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DEWI - Wirelessly into the Future

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Abstract

The ARTEMIS/ECSEL project DEWI (?Dependable Embedded Wireless Infrastructure?) focusses on the area of wireless sensor / actuator networks and wireless com-munication. With its four industrial domains (Aero-nautics, Automotive, Rail, and Building) and 21 clearly industry-driven use cases / applications, DEWI will pro-vide and demonstrate key solutions for wireless seamless connectivity and interoperability in smart cities and infra-structures, by considering everyday physical environ-ments of citizens in buildings, cars, trains and aeroplanes. It will add clear cross-domain benefits in terms of re-usability of technological building bricks and architecture, processes and methods. DEWI currently is one of the largest funded European R&D projects, comprising 58 renowned industrial and research partners from 11 Euro-pean countries. (For further details see www.dewi-project.eu)

DEWI – Wirelessly into the Future

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Abstract
The ARTEMIS/ECSEL[1] project DEWI ("Dependable Embedded Wireless Infrastructure") focusses on the area of wireless sensor / actuator networks and wireless communication. With its four industrial domains (Aeronautics, Automotive, Rail, and Building) and 21 clearly industry-driven use cases / applications, DEWI will provide and demonstrate key solutions for wireless seamless connectivity and interoperability in smart cities and infrastructures, by considering everyday physical environments of citizens in buildings, cars, trains and aeroplanes. It will add clear cross-domain benefits in terms of reusability of technological building bricks and architecture, processes and methods. DEWI currently is one of the largest funded European R&D projects, comprising 58 renowned industrial and research partners from 11 European countries. (For further details see www.dewi-project.eu)

DEWI – An Overview

Introduction

Today, wireless communication has found its way into the everyday life of almost all citizens, be it in private, in public or in business. Embedded devices like mobile phones, WLAN routers, high-speed home entertainment connections or navigation systems are familiar to everyone. It is evident that the presence of this wireless technology has significantly eased the lives of citizens, by providing connectivity.
However, wireless connections can reach far beyond mere communication needs of citizens. In combination with information retrieval from one's surroundings via wireless sensor networks (WSNs), this can significantly increase flexibility for both citizens and professional users in their environments. Here, wired technologies still dominate, mainly due to the lack of dependability (reliability, safety, security etc.), privacy and auto-configurability of wireless networks. Furthermore, current wireless solutions do not have the common reference design and service-oriented architecture needed to build a market environment where competition enables lower prices for citizens.

Thus, DEWI will provide key solutions for wireless seamless connectivity and interoperability in smart cities and infrastructures, by considering everyday physical environments of citizens in buildings, cars, trains and aeroplanes, which will significantly contribute to the emerging smart home and smart public space.

The DEWI Sensor & Communication Bubble

To make this possible, DEWI introduces the concept of a locally adaptable wireless "Sensor & Communication Bubble" (S&C Bubble), featuring: locally confined wireless internal and external access; secure and dependable wireless communication and safe operation; fast, easy and stress-free access to smart environments; flexible self-organisation, reconfiguration, resilience and adaptability; open solutions and standards for cross-domain reusability and interoperability.

The DEWI S&C Bubble consists of 3 main elements:

- sensor and actuator nodes
- gateways, serving as interfaces between different clouds or to the external world
- users (internal and external), human or machine

In addition, the bubble consists of appropriate extensions that provide functions for the bubble such as flexible data acquisition, aggregation and fusion, smart architecture, HW/SW co-design, security/data protection/authorisation, re/auto/self-configuration, intelligent energy management and energy generation, reliability/robustness/safety, wireless standards, wireless sensor/device detection & localisation.

Several different wireless communication technologies can be used within such a bubble. DEWI has a clear focus on short-range technologies and corresponding standards such as Wi-Fi (IEEE 802.11), ZigBee, WirelessHART, ISA100 (IEEE 802.15.4), Bluetooth (IEEE 802.15.1), NFC (ISO 15408 und ISO 14443/ ISO 15693), 6LoWPAN/ IPv6 (PFC 4919), Z-Wave (ITU-T G.9959), TETRA, TETRAPOL (PMR) or DLNA (UPnP). In this context, not all nodes necessarily need to be wirelessly connected to each other; in this case, other nodes can act as relays. DEWI bubbles can also have different topological layouts and be organised as distributed (ad-hoc) or centralised networks. Incidentally, the DEWI S&C Bubble is principally autonomous and should not be regarded as solely an extension to the Internet or as a first/last mile solution.

