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Development tools training session

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Peces

Pervasive computing in embedded systems

Contract:

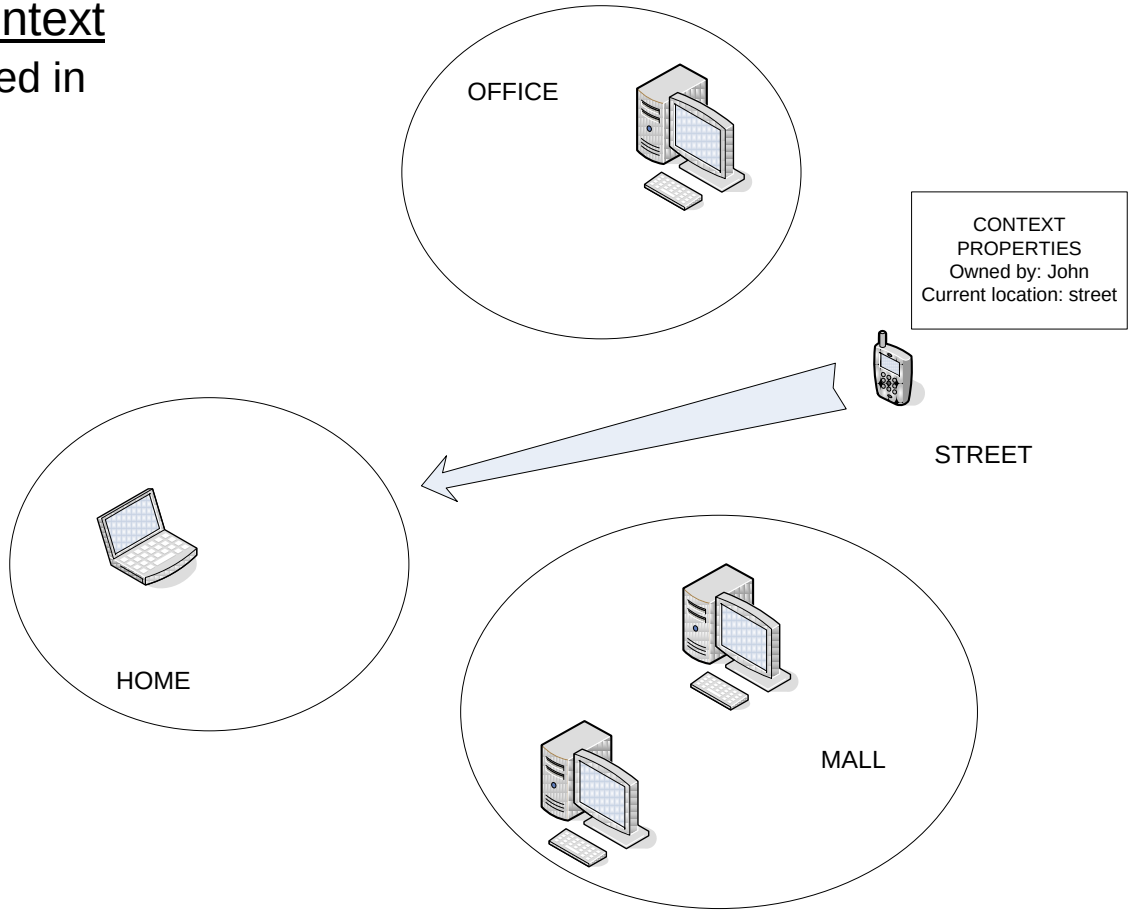
FP7- 224342-ICT-2007-2

