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CHALLENGES IN MOBILE AD HOC NETWORKING

In coming years, information technology will be mainly based on wireless technology. Future wireless is totally multidimensional, and wireless mobile and access will be converged to be more ad hoc and reconfigurable. Ad hoc will be one of the next storms in the wireless communications — large-area mobile multihop wireless and personal access networks.

A mobile ad hoc network is an autonomous system of mobile routers (and associated hosts) connected by wireless links. The routers and hosts are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a standalone fashion, or be connected to the larger Internet.

The ad hoc architecture has many benefits, such as self-reconfiguration and adaptability to highly variable mobile characteristics such as power and transmission conditions, traffic distribution variations, and load balancing.

However, such benefits come with some new challenges which mainly reside in the unpredictability of network topology due to mobility of nodes, which, coupled with the local broadcast capability, cause a set of concerns in designing a communication system on top of ad hoc wireless networks.

To deal with this issue, many potential approaches have been proposed: distributed MAC and dynamic routing, wireless service location protocol, wireless dynamic host configuration protocol, and distributed call admission control, as well as QoS-based routing techniques and so on.

This special issue presents a collection of six articles ranging from more physical aspects of mobile ad hoc networking up to application-oriented approaches.

The first article, by S. Xu and T. Saadawi, deals with the IEEE 802.11 MAC protocol, which is the standard for wireless LANs, and, more important, widely used in testbeds of wireless multihop ad hoc networks. Given that 802.11 was not designed for multihop networks, the authors analyze whether an IEEE 802.11-based system is appropriate for a mobile ad hoc testbed.

The second article, by C.-K. Toh, deals with the problem of power consumption in mobile ad hoc networks. The author highlights the desirable properties of ad hoc routing protocols, and presents a power-aware routing approach. The novel aspect is that this approach is designed to minimize the overall transmission power for each connection and distribute the power consumption rate among nodes.

There are a variety of emerging technologies and protocol enhancements designed to extend Internet services to mobile users. The article by J. P. Macker *et al.* is an interesting and detailed overview of some emerging technology efforts and

provides insight into how some of these pieces may fit together to realize seamless Internet services for users on the move or in application spaces with little to no preexisting communications infrastructure.

Providing service differentiation to mobile ad hoc networks is a challenging issue. The fourth article, by S.-B. Lee *et al.*, presents a signaling system that supports an adaptive reservation-based service in mobile ad hoc networks. This system represents a general-purpose approach to quality of service in mobile ad hoc networks that can be used with a number of IETF Mobile Ad Hoc Network (MANET) routing protocols.

The article by L. Blazevic *et al.* presents a global design of a large mobile ad hoc network based on self-organization. With this design, a mobile ad hoc network has to be highly cooperative. The tasks at any layer are distributed over the nodes, and any operation is the result of the cooperation of a group of them. New paradigms for traditional networking problems (routing, positioning, charging, security) are presented, as well as innovative solutions.

The sixth article, by L. M. Feeney *et al.*, takes an application-oriented approach to mobile ad hoc networking to show how to spontaneously instantiate the configuration infrastructure needed to establish small to medium-scale ad hoc networks supporting collaborative applications.

The guest editors are grateful to all the authors who submitted their contributions to this feature topic, and would like to express sincere thanks to all the reviewers for their cooperation and contribution to raising the value of this feature topic. Special thanks go to Andrzej Jajszczyk for his initiative to prepare this topic and his continued encouragement and support.

BIOGRAPHIES

SILVIA GIORDANO (Silvia.giordano@epfl.ch) Silvia Giordano received her Ph.D. at the beginning of 1999 from the Institute of Communications and Applications (ICA), EPFL, Lausanne. She is currently working as senior/first assistant at the ICA institute. Since 1999 she is an Editor of *IEEE Communications Magazine*. She is currently guest editor of a Special Issue on Mobile Ad Hoc Networks that will appear on MONET, as well as a Special Issue on Mobile Ad Hoc Networks that will appear on cluster computing. Her current research interests include traffic control and mobile ad hoc WANS.

WILLIE W. LU (willu@ieee.org), principal senior wireless architect at Siemens-Infineon, has extensive research, publication, consulting, and industrial experience in the design and analysis of advanced wireless telecommunication systems and networks, computer communication systems, local, metropolitan, and wide area communications networks, marketing analysis, and planning. He has profound expertise in the implementation of software-definable base station technology, wireless mobile ATM technology, third-generation mobile communications, broadband wireless access, and high-speed packet networks as well as IP/ATM network interconnections.