EUROPEAN
COMMISSION

Community research

Peces

Pervasive computing in embedded systems

SEVENTH FRAMEWORK
PROGRAMME

ETRA I+D
UNIVERSITY OF BONN
FRAUNHOFER
FRONTENDART
UNIVERSITY OF NEWCASTLE
NATIONAL UNIVERSITY OF IRELAND
UNIVERSITY OF DUISBURG-ESSEN

UBICOMM 2011

Lisbon (Portugal)

Agenda

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10:30 – 11:00 **Welcome and Introduction to PECES** (P. Rodriguez, ETRA R+D, Spain)

11:00 – 11:45 **Smart Space Application Building Blocks** (M. Handte, University of Duisburg-Essen, Germany)

11:45 – 12:15 **Tools for Development of Co-operative Smart Spaces** (K. Selvarajah, Newcastle University, UK)

13:45 - 14:45 **TUTORIAL: How to create a smart space using PECES development tools** (A. Zambrano, ETRA R+D, Spain)

14:45 – 15:30 **PECES Application Demonstrations** (A. Zambrano, ETRA R+D, Spain)

15:45 – 16:10 **The CONET Project (**P. Marron**,** University of Duisburg-Essen, Germany)

16:10 – 16:35 **The PLANET Project** (P. Marron**,** University of Duisburg-Essen, Germany)

16:35 – 17:00 **The AGILE Project** (P. Rodriguez, ETRA R+D, Spain)

17:00 – 17.25 **Passive vs Active Measurement: the role of smart sensors** (Z. Rak, FrontEndArt, Hungary)

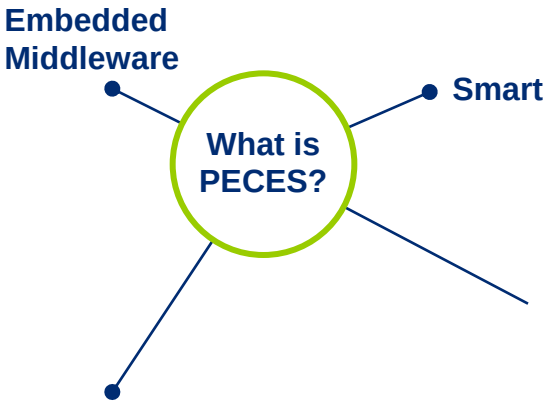
Registration: Please visit http://www.iaria.org/conferences2011/ProgramUBICOMM11.html

PECES Project Information: Please visit http://www.ict-peces.eu

Overview

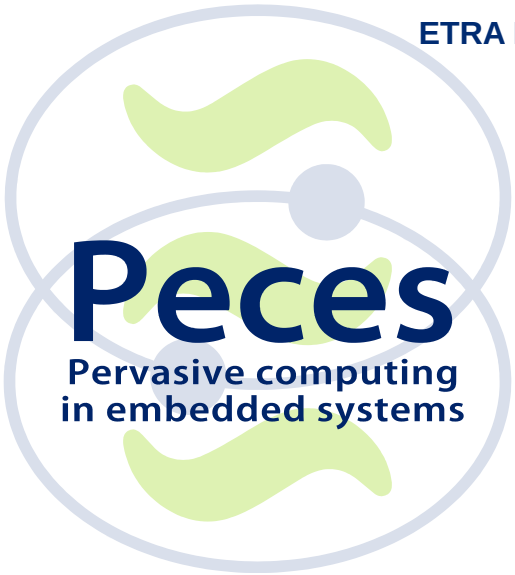
- Introduction
- Motivation
- Research Challenges
- Objectives
- Implementation
- Innovations

