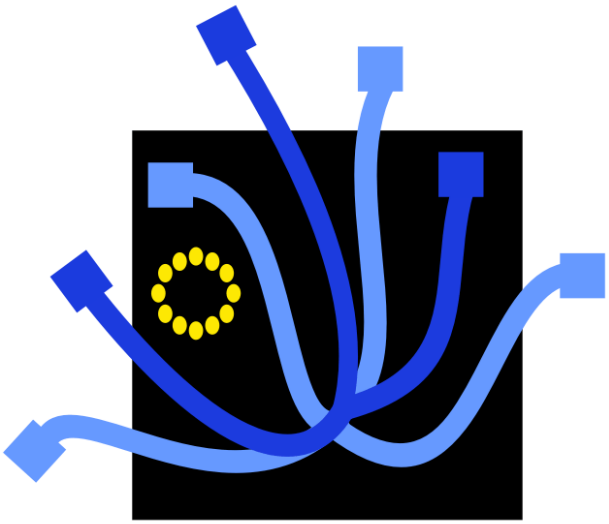

The Hydra project is co-funded by the European Commission within the Sixth Framework Programme under contract IST-2005-034891

Newsletter No. 03

http://www.hydramiddleware.eu

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Hydra's vision for 2009

In Embedded Systems the urgent need for technologies and tools that make it easier to benefit from heterogeneous networked systems is evident. The complexity of supporting technologies and tools grows exponentially with the number of devices, manufacturers and protocols involved. At this point Hydra is most relevant and the project's vision to create the most widely deployed middleware for networked mobile and embedded systems to allow producers to develop cost-effective and innovative applications for new and already existing devices is still valid.

The feedback, we received at the various occasions and events Hydra project was presented, encourages us to continue working towards the original objectives of Hydra in order to provide well-defined open interfaces between different types of devices and reduce design complexity.

Besides the middleware the Hydra project has provided and will continue to provide developer kits that will be the instrument to create innovative applications and that will feature access to the capabilities of the Hydra middleware - the Service Oriented Architecture will provide access to data, information and knowledge across heterogeneous platforms, including external web services and data repositories.

The Hydra project has developed a SDK (Software Development Kit), and is currently working on providing a DDK (Device Development Kit) and an IDE (Integrated Development Environment) to support software and hardware developers to produce cost effective and innovative ambient intelligence services and applications. In this way proactive ambient intelligence will come true and bring added value to service and application providers as well as end users of Hydra applications and enabled devices. Feedback from developers with the SDK sustain our view that manufacturers and systems integrators will be enabled to build devices and systems that can easily be networked and increase their flexibly to create cost-effective high performance solutions.

Our demonstrations and prototypes have shown that Hydra is already enabling all kinds of mobile and embedded networked devices. The middleware has already shown its potential to boost intelligent interaction in ambient intelligent networks.

The main features are still valid:

Intelligence
The reflective properties of the middleware include support for distributed as well as centralised Ambient Intelligence Architectures - by incorporating Service Orchestration and a Semantic Model Driven Architecture.

Security
Enables secure, trustworthy, and fault tolerant services and applications upon our middleware through distributed security and social trust components.

Cost-effectiveness and inclusiveness
Services and applications will be deployable on both new and existing networks of wireless and wired devices, support model-driven development and reduce time-to-market in a significant way.

Sustainability
The Hydra business modelling framework provides analysis of business sustainability of the developed services and applications.

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New Hydra brochure is available now

At the end of last year the Hydra consortium has released a new 12-page project brochure. The brochure precisely describes the Hydra project and explains the scientific objectives and achievements in the Hydra project.

The brochure provides an technical overview about the different Hydra software architecture layers including the different software components (managers) and also highlights important technical issues and challenges in areas like service oriented architectures (SOA), wireless communication and networks, (Embedded) Ambient Intelligent (AmI) Architectures and highly relevant hydra aspects like trust, privacy and security. These technical aspects are highly relevant to the Hydra results. In addition the three applications domains Building Automation, Healthcare and Agriculture with respect to their connections to Hydra are introduced to interested readers.

For further information you can download the brochure here: http://www.hydramiddleware.eu/hydra_documents/Hydra_brochure.pdf).

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Hydra Middleware Demonstrates Flexibility and Service Performance at CeBIT 2009 and GSMA Mobile World Congress

The Fraunhofer Institutes for Applied Information Technology FIT and Secure Information Technology SIT demonstrated the Hydra middleware at the GSMA Mobile World Congress in Barcelona (Feb. 16-19, 2009) and at the CeBit in Hannover (March 3-8, 2009).

