CONET Newsletter

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Contents

- **Editorial**
- **Guest Column: WISEBED – building a large-scale heterogeneous sensor network testbed**
- **Member profile: SELEX Galileo**
- **Cooperating Objects in the SmartGrid Era**
- **Integration of autonomous systems with wireless sensor and actuator networks**
- **Announcements**

Editorial

Welcome to the fourth issue of the CONET newsletter. CONET is the EU FP7 network of excellence on Cooperating Objects, merging the fields of embedded systems for robotics and control, pervasive computing and wireless sensor networks. CONET focuses on establishing the field of Cooperating Objects within the research and industrial community, thus strengthening the position of Europe in the research landscape.

This issue presents a guest column from Stefan Fischer (University of Lübeck) about the European project WISEBED. In the "member profile" section George E. Matich presents SELEX Galileo. An interesting article describing Integration of autonomous systems with wireless sensor and actuator networks is presented by AICIA. We'll also take the opportunity to present some of the work done within the CONET consortium in the "Cooperating Objects Roadmap". This issue presents a summary of the Energy domain prepared by Stamatis Karnouskos from SAP.

If you are interested in obtaining up-to-date information about the CONET project please visit our website at:

http://www.cooperating-objects.eu/

We hope you will enjoy this issue ■

WISEBED – building a large-scale heterogeneous sensor network testbed

By Stefan Fischer, University of Lübeck, Germany (Coordinator of the European project WISEBED)

The need for sensor network test beds

Sensor network technology has been under investigation for several years now and has matured to a degree which allows for commercial real-world implementations at a large scale. Before taking the step to deployment, however, it is crucial to evaluate the system, because detecting faults during runtime is extremely costly especially for sensor networks – just imagine re-accessing an installation which has been deployed in a jungle or under water.

While simulations have been an important evaluation tool for sensor network technology for a long time, it has also become clear that achieving results that reflect the reality to a high degree is extremely difficult. It will thus be of major importance to also test a system just implemented before deploying it. Multipurpose test beds for sensor networks however, which allow testing of different aspects of a sensor network system (an application, for instance), such as scalability, mobility, support for heterogeneity etc. and which are available to interested communities do so far not exist.

WISEBED objectives

The goal of the European project WISEBED is to provide an infrastructure of interconnected test beds of large-scale wireless sensor networks for research purposes. WISEBED is part of the European FIRE initiative which aims providing facilities for Future Internet Research and Experimentation. It has nine partners, namely University of Lübeck (D), Freie Universität Berlin (D), TU Braunschweig (D), Universität Bern (CH), Université de Genève (CH), UPC Barcelona (E), RACTI in Patras (GR), University of Lancaster (UK) und TU Delft (NL).

In WISEBED, we intend to bring together different test beds across Europe and form a federation of distributed test laboratories. We will provide services for allowing advances in theoretical

computer systems to be tested, at least as a proof-of-concept, in large-scale environments, so as to assess the feasibility of the new concepts and verify their large-scale effects. We will engage on implementing recent theoretical results on algorithms, mechanisms and protocols and transform them into software that is independent from current technologies. Furthermore, we will evaluate code independence by using the different hardware available across WISEBED and place the resulting code under the scrutiny of large-scale simulations and experiments. This evaluation will provide valuable feedback and derive further requirements, orientations and inputs for the long-term research. Finally, it is our strong desire to make WISEBED become part of the FIRE facility, an overall test bed federation of heterogeneous test beds throughout Europe, including the results from projects such as OneLab II, P II, Federica and Vital++.

Project operations

The project is executed in four main work packages, covering the fields of hardware, software, algorithms, and data.

In WP 1, we are currently in the process of deploying large numbers of wireless sensor devices of different hardware technologies in different types of terrains to use for evaluating and testing solutions at large scale.

WP 2 deals with the software necessary to be implemented for building test bed federations. Among other components, we implement portal servers for every single sensor network, single-sign-on solutions to achieve one-stop shop functionality, and overlay software responsible for creating the federated test bed. As a result, researchers will be able to use the facilities remotely, thus reducing the need for a local, private test bed and, more importantly, reducing the cost for conducting all-rounded research.

Based on the software solutions, WP 3 converts existing theoretical solutions into software and provides a repository of algorithms, mechanisms and protocols that can be directly used in future experiments as reference for benchmarking purposes. Such mechanisms will be tailored to small devices implementations of proxy and scaled-down solutions. We are already in the

