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Abstract

Besides its technical R&D activities, the AIM project created significant outcome in dissemination and impact creation activities, carried out within WP6. Here, the AIM project consortium focused on two tasks; Impact creation and Exploitation plans. Results of these two tasks are reported in AIM deliverables D6.1.1 and D6.2.1, respectively. Since the both deliverables are declared as Confidential document, for internal use within AIM project consortium, the outcomes of AIM WP6 are summarised in this deliverable, which is open to be given to wide public. The AIM project successfully carried out various dissemination activities, and with it, created significant impact, event the project is rather a small-scale R&D activity. Furthermore, results achieved in the AIM project present a significant potential for further innovation and creation of the related products and services, as mentioned in exploitation plans created by the AIM consortium members.

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Executive summary

Within the European Commission's research Framework Program 7, "ICT for Environmental Management and Energy Efficiency", AIM project addresses the European wide challenge of energy waste problem and the consequent need for energy optimal use.

Besides its technical R&D activities, the AIM project created significant outcome in dissemination and impact creation activities, carried out within WP6. Here, the AIM project consortium focused on two tasks; Impact creation and Exploitation plans. Results of these two tasks are reported in AIM deliverables D6.1.1 and D6.2.1, respectively. Since the both deliverables are declared as Confidential document, for internal use within AIM project consortium, the outcomes of AIM WP6 are summarised in this deliverable, which is open to be given to wide public.

It can be concluded that the project website, developed and maintained during the project, includes all necessary and updated project information, including its results and collaborative work done with other projects and organisations which are also active in the related area. Moreover, the website statistics show a significant and continuously increasing number of visits. AIM project consortium managed to publish seven per-reviewed conference papers and one journal paper, whereas two additional journal papers are submitted, and was invited to present its work at several conferences and events world-wide.

Overall conclusion which can be made is that AIM project successfully carried out various dissemination activities, and with it, created significant impact, event the project is a small-scale STREP activity. Furthermore, it can be concluded that the achieved results in the AIM project present also a significant potential for further innovation and creation of the related products and services, as expressed in promising exploitation plans from the AIM consortium members.

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Eurescom	Maria Barros	Chapters 2 and 3, participation in all the document
Eurescom	Halid Hrasnica	Participation in all the document
Keletron	Spyridon Tompros	Participation in all the document
All		Contribution to exploitation plans

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1 Introduction

Within the European Commission's research Framework Program 7, "ICT for Environmental Management and Energy Efficiency", AIM project addresses the European wide challenge of energy waste problem and the consequent need for energy optimal use.

To tackle these challenges, the objective of the project was to foster a harmonized technology for profiling and managing the energy consumption of appliances at home. The AIM introduced energy monitoring and management mechanisms' in the home network and provided a proper service creation environment to serve virtualisation of energy consumption, with the final aim of offering users a number of standalone and operator services. The main was to forge a generalized method for managing the power consumption of devices that are either powered or in stand-by state. The AIM technology has been applied on with goods and audiovisual equipments.

Besides its technical R&D activities, the AIM project created significant outcome in dissemination and impact creation activities, carried out within WP6. Here, the AIM project consortium focused on two tasks; Impact creation and Exploitation plans. Results of these two tasks are reported in AIM deliverables D6.1.1 and D6.2.1, respectively. Since the both deliverables are declared as Confidential document, for internal use within AIM project consortium, the outcomes of AIM WP6 are summarised in this deliverable, which is open to be given to wide public.

The first focus of the document is on dissemination and impact creation activities within the AIM project, which is summarised in Chapter 2. It includes information about the project website, main publications prepared by project partners, and provides information about participation at different events. In the second part of the document (Chapter 3), exploitation plans of the consortium members are presented.

2 Dissemination Activities

2.1 Website

AIM set-up a project website as a dissemination strategy in helping creating public awareness. The website went live on June 2008 and had its first visit on the 3rd of June. The website was implemented and continuously maintained in a collaborative way, through a Content Management System, Typo3, with the intention of avoiding a non-updated, static information platform. All ACTIVE members have an account, giving different priorities' accesses to the website editing tool.

2.1.1 Public Content

The figure below presents the website home page. The header presents the full title and the logo of the project, the FP7 programme logo and the European flag. The left column presents the general identification of the project and the left column presents a regularly updated list of news and events related with the project.

aim A novel architecture for modelling, virtualising and managing the energy consumption of household appliances

SEVENTH FRAMEWORK PROGRAMME

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Home About us Partners News Events Publications Links Contacts

You are here: Home > 10.6.2009 : 14:25

Home

AIM use cases:

- Intelligent power management service for autonomous energy preservation
- Metering service for energy planning
- Remote monitoring and management

AIM technology for:

- white goods
- communication devices
- audiovisual equipment

AIM* - A novel architecture for modelling, virtualising and managing the energy consumption of household appliances

AIM's main objective is to foster a harmonised technology for profiling and managing the energy consumption of appliances at home. AIM will introduce energy monitoring and management mechanisms in the home network and will provide a proper service creation environment to serve virtualisation of energy consumption, with the final aim of offering users a number of standalone and operator services.

Behind this goal, the main idea is to forge a generalised method for managing the power consumption of devices that are either powered on or in stand-by state. Especially for the second category of devices, the project will define intelligent mechanisms for stand-by state detection, using all-device-fit control interfaces.

The AIM technology will be applied on white goods (refrigerators, kitchens, washing machines, driers), communication devices (cordless phones and wireless communication devices for domestic use) and audiovisual equipment (TV Sets and Set-top-boxes) and will be built around three use-cases:

1. Use-case for residential users (intelligent power management service for autonomous energy preservation).
2. Use-case for power distribution network operators (metering service for energy planning).
3. Use-case for network operators (remote monitoring and management).

To enable wider applicability of its technology, AIM will also consider, in the specification phase, the energy management requirements of peripheral household devices, such as heaters, solar panels, etc, of which use is less frequent but also important concerning energy consumption. The AIM technology will be evaluated in the context of experiments that will be hosted, initially in virtual home environment and latter in real households. Experiments will have the objective of acquiring real users' experience with regard to the usefulness of AIM applications and to prove the efficiency of the solution in saving energy, 10% for stand-by devices and 20% for active devices.

