COOPERATING OBJECTS NETWORK OF EXCELLENCE

CONET Newsletter

INFSO-ICT-224053 www.cooperating-objects.eu

Issue nr.13, May 2011

Contents

Editorial

Welcome to the 13th 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 has a strong flavour towards communication technologies for cooperating objects as well as on the emerging domain of smart grids. We also report on upcoming events including the yearly organized CONET Summer school.

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!

■

Member Profile: SAP

SAP helps companies of all sizes and industries run better. From back office to boardroom, warehouse to storefront, desktop to mobile device, SAP empowers people and organizations to work together more efficiently and use business insight more effectively to stay ahead of the competition. We do this by extending the availability of software across on-premise installations, on-demand deployments, and mobile devices. We believe that the power of our people, products, and partners unleashes growth and creates significant new value for our customers, SAP, and, ultimately, entire industries and the economy at large. Our mission is to help companies of all sizes and industries to run better. Our vision is to help the world run better.

Headquartered in Walldorf, Germany, SAP is the market leader in enterprise application software. Founded in 1972, SAP (which stands for "Systems, Applications, and Products in Data Processing") has a rich history of innovation and growth as a true industry leader. SAP applications and services enable more than 109,000 customers worldwide to operate profitably, adapt continuously, and grow sustainably. With revenue (IFRS) of €12.4 billion for the year 2010, SAP has more than 53,000 employees and sales and development locations in more than 75 countries worldwide.

SAP Research is the technology research department of SAP and as an integral part of SAP's R&D activities, SAP Research is responsible for identifying, researching, understanding, developing and evaluating new and emerging technologies, processes and e-business solutions that strategically influence the future of SAP business applications. CONET is one of the projects where SAP Research participates with the goal to investigate the added value of collaborative networked embedded systems in future enterprise environments and their services.

ⓘ http://www.sap.com

■

SWIMming in SESAR

By Dario Di Crescenzo (Selex Sistemi Integrati)

The need for SWIM

The management of different types of ATM information has until now evolved independently based on stakeholder sub-system and service-specific requirements. As a result of this bottom-up approach, today's ATM information systems are insufficiently integrated, resulting in organizational and institutional barriers which prevent the timely use of relevant information. Aircraft operators, ATC units and airports gather their own data independently and asynchronously.

The interoperability needs identified by the ATM community will involve transforming the system from an essentially distributed network of independent units to an efficient network of integrated co-operators able to cope efficiently and effectively with the challenging targets set by SESAR.

The early introduction of System-Wide Information Management (SWIM) capability is necessary to facilitate this co-operation and has been widely recognized both by European and USA main ATM players.

The main objective of SWIM is to enable a seamless information sharing between the air transportation stakeholders as, for example, airports, airlines, military air defence and air traffic control centres, Air Navigation Service Providers (ANSP) etc.

SWIM constitutes the future software infrastructure which will interconnect the multiplicity of stakeholders and systems which take part in the ATM (Air Traffic Management) domain; its task will be to represent the software bus allowing the realization of seamless integration among geographically distributed and heterogeneous systems providing a common interface to access domain services and a uniform information model for the data exchange and intercommunication among each of such systems. SWIM will, of course, also need to include strict security characteristics together with scalability, performance, reliability, maintainability and evolution.

Different technologies are able to help the designers to reach the goal of building these kinds of systems both for distributing data, as well as requesting services to remote system instances. Principles derived from Service Oriented Architectures (SOA) are expected to play a crucial role in reaching the decoupling and flexibility levels required, while technologies like JMS, AMQP, DDS are good candidates for the task of distributing data and may provide both decoupling as well as flexibility and Quality of Service guarantees with different degrees of "resolution".

SWIM-SUIT: Learning how to SWIM

SELEX Sistemi Integrati is no stranger to these technologies which are being adopted in the development of the innovative ATM systems, including next generation middleware solutions and distributed systems.

