



PECES Development tools

Neil Speirs

Newcastle University



Objectives

- **Develop tools to facilitate the application development with the middleware**
- **Develop tools to model the context and networks dynamics**
- **Develop tools to test and analyse the middleware and applications**



Requirements (1/2)

The development tools should provide support for the devices of the prototype applications

The development tools should support the specification of policies to limit the distribution of context information

The development tools should support the specification of static device context

The development tools should support the programming language of the middleware

The development tools should support the configuration of encryption keys

The development tools should be integrated into an existing IDE

The development tools should use the context ontology to simplify the user interface

The development tool should support the graphical user interfaces of various devices and their interaction



Requirements (2/2)

The development tools should support the testing of group specifications

The development tools should support the modeling of a set of networked smart spaces



PECES Development Tools

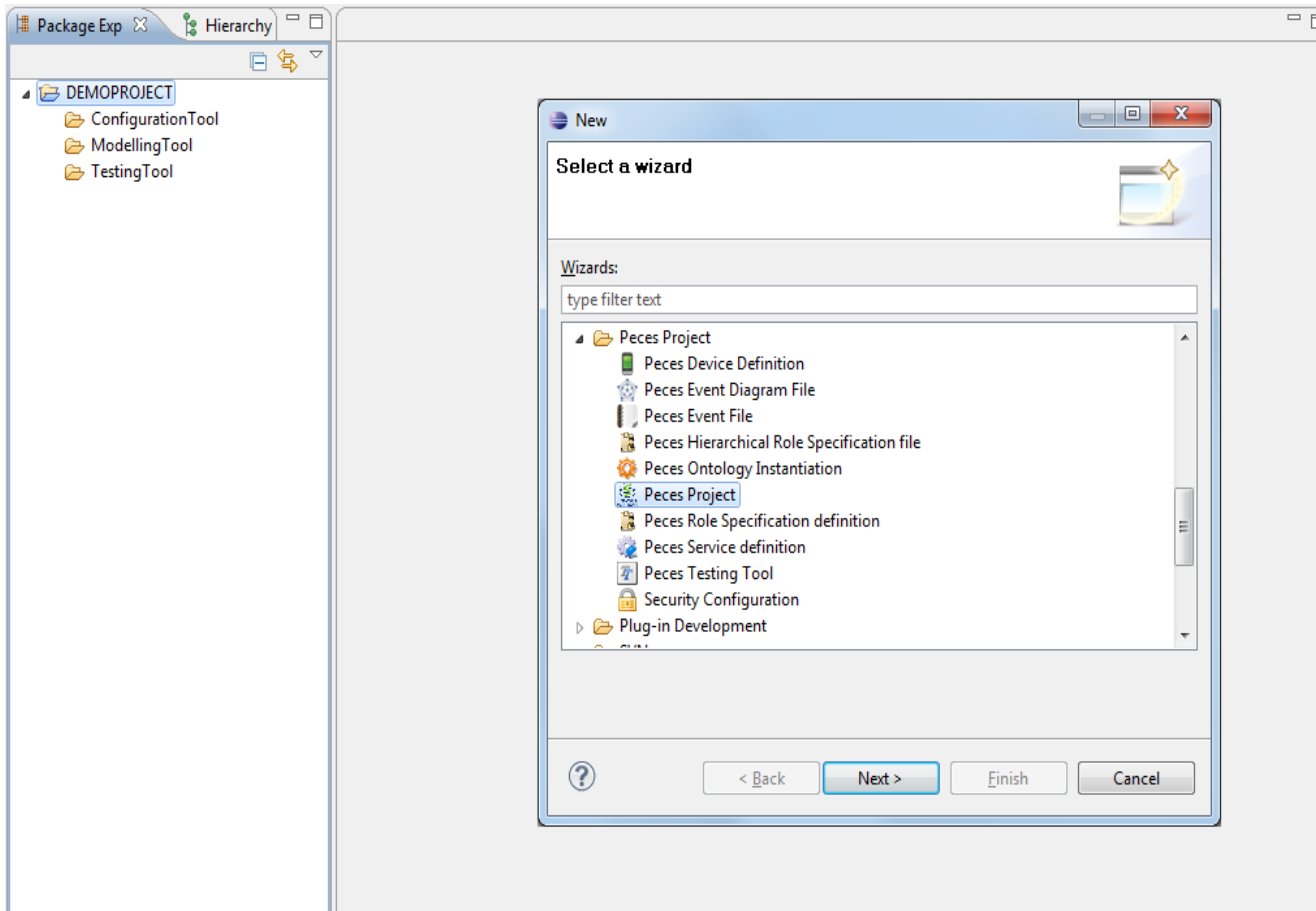
- ❑ **Project Tool**
- ❑ **Device Definition Tool**
- ❑ **Ontology Instantiation Tool**
- ❑ **Security Configuration Tool**
- ❑ **Service Definition Tool**
- ❑ **Role Specification Definition Tool**
- ❑ **Hierarchical Role Specification Tool**
- ❑ **Event Editor Tool**
- ❑ **Event Diagram Editor Tool**
- ❑ **Testing Tool**



