ebbits

Business-Based Internet of Things and Services

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Welcome to the ebbits project

We are very pleased to present this first edition of the ebbits newsletter.

The ebbits project aims at integrating The Internet of Things into mainstream enterprise systems by creating a platform that supports interoperable business applications and integrates physical devices, systems and components directly into the company's systems. The aim is to create useful, value-added business services or service components.

A particularly valuable aspect of ebbits with regard to the Internet of Things and Future Internet networked Embedded systems is the aspect of traceability and life cycle management. ebbits contributes with two domain application scenarios in which the platform is developed and tested: One for food traceability and one for automotive manufacturing. They will add a new and important level of quality and sustainability to business processes in the Internet of Things.

The two scenarios are outlined below. In the first year of the project, much effort has been spent on understanding user needs and deriving user requirements and you can read about the initial results in the two articles “Demonstrating the ebbits platform” and "Tracing the medication of pigs”.

The newsletter will be circulated via e-mail, in PDF format, and will be posted on the ebbits website: http://www.ebbits-project.eu

Enjoy the read

Dr. Markus Eisenhauer, Project Coordinator, Fraunhofer FIT

Making machines communicate

Common to the use cases in ebbits; Automotive Manufacturing and Food Traceability is the need to overcome the heterogeneity and incompatibility between different systems in order to release the full potential of collecting and distributing data.

For an automotive manufacturing plant, the challenge is to unify the heterogeneity of the machines, automating the collection of energy related data and process performance data with the aim to reduce energy and to optimise production.

The aim for ebbits is to provide a unifying platform which automates the collection and distribution of energy-related data to decision makers and other interested parties to facilitate energy reductions in the manufacturing process. In a similar fashion, it is possible to allow monitoring of the process performance by collecting data from machines, devices, sensors etc. to enable optimisation of production performance. You can read about the initial results in the article “Demonstrating the ebbits platform”.

Tracing the food we eat

The other use case in ebbits is food traceability. The demand for food safety is growing and the drive is to guarantee the same high standard whether the food is home-grown or from another country. The rapid increase of technologies is opening a variety of new ways to obtain and exchange data throughout the whole supply chain from production through processing, distribution, retail and to the consumer. As in the automotive manufacturing plant, the need is to automate collection and distribution of relevant data to the right parties, by overcoming heterogeneity and incompatibility between different systems. Focus is on providing traceability for the whole life cycle of a product starting with pig production.

You can read more about the use case in the article “Tracing the medication of pigs”

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In other news

Dissemination events:

Middleware for Service Oriented Computing - 6th MW4SOC Workshop of the 12th International Middleware Conference 2011
12-16 December, Lisboa, Portugal
The workshop deals with service oriented computing in particular service oriented middleware that can address the challenges of administrative heterogeneity, the loose coupling between coarse-grained operations and long-running interactions, high dynamicity, and the required flexibility during run-time. Partners FIT, ISMB, COMAU and SAP are preparing a workshop paper.

Deliverables released:

The following deliverables have been completed:

- D1.1 Project Quality & Risk Management Plan (confidential)
- D1.2.1 6-month progress reports for the commission 1 (confidential)
- D1.3.1 Periodic activity, management and financial report 1 (confidential) (confidential)
- D1.4 Plan for managing knowledge and intellectual property (confidential
- D2.1 Scenarios for usage of the ebbits platform (public)
- D2.2.1 Technology watch report 1 (public)
- D2.3.1 Market and regulatory standards watch report 1 (public)
- D2.4 Initial requirements report (public)
- D2.5.1 Prototype application specification 1 (confidential)
- D2.6 Validation Framework (public)
- D3.1 Enterprise use cases (public)
- D3.2 Vertical and horizontal business vocabularies (public)
- D4.1 Analysis of semantic stores and specific ebbits use cases (public)

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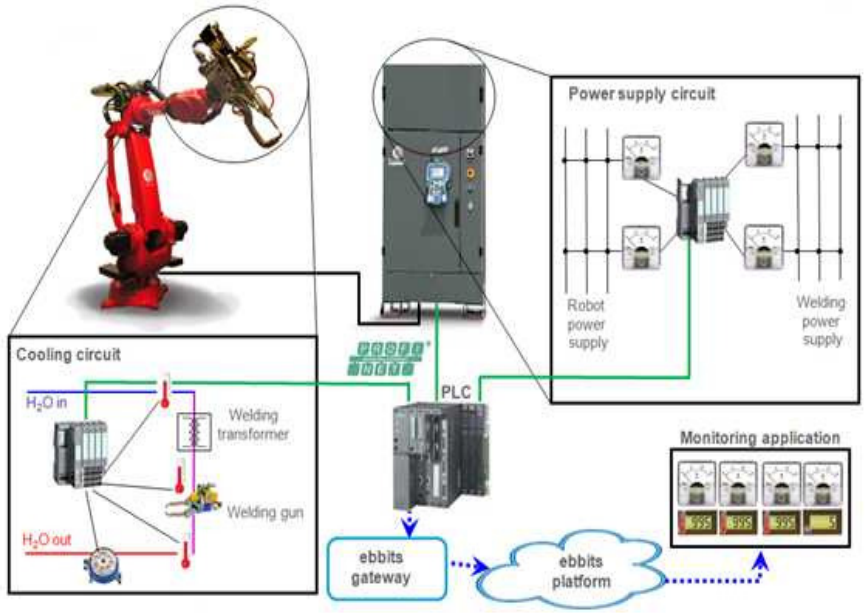
Demonstrating the ebbits platform