More specifically, Selex Sistemi Integrati is leading the SWIM-SUIT initiative which aims to provide technological assessment by developing a SWIM prototype through which the technological solutions are evaluated. SWIM-SUIT, an FP6 research Project involving 20 partners, represents the first concrete European initiative setting the baseline for the future developments of SWIM. The Projects covers the full cycle from requirements definition to validation and results assessment. Participation of 20 partners as well as outside contribution from the User Group has ensured that the requirements defined in the Project are broadly representative of the European ATM stakeholders and may therefore be taken as a decisive step towards the overall definition of SWIM. The requirement capture has of course included the crucial area of safety and security which represent vital aspects of the implementation of SWIM in the real world. The Project, which is still ongoing, is now refining the overall requirements to take on board the military perspective which is of course a crucial stakeholder for SWIM implementation in the real world. This activity is focusing on the functional and operational interoperability with the military community through SWIM and is being carried out through contacts with the military community. The capture and analysis of military inputs will prepare the ground for the subsequent work to be carried out in SESAR JU.

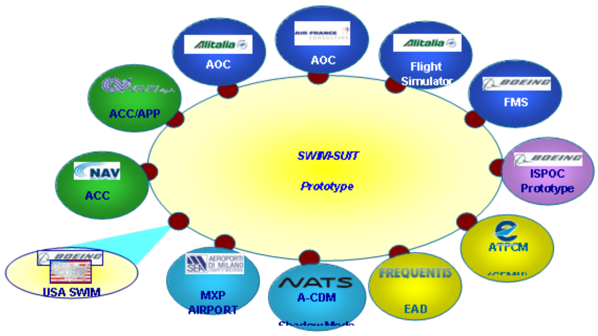

Figure 1: The SwimSuit Prototype

In order to instantiate and validate the applicability of the SWIM concept, during the course of the SWIM-SUIT project a SWIM prototype, consisting of a fully decentralized architecture, has been developed. The SWIM-SUIT Prototype represents a SWIM environment allowing the sharing of information among stakeholders, where it is needed and when it is needed. For this purpose the SWIM-SUIT prototype is connected to 'legacy systems' representative of the real ATM world which serve to stimulate the prototype with operational data providing a flavour of the future SWIM scenarios envisaged by SESAR. SWIM-SUIT is able to reproduce these SWIM scenarios by integrating applications representing the main ATM stakeholders, including ANSPS (ENAV, NAV Portugal and an ACC simulator provided by BRTE), Airlines (Alitalia and Air France AOCs), Airports (SEA), Aircraft (Alitalia Flight Simulator and Boeing FMS), CFMU (Eurocontrol) and AIS (through a Frequentis EAD application). The relevance of the simulation scenarios is being further enhanced through the integration of an Airport CDM shadow mode application provided by NATS which will allow the prototype to take on board the collaborative environments foreseen in the SESAR vision.

The SWIM-SUIT Prototype represents the 'playground' through which Selex Sistemi Integrati and Consortium partners develop experience and valuable know how which will prove invaluable for the implementation of the future SWIM. More specifically, the principles applied in the design of the prototype will set the baseline for the future refinements taken on board by the SESAR initiative. Some of these principles are therefore elaborated below so as to provide a high level view of the ground work provided by SWIM-SUIT.

The high level architecture has been structured in basically two layers: a core layer offering a set of common services and components to the upper layer (e.g. security, data distribution, and registry) which was then in charge of offering specific domain services (e.g. subscriptions to flight data, notifications of incoming flight information, subscription to surveillance information etc.).

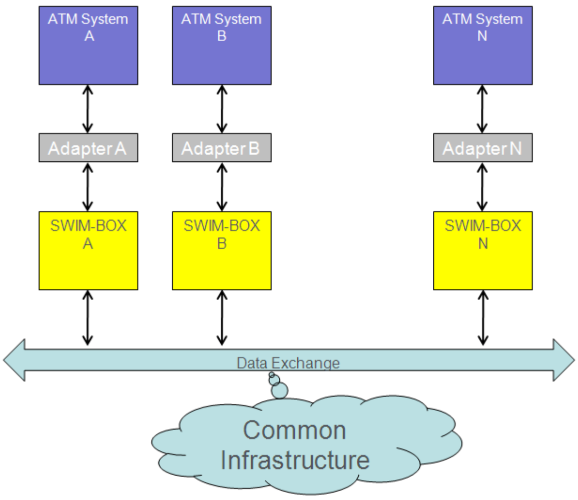

Figure 2: SWIM-SUIT prototype complete instance connections

In the SWIM-SUIT architecture the SWIM system is composed by a number of SWIM instances represented by a physical node residing at each stakeholder premise being therefore able to communicate on one hand with the local system (willing to exchange data and services via SWIM) and on the other end to the other SWIM Instances (named as "SWIM-BOXes"). The set of these system instances physically represent the SWIM Network where such system instances form the "logical bus" among which information flows and services are provided and consumed. Only "SWIM-BOX" instances are allowed to directly exchange data and invoke services over this network; therefore they act as mediators with respect to the external clients (e.g. FDP systems). As of today, each existing ATM System participating in the SWIM-SUIT project is not aware of the services and functionalities of the SWIM prototype and each might use its own technology to exchange and represent information. For this reason, on each site the task of interfacing the "legacy system" to the SWIM-BOX instance is assigned to an "Adapter" component. The resulting high level structure can be therefore illustrated as in Figure 2.