Tools Interface

- **project.xml**
 - Device Definition Tool
 - Ontology Instantiation Tool
 - Role Specification Definition Tool
 - Service Definition Tool
 - Event Editor Tool
 - Testing Tool
- **project.owl**
 - Ontology Instantiation Tool
 - Role Specification Definition Tool
 - Service Definition Tool
 - Event Editor Tool
- **events.xml**
 - Event Diagram Editor Tool
 - Testing Tool

Project Tool



This project is used to provide links to other Tools

Three folders are generated

Device Definition Tool

Pervasive computing in embedded systems

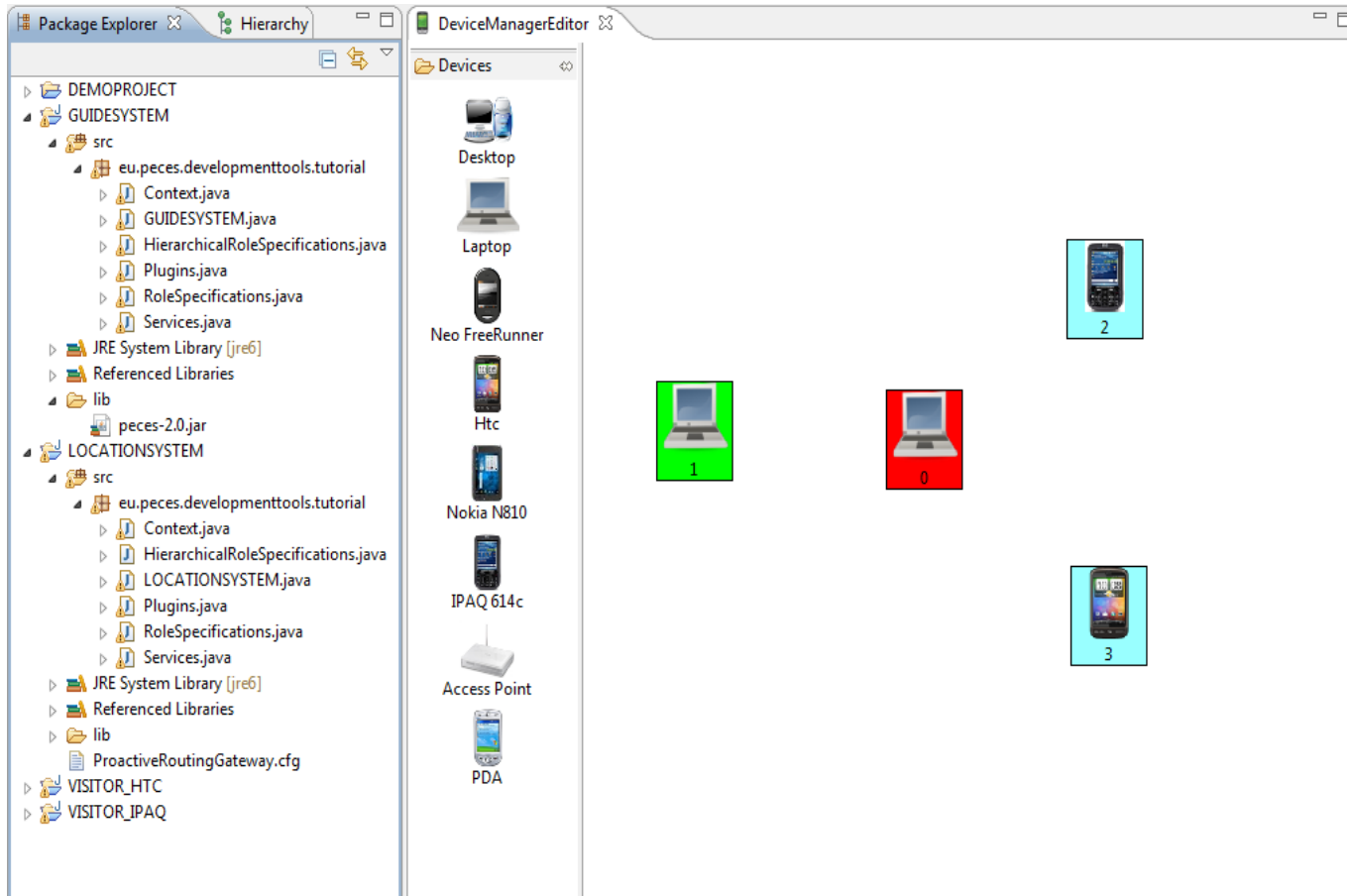


Image based interface

Drag and Drop features

Java middleware project for each device

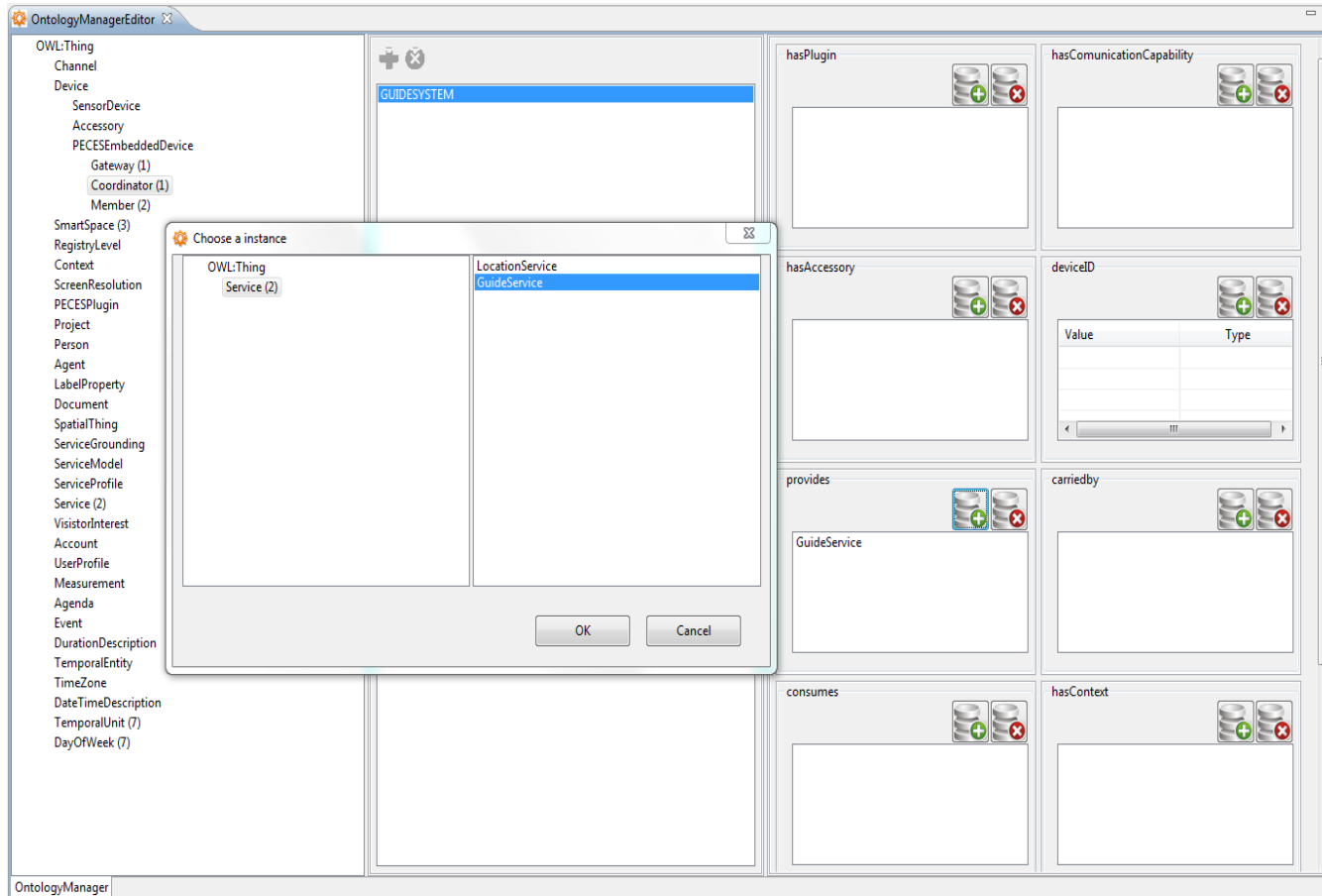
Generate project.xml file

Ontology Instantiation Tool

Pervasive computing in embedded systems



Peces



Provides protege like user interface but integrated with Eclipse

Loads device information from the project xml file

Supports PECES Ontologies as well as other ontologies

Security Configuration Tool

Pervasive computing in embedded systems



Peces

demo.secu

Security Configuration Page

Client Certificate Configuration

This section will allow user to configure client certificates (Fields marked with * are mandatory)

- Certificates
 - cacert_demoproject

Root Cert. Trust Chain

Client Cert. Trusted Device

Please provide root certificate information:

Root Cert Name*: demoproject

PEM pass phrase*:

PEM pass phrase (Verifying)*:

Country Name (2 letter code): UK

State or Province Name:

Locality Name (eg, city):

Organization Name (eg, company):

Organizational Unit Name (eg, section):

Common Name (eg, Client 1)*: tradesystem

Email Address:

Export Password:

Export Password (Verifying):

Generate Root Cert.

