



EUROPEAN  
COMMISSION

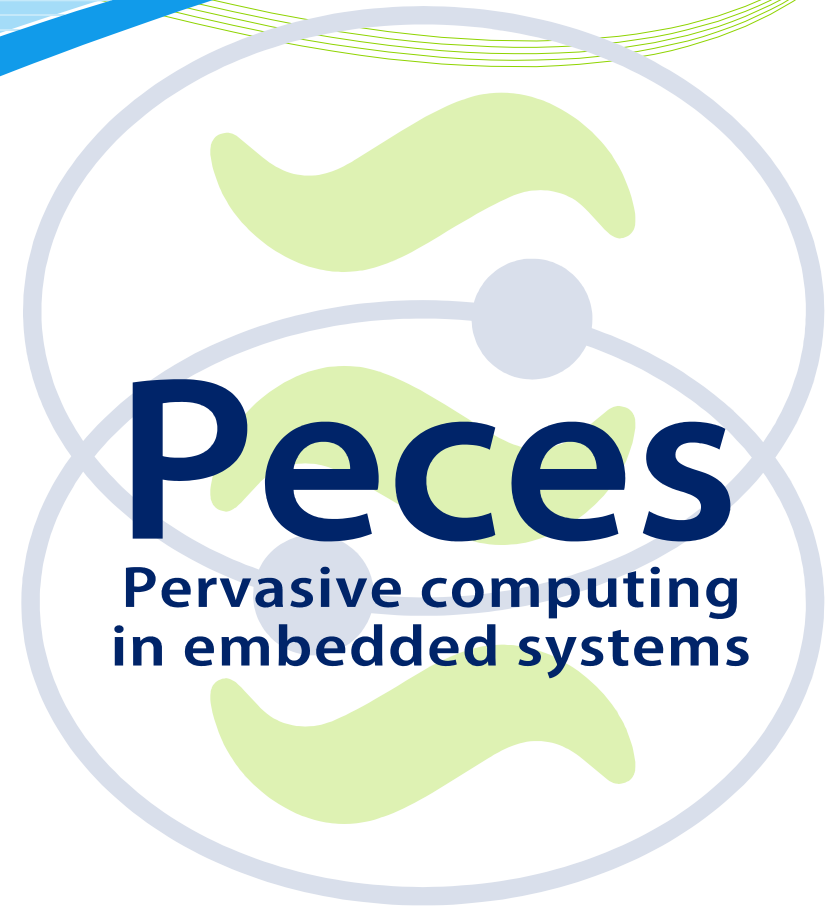
Community research

# Development tools training session



SEVENTH FRAMEWORK  
PROGRAMME

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



**Peces**  
Pervasive computing  
in embedded systems

**Contract:**  
**FP7- 224342-ICT-2007-2**



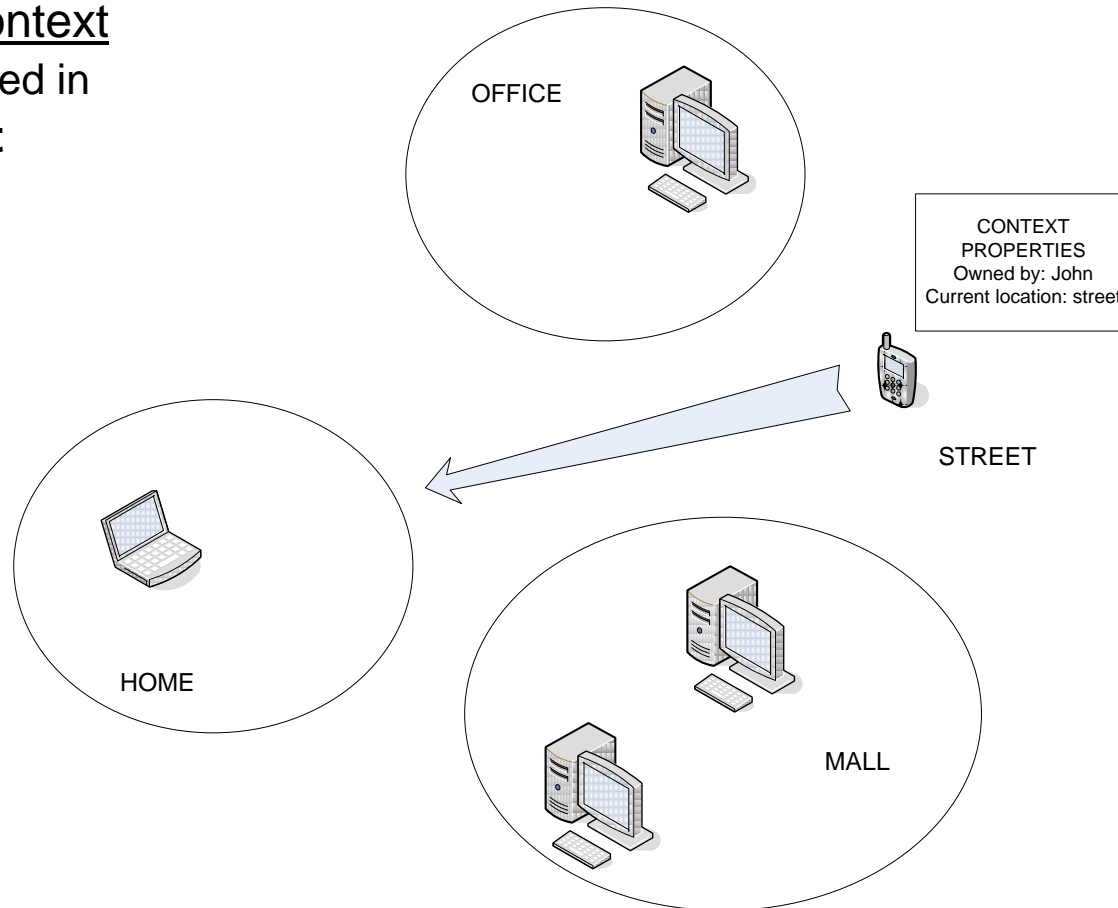
## PECES Middleware

**A comprehensive software layer enabling the seamless cooperation of embedded devices across various smart spaces on a global scale in a context-dependent, secure and trustworthy manner**



