OMEGA News

March 2010

Editorial

Dear reader,

The March edition of our newsletter offers you current information on the activities and results of the OMEGA project in the home networking area.

In this issue, the focus is on the OMEGA Open Event in Rennes in February 2010, which attracted about 100 international experts. One of the highlights of the Open Event were the two demonstrators. Cyrille Bezard from Technicolor provides a first-hand report on the Inter-MAC demonstrator, and Klaus-Dieter Langer describes the breakthrough results achieved by OMEGA partners Fraunhofer HHI and Siemens in Visible Light Communication (VLC), which were the basis for the VLC demonstrator shown in Rennes.

I hope you will find the contents of this newsletter interesting, and I would appreciate your comments and suggestions.

Milon Gupta, editor

Project results & activities

First OMEGA demonstrator presented in Rennes

The Omega project is proposing the concept of an additional OSI (Open Systems Interconnection) layer which is placed between MAC layer 2 and IP layer 3. This additional OSI layer is called InterMAC. It is intended to be implemented in gateways, which would then be able to get other gateways' status on, for instance, network load, quality, and other parameters.

In this way, an Omega network based on gateways with embedded InterMAC layer would be a non-congestion meshed network with dynamic load balancing, choice of best link, and redirection of traffic in case of link breakdown.

In addition, the Omega project also includes synchronized research on gigabit technologies like Power-Line Communication (PLC), wireless communication based on the IEEE 802.11n standard, Optical Wireless, and 60GHz. These integrated research activities all contribute to building Omega's home network with transmission rates of one gigabit per second.

In order to proof the feasibility of such a network, the Omega project includes the task of building a demonstrator, which should reflect usage of Omega technologies and InterMAC embedded gateways.

Building the demonstrator

Work on this demonstrator started in February 2009 at a project meeting in Rennes. A task force was launched to define specifications for the demonstrator and to decide on a reliable and integrated implementation.

Since then, Omeaga has finalized the specifications and issued a first design document for the InterMAC part. Lantiq, with support of University of Paderborn, is providing the required hardware, which is called Raptor boards. The Raptor boards are based on FPGA (Field Programmable Gate Array) and run on two power PCs – one for the hardware data plane , and the other for the software control plane. The University of Paderborn was responsible for developing the data plane, IHP for developing the control plane. In addition, IHP set up a development environment, including a data-plane emulator, so other partners could work on developing advanced features control plane whilst IHP and UPB integrated the demonstrator.

In February 2010, we installed three Raptor boards (with the PC holding them), Power-Line Communication boards, PCs, set-top boxes and TV sets at the Orange Labs Showroom, where the demonstrator was for the first time publicly presented in the context of the Omega Open Event.

The demonstrator was planned to be set up as described in Figure 1 (see page 3). Note that this set-up also includes a Management PC, which reflects the state of the Omega network. For the first demo, it is, however, included in an overlay network. In the following version of the demonstrator it will be integrated in the Omega network.

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Demonstration at the Open Event in Rennes

Due to natural integration issues in the implementation, a simplified demonstrator was presented at the Open Event in Rennes, showing streaming between 2 PCs (figure 2 – see page 4).

Figure 3 shows the demonstrator as it was presented in Rennes. On the left you can see the management PC. Its screen shows three coloured squares ;each of thes squares is one Omega node of the network. In the middle you see the PLC board and the PC linked to the Raptor board, and on the right you see the Raptor board. The Raptor board is the one with the Ethernet link on the top. The Raptor board is one of the Omega nodes.

