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Editorial

Distributed Middleware of Large-Scale Wireless Networks

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Large-scale wireless networks consist of a large number of nodes that communicate through wireless links. Scalability is not only one of the most important quality criterion but also a challenge to protocol design of large-scale wireless networks. Nowadays, although a great number of algorithms and protocols have been proposed, most of them are not fit for large-scale wireless networks, as they are centralized in essence, which brings formidable obstacle to scalability. Thus, developing distributed middleware is necessary for further advancing actual application of large-scale wireless networks.

This special issue is intended to provide recent advances on distributed middleware of large-scale wireless ad hoc networks and wireless sensor network. It focused on how distributed middleware has affected different aspects (protocols, algorithms, paradigm, etc.) for a large family of applications using wireless network technologies. Totally 8 papers were selected from numerous submissions after careful reviews and are divided into 3 categories.

The first category consists of 3 papers and is devoted to distributed security.

X. Zhu et al. describe a distributed traceable pseudonym management scheme in VANETs. To break risk due to centric authentication scheme, a blind signature method is adopted to achieve strict separation of issuance and tracking, which is based on the improved scheme for shared generation of RSA keys.

F. Wang et al. focus on problems of user privacy leakage and end-to-end confidentiality invasion in content-based or interest centric wireless opportunistic network. They propose a PEFKS (Public Encryption with Fuzzy Keyword Search) and CP-ABE (Cipher-text Policy Attribute Based Encryption) based distributed security scheme by refining and compromising two-pairing based encryption, searchable encryption, and attribute-based encryption. The scheme enables opportunistic forwarding according to fuzzy interests preserving full privacy of users and ensures end-to-end confidentiality with a fine-grained access control strategy in an interest-centric scenario of large-scale wireless opportunistic networks.

L. Zhu et al. focus on confidentiality-preserving data aggregation. To overcome overwhelming extra communication overhead caused by transfer list of sensors' ID, they propose a provably secure aggregation scheme PEC2P (Perturbation-based Efficient Confidentiality Preserving Protocol) that allows efficient aggregation of perturbed data without transferring any ID information.

The second category consists of 3 papers and is devoted to distributed networking.

D. Wu et al. study multimedia files transmission problem in DTN (Vehicle-Based Delay-Tolerant Network). They propose an optimal fragmentation-based multimedia transmission scheme based on P2P lookup protocol. The proposed transmission scheme enables fast and reliable multimedia file transmission in wireless mobile P2P networks over VDTNs.

N. Xia et al. study how to optimize the channel selection for wireless sniffer to maximize information collected, so as to maximize the Quality of Monitoring (QoM) for wireless networks. They propose a multiple quantum immune clone

algorithm-based solution to achieve the optimal channel allocation.

Z. Dengchang et al. study distributed time synchronization problem in large-scale wireless network. They use max-consensus to compensate for clock drift and average-consensus to compensate for clock offset. The main idea is to achieve a global synchronization just using local information.

The third category consists of 2 papers and is devoted to distributed architecture and testbed.

W. Lin et al. design an experiment platform used for teaching, research, and development of wireless sensor network. Their online Plug-Configure-Play experiment platform has four prominent strong points: in-application programming in batch, noninvasive measurement method, sensor self-awareness, and remote operation. They also develop a sensor-aware Zigbee-based smart home system prototype based on the platform.

W. Tian et al. introduce an advanced RFID middleware management system over cloud computing.

The guest editors hope that this special issue can provide a snapshot of the latest advances in distributed middleware of large-scale wireless networks and stimulate more research interest and efforts in research and development.

The guest editors would like to express their sincere gratitude to all the reviewers for their professional contributions.

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