Each ATM system (as depicted in Figure 3) exchanges data and provides/consumes services via the mediation of the SWIM-BOX component which defines and assures a common dictionary for each of the data domains supported (e.g. aeronautical, flight data, surveillance etc.) enforcing the respect of security policies (e.g. restricted access both to data then to services). The Adapter architectural component shown in Figure 2 will presumably be removed (or incorporated) in the future ATM systems since they will be natively able to interact with the SWIM Infrastructure.

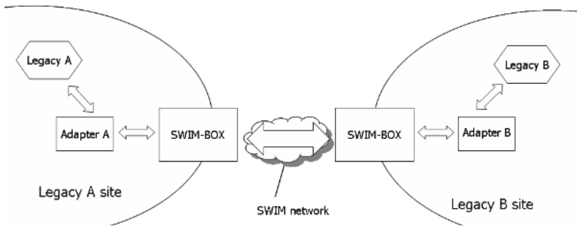

Figure 3: The end to end interaction among (current) ATM systems in a SWIM Network

The relevance of the SWIM-SUIT experience for the future implementation of SWIM is being further enhanced through an ambitious programme aimed at connecting the SWIM-SUIT Prototype with a similar test bed in the USA provided by Boeing and representative of the NEXT GEN initiative of the FAA. By integrating both SWIM environments, this SWIM-SUIT initiative will open the way for the testing of transatlantic interoperability scenarios involving both Flight and Surveillance Data Domains. Validation of these scenarios is expected to provide precious feedback to the NEXT Gen and SESAR initiatives.

Before developing and implementing the prototype, the SWIM-SUIT Project team has set about the important task of selecting the most suitable technology both for the aspects related to the data distribution (following the publish/subscribe pattern) and to the invocation of synchronous services using a request/reply approach. The selection has been based on a wide set of formalized weighted selection criteria which have of course targeted the immediate objective of implementing a SWIM prototype in the short run. As a result of this preliminary activity the project team adopted JMS/DDS as technologies to be experimented for the data distribution while Web Services for the request/reply interactions.

SWIMming towards SESAR

The course of the SWIM-SUIT project is giving the project team a very valuable opportunity to experiment different solutions both architectural and technological. It also represents a test case for the challengers facing the SESAR initiative in the SWIM domain, which will of course greatly increase the level of complexity also with respect to programme management itself.

The interactions among a wide variety of actors, each with its own background and skills, the set up of geographically distributed validation session (each with specific actors involved), the synchronization for assuring the availability of the partner legacy systems, network connectivity, personnel for performing tests, validation and actual building of several “adapter” prototypes is an extremely complex task which will be faced on an even larger scale within SESAR.

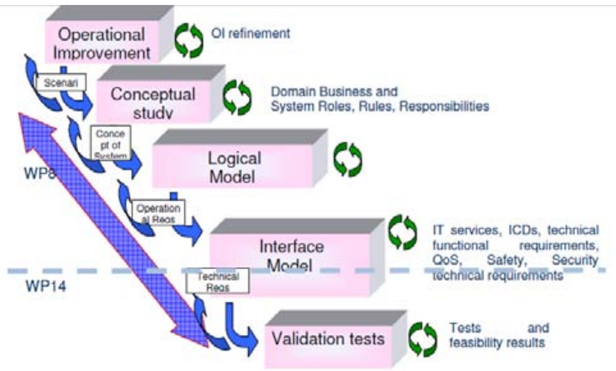

Figure 4: Development Structure

In fact, in order to keep the complexity more manageable, the definition and implementation of the SWIM concept in SESAR has been split in two Work Packages, namely WP8 and WP14.

WP8 establishes the framework which defines seamless information interchange between all providers and users of shared ATM information so as to enable the assembly of the best possible integrated 4D picture of the past, present and (planned) future state of the ATM situation.

