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New challenges and burning issues

..... Welcome to *IEEE Micro's* first issue of 2004. The past year was an exciting new beginning for this magazine. The editorial board and I were able to bring some new faces and ideas to our group; this helped us chalk out a crisp road map for making *Micro* the leading magazine for professionals and researchers in the area of microprocessors, specifically those who deal with architecture, design, and evaluation. Of course, as we strive to reach our goals over the next few years, we will continue to need input and feedback from you, our esteemed readers. Although we have initiated some strategic changes to make *Micro* relevant to the newer challenges and issues facing 21st century microarchitects and chip designers, a lot more work remains.

We ended 2003 with the implementation of a bold new idea: a year-end special issue featuring our top selections from all the microarchitecture research papers published in conferences the previous year. Of course, we selected only from abstracts submitted in response to our call for papers; but judging from the response—more than 70 abstracts—the idea was well-received by the computer architecture community.

We thought there was a need to distill the large number of conference papers published in this field into a select set—adapted to *Micro's* presentation style for

wider and easier dissemination—of the most promising or proven industry-relevant ideas. We want to hear from you on how successful you think we were in fulfilling that need with the year-end issue, and all the issues of 2003. Just so you know, in general, we have seen an increase in submissions, and we have been able to increase *Micro's* quality by being more selective throughout the technical review process. With your feedback and suggestions, we hope to do an even better job in 2004.

As we look forward to addressing the many new challenges facing chip-level microarchitects and designers, it is difficult to resist focusing on a few “burning” issues that have surfaced recently and are likely to face our community for a while. These issues concern the problem of escalating power densities and temperatures in future CMOS microchips. The power (and power density) limits in air-cooled systems make the outlook for future performance growth uncertain because of the pressure on package and cooling (and overall system) costs. Higher chip and device junction temperatures threaten to degrade lifetime reliability as well as delivered performance. The effect of technology scaling in itself (that is, even without considering the temperature hot-spot issue) has led to microcomponents on the chip or die that are inherently less

robust in functionality as well as performance. In addition, increased concern about soft error rates has spawned new research and development work in error-tolerant design.

In 2003, *IEEE Micro* addressed some of the modern challenges in power efficiency through a special issue on power and complexity-aware design (September-October), and you might have noticed that *Computer* also devoted its Dec. 2003 issue to power-aware computing. At recent computer architecture conferences, *power* has received the same (if not more) attention as the traditional metric of *performance*. Side effects related to temperature hot spots and reliability are also receiving lots of attention.

Industry's and academia's current fixation with chip-level power and temperature adds new meaning to the titles of *Micro's* first two issues of the year: Hot Interconnects and Hot Chips. Modern microprocessor cores and interconnects (both on- and off-chip) are literally *hot*, irrespective of whether they represent the most promising products or novel ideas that make it into the correspondingly named conferences or not.

We hope you enjoy this bright, new issue of *Micro* as we step into 2004. We wish all our readers and sponsors a very happy new year.