PERCCOM
asmus mundus

LUT
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University of Technology

2016 Code Camp on Home Automation

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Introduction

Code Camp on Platform Based Application Development

The idea of this code camp is to have sustainability through home automation

Introducing technologies of home automation (e.g. FS20, HomeMatic)

Setting scenarios based on available technologies

Scenario

Smart Office

- Automation of office environment
- Automation based on scheduling
- Reduction of energy consumption and modification of human behavior
- Educate employees to maintain good working behaviors

About our Scenario

From 07:00 : Starting the heating. Enabling power for lighting and office equipment

From 19:00 : Lowering the temperature from 20 to 18 °C. Continuously monitoring movement inside office space. Shutting down the lighting and heating when no movement have been detected for half an hour. Notify the end user by email of the shutdown times and how much extra energy they spent.

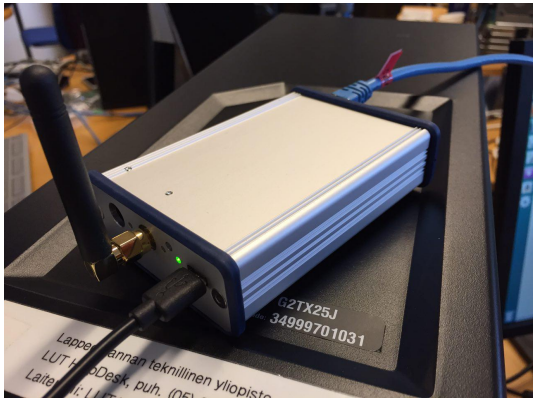
About our Scenario (2)

At midnight: Checking for open windows and notifying by e-mail in case windows were left open.

On the weekend and holidays : Shutting down heating and lighting.

Equipment used

- Radio3 linux server
- Thermostat FHT 80b
- Motion sensor FS20
- Door/window sensor FHT80



Benefits

- Reduce energy consumption/cost of heat and electrical systems during down-time
- Reduce security risks and decrease heating costs by ensuring windows remain closed
- Influence/teach employees to effects of their actions (bonus/penalty for keeping windows closed/opened)

Calculated savings (electric)

Per employee:

- 55 W light
- 14 W screen
- 85 W computer

Total: 154 W, Per 12h: 1824 Wh possibly saved nighttime per employee

In price: 0.167 euros per employee per day (Finland EUR 0.0915 per kWh)
In CO_2: 0.4112 kgCO_2 per day (Finland, 0.2254 kgCO2 per kWh)

Yearly 60.955 euros, 150.088 kgCO_2 per year per employee

Calculated savings (heating)

Using setback during nights for thermostats savings can be up to 10~15% (D. Quentzel, ASHRAE J), and with using certain classifiers of temperature and comfort reductions up to 20% could be found (Hamdi M., IEEE).

1.23 euros per per square foot (National Grid), mean 890 square feet per employee (US EIA), total 1094.7 euros per employee per year without savings

Possible savings of 109 to 219 euros per year per employee (estimate)