Security

Integration of openssl toolkit with Eclipse

Root certificate

Certificate of chains

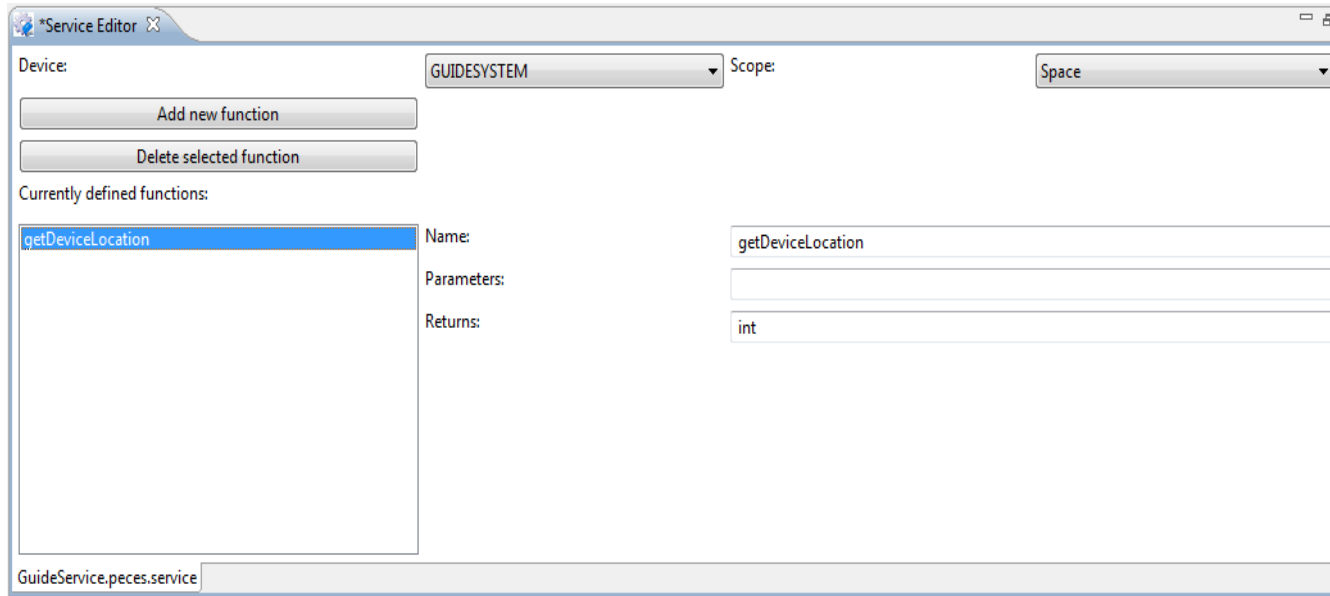
Client certificate

Service Definition Tool

Pervasive computing in embedded systems



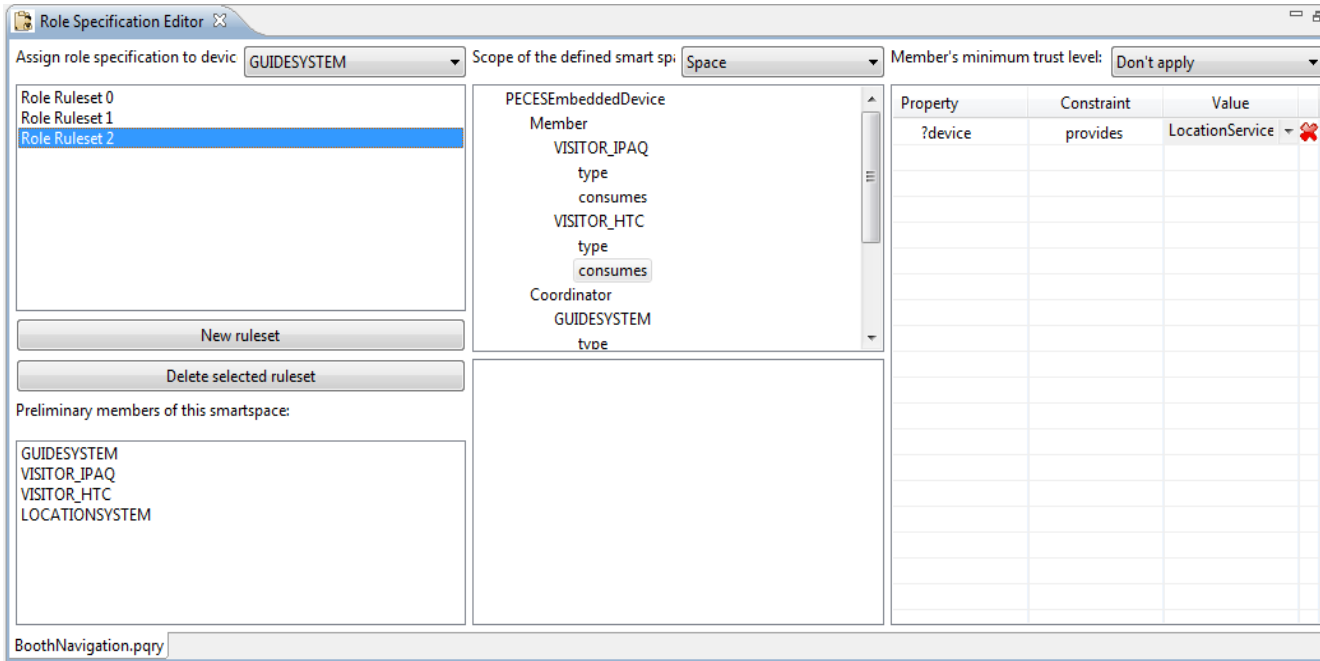
Peces



