

EURASIP Journal on Wireless Communications and Networking

Special Issue on

Novel Techniques for Analysis & Design of Cross-Layer Optimized Wireless Sensor Networks

Aim and Scope

Sensor networks have been researched and deployed for decades; their wireless extension, however, has witnessed a tremendous upsurge in recent years. This is mainly attributed to the unprecedented operating conditions of wireless sensor networks (WSNs), i.e.

- a potentially enormous amount of sensor nodes,
- reliably operating under stringent energy constraints.

The virtually infinite degrees of freedom of wireless sensor networks have ignited intense research activities, which in turn led to thousands of publications, white papers and patents in less than a decade, with new contributions emerging on a daily basis. The rich mathematical and technical toolboxes already available from the design of wireless cellular and ad hoc systems clearly aided the birth of new ideas tailored to the problems in WSNs.

To date, the main problem in deploying WSNs is their dependence on limited battery power. A main design criterion is to extend the lifetime of the network without jeopardizing reliable and efficient communications from sensor nodes to other nodes or to data sinks. A prominent example of today's non-optimized WSN deployment experiences is that the start-up alone costs the network half its battery power.

Optimizing every facet of the communication protocols is therefore vital and imperative. Such stringent design requirements can be met by a plethora of approaches, e.g. optimizing each layer of the protocol stack separately (traditional) or jointly (cross-layer), for each node separately (traditional) or for an ensemble of nodes (distributed and cooperative), etc. This has led to copious novel distributed signal processing algorithms, energy-efficient medium access control and fault-tolerant routing protocols, self-organizing and self-healing sensor network mechanisms, etc.

In the light of the above, the main purpose of this special issue is twofold:

- to obtain a coherent and concise technical synthesis from the abundance of recently emerged material in the area of WSNs, and
- to promote novel approaches in analyzing, designing and optimizing large-scale WSNs, preferably inspired by approaches from other disciplines, such as physics or biology.

Very few papers are currently available which synthesize the large amount of fairly dispersed technical contributions; a coherent exposure, also touching upon open research issues, will certainly be appreciated by the academic and industrial research community. We believe that novel approaches, potentially inspired by entirely disjoint disciplines, may help considerably in dealing with networks of thousands of nodes.

Topics of Interest

Topics of interest in the area of energy-constraint WSNs include, but are not limited to:

- network capacity w/out imperfections
- joint source and channel coding
- cooperative and distributed signal processing
- data fusion and data aggregation
- novel PHY, MAC and network paradigms
- cross-layer and cross-functionality design
- security, robustness, reliability
- self-healing, self-stabilization, self-organization
- applications, architectures and topologies
- (macroscopic) information flows
- physically and biologically inspired approaches

Proposed Timeline

Call for papers:	1 April 2006
Submission deadline:	1 October 2006
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Guest Editors

Dr Mischa Dohler
France Telecom R&D
France

Prof Taieb Znati
University of Pittsburgh
USA

Dr Stavros Toumpis
University of Cyprus
Cyprus

Prof Lionel M. Ni
Hong Kong University of Science and Technology
Hong Kong, China