



Workshop on Wireless Sensor Networks:

Wireless Sensor Networks, blazing the road to the Internet of the Future

Co-located with VTC 2007 Spring, Dublin, April 25, 2007

Organised by:

Neeli Prasad, CTIF, Aalborg University, Denmark,
Gabriele Kotsis, University of Linz, Austria,
Dirk Pesch Cork Institute of Technology (CIT), Ireland
Paulo De Sousa, European Commission, Belgium

Advances in technology are acting as enablers for the development of innovative applications and services in sensor environments. Data for wide variety of parameters of the physical world will be collected, analysed and processed in the systems. Networks of these nodes will support the individuals in their every day lives in an unobtrusive way which requires adaptiveness and intelligence in all building blocks of such systems.

Wireless Sensor Networks and Personal Networks are therefore expected to promote a variety of application domains with a huge potential for the industry, for the individual user and for the society.

Application domains such as the car industry or the health care sector are setting the requirements and define by their specific needs the path for future technology developments.

In this workshop key players from academia and industry will discuss new trends in wireless sensor networks. Presentations and discussions on visions for technology-driven research but also share opinions on emerging needs for wireless sensor-based applications and services thus being drivers for further technological innovations.

The goal of this Workshop is to create the vision for the sensor and personal networks.

Speakers will be invited from industry and academia from Europe and Asia. There will be presentations from the IST projects CRUISE, MAGNET Beyond and PULSERS Phase II.

Preliminary programme

April 25, 2007

08:30 – 08:40 Welcome: Neeli Prasad, CTIF, Aalborg University, Denmark

08:40 – 09:10 Opening Talk:

Jorge Pereira, European Commission, Belgium

Invited Speakers:

09:10 – 09:55

Seung-Woo Seo,
Seoul National University, Korea

Title: Security Issues in WSN – Group Key Management

Abstract: It is envisaged that wireless networks of smart sensor devices will be widely used in various applications such as monitoring and control in factories, large buildings, environments, etc. In this talk, I begin with the short review of the current status of wireless sensor networks (WSNs). I also show the challenges of WSNs and mention about some testbeds which have been built for various research purposes, including our effort in Seoul National University. Then, I discuss the security issues in WSNs and explain the general key management schemes. As a detailed topic, I focus on the issue of group key management and show the concepts of many schemes proposed so far. I also introduce our approaches with some performance evaluation results. One of our approaches is to consider the WSN topology information in managing the group keys, while another attempts to generalize the key tree structure for hosting an arbitrary number of users. I show that our proposals are general enough to be applied to diverse service scenarios in future WSNs.

09:55 – 10:40

Elena Gaura
Coventry University, UK

Title: Efficient Information Retrieval for Wireless Sensor Networks

Abstract: The increased availability and lower cost of wireless technology has led to an increased use of wireless sensor network (WSN) applications in a number of domains. The majority of these are monitoring applications where sensed data is collected at a central user point, commonly outside (geographically and topologically) the network for processing. Resource constraints on nodes in the network and unreliability of radio communication mean that applications have to be developed with an eye on maximizing energy efficiency in order to extend network life. To that end, in-network computation and in particular in-network information extraction from data has been promoted as a technique for achieving this aim. In-network processing, however, has been limited to systems where at most, simple aggregate queries are evaluated, the results of which are communicated to the outside world. There is currently little research into how this idea can be extended to allow more complex queries to be processed. This paper examines key applicative query-based approaches that utilize in-network processing for query

resolution, identifies their strengths and limitations and puts forward the case for in-network complex query processing in WSNs. Finally, an approach in which in-network attribute-based logical abstractions are used for processing complex queries is presented.

10:40 – 10:50 Coffee Break

10:50 – 11:35

Anand R. Prasad,
DoCoMo Communications Laboratories Europe GmbH, Germany

11:35 – 12:20

Srdjan Krco
Ericsson, Ireland

Title: Mobile network supported ubiquitous sensor architecture

Abstract: Wireless sensor networking research has been mainly focused on internal wireless sensor network issues like MAC and routing protocols, energy saving, HW design and to some extent on the architecture of gateways that connect a wireless sensor network with the rest of the world.

