

ClouT: Cloud of Things for empowering the citizen cloud in smart cities

Levent GÜRGEN, CEA-LETI

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Séminaire ASPROM

Objets communicants connectés industriels,
M2M, réseaux

Vendredi 13 Juin
Paris

Agenda

- From embedded systems to Internet of Things
- European IoT Research Priorities
- sensiNact - Service-oriented approach for IoT application development and deployment
- Applications in smart cities
 - ClouT project, Cloud of Things for empowering the citizen clout in smart cities
 - BUTLER project, uBiquitous, secUre inTernet-of-things with Location and contExt-awaReness
 - OUTSMART project, Provisioning of urban/regional smart services and business models enabled by the Future Internet
- Summary

Internet of Things

- Personal Computers were revolutionary!
- But the real revolution was when we inter-connected them!



=> Internet



Internet of Things

- Personal Computers were revolutionary!
- But the real revolution was when we inter-connected them!



=> Internet



- Embedded devices are revolutionary!
- But the real revolution will be when we will inter-connect them!

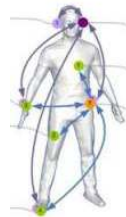
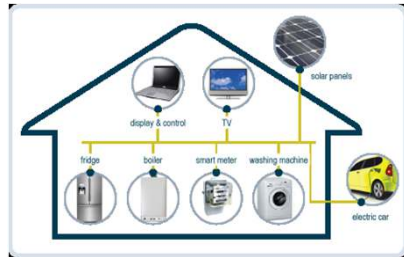


=> Internet of Things



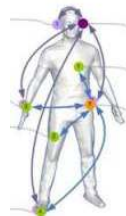
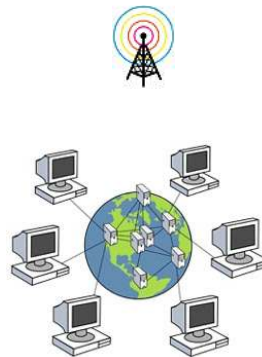
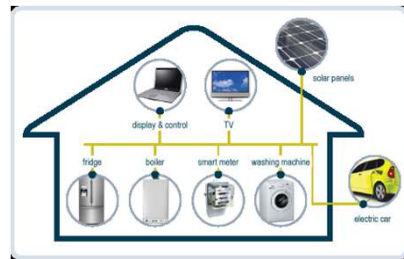
From embedded systems to Internet of Things (IoT)

- Traditional embedded systems: dedicated to a specific task in a given application domain.



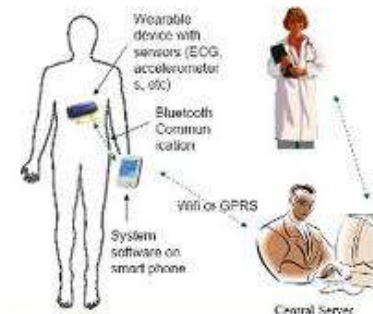
From embedded systems to Internet of Things (IoT)

- Traditional embedded systems: dedicated to a specific task in a given application domain.
- Internet of things: **communicating** and **collaborating** embedded systems that are **massively deployed**, that can perform **universal** tasks **across domains**