## PECES operation

Devices have context properties, defined in terms of **context ontologies**





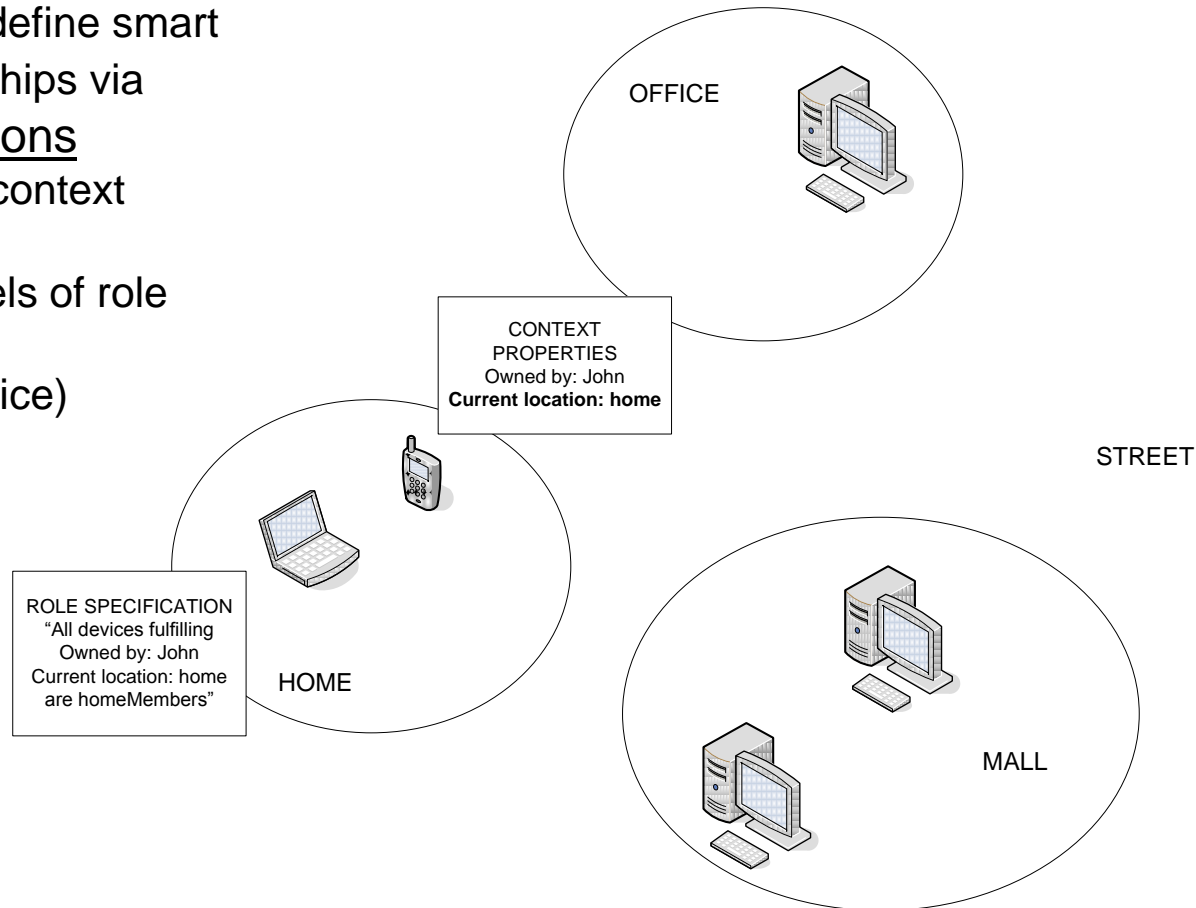
# PECES operation

Coordinators define smart space memberships via role specifications