Events

ICT4EE: High Level Event on ICT for Energy Efficiency
The ICT4EE- High Level Event on ICT for Energy Efficiency is organised by the European Commission's...

e-Envi2009- TOWARDS eENVIRONMENT
Opportunities of SEIS and SISE: Integrating Environmental Knowledge in Europe

Networking Session supported by AIM at ICT2008 Event- here the report and presentations
N.105-"ICT for Energy Efficiency through Home Automation", 27 November 2008, 11.00-12.30, room...

→ Full list of events

NEWS

15 April 2009
AIM won first prize for Best Paper Award at e-Envi2009
AIM won a first prize for best paper award with the paper "A New Architecture for Reduction of..."

* AIM is a STREP Project of the ICT work Programme under the European Community's 7th Framework Programme (FP7).

Figure 1: AIM website

Next figure presents the website sitemap, which gives an idea of the full structure of the website.

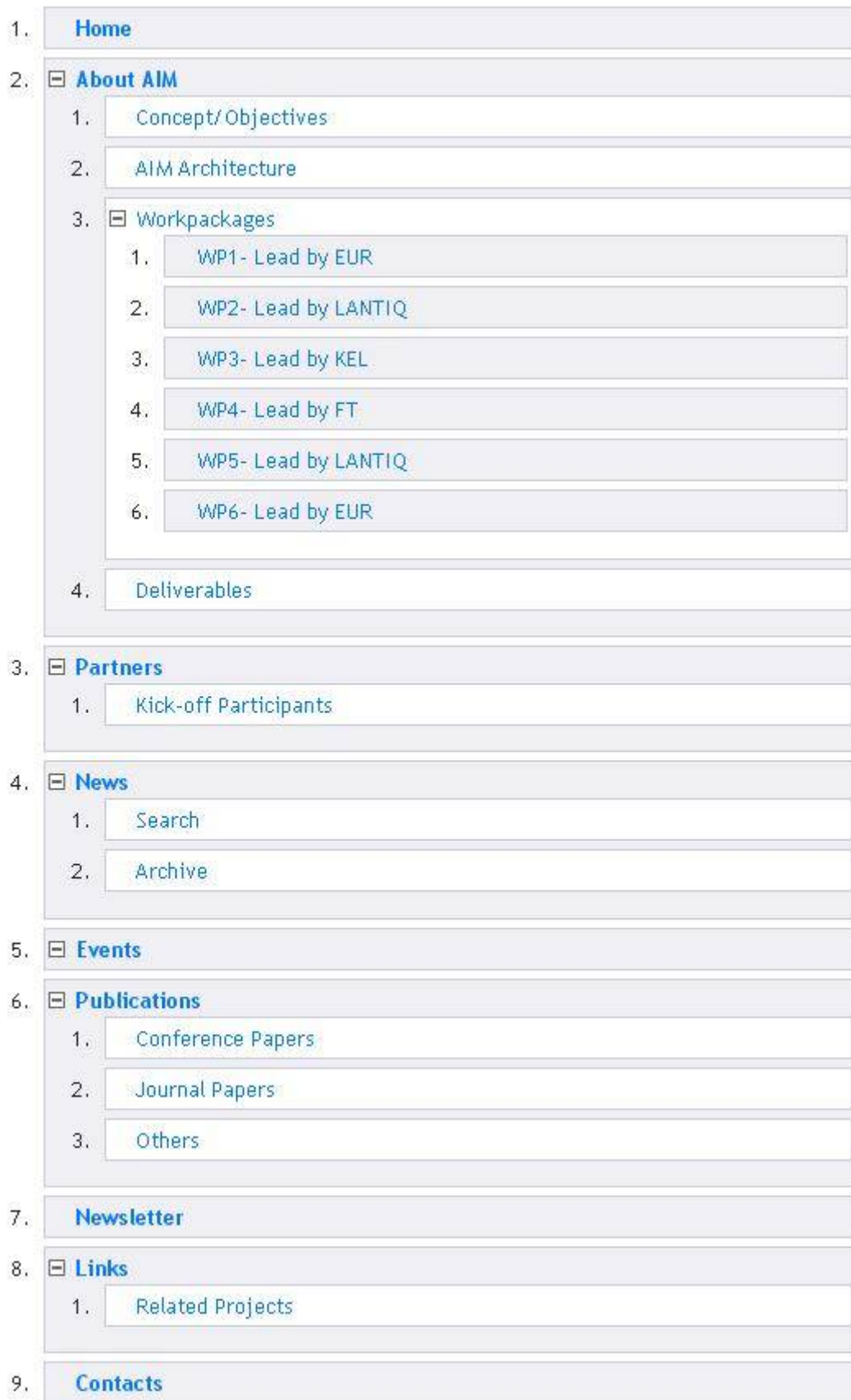


Figure 2: Website sitemap

On the “homepage” there is the page “About Us” with several sub-pages describing the project in detail, regarding the project objectives, approach, the system architecture being developed and the different workpackages. In a different page on the “homepage”, called “Partners” the consortium is presented, with the respective links to their websites.

Also on the “homepage” there is a page with several sub-pages devoted to the project publications: publications in Journals, in Conferences, and others (press releases, academic publications, etc.). The “Publications” page of the AIM website provides the abstract of all publications. This is in line with the requirement of the FP7 Guidance Notes on Project Reporting which require the coordinator to provide references and an abstract of all scientific publications.

Different dissemination materials have been developed and updated during the lifetime of the project to support the dissemination of AIM. The dissemination materials that can be downloaded from AIM website consist in:

- A leaflet of the project;
- A poster of the project;
- The Newsletter;
- The scientific publications generated by the project.

The website presents also a page with the project newsletter; a page with important links to relevant entities and to related projects; a page with contacts; a page with project news; and a page with relevant events for the project.

The information on the website is continuously updated.

2.1.2 Visits' Statistics

The following table presents some significant statistics on the website dissemination results, as the number of unique visitors, the number of visits, the number of visited pages, the number of hits per page and the bandwidth used for all the visits.