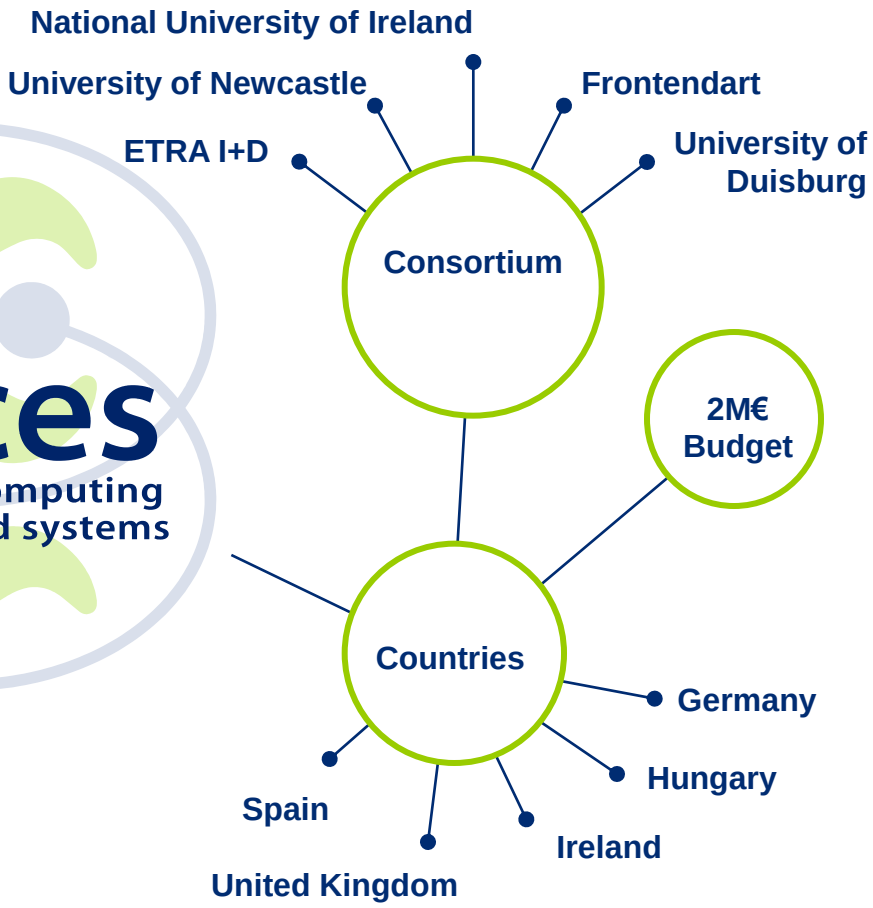
Introduction



Strategic Goal

PECES will develop an innovative comprehensive software layer that enables the seamless cooperation of embedded devices across various smart spaces on a global scale in a context-dependent, secure and trustworthy manner .





Motivation

Dramatic growth of the amount of information available through computer systems and increasing need to access relevant information anywhere at any time

PROBLEM: current systems aim at providing transparent access to all available information

PROBLEM: users are accessing information on-the-move

Pervasive Computing aims at solving these problems by providing **seamless and distraction-free support for user tasks with devices that are invisibly embedded into the environment**

Motivation (II)

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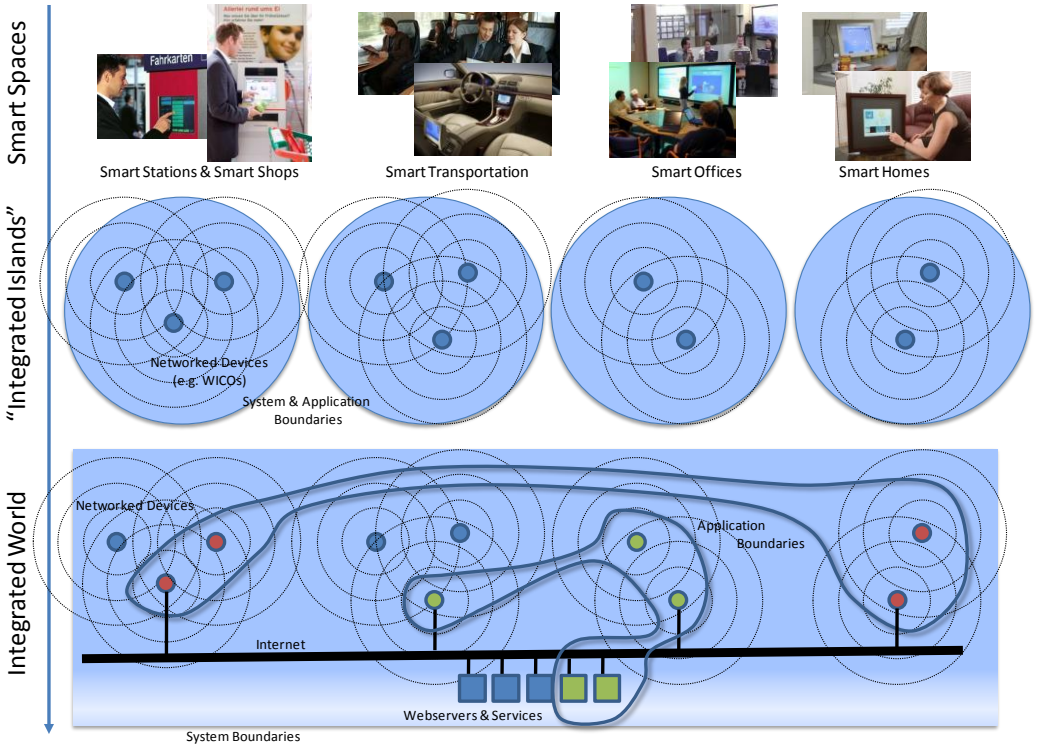
In addition, not only focus on a single smart space, but on one system that exposes a single and unifying image to its human users