(constraints on context properties)

There are 3 levels of role specifications:

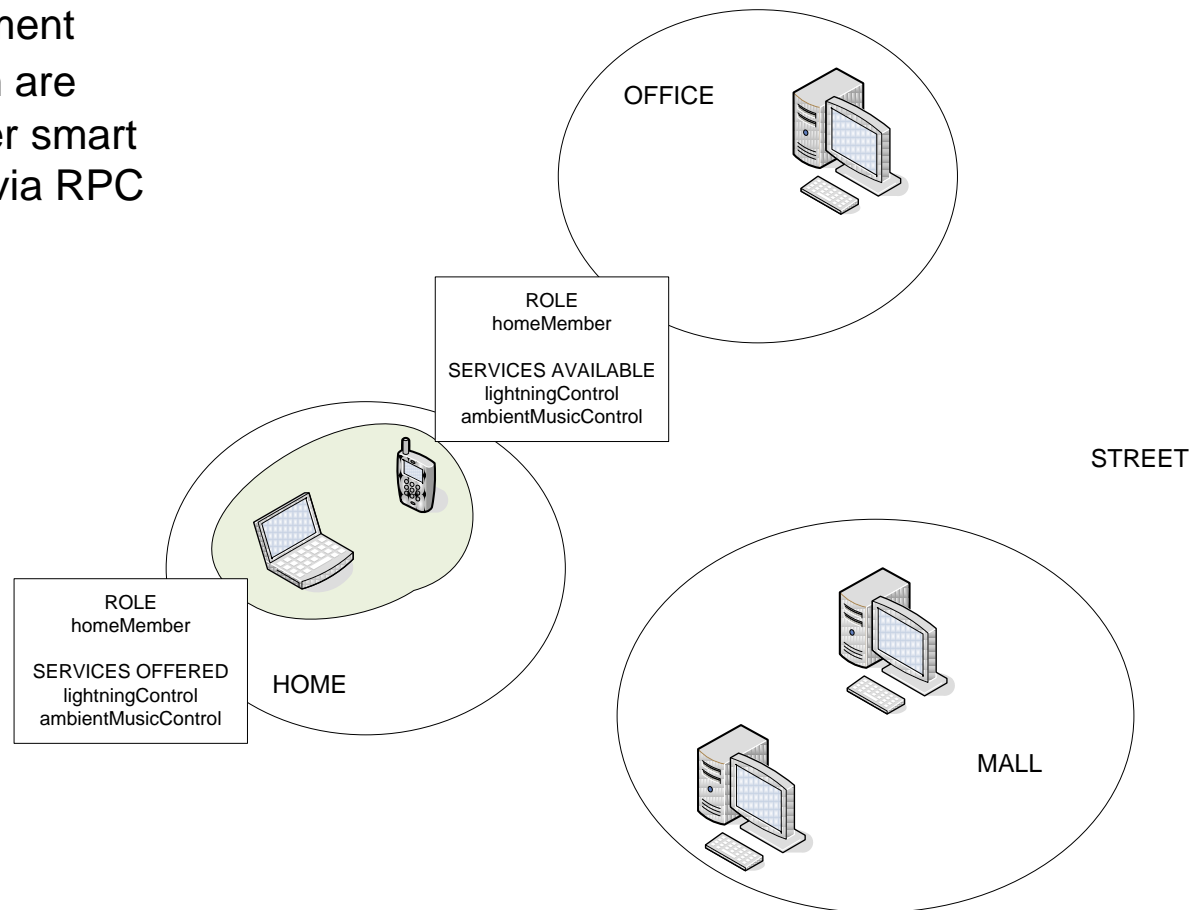
- local (intradvice)
- space (PAN)
- internet