170 to 280 euros saved per year per employee with our solution

Demo

Technology

EnOcean

EnOcean GmbH

Energy harvesting wireless technology

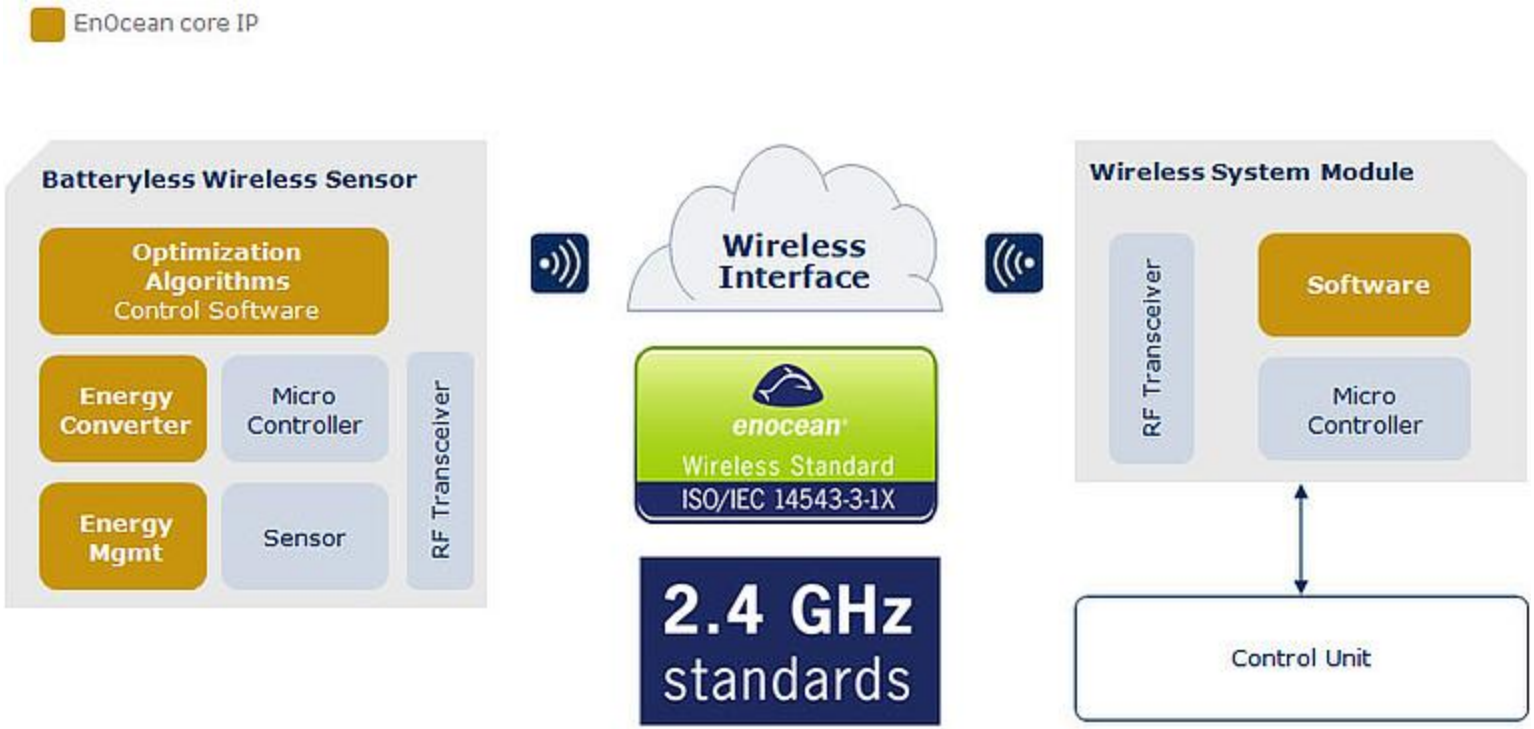
“No batteries”

ISO/IEC 14543-3-10

Operation

- Uses the 868 MHz, 902 MHz and 928 MHz frequency bands (worldwide)
- Telegrams are 1 ms in duration and transmitted at a rate of 125 kbps
- Telegram is repeated twice in the space of 40 ms (eliminate tx errors)
- Data packets are transmitted at random interval (small collisions)
- Range is about 300 m in the free field and up to 30 m inside buildings
- Unique 32-bit identification number (overlap with other wireless swithces)
- Enhanced data security features
- RF energy is only transmitted for the 1's of the binary data

Operation cont.



Benefits

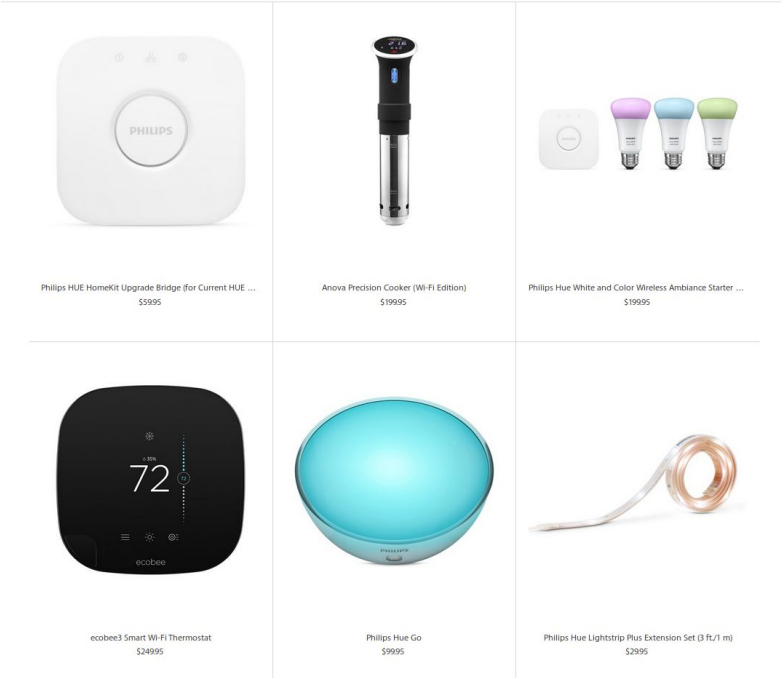
- Reduce planning and installation costs
- Maintenance-free for > 20 years
- Equivalent functionality as wired devices
- Flexible positioning and updating
- Reliable, long range communication
- No hazardous waste disposal
- Worldwide use
- No wires or batteries

Conclusion

Our system not only saves energy but also reduces environment pollution.

Along with using office automation to have sustainability in our working environment it is also important to consider human behavior and their impact.

Technologies of home automation should be more user friendly and affordable.



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