Microprocessors for the Indecisive

Motorola Stacks a Fourth 32-Bit CPU Into Its Deck; Is It Too Much?

How many CPU architectures does one company really need? With Motorola's announcement of M•Core (see MPR 9/15/97, p. 4) the company adds a fourth 32-bit architecture on top of ColdFire, PowerPC, and the 68000. And that's in addition to the company's strong 68HC05, 68HC08, 68HC11, 68HC12, and 68HC16 microcontroller lines. Is this a shrewd product strategy, or merely signs of schizophrenia?

I think Motorola's move comes not a moment too soon. Even a broad product line can have holes in it, and Motorola's has a big hole right in the spot where low-power, 32-bit ASIC cores go, a region that ARM, MIPS, and some newcomers address today.

Few companies have Motorola's experience with embedded designs, and none is better equipped to understand that a few products can't address all needs. There's no such thing as a typical embedded application, and the market is scattering. To cover all the options, Motorola is expanding its play-book. Let's review.

PowerPC tackles the high end: systems where performance and software compatibility are important and power consumption isn't. Still, with 85% of these devices tied to the fortunes of a foundering system vendor, users of the other 15%—embedded designers—are exercising caution.

The 68K is for the sentimental. Not counting PCs, the 68K family still outsells every other 32-bit architecture, and all the RISCs put together. Unit sales of 68K chips are actually increasing by 10% per annum, and Motorola doesn't expect volume to level off until after the close of the millennium (this millennium, not the next). All this attention goes to chips with abominable price/performance (for example, a 40-MHz 68040 lists for $192).

ColdFire handles low-cost control systems. The architecture initially got mixed reactions from the user base. ColdFire is touted as a variable-length RISC architecture (an oxymoron of the first order), and many people first thought it compatible with PowerPC, then saw it was descended from the 68K. Finally, the realization set in that there is no binary compatibility among any of these families. To this day, Motorola still does not supply a source-level translator between 68K and ColdFire code, though this may change soon.

Motorola needs M•Core to compete in the portable market, which is where a lot of future CPU volume is headed. PowerPC is too big and complex, the 68K will expire (eventually), ColdFire is synthesized, which compromises speed and power, and the 16-bitters aren't fast enough.

The problem with maintaining so many product lines is internecine competition. Motorola needs to clearly separate 68K, ColdFire, PowerPC, and M•Core so it doesn't cannibalize its own business. In this case, I don't think Motorola's customers will have much trouble distinguishing M•Core from its stablemates. M•Core should be far more power-efficient than ColdFire with equal or better performance. The initial M•Core chips should run at 50 MHz; the fastest ColdFire parts currently plod along at 33 MHz. The only thing that would make these two families comparable would be if Motorola grossly overprices the M•Core parts.

More direct competition is likely to come from ARM and its many devotees (23 at last count). The English company made its mark providing flexible, low-power CPU cores to telecommunications and consumer-electronics vendors. Ericsson and Nokia, Motorola's two biggest competitors in the wireless business, both selected ARM for upcoming projects—as has Motorola itself, in what must have been a galling decision (see MPR 3/31/97, p. 4). Hitachi's SuperH is also making inroads here. Motorola will have to follow this well-worn path with a significantly better product to wrest away design wins.

Motorola's decision to license M•Core to outside companies is another nod to the realities of business in the '90s. Licensees could help wedge the architecture into little niches that Motorola either doesn't see or can't reach. The company may have a tough time finding any chip makers in the northern hemisphere that aren't already ARM licensees, though. It's hard to foresee any significant foundry signing up at this late date, unless it's at the behest of a major customer.

Microprocessors tend to be an IC vendor's flagship—its defining product. Public attitudes can be swayed by the ups and downs of a company's chosen architecture, out of all proportion to its real value. Egos are involved, and there's more than a little partisan flag-waving in most camps.

Yet each vendor's real goal is—or should be—to provide the tools necessary for engineers and designers to create the products they want. That requires more than just a lot of different chips. It requires different instruction-set architectures with different characteristics. A company with only one or two architectures can't compete in all markets. It takes a big company to admit it doesn't have the right solution for every problem—and then to fix it. M