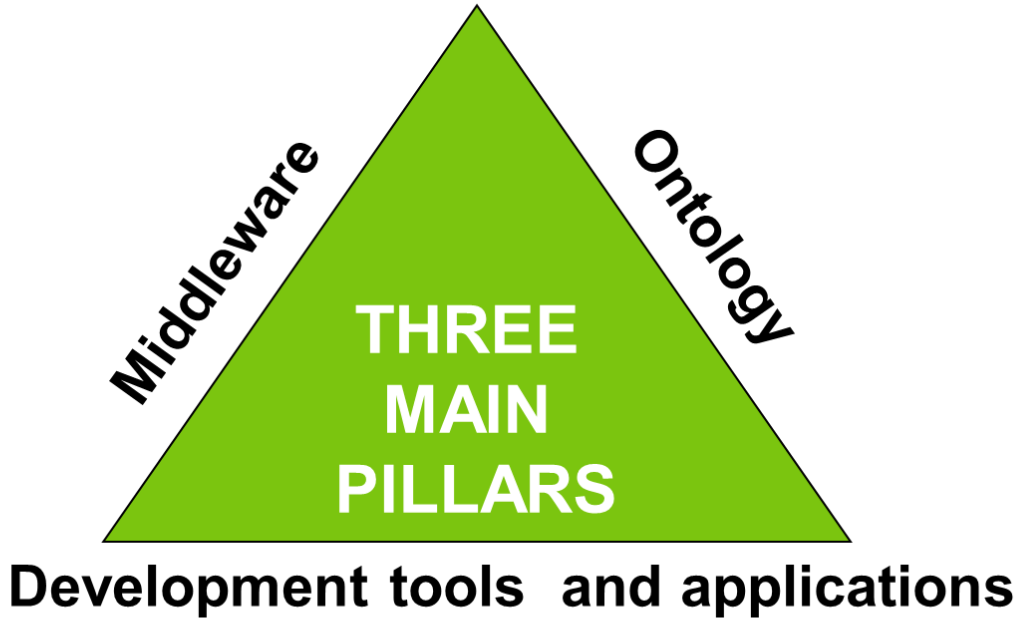


Research challenges

- Design of efficient, adaptive and interoperable communication mechanisms,
- Development of new coordination mechanisms to enable the automated formation of dynamic groups of cooperative devices that are secure and trustworthy,
- Definition of an adequate ontology to model device capabilities and resources in an extensible way that can support the ongoing evolution of technology,
- Design of mechanisms to capture the state of a physical environment, to provide this state in a meaningful way to applications, and to reason about causes and effects of changes,
- Development of operating and middleware systems that provide efficient and secure runtime support for applications that are executed in a massively distributed environment,
- Design of new, and the adaptation of existing development tools to improve the cost-effectiveness of the application development process,
- Development of new human computer interaction techniques to support the intuitive interaction with invisible embedded computer systems.