The values for these measures are presented in two separate categories, one is called the “viewed traffic”, which only includes relevant traffic, and the other is called “not viewed traffic”, which includes traffic generated by robots, worms, or replies with special HTTP status codes.

For better clarification, a description of each measure is following presented:

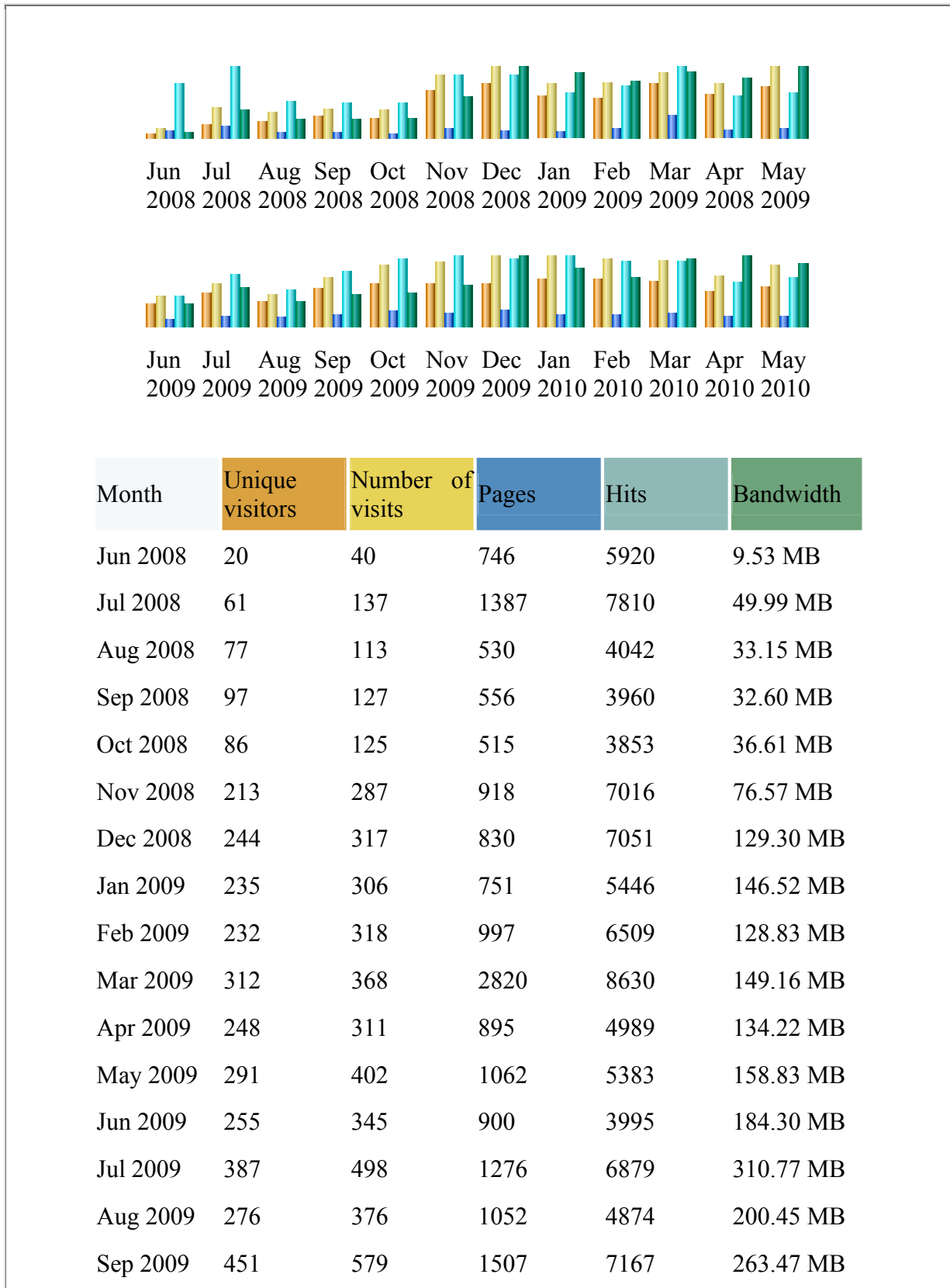
- **Unique visitors**- number of client hosts (IP address) who came to visit the site (and who viewed at least one page). This data refers to the number of different physical persons who had reached the site.
- **Number of visits**- a new visit is defined as each new incoming visitor (viewing or browsing a page) who was not connected to your site during last 60min.
- **Pages**- number of times a page of the site is viewed (sum for all visitors for all visits). This data differs from "hits" in the sense that it counts only HTML pages as oppose to images and other files.
- **Hits**- number of times a page, image, file of the site is viewed or downloaded by someone.
- **Bandwidth**- this information refers to the amount of data downloaded by all pages, images and files within the site.

In the following table the number of unique visitors, global visits, visited pages, hits, and bandwidth are presented by month for all the lifetime of the project, June 2008 to May 2010. Table 3 presents the figures of the “not viewed traffic”.

The maximum number of “unique visitors” and “visits” was in November and December 2009, when the project gave a presentation at the ICT for sustainable homes event, held in Nice, France, and another presentation at the "Green and connected cities" event, Strasbourg (EU Parliament), France.

Another reason for this peak can be the participation to the “Best ICT4EE Project Award”, which gave large visibility to the project website as well.

Table 1: AIM website statistics (viewed traffic)



Oct 2009	498	718	1898	8813	281.31 MB
Nov 2009	505	746	1675	9159	337.69 MB
Dec 2009	503	816	2078	8826	581.62 MB
Jan 2010	498	729	1655	10119	311.53 MB
Feb 2010	494	698	1707	9351	263.24 MB
Mar 2010	466	692	1902	9227	354.76 MB
Apr 2010	367	534	1524	6325	370.84 MB
May 2010	409	634	1376	7100	335.23 MB
Total	7225	10216	30557	162444	4.77 GB

Table 2: AIM website statistics (not viewed traffic)

	Pages	Hits	Bandwidth
Total	61994	109115	4.16 GB

Table 3 presents statistics for most visited (top 30) AIM web pages. These statistics are particularly interesting to understand the impact of each of the dissemination activities. The page of publications presents 1475 visits and it is possible to see that there were 1354 views of the page “about-AIM”. The type of publications that was most viewed were the conference papers, with 1013 visits, followed by the journal papers, with 636 views. The paper mostly seen is the one published in the ISPLC2009 conference, followed by the one published at PETRA2008, about the aspects of energy management at home. Another interesting example is the paper published in the conference e-ENVI, which won the best paper award, as it has 560 views.