WP8 is in charge of defining a new and comprehensive Information and Service Model for the ATM as a whole by delivering the so called AIRM (ATM Information Reference Model) and ISRM (Information Service Reference Model).

WP14, in turn, is responsible for selection of technology and implementation details based upon models and other artifacts delivered by WP8. It’s objective is therefore the actual definition and implementation of the future technical (middleware) infrastructure that, by supporting data and services as specified by WP8, will allow future ATM systems to interoperate by sharing information and services.

As already noted, a wide variety of heterogeneous systems each with their own constraints and requirements will rely on such software infrastructure in order to receive and distribute information. This is of course one of the main challenges not only of the SWIM infrastructure designers (for WP14 in particular) but also of the management programme itself, since it will act as a backbone both at technical level and at programme level (as it will have to assimilate the specifications coming from many of the SESAR system and operational Work Packages).

■

Advanced Communication Technologies Development of Cooperating Objects

By Yu Chen (UCL)

A Cooperating Object (CO) is a single entity that consists of sensors, controllers (for processing information), actuators and wireless communication modules (for wirelessly communicating with other COs). This concept was envisaged by Mark Weiser in 1991 and similar products, i.e., wireless sensors, were firstly appeared in markets in the late 1990s. Since then, Wireless Sensor Networks (WSNs) have been widely promoted and used in the areas of civil engineering and health care. A CO is considered as a superset of a sensor, not only because 1) in comparison to a CO, which is envisioned as a product with matured and advanced technologies, the sensor technology is still in a preliminary stage, but also because 2) the customer’s requirements for COs are comparatively more general. Therefore, this article will present two pieces of work from UCL that aim to advance sensor technology by adopting technologies in Third-generation (3G)/Fourth-generation (4G) wireless communication systems.

Multiple Sub-carriers MAC layer Accessing Scheme Using OFDMA technology

Traditional sensors use the wireless channel with preset bandwidth and modulation method, but this way will greatly affect the throughput performance due to packets collision. When more nodes are connected and trying to form a star/mesh network, packets collision will be intensified by its built-in scheme of random back-off times. It has been scientifically proven that packets collision can be mitigated by using multiple sub-carriers accessing scheme (a scheme that allows more than one node to transmit data simultaneously) and such mechanism can be found easily in almost every advanced communications system. Furthermore, 4G systems are prone to use Orthogonal Frequency Division Multiple Access (OFDMA) technology (for example, WiMAX uses OFDMA as the downlink method) for providing this multiple sub-carriers accessing capability and the spectrum-efficient communications. However, using OFDMA requires a more sophisticated architecture design because sender's Local Oscillator (LO) frequency variation will cause significant Inter Channel Interference (ICI) and Multi User Interference (MUI), both of which would result in a decrease of the system Bit Error Rate (BER). Especially in a WSN consisting of hundreds of nodes and tens of hops, this problem will be much severer to handle with. Hence, one direction of research in UCL is to adopt pulse shaping, other than the simple rectangular pulse shaping, as an approach to increasing the resistance to Carrier Frequency Offset (CFO) and time shift. This method is highly suitable for WSN because it only requires a simple modification of pulse shaping function in digital part of RFIC and therefore requires no increase in the complexity and power consumption.

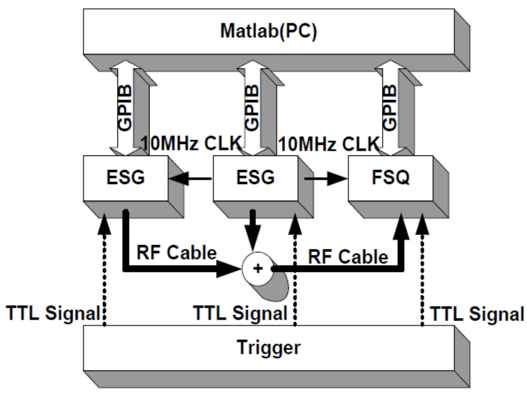

Figure 5: Experiment Setup of CC2420 RFIC [1]

Experimentally, we evaluated this proposed system by emulating the CC2420 (the most popular RFIC in WSN area designed and produced by Chipcon). As shown in Figure 5, CC2420 was divided into three functionalities, namely, Matlab (running in a laptop for digital processing), Agilent ESG 4432b (for up-converting and as a power amplifier) and R&S FSQ 40 (for down–converting and as a linear low-noise amplifier). Results indicated that using pulse shaping will increase performance and counteract the effects of ISI/ICI [1].