Our goal

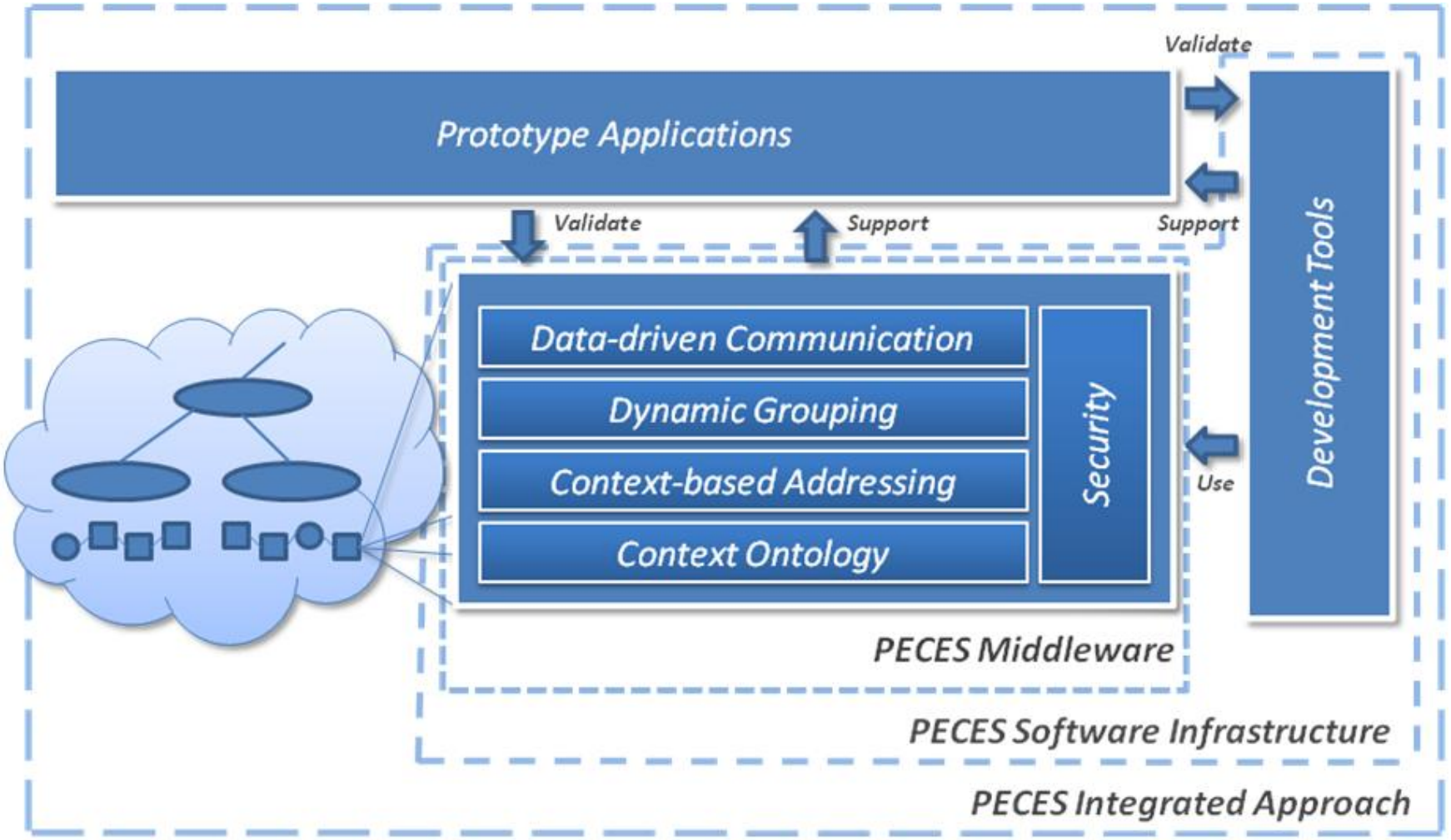
PECES will develop an innovative comprehensive software layer that enables the seamless cooperation of embedded devices across various smart spaces on a global scale in a context-dependent, secure and trustworthy manner.



Objectives, in details

1. Development of a flexible ontology to capture the context of cooperating objects and to specify groups of cooperating objects in an abstract manner.
2. Development of a middleware – i.e. a set of application-independent services that enable the dynamic and context-aware formation of a secure execution environment from a set of cooperating objects. This will encompass:
    a. an addressing and grouping scheme with associated gateway concepts to enable the interaction of cooperating objects between smart spaces,
    b. a distributed registry for cooperating objects that enables the dynamic formation of an environment on the basis of application requirements and
    c. associated concepts and protocols to ensure that environments can be formed in a secure manner and that the data-oriented communication between cooperating objects is secure.
3. Development of a set of application development tools that simplify the formation of groups and the description of the context of cooperating objects.
4. Validation of the abstractions using lab tests and prototype applications.