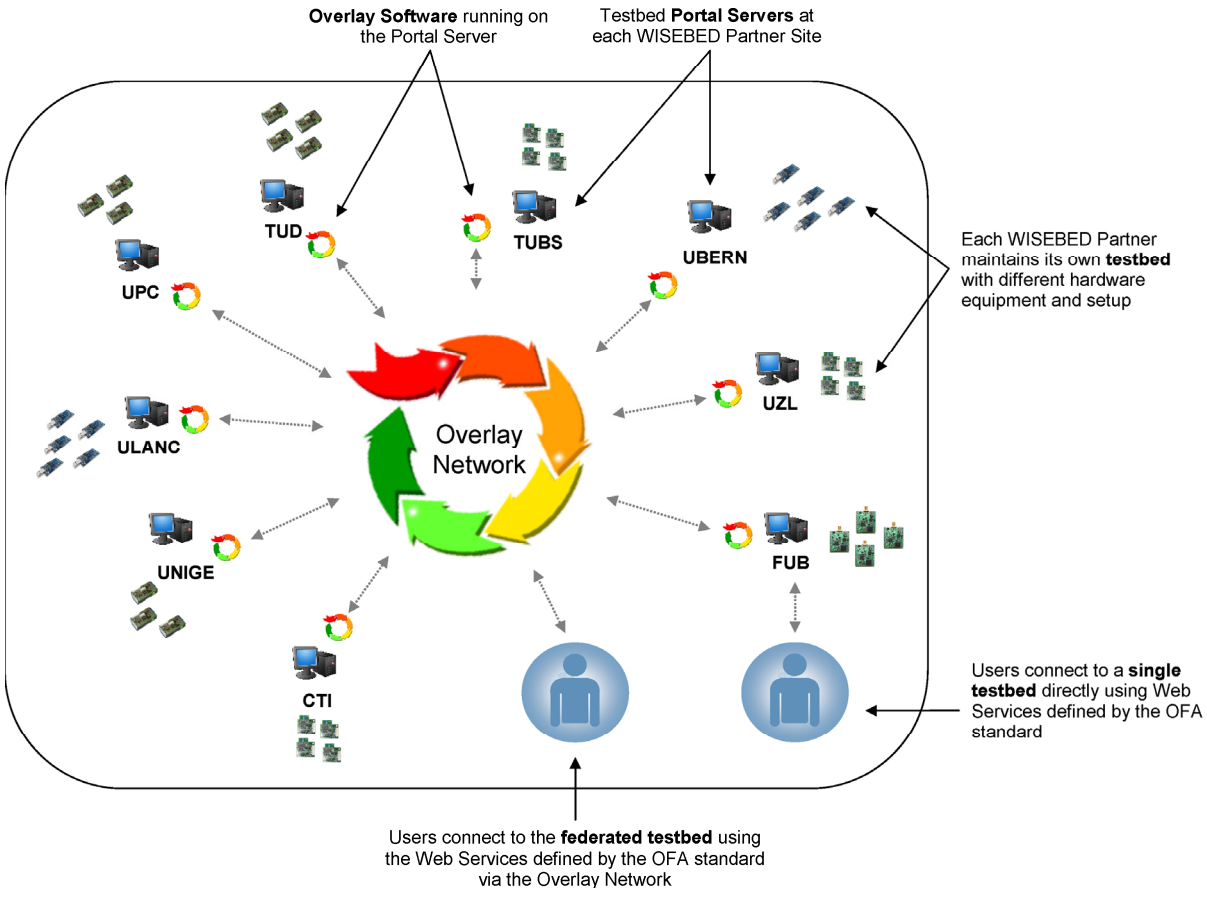

Figure 1 – WISELIB Overall Architecture

process of using the repository of algorithms and develop a library WISELIB that can be directly used in future system or integrated in order to deal with the vital challenges of the wireless sensor networks and offer efficient interconnection with the Internet.

In WP 4, we use the test beds to collect traces of data from the physical environment and derive models of real-life situations and scenarios. These scenarios will be used to evaluate the performance of algorithms and systems and draw conclusions on their operation and how it can be improved.

The overall architecture resulting from these activities can be seen in Figure 1.

Apart from these project-internal activities, we have also become very active in the FIRE community. Through cooperation with the other FIRE projects, we are about to interconnect our test bed federation wireless networks with the Internet and especially with other test beds from FIRE in order to provide a virtual unifying laboratory to enable testing and benchmarking, in a controlled way, in different "real-life" situations.

Outlook

We intend to make the WISEBED distributed laboratories available to the European scientific community and disseminate our methodology to research groups of both theoretical and practical background. It is our goal to establish a process of joint research activities, in which both theoreticians and practitioners will get together and use our facilities in order to interact and put the methodology into action. For that purpose, we have already published a preliminary offering explaining how the WISEBED Experimental Facility can be used by other research groups within Europe.

Contact

More information on WISEBED is available on www.wisebed.eu or directly through the coordinator at fischer@itm.uni-luebeck.de. ■

Member Profile: SELEX Galileo

SELEX Galileo is a part of the Finmeccanica group and employs over 7000 staff, with operations in Italy, UK and the USA. The Company develops integrated capability solutions delivering enhanced situational awareness, security and safety across land, sea, air and space domains. In the UK the Company has four key sites accommodating 4,000 staff – more than half of whom are engineers and scientists, from graduates to PhDs. The Company's IP portfolio includes in excess of 300 patents with inventions covering all aspects of its product and integrated systems business. The organisation provides full end-to-end sensor, instrumentation and system design, development, integration and manufacturing services for a wide range of international clients throughout the aerospace, defence and homeland security sectors.

EUROFIGHTER TYPHOON: SEIEX Galileo has responsibility for the design and manufacture of the key Radar, Electronic Warfare and Infrared Search and Track systems for this important multi-national fourth generation front line fighter.

SELEX Galileo's infrared sensing solutions are used for night vision in surveillance, search and rescue and military applications, determining targets for weapon systems in difficult conditions. Technologies cover the entire sensing and data processing chain- from development and production of the front-end Mercury Cadmium Telluride (MCT) detector arrays, through multiplexers and fast signal and data processing, to algorithm development for real-time multi-sensor (acoustic, seismic, RF etc) supporting collaborative enhancement of imager information.

SELEX Galileo also enjoys an enviable reputation for world class multi-spectral sensor arrays that