A special issue of ad hoc networks on "Smart solutions for mobility supported distributed and embedded systems"

The proliferation of wireless networking and Internet technologies, supported by the development of embedded networking devices with smart information processing and computing capabilities promoted many new wireless and mobile applications in our lives, in all kinds of environments. From small sensor nodes to smart phones and other palm-top devices, a wide range of embedded devices opened major avenues for mobile applications. With increasing number of users for these applications, decentralized and ad hoc management and operation became a necessity. In parallel with these architectural requirements, new models and mechanisms are being proposed in all communication layers and security services.

With this special issue, we aimed to present novel research contributions on new frontiers and applications in mobility supported distributed and embedded systems with special emphasis on wireless ad hoc networking, wireless cross-layer design, security, privacy and trust. This special issue is comprised of six papers covering various aspects of these topics. Each paper has been reviewed by at least two reviewers and the accepted papers went through two or more review rounds.

In the article entitled, "Performance Analysis of CSMA-based Opportunistic Medium Access Protocol in Cognitive Radio Sensor Networks" Shah and Akan present the performance analysis of secondary users in a cognitive radio sensor network. The authors consider a CSMA-based medium access control protocol with a common control channel where secondary users negotiate the wideband data traffic channel. Two fundamental performance metrics, bandwidth and delay are formulated based on the fact that secondary users can exploit the cognitive radio to simultaneously access distinct traffic channels in the common interference region. The analysis reveals that dedicating a common control channel for secondary users enhances their aggregated bandwidth approximately by a factor of five while reducing the packet delay significantly.

In the paper, "Collision Correction using a Cross-Layer Design Architecture for Dedicated Short Range Communications Vehicle Safety Messaging" by Cassidy, Jaber and Tepe, a new cross-layer architecture is designed for collision correction of the safety messages in dedicated short range communications in a vehicular environment. The collision correction at the physical layer uses a new decision making block that uses information from the medium access control layer for the channel estimator and equalizer. With this scheme, especially under high user load, reception reliability of the dedicated short range safety messages is significantly improved and the packet error rate is reduced.

In the paper "Efficient Topology Construction for RPL over IEEE 802.15.4 in Wireless Sensor Networks" Pavkovic, Duda, Hwang and Theoleyre address the well known single point of failure problem in multi-hop sensor networks. To improve the reliability and optimize the topologies at MAC layer, authors propose to modify the cluster-tree structure into a cluster-Direct Acyclic Graph (DAG) as well as a greedy algorithm integrated with the IEEE 802.15.4 standard. The presented analysis considers the global energy saving by reducing MAC layer signaling for selected known routing protocols in addition to delay and packet loss evaluation metrics.

In the paper entitled "Hop Count Based Distance Estimation in Mobile Ad Hoc Networks – Challenges and Consequences", Merkel, Mostaghim and Schmeck present two indicators to identify and characterize the mobility of devices in a decentralized way in mobile ad hoc networks. Accuracy of distance estimations from hop counts depends on network density and mobility patterns. Their analysis demonstrates that while mobility can have a positive effect on the accuracy of distance, this positive effect can turn into a negative one with increasing mobility. The difference between mobility and density induced error is discussed and their individual adverse effect is weighted against each other. This paper also includes a proposed algorithm to determine hop counts which is designed to mitigate the effect of mobility w.r.t. direction, speed, and similarity in movements of neighbors.

In the paper "Multi-Party Trust Computation in Decentralized Environments in the Presence of Malicious

Adversaries", Dimitriou and Michalas describe a decentralized privacy-preserving protocol for securely casting ratings in distributed reputation systems. Their solution allows n participants to cast their votes without revealing the real identity. Authors prove that their protocol is immune against various classes of attacks (including some internal attacks). Authors also provide a bulk of experimental results and show that their protocol is almost one order of magnitude faster than the previous best protocol for providing anonymous feedback in decentralized systems for the same security level.

The paper "Distributed Node Placement Algorithm Utilizing Controllable Mobility in Mobile Ad-Hoc Networks" by Roh and Lee addresses the issue of topology planning and control in sensor networks. Namely, the authors define the problem of deploying sensor nodes in mission-critical networks to maximize the coverage while enforcing radio connectivity to deliver the sensed information remotely. A distributed protocol is then proposed to optimize the coverage by exploiting the mobility of the deployed nodes.

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