The leaflet of the project had 602 views through the website, but the leaflet was also distributed at every event attended.

Table 3: Statistics for individual AIM web pages

Top 30 pages-url	Viewed
/partners.html	2069
/home.html	1621
/publications.html	1475
/about-aim.html	1354
/publications/conference-papers.html	1013
/events.html	850
/news.html	832
/links.html	739

/fileadmin/user_files/ISPLC2009.pdf	663
/publications/journal-papers.html	636
/fileadmin/user_files/aspects_of_energy_management_at_home_final.pdf	621
/about-aim/aim-architecture.html	614
/fileadmin/user_files/AIM-leaflet.pdf	602
/contacts.html	594
/about-us/conceptobjectives.html	560
/fileadmin/user_files/paper-AIM-envi2009_v1_0_reviewed.pdf	560
/fileadmin/user_files/deliverables/AIM-D2-3v1-0.pdf	532
/publications/deliverables.html	519
/fileadmin/user_files/deliverables/AIM-D2-2v1-0.pdf	404
/publications/newsletter.html	395
/about-us/workpackages.html	350
/service/sitemap.html	318
/partners/kick-off-participants.html	289
/publications/others.html	248
/fileadmin/user_files/deliverables/AIM-D3-1-1-2v1-0.pdf	232
/fileadmin/user_files/Builsys09.pdf	218
/service/search.html	166
/fileadmin/user_files/deliverables/AIM-D2-3v1-0.pdf	117
/events/eventview/article/networking-session-supported-by-aim-at-ict2008...	76
/news/view/article/aim-newsletter-launched.html	65

Considering the statistics about the website visits, we can conclude that activity on creation and maintenance of the project website fulfilled its expectation to serve as a communication and knowledge sharing tool among project participants as well as dissemination tool to all the community, helping ensuring a wide publication and presentation of the project results and further achievements of the AIM project consortium.

2.2 Peer Review Publications

2.2.1 At conferences

Paper	Authors	Conference	Venue	Date
A pervasive network architecture featuring intelligent energy management of households	Spyridon Tompros, Nikolaos Mouratidis, Michael Caragiozidis, Halid Hrasnica, Anastasius Gavras	1st International Conference on Pervasive Technologies Related to Assistive Environments PETRA 2008	Athens, Greece	July 16-19, 2008
A New Architecture for Reduction of Energy Consumption of Home Appliances	Antonio Capone, Maria Barros, Halid Hrasnica, Spyridon Tompros	TOWARDS eENVIRONMENT, European conference of the Czech Presidency of the Council of the EU e-Envi2009	Prague, Czech Republic	March 25-27, 2009
A novel power line network architecture for managing the energy resources of the residential environment	Spyridon Tompros, Nikolaos Mouratidis, Halid Hrasnica	13th IEEE International Symposium on Power Line Communications and its Applications ISPLC 2009	Dresden, Germany	March 29-April 1, 2009
AIM Architecture Evaluation and Validation Testbed	M. Barros, Hrasnica, Tompros, Caragiozidis	H. International Conference S. On Ultra Modern Telecommunications ICUMT (IEEE TS)	St-Petersburg, Russia	October 12-14, 2009
Home Energy Saving through a User Profiling System based on Wireless Sensors	Antimo Barbato, Luca Borsani, Antonio Capone, Stefano Melzi	First ACM Workshop On Embedded Sensing Systems For Energy-Efficiency In Buildings BuildSys	Berkeley, CA, USA	November 3, 2009
Home Energy Saving through Wireless Sensor Networks	Antimo Barbato, Luca Borsani, Antonio Capone	1st International Conference on Energy-Efficient Computing and Networking e-Energy 2010	Passau, Germany	April 13-15, 2010
A Wireless Sensor Network based System for Reducing Home Energy Consumption	Antimo Barbato, Luca Borsani, Antonio Capone	IEEE SECON 2010	Boston, USA	June 21-25, 2010

2.2.2 In Journals

Paper	Authors	Journal	Date
Enabling applicability of energy saving applications on the appliances of the home environment	Spyridon Nikolaos Maurice Andreas Hrasnica	Tompros, IEEE Mouratidis, Magazine, Draaijer, Issue: 6 - Special Issue Foglar, Halid on Digital Services	Network Volume: 23 November- December 2009

A paper with the AIM final results is being prepared to be submitted to the Elsevier Computer Communications Journal.

2.2.3 Other Publications

2.2.3.1 Newsletter

AIM published a periodic newsletter with the news and awareness of the project results, which can be downloaded at the project website. The newsletter published three issues during the lifetime of the project: the first issue on July 2008; the second on April 2009; and the third on April 2010.

2.2.3.2 Diploma Thesis

A Diploma thesis was generated with work developed in AIM project. The thesis, called "Planning and realisation of an interactive energy management system in households", was published in 2009 and was written by Sandor Plosz, participating in AIM project. The work was carried under the supervision of Andreas Foglar, Infineon Technologies AG, and Istvan Moldovan, BME-TMIT, and can be downloaded at AIM website.

2.2.3.3 External Publications

Two articles about AIM project were published in the Eurescom message magazine, issue 1/2009 dedicated to "ICT and sustainability". The articles were called "Sustainability ICT and energy efficiency" and "Reducing CO2 emissions at home – The AIM project".

2.3 Participations at key events

2.3.1 Sessions Organization

2.3.1.1 Networking Session

AIM organized a networking session about ICT for Energy Efficiency through Home Automation, in collaboration with a Danish cluster of projects, at ICT2008 Event, the most important forum for discussing research and public policy in information and communication technologies at European level organised by the European Commission's Directorate General for the Information Society and Media, this time in Lyon, France, November 25-27, 2008.