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

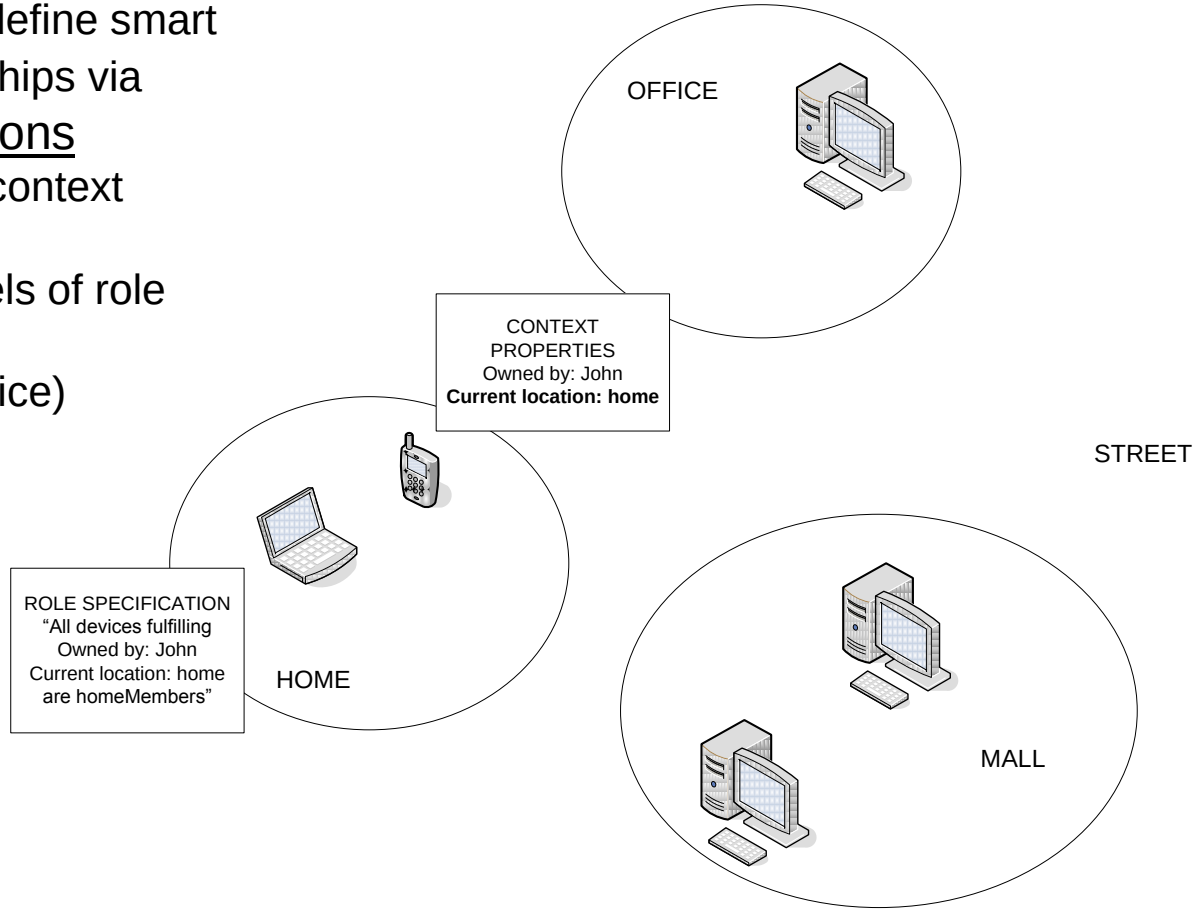
PECES operation

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



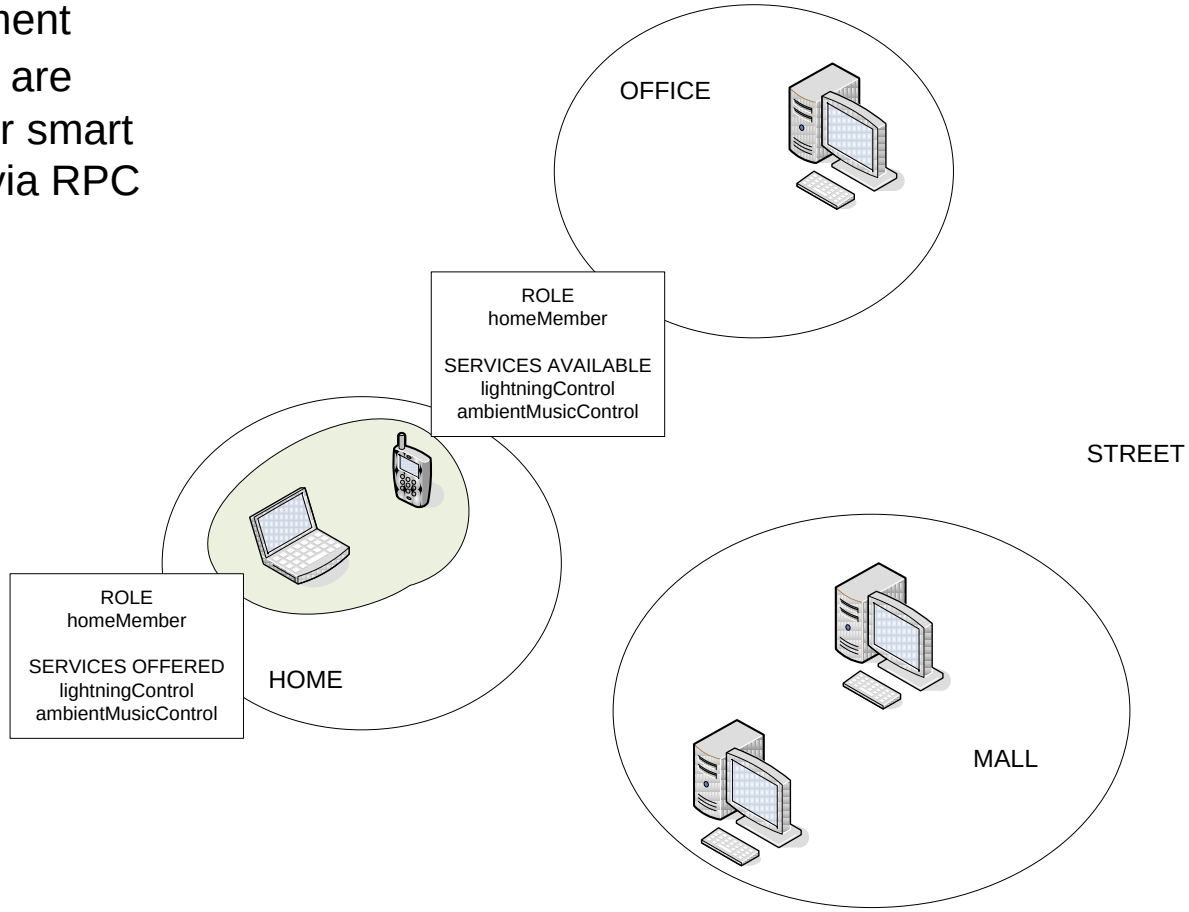
PECES operation

Coordinators define smart space memberships via role specifications (constraints on context properties)