Implementation



Innovations

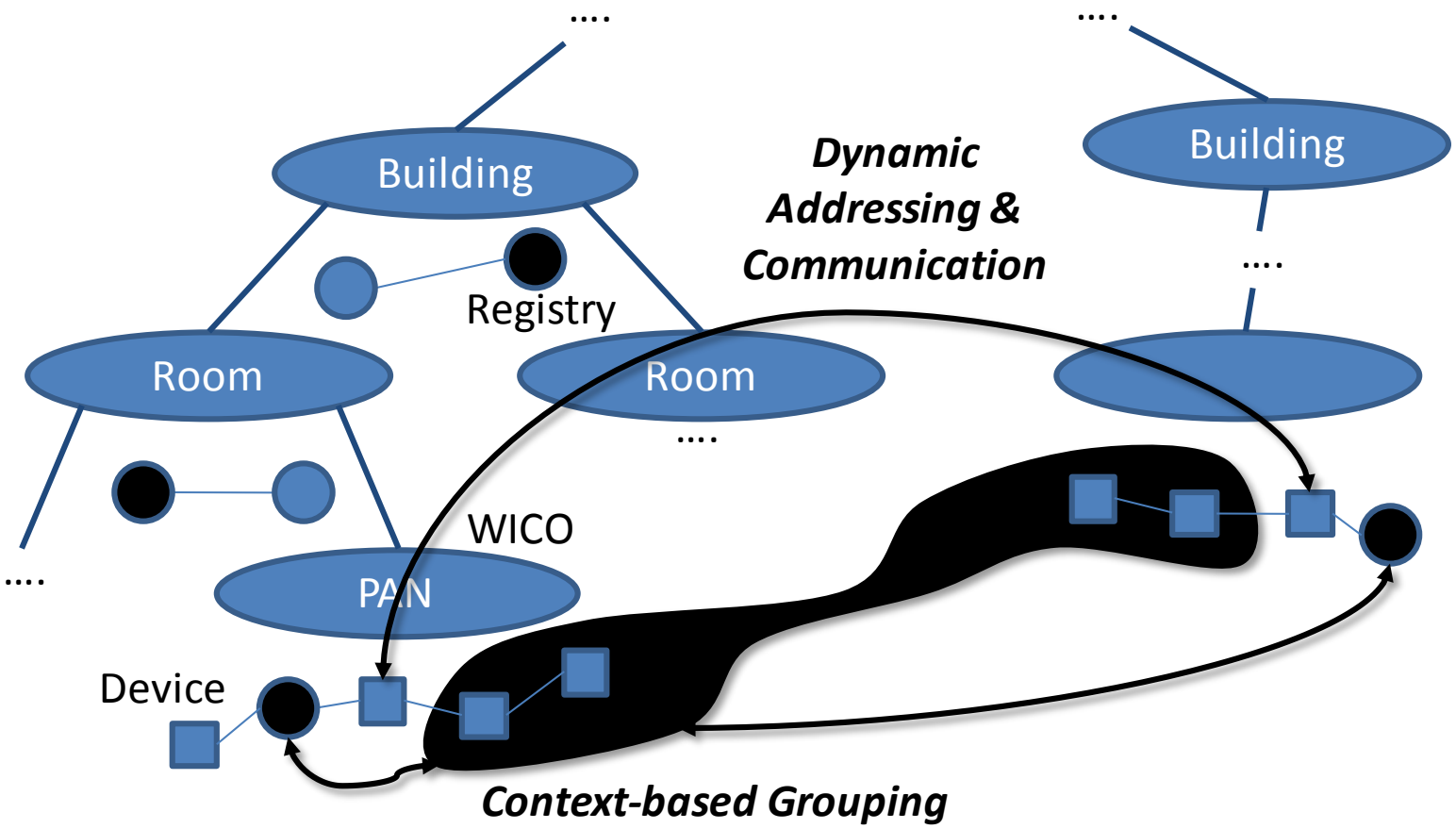
1. Ontology
   - a common vocabulary for disparate processes
   - machine-interpretable definitions of basic concepts
   - machine-interpretable definitions of relations between concepts
   - terms to span application domains
   - expression of application requirements
   - enable discovery of available applications
   - support dynamic incorporation of previously unknown devices into network

Innovations (II)

2. Middleware

- Flexible addressing scheme to integrate devices across different smart spaces
- Content-based communication across WICOs in different smart spaces
- Dynamic formation of WICOs based on context information and application requirements
- Key distribution concept and mechanisms to secure communication within and between different WICOs
- Configurable encryption mechanisms integrated into communication
- Access control concept and mechanisms to limit information sharing in and between WICOs