Provides interface for code generation for use of a PECES- based service and hide development complexity

Role Specification Definition Tool

Pervasive computing in embedded systems



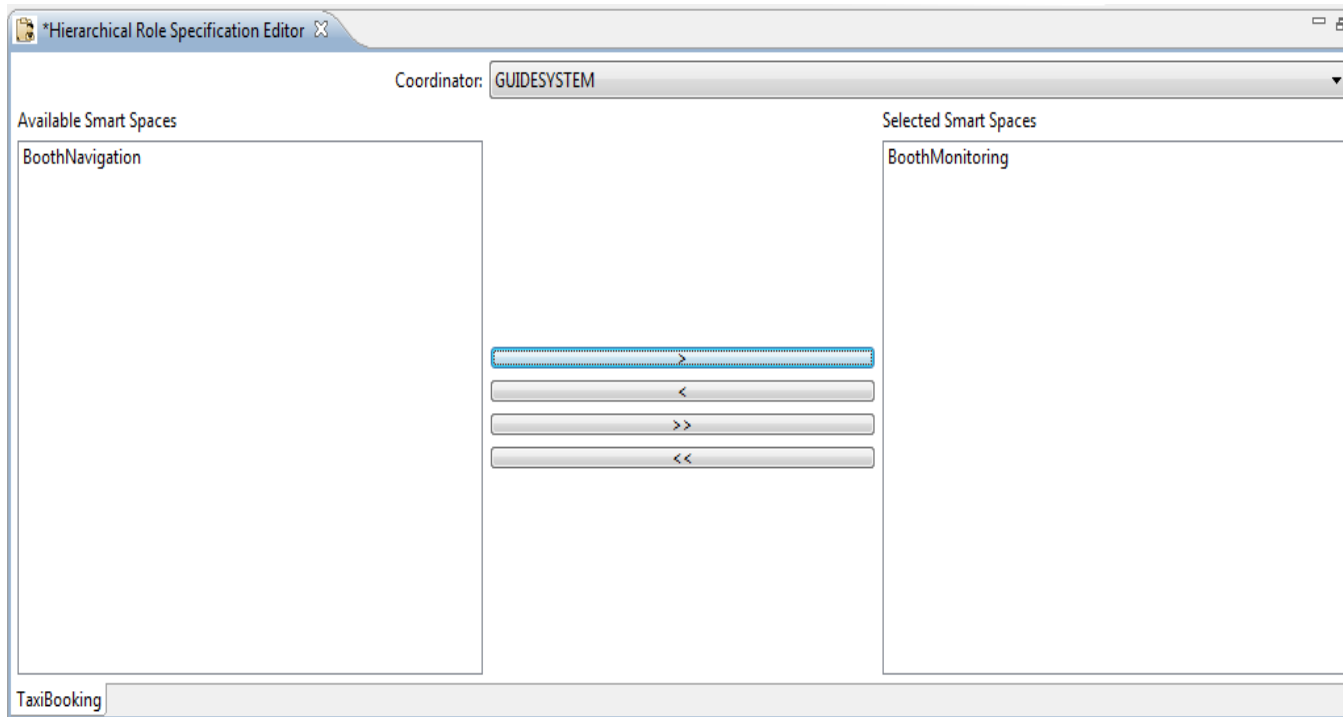
Ruleset: any device providing any service?