There are 3 levels of role specifications:
- local (intradevice)
- space (PAN)
- internet



PECES operation

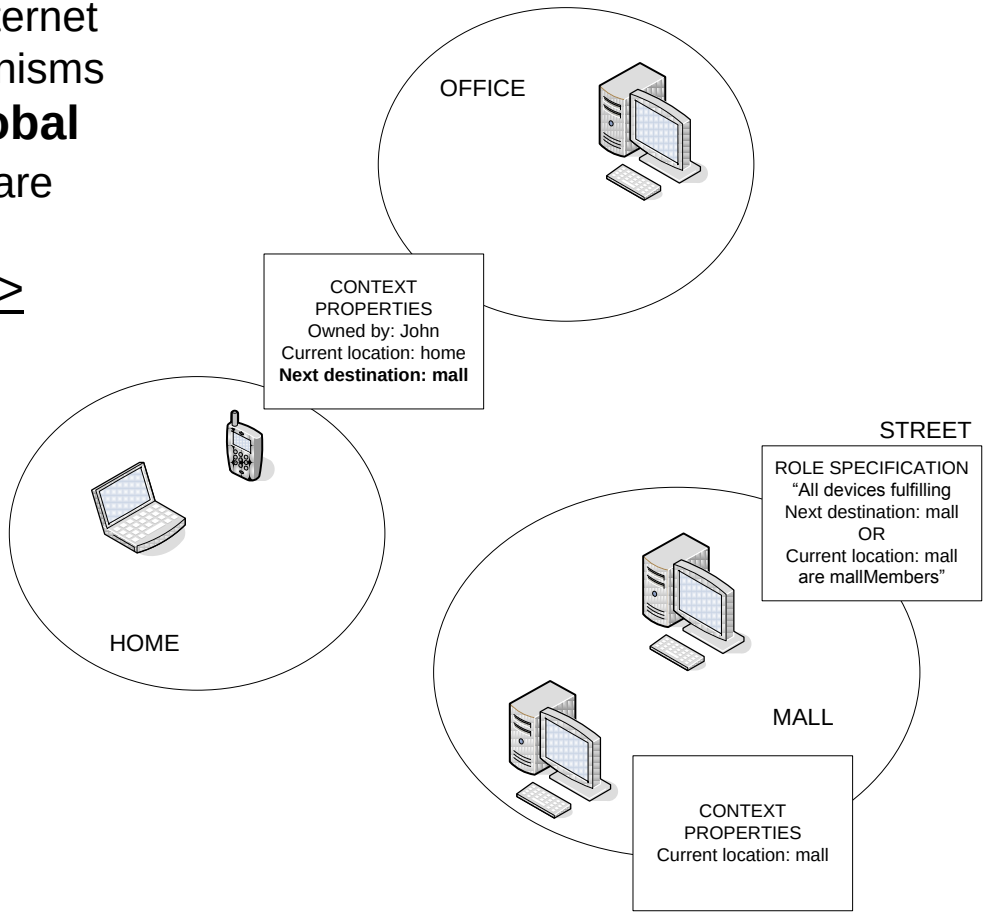
Devices implement services, which are available to other smart space partners via RPC mechanisms



