THE EDITOR'S VIEW

Multimedia Boom Affects CPU Design

Vendors Apply Different Techniques to Handle Video, Audio Data

At Comdex, the signs of the multimedia explosion were everywhere. The hot PCs had CD-ROM drives and stereo speakers. Numerous vendors were hawking CD-ROMs full of video and audio clips on everything from Ted Williams to movie reviews. Add-in cards and special software provide services including voicemail, video-conferencing, and CNN, all using a standard PC.

Over time, audio and video data will become integral parts of most general-purpose software. This change will create a fundamental shift in the types of activities performed by the typical PC: instead of focusing on sequential number-crunching and decision-making tasks, the system will spend considerable time moving, compressing, and decompressing audio and video in real time. To be successful in the future, processor designers must begin to tune their products for these tasks.

Two approaches to this problem are illustrated in this newsletter. Sun *(see **081604.PDF**)* has taken a more conservative approach, adding a small amount of circuitry to its forthcoming UltraSparc processor, improving its ability to handle multimedia data. Philips' TriMedia unit *(see **081603.PDF**)* has built a new processor from the ground up to efficiently process these data types.

The TriMedia design is likely to offer higher performance than patching a general-purpose processor. Furthermore, by accepting the burden of multimedia processing, it allows the CPU to concentrate on the task at hand, be it a spreadsheet or word processor. Audio and video data can be processed in real time by the TriMedia chip without interrupting the main processor.

The biggest drawback to an external multimedia accelerator is the cost. In the highly cost-sensitive PC market, few vendors are willing to add such a device as a standard feature, and the market penetration of an add-in card will be much smaller than that of a standard device. Software vendors won't target their applications to an accelerator unless there is a sufficient installed base. Philips will have to solve this chicken-and-egg problem to establish TriMedia as a standard.

The alternative is a cost-free solution: process the multimedia data on the CPU itself. Intel has recently come out in favor of this approach, which it has labeled native signal processing (NSP). The company points out that Pentium processors, without any add-in chips or cards, are powerful enough to perform tasks such as (Indeo) video decompression and video teleconferencing. Fast RISC chips, such as Digital's 21064A, can decompress MPEG-1 video, a more complex format than Indeo.

The advantage of NSP is that all systems with a particular processor can perform these tasks without any optional hardware. As the installed base of Pentium systems grows, multimedia software vendors can target these systems with expectations of significant unit sales. This effect will probably focus more developers on NSP than on add-in solutions like TriMedia.

Sun has taken the NSP approach one step further by modifying the CPU for these multimedia tasks. The added hardware takes advantage of the fact that most of these calculations can be done with lower precision (16 or 32 bits) than provided by the 64-bit registers and ALUs used for standard integer and FP data. Thus, it is relatively easy to generate two, four, or even eight results per cycle, providing enough throughput for very demanding multimedia tasks.

As transistor budgets increase, this type of hardware takes only a small fraction of the chip space; the added cost to the system is minimal compared with the cost of an add-in chip or board. Yet the performance gain can be enormous: UltraSparc can handle MPEG-2 decoding in software, a task four times more complex than MPEG-1 decoding and well beyond the capabilities of any current microprocessor.

UltraSparc is not the only processor to take this approach: Intel's i860 and the Motorola 88110, as well as HP's PA-7100LC and forthcoming PA-8000, have similar, if less extensive, feature sets. UltraSparc, however, is likely to have a far greater lifetime volume than any of these other chips, doing more to popularize the concept of optimizing the central processor for multimedia.

It is surprising that truly high volume chips such as Pentium and the PowerPC line have so far missed out on this concept. Intel's push for NSP would be a great setup for the inclusion of multimedia features on the P6, but rumors indicate that the P6 will not have any special multimedia hardware.

As multimedia data types become pervasive, there is an opportunity for Intel, other x86 processor vendors, or the PowerPC camp to market a processor that, like UltraSparc, is optimized for audio and video. Such a device would have capabilities well beyond those of its competitors, giving its vendor an edge in the PC processor battle. ♦