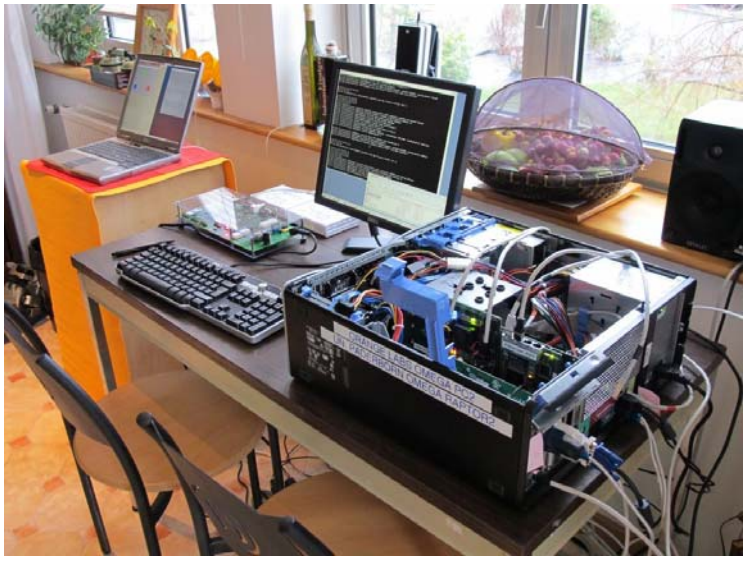

Figure 3: Omega demo set-up at the Open Event in Rennes.

What next?

This demonstrator is a very good basis for demonstrating more Omega features and more technologies. It will be used to continue integration on the data plane and the control plane, to define more services to show, to prepare to integrate other technologies and define scenarios according to the different set-up, so V2 demonstrator (scheduled for end of 2010) could give a more impressive Omega user experience.

Cyrille Bezard-Falgas, Technicolor

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Figures for the article "First OMEGA demonstrator presented in Rennes"