In this paper, a different view of wireless sensor networking world is presented where the existing infrastructure is used to interconnect independent wireless sensor networks and provide services based on their aggregate input. Sensor networks (small or large, deployed for any purpose and by anyone) represented by its gateway are treated as leaf nodes hanging off a mobile or fixed network and using these networks to interact with remote users. Each gateway exposes the capabilities of its sensors and the sensor network as a whole. This information is used by remote users to query the network. The details of the interaction between gateways and its sensors are of no interest to the remote users.

Further on , the whole wireless sensor networking landscape is considered as an open information market with the underlying mobile and fixed networks facilitating interaction between sensor networks and users of the information they produce. Each sensor network is a sensor information provider that offers specific sensor information defined by the type of available sensors and their spatial and temporal conditions to the interested users. Obviously, in such environment, where many mobile users are acting as tiny information providers, service discovery, composition and provision are very challenging problems. These problems are addressed by the proposed architecture by introducing a middle layer that aggregates information from all small information providers and provides higher level services to the end users. This layer provides the means to quickly add or remove sensors/sensor networks/sensor networks providers, to modify existing or add completely new services utilizing the underlying infrastructure. It could be thought of as a “plug-and-play” functionality for interconnecting different sensor networks and addition of new sensor networks, which is important for easy expansion of the entire system as well as capability expansion for individual sensor networks.

Potential impacts of ubiquitous deployment of sensors on radio access networks are discussed as well.

12:20 – 13:30

Lunch Break

13:30 – 14:15

James P. Brusey
Coventry University, UK

Title: Complementing RFID with Other Sensors

Abstract: Radio Frequency Identification (RFID) has emerged recently as key technological aid to improving the accuracy, timeliness, and completeness of logistical data. An important innovation has been the understanding that the use of a standard Electronic Product Code (EPC) can allow the same RFID tag to be used by several independent bodies. This allows benefits to be derived across the whole supply chain whilst, to some extent, sharing the infrastructural cost across all parties. In some cases, however, implementing RFID is turning out to be problematic—RFID enables closed loop control but errors, such as missed tag reads, can have dramatic consequences in such a system. Adding RFID tag readers may reduce the incidence of missed tag reads, but this option is expensive and errors may still occur. Instead, other types of sensors can be used to complement RFID data.

This paper proposes an approach to complementing RFID data from a hand-held RFID reader with accelerometer data, tracking the motion of the reader. Initial analysis suggests that fusing the two data sources will yield more accurate and complete data about inventory location. Furthermore, the approach should cost less than existing approaches and thus remove barriers to deploying RFID in small to medium size businesses.

IST Project Session:

14:15 – 14:35 Capacity of autonomous UWB Node Aggregates
Heinz Luediger
IMST, Germany
Project: Pulsers II

14:35 – 14:55 Cooperation in 4G Systems: A Service-Oriented Perspective
Usman Javaid, Orange-FT Group, France
Project: MAGNET Beyond

14:55 – 15:15 Context-Aware Security for Mobile and Ubiquitous Environments
Dimitris M. Kyriazanos, Anelia Mitseva, Maria A. Marchitti and Neeli
R. Prasad
ICCS/NTUA, Greece and CTIF, Aalborg University
Project: MAGNET Beyond and CRUISE

15:15 – 15:25 Mobility Framework for Wireless Sensor Networks: CRUISE
Approach
Anelia Mitseva, Tapio Suihko, Radosveta Sokullu, Slobodanka
Tomic, Maria Marchitti and Neeli R. Prasad

Abstract: This paper presents mobility framework for Wireless Sensor Networks (WSNs), which identifies mobility issues and requirements for mobility management within the Hybrid Hierarchical Architecture (HHA) proposed by CRUISE, and provides a methodology for evaluation of mobility-management solutions including mobility

classifications, mobility models and performance metrics. The proposed mobility framework is therefore a tool for evaluation of diverse set of scenarios and applications, in terms of mobility impact and mobility-enabled functionality. The paper briefly summarises all aspects of the mobility framework and provides examples of how the proposed methodology could be applied in a logistics scenario and a road-traffic scenario.

15:25 – 15:55 Simulation and Modelling of Wireless Sensor Networks

Andreas Timm-Giel, Markus Becker, Ciaran Lynch and Dirk Pesch

Abstract: The topic would be an overview on issues of simulating Wireless Sensor Networks, in particular highlighting differences to Communication Network simulations. Also a description of differences in models, e.g. traffic, mobility will be given. Additionally an overview and classification of available simulation environments for Wireless Sensor Networks is given.

15:55 Closing