The session comprised some projects presentations followed by a discussion session between the audience and five invited panellists. The presentations and report of the Networking Session can be downloaded from the events page, at the project website.

2.3.1.2 Workshop

Politecnico di Milano organized a workshop, "Communication Technologies and Environmental Sustainability: Green ICT & ICT for Green", in February 2010, in which AIM project was presented.

AIM project presentation was called “Energy savings with home networking” The event website is <http://home.dei.polimi.it/capone/GreenICT/>

2.3.1.3 Special session

Keletron organized a special session at the International Conference On Ultra Modern Telecommunications, ICUMT-2009 (IEEE TS), held in ST-Petersburg, Russia, 12-14 October 2009, in which a paper on the testbed planed for the AIM architecture evaluation was presented.

2.3.2 Stands at events

2.3.2.1 ICT4EE 2009

AIM participated with a stand demonstrating the EMD in two different scenarios: communicating with a kitchen oven via powerline and with a TV via wireless, at the exhibition ICT4EE- High Level Event on ICT for Energy Efficiency, organised by The European Commission's Information Society and Media Directorate-General, in cooperation with the Czech Presidency of the European Union, held in Brussels, Belgium, March 19-20, 2009.

2.3.2.2 ICT4EE 2010

AIM participated with a stand demonstrating the EMD with two different demos: “WSN for Home Energy Saving” and "AIM Mobile Application", at the exhibition ICT4EE- High Level Event on ICT for Energy Efficiency, organised by The European Commission's Information Society and Media Directorate-General, in cooperation with the Spanish Presidency of the European Union, held in Brussels, Belgium, February 23-24, 2010.

The demo “WSN for Home Energy Saving” showed how the AIM automation system uses information provided by the wireless sensor network (WSN) to automatically control home appliances (e.g. air conditioners, lighting systems, TV, WiFi routers) according to user habits. The system interface, called Home Virtualization Application (HVA), was used to demonstrate how the data can be shown through two main panels, one representing the house map and some house information and another one that is associated with the selected room and presents four panels: the information panel, showing information (temperature, light, user presence and power consumption) provided by sensors located in the selected room; the room devices panel, showing the virtualized devices located in the selected room and their status; the consumption panel, representing the consumption chart of the selected room for the current day; and the presence panel, representing the predicted presence profile and the daily presence profile of the selected room for the current day.

The demo "AIM Mobile Application" showed how the AIM automation system allows the user to be aware of the energy consumed at home, to control his/her appliances, and to receive alerts from the system. As an extra feature, the AIM mobile application introduces a new approach based on social networks to foster individual energy consumption reduction. The application, which runs on Android touch phone, is defined by a mix between "conventional" remote command and a game. The demo gave the opportunity to interact with the AIM mobile application user interface, which allows user to be aware of green energy and CO₂ consumed and supports the following: AIM automation system remote configuration; appliances monitoring and control; alerts to be received in case of abnormal consumption; and social network management and automatic stimulation for energy consumption reduction.

2.3.3 Other participations

2.3.3.1 ICT21EE European thematic network Conference

AIM participated to the ICT21EE European thematic network Conference, at the European Parliament in Strasbourg, France, on the 11th of December 2009.

This participation brought to AIM the opportunity of presenting AIM System and networking with different players operating in many fields: local players and decision makers, communication experts,

NGO managers, experts in the fields of Internet and new technologies, media managers, scientists, and all people involved in concrete projects and initiatives.

2.3.3.2 Best Paper Award ceremony at e-Envi2009

AIM won a first prize for best paper award with the paper “A New Architecture for Reduction of Energy Consumption of Home Appliances”, at the European conference of the Czech Presidency of the Council of the EU TOWARDS eENVIRONMENT, e-Envi2009, in Prague, Czech Republic, March 25-27, 2009.

2.3.3.3 AIM at the EU-China Science and Technology Week

AIM will present its energy efficiency management’s approach during EU-China Science and Technology Week, at World EXPO 2010 Shanghai, 14-19 June 2010.

AIM was invited by the European Commission to participate in the EU-China Science and Technology Week and to give a presentation during the session ICT for smart energy efficient cities, giving the project the opportunity not only to present its system but also to network with leading scientists, journalists, and representatives from industry, academia and government from the European Union and China.

3 Exploitation

3.1 Individual Exploitation Plans

3.1.1 Eurescom GmbH

Since AIM project already designed an appropriate architecture for improvement of energy efficiency in the households Eurescom sees it as good opportunity for network operators, having the mandate from its shareholders and members which are mainly the largest European telecommunications operators, to offer corresponding services to their customers. Accordingly, regulatory situation in the area will be continuously observed and suggestion to launch creation of such services will be made to the operators, but also other potential service providers, when appropriate. Furthermore, application and further development of AIM technology is seen as an opportunity beyond its application for private households, where activities on creation of new research projects in the area, since definition of joint and collaborative research undertakings belongs to Eurescom main missions, are already carried out.

3.1.2 France Telecom

France Telecom is interested in exploring environmentally friendly services for its users. FT is preparing innovative services based on residential gateway and new sensors. For this purpose, a telecom operator platform for creation of the energy saving services has been developed in the project.

This platform is composed of a service platform and a Android mobile application that allow users to:

- Monitor and control appliances;
- Receive alerts in case of abnormal consumption;
- Be aware of energy and CO2 consumed at home.

The result of the evaluation of remote interface by real users is positive. It has demonstrated that a social network approach to stimulate users and change their habits may be a new way of innovation and services.

This developed platform will be considered within plans for provision of the related services to the customers in the future.

The AIM architecture is also based on the Device Virtualization Engine that is the Single Point of Contact at home. The integration of the Device Virtualization Engine within the France Telecom's Livebox will be investigated. The rational of the DVE may be fully included in a separate box. It also could be fully or partially included in the telecommunication network.

France Telecom believes it is now possible to include EMD, DVE and mobile application within an "Energy kit saving" to allow its customers to save energy."

