third quicker in 32-bit mode. The dual Xeon caught up only slightly; in 64-bit mode a dual Opteron is 40 per cent quicker, and still 25 per cent quicker in 32-bit mode.

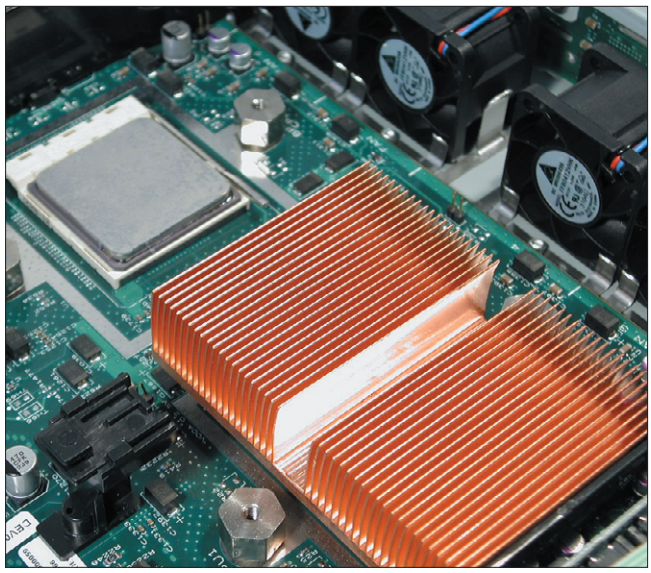


Figure 2: Both Opterons are located below flat copper heatsinks which in turn are cooled by four small fans

Conclusion

AMD's Opteron is clearly hot stuff, but a MySQL benchmark should not be viewed as the ultimate test of the Opteron's performance. More tests are essential, but one thing we can say is that Intel is in for a surprise. The Opteron's 32-bit MySQL performance figures were "a mere" 25 to 45 per cent lower than its 64-bit benchmarks, whereas Intel's new Itanium processor is forced to run 32-bit code in a slow emulation and capitulates when faced with 16-bit programs.

With the Opteron and its 64-bit kid brother, the Athlon 64, AMD may just achieve what Intel failed to achieve with the Itanium: a slow but sure migration of the PC community from 32 to 64 bits. ■

INFO

[1] Tom's Hardware Guide: *www.tomshardware.com*

Figure 3: The 1.8 GHz CPUs were pre-production engineering samples

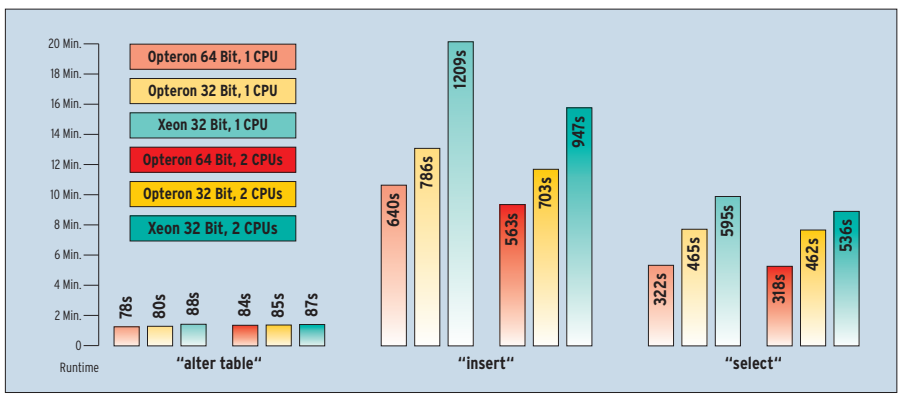


Diagram 1: The Opteron produced convincing performance results, in both single and dual CPU configurations with 32 and 64-bit software. The AMD's 32-bit performance is in the region of 25 to 45 per cent less than 64-bit performance; Intel's Xeon lost out badly