THE EDITORS' VIEW

PDAs—The Next Big Processor Battle

Multitude of Processor Makers Look for Pot of Gold at End of Rainbow

In the late 1980's, it seemed that every processor vendor was going to take over the desktop computer market with their superior RISC processors. In the early '90's, having found out what a tough battle this was, the laser printer became the nearly universal target. Alas, while laser printers are indeed a large market, Motorola's 68000 family has managed to hold on to much of it, and AMD and Intel captured most of the rest.

Now the market for personal digital assistants (PDAs) and other handheld gizmos is getting all the attention. Once again, processor vendors smell an opportunity for new architectures to gain a foothold in what promises to be a multimillion-unit market.

Just a few months ago, the list of processors publicly chasing this market was short: AT&T's Hobbit, which is being marketed solely for personal communicators, and the ARM processor, catapulted into the limelight by Apple's selection of it for the much-hyped Newton.

Last month, Motorola joined the pack with its announcement of the 68349 "Dragon I," which was designed in collaboration with General Magic. Most recently, NEC's V810 and Hitachi's SH7000 family joined the fray with new architectures.

This fall, the Intel/VLSI Technology joint venture will throw its hat into the ring with a two-chip set that includes a 386SL core and all the other functions for a basic PDA. AMD is also working on x86 devices for this market (see pages 4 and 5).

Others are looking in this direction as well. AMD is rumored to have a PDA design win for one of its 29000-based microcontrollers; Sun has a division developing personal communicator technology; MIPS is rumored to be developing a PDA chip; and Motorola is reportedly planning a derivative of its PowerPC 603 chip for personal communicators. This leaves Intel's 960, HP's PA-RISC, and DEC's Alpha as the only leading architectures *not* aiming for this market—yet.

The appeal is understandable; this is a new territory, which will require new software, and therefore does not have the barrier to entry for new architectures that has kept non-x86 chips out of the PC market.

Success will depend, in large part, on alliances with software suppliers. Most of the processors fighting for this market are tied to a particular operating system. Some degree of success will be possible without any third-party software alliances, since some devices will come with all the software they will ever run, and such devices can use any processor.

Calling a winner in this battle is impossible at this point. It is very early in the game, and many cards have yet to be played. It is like looking at personal computers in 1975—the Imsai, Altair, Commodore, Apple II, and Northstar—and trying to guess which will dominate in the 1990's. The answer may be none of them. Even if Magic Cap, for example, turns out to be the big winner for personal communicators, that wouldn't necessarily mean a long-term success for the 68000 family; the OS will be ported to other architectures long before volumes reach their potential.

While it is tempting to make comparisons based on the technical merits of the current chips, it is next to impossible to make a clear evaluation today. There are no performance benchmarks quoted by all the vendors except Dhrystone, and this is an inadequate indicator of performance, especially on object-oriented code (such as Newton or PenPoint) that has much poorer locality of memory references. Power consumption figures aren't much better. Some companies quote typical numbers, while others quote maximums; some quote with minimal capacitive loads, while others quote with realistic loading levels, and the true loading level depends on the overall system design. What should really be evaluated is the power consumption of the full chip set, but details on many of the support chips haven't yet been revealed.

A popular metric has been MIPS/mW, which isn't bad in concept—except that both the numerator and denominator are very poorly defined, resulting in an easily abused figure of merit. In any case, it isn't just the CPU that counts; it is the entire system. Comparing the MIPS/mW of a processor with on-chip peripherals to one without isn't very meaningful.

Another red herring has been the "my core is smaller than your core" battle. Some vendors have quoted their tiny core size in the same breath as they mention performance figures that require an on-chip cache many times the size of the core. When all the functions for a complete system are taken into account, modest variations in core size simply aren't very important.

When complete system solutions are available, we'll compare them on their total power consumption and application-level performance. Until then, beware of numerical comparisons, as they can be very misleading. ♦