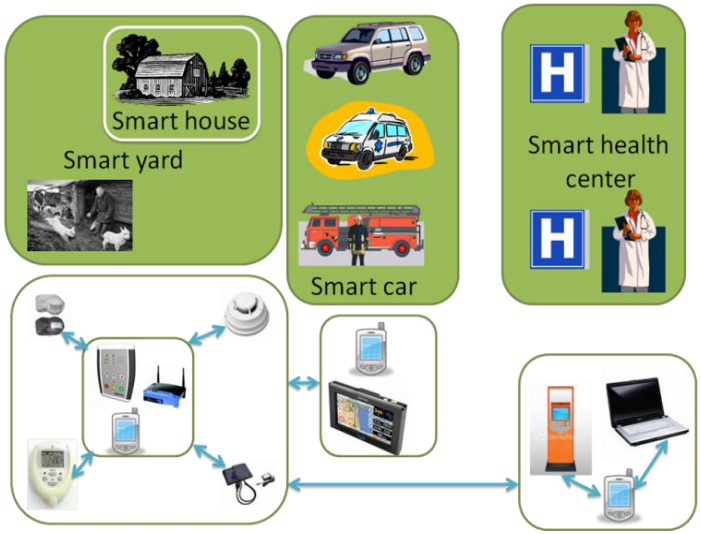
Innovations (III)

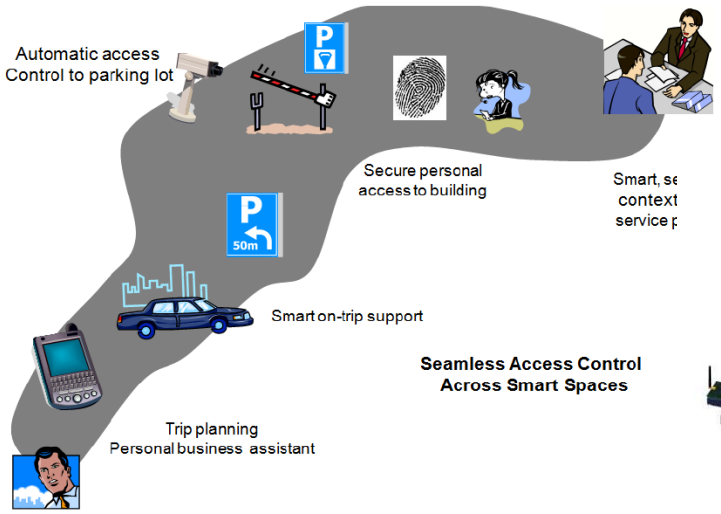


Applications

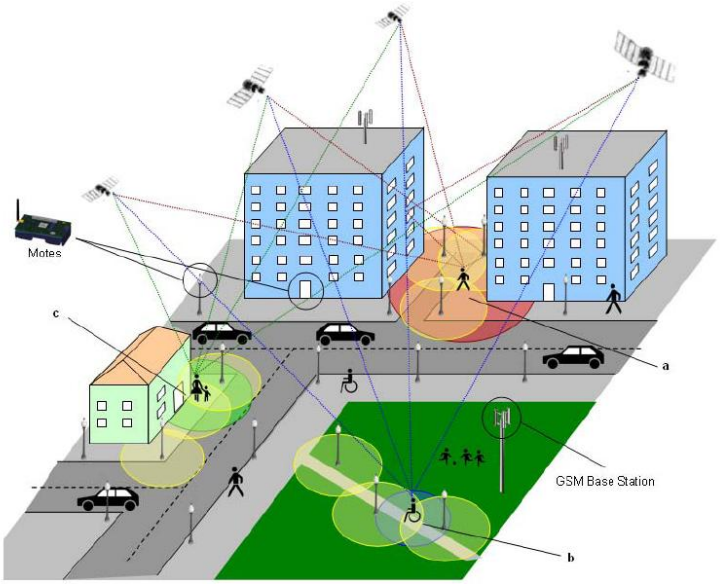
Development tools and Applications

- Smart Access Services
- E-health Nursing Care Services
- Trade Show Guide System