3.1.3 KELETRON Special Electronic Applications Ltd

Keletron is cooperating commercially with Bosch Siemens Household appliances (B/S/H) and Gorenje as third party communication sub-systems developer for washing machines, refrigerators and ovens.

In relation to the addressed technological field in the AIM project Keletron has many years of cooperation with B/S/H on the design and implementation of diagnostic appliance control applications featuring communication over home and WAN networks. B/S/H is using this technology in the iService set of diagnostic applications which is operated world-widely for troubleshooting and malfunction detection of commercial white good products. Through the AIM project Keletron aims at enhancing its role on iService implementation by planning to extend its contributions with a gateway architecture that is capable not also to act as commands mediator but also as local host of service logic.

Another internal B/S/H product, also available on commercial white goods products is the so-called smart@home concept of intuitive appliance management. The smart@home concept is based on the deployment of a residential gateway and the use of physical communication interfaces that do not

impose alterations on households' wiring infrastructure. Keletron contributes to this project with M2M interfaces and protocols for appliance program management. Through AIM, Keletron aims at extending its involvement in this product range with energy management logic and M2M interfaces portable to centralized energy saving applications.

Regarding Gorenje, Keletron works towards gaining a contract for KNX interfaces implementation as built-in component within Gorenje appliances. Through the AIM project, Keletron has been in position to design and develop such physical interfaces, which were already demonstrated to Gorenje representatives and boosted decision on contract award.

3.1.4 CEFRIEL

CEFRIEL is a not-for-profit organization that carries out research and development in many ICT application fields that today are crucial for most enterprises and public authorities. The most relevant purpose at CEFRIEL is to strengthen existing ties between academic and business worlds in the innovative ICT sector.

Thanks to its multidisciplinary competencies, CEFRIEL is able to design and implement cutting-edge solutions that integrate hardware, software and the most recent multimedia communication technologies into innovative products and services.

CEFRIEL takes part in many research projects, such as the AIM, in order to share its skills and qualifications with both academic and industrial project partners, thus enhancing competencies that are to be use in productive contest by its customers. CEFRIEL will exploit AIM results, know-how acquired during the project execution supplying innovation services within the CEFRIEL consortium and with its industrial partner, public administration and in general with its customer. As a result CEFRIEL clients take indirectly advantage of this experience by adopting the best enterprise innovation processes.

3.1.5 Politecnico di Milano

Politecnico di Milano, as public research and technical university, is involved its departments and laboratories in many projects focused mainly on medium to long term research and also basic research. The results of most of the projects are exploited to stimulate the further development of research activities that move forward the high level goals adding new challenges. Most of the projects have an impact on teaching activities mainly at graduate level (master and PhD) where students take advantage of the knowledge developed during the projects and the contacts and cooperation activities with industrial partners.

However, Politecnico di Milano has also developed an internal organization structure composed of several entities for fostering the technology transfer towards the market. The organization includes the Technology Transfer Office (TTO) that is in charge of the managing IPR policies and investigating potential industrial exploitation actions of research results, non-profit organizations (like CEFRIEL) devoted to knowledge transfer and innovation activities, and spin-off companies where the university keep a share and that are devoted to the market exploitation of solutions and products derived from the research activities of university labs.

In addition to the usual exploitation plans mentioned above, for the AIM project Politecnico di Milano plan to attempt the exploitation of the results obtained by the Advanced Network Technologies Laboratory (ANTLab) through the spin-off company MobiMESH. MobiMESH plans to exploit the project results to create a new product line for indoor wireless sensor networks based.

This is perfectly in line with the mission of university spin-off companies that are mainly targeted to bring to the market the innovative ideas and solutions developed in the academic research labs with a process that usually goes through several phases:

- 1) Prototype implementation of the system architecture, devices and software modules
- 2) Lab testing of the solution
- 3) Prototype refinement
- 4) Testing of the final prototype in pilot installations
- 5) Product engineering

6) Commercialization activities

In project AIM, ANTLab carried out the phase (1) and (2). MobiMESH plans to complete phases from (3) to (6).

3.1.6 INDESIT

Indesit was investing on smart appliances and connectivity issues since the first half of nineties, has developed the first generation of connected products during the years 2000-2003 (Margherita2000.com washing machine, Leon@rdo internet appliance, Ariston Digital system, Margherita Pay-x-Use washing machine), considers such activities strongly strategic for the future and intends to increase its leadership in the field of the connected homes. For this reason Indesit consider the AIM achievements as a very important opportunity for giving an effective support to its medium/long term strategy. Therefore the exploitation of the AIM results becomes an important part of the activities which Indesit intends to perform in short term for creating, with the help of its direct competitors, the necessary standards to support the connected home.

The Indesit exploitation plan includes the following activities:

- Direct involvement on the activities set up by CECED for aiming the diffusion of smart appliances able to meet the requirements coming from the “smart grid revolution”;
- Participation to specific events (conferences, workshops, fairs) dedicated to “smart grid” and “smart appliances” issues;
- Direct involvement on activities for defining communication standards of the connected home;
- Participating to field trials together with important actors in the field of energy generation and distribution, Information and Communication technologies, web based Services providing;
- Collaborating with direct competitors for negotiating and defining common rules for the connected appliances;
- Writing articles for magazines dedicated to new technologies for the connected home;
- Proposing/participating to research projects dedicated to energy monitoring/management issues, environmental impact reduction, Assisted Ambient Living;
- Contributing in defining new use cases for promoting new business opportunities for the white goods.

A first opportunity to share and apply the AIM achievements is actually offered to Indesit by the Italian Energy@home project, started last October 2009 together with Enel (the big Italian utility), Telecom Italia and Electrolux with the intention to set up and validate a standard communication infrastructure for supporting interoperability among utilities, household appliances, service providers and household users. The main objectives of such project are: increasing the user awareness about energy consumption through proper monitoring activities, increasing the efficiency of energy distribution through proper interactions between the utility and the appliances (under the control of the user), reducing environmental impacts and costs by avoiding power peaks, creating the technical conditions for offering future innovative web based services to the connected home.

