MobiDE 2009

Proceedings of the

Eighth ACM International Workshop on Data Engineering for Wireless and Mobile Access

(in conjunction with ACM SIGMOD / PODS 2009)

June 29th, 2009, Providence, RI, USA
10 Year Anniversary

Edited by
Le Gruenwald and Demetris Zeinalipour

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Foreword

It is our great pleasure to welcome you all to the *ACM International Workshop on Data Engineering for Wireless and Mobile Access* (*MobiDE'09*), held in conjunction with SIGMOD 2009. MobiDE continues its tradition of bringing together researchers and practitioners in databases, mobile computing, and networking, and providing a full day of exciting presentations and discussions. As in previous years, the workshop serves as a forum to present latest research and engineering results and contributions, and set future directions in wireless and mobile data management.

MobiDE'09 is the eighth of a successful series of workshops that aims to act as a bridge between the data management, wireless networking, and mobile computing communities. The 1st MobiDE workshop took place in Seattle, USA (August 1999), in conjunction with MobiCom 1999. The 2nd MobiDE workshop was held in Santa Barbara,USA (May 2001), together with SIGMOD 2001. The 3rd MobiDE workshop was organized in San Diego, USA (September 2003), co-located with MobiCom 2003. The 4th, 5th, 6th and 7th MobiDE workshops took place in Baltimore, USA (June 2005), Chicago, USA (June 2006), Beijing, China (June 2007), and Vancouver, Canada (June 2008), respectively. This year's event marks the 10-year anniversary of the workshop.

The final program covers a range of topics such as querying and security in mobile systems and applications, location-based/context-aware data management, database issues for mobile computing and pervasive systems. In addition, the workshop program includes two keynote speeches, the first one by Matt Welsh of Harvard University, USA, with title "A New Era of Resource Responsibility for Sensor Networks" and the second one by Frank Olken of the National Science Foundation, USA, with title "Space, Time, Sensors, and Data Semantics". Finally, the workshop features a panel with title "20 Years of Mobile Data Management Research: Vision and Reality" which is moderated by Panos K. Chrysanthis, of the University of Pittsburgh, USA. These proceedings will serve as a valuable reference point for the latest results on mobile and wireless data engineering.

Several people contributed to the successful organization of *MobiDE'09*. We thank the authors for providing the content of the program. We owe our sincere gratitude to the members of the technical Program Committee and external reviewers for their excellent work in reviewing the papers and providing valuable feedback under a tight deadline. We also thank Microsoft for granting us permission to use the Microsoft CMT service and the entire CMT support team, for their help in setting up and managing the online review process.

Our special thanks go to the demo chair Zografoula Vagena, from Concentra Consulting, UK, our publicity chair, Feifei Li, from the Department of Computer Science, Florida State University and our Steering Committee members Ugur Cetintemel, from Brown University, Panos K. Chrysanthis, from the University of Pittsburgh, Christian Jensen, from Aalborg University, Alexandros Labrinidis, from the University of Pittsburgh, Dik Lun Lee, from HKUST and George Samaras, from the University of Cyprus. We are also grateful to our industrial sponsors: The Cooperating Objects Network of Excellence (CONET) and the Microsoft .NET club for the financial support they provided.

Last, but definitely not least, we want to thank ACM and, in particular SIGMOD, for sponsoring the workshop and SIGMOBILE for supporting it (*MobiDE'09* is sponsored by ACM SIGMOD and held in-cooperation with ACM SIGMOBILE). We acknowledge the help of many people

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Keynote Speech 1

"A New Era of Resource Responsibility for Sensor Networks"

Matt Welsh (Harvard University, USA)

Abstract:

Sensor networks have taken off, but they are still notoriously difficult to program. Our group has deployed sensor networks for volcano monitoring and rehabilitation medicine, and each time we find that tuning the network to achieve the right trade-off in terms of data quality, battery lifetime, and bandwidth usage is quite painful. To make things worse, resource availability fluctuates over time, as does the load that the application places on those resources. The severely constrained and decentralized nature of sensor networks makes this problem fairly challenging.

In this talk, I will argue that the software for sensor networks should be designed around the fundamental abstraction of resource-aware programming. In this model, the application has direct visibility and control over resources as a first-class primitive. This requires the application code to take responsibility for its own resource management decisions, since it cannot expect a "bailout" from the OS. This approach enables much more effective adaptations to changing conditions, and supports a rich space of resource-management policies.