# PECES operation

Devices implement services, which are available to other smart space partners via RPC mechanisms

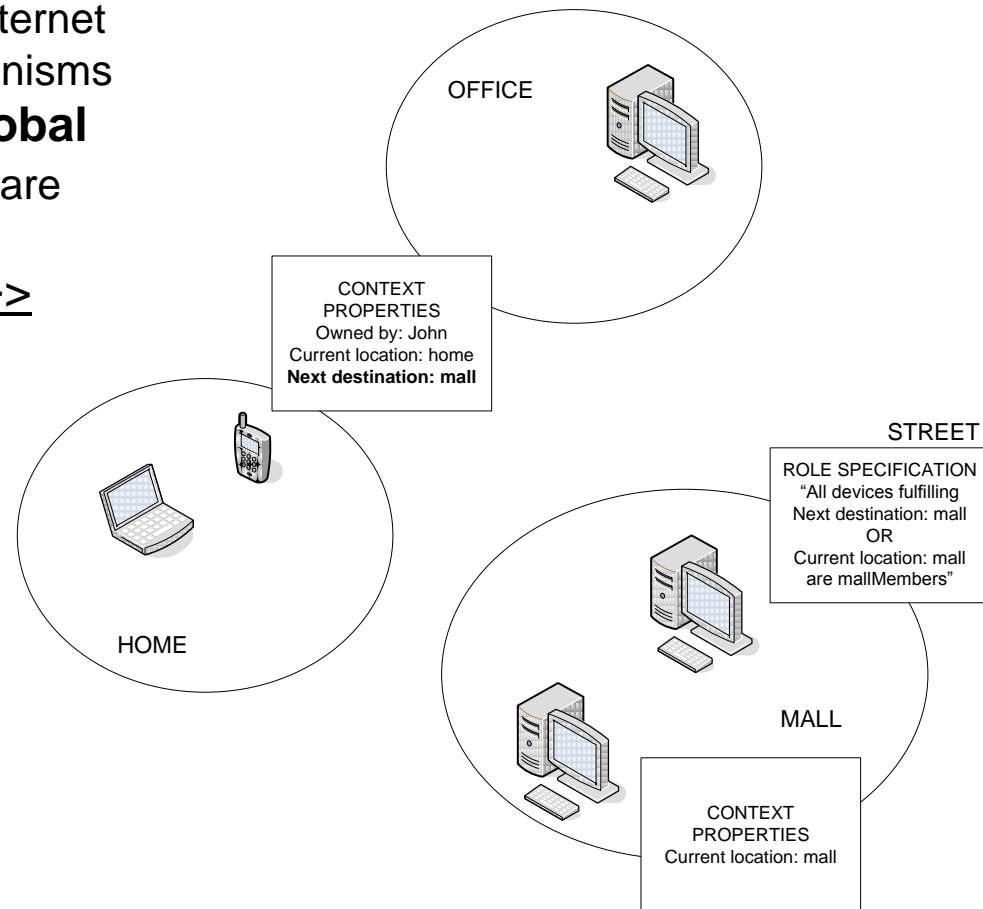




## PECES operation

With the help of an internet registry, these mechanisms are available on a **global scale** (local barriers are broken)