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



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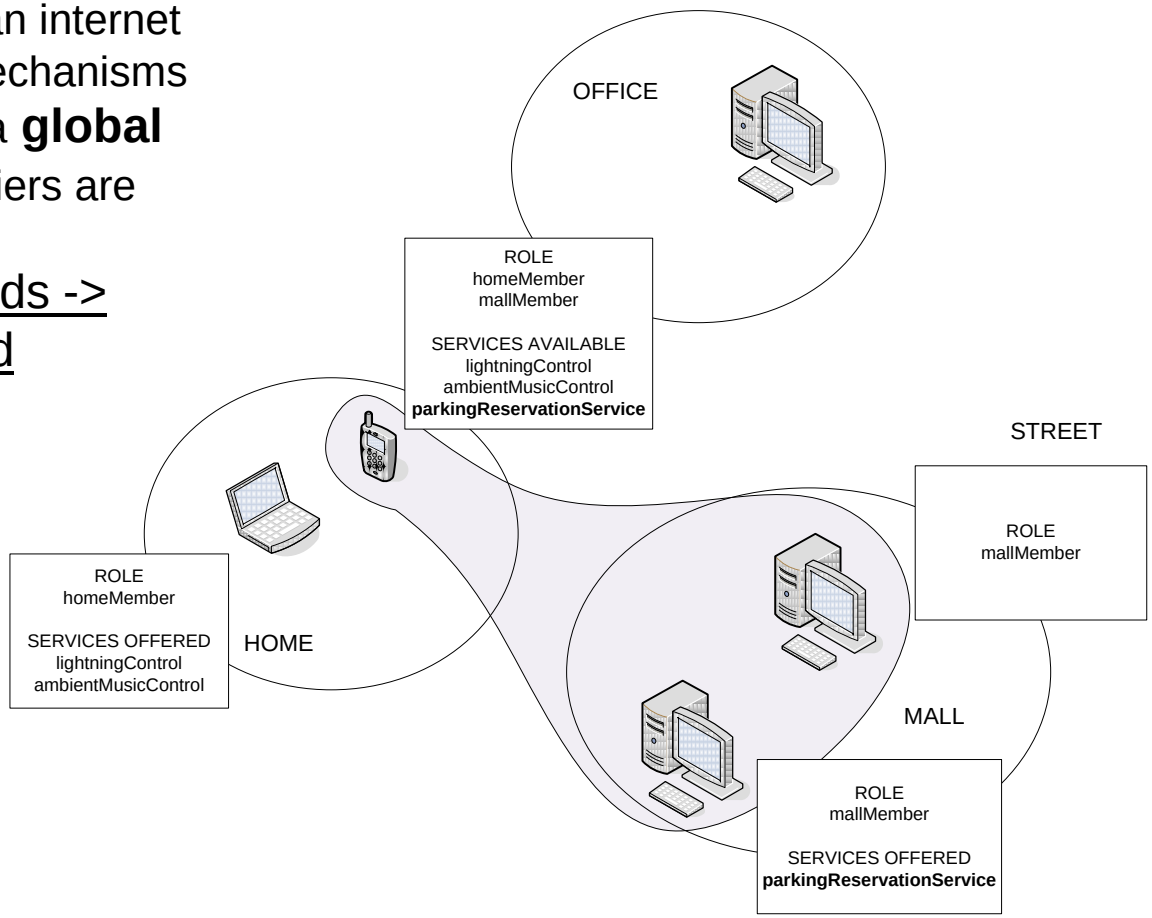
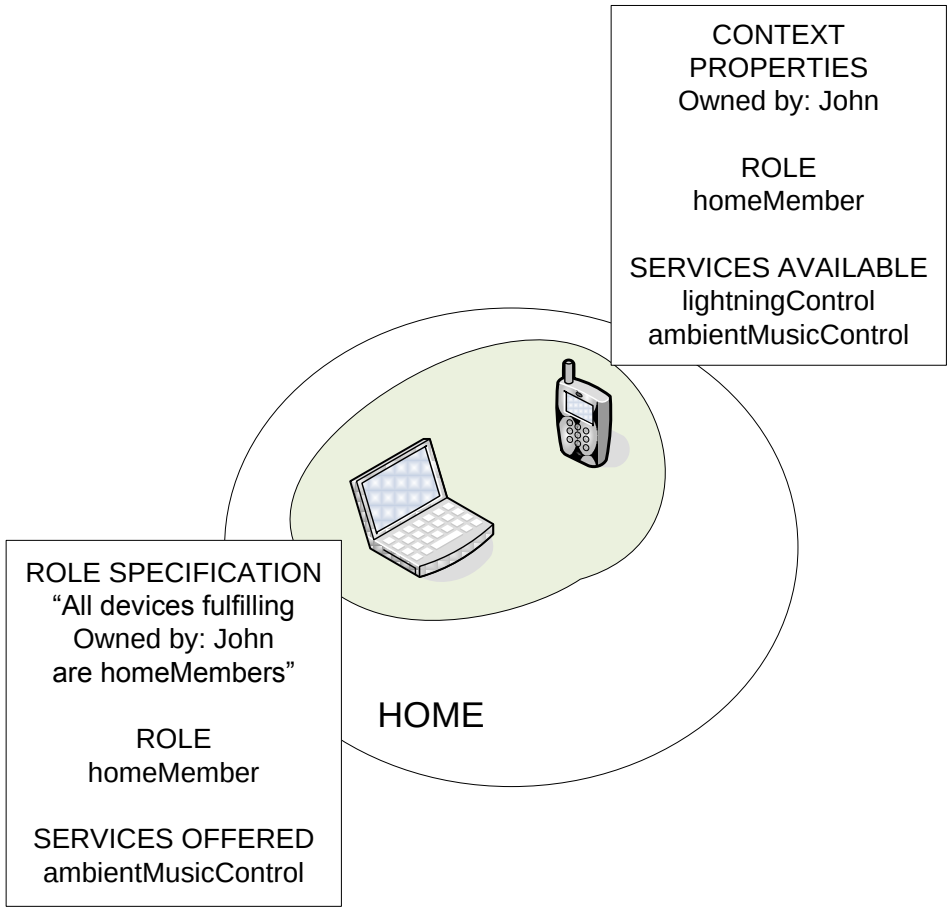


Concepts

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 common role
Role specification	Constraints a device must fulfill in order to acquire a certain role, defined in terms of context ontologies

Tutorial


CONTEXT
PROPERTIES
Owned by: John
ROLE
homeMember
SERVICES AVAILABLE
lightningControl
ambientMusicControl
ROLE SPECIFICATION
“All devices fulfilling
Owned by: John
are homeMembers”
ROLE
homeMember
SERVICES OFFERED
ambientMusicControl
HOME

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)