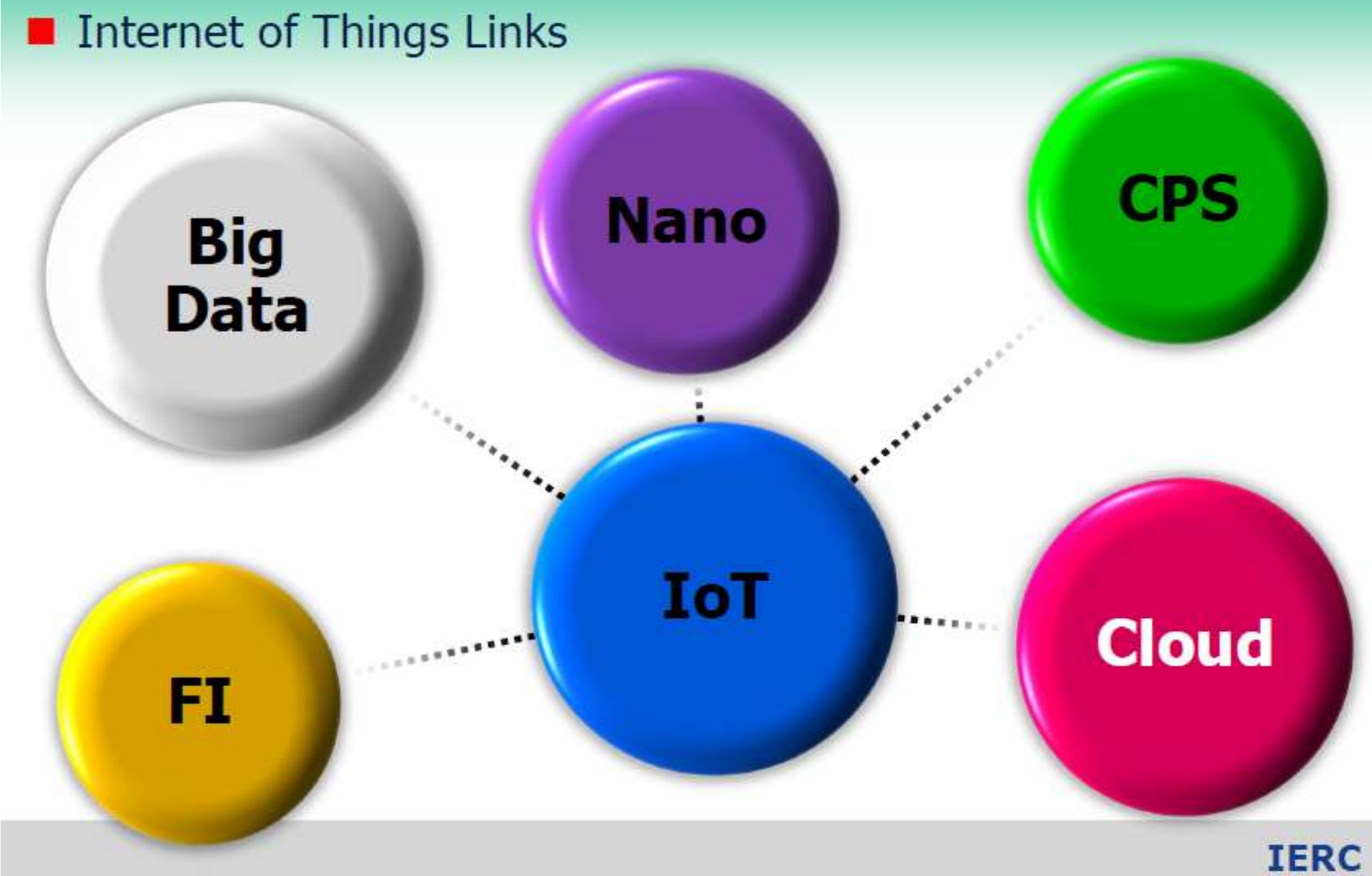


Many application areas

- environmental monitoring,
- ambient intelligence for smart places (homes, buildings, cities, shops, transportation),
- critical physical infrastructures (e.g. bridges, tunnels) monitoring,
- homeland security,
- smart utilities (e.g. electrical, gas, water, oil),
- factory automation and process control,
- disaster management
- health care,
- etc.



