From the Editor in Chief

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Twenty Years On

Nigel Davies

In this issue, we commemorate the 20th anniversary of Mark Weiser’s seminal article, “The Computer for the 21st Century,” first published in Scientific American in September 1991. When IEEE Pervasive Computing was first launched, 10 years had passed since Weiser’s article, and the magazine marked this event by featuring articles from the associate editors in chief. The articles in that inaugural issue provided a snapshot of the state of the art in pervasive computing and charted the progress the field had made in the 10 years since Weiser’s article. To mark the 20th anniversary, this issue similarly contains a series of invited articles (all of which went through our standard peer-review process) from four of the magazine’s AEICs.

PERSPECTIVES ON THE STATE OF THE ART

The first of our invited papers, “Ubiquous Systems at 20: Progress, Opportunities, and Challenges,” by Ramón Cáceres and Adrian Friday, is a fascinating retrospective on 20 years of systems-oriented ubiquitous computing research, providing an excellent groundwork for many of the articles that follow. Looking forward, the authors identify opportunities for leveraging utility computing and the Internet of Things to grow the ubiquitous infrastructure. They also discuss remaining challenges to taking ubiquitous computing systems to the point where they indeed become ubiquitous.

The second article, “Interacting with 21st-Century Computers,” by Albrecht Schmidt, Bastian Pfleging, Florian Alt, Alireza Sahami Shirazi, and Geraldine Fitzpatrick, focuses on the research challenges of designing the interface between humans and ubicomp systems. The authors consider research developments in this area over the last 20 years and present a number of remaining research challenges as well as identify interaction technologies likely to have a significant impact on the field in the coming years.

For many years, the topic of context awareness has been key to our research community. In “From Context Awareness to Socially Aware Computing,” Paul Lukowicz, Alex “Sandy” Pentland, and Alois Ferscha consider the evolution of this area and present a thought-provoking vision of the future in which reliable recognition of complex contexts and activities is possible. They also consider how the field might move toward understanding much richer forms of context, such as social and community situations.

Ubiquitous computing, by its very nature, implies widespread deployment of technologies. In the fourth article, “Pervasive Tabs, Pads, and Boards: Are We There Yet?” Maria Ebling and Mary Baker consider how far toward Weiser’s vision we have come with respect to commercial deployments of the devices he described. This review evaluates the commercial success of tabs, pads, and boards and discusses their real-world use.

This issue also features two additional pieces that help chart the state of the art in pervasive computing. In the article, “20 Years Past Weiser—What Next?” Alois Ferscha discusses the results of a large-scale European initiative to collect a list of challenges in the area of pervasive computing. Ferscha solicited contributions from a large number of researchers in the field, compiling them into a book describing a research agenda for pervasive computing. The book itself is an evolving document, and readers can contribute to or download the latest version at www.perada.eu.

The European theme continues with an interview with Norbert Streitz, Twenty Years On
who, among many roles, was the Chair of Steering Group of the EU-funded proactive initiative “The Disappearing Computer.” In an extensive interview, Streitz reflects on the early days of ubiquitous computing and the role of the Disappearing Computer initiative in helping to shape the European research landscape in the field.

As this issue also marks 10 years of IEEE Pervasive Computing, I asked the two previous EICs, founder Mahadev Satyanarayan and his successor, Roy Want, to give us their own reflections on how the field has evolved (see the related sidebar on the next page).

**ALSO IN THIS ISSUE**

In addition to the invited papers and interview, we have one feature article this issue. In “Location-Based Services on Mobile Phones: Minimizing Power Consumption,” Mikkel Baun Kjærgaard considers the problem of building low-power location-based services that can operate on mobile phones without reducing their battery life to unacceptable levels.

This issue also features six excellent departments covering recent conferences, initiatives in pervasive education, works in progress, wearable computing, smartphones, and innovations in the pervasive computing product space.

Finally, I’m delighted to announce that Elizabeth M. Belding has joined IEEE Pervasive Computing’s editorial board. Belding brings extensive experience in the area of mobile networking and has recently focused on solutions for developing and underdeveloped regions. (See the “New Editorial Board Member” sidebar for more information.)
PERSPECTIVES FROM FORMER EICs

The two previous editors in chief, Roy Want and founder Mahadev Satyanarayan, provide their own reflections on how the field has evolved.

ROY WANT: JUST A FEW MORE YEARS
I had the good fortune of working with Mark Weiser in the early 1990s as part of the Ubiquitous Computing initiative at PARC. It’s remarkable to think that many of the things we take for granted didn’t exist at that time. Cell phones (in the US) were a rarity; laptops were large clunky devices—more luggable than mobile; and PDAs had not been invented. Wi-Fi didn’t appear until 1999, nor Bluetooth, and there weren’t any short-range radio standards in general use. Pen computers were thought to be the next big thing, catalyzing the testing of primitive tablet computers in the marketplace. But they were doomed to fail (this was even before the Apple Newton or Palm Pilot). Furthermore, there were no digital TVs—and certainly none connected to the Internet. Also, the Web had recently been released to the public (around 1991), but its significance wasn’t generally realized until a few years later.

However, in September 1991, Mark published his article, “The Computer for the 21st Century” in Scientific American, where he described what we now know as ubiquitous computing, along with his notion of tacit interaction and his metaphor of size to describe various domains of human activity. The standard inch, foot, and yard—a set of units created because they fit different scales of human activity—inspired the creation of the Tab, Pad, and Liveboard projects. These were roughly matched to devices that were “pocketable,” “carry-able,” or had a fixed infrastructure. He had the vision that they would all be wirelessly connected and in the background, seamlessly orchestrating data flow between them. In 2011, with smartphones, tablets, and digital TVs (or set-top boxes) in common use, all connected by Wi-Fi and the Internet, this vision has largely come true. Perhaps our interaction with these devices isn’t as tacit as Mark would have liked, but give it a few more years, and I’m sure he would have been very proud.

—Roy Want

SATYA: LOOKING BACK
It’s wonderful to see how far this publication and the field it reports on have come in 10 years. The 2001 founding of IEEE Pervasive Computing was itself the 10-year anniversary of Mark Weiser’s seminal paper in Scientific American. In the EIC message of that inaugural issue, I wrote,

One of the most difficult challenges in realizing Weiser’s vision is that it requires a multidisciplinary approach. A successful deployment will require the collaboration of hardware designers, wireless engineers, human-computer interaction specialists, software system developers, and so on. This magazine will serve as a forum for timely material to bring these diverse communities together.

Looking back now, it’s clear that we have succeeded in creating a vibrant publication forum for this multidisciplinary community. Through the sustained efforts and hard work of many people over the past decade (especially the EICs who followed me, associate EICs, department editors, editorial board, and IEEE Computer Society staff), we have created a publication forum that’s welcoming of the many different strands of thought and action from which is woven the fabric of Weiser’s vision.

Prior to the inaugural issue, in August 2001, I wrote:

Like the frontier of the American West in the early 19th century, pervasive computing offers new beginnings for the adventurous and the restless—a rich open space where the rules have yet to be written and the borders yet to be drawn.

Even after 10 years of exploration, this frontier stretches endlessly in front of us. As we further expand our horizons and continue to explore this rich territory, IEEE Pervasive Computing is well positioned to help write the rules and draw the borders.

—Satya

I would like to take this opportunity to thank all of the contributors to this special issue. I hope that you enjoy this 20th anniversary issue and that IEEE Pervasive Computing will continue to act as a catalyst for your research and developments for many years to come.

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