This second year demonstrator showed a conceptual healthcare assistance system for patients at their homes. The system monitors the health status, notifies the patient of missing measurements and informs the doctor in charge. The doctor can also take measures such as mandating a caretaking service. The staff member authenticates at the system with a writable smartcard.

At home, sensors and medical devices allow the patient to perform different meas-

GSMA Mobile World Congress:
The GSMA Mobile World Congress combines the world's largest exhibition for the mobile industry with a stimulating and insightful congress that brings together prominent leaders and personalities from mobile operators and equipment vendors, as well as Internet and entertainment professionals. It is the leading event for the mobile communications industry. The four-day conference and exhibition attracted executives from the world's largest and most influential mobile operators, software companies, equipment providers, Internet companies and media and entertainment organizations, as well as government delegations.

urements such as the current weight, the temperature or the current glucose value. A "daily medical calendar" running on a mobile phone smartly guides the patient through important daily activities suited to the current situation of the treated person. A physician and a mobile healthcare service can access different parts of that application by authenticating themselves with a smartcard. Depending on the access right, different information about the patient's current status is available. Additionally the physician has the opportunity to change the medication, prescribe measures and to send messages to the patient in order to give advice.

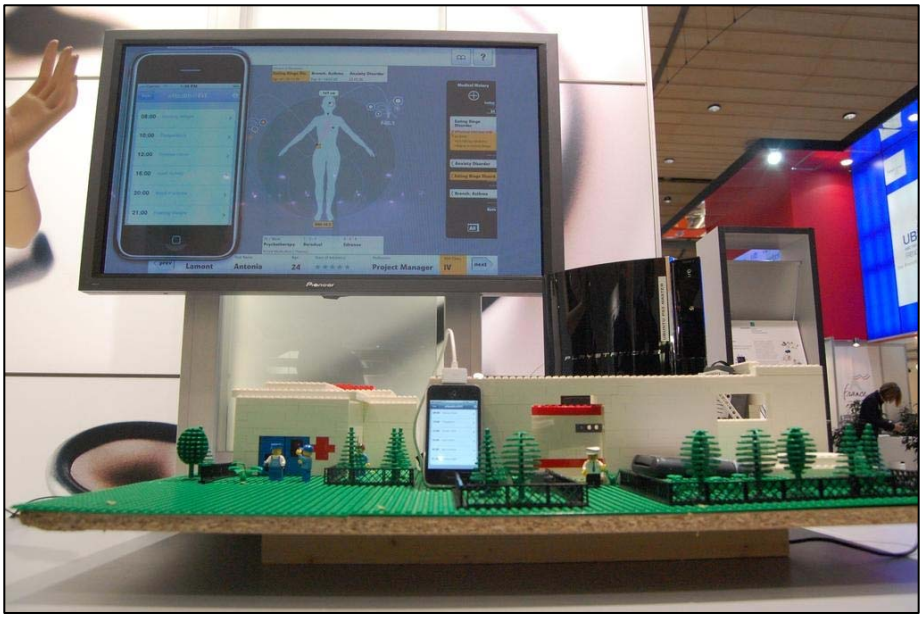

Figure 1 – CeBIT 2009 demonstrator

Via LAN, WiFi, Bluetooth, USB and serial ports, the Hydra middleware networked a VarioPort® sensor device capable of performing certain physiological measurements, a Nintendo® Wii Board® determining the current weight of the patient, a Sony® Playstation 3® as the central home device, and the Lego® Mindstorm® technology. The validity of the RFID token used by the caretaking service was checked by the Playstation 3® to which the corresponding reader was detected. The medical application supporting the supervised patient was running on an Apple® iPhone 3G®.

"The system demonstrates how sensors and devices, which measure and monitor the status of a patient, are networked into a complete system" explained Dr. Markus Eisenhauer from Fraunhofer FIT, the project's coordinator. "Through its flexibility and domain independence, the middleware assists manufactures of intelligent environments and accelerates the development of innovative systems."

Typical application fields are clinics, hospitals, home care and assisted living, in which security and privacy have long been major issues. Hence, the concepts for minimizing information exchange and the mechanisms for secure communication, which were developed by the Fraunhofer Institute for Secure Information Technology SIT, are significant features of the Hydra middleware.