European Research Cluster on the Internet of Things (IERC)



IERC main goals

- Create communities for open IoT platforms
- Contribution to pre-normative activities / standardisation, development of business models, innovation activities which aim at stimulating platform adoption
- Networking of IoT technology stakeholders
- Activities to increase societal acceptance and foster specific education

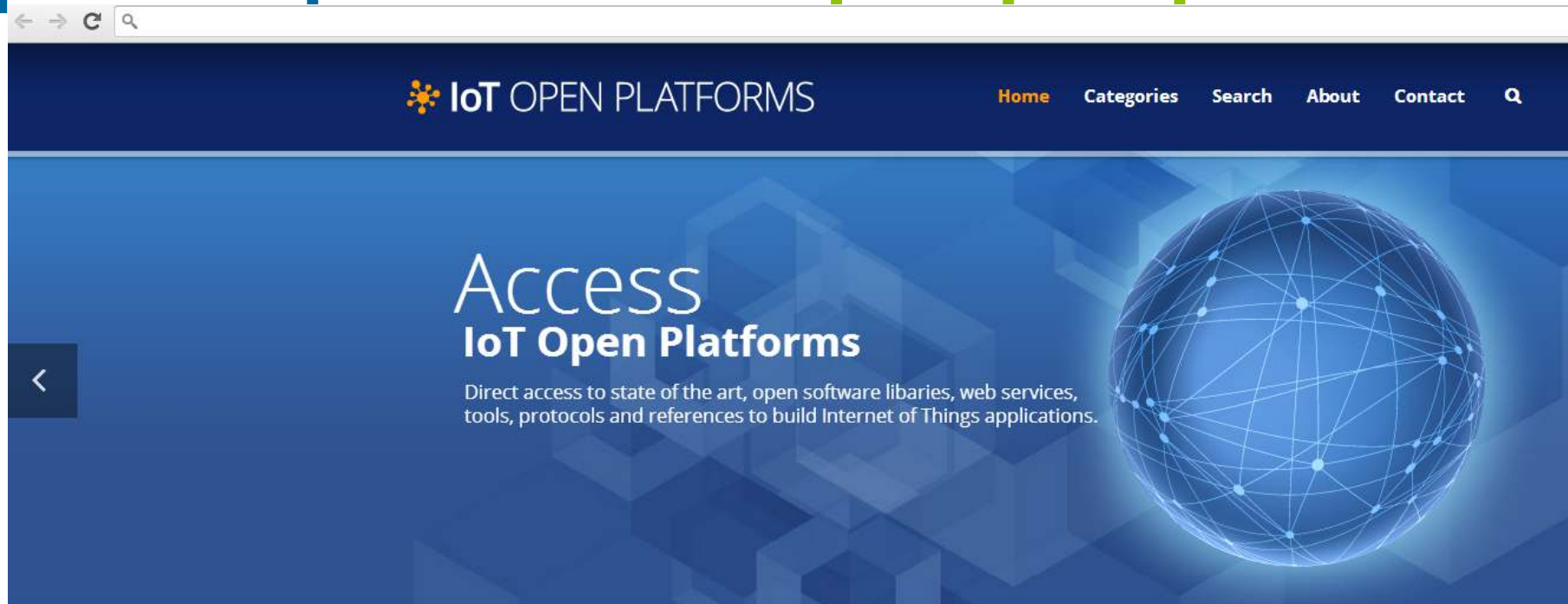
IERC Transversal activity chains



IERC Transversal activity chains



Open IoT platforms: <http://open-platforms.eu>



The screenshot shows the homepage of the IoT Open Platforms website. At the top, there is a dark blue navigation bar with the logo "IoT OPEN PLATFORMS" on the left and menu items "Home", "Categories", "Search", "About", and "Contact" on the right. Below the navigation bar is a large blue banner with a background of hexagonal patterns. On the left side of the banner, there is a white arrow pointing left. The main text in the banner reads "Access IoT Open Platforms" in a large, white, sans-serif font. Below this, in a smaller white font, it says "Direct access to state of the art, open software libraries, web services, tools, protocols and references to build Internet of Things applications." To the right of the text is a glowing blue sphere composed of a network of nodes and lines, representing the Internet of Things. The overall design is clean and modern, with a focus on technology and connectivity.