3.1.7 Döbelt Datenkommunikation

Doebelt Datenkommunikation is specializes in the development and production of electronic devices in various fields of application. We primarily develop and manufacture event monitoring, telecontrol and remote maintenance systems. A special focus is in metering and energy saving applications.

We aim to improve our customers' operation of many kinds of decentralized facilities by increasing cost-efficiency and electronic monitoring of these installations. We provide efficient data processing and communication devices by employing cutting-edge micro-electronics devices and by using all available networks for information transmission.

Our knowledge and qualification include the research, planning, design, and delivery of complete system solutions. These complete hardware and software systems provide the capability of data

transmission over any kind of radio or cable communications network. Furthermore we develop and deliver customer-specific components and maintain these systems after delivery.

Doebelt Datenkommunikation has worked in WP3 and WP5 and researched in protocols and developed an EMD. In this EMD we implemented the AIM protocol based on UPnP. Furthermore we have enriched the functionality of the complete AIM-System for remote service fulfilled by third parties. Especially the AIM home gateway was enhanced by port-forwarding functionality as well UPnP commands for data logging.

In the AIM project we have find out consolidate findings, which we will implement in some of our new products. For an overall implementation of measurement and control devices in big projects or applications with different suppliers a standardization of the main information which will be transferred, is evident. So we will integrate in new devices the UPnP protocol for local in-house applications.

For further standardization we will use profiling for special applications like smart-energy profile and home automation profile. The devices can deliver the specific information for the application where they are used.

Doebelt Datenkommunikation work on an Ethernet-WIFI prototype device according to the standard IEEE 802.3 and IEEE 802.11 for power-controlling and power -management to act as an AIM EMD with the AIM-Protocol. It should be an easy to use AIM-EMD for existing power meter and appliances with power proportional pulses and offers opportunities for remote supervision and remote control functionalities. Furthermore it will support relay outputs for switch on/off appliances according to the requirements of the power supplier and the user. All information, including the power consumption values will be transferred via the UPnP AIM protocol through the DVE and the web service manager to an external independent web-server with an interface for standard users as well as power suppliers. To be flexible other communication protocols will also be implemented.

In this new product we will deeply consider the Power consumption. Based on new chips with optimized power saving modes we will develop new and modify existing software to use this features for power saving.

The usage of the results of the AIM project in the home environment is depending on the integration of the AIM protocol and EMD's into the appliances. Furthermore the availability of the DVE and the ability of the utilities to offer such services like highlighted in the AIM project.

Best way to implement AIM results will be to use it in concrete light house projects with appliance manufactures and utilities.

Implementing the research results of the AIM project into industrial products is strongly depended from the integration into the appliances. Furthermore we will focus on add-on EMD devices.

The complexity of a project like this with different appliances manufacturer and different kind of control make it difficult to implement all this features in a single product. Furthermore there are many rules and regulations as well as standards to consider. The price requirements by the costumer are also very strong. Production only in big quantities or for high value appliances is reasonable. Establishing a mass production in this fast going market is not easy for an SME in our scale.

3.1.8 INFINEON

During the execution time of the project Infineon carved out the WLC division in the new company Lantiq. Among others the WLC division contained the home networking (CPE) business. Hence all the further exploitation is done within the new company (see Section **Error! Reference source not found.**).

One minor activity was dropped after the carve-out: in the first DECT demonstrator provided by Sandor Plosz within his diploma thesis a hall sensor from the Infineon Automotive division was used for current measurement. After the carve-out the support of the Automotive division was not available any more, so that the sensor was replaced by a shunt resistor.

3.1.9 Power Plus Communications AG

Power Plus Communications AG (PPC) is a provider of IP based communication solutions for the utility industry. Besides this PPC is operating one of the worlds largest Broadband Powerline Communication (BPL) networks in the city of Mannheim for the provisioning of smart metering and smart grid services to the local utility MVV Energie AG.

The knowledge gained in the AIM project has a significant impact on the future design of our products and services. Since its foundation PPC is aiming to develop standardised solutions. We are deeply involved in different regulatory and standardisation bodies. The developed network architecture shows clearly the importance of open communication infrastructures and standardised interfaces - a concept PPC is following since its foundation. Today utilities in general are mainly concerned with compliance to the 2006/32/EC directive, its requirement for installation of smart meters and the implied need for a communication infrastructure as standardized by the Mandate M/441. AIM project results in general will be exploited by PPC by taking an advisory position for utilities on new smart grid technologies, applications and the interaction of smart grid and smart house.

Among the surveyed use cases, the:

- Use-case for power distribution network operators (metering service for energy planning) and
- Use-case for network operators (remote monitoring and management)

are playing a very important role in the further development of new services for our clients. The output of the project is helping us in adjusting our products and services in this field and to develop improved solutions, e.g. with energy procurement based on detailed load information from the customer households. The detailed and predictive information on energy consumption given by each AIM household is of great importance to utilities.

PPC sees also several more classes of devices which will benefit from integration into the smart grid. Examples are devices with large power consumption like heaters, air conditioning, pool pumps, etc. Another important type of devices which will definitely need management are recharge stations of battery-operated vehicles. Recharge stations require high currents for loading the car batteries in a short time which, if left unmanaged, would destabilize the power network. In a managed operation mode recharge stations offer several new possibilities. Car batteries will be recharged, when energy is plenty and plans for using car batteries for temporary energy storage are developed today. And as every household with an e-car will need the means to charge it the recharge station is part of the household and is managed via the smart house. Apart from the consumer devices also distributed generators like solar panels and micro-CHPs have to be integrated in the smart house. Information on self-generated energy is of value to a household and scheduling the energy consumption of a household so that it coincides with one's energy production not only reduces the load of the power grid but will also reduce energy costs.

Further possibilities of smart grids are not yet explored in depth and our knowledge from AIM is certainly of value to our customers. In new projects PPC is leveraging the AIM experiences. We are currently setting up different new smart grid projects in which we are also including the management and control of household appliances. This gives us the chance to double check the AIM results in real environment.

