Project Information

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

AIM project is developing a new information and communication technologies (ICT) architecture for modelling, virtualising and managing the energy consumption of home appliances, supporting Europe's Action Plan on Energy Efficiency of using the opportunities offered by ICT to achieve technology-driven energy efficiency gains.

The requirements defined for the architecture concern mainly usability aspects of power management functions, integration with the home network and service deployment. The two major challenges are (i) energy saving and (ii) architecture's long-term sustainability.

Main focus

The main focus of the project 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.

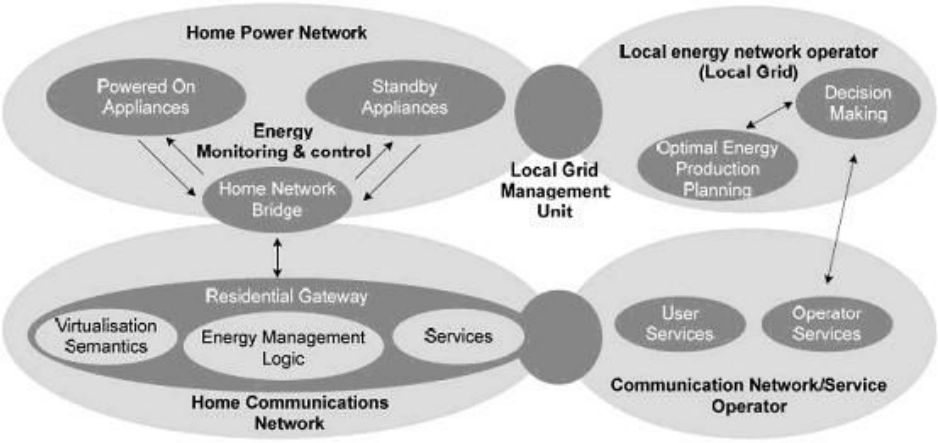
The project addresses three household "appliance" types:

- White goods (refrigerators, kitchens, washing machines, driers);
- Communication devices (cordless phones and gateways for domestic use);
- A/V (audiovisual) equipment (TV Sets and Set-top-boxes).

Approach

AIM adopts a generalised method for household appliances management, which is based on an accurate modelling of operational modes of appliances and the ability of the home network to switch on or off even some of their internal functions without limiting their control just to the active or stand-by states.

The apparatus that constitutes the local hub of the energy control system is called Energy Management Device (EMD) and is conceived as an independent functional entity that conveys control logic for both active and stand-by appliances and energy management functions integrated



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CEFRIEL, Italy

Döbelt Datenkommunikation, Germany

Eurescom GmbH, Germany

France Telecom, France

INDESIT, Italy

INFINEON, Germany

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

SEVENTH FRAMEWORK PROGRAMME

AIM comprises a periodic newsletter with the news and awareness of the project results, which can be downloaded at: http://www.ict-aim.eu/publications/newsletter.html