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Hydra Training Activities

Training is a key dissemination cornerstone of Hydra and focuses on a holistic picture, which caters for the training needs of software engineers and business managers towards the development of end-to-end solutions built upon the Hydra platform. Training aspects will be covered in form of training manuals, materials and through high-level scientific and business training events.

Hydra training manuals describe technical details of how the Hydra software components can be used to develop solutions to meet business needs. These manuals target software developers and architects to expose them to the advantages of using the Hydra platform to create innovative and reusable systems built on open standards. Training in business modelling is directed at business managers to improve the understanding of how the Hydra platform and technologies can benefit their business and reduce their business' time to market. Internal trainings are carried out to train members of the Hydra Consortium on the use of various Hydra relevant technologies. These technologies range from semantic technologies for ambient intelligent applications to model-driven architectures and security. Besides several high-level scientific workshops and technology training events to introduce the scientific and research communities to the Hydra architecture for building an "Internet of Things and Services" that is the future of the Internet are organised.

Past training events

- A Hydra Business Training Workshop was held in Copenhagen (Nov., 2006) to address End-to-End configurability, business cases and technical issues.
- Training in Semantic Technologies addressing the use of semantic technologies to support ambient intelligent applications was held in Reading (March, 2008). Hydra researchers and developers have been targeted.
- A technical workshop "The Internet of Things and Services" was held in Sophia Antipolis, France and organised by Hydra under the umbrella of the EuroTrust AMI conference (Sept., 2008). The target audience was technical researchers and directors. On day one there have been tutorials panels on Context Awareness. On the second day there was a discussion panel on Business Models for the Internet of Things and Services ecosystem.
- A Business modelling workshop, was held at the eBusiness group of Danish Industries (Sept., 2008)
- A workshop on Total Management at the Danish Industries (Nov., 2008)
- A networking session was organised and hosted by Hydra on the Hydra research agenda as a middleware platform for the Internet of Things and Services at the ICT 2008 events in Lyon. The session was very successful and well-attended. The Hydra prototypes which were on display at the Hydra Consortium Exhibition stand was voted as ranking among the "Top 10 best Exhibit" (Nov., 2008).

Upcoming training events

- An upcoming training, at a technology firm, which makes innovative linear actuation solutions that improve people's quality of life and working environment, will focus on using the Hydra middleware as a platform to build their system on open standards. While the user's demand of ubiquitous services is increasing the complexity due to the heterogeneity of devices, access and domains and the diversity of technologies make the realisation of future embedded networked systems quite challenging. The purpose of the workshop is to train the participants in applying a holistic, business-driven approach to design and development of embedded networked systems with end-to-end configurability.
- Technical workshops and scientific conferences are being planned for 2009 to build upon the success of Hydra in the past years and to improve the reach of

the awareness about and the benefits of the Hydra platform in the scientific, academic community and in the industry.
- Workshops on how to-style videos and tutorials are being planned which are targeted at software developers to highlight the new features and the latest developments within the middleware platform. It is planned that these videos and tutorials will be turned into a comprehensive E-learning platform that is accessible to potential customers of Hydra.

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Semantic Technologies and their application in Hydra

The Hydra project introduces the Semantic Model Driven Architecture (Semantic MDA) which aims to facilitate application development and to promote semantic interoperability for services and devices. The semantic MDA of Hydra includes a set of ontology-based models and describes how these models can be used both at the design- and run-time. The basic idea behind this approach is to differentiate between the physical device and the application's view of the device. Hydra introduced the concept of Semantic Devices, which represent models of the real devices and serve as logical units, which can be semantically discovered and provide information about the device capabilities and services (Figure 2).

The services offered by physical devices are designed independently of a particular application where the devices might be used. On the other hand the semantic device represents functionality of a device from the point of view of a particular application. Semantic Devices should be seen as a programming concept. The application developer designs and programs his application using semantic devices. The Semantic Device concept is flexible and will support both static mappings as well as dynamic mappings to physical devices.

