THE EDITOR'S VIEW

# Lessons from the 88000's Demise

## Advanced Technology Fails to Find Support in the Marketplace

Data General's abandonment of the 88000 *(see **0909MSB.PDF**)* puts the final nail into the coffin of Motorola's original RISC processor. The saga of the 88000 shows how a well-designed product can fall prey to intracompany bickering and a poorly executed strategy.

Around 1985, Sun decided to switch to a RISC processor instead of Motorola's flagship 68000 line, which ruled the workstation market at that time. At first, the two companies hoped to jointly develop a RISC processor, but Sun soon realized that Motorola's emphasis on the 68000 would prevent it from making a serious commitment to a fledgling RISC product. So Sun went its own way, developing SPARC, while Motorola's efforts resulted in the 88000.

The first product in this family, the 88100, achieved volume shipments in 3Q89. It was unique in integrating a floating-point unit on the CPU chip and including 32K of primary cache in the three-chip set. The 88100 was the first announced microprocessor to use techniques such as register scoreboarding and glueless multiprocessing that are common today. Its performance was three times that of 68030 chips available at the time and ranked it among the top RISC processors.

Motorola's 68000 group, however, was concerned that the new device could cannibalize its successful business. To avoid conflicts with the 68000, Motorola initially sold its new device at extremely high prices: from $1,700 to more than $3,000 for a three-chip set. Pressure from the 68000 group also killed a proposal to offer migration tools from the 68000 to the 88000, and generally prevented the company from devoting the resources needed to build software, system, and tool support for the new instruction set.

As a result, the 88000 couldn't gain traction in the market. Instead of moving to the 88000, Sun, HP, NCR, and Digital abandoned the 68000 for SPARC, PA-RISC, x86, and MIPS, respectively. Early 88000 adopters such as Stratus and Opus moved to other architectures, and Tektronix shut down its workstation business. Motorola's biggest design win was at Data General, which became a second-tier workstation vendor with its line of 88000-based Aviion systems.

Ironically, the 88100 attracted many low-volume design wins. Its integrated design was ideal for vendors that needed strong performance with little upfront effort. The processor's high cost and lack of other distinguishing features, however, made it poorly suited for high-volume applications. Motorola began work on an 88300 line of embedded processors, and even had a design win at Ford, but these chips never reached the market. The Ford win was converted to a PowerPC core.

Motorola's second generation, the 88110, was its last great hope. By combining the original three chips into one and adding other performance enhancements, the company hoped to produce an inexpensive yet powerful chip. Motorola worked closely with Apple, its biggest 68000 customer, on the design of the new chip, hoping that the PC vendor would adopt it.

Motorola originally planned to deliver the 88110 by 4Q90, but in the spring of 1991, it still had not delivered fully functional parts. Apple had also grown disenchanted with the 88000, realizing that it would be the sole major system vendor using the parts and would thus bear the brunt of supporting the architecture. Apple, IBM, and Motorola announced the PowerPC architecture that July, with Apple agreeing to use the new chips in its systems. Motorola's adoption of a new RISC architecture marked the beginning of the end of the 88000.

The 88110 did not ship until 3Q93, setting a record for most months between announcement and delivery, and it never reached its target clock speed of 50 MHz. An 88120 was promised but never delivered.

The 88000 processor is survived by its system bus, which became the PowerPC 60x bus. Several embedded applications, particularly in the telecommunications area, will continue to use the 88100 for years, until their products reach end of life. Perhaps the 88000's biggest legacy is from 88open, the users group for the 88000, which created a multivendor binary standard and certification tools to verify that a particular program would run on all conforming platforms. This group became a model for organizations such as PowerOpen and the PA-RISC Organization.

With RISC efforts from Motorola, Intel, and AMD either failed or driven into the embedded market, it is clear that to survive, a RISC architecture must have a strong system patron, as do the remaining five desktop RISCs. The collapse of Intergraph's Clipper processors provides a corollary: an architecture is only as strong as its biggest system vendor. Sun, Digital, and Silicon Graphics must prove that they can compete in the new, undifferentiated desktop and server markets, or their architectures may also face extinction.♦