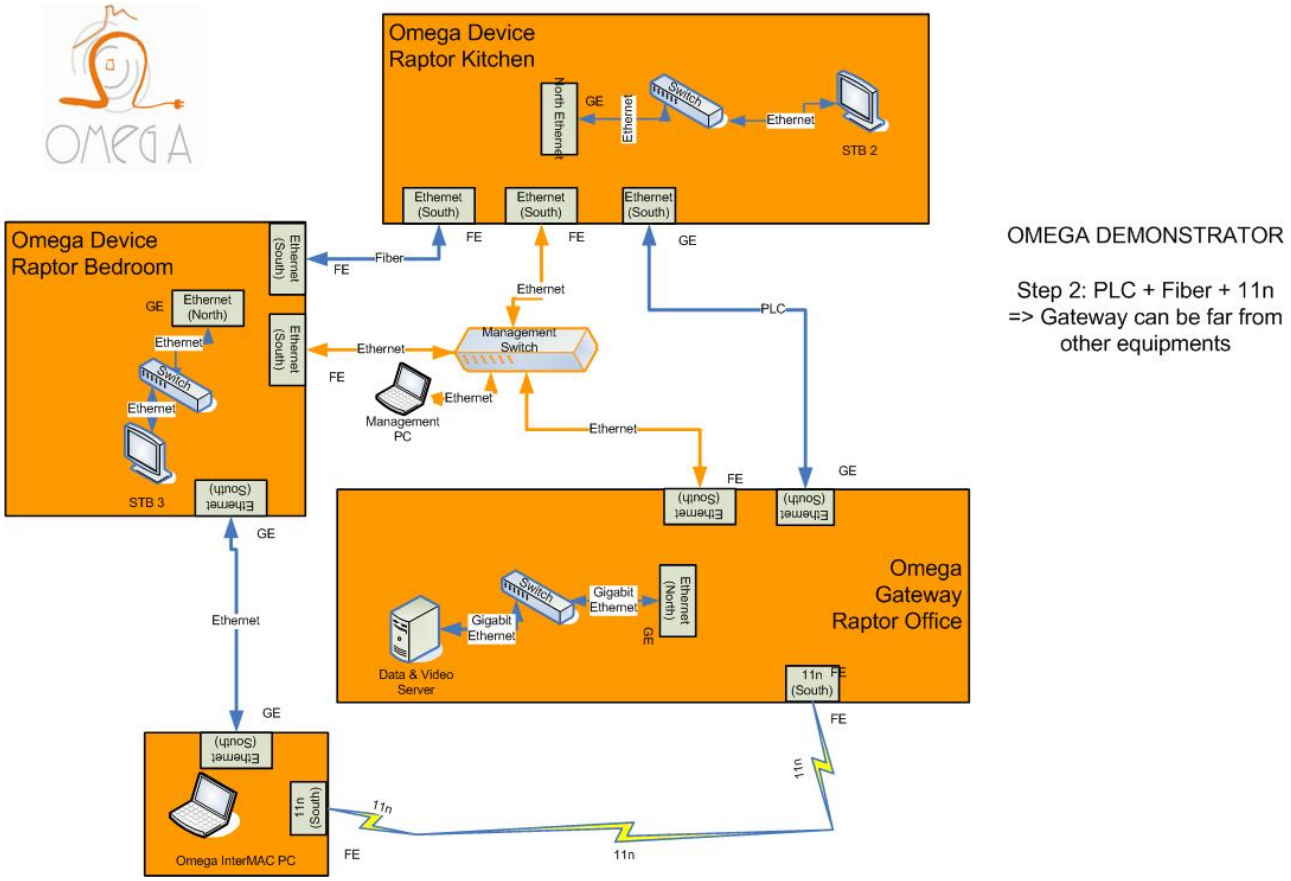

Figure 1: Outline of the first demonstrator

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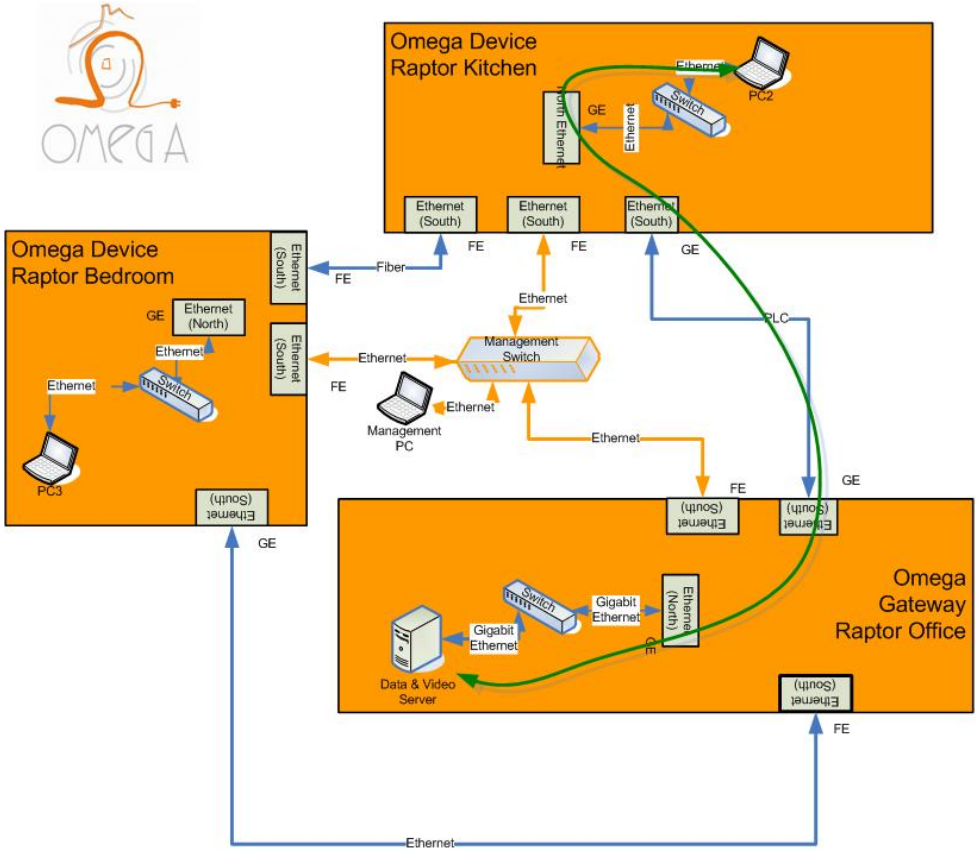

Figure 2: Simplified demonstrator as presented at the Open Event in February 2010

