The End of x86

By Peter N. Glaskowsky

The following is an adaptation of remarks delivered as my introduction to Microprocessor Forum 2002.

Welcome to Microprocessor Forum 2002, our fifteenth annual fall event. Those of you who attended our first conference in 1988 may recall that it was a RISC-centric affair. There were no x86 processors in the program that year. In 1989, we had our first x86 presentation, and x86 has been a major part of the Forum ever since. But not this year. For the first time in fourteen years, no x86 processor will be announced here. We have come full circle; the market has moved on.
X86 might still be a major part of our program if not for Intel's 1994 decision to purchase Digital Semiconductor and adopt the Alpha processor as Intel's workstation and server processor of choice. Though the purchase may have been forced on Intel by Digital's threat of litigation, Intel got a great deal. Along with Alpha, Intel acquired the StrongARM processor, a substantial portfolio of communications products, and Digital's unmatched circuit-design talent. We can see today that Intel's decision to support Alpha was a turning point in our industry. With Intel's considerable resources behind it, RISC-based Windows NT took off immediately.
By 1999, RISC-based Windows NT systems had moved out of server rooms to take over the corporate desktop. The transition to NT in home systems has taken longer than expected, but Microsoft's decision to release only the 64-bit RISC version of Windows XP means the eventual end of x86 PCs. Intel and AMD will sell over 30 million x86 processors into low-end home computers this year—almost 20% of the total PC market—but few Tier One OEMs are likely to introduce new x86 PCs in 2003.

**PENTIUM REACHES END OF ROAD**

_Citing Lack of Desktop Demand, Intel Drops Pentium 5 Plans_

_By Kevin Krewell [1/28/02-01]_

The world's fastest x86 processor will be Intel's last. With Alpha now representing 80% of Intel's shipments into PC desktop, server, and workstation systems, the company has shelved release plans for the Pentium 5 processor now under development and will transition its x86 developers to new mobile and desktop Alpha processors. Elements of the Pentium 5 design are likely to be reused, including its cache structure and bus interface, but there is little in the processor core that can be applied to an Alpha design.

The Pentium 4 design, although technically impressive, failed to recoup Intel's investment. Even at 1GHz, a speed no other CISC processor could approach with current process technology, Pentium 4 has been unable to compete effectively.

The OEM and end-user preference for Windows XP is behind Intel's decision, announced early this year, to stop further development of Pentium processors for PCs. Though the 1GHz Pentium 4 is an impressive accomplishment, no amount of tweaking will let an x86 core compete against the 8GHz RISC designs we'll see today. Intel continues to offer low-end x86 chips for low-margin applications such as information appliances, but we wouldn't be surprised to see Intel sell off the last of its x86 business within the next year or two.

We have a remarkable variety of presentations for you today, but I'd like to highlight just three. I'm sure you're all eagerly waiting to hear about Intel's Alpha EV11, the world's first massively multithreaded processor architecture. This new design, which will be made in variants supporting from 8 to 32 threads and up to 24 execution units, depending on the target market segment, could very well account for over half of all Intel-based PCs and servers sold in 2004.
As a Mac user, I'm also looking forward to AMD's disclosure of the PowerPC 680. AMD's 1995 decision to license the PowerPC architecture certainly paid off. Though most of AMD's production goes into Windows XP systems, the company competes strongly with both Motorola and IBM for sales into the low-volume but high-prestige Apple Macintosh market.

We're also happy to have HP-Sun here to present its next-generation EPIC III processor, the latest VLIW implementation of the SPARC instruction-set architecture. As you know, 2002 will see the final shipments of HP-Sun's PA-RISC and SPARC systems. This commitment to EPIC was a major component
of the merger of the two companies in 2001. The new EPIC III processor being announced here today will provide an excellent platform for both technical computing in the HP division and business systems under the Sun brand.

You may remember the rumors from 1994 that Intel was negotiating with HP to co-design EPIC as an x86-compatible VLIW machine. How different the world would be today if that deal hadn't fallen through...

Okay. Back to reality.

Obviously, that's not how the world turned out. Aside from the details of corporate alliances, the most striking difference between my little fantasy and the real world today is the strength of x86. Not only is Pentium 4 the fastest and most successful PC processor in the world, but AMD's plan to extend the x86 architecture for 64-bit computing means we could be looking at another 20 years of x86 PCs and servers. So, for the foreseeable future, x86 will continue to play a major role at Microprocessor Forum. In fact, we had several important x86 presentations at the Forum this year.

All of the RISC architectures that vied for Windows NT system sales in the mid-1990s are still around, but not in PCs. Some still contend for shares of the server business, but only IBM's Power and Sun's SPARC seem to have long-term prospects there. The Intel/HP Itanium project has cut the legs out from under Alpha, MIPS, and PA-RISC.

Itanium got off to a shaky start, but it's standing on its own two legs today and is likely to cover considerable ground over the next several years. Intel has hinted at some remarkable Itanium designs in the works, and we heard more hints in Forum presentations from Intel's John Crawford and Robert Yung.

In the embedded world, RISC has nothing to fear from x86. Both approaches have natural applications in embedded systems, as we heard on the second day of MPF 2002, but RISC owns most of the overall embedded market. Network processors, media processors, and the best low-power and high-performance embedded processors are all RISC designs.

Microprocessor Forum 2002 was a great success, and we hope to see you all at the next Embedded Processor Forum in June and at MPF 2003 next October.