

Introduction to the Mobile Computing and Wireless Networks Minitrack

Stephan Olariu
Dept. of Computer Science
Old Dominion University
Norfolk, VA 23529-0162, U.S.A.
olariu@cs.odu.edu

Ivan Stojmenović
Dept. of Computer Science
University of Ottawa
Ottawa, Ontario K1N 6N5, Canada
ivan@site.uottawa.ca

We are very proud and honored to have been entrusted with the management of the minitrack titled "Mobile Computing and Wireless Networks" organized and run as part of the Software Technology Track of the 33rd Hawaii International Conference on Systems Sciences. Our goal was to put together a strong program emphasizing quality and relevance to current interests in this important field.

The minitrack has focused on fundamental challenges and issues in the field of wireless networks and mobile computing. Our goal was to bring together leading researchers in this "hot" field of research in order to identify the fundamental challenges and future perspective of these important areas. Indeed, it has been noticed that wireless communications and mobile computing are redefining computing as a discipline. The impact ranges from medical, to military, to industrial, to societal.

Our primary interest was in identifying new techniques for solving problems arising in mobile computing and wireless networks. These problems include location management, data management, query processing, mobile agents, data delivery, broadcast scheduling, routing in ad hoc networks, fixed and dynamic channel assignment, multiple access schemes, time, code and frequency division, MAC protocols, power saving issues, broadcasting and multicasting, handover and call admission, wireless error control and security, and satellite networks.

In response to the Call for Papers, we received 36 submissions from all over the world, leading to a truly international competition. After a preliminary review, 4 papers were judged to be out of scope and were returned promptly to the authors. The remaining 32 manuscripts underwent a very rigorous peer review process. Each manuscript was reviewed by at least five referees. Based on the referee reports, 12 papers were selected for presentation in the minitrack and for inclusion in the conference proceedings.

The result is truly remarkable: the minitrack brings together an outstanding collection of papers on various topics of high relevance to the ever growing field of Mobile Computing and Wireless Networks.

Three of the selected papers deal with the problem of routing a message from a source to a destination in a wireless ad hoc or sensor network. Two nodes in the network may communicate directly if they are close enough, or indirectly, by having other (possibly mobile) hosts relay their packets. Recently, a variety of routing algorithms for wireless networks was proposed. The selected papers reflect three important aspects in routing decisions: algorithms which are power aware, algorithms that do not use hosts locations (i.e. GPS) in their decisions, and GPS based routing algorithms.

Heinzelman, Chandrakasan and Balakrishnan have studied the problem of energy-efficient routing of a message from any sensor to a fixed destination (base station that collect information from the field) in a wireless sensor network. Their energy efficient protocol is based on randomized rotation of local clusterhead stations, collection of data within each cluster by these clusterheads, and forwarding collected data together toward the destination.

Camara and Loureiro presented a routing algorithm that build routing tables according to information collected by software mobile agents which randomly travel between stations and gather and disseminate information about GPS coordinates (latitude, longitude, and time) of visited nodes. These software mobile agents are modeled on ants. Comparison with a previously known LAR scheme shows significantly less overhead involved with the new method.

Wu, Lin, Tseng and Sheu observe that existing routing protocols will stick to a fixed route between a pair of mobile hosts once it is discovered, until it is expired or broken. However, a route, while

being used for transmission, may become worse due to host mobility or the system may newly form some better routes. They show how to enhance these four protocols with route optimization capability, such that the routing paths can be adjusted on-the-fly while they are still being used for delivering packets.

Byun and Han propose a scheme to support multiple MCSs over a single large cluster in ATM networks. When an ATM hosts requests joining a multicast group the MARS designates a proper MCS among the multiple MCSs for the group member to minimize the average path delay between the sender the group members. The authors also evaluate the performance of their scheme via simulation.

Lim and Stern propose a new allocation method that they term the Fixed cell Assignment. This method employs TDMA transmission on the forward link in broadband wireless networks. The system is configured with directional base station antennas and omnidirectional mobile antennas, with each cell divided into six sectors. Performance is evaluated using both analytical techniques and simulation results.

Bononi, Conti and Gregori described and evaluated a distributed mechanism for the contention control in IEEE 802.11 Wireless LANs. Their mechanism, called Asymptotically Optimal Backoff (AOB), dynamically adapts the backoff window size to the current load. AOB guarantees that an IEEE 802.11 WLAN asymptotically achieves its optimal channel utilization.

Radakrishnan {em et al.} present an end-to-end QoS provisioning mechanism for Rapidly Deployable Radio Networks (RDRN) A QoS architecture for an RDRN has is also being proposed which provides the framework for the configuration, prediction, and maintenance of end-to-end QoS.

Schiller explores quality of service in wireless networks containing devices that may use different technologies, different operating systems, and may run different applications. The quality of their connectivity may change over time. He describes the implementation of adaptive and proactive applications and their benefits for mobile and wireless environment. Applications should adapt to

changes in points of attachments, different bandwidth, jitter or delay, and adaptation should be performed without user interaction.

Andre and Segarra discuss a number of application-level approaches to adapt software behavior to current conditions. The toolkit, running at the device level provides storage system-independent services such as resource monitors and global context adaptation service. The authors argue that by using this layered architecture they can achieve an effective code reuse and a highly flexible system in a wireless computing domain.

Horvat gave an overview of mobile agents and tools for building mobile agent system in Java. The argues that Java is currently the easiest way for making mobile agents roaming through the Web for the time being.

Cvetkovic, Horvat, Pesic, Petkovic and Milutinovic propose efficient algorithms and tools for search and retrieval of documents over Internet. Congestion of servers and links can be alleviated using proxy caches, while latency on web can be reduced using prefetching and caching. Efficient search of documents can be done with improved genetic algorithm that exploits the principles of temporal and spatial locality. Mobile agents can be used to optimize network traffic for distributed applications.

Brusic {em et al.} discuss the application of mobile agents to the management of mobile telephone cellular networks. The authors begin by proposing a mobile agent technology that helps reduce the volume of control signaling in cellular networks. They introduce a method to improve the quality of network coverage by collection measurement data by a mobile agent. The data thus collected can be used by the service provider to enhance the overall quality of the service provided within the network.

Many individuals have contributed to the success of the conference. We take this opportunity to thank all the authors for their submissions. We are also indebted to all the referees who have put in the hard work and the long hours to review each paper in a timely and professional way! Last, but not least, we are indebted to Hesham El-Rewini and Sumi Helal for their advice, support, and patience in working with us.

We trust that you will find our minitrack both informative and enjoyable!