[1] ARTEMIS … Advanced Research and Technology for Embedded Intelligence and Systems.
ECSEL … Electronic Components and Systems for European Leadership.

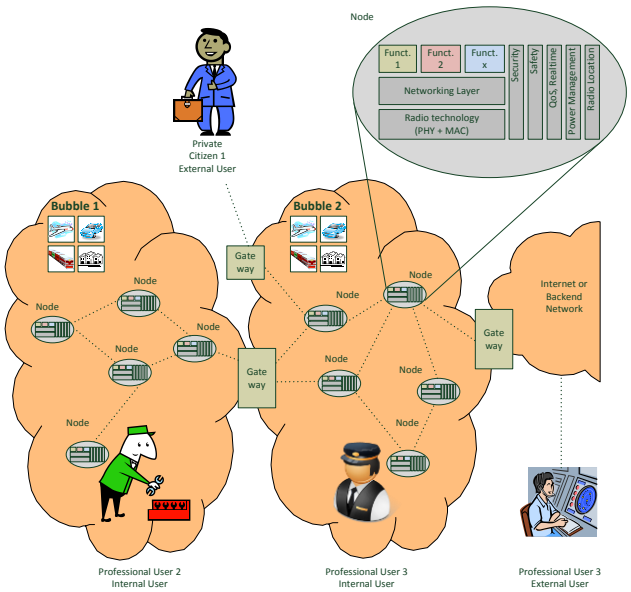

Figure 1: The DEWI Sensor & Communication Bubble.

Goals and Objectives

The overall project goal of DEWI is to provide key technologies and reference architectures with a focus on the S&C Bubble, the internals of the bubble and its interfaces to the environment, but not beyond.

This means:

a) Dependable, auto-configurable, optionally secure, short-range communication
b) Local energy-management: efficiency, harvesting, storage
c) Localization of sensors and mobile devices
d) Smart composability and integration of WSNs

DEWI will achieve its objectives through a clearly use-case-oriented and industry-driven approach with the following key success factors to contribute to vertical and horizontal application innovation:

- Identification and build-up of a common, multi-domain applicable, service-oriented short-range wireless communication architecture that eases the life of citizens and professional users and enables service innovation
- Driving forward the domain-specific and cross-domain technology items, i.e. re-useable technological building blocks (methods, software, hardware)
- New vertical and multi-domain (horizontal) services that allow to easily integrate new technologies, SMEs, and tool providers
- Enabling vertical and horizontal business cases representing added value for the transport and building domain
- Identification of infrastructure requirements within vertical activities (domain-specific use cases) to take into account new interaction and interface concepts for proper tackling of cross-domain issues in smart environments
- Transfer of knowledge and experience between different domains – identification of domain-independent problems to foster cross-domain reusability
- Providing input to, make use of results of and interact with other projects (in particular ARTEMIS/ECSEL)
- Contribution to the ARTEMIS repository by development of results from industry-driven use cases
- Gathering the main European players regarding wireless embedded systems engineering in the areas of transportation and building / surveillance providing a critical mass of European technology providers for future safer, securer, and more comfortable transport and living
- Exemplary show cases that will demonstrate the key results of DEWI, by displaying high relevance to societal needs and cross-domain applicability.
- Regarding interoperability, DEWI will also contribute to establishing a standard for wireless systems engineering in a certification and security context, which entails conformity to both specific standards as well as international domain-independent standards.

Market Innovation and Impact

DEWI, with its four industrial domains (Aeronautics, Automotive, Rail, and Building), will add clear interoperability and cross-domain benefits in the area of WSNs and wireless communication, in terms of re-usability of technological building bricks and architecture, processes and methods.

Based on more than thirty clear business needs identified by DEWI industrial partners, the concept of the S&C Bubble is being realised in twenty-one industry-driven use cases, aimed at tackling dependable, auto-configurable, optionally secure, short-range communication, local energy-management (efficiency, harvesting, storage), the localisation of sensors and mobile devices, and the smart composability and integration of WSNs. These many and various use cases of DEWI will clearly highlight the advantages of replacing wired by wireless solutions. Some of the benefits are lower weight in weight-sensitive environments, more flexibility and re-configurability, easy, cost-effective feature updates, novel “bring your own device” applications, error elimination -caused by faulty wiring - by self-managed wireless networks, the reduction of installation costs by simplified deployment procedures, and easy switching of network topologies. The key results of DEWI will be shown in the attractive real-life demonstrators of the DEWI S&C Bubble.

