Christian Müller-Schloer
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Organic and Pervasive Computing – ARCS 2004

International Conference on Architecture of Computing Systems
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Preface

Where is system architecture heading? The special interest group on Computer and Systems Architecture (Fachausschuss Rechner- und Systemarchitektur) of the German computer and information technology associations GI and ITG asked this question and discussed it during two Future Workshops in 2002. The result in a nutshell: Everything will change but everything else will remain.

Future systems technologies will build on a mature basis of silicon and IC technology, on well-understood programming languages and software engineering techniques, and on well-established operating systems and middleware concepts. Newer and still exotic but exciting technologies like quantum computing and DNA processing are to be watched closely but they will not be mainstream in the next decade. Although there will be considerable progress in these basic technologies, is there any major trend which unifies these diverse developments?

There is a common denominator – according to the result of the two Future Workshops – which marks a new quality. The challenge for future systems technologies lies in the mastering of complexity. Rigid and inflexible systems, built under a strict top-down regime, have reached the limits of manageable complexity, as has become obvious by the recent failure of several large-scale projects. Nature is the most complex system we know, and she has solved the problem somehow. We just haven't understood exactly how nature does it. But it is clear that systems designed by nature, like an anthill or a beehive or a swarm of birds or a city, are different from today's technical systems that have been designed by engineers and computer scientists. Natural systems are flexible, adaptive, and robust. They are in permanent exchange with their environment, respond to changes adequately, and are very successful in staying alive. It seems that also the traditional basic technologies have realized this trend. Hardware is becoming reconfigurable, software now updates itself to fulfill new requirements or replace buggy components, and small portable systems form ad hoc communities. Technical systems of this kind are called Organic Computer systems. The key challenge here will be to understand and harness self-organization and emergence. Organic Computing investigates the design and implementation of self-managing systems that are self-configuring, self-optimizing, self-healing, self-protecting, context aware, and anticipatory.

ARCS 2004 continued the biennial series of German Conferences on Architecture of Computing Systems. This seventeenth conference in the series served as a forum to present current work on all aspects of computer and systems architecture. The program committee of ARCS 2004 decided to devote this year's conference to the trends in organic and pervasive computing.

ARCS 2004 emphasized the design, realization, and analysis of the emerging organic and pervasive systems and their scientific, engineering, and commercial applications. The conference focused on system aspects of organic and pervasive computing in software and hardware. In particular, the system integration and

self-management of hardware, software, and networking aspects of up-to-now unconnected devices is a challenging research topic. Besides its main focus, the conference was open to more general and interdisciplinary themes in operating systems, networking, and computer architecture.

The program reflected the main topics of the conference. The invited talk of Andreas Maier (IBM) presented the Autonomic Computing Initiative sparked by IBM which has objectives similar to but not identical with Organic Computing. Erik Norden's (Infineon) presentation discussed multithreading techniques in modern microprocessors.

The program committee selected 22 out of 50 submitted papers. We were especially pleased by the wide range of countries represented at the conference. The submitted paper sessions covered the areas Organic Computing, peer-to-peer computing, reconfigurable hardware, hardware, wireless architectures and networking, and applications.

The conference would not have been possible without the support of a large number of people involved in the local conference organization in Augsburg, and the program preparation in Hannover. We want to extend our special thanks to the local organization at the University of Augsburg, Faruk Bagci, Jan Petzold, Mattias Pfeffer, Wolfgang Trumler, Sascha Uhrig, Brigitte Waimer-Eichenauer, and Petra Zettl, and in particular to Fabian Rochner of the University of Hannover, who managed and coordinated the work of the program committee with admirable endurance and great patience.

February 2004

Christian Müller-Schloer
Theo Ungerer
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The conference was organized by the special interest group on Computer and Systems Architecture of the GI (Gesellschaft für Informatik – German Informatics Society) and the ITG (Informationstechnische Gesellschaft – Information Technology Society), supported by CEPIS and EUREL, and held in cooperation with IFIP, ACM, and IEEE (German section).

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Table of Contents

III Reconfigurable Hardware

IV Hardware

V Wireless Architectures and Networking

Invited Program

Keynote
Autonomic Computing Initiative

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Abstract. Autonomic computing systems have the ability to manage themselves and dynamically adapt to change in accordance with business policies and objectives. Self-managing environments can perform such activities based on situations they observe or sense in the IT environment, rather than requiring IT professionals to initiate the tasks. Autonomic computing is important today because the cost of technology continues to decrease yet overall IT costs do not. With the expense challenges that many companies face, IT managers are looking for ways to improve the return on investment of IT by reducing total cost of ownership, improving quality of service, accelerating time to value and managing IT complexity. The presentation will outline where IBM comes from with its autonomic computing initiative and what has been achieved to date.

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