Arc of an Architecture: The i860

Not All Intel Architectures Have Been as Successful as the x86

NOVEMBER, 1988—Intel is expected to introduce a new RISC processor, code-named the N10. We hear that the N10 is capable of operating as a stand-alone processor, but that it will be marketed solely as a coprocessor for the 486 and, perhaps, the 386. The N10 is expected to be introduced sometime next spring, and to provide floating-point performance well beyond that provided by the 80387.

The N10 was announced as the i860. Intel shifted its positioning at the last minute to promote the chip as a Unix engine as well as an accelerator:

March, 1989—[the formal announcement of the i860.] The level of integration and performance of the i860 represents the next trend in general-purpose microprocessors. However, few microprocessors will leave the raw pipelines as exposed as they are in the i860.... This chip is perhaps the most unusual microprocessor design yet, and seems destined for success in high-end 3D graphics and floating-point applications. Its success in a broader range of applications is much less assured.

No other processor has exposed its pipelines to the degree the 860 did.

OCTOBER 1989—Rumors began circulating last month that i860 architect Les Kohn and other members of the design team had resigned from Intel.

Kohn eventually went on to work on UltraSparc at Sun and is now an architect at C-Cube.

NOVEMBER 1989—Intel and Alliant Computer Systems have announced plans for a set of extensions to the i860 hardware and software to support parallel processing [called PAX].... Given that Intel does not yet have fully functional silicon on the basic i860, it seems rather extreme (some say desperate) to be adding another level of complexity to the system architecture.... If—and this is a big if—the PAX standard is widely supported by hardware and software vendors, it could push the i860 ahead of its competitors for these application areas.

JANUARY 1990—In theory, the PAX standard will create "shrink wrap" software for 860-based systems ranging from workstations to supercomputers.... Alliant claims that over 50 software vendors have "endorsed the standard," but it remains to be seen how quickly these endorsements turn into products.

No systems supporting the PAX standard were ever introduced, nor was any software to support it. Alliant went bankrupt.

APRIL 1990—Intel's 860, while still facing an uncertain future as a Unix workstation central processor, looks like a big winner in the high-end graphics market.... With IBM, DEC, HP, and a slew of smaller companies all behind the 860 as a graphics engine, its future in that market seems assured.

Despite the fact that 3D acceleration was the market in which the 860 was succeeding, Intel kept up its ill-fated push into the workstation market :

NOVEMBER 1990—Intel is expending a tremendous amount of effort trying to push the 860 into a market that doesn't want it.... Its efforts to sell the 860 into the workstation market are misdirecting its attention.... If Intel wants to penetrate the Unix market, a 486 variant with a faster floating-point unit and larger caches would be a better bet than a next-generation 860.

The introduction of the second-generation i860XP didn't change its prospects:

JUNE 1991—The i860 was announced too late and had too many software problems to have a real chance of penetrating the general-purpose workstation market. Intel no longer claims that the i860 will compete in the mainstream Unix workstation market.

Soon, the end was in sight:

AUGUST 1991—Rumors have been circulating that Intel is cutting back on future 860 and 960 developments to put all its weight behind the x86.... Ken Fine, general manager of the group responsible for the 860 and 960, said that the company is "continuing to invest heavily in the 860 and 960," and that no resources have been taken away from these projects.

Within a year, we filed the death certificate.

DECEMBER 1992—The i860 has seen its last remaining system vendors either withdraw from the market (Oki), switch to another CPU (Stratus), or go into bankruptcy (Alliant). This leaves the chip in a niche market as a 3D-graphics accelerator and as the CPU in Intel's massively-parallel supercomputers. ... Intel may have to build an x86-based supercomputer before it can terminate the i860.

Intel never developed any new i860 processors, and it recently completed a massively parallel supercomputer based on Pentium Pro processors. ♦