Furthermore, the project will contribute to emerging international standards, influence new regulations and lay the basis for efficient certification processes. In addition, DEWI will make a significant contribution to and benefit from existing ARTEMIS Tool Platforms, the ARTEMIS Repository and ARTEMIS sub-programmes, providing not only concrete input through its well-defined technology items, but also strategic input to other fields of application.

Figure 2: The DEWI project consortium made up of 58 renowned partners from industry and academia.

DEWI – The Industrial Domains

a) Aeronautics

So far, aeronautics industry has been particularly reluctant to the adoption of wireless networks due to its highly critical operation standards. Therefore the development of the DEWI wireless S&C Bubble for the aeronautics industry is a major challenge. Solutions provided have to comply with the high standards, low interference levels and harsh environmental conditions of the aeronautical industry, and have to enable flexible and competitive applications that foster business and revenue for all stakeholders of the aeronautics industry.

Two main objectives are pursued in the Aeronautics Domain: Replacing of wires to reduce weight and improve fuel efficiency, range, or speed of aircrafts, and enabling advanced applications with high density of sensors and actuators to reduce turbulent flow across fuselage and also improve fuel efficiency of aircrafts.
In order to achieve these goals, there are several challenges to be addressed. For example, the study of reliable propagation in metallic environments, resilience to high level of vibrations, accelerations, large temperature and pressure changes, design of resistant wireless links, ruggedized hardware, special antennas, supply of sensors, etc.

By removing wires and using WSNs weight reduction of aeroplanes, helicopters, and satellite launchers will be achieved. This will lead to considerable savings in fuel consumption, improved speed as well as range. Wireless technology also provides improved troubleshooting, reconfiguration, as well as more flexible deployment and aircraft design. In addition, wireless sensor nodes can reach places difficult to reach by cables.

Approaches & Solutions

The sounding rocket use-case (see Use Cases below) will deploy launcher sensors connected with Multi-link Telemetry Unit and with the ground operator by access points compatible with most common standards such as: ZigBee, IEEE1451, and IEEE802.11n.
In the active flow control system, patches of sensors and nodes are wired together to form a DEWI node. Preprocessing, filtering and compression of sensor information will be performed in each patch to reduce data rate requirements and improve scalability. Patches will communicate the turbulent flow layer formation across the fuselage to the internal avionics network and also to ground control. Actuation policies will be selected according to a flight profile and the collected sensor information. Synthetic jet actuators will be activated to counteract the turbulent flow formation.

Use Cases

- *Launchers Sensor Network:* Wired sensors on-board a flying sounding rocket will be replaced to reduce weight. Important data regarding operation in harsh environments (extreme temperatures, pressure, radiation, and speed conditions) will be collected.
- *Increased Fuel Efficiency by Aircraft Skin Drag Reduction:* A novel approach together with a dense network of sensors and actuators based on the DEWI bubble shall reduce the effect of skin drag over the fuselage of aircrafts.

Demonstrators

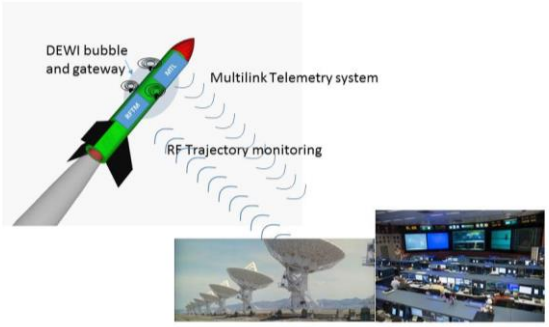

Figure 3: WSN for sounding rocket with trajectory monitoring and multi-link telemetry system.

Launchers Sensor Network will be demonstrated on a flying sounding rocket capable of reaching up to 8 km of

altitude. The rocket has already been tested at the end of April 2015. Two further tests are envisioned with more components and more complexity on-board. The DEWI bubble will collect measurements of the rocket (temperature, pressure, etc.) and will also control some subsystems related to the parachute control and the trajectory guidance subsystems. Two additional subsystems accompany the DEWI bubble on board the rocket: the RFTM (Radio Frequency trajectory monitoring subsystem) that provides the positioning information to the guidance subsystem, and the multi-link telemetry logger (MTL) which consolidates the positioning data provided by the RFTM, and provides the interconnection between the on-board DEWI bubble, the RFTM subsystem and ground control.