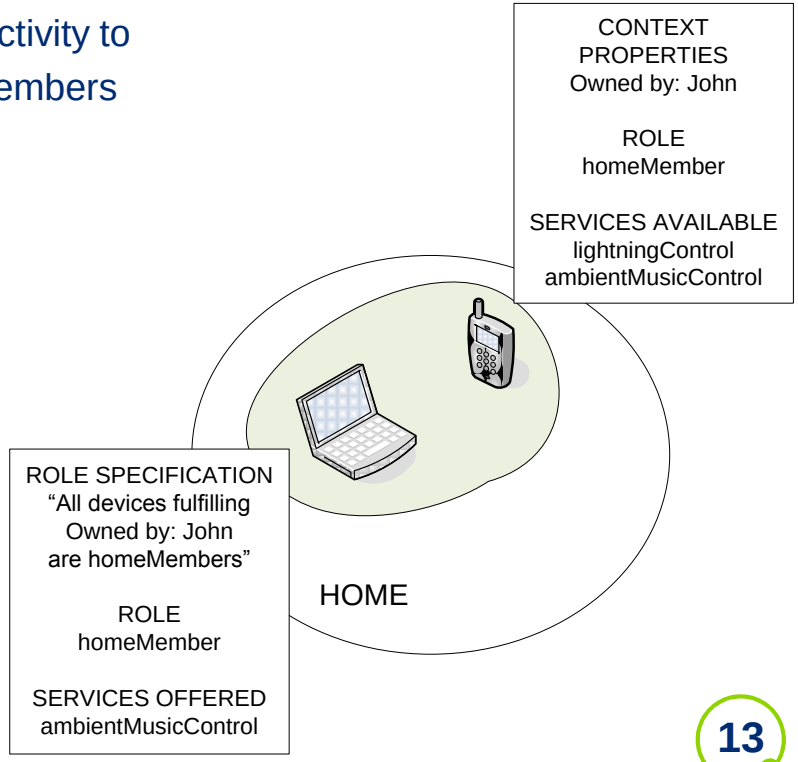
- **Install tools using Eclipse usual procedure**