Supports AND/OR conditions

Generates Role Specification for smart space formation



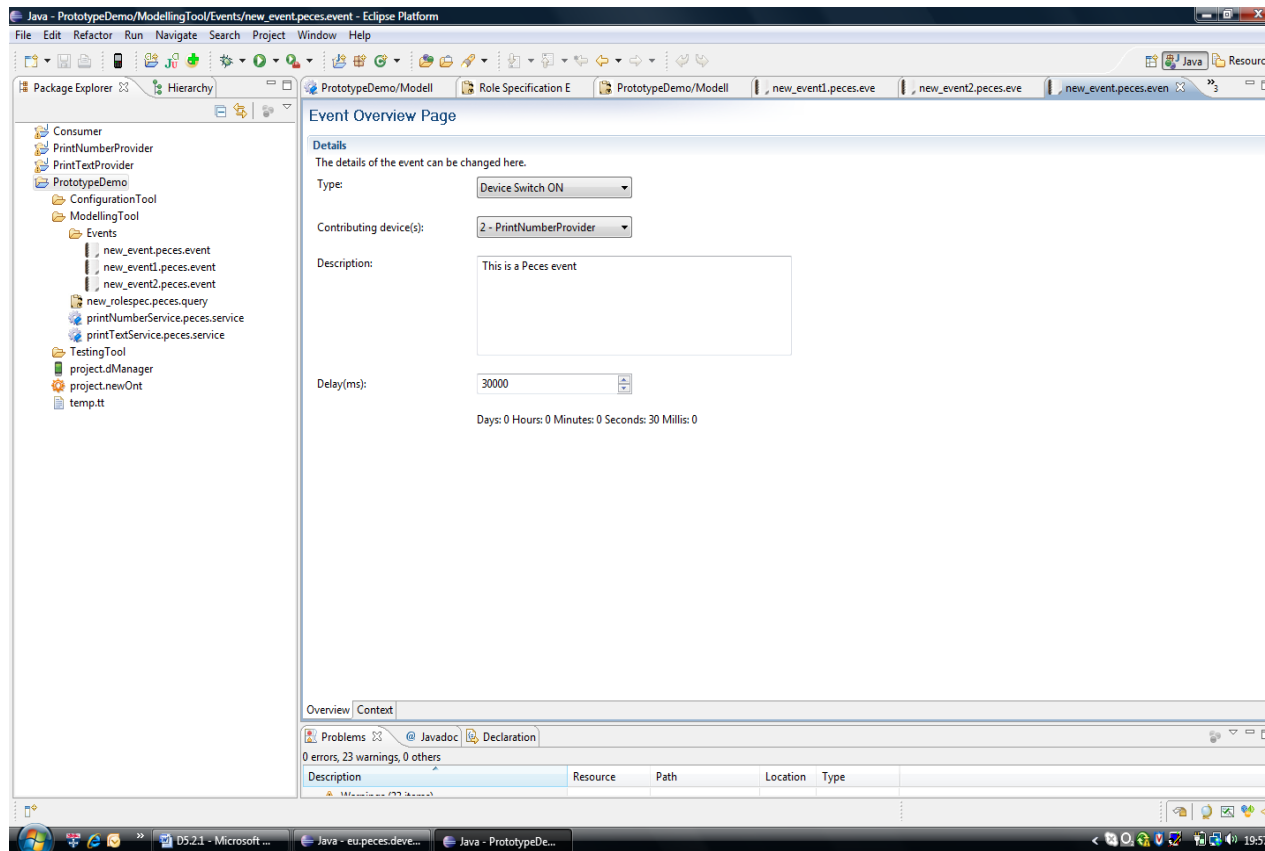
Hierarchical Role Specification Tool



Provides feature to
define smart spaces
hierarchically



Event Editor Tool – Overview



Type
Contributing Devices
Description
Delay



Event Editor – Context Page

The screenshot shows the Eclipse IDE interface. On the left, the Package Explorer displays a project structure with 'new_event4.peces.event' selected. The main editor area is titled 'Event Context Page' and is divided into two panes: 'Instance Attributes' and 'Defined Changes'. The 'Instance Attributes' pane shows a list of attributes for the 'Consumer' class, including 'hasCommunicationCapability', 'carriedBy', 'ownedBy', 'mobility', 'hasContext', 'hasAccessory', and 'provides'. The 'provides' attribute is highlighted. The 'Defined Changes' pane is empty. The bottom status bar shows '0 errors, 23 warnings, 0 others'.