Increased Fuel Efficiency by Aircraft Skin Drag Reduction will be demonstrated by re-creating a small section of an aircraft wing. A set of sensors and actuators will be deployed over the wing area. The test will be performed in a wind tunnel with and without the active flow control system. The test will measure the difference in lift force for different values of the angle of attack and wind speed. For practical purposes, sensors will be grouped in patches. Sensors inside a patch will be wired together. Once the central unit will collect measurements of a patch and relay compressed information via wireless to the sink of the DEWI bubble. This hybrid wired/wireless architecture is particularly attractive to deal with highly dense wireless sensor and actuator networks. It is expected that compression tools will allow the system to reduce the amount of data to be transmitted through the network. In turn, this will improve scalability and will make system design more flexible, particularly in the design of the wireless links.

b) Automotive

In the Automotive Domain, the aforementioned DEWI S&C Bubble typically covers one vehicle, for in-vehicle use in passenger cars as well as for heavy vehicles like trucks and off-road use in excavators. Another important aspect is the application of measurement systems based on WSNs for verification and validation during automotive development, for example in engine test beds or test vehicles.

Automotive applications in vehicles as well as in test environments are typically characterized by challenging RF (radio frequency) channel properties. Metal parts like the powertrain, chassis or device housings can cause reflection and absorption for RF in typical bands like 2.4 GHz. Communication has to deal with multi-path propagation and has to overcome non-line of sight scenarios.

Commercial of-the-shelf transceivers typically operate in ISM (industrial, scientific and medical) bands. Using such hardware and frequencies allows benefiting from proven, robust and cost-efficient designs, but also requires being able to deal with interferences with other systems, like Wi-Fi or entertainment systems. DEWI strives to come up with solutions to cope with interference while at the same time guaranteeing low latency and real-time communication.

Another challenge is caused by having a plurality of similar systems ("DEWI bubbles") in close proximity. As an example, multiple vehicles might be placed side-by-side in a parking lot, or multiple test facilities are hosted wall-to-wall within a test factory. Suggested technologies shall address co-existence of multiple systems, e.g. by means of channel management or cognitive radio principles.

Especially for data acquisition systems, consistency and therefore robustness of data communication is paramount. Several partners investigate solutions in hard- and software to guarantee this consistency while at the same time minimizing energy consumption.

Functional safety of vehicles is paramount to protect health and lives of vehicle and road users. As wireless interfaces in cars or trucks could potentially provide a new gateway for attacks, measures to provide sufficient security are important. Establishing confidentiality, integrity and authentication on resource-constrained nodes of a WSN is an especially challenging goal.

In general, solutions in this domain have to meet general requirements for automotive use, like extended temperature range, mechanical robustness and cost efficiency.

<u>Approaches & Solutions</u>

Partners in DEWI Automotive Domain address these challenges in multiple use cases and approaches.

Prototypes of WSN nodes will be based on standard physical layers like IEEE 802.15.1, IEEE 802.15.4 and IEEE 802.11s, and implement standard as well as new designed protocols for higher layers. For especially harsh environments, new UWB systems will be developed.

Several detailed measurement campaigns shall provide a comprehensive comparison of these technologies under real-life conditions. Different solutions allow comparing and selecting the fittest solution for any use case.

Energy efficiency in nodes is fundamental to allow reasonable operating time on batteries, and eventually a complete sustainable supply by different kinds of energy harvesting. Several new ideas for in-node power management, energy-aware protocols, energy prediction as well as channel optimization are being followed.

Some tasks concentrate on providing security even in resource-constrained environments.

Industrial partners of DEWI Automotive Domain concentrate in detailed requirement engineering and will provide

extensive validation of the innovations in real-world set-ups.