Providing QoS using EC modelling technology

The issue of Quality of Service (QoS), such as data rate, delay and delay-violation probability, is raised when COs need to handle diverse traffic and each traffic has its own characteristics and requirements. 3G and 4G wireless systems are typical examples that take accounts of QoS considerations but since packet delay is heavily dependent on wireless channel condition, which has a stochastic behaviour, how to guarantee QoS in wireless scenario has not been fully answered. Single-hop Effective Capacity (EC) model was proposed in 2003 by Wu [2] and was intended to be used in 3G networks. The model revolutionarily focused on connection-level channel model that is above the physical layer, thus enabling us to predict parts of QoS metrics, including delay and delay-violation probability, accurately and efficiently. The computational efficiency of EC model is also attractive to Cooperating Objects.

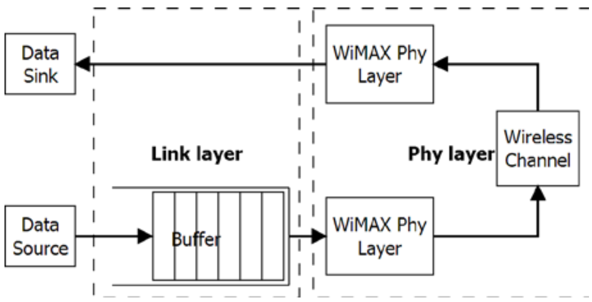

Figure 6: WiMAX communication system

Figure 6 shows a cross-layer (Physical Layer combined with Link Layer) WiMAX simulation platform built by MATLAB Simulink and EC theory was validated in this platform. As shown in the Figure 6, packets are generated by a data source in a constant rate and are pushed into a link-layer queue. WiMAX physical layer is responsible for pulling the packets from the queue and sending them to the receiver. In the end, packets will arrive at data sink and their delays will be calculated and saved in a text file. Results indicated that delay-violation probability behaves exactly as what EC theory says, i.e., the distribution will have an exponential-like distribution [3]. As a step forward, it is planned that the experimental testing of the theory will be carried out in a real WSN in the near future.

References

[1] Fei Qin, Yang Yang, and John E Mitchell, "Performance Increase Through the Use of Multiple Sub-carriers in WSN," in 7th ACM International Symposium on Mobility Management and Wireless Access(MobiWac) 2009.

[2] D. Wu and R. Negi, "Effective capacity: a wireless link model for support of quality of service," Wireless Communications, IEEE Transactions on, vol. 2, no. 4, pp. 630 – 643, July 2003.

[3] Yu Chen, Izzat Darwazeh, "End-to-End Delay Performance Analysis in the IEEE 802.16j Mobile Multi-hop Relay (MMR) Networks," in 18th International Conference on Telecommunications (ICT) 2011

■

Neighbourhood Oriented Brokerage ELectricity and Monitoring System

By Manuel Serrano Matoses (ETRA I+D)

Distributed generation of energy coming from various vendors, even private homes, is a big challenge and, additionally, a source for new business opportunities for tomorrow's power management systems that, unlike today, will not dispatch energy centrally or under central control [2]. On the contrary, the production, distribution and management of energy will be treated and optimized in a distributed manner using local data.

Nowadays, 40% of all energy consumption in the world is electrical energy, with 41% of this energy consumed by households and services [1]. This will grow to 60% by 2040. Much of this energy is wasted by inefficient technologies, especially during its transport, but also in the last mile of distribution, where the management and control take place, most of the time, in a centralized way, as opposed to a more local driven monitoring and control.

Information and Communication Technologies (ICT) are the key to enhance the monitoring and control of electrical energy from the source to the load, especially in cases where we have large scale distributed energy production.

The NOBEL approach targets to develop, integrate and validate ICT enabling a reduction of the currently spent energy, by providing a more efficient distributed monitoring and control system for local network operators and prosumers (as depicted in Figure 7).

NOBEL will focus its efforts in designing a new Neighbourhood Oriented Energy Monitoring and Control System. This solution will help network operators to improve last mile energy distribution efficiency by integrating operators' requirements and by enabling bidirectional interaction between them. By improving monitoring efficiency, the NOBEL approach aims at reducing the required production of energy. In the short term, it is more important to improve the efficiency than trying to dramatically reduce the production, which would require a major social agreement and a major adjustment in the behaviour of citizens.