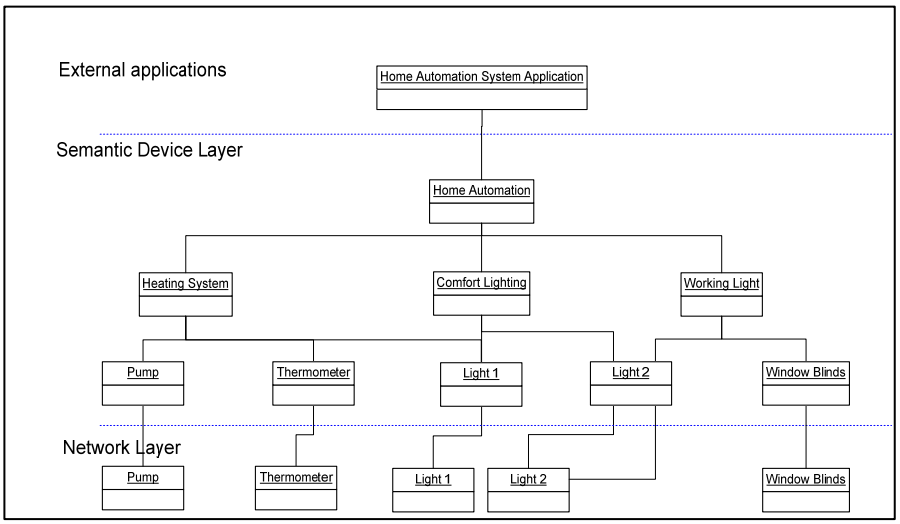

Figure 2 - Semantic Device provide a high-level programming interface

Semantic descriptions of the devices and their services are used at the design time to find suitable services for the application that the application developer is working on. The descriptions of these services will be used to generate code to call the service, query the device that implements the service, and manipulate the data that the service operates on. The application developer can specify a service to be used, and leave the device as generic as possi-

ble. The necessary code will be generated for the service and the device. These device objects could be used when creating a semantic device or a Hydra application from the selected devices and services.

Model driven code generation for physical devices - semantic description is used to determine the compilation target; depending on the available resources of a device, either embedded stubs or skeletons are created for a web service (to run on the target device) or proxy stubs and skeletons are created for the web service (to run on an OSGi gateway). Semantic description also provides support for reporting the device status. Based on a description of the device states at the run-time, support code is generated for reporting state changes.

Model Driven Architecture:
MDA is a new way of writing specifications, based on a platform-independent model. MDA specifications consist of a definitive platform-independent base UML model, platform-specific models and interface definition sets, each describing how the base model is implemented on middleware platforms.

At the design time, the Hydra application developer selects Hydra devices and services that will be used to implement the application. These devices may be defined at a fairly general level, e.g. the application may only be interested in a "HYDRA SMS Service" and any device entering the network (or application context) that fits into this generic definition will be presented to the application. The application will then work against the more general device descriptions.

In the area of security, the ontology is used to describe the security capabilities of Hydra devices and different services they provide. Devices and services provide descriptions of their security properties, which refer to instances in the security ontology. Further information can then be derived from this ontology, such as the protection goals supported by a device's security mechanisms. The basic device ontology describing device and service properties was extended by a model representing security concepts. **If you are interested in further information, please join our Hydra website:**

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An integrated scenario using Hydra technology

After demonstrating the scenarios building automation and healthcare, the focus of this third prototype development iteration is an integrated scenario considering also the agriculture domain, where the different functions and components developed in the use cases are demonstrated. The scope is to show the flexibility gained through applying the Hydra framework covering different domains. Therefore the scenario (Figure 3) will highlight the features and benefits that are offered by employing Hydra in all three domains.

Michael, a truck driver, is suffering from diabetes, caused from obesity which has also the severe consequence of high blood pressure. Under the suggestion of his Practitioner, he joined a liaison community called OurHealth for patients like him. It is formed around a virtual community in which members and also doctors and dieticians use internet and wireless technologies to stay in contact with each other anywhere and anytime. It uses peer pres-

sure to help members stay on track with their diet and weight loosing programmes.

His health status and dietary nutrition need to be frequently monitored even while he is at work. Being often far from home due to his job makes this task more complicated, but with the support of the Hydra platform the surrounding environment is helping him in his daily activities.

