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Research results of the pinta project

Project summary

Project title:	ρinta – Pervasive Energy via Internet-Based
Telecommunications Services

BMWi code:	01ME11028

Term:	01/06/2011 to 31/03/2014

Consortium:	E.ON Mitte AG

Fraunhofer IWES

Siemens AG

University of Kassel

IdE

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Research topics

The Pinta project has three main areas in terms of reducing energy consumption in the office through automated disabling of components that are not needed:

- Automatic, on-demand control of ICT, light and heating in the workplace (integrated linking of IT and building services engineering for lighting, heating, cooling)

- Linking of various context sources and sensors for detecting the presence of a user (smartphones, Bluetooth transmitters, motion detectors, etc.)

- Development of different user profiles (e.g. standard user, 8 AM to 5 PM in the office, absent 30% of the time)

- Integrated control through implementation of a software environment that is extensible and open (OGEMA)

- Engineering in regard to installation and operation

Presence and energy consumption determination

The actual presence of the users (groups) is necessary in order to assess the added value of such a system.

- On average, users are not at their workplace during 27% of working time (during this time energy can be saved)

- This varies by the agreed working time and position (a part-time worker tends to be at their workplace for longer, as certain breaks are omitted; a secretary has fewer meetings outside the office as a project manager)

- Logging of presence is carried out by smartphone and at the same time by manual logoff on the PC for a redundant solution

Context-intensive detection of presence

Functional robust context detection is the most important prerequisite for automatic control:

- Good results with Bluetooth and PIR sensors

- WLAN and mobile wireless proved to be susceptible to interference in certain environments

- The additional power requirements of the location detection is in the overall energy balance

Energy optimisation by presence detection

In the absence of the user, the PC, monitor and printer are put into soft-off mode. The following energy savings were achieved here:

- Computer: up to 41 W

- Monitor: up to 19 W

- Printer: up to 14 W (only in the absence of the entire group)

Additional large savings potential is provided by the infrastructure of the office building (based on a standard user):

- Light: up to 12.8 kWh/(m²a)

- Heating: up to 6.5 kWh/(m²/a)

The control system itself has a capacity of about 9.76 W, that is, about 85.5 kWh consumption per year

Control of load-adaptive operation

Development based on OGEMA:

- System-spanning automated detection and control of the state of the systems is enabled (connection of sensors and actuators)

- In addition to the known sensors for detecting presence (motion detectors, Bluetooth, Smartphone/WLAN), there are also sensors used for monitoring status

- Especially in the area of lighting and heating, these are based on EnOcean technology

- Development of building hierarchies down to the user enable both individual and group control

- Control is by heat controllers and switches (light), wake-on-LAN (PCs)

Calculation of potential savings

A variety of scenarios were calculated for savings in ICT:

- Users with minimal savings: 6–9%

- Users with average savings: 22–25%

- Users with maximal savings: 37–41%

However, the degree of savings depends on which basic PC equipment is available and what energy-saving measures have been taken so far

- An optimized PC system increases savings by 4 to 29 percentage points.

- With the addition of heating and lighting, there is a savings potential of approx. 23–26% (with optimized PCs, about 2 percentage points less), that is, up to 1000 kWh per year in an office with three occupants.

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Making use of the results

In the short term:

- Development of the pinta demonstrator & standardisations
- Energy efficiency services / consulting services for municipalities
- Involvement of other context sources
- OGEMA 2.0 Workshops and tutorials for industry working group

In the medium term:

- "Kismet Drone" / SSID detection
- Other scheduling systems, such as Outlook, Google Calendar, etc.
- Development of the data privacy concept
- Control of air conditioning (building and home automation)
- Predictive context recognition
- User interfaces on smartphones and product-related prototype for control of ICT devices through context sensitivity (with PhoneTec)

Patents and publications

- Patent registration and other publications in 2012: "Intelligent workplace" (Susana Alcalde, Cornel Klein, Jelena Mitic, Jürgen Reichmann)

- 7 national and international scientific publications