Integrated islands ->  
Integrated world

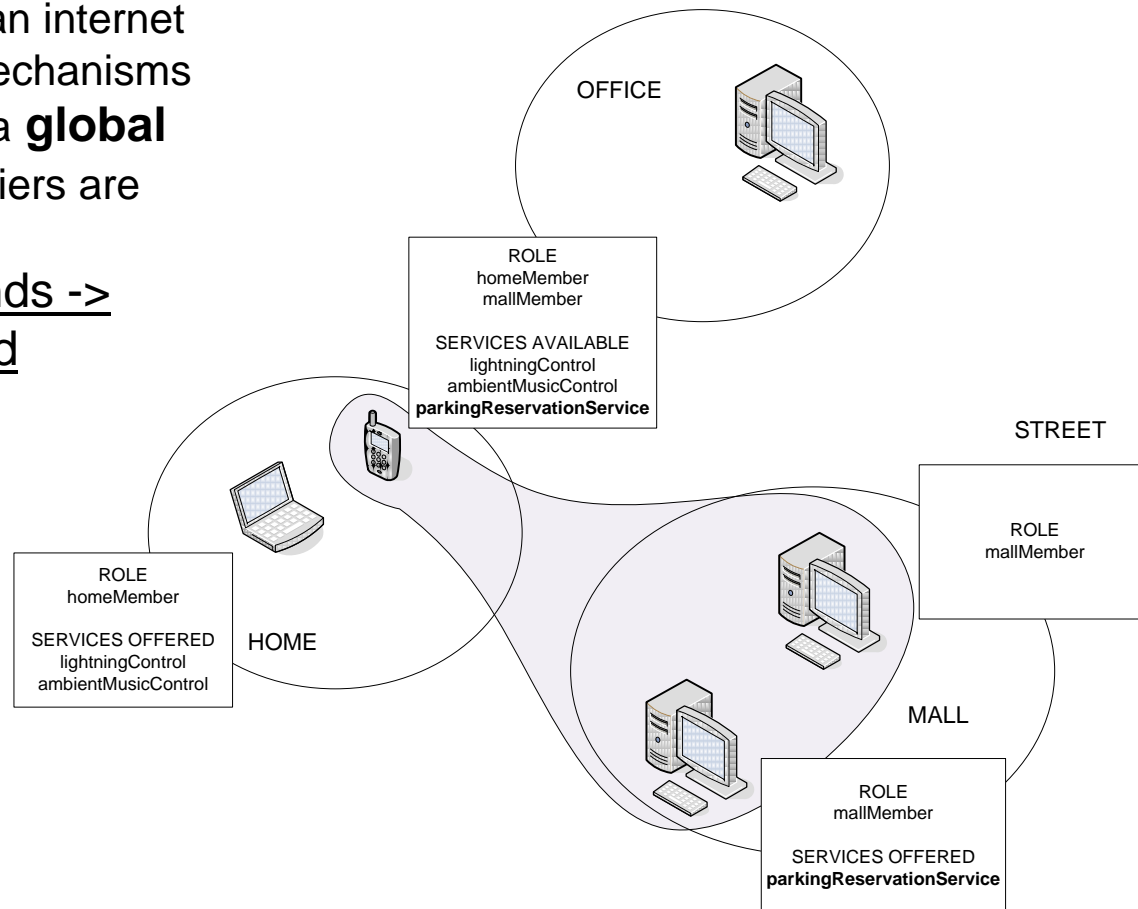




# PECES operation

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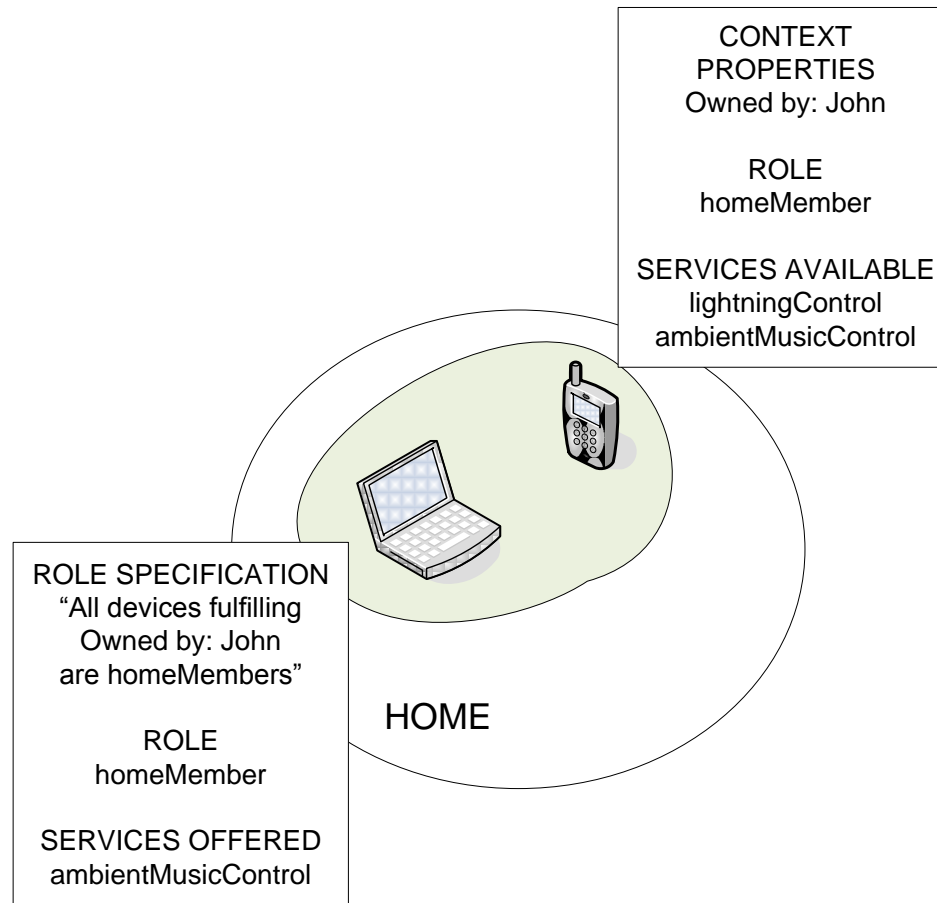


## Concepts

Ontology	Knowledge defined as a set of concepts within a domain, and the relationships between these concepts. It can be used to reason about the entities within that domain and may be used to describe the domain [wikipedia]
Smart space	Group of devices that are allowed to collaborate with each other by means of services and information exchange. All members of a certain smart space share a <u>common role</u>
Role specification	Constraints a device must fulfill in order to acquire a certain role, defined in terms of context ontologies



## Tutorial





## Development tools

- **Eclipse plugin**