Besides this, PPC is exploiting the project results within its "usual" marketing activities: at fairs and conferences, especially in the field of smart metering and smart grid as well as in articles or white papers. The deepened relations with all project partners are a very good foundation for the collaboration for future projects.

3.1.10 Philips Electronics Nederland B.V.

Philips takes the sustainability impact of its products and is already considering very seriously results achieved in the AIM project for their implementation in consumer products in development. Thus, Philips already developed an EMD prototype with its particular purpose to manage energy consumption of audio-visual devices. The EMD prototype developed for energy management of TV and DVD device was already shown to public at High Level Event on ICT for Energy Efficiency,

Brussels on 19/20 March 2009. Furthermore, Philips is considering possibility to include overall AIM results within an appropriate standardisation contribution.

3.1.11 BlueChip Technologies SA

The role of BCT within AIM has been with the protocols implementing communication between EMD and the gateway and the low command interface of the residential gateway to the AIM services. This role has been in-line with the business orientation of the company, which mainly concerns sales of smart cards and home communication devices.

In these business fields BCT has from its setup times multimillion Euro contracts with almost all network operators in Greece (OTE, COSMOTE, WIND) and with the largest ones in the wider area of Balkans (Romania, Bulgaria, FYROM, Albania and Serbia).

Having consolidated its presence in the field of telecom products as an important reseller, through the AIM project BCT is planning sales enhancement through the addition of some added-value services coming from AIM, such as:

- Services pre-stored in the USIM application of smart cards, for the realisation of:
 - o Appliance control applications for mobile users.
 - o Remote monitoring of the household environment.
- High level protocols supplied as add-ons to the traded home networking products. Such protocols can be used in the realisation of special services, such as:
 - o Appliances control applications/services
 - o Energy saving applications/services

BCT has already put in operation the plan for exploiting the resulted sub-systems, by moving on with system deployment in real households. In addition to this step, BCT has already contacted several discussions with the Greek operators and results are encouraging for the deployment of first USIM applications to be procured by operators together with the smart cards that will enable users to get connected to their households through the operator gateway.

Moreover BCT is committed to further promoting AIM results and as a continuation of this first success will undertake a series of pilot sub-systems implementations on operator products with the aim to push forward its marketing policy for integrated product/added-value solution reselling.

3.1.12 LANTIQ Deutschland GmbH

At the start time of AIM Lantiq (respectively the preceding organisation WLC) had a complete solution for home communication, consisting of ADSL/VDSL access, home router, WLAN, cordless phone and fixed line phone. Within the run time of AIM the interest of Lantiq marketing organisation on home control applications was increasing and a product development request process was started. Considering the development cost of several million Euros for today's chips this process needs some time.

While the decision and the development process were ongoing an early demonstrator could be built thanks to the AIM project. This early demonstrator will allow Lantiq to gain experience and access possible customers ahead of time.

As physical layer technology for the early demonstrator we selected DECT technology, which was available at Lantiq. We developed a DECT controlled power outlet, which it fits to the AIM target of immediate energy saving means.

Power outlets which are remote controllable can be installed easily. We differentiate two cases:

- a) A separate box plugged into a power outlet; these boxes are already on the market today; not with DECT standard, but proprietary RF interface in the ISM band. Advantage of the separate box solution is that it can be deployed by everybody. Disadvantages are that the box is bulky and boxes can be interchanged, inhibiting a fixed assignment of box to appliance.
- b) A small form factor power outlet with integrated electronics could replace existing outlets (in-wall mounted). These must be installed by experienced persons, but this is feasible within an

existing household with low effort. Once installed each outlet can be associated with the place where it is located and the appliance connected to it.

Scenario a) was realised within AIM. It already shows the advantage of using DECT technology: instead of yet another remote control the available DECT handset can be used. For this purpose additional menu was added to the GUI of the handset. The EMD in this case is a modified base station realised with an evaluation board.

Scenario b) needs integrated electronics so that the plug fits in the wall cavity. Two-colour LED indicates the status of the plug: on, off, short circuit etc. The EMD functionality has moved into the power outlet. The residential gateway is an existing product enhanced by SW update from the manufacturer. DECT is replaced by the upgrade technology CAT-iq. It provides standardised transmission of IP packets over the air interface. Thanks to the standardised “D” message interface of AIM the power outlet can be purchased from another manufacturer, for example in a do-it-yourself market.

These two tasks are needed to achieve this business case:

- Construction of a Power outlet with integrated electronics, DECT and power control in small form factor. This can only be achieved together with a manufacturer of this type of equipment.
- The “D” interface of AIM must become a standard.

To achieve the first task a bi-lateral development project of Lantiq and a plug manufacturer is needed. Lantiq will approach several potential manufacturers using the AIM demonstrator to prove feasibility.

The second task is more difficult to achieve. After the termination of AIM the specification of the “D” interface will be public. However, it does not have yet the maturity of a standard. In particular not every possible command has been specified up to now. And there will be the need for more commands as remote power control is a new area where more and more message types will be needed.

One possible solution could be to upload the “D” interface messages on the AIM web site as a starting base for the “community”.

4 Conclusions

AIM project presents in this deliverable the dissemination activities carried on during the lifetime of the project and created project impact to the wide community. It can be concluded that the project website, developed and maintained during the project, includes all necessary and updated project information, including its results and collaborative work done with other projects and organisations which are also active in the related area. Moreover, the website statistics show a significant and continuously increasing number of visits.

AIM project consortium managed to publish seven peer-reviewed conference papers and one journal paper, whereas two additional journal papers are submitted. At European e-Enviro2009 conference, the AIM project received also the best paper award. Furthermore, AIM was invited to present its work and achievements at several events; among others ICT21EE conference at European Parliament I Strasbourg and at EU-China Science and Technology Week in Shanghai.

Accordingly, an overall conclusion can be made that AIM project successfully carried out various dissemination activities, and with it, created significant impact, even the project is a small-scale STREP activity. Furthermore, it can be concluded that the achieved results in the AIM project present also a significant potential for further innovation and creation of the related products and services. Accordingly, serious and promising exploitation plans have been created by the AIM consortium members.