Use Cases

- *Identify, configure and join WSN in static networks*: The DEWI bubble concept is applied to automatically identify, configure and join WSN's in static setups.
- *Synchronized and robust real-time data communication on wireless networks*: Node and network concepts are investigated to allow synchronized and robust real-time data communication on wireless networks
- *Automatic sensor and actuator configuration based on identification and localization*: Several localization methods shall be applied to support automatic sensor and actuator configuration
- *Wireless sensors for extreme environments*: Ultra-wide-band (UWB) solutions shall be put to test in challenging WSN environments
- *Secure tamper-proof in-vehicle device-to-device communication*: This work focusses on protecting sensitive data on wireless in-vehicle networks
- *Wireless update of ECU SW for vehicles*: Create industrially applicable concepts for wireless software updates for vehicles.
- *New wireless solutions for energy efficiency and comfort in vehicles*: Wireless communication in and near vehicles shall allow new applications for improved energy efficiency for electric vehicles as well as modern lifestyle car usage.
- *Integration platform for WSN*: Provide a platform to connect wireless communication in and between trucks and trailers
- *Instrumentation for combined data acquisition*: wired–wireless: Goal is to develop a solution allowing flexible, cost-effective and robust instrumentation for in-vehicle use.
- *Wireless vibration monitoring for comfort and health assessment of human operators*: Focusses on assessment of vibration comfort and health of human operator in off-highway vehicles using a Wireless Sensor Network

Demonstrators

Several automotive demonstrators will allow applying, testing and demonstrating DEWI's innovations in real-life scenarios for research, industry and general public.

- **Truck demonstrator:** Partner Volvo will provide a heavy duty truck as a platform for demonstrating WSN's with one or more gateways, with diverse timing constraints, utilizing autonomous power and provided in different geometric modules.
- **Passenger car demonstrator:** Partner Valeo will equip a Citroën DS5 vehicle to demonstrate new innovative applications like car sharing with virtual key transfer to a smart phone.
- **Development test bed:** Partner AVL will provide an engine test bed as demonstrator platform for WSN in automotive testing, demonstrating aspects like robust real-time communication, automatic localization of nodes and node energy harvesting.

Figure 4: Development test bed for WSN in automotive testing.

- **Off-road demonstrator**: an excavator vehicle will be equipped with combined wired-wireless acquisition systems, allowing to show applicability of wireless vibration monitoring on operators and vehicles during operational tests.

c) Rail

So far, wireless technology is not widely used in the rail industry. However, it may provide the base to develop new functionalities, like the Train Integrity Management or to increase pre-existing functionalities like the Train Position Report.

In DEWI, the proposed solutions are focused in two ways. The first one is to collect important data related to train integrity and train composition, which can be used by the ERTMS (European rail transport management system) on-board equipment in order to use Level 3. On the other hand, the DEWI Rail Domain proposes novel solutions to ease the freight management.

With these proposed solutions it is possible to achieve other inherent goals like energy harvesting, energy efficiency, environment protection, introduction of non-wired technology in the Rail Domain, cost reduction of infrastructure installations, etc. Furthermore, wireless technologies in the rail domain may ease maintenance, reduce installation costs, or increase the safety level for some application or systems.

However, important challenges have to be analysed and mastered:

- How to achieve of a high safety integrity level in communication with non-wired devices.
- How to design very low energy consumption devices.

- How to design plug & play devices to ease the operation and the maintenance.
- How to store all collected data and keep it available to the systems.

These challenges are only a few examples of the difficulties to be overcome.

Approaches & Solutions

For both, collecting data and managing freight trains, the approach is the same. A WSN will be deployed along the different wagons or locomotives of a train, which will send the data (freight, train composition or train integrity) to a gateway. This gateway is responsible to store and manage the collected data, sending it to the system which requires information.

Use Cases

- *Train Integrity Detection System*: This system has the clear functionality to ensure the completeness of the train.
- *Train composition Detection System*: This system shall be able to collect important variables of the train, like the length or the weight in order to be used by the on board units.
- *Smart Integration Platform*: This is a platform able to store and manage the collected data from sensors in order to provide it to train systems.
- *WSN for freight advanced monitoring and management*: This comprises a system for freight monitoring in goods transport and a system for freight monitoring optimized in underground worksites.

Demonstrators

In the Rail Domain, all use cases have its own demonstrators.

