THE PUBLISHER'S VIEW

What Is a 586?

Cyrix's 5x86 Blurs 486/586 Line—More Confusion to Come

Cyrix's latest microprocessor, code-named the M1sc and now officially christened the 5x86, once again raises the thorny issue of x86 microprocessor naming. As detailed in our cover story, Cyrix's chip falls between the 486 and Pentium in microarchitecture features and performance, but Cyrix is positioning it against Pentium.

Cyrix has cleverly defused the question of whether the 5x86 is literally a 586 or not. It's not—it's a 5x86, a name that conjures up the image of 586 without actually calling it that. The idea, which others are likely to follow, is to change the playing field instead of sticking by Intel's historical naming scheme (now abandoned by Intel, of course).

Despite Cyrix's avoidance of the literal 586 name, the new chip does raise the question of what constitutes a 586-class design. There are three aspects to look at: pinout, microarchitecture, and performance.

For hardware designers, pinout (or bus structure) is the defining feature for a processor class. For better or worse, however, the concerns of hardware designers no longer drive product naming decisions; PC buyers have become the critical audience *(see **0814ED.PDF**)*. As a result, this clear-cut categorization has been abandoned. For example, Cyrix's 486SLC and NexGen's Nx586 don't follow the pinouts implied by their names.

Microarchitecture is a more meaningful dimension for classification, but it defies simple categorization. In Intel's product line, it is superscalar operation that distinguishes Pentium from the 486, and decoupled, out-of-order execution (along with register renaming) that distinguishes the P6. But other designs can achieve similar performance goals using different features, or may use these features but make tradeoffs that put performance in a lower class. NexGen's Nx586, for example, isn't superscalar at an x86 instruction level, yet it achieves Pentium-class performance levels. Likewise, Cyrix's 5x86 is not superscalar but can match the performance of low-end Pentiums.

If processor names are now driven by end-user perceptions, should microarchitecture be a factor? Users certainly don't care whether their processor has branch prediction, or whether it is superscalar, except for the degree to which these features affect performance. For end users, a 586-class microprocessor could be defined by the net effect of the microarchitecture features: a certain range of performance per MHz. Since not all 586-class processors—by whatever definition—will deliver the same performance at the same clock rate, however, clock rate cannot be used as a performance metric even within a processor class.

Ultimately, since all that matters to users is delivered application performance (and price, of course), this has to be the metric used for selecting processors. What chip vendors need is a way to divert attention from clock speed to performance, eliminating the need for users to grapple with microarchitectural subtleties and the resulting variations in performance per MHz.

NexGen hit on what is likely to be a popular solution to this problem with its -Pxx suffix. Instead of using actual clock speed as the suffix, the company uses "Pentium equivalent" MHz. So a Nx586-P100 is supposed to deliver performance comparable to a Pentium-100, and the fact that it has a 93-MHz clock rate is irrelevant—and hidden from end users.

There is one big problem with this approach: while clock speed is a simple, objective measure, performance is not. Any single-number performance rating is a vast simplification of the reality, which is that the relative performance of two processors can vary greatly depending on the application and the system design.

For example, because integer programs are dominant, chip makers are likely to base their performance ratings primarily on integer benchmarks. For users who depend on floating-point performance, however, integer-oriented comparisons aren't valid and will typically overstate the performance of Pentium competitors. NexGen's current chips, for example, fall far short in FP performance, since they don't include any FPU at all.

The range of system designs presents another problem. What Pentium system should microprocessor vendors use as the basis of comparison? An older design, which makes a competitive chip look better, or the latest design? The right solution is to use an identical system design for both processors, but this is not always possible (as in NexGen's case). System designs also change over time, but chip vendors aren't going to want to change their ratings.

It seems inevitable that each chip vendor is going to choose its own method for deriving Pxx ratings, and it will be up to the press to be vigilant in validating or deriding them. Ideally, the creation of such ratings should be left to an independent third party, but chip vendors