- **Support developers during creation of base projects for PECES application, including**
  - Initialization of the middleware
  - Initialization of communication plugins
  - Definition of context properties associated to devices
  - Definition of services
  - Definition of smart spaces
  - Definition of security requirements
  - Simulation of the interaction between different devices



## Install tools in Eclipse

- Update site:  
<http://www.ict-peces.eu/eclipsetools> (includes middleware library)
- Install tools using Eclipse usual procedure



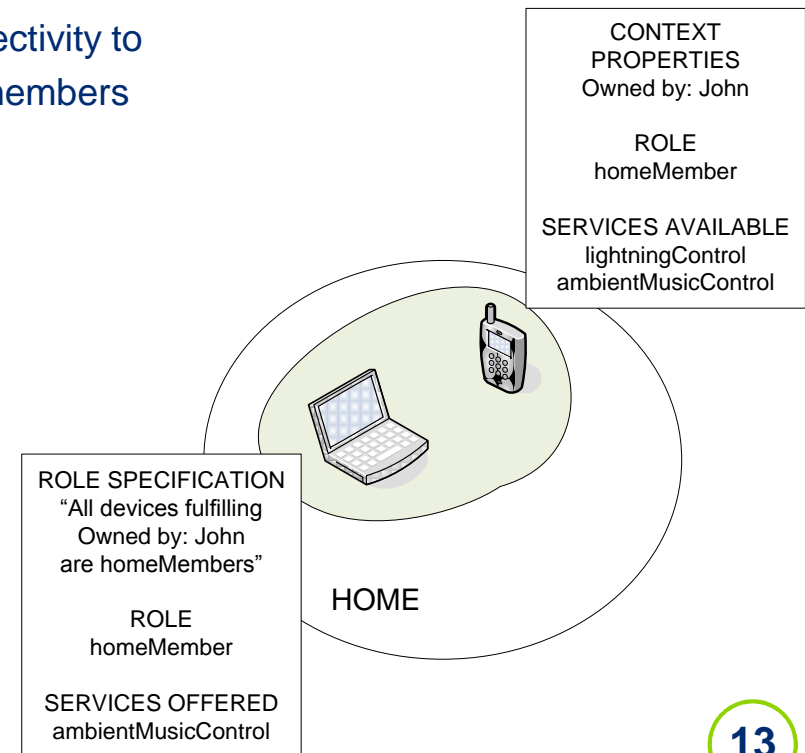
## Project set-up

- **Project structure: one application consists on several projects**
  - One project for overall definitions
  - Specific per-device projects
- **Create new PECES project (Tutorial)**