In this talk, I will present three related systems that leverage this approach: Pixie, a new sensor node operating system; Lance, a network-wide resource management plane; and Mercury, a platform for maximizing data quality in a wearable sensor network. I will present examples and evaluations based on our real-world deployments.

Short Bio:

Matt Welsh is an Associate Professor of Computer Science at Harvard University, where he has been on the faculty since 2003. His research interests span many aspects of distributed systems, operating systems, and programming languages. His current focus is on wireless sensor networks including new OS and language designs to enable efficient, high-data-rate applications. Prior to joining Harvard, he spent one year at Intel Research, Berkeley. He completed his Ph.D. at UC Berkeley and his B.S. at Cornell University.

Keynote Speech 2

" Space, Time, Sensors, and Data Semantics"

Frank Olken (Lawrence Berkeley National Laboratory and National Science Foundation, USA)

Abstract:

In this talk we will discuss the issues concerning data management for environmental monitoring of moving phenomena in continuous media. Specifically, we will concentrate on three topics: non-Newtonian notions of time, measurement units, and the need for better spatio-temporal data models, such as fiber bundle data models to model vector field data.

Classical temporal data modeling for databases has invoked a Newtonian conception of time, with the notion of universal simultaneous time. Einstein's theory of relativity has supplanted the earlier Newtonian model of time among physicists, astronomers, and now GPS users. We will discuss why and how this matters for DBMS systems.

Most contemporary DBMS systems, query languages, etc. entirely ignore issues of measurement units failing to adequately support many sensor based applications. We will discuss some measurement unit issues and dimensional analysis and suggest that they be incorporated into our type systems for DBMSs.

We note that conventional DBMSs (relational, object oriented, OLAP, and XML) are built from collections of discrete things (tuples, objects, "facts", or trees). However, for many applications, such as weather forecasting, climate simulations, oceanography, water pollution studies, astrophysics, and other fluid dynamics applications, such collections of discrete objects (e.g., sets) are not an appropriate data model. Common to many of these applications is the notion of vector field data (such as velocity fields for wind or ocean currents). It hardly makes sense to talk about interpolation in classical data models of collections of discrete objects. We will recount some of the basic ideas of fiber bundle data models, first investigated by Lloyd Treinish at IBM for data visualization applications. Variations of such data models have sometimes been referred to as vector bundle data models or as sheaf data models.

We summarize by suggesting that sensor data management for environmental monitoring of fluid dynamics phenomena (weather, climate, oceanography, etc.) is an area of growing importance, rapidly growing data sets, and in need of considerable development of better data management technology. We will then discuss a number of funding opportunities at National Science Foundation that support such research.

Short Bio:

Frank Olken has been a computer scientist at Lawrence Berkeley National Laboratory working primarily in scientific and engineering data management research and standards development and in bioinformatics. He has a Ph.D. in Computer Science from UC Berkeley. For the past 3 years he has been detailed to the National Science Foundation, Computer and Information Sciences and Engineering Directorate, Information and Intelligent Systems Division, Information Integration and Informatics Program. As a program director at NSF he manages proposal reviews and research awards in core data management topics, graph and tensor data management and mining, data semantics, ontology and semantic web technologies, cyber-physical systems, parallel DBMS, and bioinformatics. His research interests include query optimization, scientific, engineering, and social science data management, electronic health records, data semantics, ontologies, XML and graph data management, etc. He is a member of ACM, IEEE, ASA, AAAI, AAAS, and ACS. He is also a metric zealot. He can be reached via email at folken@nsf.gov.

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Research Panel

"20 Years of Mobile Data Management Research: Vision and Reality"

Moderator: Panos K. Chrysanthis (University of Pittsburgh, USA)

Abstract:

Since the first research papers on mobile computing (c. 1989), enabled by the phenomenal progress of portable computers in the last 25 years, the vision of mobile computing some times has been riding the technology wave and other times has been ahead of the technology wave. As a result over the years, mobile computing has appeared under many aliases and new meanings: Portable, Nomadic, Mobile and Wireless, Pervasive, Invisible and Ubiquitous Computing. Irrespective of the alias, power-aware, context-aware, location-aware, mobile and wireless data management has been in the core of mobile computing and its vision can been simply summarized in three letters AAA:

Anywhere, Anytime and in Any way/form.

The goal of the panel is to discuss (1) to what extend this vision of reliable access to information and services anywhere, anytime and anyway has been achieved, for example, with smart phones -today's pervasive mobile device and (2) how research in mobile and wireless data management can continue to be transformative.