IoT Solutions directory

Browse all our **libraries and technical documentations**

35

Open Libraries and Tools

45

Technical References and Tutorials

0

Use Cases and Deployment



Recent activity



Latest News

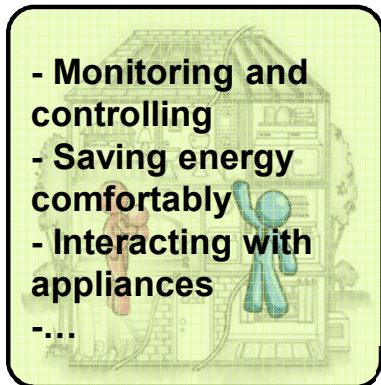
An open IoT platform

**sensiNact - Service-oriented approach for IoT
application development and deployment**

Today: Domain-centric smart solutions

SmartHome

- Monitoring and controlling
- Saving energy comfortably
- Interacting with appliances
- ...



SmartTransport

- Promoting carpooling
- Minimizing taxi delays
- Avoiding traffic jams
- ...



SmartShopping

- Managing sparkdeals
- Getting advice on buying goods
- Retrieving discount
- ...



SmartHealth



- Monitoring medicine intake
- Personalized diabetes assistance
- Providing training tips
- ...

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- Personalized diabetes assistance
- Providing training tips
- ...



- Managing parking space
- Lighting up a city efficiently
- Monitoring Air Quality
- ...

SmartCity

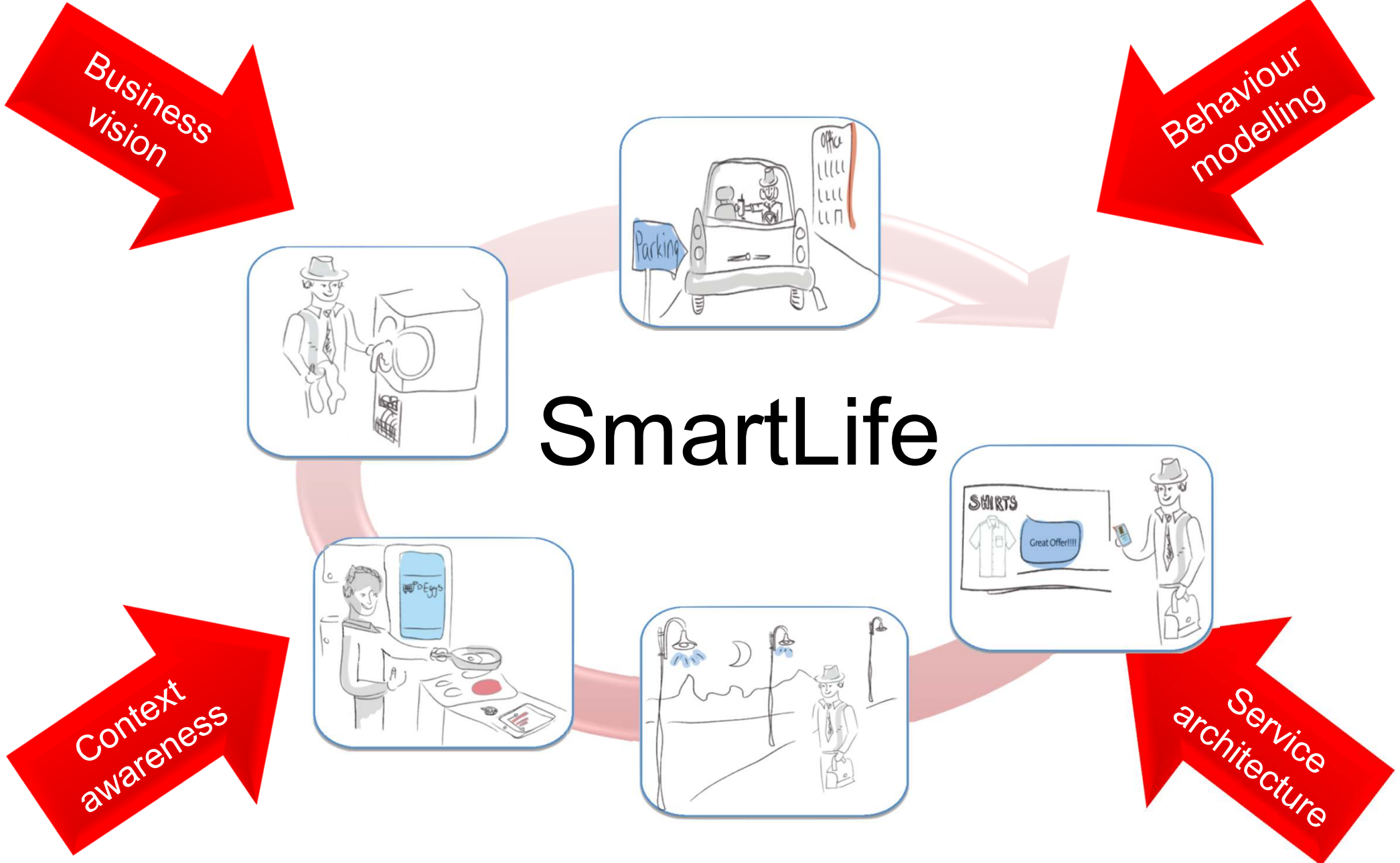
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- Managing parking space
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- Monitoring Air Quality
- ...