## Define devices

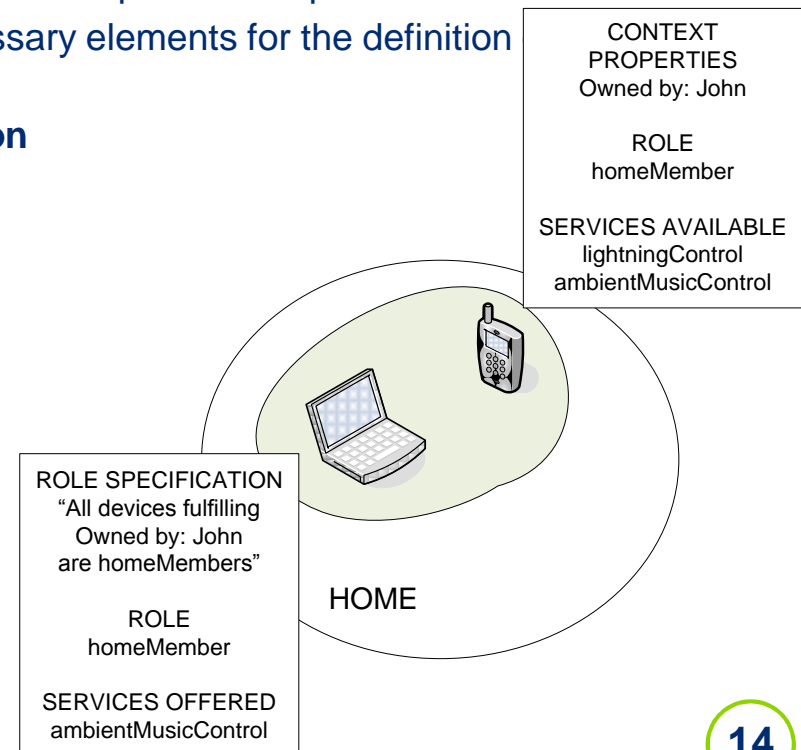
- **Project structure: one application consists on several projects**
  - **Device manager: set the devices that take part of the application**
  - **Device properties**
    - Coordinator: able to define smart spaces
    - Gateway: able to provide Internet connectivity to other smart space members
    - Communication capabilities
- **Device manager: two devices**
  - **homeserver: coordinator**
  - **myphone**





# Define devices' context properties

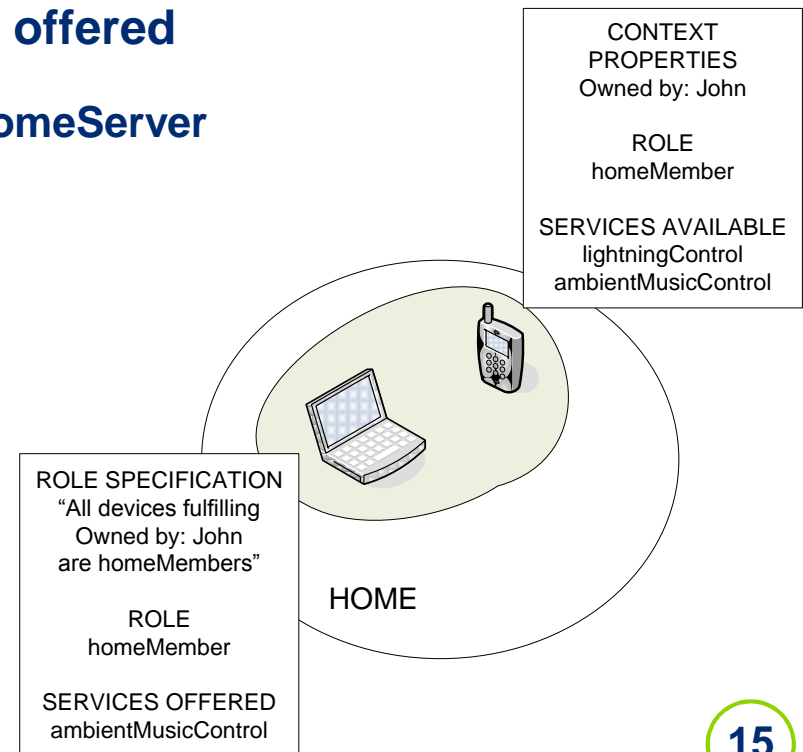
- Devices are defined by their context properties
- Context properties are used for intelligent smart space formation
- Define the necessary properties that will be used during the smart space formation
  