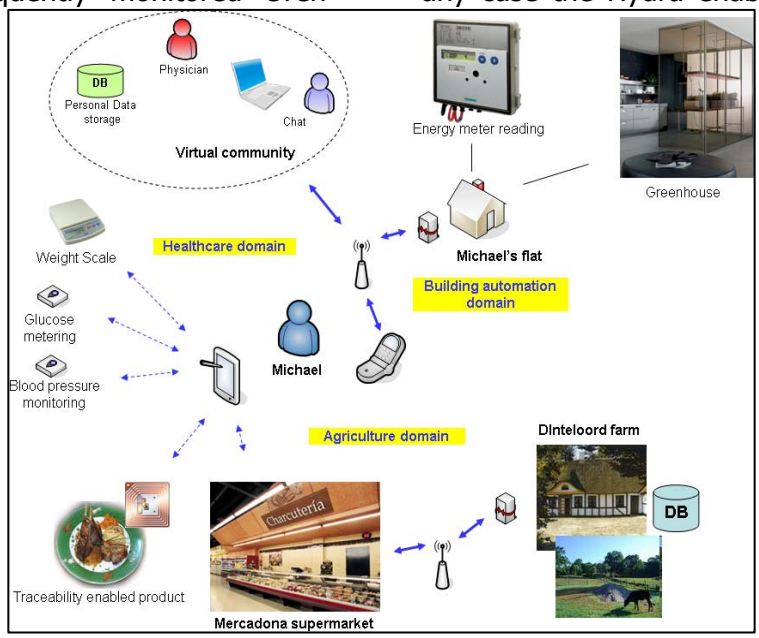

Figure 3 - Integrated Scenario

His house is equipped with the most recent devices in building automation. This is done especially for having the possibility to monitor his house while he is travelling, and for his wellbeing, because his health needs particular attention as regards the monitoring system, for both his physical conditions and the food he can eat. He just received a service notification from home telling that the smart meter reports a sudden increase in the use of energy at home. He wonders himself about the increase of power consumption in his house, because he switched off the heating system and according to the weather report it is not too cold, thus the heating systems starts automatically.
Then he remembers at that time there is the greenhouse light turning on. He built up a cute greenhouse in the terrace and he is absolutely proud of the little forest

Apart from travelling as a truck driver he lives in Copenhagen at the "Krøyers Plads" housing complex, thus travelling so far with his diseases is not always easy. In any case the Hydra enabled tablet PC let him be constantly networked to his life at home and to his virtual community to stay in contact with his friends and other patients and to exchange ideas with them but he also talks with doctors and tutors. he was able to grow up in the last floor of the apartment complex. He gives a look via webcam to the interior of the glasshouse. He planted a few month ago some seeds from a tropical plant he saw at his doctor's ambulatory, and now he is waiting that the plant sprouts with the help of the automatic lights. At the beginning he was using a halogen bulb lamp that required too much energy. He always received a service notification from the meter reading that the power consumption had a sudden peak when the light turned on. Thus he decided to change the lamp. **[Read more]**

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Siemens brings new device category to Hydra

Enabling "dumb" devices to be intelligently accessible from an IP infrastructure is one of the main challenges within Hydra. Besides medical devices like blood pressure meter and blood glucose meter that have already been incorporated in the Hydra middleware Siemens is now working on the integration of power consumption metering devices into the Hydra middleware.

These metering devices consist of metering sensors and a receiver station. The metering sensors are plugged into the power network in order to be able to measure the power consumption of home appliance. The receiver station is collecting the measuring data from a couple of metering devices and is also connected to a PC via USB. Via the PC the collected data can be evaluated and a graphical consumption pattern can visualize the consumption behaviour of the household and the home appliances.
The realization is not as trivial as described. The challenge is on the one hand to exploit the limited features of the involved devices in such a way that they can be addressed within the middleware and on the other hand to process a continuous stream of power consumption data. For doing this, the approaches and technology developed in the proceeding phases of Hydra will be applied and adapted accordingly. For each device descriptions in WSDL and of their ontology will be created, thus web services for device access can be generated automatically via "Limbo".