A concept demonstration of the ebbits platform took place at the project review meeting on 15 September in Brussels. For the ebbits scenario Automotive Manufacturing, the focus was on showing how tracking the energy and water consumption of a welding robot can be used to optimise production.

During the meeting, ebbits partners presented a status update of first year activities and the advancements toward the definition of a middleware oriented platform enabling the convergence of the Internet of People, the Internet of Things and the Internet of Services into the "Internet of People, Things and Services (IoPTS)" for business purposes. To illustrate the progress in the automotive scenario, a prototype of the ebbits platform was presented with the aim to highlight the potentials of ebbits-enabled IoPTS applications to manage production optimisation with special emphasis on energy consumption.

Tracking the energy and water consumption to assess efficiency more accurately

The demonstration emulates a welding cell with a single welding robot as shown on figure 1. The goal of the prototype is to quantify and track the energy and water consumption required for welding operations on a particular item. Such information can be used to assess the manufacturing process efficiency and the production cost in a more accurate way.



More specifically, the emulated scenario envisions a cell running an infinite production cycle where each cycle is focused on a single manufactured item. A PLC is in charge of controlling cell operations by interacting through a PROFINET field bus with the other cell elements i.e., Robot Controller and I/O interfaces. The I/O devices enable extraction of information from the cooling circuit and the power supply circuits. In the cooling circuit, two types of sensors are installed:

• A flux meter retrieves data concerning water usage/waste of the cooling system adopted for the welding transformer and the welding gun.

• Several thermometers are used to measure heat drained from the different devices that compose the welding circuit.

In the power supply circuit, two separate circuits for the robot axis power supply and for the welding power supply are considered. Using a voltmeter and an ammeter on each power supply, it is possible to collect data regarding power consumption.

Integration into the ebbits framework

The integration of the welding cell into the ebbits framework is performed through the PLC that is virtually connected to an ebbits gateway, in charge of extracting the information contained in its memory by using the OPC protocol. To this aim, a first preliminary prototype of the Physical World Adaptation Layer has been developed.

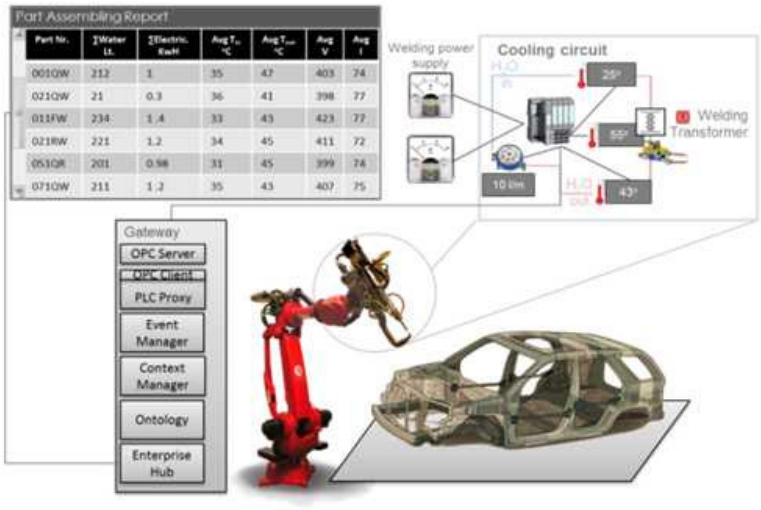
- D4.2 Knowledge representation formalism analysis (public)
- D4.3 Coverage and scope of a semantic knowledge model (public)
- D5.1.1 Concepts and technologies in intelligent service structures 1 (public)
- D5.2.1 Architecture for intelligence integration 1 (public)
- D5.3 Specification of sensor fusion and context awareness 1 (restricted)
- D5.4.1 Multi-sensory fusion and context awareness prototype 1 (restricted)
- D6.1 Design of business rules representation and execution (public)
- D6.2 SOTA implementation of systems with high volume data (public)
- D7.1.1 Concepts for a unified lifecycle persistent data fusion architecture 1 (public)
- D7.2 Event and data structures, taxonomies and ontologies (restricted)
- D7.3.1 Technical description of implementation of Data and Event Management 1 (public)
- D7.4.1 Prototype of Data Management subsystem 1 (restricted)
- D7.5.1 Prototype of Event Management subsystem 1 (restricted)
- D8.1 ebbits network architecture (public)
- D8.2 Survey of Physical World in manufacturing and traceability scenarios (public)
- D8.4 Integration of Physical World in manufacturing scenario (public)
- D8.9.1 ebbits SOA-based communication 1 (restricted)
- D9.1 Test and integration plan (public)
- D9.2.1 Annual Integration and Quality Assurance Report 1 (public)
- D9.3 Integrated platform prototype for proof-of-concept (restricted)
- D10.1 Description of communication networks and common components (public)
- D12.1 Project website (public)
- D12.2.1 Dissemination strategy, cluster and other activities 1 (public)
- D12.3 Activities for contribution to standardisation work (public)
- D12.7 Cluster collaboration plan (public)
- D12.8.1 Cluster collaboration report 1 (public)