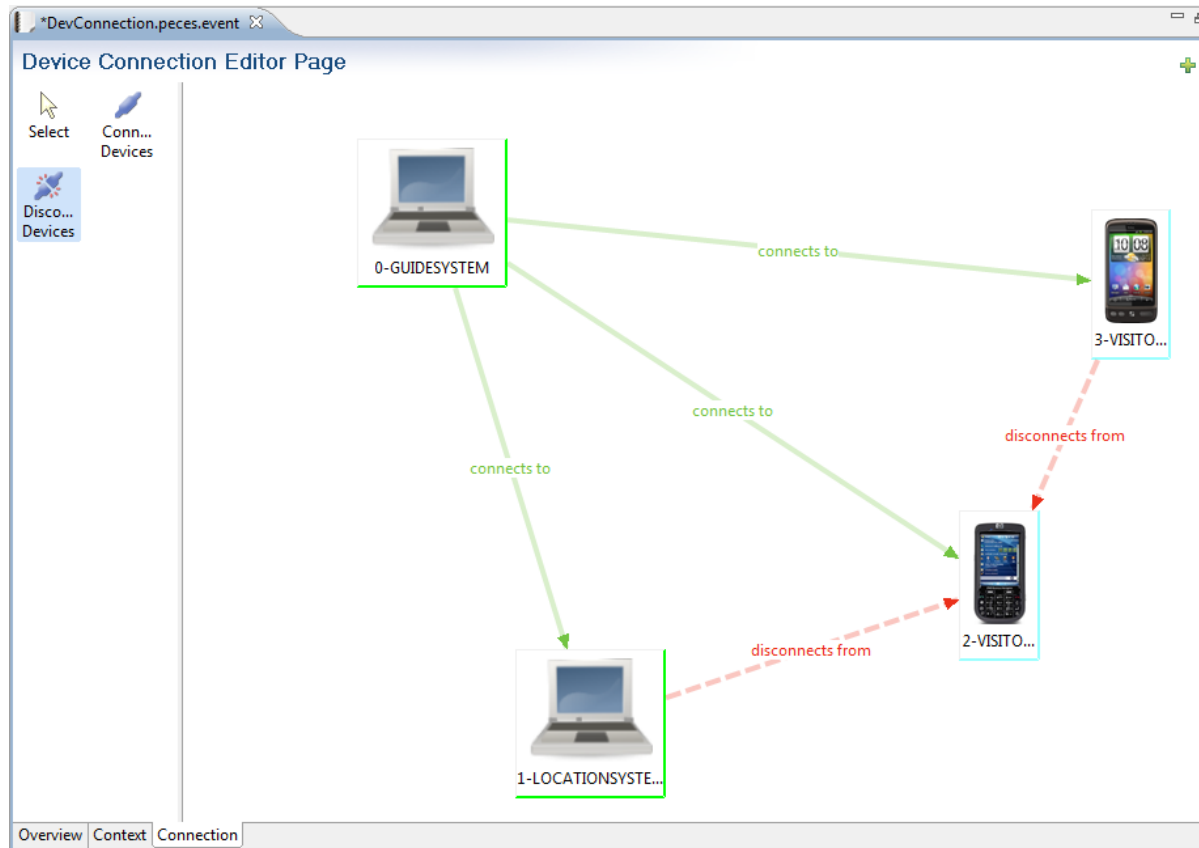
Loads from
project.xml file

Add triplet

Remove triplet



Event Editor Tool – Connection Page



Loads device
information from
project.xml file

Two devices can be
connected or
disconnected



Event Diagram

The screenshot shows the Eclipse IDE interface. The main window is titled "Event Diagram Editor" and displays a sequence of three events: "new_event", "new_event1", and "new_event2", connected by downward arrows. The Package Explorer on the left shows the project structure, including the Events package and the events.xml file. The Problems window at the bottom shows 0 errors and 23 warnings.

Events are sequenced

Events can be used multiple times

Generates events.xml to be used by the testing tool

Testing Tool - Execute Page

Pervasive computing in embedded systems



Peces

Testing Tool Execution Page

Smart Space Simulation

Simulation Time (ms) Ready to Run

Consumer OFF PrintTextProvider OFF

PrintNumberProvider OFF

Execute | TestLog | Visualize

Problems | @ Javadoc | Declaration

0 errors, 23 warnings, 0 others

Description	Resource	Path	Location	Type
Maximized (2) items				

Simulation time can
be specified

Internet Registry IP
can be defined

Defined application
can be executed

Device status will be
shown during testing
(Off/On)

Peces Testing Tool – TestLog Page

Pervasive computing in embedded systems



Peces

Test Log data Processing Page

Test Log Data Processed Results
This page will provide detail information of the test results by analysing the log output