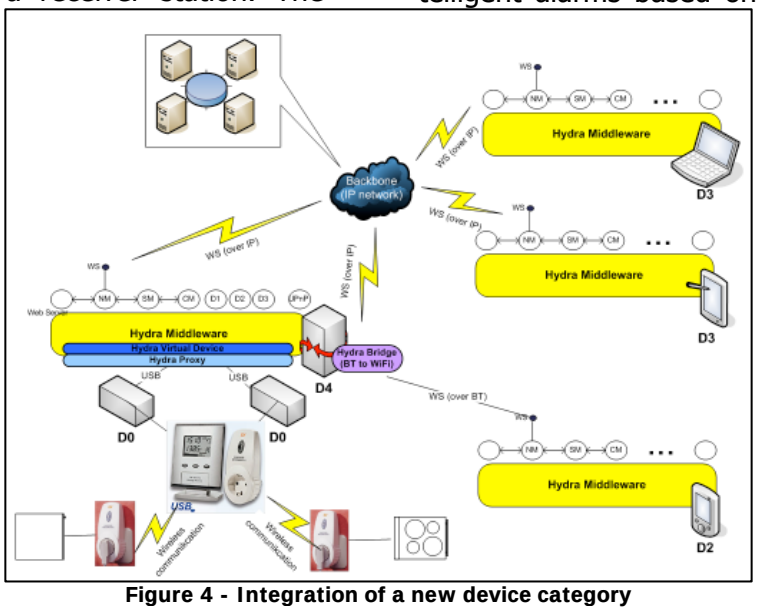

Figure 4 - Integration of a new device category

Through the integration of metering devices into the power network and because of the Hydra middleware's ability to grab this data several possibilities occur to make use of the received power consumption measuring data. One possibility would be a detailed power consumption chart for each device in order to derive intelligent hints for power saving opportunities. Additionally the information can be used for intelligent alarms based on specified measuring events or to initiate follow up events. One example would be a steady increase of power consumption for a dedicated device, indicating that specific components - e.g. cooling - are not working properly. This can indicate to start a maintenance job for the device. With this approach Hydra joins the common trend of smart metering which itself is part of the nowadays very widespread green IT trend. The Hydra technology thus supports the wide spreading and applying of green IT to concrete devices.

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Call for Papers - 1st International Workshop on Distributed Computing in Ambient Environments (DiComAe)

In combination with the 32nd Annual Conference on Artificial Intelligence in Paderborn, the Workshop on Distributed Computing in Ambient Environments organized by members of the Hydra consortium will start for the first time also located in Paderborn, September 15th, 2009.

Scope of workshop

This Workshop is looking for papers describing original research work, experimental efforts, practical experiences with existing systems and industrial developments in the field of distributed, ambient computing.

The Workshop provides a forum for scientists and engineers from academia and industry to exchange and discuss their experiences, new ideas, research results, and knowledge processing for developing smart applications in for instance health care, sustainability or consumer domains.

KI 2009:
The 32nd Annual Conference on Artificial Intelligence aims to gather researchers and developers from academic fields and industries worldwide to share their research results covering all aspects of artificial intelligence. This year the focus lies on AI and Automation: How artificial intelligence has entered industrial production and intelligent products.

Topics of Interest

The workshop includes, but is not limited to, the following topics for ambient environments:

- Distributed algorithms for communication, synchronization and coordination
- Environments, middleware and tool support
- Distributed applications
- Fault tolerance and security+
- Self-management for distributed systems
- Semantic processing
- Ontologies and security
- Energy-awareness in distributed computing

Submission Guideline

Authors are invited to submit original papers in any of the areas listed above. The length of the paper must not exceed 8 pages. Papers should follow the submission guideline of KI 2009. At least one author of an accepted paper is expected to attend the workshop to present the paper. For more information on paper submission, please click **here**.

Important Deadlines

Papers Due:	June 1st
Authors Notification:	July 1st
Camera-ready copies due:	August 1st

The workshop and program is organized by members of the University of Paderborn, Siemens AG, COMSATS Institute of Information Technology, National University of Science and Technology, Delft University of Technology, University of Arhus and Cardiff University.

If you are interested in further information, please read more here.

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Outlook for the next months

Confirmed workshops, conferences and exhibitions

2nd – 4th June 2009 –
University of Aarhus will attend the 14th International Conference on Engineering of Complex Computer Systems in Potsdam, Germany. They will present two papers with the titles "Evaluation of NSGA-II and MOCell Genetic Algorithms for Self-management Planning in a Pervasive Service Middleware" and "Towards Open World Software Architecture with Semantic Architecture Styles, Components and Connectors".

29th June - 1st July 2009 –
Telefonica I+D, University of Aarhus and CNet Svenska will attend the 1st International Workshop on Smart Homes Infrastructures and Interactions (SHII), co-located with the 18th IEEE International Workshop on Enabling Technologies: Infrastructures for Collaborative Enterprises in Groningen, Netherlands.

September 2009 –
Due to its previous success, the University of Reading is planning to organize a 2nd international "Internet of Things and Services" research workshop.

15th – 18th September 2009 –
1st International Workshop on Distributed Computing in Ambient Environments (DiComAe). The workshop is co-organized by the University of Paderborn, Germany.

