Intel Finally Embraces StrongArm

Intel has officially become an ARM licensee, clearing the way for the processor powerhouse to assume responsibility for StrongArm. Assuming the FTC approves Intel's acquisition of Digital Semiconductor (see MPR 11/17/97, p. 1), Intel will soon begin producing and marketing the SA-110, SA-1100, and SA-1500 microprocessors. Intel has also said it will continue the development of StrongArm processors and support chips already under way at Digital before the acquisition offer was made.

Financial terms of the Intel/ARM licensing agreement were not officially disclosed, but sources indicate no money changed hands. ARM and Digital have had a cross-licensing agreement in place since 1995 when StrongArm was first being developed. That agreement is among the Digital assets that Intel will acquire. The negotiations between ARM and Intel were focused on fine-tuning the rights each party gains.

The transfer of Digital's license means that ARM is now covered by a broad cross-licensing agreement that gives it access to many of Intel's patents. The British company may use some of Intel's intellectual property in ARM10 or future designs, or it may just use the agreement as a legal umbrella, protecting itself from unintended infringement. ARM is specifically prevented from producing x86 chips.

Under the revised cross-licensing agreement, Intel shares ownership of the StrongArm core with ARM (as did Digital) and has unlimited rights to design new StrongArm-based chips. Intel can also sublicense StrongArm should it wish to do so, but the company has said it has no interest in renting out its newest processor architecture.

Intel's StrongArm license gives it considerably more freedom than the average ARM licensee is granted. Intel has complete leeway in the microarchitectural design of future StrongArms. As long as the devices remain software-compatible with ARM's architecture specification, Intel can implement the chips any way it likes. In contrast, most ARM licensees are given transistor-level, or even layout-level, chip definitions to fabricate.

The licensing transfer between ARM and Intel ends months of nervous waiting among StrongArm's customers, who were never sure if their chosen processor would have a future under the new regime. Certainly, the FTC still has the right to modify or negate the entire deal, casting the future of StrongArm into doubt once again. But assuming the FTC smiles on the union, StrongArm can again become a force in the embedded market. Customers who were on the fence can choose StrongArm with confidence, and defectors may return. Looking forward, Intel now has a creditable product line for high-performance but low-power products such as digital cameras, network computers, and television set-top boxes. Under Intel's wing, StrongArm will be a force to be reckoned with. —*J.T.*

Falling Apple Kills Newton

As its corporate revenues turn sour, Apple is trimming unfruitful business units in an effort to pare expenses to the core. The latest casualty is the Newton OS, a blow not only to fans of the handheld MessagePad and eMate notebook computers, but to the StrongArm processor as well.

Newton entered the market with high hopes ("a watershed event;" MPR 9/13/93, p. 3), as it was the first handheld computer with a graphical user interface. The original Newtons, based on an ARM610 processor, had much of the power of a personal computer yet fit in one's hand and sold for less than $1,000. Without a keyboard, Newtons accepted handwritten data.

Although these systems represented the birth of a new platform—former Apple CEO John Sculley coined the term personal digital assistant (PDA) to describe the category—like many initial products, they had many problems. The handwriting recognition was famously inaccurate, PC and Mac connectivity was poor, and they were too expensive for widespread deployment. Apple improved the first two problems over time, but the Newton remained a bulky, expensive device that saw its greatest acceptance in vertical markets.

The Newton OS was designed to be very flexible, yet Apple was slow to capitalize. The company was slow to move to faster ARM processors, although it eventually deployed versions based on the StrongArm-110, and it never produced a smaller, less expensive version. The Newton's flaws were vividly exposed by the success of the Palm Pilot, which fits in a shirt pocket and sells for about $300. The Pilot is less powerful and has a more limited repertoire, but it does what many people want. Palm (now part of 3Com) sold more than one million Pilots in the past year, versus 65,000 Newtons.

Apple could have sold the Newton line to another company or even spun it off to the employees, but the company apparently wanted to keep the employees and the technology in house. Sources indicate Apple is continuing work on the eMate platform (which is also based on Newton OS), shifting it to MacOS. Apple will support Newton itself, but all work on future Newton-compatible devices has been terminated.

The end of Newton will have a significant impact on StrongArm. The SA-1100 was designed primarily for Newton, although it can (and will) be used in Windows CE systems. Last year, roughly 30% of the 250,000 StrongArms that Digital shipped went to Apple.

Intel's pending purchase of StrongArm (see previous item) may soften the blow. Intel is likely to focus StrongArm on Windows CE units that work as "PC companions" as well as on new applications such as set-top boxes and digital cameras. While Newton's passing deserves a tear, the category it

advanced will continue onward and is likely to thrive—at companies other than Apple. —*L.G.*

Motorola Speeds Embedded PowerPC EC603e

Scant months after announcing four speed grades of its new embedded PowerPC EC603e (see MPR 10/6/97, p. 8), Motorola has released two speed bumps. The EC603e is now available in 233- and 266-MHz speed grades, a 33% boost from the earlier speed limit.

Quantity pricing is $68 for the 233-MHz part and $81 for the 266-MHz version, a small premium over the $0.22/MHz average price for the slower four chips. Although the company has not announced any plans, IBM may follow Motorola's move within a few weeks. In the same 0.35-micron process, IBM and Motorola have been able to push desktop 603e chips to 250 MHz. Thus, any additional speed upgrades for the EC603e will have to wait until capacity of 0.25-micron wafers improves.

Motorola and IBM have made a very aggressive move into the high-end embedded market with the EC603e (or, to IBM, the EM603e), disabling the chip's floating-point unit as grounds for slashing prices to as little as $20. The chips' superscalar execution and fast, wide bus interface make it a formidable competitor to devices such as QED's RM52xx and NEC's VR54xx chips (see MPR 3/9/98, p. 1). The new speeds now match anything the MIPS vendors can do. At this rate, embedded PowerPC 740 chips may not be far behind. —*J.T.*

Xilinx Offers Microprocessors in FPGAs

Through a number of agreements with third parties, Xilinx is offering several design macros for its programmable logic arrays, including a 16-bit CPU core, FIR filter, Reed-Solomon encoder, and UART. The macros are available for a one-time license fee; no royalties are charged. All macros are compatible with Xilinx's XC5200 family of FPGAs as well as the company's newer Spartan family.

In the case of the CPU core, the design is licensed from T7L Technology (North York, Ontario; *www.t7l.com*). The CPU is a proprietary design, which the company says is scalable from 8 bits to 32 bits. In its 16-bit incarnation, the CPU uses 36% of an XCS30XL logic device. Since the FPGA itself costs less than $10 in volume, users could design their own integrated 16-bit processor with custom peripherals and/or memory at a small premium over standard 16-bit chips.

The overall concept is similar to Motorola's recently announced Core+ chips (see MPR 2/16/98, p. 10), which merge a hardwired ColdFire CPU with programmable logic. In both cases, the hybrid CPU/CPLD devices should appeal more to designers who are already using programmable logic and want to eliminate a separate microprocessor than to those looking to create a new CPU-based design. The clock speed of these "soft" microprocessors would generally not be up to those of a conventional CPU; power consumption is likewise compromised. For moderate volumes, though, these chips provide an interesting design option. —*J.T.*