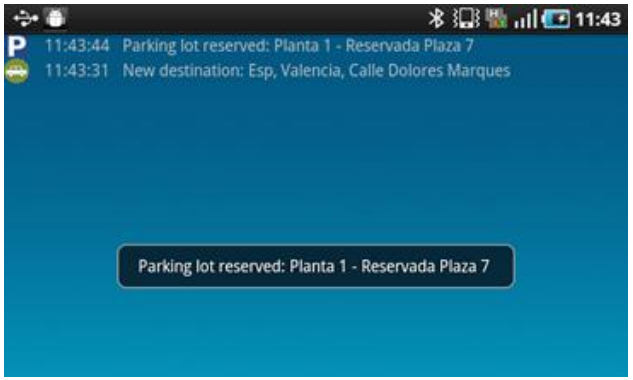


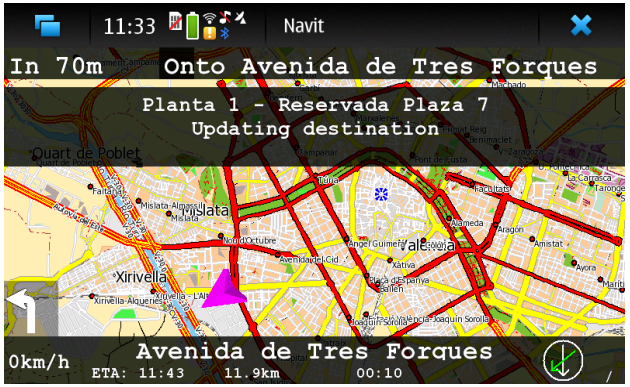


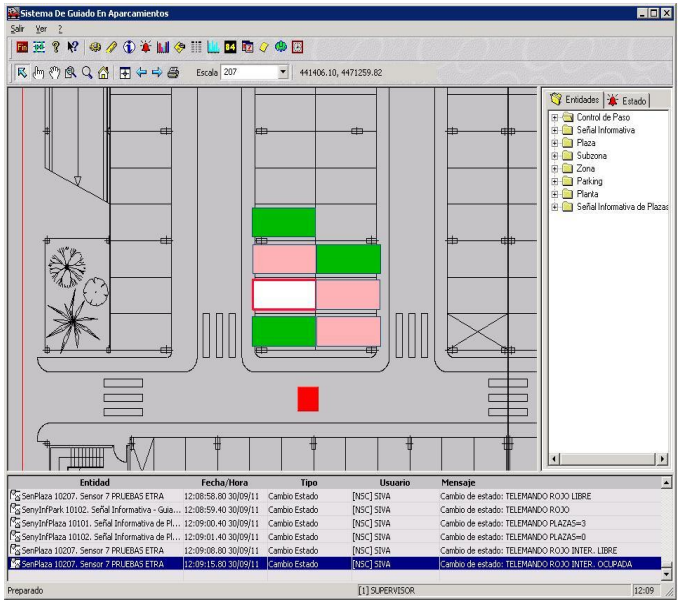
Seamless Access Control Across Smart Spaces