- **Context properties: based on ontologies**
  - PECES project provides a set of ontologies under <http://www.ict-peces.eu/ont>
  - device.owl and smartspace.owl provide necessary elements for the definition typical scenario
- **Custom ontologies can be also used in the application**
  
- **Ontology manager: necessary elements**
  - One user: "John"
  - One service: "ambientMusicControl"
  - myphone: carried by "John"
    - consumes "ambientMusicControl"
  - homeserver: carried by "John"
    - provides "ambientMusicControl"





## Define available services

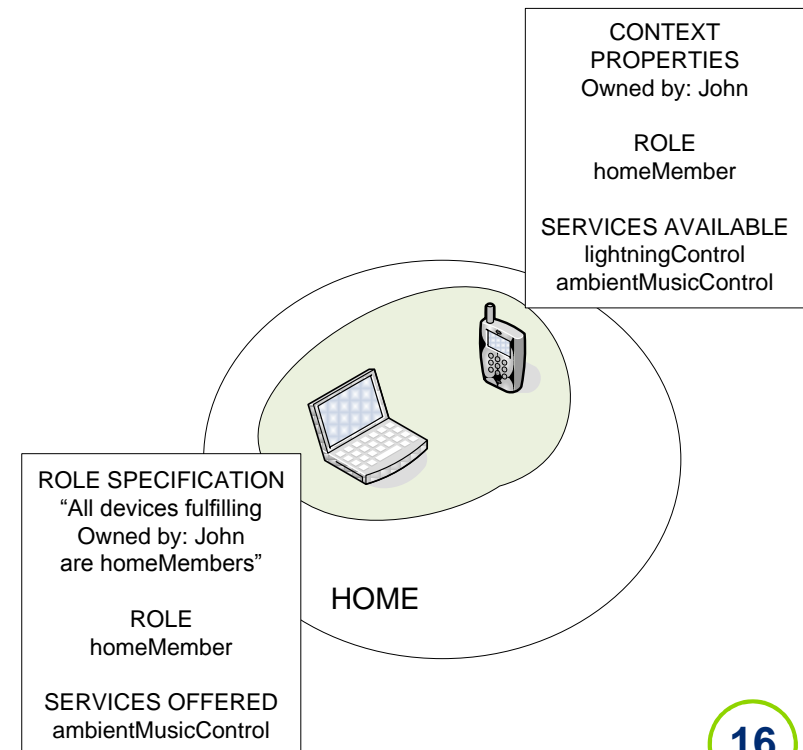
- Services offer public interfaces to other smart space members
- Service clients instantiate proxies to services offered by other devices
- Services definition tool: one service is offered
  - ambientMusicControl: implemented by homeServer





## Define smart spaces

- Smart spaces are groups of collaborative devices
- They are defined by applying conditions (role specifications) to devices context properties
- Devices inside smart spaces can
  - Communicate each other
  - Broadcast messages inside the group
  - Make use of the available services
- Role spec. tool: one smart space
  - home: all devices carried by John





## Results

- **Two java projects: one per device**
- **Configured features**
  - **Devices initialization**
  - **Services definition**
  - **Smart groups definition**
  - **Static/initial context properties**
- **TODOs**
  - **Implement services code**
  - **Implement further devices' functionality**
  - **Deployment on devices**
- **The development tools set includes other tools with further functionality:**
  - **Security-related configuration**
  - **Simulation of application on custom-defined scenarios**



# Thanks for your attention!

- **More information and downloads**

- [www.ict-peces.eu](http://www.ict-peces.eu)
- [www.ict-peces.eu/eclipsetools](http://www.ict-peces.eu/eclipsetools)