SENSINACT - HORIZONTAL OPEN PLATFORM FOR AN INTEROPERABLE IOT WORLD

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FROM VERTICAL TO HORIZONTAL IOT PLATFORMS

- IoT PF1: Smart Home
- IoT PF2: Smart City
- IoT PF3: Smart Shopping

- Domains specific platforms
- Various application domains
- Heterogeneous IoT devices
- Heterogeneous physical quantities
- Heterogeneous physical world

Sensing → Actuating
FROM VERTICAL TO HORIZONTAL IOT PLATFORMS

HORIZONTAL IoT PLATFORM

- Various application domains
- Heterogeneous IoT devices
- Heterogeneous physical quantities
- Heterogeneous physical world
FROM THE GROUND PERSPECTIVE

- The IoT environment is divided and each protocol brings its data model.

This list is far from being exhaustive.
FROM THE CLOUD PERSPECTIVE

- IoT generates lots of data that need to be processed.
  - Centralization of data.
  - Processing far from the physical devices.
CHALLENGES

• Handling heterogeneity of protocols
  • Ease the development of new bridges
  • Provide an homogeneous data model
  • Provide an homogeneous access to the data

• Process the data as far as possible in the lower layer
  • Ease the creation of applications
  • Create “virtual” sensors using data-fusion
  • Handle event-based IoT environment

• Providing an extensible and modular platform
  • Ease integration of third party functionalities
  • Adapt the functionalities according to the needs
SENSINACT GATEWAY – AN OSGI-BASED IOT FRAMEWORK
ARCHITECTURE OF THE GATEWAY
THIRD PARTY INTEGRATION

Northbound bridges:
- HTTP Rest
- JSON RPC
- X Bridge
- MQTT Agent
- CDMI Agent
- XMPP Agent
- X Agent

Extension point for NB bridges

Core

OSGi Registry

Application Manager

Extension point for applications

Extension point for SB bridges

Southbound bridges:
- COAP Bridge
- Waspmote Bridge
- Arduino Bridge
- TST Bridge
- MQTT Bridge
- EnOcean Bridge
- Philips Hue Bridge
- Kodi Bridge
- Genova Bridge
- Sigfox Bridge
- Santander Bridge
- X Bridge

- COAP Stack
- XBEE Stack
- MQTT Stack
- EnOcean Stack
- Philips Hue Stack
- HTTP Stack
- NGSI Stack
- X Stack

...
THIRD PARTY INTEGRATION

Northbound bridges:
- HTTP Rest
- JSON RPC
- X Bridge
- MQTT Agent
- CDMI Agent
- XMPP Agent
- X Agent

Public API for third party development

Core

Application Manager
- Basic Plugin
- CEP Plugin
- X Plugin

Public API for third party development

Southbound bridges:
- COAP Bridge
- Waspmote Bridge
- Arduino Bridge
- TST Bridge
- MQTT Bridge
- EnOcean Bridge
- Philips Hue Bridge
- Kodi Bridge
- Genova Bridge
- Sigfox Bridge
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COAP Stack
- XBEE Stack
- MQTT Stack
- EnOcean Stack
- Philips Hue Stack
- HTTP Stack
- NGSI Stack
- X Stack

...
The IoT environment is an event-based environment, applications are triggered on an event.

Applications are based on the Event-Condition-Action (ECA) axiom.
- When an *event* occurs, if the *condition* is satisfied, then the *action* is executed.

An application is a processing of one or many data in order to produce a upper level data (data-fusion) or to execute actions.

An application is a sensiNact service, with its sensors and its actuators (START, STOP, status,…). Thus, it is subject to composition by others applications.
• Connect sensors and actuators to automatize tasks.
EXAMPLES OF APPLICATIONS

- Light changes on presence

- TV pauses/resumes on presence leaving/arriving in the room
EXAMPLES OF APPLICATIONS

- Create “virtual” sensor
  - Pollution area 1
  - Pollution area 2
  - Pollution area 3
  - Global pollution

- Reuse “virtual” sensor
  - Traffic
  - Global pollution
  - Weather
  - Display “slow down” on the billboards
THE SNA LANGUAGE

- A Domain Specific Language (DSL) eases the development of the applications.

```
[resource <resource>]+

on <events>
[if <condition> do]+
  [<actions>]+
[else do]? 
  [<actions>]?
end if;
```

```
resource shortcutLightOn=/URI/of/the/lightOn
resource shortcutLightOff=/URI/of/the/lightOff
resource shortcutButton=/URI/of/the/button
on shortcutButton.subscribe() 
if shortcutButton.get() == true do
  shortcutLightOn.act()
else do
  shortcutLightOff.act()
end if;
```
SENSINACT STUDIO, A RICH CLIENT

• **Goals**
  • Browse the available devices.
  • Interact with the devices.
  • Ease the development of sNa applications.
  • Ease the development of new bridges to handle new protocols.

• **The Studio is a set of Eclipse plugins.**
• A map to locate the devices
A list of the service providers, services and resources
• An assistance for the creation of applications
SENSINACT IN THE PROJECTS
SENSINACT IN THE PROJECTS

• Projects
  • Butler (ended)
  • ClouT (in progress)
  • OrganiCity (in progress)
  • Festival (in progress)
  • SocIoTal (in progress)
  • Big ClouT (soon)
  • Wise IoT (soon)

• Number of devices
  • Aarhus (Denmark): a lot but they don’t know
  • Genova (Italy): ~ 100
  • London (United kingdom): a lot but they don’t know
  • Mitaka/Fujisawa (Japan): ~ 8 000
  • Santander (Spain): ~ 5 000
THE EXAMPLE OF THE CLOUT PROJECT

- ClouT's overall concept is leveraging the Cloud Computing as an enabler to bridge the Internet of Things with Internet of People via Internet of Services, to establish an efficient communication and collaboration platform exploiting all possible information sources to make the cities smarter and to help them facing the emerging challenges such as efficient energy management, economic growth and development.
ORGANICity aims at integrating the testbeds from 3 Europeans clusters (Santander, London, Aarhus) in order to provide an “Experimentation as a Service” platform.

- The platform provides an homogeneous access of the testbeds for the “co-creation” of services by citizens.

- Open calls are organized to invite the SMEs to use the testbeds.

THE EXAMPLE OF THE ORGANICITY PROJECT

http://organicity.eu
THE EXAMPLE OF THE FESTIVAL PROJECT

- Join forces and connect & federate EU and JP platforms for experimenters (researchers, developers, SMEs, web entrepreneurs, ...).
- Concrete, tangible smart ICT applications deployments, experimentations in the federated testbeds with real-user involvement.

http://festival-project.eu/en
For the gateway
- Consolidate the documentation before publishing it in open source.
- Integrate the distribution of the gateways and of the applications.
- Verify the consistency of the applications.

For the Studio
- Improve the web version.
- Integrate a graphical development environment (boxes to facilitate the creation of applications).

For the projects
- Confront sensiNact with on the ground experiments.
- Create a community around sensiNact.
Thank you

Any questions?

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