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**

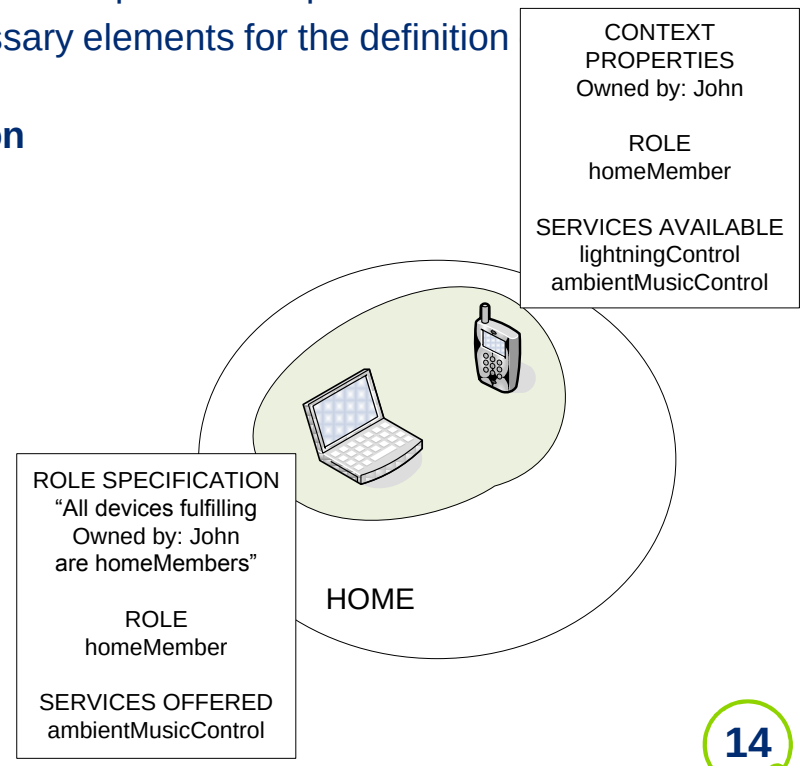


Define devices' context properties

- **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**

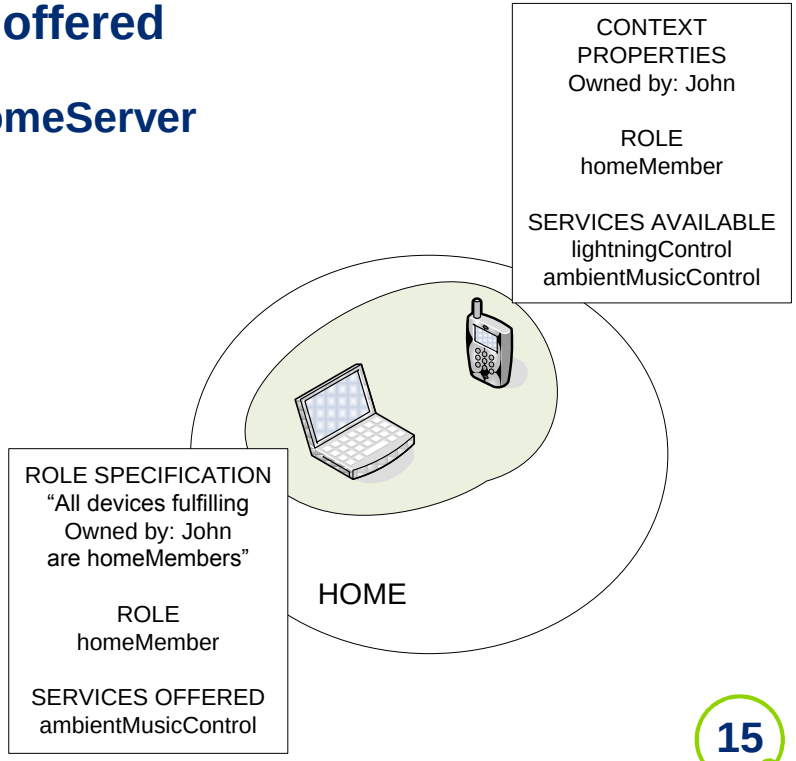
- **Ontology manager: necessary elements**
  - One user: "John"
  - One service: "ambientMusicControl"
  - myphone: carried by "John"
    consumes "ambientMusicControl"
  - homeserver: carried by "John"
    provides "ambientMusicControl"



Define available services

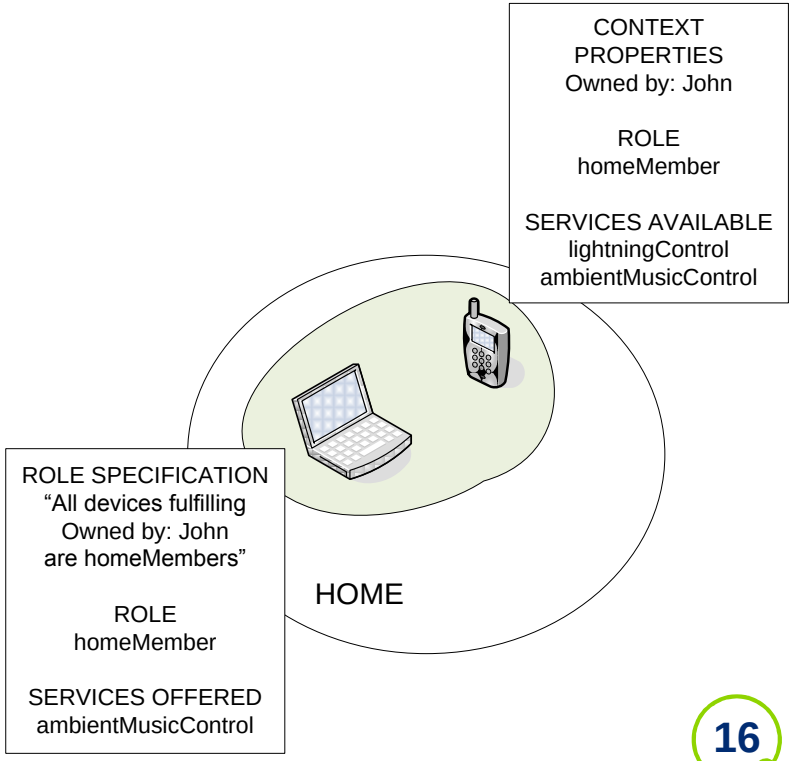
- Services offer public interfaces to other smart space members
- Service clients instantiate proxies to services offered by other devices

- 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
  - www.ict-peces.eu/eclipsetools