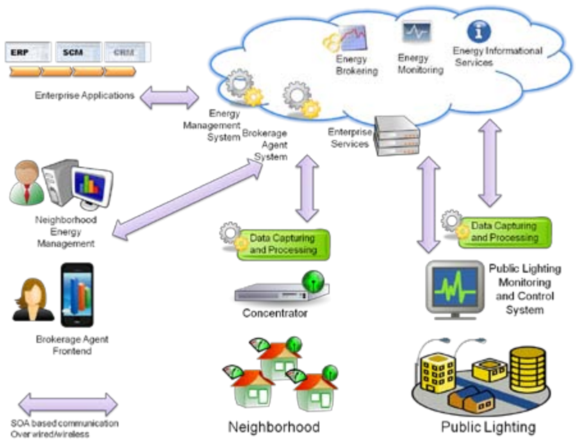

Figure 7: NOBEL Overview

The key to NOBEL's efficiency improvement is that prosumers become sources of both energy and information. The information allows the energy system to better adapt the amount of electricity in the network to the real time demand. The performance of the entire system is enhanced by exploiting the locality of the processes in monitoring and control that normally do not consider the detailed behaviour of the actual consumers.

Key Directions

In summary, the NOBEL project has set the following scientific and technical objectives:

- Information retrieval: NOBEL uses state of the art technologies to dynamically obtain and process information from current available installed equipment. This will be achieved by implementing bidirectional communication with all involved entities, process the information with respect to consumption and production and automate decisions to be made network-wide.

- Information distribution: NOBEL develops a service oriented framework that will allow easy flow of information among the prosumers and the enterprise systems in order to foster more energy efficient processes. This implies the development/extension of a middleware and a set of application independent services that enable the distributed capturing, filtering and processing of the energy related data. The same services will ease enterprise wide inclusion and allow for better cross-layer collaboration which will lead to holistic optimization strategies.
- A cooperative system: NOBEL develops cooperation approaches for all entities involved. This assumes cooperating objects at device level, at the energy brokerage system, at service level etc. Interoperability in heterogeneous environments will need to be tackled, while we focus on the use of the Internet Protocol for communication e.g. at smart meters, etc. The system includes a core platform to assist local network operators in the monitoring and control of energy, and a brokerage system and usage of brokerage agents that act on behalf of a prosumer, to distribute fine-grained knowledge and gather information through the network.
- End-user applications: A Neighbourhood Oriented Energy Monitoring and Control System, a Brokerage Agent front-end, a Neighbourhood Oriented Public Lighting Monitoring and Control System, and applications are expected to be strongly integrated with the Enterprise Services and provide mash-up customized services to the users.
- Real-world evaluation: NOBEL validates and assesses the NOBEL approach in a real world Pilot Site, where customers reside and use it in their daily lives.

Apart from the energy efficiency, the NOBEL project focuses on the technology side as well, including IP communication for low power networks, data capturing and on-device / in-network cooperative processing, enterprise integration and timely user interaction also with the usage of mobile devices.

- IP Communication for Low-power Networks: to support the large number of devices and communication patters in NOBEL, the underlying networking technology must be inherently scalable, interoperable, and have a solid standardization base to support future innovation as the application space grows.
- Data capturing and cooperative processing: This includes the definition of relevant data to the application and its efficient capture, routing and processing within the network.
- Enterprise Integration and Energy Management: in network and at enterprise level data acquisition and processing is coupled with enterprise functionality that can deliver the next generation of energy services.

Trials

The approach will be evaluated in a real world trial. A real world trial will be realized in the town of Alginet, which is located 25 Km from Valencia, Spain. Alginet has 15000 inhabitants, the majority of whose lives in homes equipped with smart meters that can make fine-grained measurements. The Electrical Cooperative of Alginet is the local electricity provider with an approx. 6000 customer base where the neighbourhood concepts of NOBEL can be tested. Additionally the coverage of the area via WiMax will enable us to test mobile applications.