[Load Test Log](#)

```
PrintNumberProvider :[DBG][00:00:00.111][PluginManager] Installing plugin info.pppc.base.plugin.discovery.ProactiveDiscovery
PrintNumberProvider :[DBG][00:00:00.115][PluginManager] Installing plugin info.pppc.base.plugin.semantic.SyncSemantic
PrintNumberProvider :[DBG][00:00:00.117][PluginManager] Installing plugin info.pppc.base.plugin.semantic.AsyncSemantic
PrintNumberProvider :[DBG][00:00:00.117][PluginManager] Installing plugin info.pppc.base.plugin.serializer.ObjectSerializer
Consumer :[DBG][00:00:10.170][LocalRoleExecutor] Evaluating role specification.
Consumer :[DBG][00:00:10.170][LocalRoleExecutor] Testing role System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff new_rolespecMem
Consumer :[DBG][00:00:10.171][LocalRoleExecutor] Query not matching.
Consumer :[DBG][00:00:10.171][LocalRoleExecutor] Testing role System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff new_rolespecMem
Consumer :[DBG][00:00:10.228][LocalRoleExecutor] Role assigned, query matches.
Consumer :[DBG][00:00:10.228][LocalRoleExecutor] Assigning assignment b686acaaaf79697f System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff
PrintTextProvider :[DBG][00:00:05.492][Notifier] Assigning assignment b686acaaaf79697f System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff r
Consumer :[DBG][00:00:10.243][CoordinatorRegistry] Register service called with: C: 9f796abc80f7bd8 IF: eu.peces.developmenttools.tutorial.PrintTe
Consumer :[DBG][00:00:20.228][LocalRoleExecutor] Evaluating role specification.
Consumer :[DBG][00:00:20.228][LocalRoleExecutor] Testing role System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff new_rolespecMem
Consumer :[DBG][00:00:20.228][LocalRoleExecutor] Query not matching.
Consumer :[DBG][00:00:20.228][LocalRoleExecutor] Testing role System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff new_rolespecMem
Consumer :[DBG][00:00:20.230][LocalRoleExecutor] Role assigned, query matches.
Consumer :[DBG][00:00:20.230][LocalRoleExecutor] Testing role System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff new_rolespecMem
Consumer :[DBG][00:00:20.246][LocalRoleExecutor] Role assigned, query matches.
Consumer :[DBG][00:00:20.246][LocalRoleExecutor] Updating assignment b686acaaaf79697f System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff
Consumer :[DBG][00:00:20.247][LocalRoleExecutor] Assigning assignment 95e800f93d426802 System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff
PrintTextProvider :[DBG][00:00:15.510][Notifier] Assigning assignment b686acaaaf79697f System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff r
PrintNumberProvider :[DBG][00:00:10.459][Notifier] Assigning assignment 95e800f93d426802 System(9f796abc80f7bd8) Object(9f796abc80f7bd8) ffffffff
Consumer :[DBG][00:00:20.256][CoordinatorRegistry] Register service called with: C: 9f796abc80f7bd8 IF: eu.peces.developmenttools.tutorial.PrintN
```

Important events are logged

Absolute time is used

Device reference is in the log



Testing Tool – visualise page 1

Peces_test_demoproject.peces.test

Network Visualisation

Time: 12105ms

List of Events

Device 1 On
Device 3 On
Device 2 On
Device 0 On
SmartSpace_Establish
0 connects to 1
0 connects to 3
0 connects to 2
1 joins Smartspace
3 joins Smartspace
2 joins Smartspace
1 Removing Context
1 leaves SmartSpace
0 disconnects from 1
0 disconnects from 2
2 leaves SmartSpace
0 connects to 2
2 joins Smartspace

BoothNavigation

Execute TestLog Visualise

Smart space
established

Four devices are On

Role assigned

Devices are not
connected

Testing Tool – visualise page 2

Pervasive computing in embedded systems



Peces

Peces_test_demoproject.peces.test

Network Visualisation

Time: 32273ms

List of Events

Device 1 On
Device 3 On
Device 2 On
Device 0 On
SmartSpace_Establish
0 connects to 1
0 connects to 3
0 connects to 2
1 joins Smartspace
3 joins Smartspace
2 joins Smartspace
1 Removing Context
1 leaves SmartSpace
0 disconnects from 1
0 disconnects from 2
2 leaves SmartSpace
0 connects to 2
2 joins Smartspace

Execute | TestLog | Visualise

Testing Tool – visualise page 3

Pervasive computing in embedded systems



Peces

Peces_test_demoproject.peces.test

Network Visualisation

Time: 42170ms

List of Events

Device 1 On
Device 3 On
Device 2 On
Device 0 On
SmartSpace_Establish
0 connects to 1
0 connects to 3
0 connects to 2
1 joins SmartSpace
3 joins SmartSpace
2 joins SmartSpace
1 Removing Context
1 leaves SmartSpace
0 disconnects from 1
0 disconnects from 2
2 leaves SmartSpace
0 connects to 2
2 joins SmartSpace

Execute | TestLog | Visualise



Summary

- Many tools implemented
- Tools evaluated on non-PECES users and results currently analysed
- First indications are that using the tools speeds up productivity considerably
- Tools available online from the PECES project tools site:
<http://www.ict-peces.eu/eclipse/tools>.