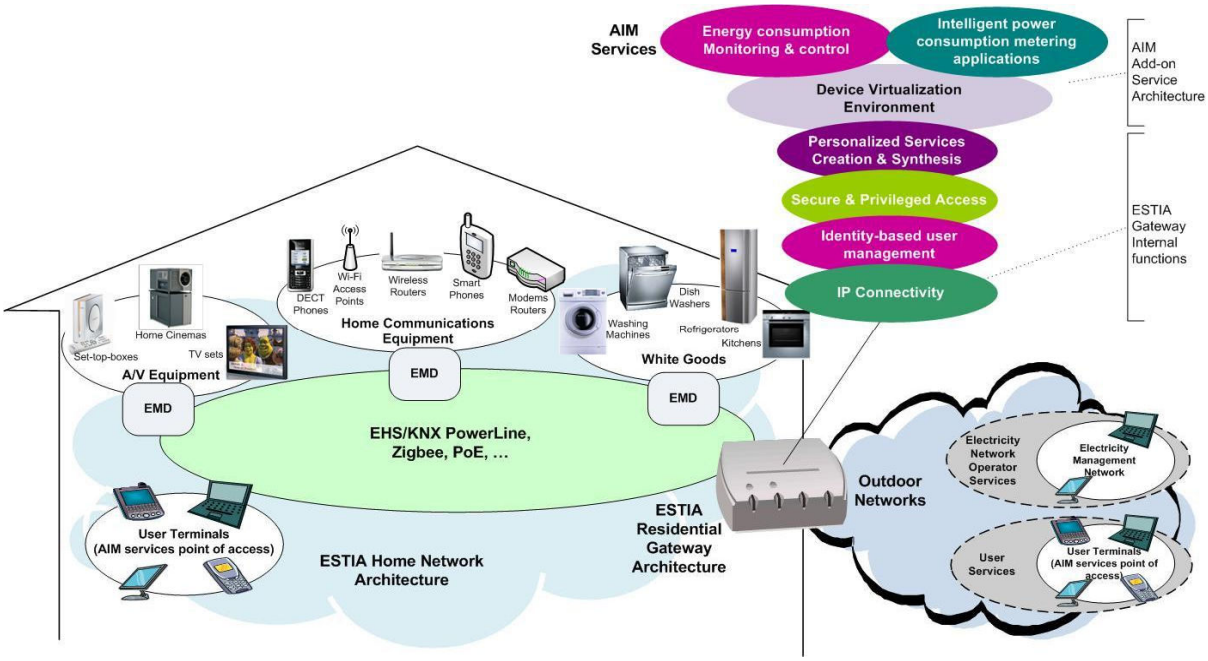
through a multimode of communication interfaces with the home network and the residential gateway, hosting the service logic.

The EMD is controlled by the residential gateway, using a bus interface that grants access to multiple EMDs from a single access-point, either locally or remotely via an operator network. The residential gateway selects and conduits information to the proper device interface, applies the necessary centralized control logic and enforces rigorous communication encryption.

Main objectives

In order to achieve its goals the project builds on consortium partners experience in the area as well as the results of past research projects, such as the ESTIA project on home media gateways and the COMANCHE project on service creation/execution environments and evolves along the following technological and scientific objectives:

- Design and implementation of an energy resources virtualisation environment and appropriate semantics to be used for building energy management applications
- Designation and implementation of a methodology addressing energy management of active as well as stand-by appliances
- Design and implementation of energy management applications targeting the usability requirements of three (3) user-groups: power distribution network operators, residential users and communication network operators
- Enhancement of the ESTIA gateway architecture from a simple communication equipment to an energy-aware management system, with the addition of logic for autonomous energy consumption monitoring and control
- Evaluation of the AIM architecture through the involvement of real users



- Design and implementation of logic for managing the energy consumption of home appliance intelligently, beyond the simple ON/OFF model
- Design and implementation of a generic method for measuring energy consumption of appliances at home
- Interfacing to the home network the energy consumption values of three household appliance types
- Validation of the functionality of the AIM architecture through a number of evaluation experiments involving applications for three (3) use-cases: Users of the first category will be invited to use the AIM appliances and the platform, all installed in a virtual household environment that will be provided by France Telecom
- Evaluation, through the installation of the AIM appliances and platform in real households, of the efficiency of the AIM architecture to reduce energy waste in households

Impact

AIM is contibuting to standardisation bodies, such as ITU, being directly involved in ITU-T Focus group on ICTs and Climate change.

Network operators may use the interfaces of the residential gateway to implement services for mobile and fixed terminals featuring remote energy monitoring and control of the home environment.

Power distribution network operators have particular interest to monitor the energy consumed by large blocks of users on macroscopic level. Accessing households through such a system is an efficient and cost effective way of accomplishing such task.

Home users may control their environment through the service interface of the gateway that is able to get connected with any type of home terminal, like e.g. wireless PDA, embedded devices, etc. Moreover, the system is able to collect additional information from the environment through a sensor network and create user profiles in order to perform a partially automatic configuration of the energy management policies. Home terminals distribute commands to the appropriate appliance via the EMD, thus affecting their energy consumption attributes.