

Development of Wireless Stations for Distributed Field Operations

by T. Andrew Yang and Sadegh Davari

DISTRIBUTED FIELD OPERATIONS INVOLVE dispersed mobile units operating in a wide geographical area, such as battlefield operations or exploration on the moon. One or more wireless stations may be deployed for effective connectivity among the units. In this project, we investigate the security and performance issues of wireless stations in mobile ad hoc networks (MANET), with a focus on the public key management system using certificates. One of the main issues to consider in a certificate-based scheme is the secure distribution of the public keys to all the nodes in the network. The Public Key Infrastructure (PKI) defines methods for handling public key management using X.509 certificates. In a wired network, there exists a centralized certificate server which handles the creation, renewal, and revocation of certificates. This is not feasible in mobile ad hoc networks (MANET), which are composed of mobile nodes that may be constantly moving in the geographical area, and do not have a fixed infrastructure or centralized management. Besides, due to the dynamic topology of the network, frequent link failures may occur, resulting in issues such as re-authentication and timely communication with the certificate server.

Over the past year (2006), our work in mobile networks had led us to explore a related research area, the wireless sensor network (WSN), which is a network composed of wireless sensor nodes. Each sensor node is a small computer with three modules: the energy module, the radio module, and the sensor module. A WSN may be deployed to monitor a variety of phenomena, such as light, motion, humidity, moisture, wind speed, etc.



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We have come up with an efficient WSN algorithm, entitled OCO (Optimized Communications and Organization), which proved to be very efficient in accurately detecting intruding objects while conserving energy use.

To date, we have published our work on OCO in two refereed articles and have acquired a Texas Higher Education Coordination Board's ARP (Advanced Research Program) grant to further our research in this area.

Publications

Sadasivam, K., V. Changrani, and T. A. Yang. "Scenario Based Performance Evaluation of Secure Routing in MANETs," *Proc. of the Second Int. Workshop on Mobile Ad Hoc Networks and Interoperability Issues (MANETII'05)*. 2005.

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Tran, S. P. M. and T. A. Yang. "Evaluations of Target Tracking Methods in Wireless Sensor Networks," *Proc. of the 37th ACM SIGCSE Technical Symposium on Computer Science Education. SIGCSE*, 2006.

Tran, S. P. M. and T. A. Yang. "OCO: Optimized Communication & Organization for Target Tracking in Wireless Sensor Networks," *Proc. of the IEEE International Conference on Sensor Networks, Ubiquitous, and Trustworthy Computing*, 2006.

Grants

Yang, T. A. "SOCO: Secure and Optimized Communication & Organization for Target Tracking in Wireless Sensor Networks," Advanced Research Programs (ARP), Texas Higher Education Coordination Board (THECB), 2006-2008, \$48,780.



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