



CA103 | Energy-efficient home networks [HERTZ]

PROJECT CONTRIBUTES TO

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|-----------------------------------|---|
| Communication | ✓ |
| Healthcare | |
| Energy saving | ✓ |
| Design technology | ✓ |
| Process development | |
| More than Moore | |
| Transport and safety | |
| Secure society | ✓ |
| Digital content and entertainment | ✓ |
| Sensors and actuators | ✓ |
| Manufacturing science | |
| More Moore | |
| Technology node | |

HIGH QUALITY, HIGH SPEED USER-CENTRED COMMUNICATIONS SYSTEMS

Partners:

Dialog
Infineon Technologies
Iquadrat
Philips
Quintor

Project leader:

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Key project dates:

Start: October 2009
End: September 2012

Countries involved:

Austria
The Netherlands
Spain

Energy efficiency is a major concern while maintaining a pleasant comfort level, particularly in the home. The objective of the HERTZ project is to enable domestic equipment to share information and behave in a more energy-efficient way. This will involve development of a wireless network infrastructure facilitating connectivity between sensors and equipment throughout the home. An essential feature will be inbuilt intelligence to run certain energy-saving programmes independently, without any conscious act triggered by the user. This approach will exploit pre-defined scenarios or self-programmable or self-learning user profiles. The resulting equipment will meet worldwide needs for ambient living.

A substantial amount of energy is wasted in the home by equipment that does not have the intelligence to know when it is not needed.

Two basic examples are: lights left on while the illuminated area is unoccupied or a television set always in stand-by mode when it is not actually in use.

To avoid these issues, a communications infrastructure is needed to obtain information from different sensors to provide equipment with the data required to perform in a more energy-efficient manner. The CATRENE CA103 HERTZ project is developing such an infrastructure which will be easy to install as it requires no new wiring, is easy to maintain as frequent battery changes are unnecessary and is interoperable across heating, domestic appliances, consumer electronics and lighting systems.

New approach to wireless

A wireless network is the obvious infrastructure for this but state-of-the-art wireless network technologies are not especially energy efficient and are, therefore, not easy to justify in home energy-control systems. Wireless network access is currently only available at the cost of relatively high energy consumption and that is still quite difficult to overcome.

HERTZ aims at developing a design and technology platform for an energy-efficient wireless home net-

work. At the same time, the widespread use of wireless networks for a variety of applications requires transparency and smooth integration of different protocols on both sides of the residential gateway. This applies to all networks in the home – Wi-Fi, Bluetooth and ZigBee – as well as outside the home over the Internet or other access network. Increasing penetration of the access network into the home network will open up new markets for content and service providers.

Key elements include use of state-of-the-art components such as ultra low power sensors and reliable presence sensors, ultra low power networks, integration of heterogeneous networks, control of energy-consuming equipment and sufficient intelligence to enable certain energy-saving programs to run independently and automatically.

The resulting network will facilitate the next step in energy efficiency at home by controlling heating, lighting and other energy-consuming devices. HERTZ will develop a demonstrator with an access point for integrated control over both the lighting system and domestic appliances. The router will support the installation and downloading of control algorithms, user-interface applications and network drivers. The network technology developed will allow for the creation of wireless sensors and switches able to operate for years without external power or the need to change batteries.



Power-efficient house

A prerequisite for an energy-efficient house is independent action – for example, it will reduce the ambient temperature and switch off all unused devices when occupants leave the premises. This leads to the necessity to store user or scenario profiles. A profile store will be developed to accommodate different lighting arrangements such as dimming the room lights while watching TV.

The key factor for automatic energy savings in the home environment is that the required domestic energy reductions can only be achieved by making use of wireless technologies. The number of networking clients in the home is growing exponentially and will continue to increase for the foreseeable future.

At this stage, the market potential for home control is enormous as lack of standardisation in this area means that power-efficient home-control networks are not yet available. HERTZ will develop the hardware platform for a power-efficient house and provide open interfaces to allow commercial companies as well as European co-operative projects, such as AIM, to test their middleware and firmware.

New application potential

Major aspects of the HERTZ home-control network will include:

- Use of a powerful home-control centre such as a domestic gateway designed to be energy-efficient in combination with relevant room sensors;
- Storage and use of user and scenario profiles in the gateway;
- An Internet connection to allow remote home-control and service by the user or content providers;

- A reliable room-to-room backbone network using wireless local area networks; and
- A power-efficient home network to control all in-house clients and share information between those clients.

The CATRENE project will explore and develop a wireless design and technology platform for 'ambient living' in different application areas. This will effectively constitute a European ecosystem for the development of a smart lighting system, home automation and consumer lifestyle devices, including access-point technologies to allow for an energy-efficient home.

The main technical challenge lies in creating a reliable wireless network that is energy-efficient enough to support many years of battery life. Such a network involves: low-power signal processing and wireless chips; control standards optimised for reliable low-power use; and high-capacity batteries. Tackling these technical challenges in parallel will open the doors to a whole new range of applications.

To secure the home network, HERTZ will rely on the CATRENE OMEGA project, which employs end-to-end encryption using an automatic distribution process of key pairs. End-to-end encryption was chosen by OMEGA for enhanced security and also to minimise energy consumption, as every encryption process adds significant power consumption. However, outdated encryption processes are still in place. In HERTZ, chip and equipment manufacturers will make sure that obsolete encryption processes are disabled/bypassed for real energy savings.

HERTZ will interact with the APPSGATE project in the development of the flexible router applications.

Boosting European leadership

The EU is actively addressing the development of a sustainable integrated European climate and energy policy as a top priority. The European Commission has also acknowledged the usefulness of information and computer technology (ICT) in reducing energy intensity and increasing the energy efficiency of the economy.

Such a European spirit for efficient use of resources can lead to advantages in worldwide competition for European ICT companies. Strong competition can be expected from the USA and China which will aggressively target the ambient-living market. Standardisation projects, such as AIM, together with the open hardware platform from HERTZ should establish European leadership in this crucial sector.



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CATRENE ($\Sigma!$ 4140), the EUREKA Cluster for Application and Technology Research in Europe on NanoElectronics, will bring about technological leadership for a competitive European information and communications technology industry.

CATRENE focuses on delivering nano-/microelectronic solutions that respond to the needs of society at large, improving the economic prosperity of Europe and reinforcing the ability of its industry to be at the forefront of the global competition.