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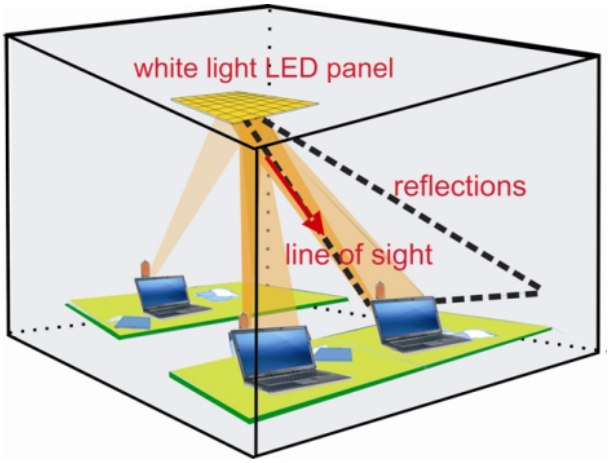
Record communication speeds over ceiling lights

The OMEGA partners Fraunhofer Heinrich Hertz Institute (HHI) and Siemens have scored a peak data rate of 500 megabits per second (Mbit/s) using off-the-shelf LED lights. The new benchmark breaks the previous record they held of 200 Mbit/s. Data transport over visible light is a means of transmission that is license-free, and tap-proof and that opens the way for a range of novel applications in the home, industry and transport.

Researchers at Siemens Corporate Technology in Munich and the Heinrich Hertz Institute set the new free space data transmission record for a distance of up to 5 meters using a white light emitting diode from the Siemens subsidiary Osram. Data were directly modulated from the supply current onto the quantity of light emitted by the LED. The Ostar LED can be modulated so rapidly that a high-speed data transmission rate of 500 Mbit/s can be achieved while the human eye detects no change in the level of brightness. The receiver is a photodetector that transforms light signals into electrical impulses.

Visible Light Communication (VLC) can be used as an extension to WLAN in the home. Further application areas are factories, medical facilities and other places places where wireless cannot be deployed or only to a limited extent. Another application area is the transport domain where LED traffic lights and railway signals could relay information to cars and trains.



The researchers also demonstrated that a network of up to five LEDs is capable of achieving data transmission speeds of up to 100 Mbit/s over a longer distance. This is a critical point for practical applications as, for instance, data from ceiling lights can then be sent to a receiver on a desktop no matter where the desk is positioned in the room. Since 2007 the Institute of Electrical and Electronics Engineers (IEEE) has been working on standardization of the technology in a procedure scheduled for completion by late 2010.

Parts of the research work were conducted within OMEGA.

Further information is available at

www.hhi.fraunhofer.de/en/press/press-and-media/record-communication-speeds-over-ceiling-lights

Klaus-Dieter Langer, Fraunhofer HHI

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Past events

2nd OMEGA Open Event

The second OMEGA Open Event in Rennes, France, presented from 24th to 25th February 2010 presented leading-edge technologies which will shape the future of home networking. About 100 international experts witnessed the first public demonstration of OMEGA's solutions, which will enable data transmission speeds up to one gigabit per second and the integration of heterogeneous communication technologies in the home.

The Open Event presented the state-of-the-art and the future of home networking technologies and made the participants familiar with OMEGA's concepts and technological solutions. For the first time, OMEGA performed live demonstrations of its leading-edge research results.

The Open Event covered four main topics: Radio, Power Line Communication (PLC), Wireless Optics, and Inter-MAC. The event consisted of two parts: a tutorial part on the first day and a workshop including presentations and technical demonstrations on the second day. The technical demonstrations included implementations of OMEGA solutions for Inter-MAC and Optical Wireless (Infrared Communications and Visible-Light Communications). In addition, the event was complemented by video and poster sessions.

Tutorials

The tutorial part was specifically designed for Ph.D. students and other participants interested in the home networking technologies and concepts explored in the OMEGA project. In this context it was one of the goals of the event to build e-skills among graduate students. Thus, the OMEGA Open Event was part of the first European e-Skills Week 2010, an awareness campaign by the European Commission made to promote e-skills particularly among students, young professionals, and SMEs.

The first tutorial by Jean-Philippe Javaudin and Martial Bellec from Orange Labs, who lead the OMEGA project, presented the vision, challenges and use cases of the digital home network. OMEGA's vision is to develop a home network which is capable of delivering up to one gigabit per second over wired and wireless technologies anytime, anywhere, and on any device. The presenters showed examples of how such an easily configurable home network enables the end-user to enjoy seamless service access.