Public deliverables can be downloaded from the project website after they have been reviewed and approved by the EC: www.ebbits-project.eu

In this first prototype, most of the data gathered from sensors are simulated and inserted in the actual PLC memory according to the production step in which the manufacturing process is working. To this purpose, the demo includes a simulator able to interact with the PLC using the OPC protocol and to feed the simulated sensor data.

After retrieving information from the sensors inside the cell, the prototype is able to measure and log the instantaneous consumptions associating them to the current workpiece, properly identified e.g., by means of a barcode reader, from the actual PLC. The behaviour of the bar code reader is simulated as well. Multi-sensory fusion and context awareness algorithms are then applied to correlate and aggregate the collected measurements in order to generate reports or trigger alarms when an anomalous consumption is detected. More specifically, the system is able to infer whether the transformer is broken or a false positive is triggered by values sent by faulty sensors.

Figure 2 introduces the Graphical User Interace being used during the demonstration: It shows the current cell production status, the current values of the sensors, the information inferred for each produced item using Multi-sensory fusion and context awareness algorithms and, if needed, alert messages notifying sensors or transformer failures.



Showing the scalability of the project

Several field trials are planned to take place during the ebbits project. The next automotive manufacturing prototype is due in June 2012 and will include a selection of actual manufacturing sensors.

The last two prototypes, planned for June 2013 and June 2014, will show the partial/full set of ebbits features in a real world environment based on the previous field trials. For automotive manufacturing, it means working towards expanding the application to the whole manufacturing plant, correlating all the production lines and giving a full, easy-to-understand overview about the status of the whole manufacturing plant, hence demonstrating the scalability of the project.

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Tracing the medication of pigs

ebbits partners have produced a first traceability demo that seeks not only to enhance the communication workflow of medical data between vets and farmers but also to meet a growing demand for food safety.

The demo, which was presented at the MobileHCI 2011 in Stockholm this month, shows how tracing the medication of pigs can help prevent medicated animals being sent to slaughter by mistake and make sure that the animals can be traced back in case of contamination. Based on automatic data synchronisation between the farmer's management system and the vet's mobile device, data on medicated pigs are collected and made available online for the farmer, enabling a more efficient management.

Communication between systems

European Commission
Information Society and Media

The ebbits project is a 4-year project started in 2010. It is partly funded by the European Commission under the 7th Framework Programme in the area of Internet of Things and Enterprise environments under Grant Agreement no. 257852

Read more at:
www.ebbits-project.eu

The developed system comprises an application deployed on a personal digital assistant (PDA) that feeds data through a pervasive middleware into an enterprise resource system (ERP), enabling farmers to monitor the state of health of their pigs by a web interface. Practically, it means that a vet examines a sick pig, identified by a RFID tag. After medicating the pig, the vet documents the treatment using a PDA. Finally, the data is synchronised by means of LinkSmart (formerly known as Hydra) middleware with the ERP system of a farmer. The latter can then monitor the state of health by using a dedicated web application.

The PDA (left) is used by the vet and the web interface (right) is provided in the ERP. Here the farmer can check the status of medicated pigs via icons. A check depicts that all pigs are healthy, an exclamation mark that in the range of 3-10 days at least one pig has been medicated, and a cross that in the last three days pigs were medicated. To see the medication details (dose etc.) the farmer can select a pen and choose a specific pig from a list.