- **Train Integrity Detection System**: Both, real and laboratory tests are expected. In the laboratory tests, the whole system will be tested in simulated environment on test beds. After the laboratory tests the system will be tested, validated and assessed in real-life mock-up-demonstration on a tourist train controlling the integrity of a train by monitoring the completeness of a train composition.
- **Train composition Detection System**: Laboratory tests will be carried out over a simulated environment.
- **Smart Integration Platform:** The demonstrator will be carried out in laboratory, but the Smart integration Platform will be used in the real demonstration because it is part of the system developed in the Train Integrity Detection System.
- **WSN for freight advanced monitoring and management**: A laboratory demonstrator will be developed to test the Freight monitoring system designed.

d) Building

The Building Domain focuses on the development of the DEWI bubble for the building industry, maintenance and management of buildings. The building itself provides the most common ground for wireless technologies of all the domains. Wireless technologies were introduced in buildings since the very first solutions became available. Yet, there is still much room for improvement of the utilisation of wireless technologies in buildings. Especially the management and maintenance operators have only recently started exploiting the Internet of Things (IoT) technologies to improve their systems and services. In this systems and service innovation, wireless technologies such as sensor networks play a key role.

The development work aims at reaching five objectives, which are

- To improve situational awareness and access control in buildings
- To decrease energy consumption and reduce emissions in buildings
- To optimise facility operation and maintenance work
- To easily deploy and maintain the WSN networks in buildings, and
- To increase the performance and scalability of building WSN solutions

Data mining, data fusion and context-aware reasoning utilising various types of data play a key role in the solution development. Data may be retrieved from camera feeds, drones, indoor positioning systems, or by monitoring overall indoor conditions like temperature and lighting using sensor data. The aim is to reduce the costs of the WSN itself by making it more energy efficient, easier to install, robust, less complex and scalable.
The developed solutions cover the whole chain of operators and customers in buildings: the owners, the service providers and the end users.

The building environment is confronted with different challenges compared to the other DEWI domains. The construction materials of buildings are different, the scale of the environment is usually much larger and the environment itself is much more stationary. These require different challenges to network performance, topology and scalability. In addition to this, the building market in Europe consists of up to 95% of renovation building as opposed to 5% of completely new construction. Hence, older building environments must also be taken into consideration in the solution development.

Approaches & Solutions

Applications and services under development are as follows:

- Solutions for flexible, secure and safe access of visitors and employees in dynamically configured office

spaces as well as prevention of unauthorized access to buildings.

- Solutions for achieving significant cost savings and CO_2 emission reduction by saving energy in heating, cooling, ventilation and lighting systems utilising more optimal system control and smart power management. Target is energy costs reduction (5-10%) by using WSN enabled solutions.
- Solutions for facility management in order to gain the full advantage of predictive and condition based maintenance especially in existing buildings where until now the cost of installing wired sensor and actuator systems has been prohibitive. The target is reduction of maintenance costs (10-20%) by WSN enabled technologies.

Moreover, development of technological solutions for efficient, flexible and self-configuring installations of WSN systems is in focus.
In above solutions, special attention is being paid to needs and requirements for cyber security in WSN enabled building solutions.

- Utilisation, adaptation and development of following technologies play a remarkable role in the application and solution development in the building domain.
- Advanced data processing
  - WSN data aggregation and fusion technologies
  - WSN data utilization in energy and maintenance optimization
- Context aware technologies
  - Indoor positioning technologies
  - Access and assets control management technologies
- More efficient WSN technologies
  - Scalability of WSNs in buildings
  - OTA programming, monitoring and control of WSNs
  - WSN communication improvements

Use Cases

- *WSN for situational awareness in building security*: WSN-based solutions provide data from visual, indoor positioning and unmanned drone based sources. This data is fused and processed into information that produces an enhanced understanding of the situation inside the building and in the near vicinity.
- *Efficient WSN design for deployment and maintenance costs reduction*: Scalability, energy efficiency, communication robustness and flexible deployment and maintenance of the WSN solutions are the target.
- *WSN for facility and housing energy optimization*: WSN solution to create energy optimization solution via monitoring indoor conditions and lighting. Based on the monitoring data both the building automation systems and the lighting systems are controlled wirelessly.
- *WSN for facility operation and maintenance*: Create a basis for planned and even pre-emptive maintenance actions for facilities by monitoring indoor conditions and providing data from automated lighting systems via WSN solutions. Utilization of context-awareness and reasoning on the data plays a key role in reducing the maintenance costs.
- *WSN for access control and assets management*: Tracking people and assets inside a facility for access control scenarios. WSN technology for indoor positioning of people and assets, a gateway for wireless data aggregation and a device for indoor user assistance. Information security is also considered.