Martial Bellec from Orange Labs, technical manager of OMEGA, sharing the OMEGA vision with the audience.

The second tutorial was held by Vincenzo Suraci from the University of Rome. He explained OMEGA's Inter-MAC concept, outlining the underlying architecture and the challenges to be addressed. Inter-MAC is an additional sub-layer between layers 2 (LLC/MAC) and 3 (IP). It adds features such as auto-configuration, QoS, redundancy, security etc. to the OMEGA network. He particularly described the challenges in forwarding high-rate packet streams in future home networks and solutions to this challenge using Inter-MAC as an additional sub-layer.

In the third tutorial Pierre Jaffré from Orange Labs and Rafael Gonzalez from Telefonica I+D presented an introduction to the architecture of OMEGA's gigabit home network. They first provided a functional description of the data, control and management planes and then presented the OMEGA security approach before

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finally explaining the potential of the OMEGA framework to support self care and customer care utilities as well as resource management.

Workshop

The workshop consisted of three topical sessions. The first session provided an overview on the UPnP-QoS standard for home networks. The standard defines a framework for the quality of service (QoS) of Universal Plug and Play (UPnP). Jelle Nellis from IBBT explained how UPnP-QoS works and which benefits it offers for home networking. Marco Castrucci from the University of Rome pointed out the advantages that can be achieved through the integration of UPnP-QoS and the Inter-MAC layer.

Jelle Nellis from IBBT talking about the UPnP-QoS standard for home networks.

The second session was dedicated to standardisation. Jed Hurwitz, CTO of Gigle Networks, presented his company's solution, referring to several issues relevant for standardisation. Michael Bahr from Siemens presented the current status of OMEGA's standardisation activities, pointing out the importance of standardisation for innovative solutions like the one developed within the OMEGA project.

Kenjiro Nishikawa from NTT presented the latest advances in ultra high-speed radio communication systems.

Finally, in the third session, the focus was on connectivity in the future sustainable home. Kenjiro Nishikawa from NTT in Japan presented the state of the art in ultra high-speed radio communication systems and their applications, pointing out the opportunities and challenges of different emerging communication technologies relevant for sustainable home networking. Andreas Foglar from Lantiq and Marie-Hélène Hamon from Orange Labs presented OMEGA's technical approach towards the sustainable home.

Demonstrations

The highlight of the event were certainly the four demonstrations of OMEGA solutions. The first demonstrator showed how the project implemented Inter-MAC on top of Ethernet, Wi-Fi and Power-Line Communication (PLC). The second implementation demonstrated video streaming via Visible-Light Communications (VLC), where data can be communicated via an ordinary LED lamp.

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Cyrille Bezard from Technicolor (second from right) explaining the Inter-MAC demonstrator to interested participants in the showroom.

The live demos were complemented by videos showing OMEGA's implementation of infra-red and 60 GHz radio communication. In addition, the participants had the opportunity to view posters on OMEGA's results in the foyer and discuss with the Omega partners technical subjects like connectivity via radio, powerline, and wireless optics as well as techno-economic aspects.

The final results of OMEGA will be presented at the third Open Event which will be held in Rennes in December 2010 or January 2011.

Further information about the Open Event 2010, including downloadable presentation slides are available at http://www.ict-omega.eu/events/open-event-2010.html.

Milon Gupta, Eurescom

Upcoming events

MobiLight 2010

Barcelona, Spain, 10 – 12 May 2010

OMEGA will organize a special session dedicated to wireless home networking via radio technologies and smart wireless optics and themed "Advanced wireless technologies for a converged ultra-broadband home network." Furthermore, there will also be a tutorial on radio technologies given by OMEGA.

Conference website

Future Network & Mobile Summit 2010

Florence, Italy, 16 – 18 June 2010

OMEGA is planning to submit and present several papers.

Conference website

About OMEGA

OMEGA is an Integrating Project in the ICT area funded by the European Commission under the Seventh Research Framework Programme (FP7). The project is running for three years from January 2008 to December 2010.

OMEGA will develop a user-friendly home area network capable of delivering high-bandwidth

services and content at a transmission speed of one Gigabit per second. The interdisciplinary project consortium consists of 21 European partners from industry and academia.

OMEGA website

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