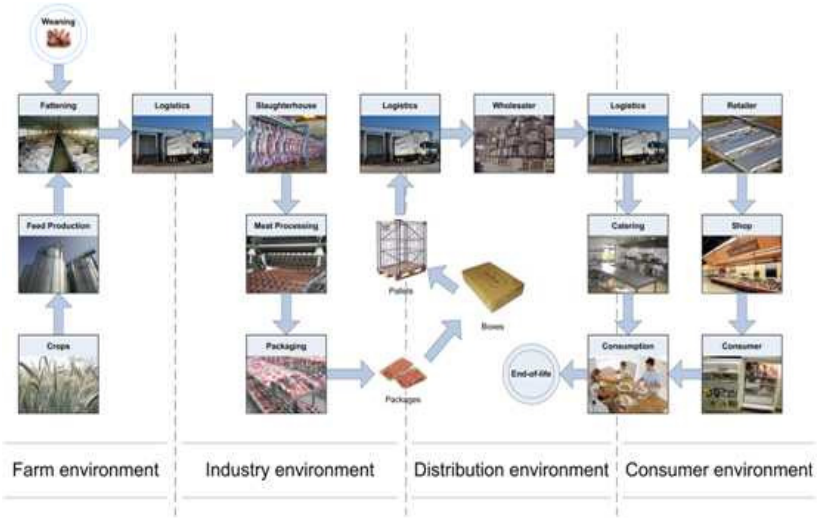
Today vets often take notes by pen and paper which then the farmers have to enter into the ERP. With the automatic synchronising between a mobile client and the ERP, the workflow will speed up and as the field collected data are now fed more efficiently into the ERP database, farmers can benefit from a better synchronised management.

Traceability for the entire life cycle of a product

Besides the demo, ebbits partners will develop several traceability prototypes throughout the project that aim to show how data collected and communicated via the ebbits platform can be used in many ways and for many purposes. The first prototype, which has been presented at the review meeting on 15 September 2011 in Brussels, focuses on farm management and health monitoring of pigs on a large pig farm. The primary goal is to collect data about consumption (feed and water) and movement that can be used to detect unusual behaviour in pigs due to illness. This way, farmers can detect possible illness at an early stage and treat the pig accordingly. The data extracted from the feeding and management system of the pig farm will be integrated into the ebbits platform and used as input to statistical models developed for enhanced monitoring.

Apart from providing the farmer with valuable information on the state of health of his pigs, the collected data can also be of use to other stakeholders such as the consumer who can be presented with information on the origin and conditions for the meat he or she intends to buy i.e. is the feed organic or not and what farm does the meat come from"

The next prototype which is due in June 2012 will focus on integrating data from the slaughterhouse whereas the last prototypes will target the end-user, making it possible to access the traceability data collected through the lifetime of a product.



Whereas the data extracted offer great potentials in terms of transparency, one of the arguments in the

traceability scenario is that an acceptable level of transparency over the entire life cycle of a product must be provided, which meets the demand for traceability and food safety. This means finding a level of transparency that provides stakeholders with relevant value-added information about the products that are produced, distributed and consumed at the same time as respecting rules, rights and regulations.

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Cooperating with other ICT projects

The ebbits project is actively involved in EU clustering and concertation activities with the aim to disseminate the work done in ebbits and exchange knowledge with other related EU funded ICT projects.

The clustering of research projects that are being funded under the 7th Framework Programme is heavily promoted by The European Commission. The wish is to set up a framework of cooperation which is a contact point for IOT research in Europe.

ebbits is represented in three clusters: IERC (IOT European Research Cluster), FInES (Future Internet Enterprise Systems) and the Monitoring and Control cluster on Smart Buildings/Smart Spaces and in the Future Internet Assembly (FIA). In some clusters, ebbits takes a leading role: In FInES, FIT is leading a taskforce on international relations and IN-JET a taskforce on manufacture and industry. Additionally, CNET has taken on the responsibility in IERC as leader on semantic technologies.

"Being part of a Cluster of Research Projects is an important part of our dissemination work. It allows us to exchange views on the ways of future research work in Europe and, in particular, in our projects. We learn from the other projects and develop a common view together with the Commission", says Jesper Thestrup, chair of the Industry and Manufacturing taskforce.

Conference on the use of RFID technology

The involvement in clustering activities comes in many forms from the production of papers, publications and dissemination material and participation in meetings and conferences to the creation of strategies for cluster work and organisation of workshops and conferences.

One example is the conference on RFID technology which ebbits arranged in Denmark on 3 May 2011 together with the FInES cluster, the “RACE network” and the network “RFID in Denmark”. The aim was to introduce RFID/ IoT in Enterprise Systems for product management and inaugurate the RFID action plan in Denmark. Speakers included the Danish Minister for Research and Innovation Mrs. Charlotte Sahl-Madsen, Mr. Frederix Florent from the EC and Mr. Ian Williams from the RACE network.

"The conference was sponsered by the FInES cluster and the ebbits project and provided a great opportunity to promote the concept of the Internet of Things to Danish industry and researchers", explains Jesper Thestrup.

At the conference partner SAP presented the future vision of Internet of Things and IN-JET presented the ebbits project. You can download the presentations on the ebbits website or read more about the conference on the RFID in Denmark website (in Danish).

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