New Hydra Publications

AMBIENT HEALTHCARE SYSTEMS – Using the Hydra Embedded Middleware for implementing an Ambient Disease Management
Published by: Heinz-Josef Eikerling, Gernot, Graefe, Florian Roehr, Siemens AG, Siemens IT Solutions and Services, Germany, Walter Schneider, University of Paderborn

System Towards Semantic Resolution of Security in Ambient Environments
Published by: Mario Hoffmann, Atta Badii, Stephan Engberg, Renjith Nair, Daniel Thiemert, Manuel Matthess, and Julian Schütte.
[Download paper]

An Approach for Continuous Inspection of Source Code
Published by: Christian R. Prause, Stephan Apelt, Fraunhofer Institut für Angewandte Informationstechnik, Schloss Birlinghoven, Sankt Augustin, Germany.
[Download paper]

Social Aspects of a Continuous Inspection Platform for Software Source Code
Published by: Christian R. Prause, Markus Eisenhauer, Fraunhofer FIT, Schloss Birlinghoven, Sankt Augustin, Germany.
[Download paper]

Managing the Iterative Requirements Process in a Multi-National Project using an Issue Tracker
Christian R. Prause, Marius Scholten, Andreas Zimmermann, René Reiners, Markus Eisenhauer, Fraunhofer Institute for Applied Information Technology, Schloss Birlinghoven, Sankt Augustin, Germany.
[Download paper]

Laws of Identity in Ambient Environments – The Hydra Approach
Published by: Hasan Akram, Mario Hoffmann, Fraunhofer Institute for Secure Information Technology, Darmstadt, Germany.
[Download paper]

Semantic Devices for Ambient Environment Middleware
Published by: Peter Kostelník,, Martin Sarnovský, Ján Hreňo, Technical University of Košice, Slovakia, Matts Ahlsén, Peter Rosengren, Peeter Kool, Mathias Axling, CNet Svenska AB, Dandaryd, Sweden.
[Download paper]

Applications of Semantic Technologies in AmI
Published by: Peter Kostelník,, Tomas Sabol, Faculty of Economics, Marian Mach, Faculty of Electrical Engineering and Informatics, Technical University of Košice, Slovakia.
[Download paper]

Requirements Analysis for Identity Management in Ambient Environments: The HYDRA Approach
Published by: Hasan Akram, Mario Hoffmann, Fraunhofer Institute for Secure Information Technology, Darmstadt, Germany.
[Download paper]

Product Line Enabled Intelligent Mobile Middleware
Published by: Weishan Zhang and Klaus Marius Hansen, Department of Computer Science, University of Aarhus, Denmark, Thomas Kunz, Department of Systems and Computer Engineering, Carleton University, Ottawa, Canada.
[Download paper]

Device Description in HYDRA Middleware
Published by: Martin Sarnovský, Peter Kostelník, Ján Hreňo, Peter Burka, Technical University of Košice, Slovakia.
[Download paper]

Semantic Web based Selfmanagement for a Pervasive Service Middleware
Published by: Weishan Zhang and Klaus Marius Hansen, Department of Computer Science, University of Aarhus, Denmark.
[Download paper]

Towards Self-Managed Executable Petri Nets
Published by: Klaus Marius Hansen and Weishan Zhang and Mads Ingstrup, Department of Computer Science, University of Aarhus, Denmark. [Download paper]

Supports for Identity Management in Ambient Environments
Published by: Hasan Akram, Mario Hoffmann, Fraunhofer Institute for Secure Information Technology, Darmstadt, Germany.
[Download paper]

Security, Trust and Privacy supported by Context-Aware Middleware
Mario Hoffmann, Atta Badii, Stephan Engberg, Renjith Nair, Daniel Thiemert, and Manuel Matthess.
[Download paper]

Flexible Generation of Pervasive Web Services Using OSGi Declarative Service and OWL Ontologies
Published by: Klaus Marius Hansen, Weishan Zhang, and João Fernandes, Department of Computer Science, University of Aarhus, Denmark.
[Download paper]

Semantic Web ontologies for Ambient Intelligence-Runtime Monitoring of Semantic Component Constraint
Published by: Klaus Marius Hansen and Weishan Zhang and Joao Fernandes and Mads Ingstrup, Department of Computer Science, University of Aarhus, Denmark.
[Download paper]

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