The users will have access to their existing energy consumption, analysis of the situations and possible identification of energy wasting. They will be able to have a historical overview as well as a projection of their future energy and costs depending on their current consumption behaviour. Further customized services will be available for them, and will be provided by wired and wireless means in order to achieve access to the energy data anywhere, anytime, in any form easily and effectively. Based on their capabilities the users will be able to not only have monitoring information but also manage their personal plans and their infrastructure. By increasing visibility via near real-time assessment of the energy information, providing analytics on it and allowing selective management, NOBEL will provide a new generation of customized energy efficiency services

NOBEL presents a new approach that focuses on the small and medium-sized communities, with the goal to better enable them to manage their resources and additionally achieve better energy efficiency. Towards this quest we will investigate and advance state of the art technologies by taking full advantage of the Internet technologies, the capabilities of modern networked embedded systems and the collaboration of different actors to achieve the common goals.

As we have presented there are several challenges that lie ahead, however the benefits for communities will be significant. We aim at validating our prototypes in real-world trials in the city of Alginet in Spain.

ⓘ www.ict-nobel.eu

References

[1] W. Eichhammer, T. Fleiter, B. Schlomann, S. Faberi, M. Fioretto, N. Piccioni, S. Lechtenböhmer, A. Schüring, and G. Resch. "Study on the energy savings potentials in EU member states, candidate countries and EEA countries". European Commission, Directorate-General Energy and Transport, 2009. http://ec.europa.eu/energy/efficiency/studies/doc/2009_03_15_esd_efficiency_potentials_final_report.pdf

[2] SmartGrids European Technology Platform. "Smartgrids: Strategic deployment document for Europe's electricity networks of the future". European Commission, Apr. 2010. http://www.smartgrids.eu/documents/SmartGrids_SDD_FINAL_APRIL2010.pdf.

■

CONET Summer School 2011

The 3rd CONET summer school is organized this year in July in Bertinoro Italy. Approximately 60 participants have been selected to participate in a fully packed programme:

- **"Physical-Layer Security for Embedded Wireless Networks"** by Srdjan Capkun
- **Sensors, People, Animals and Robots** by Peter Corke
- **Machine Learning for Wireless Sensor Networks: Learning from the Environment and from Users** by Anna Förster
- **Mobile Social Cloud Computing To Enable Next-Generation Context-Aware Applications** by Rick Han
- **Wireless Health: Opportunities and Challenges for Wireless Sensor Networks** by Andreas Terzis
- **Participatory Sensing** by Mark Hansen
- **Designing Digital Artifacts: Understanding Interaction with Smart Objects** by Lars Erik Holmquist
- **Embedded Interaction** by Marc Langheinrich
- **Smart Energy** by Friedemann Mattern
- **Computers and Privacy** by Marc Langheinrich
- **Bullet-proof Software Development for Networked Embedded Systems: Dream or (Future) Reality?** by Luca Mottola
- **Haptic Interaction in Human-human and Human-robot Dyads** by Angelika Peer
- **Wireless Sensor Networks Deployments: From Research to the Real-World and Back** by Gian Pietro Picco
- **Debugging Networked Embedded Systems** by Kay Roemer
- **Contiki COOJA Hands-on Crash Course** by Thiemo Voigt

ⓘ http://www.cooperating-objects.eu/school/2011/

■

Announcements

Special Issue of Elsevier Ad Hoc Networks on "SCEnarios for ad hoc Network Evaluation Studies (SCENES)"

ⓘ http://www.elsevierscitech.com/cfp/SCENES-CFP.pdf

Paper Submission Deadline: Aug 15, 2011
Notification of Paper Acceptance: Nov 30, 2011
Camera-ready: Jan 31, 2012

6th IEEE International Workshop on Service Oriented Architectures in Converging Networked Environments (SOCNE)

September 05, 2011, Toulouse, France

ⓘ http://www.socne.org

Paper Submission Deadline: May 30, 2011
Notification of Paper Acceptance: Jun 24, 2011
Camera-ready: Jul 08, 2011

ACM SenSys 2011 – Call for Posters/Demos

November 01-04, 2011, Seattle, USA

ⓘ http://sensys.acm.org/2011/

Important Dates (Posters):

Paper Submission Deadline: Aug 01, 2011
Notification of Paper Acceptance: Aug 15, 2011
Camera-ready: Aug 29, 2011

Important Dates (Demos):

Paper Submission Deadline: Jul 22, 2011
Notification of Paper Acceptance: Aug 05, 2011
Camera-ready: Aug 19, 2011

■

Register @ http://www.cooperating-objects.eu to receive future issues of the CONET Newsletter