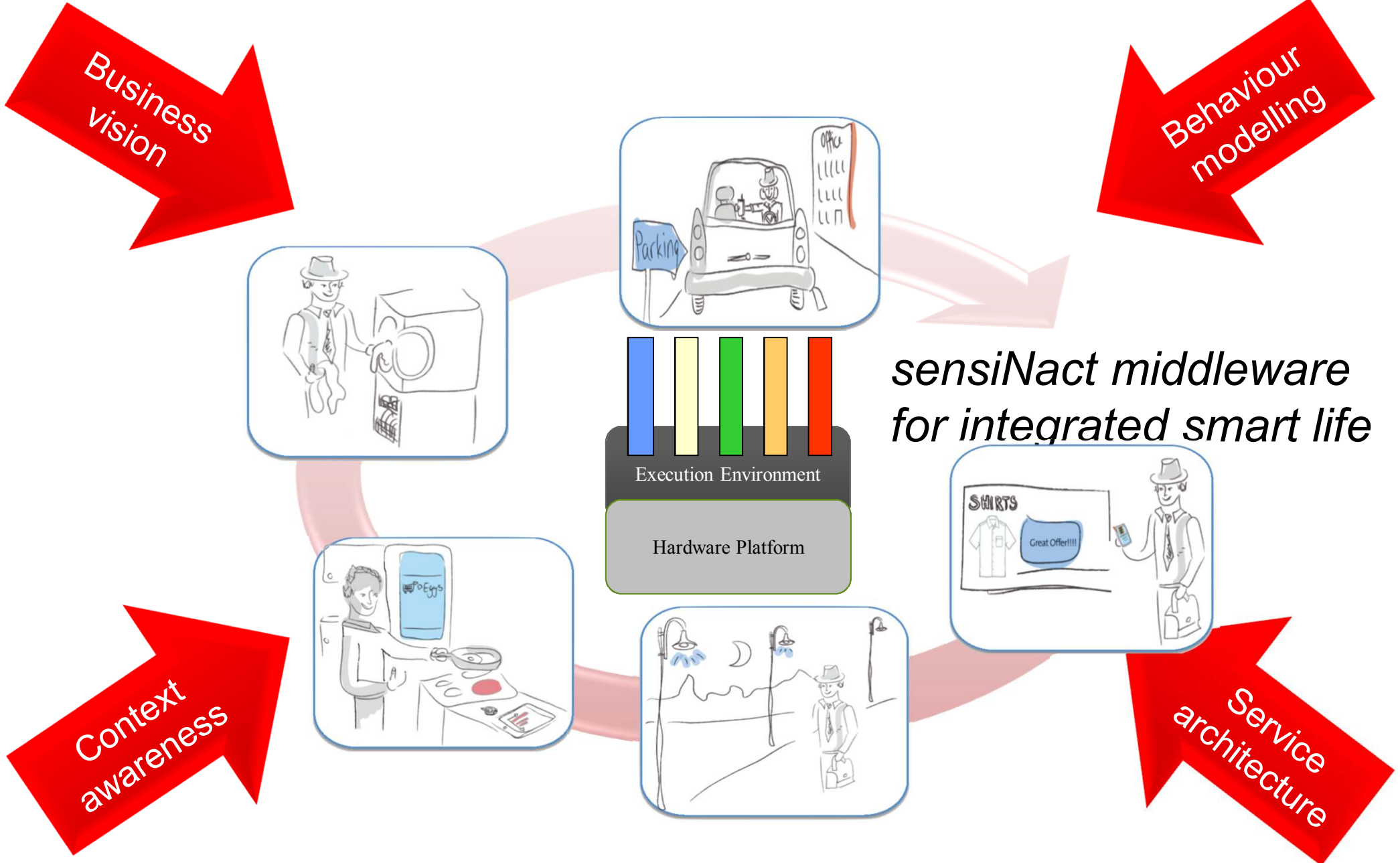


Tomorrow: horizontal smart solutions



Illustrations from the EU FP7 BUTLER project

Tomorrow: horizontal smart solutions



Illustrations from the EU FP7 BUTLER project

Heterogeneous IoT Devices



Various application domains

Smart Parking

Home-automation

Energy monitoring

Media Follow-me

Secure access

Personalized coupons



sensiNact horizontal platform

Smart Parking

Home-automation

Energy monitoring

Media Follow-me

Secure access

Personalized coupons

APIs, Data as a Service, user portal, service management portal

user context

environmental context

user future behaviour

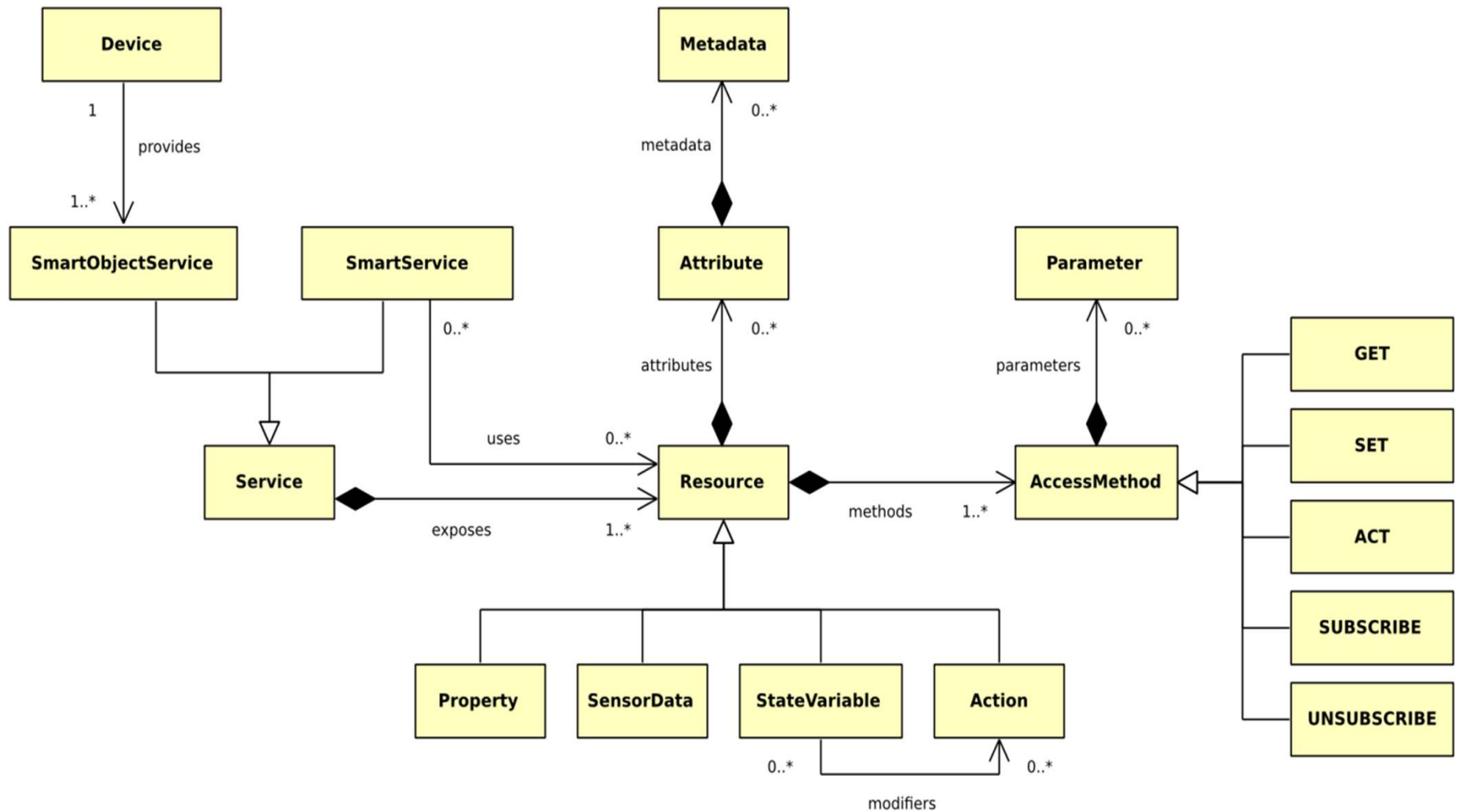
user preferences

user location

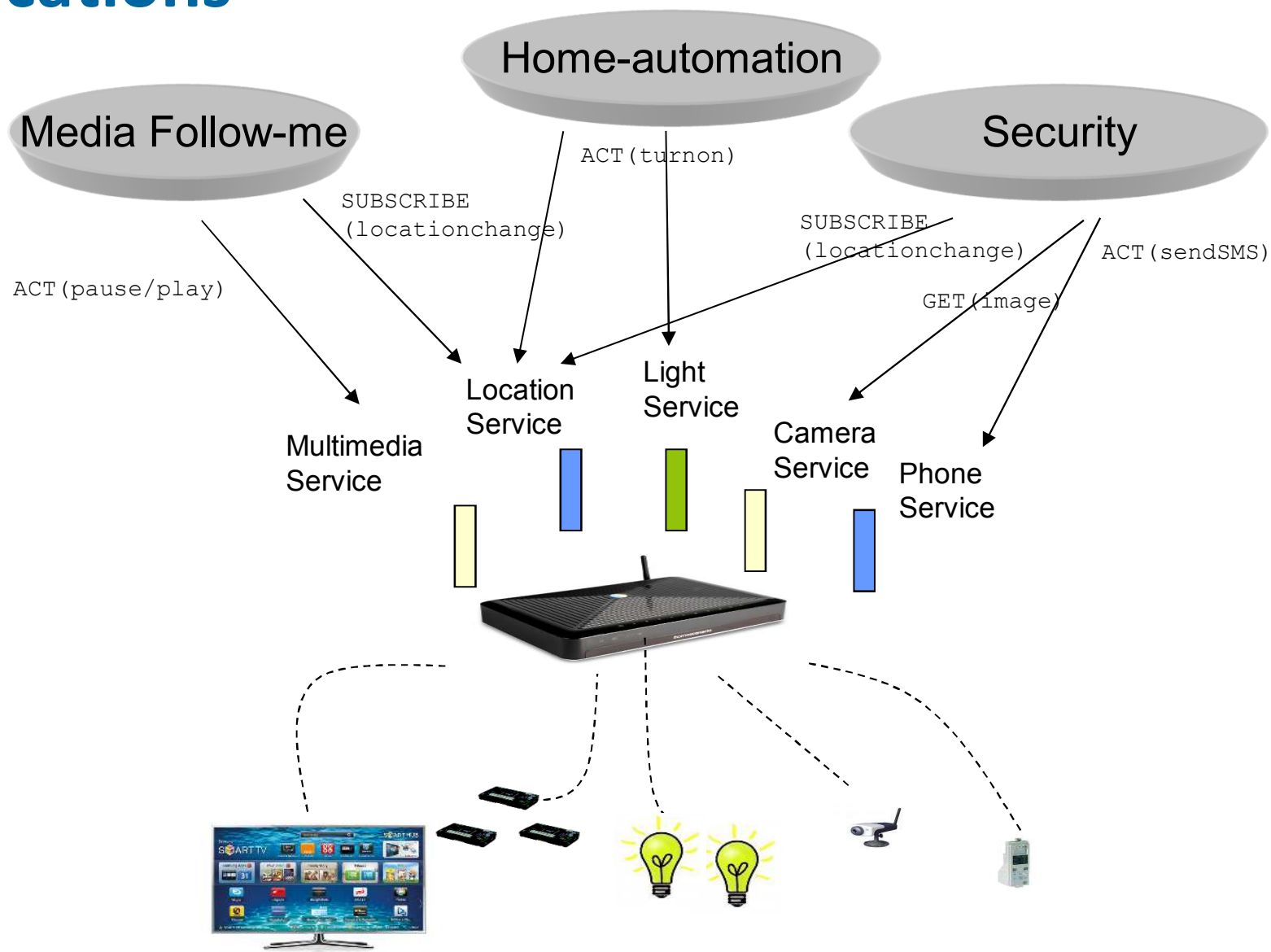