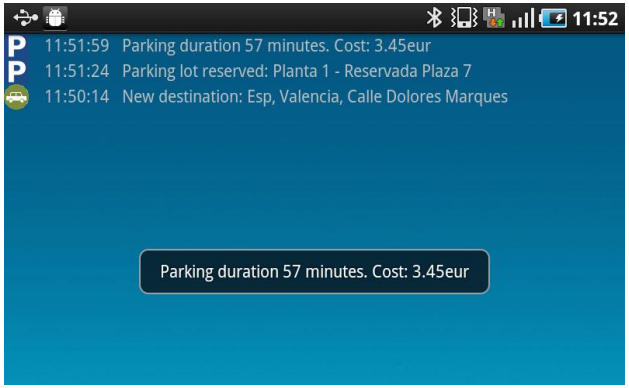


Smart Access Control

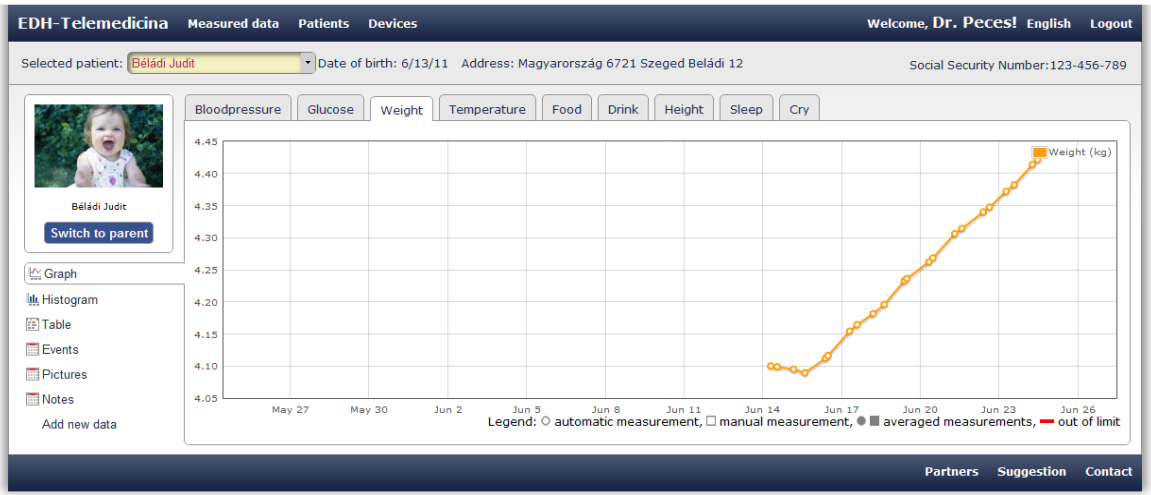








eHealth Nurse Care Service



Trade Show Guide Service

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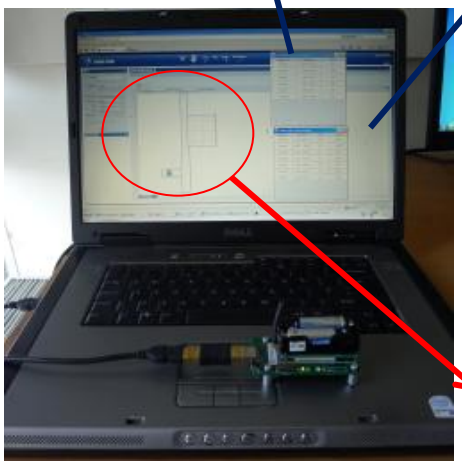
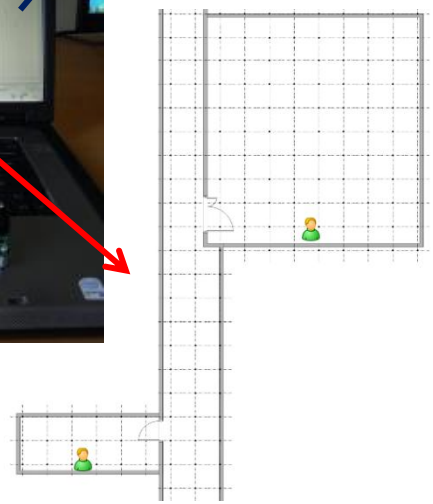
Microphone Sensor Reading

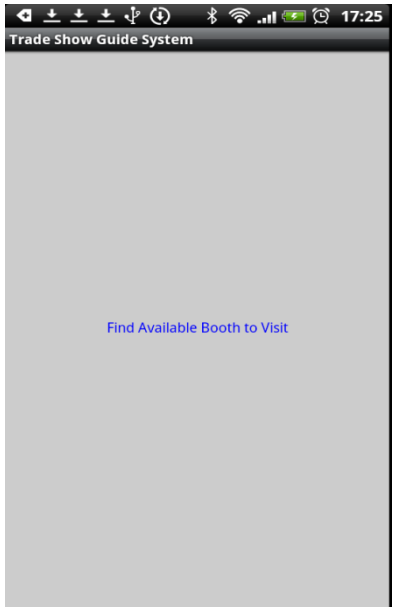
Booth ID	Location	Mic
Booth8	(1347, 800)	461
Booth7	(950, 800)	464
Booth2	(685, 2015)	486
Booth3	(685, 2400)	464
Booth1	(180, 2200)	489
Booth4	(950, 1550)	899
Booth5	(1347, 1550)	463

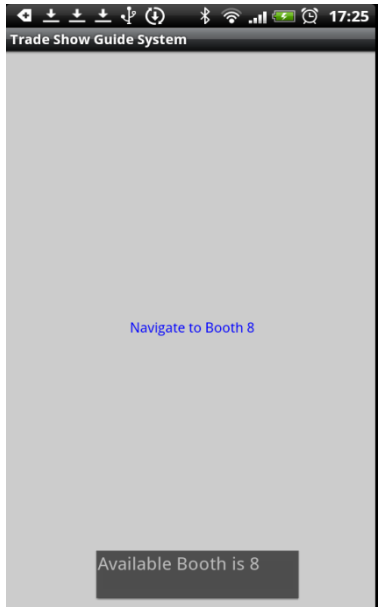
Visitors joined with BoothNavigation Smart Space

Visitors	Device ID	Location
Visitor2	7d82fdbd7da3b15f3f7a4f75ac1a5fc521aa5666	(196,2303)
Visitor1	cbf4eac1d9f133c0ddcac4e0dbedbc39ed3f4804	(1084,1373)









Any Question?

- Thanks

- For more information:
  - www.ict-peces.eu