Figure 5: The Use Cases of the DEWI Building Domain.

Demonstrators

Firstly, each of the Use Cases develops smaller demonstrators of the sub-systems utilising technologies developed or adapted. Secondly, these smaller demonstrators are combined into two larger demonstrators showcasing the complete work of the building domain.
The current plan is to have one demonstrator in Poland, which will mainly showcase the combined work of the Use Cases on *WSN for situational awareness in building security* and *WSN for access control and assets management*: This demonstrator is called **WSN for access control and assets management**. The work of the other three Use Cases is planned to be showcased in Finland. The name of this demonstrator is **WSN for building energy efficiency, operation and maintenance**.
The demonstrators should be available for the public to certain extent.

DEWI - Interoperability, Re-usability and Co-existence

Interoperability is defined as the ability of diverse sensor networks or sensor nodes to exchange information and to make mutual use of the information that has been exchanged. DEWI follows the official definitions coming from ISO/IEC 29182-2:2013(E) [Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 2: Vocabulary and terminology].
DEWI has installed a dedicated Interoperability Domain to ensure an efficient technical management all along the DEWI project and to align identical technologies amongst the four industrial domains of DEWI described above. The Interoperability Domain targets to increase the visibility of the project results by the development of generic methods, processes, and tools for resource management and mastering mixed requirements for intra-vehicle / smart environment / smart home / smart cities.

The Interoperability Domain is split into 5 distinct activities:

- Coordination Interoperability
- Technology Items & Technology Item groups
- High-level Architecture
- Know-how transfer
- Standardization, Regulation, Certification

Challenges within Interoperability Domain deal with aligning technologies and includes:

- Derive the metrics needed for the technical progress monitoring within each domain. By having these metrics defined, one can make the technical progress visible as it were some kind of thermometer.
- Derive input for Technical Item groups describing the interoperability framework of functional and non-functional specifications.
- Derive a high level architecture definition and perform interoperability analysis between the different domains of DEWI.
- Enable methods of know-how transfer within and cross domains. This includes possible co-operations with other projects that are beneficial for the progress within DEWI.
- Create contact with bodies that consider standardization, regulation and/or certification of sensor networks.

Groups and Standardization, Regulation

Cooperation with relevant standardization and regulation bodies is crucial to disseminate the findings from the DEWI project. Preparatory steps are taken in order to identify and prioritize those areas of work in which standardization, regulation and certification might become relevant in a subsequent research and development (R&D) phase. Furthermore, structures are to be established, networks and co-operations are to be approached which enable a "fast track" in cases where it might become apparent that a certain DEWI technology has the potential and format to serve as a standard for comprehensive application in wireless devices. To date DEWI has managed to create an official category "C" liaison with ISO/IEC JTC 1/WG 7 "Sensor Networks". Additionally, a possible co-operation with the IEEE 802.15.x standardisation groups is being prepared.

Conclusions

As a large and strategic initiative, DEWI involves 58 key European Embedded Systems players in transportation and building automation – large enterprises (LEs), small and medium-sized enterprises (SMEs) as well as academia – from 11 EU countries. This creates the necessary critical mass to achieve both societal impact regarding future safer transport and building and technological advances in terms of cross-domain, platform-based reusability. In general, DEWI will raise awareness, as well as prepare the ground, for the broad introduction of wireless sensor networks and wireless communication. This is made possible by a strong symbiosis between industry, research, and education and is underpinned by the equivalent of 130 dedicated persons working full-time for 3 years in DEWI (Mar 2014 – Feb 2017).
DEWI will really help boost employability in Europe, by opening up novel business opportunities and new markets, in particular for European SMEs in cooperation with LEs having direct global market access (DEWI has an outstanding ratio of SMEs to LEs of 2:3). Thus, DEWI will create new high-quality sustainable jobs and will promote academic education in the area of wireless sensor networks & wireless communication. Eventually, DEWI wants to foster Europe's leading edge position in the design, development and deployment of smart dependable wireless environments, in particular regarding quality, cost effectiveness, composability, flexibility, reusability, acceleration of time-to-market, continuous integration of innovations and sustainability. It will strengthen European competitiveness and will increase the reliability of wireless communication, to enable new markets and societal applications for citizens.

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