Device as a Service; device/service discovery, generic APIs for resource access



sensiNact Service/Resource Model



IoT Device as a Service: reuse of devices by different applications



sensiNact Studio: tool for IoT application development and deployment

The screenshot displays the sensiNact Studio interface, which is divided into several key components:

- Deployment View:** A map of London showing the geographical distribution of IoT devices and services. A red box highlights this area with the label "Deployment View".
- Navigator View:** A tree-like structure on the left side of the interface, listing various IoT services and devices such as "PHDGT_128045", "LEDService_PHDGT_128045", "WSPT_XBEE_1336310592", and "ZLRT_COAP_0003". A red box highlights this area with the label "Navigator View".
- Properties View:** A table at the bottom left showing the properties and values of the selected IoT device. A red box highlights this area with the label "Properties View".
- DSL editor:** A central text editor where users can write Domain Specific Language (DSL) code. A red box highlights this area with the label "DSL editor".
- Graphical Editor:** A visual programming environment on the right side, featuring a palette of components like "process_0", "turn_on", "pir", and "hal", and a workspace where these components are connected to form a logic flow. A red box highlights this area with the label "Graphical Editor".

sensiNact Studio: tool for IoT application development and deployment

The screenshot displays the sensiNact Studio interface, which is used for developing and deploying IoT applications. The interface is divided into several main sections:

- Left Panel (Project Explorer):** Lists various services and their properties. Services include ButlerDvbService, ButlerMessagingService, ButlerPlayerService, and ButlerTvService. Properties listed include channelNumber, zap, displayHtml, displayMessage, displaySms, displayWebcam, disposeHtml, disposeMessage, disposeSms, disposeWebcam, currentMedia, jumpBackwardMs, jumpForwardMs, muted, pause, play, positionMs, resume, state, stop, and volume.
- Top Center (Floor Plan):** Shows a detailed floor plan of a building with various rooms labeled, such as LOCAL ELECTRIQUE, LABO, LOCAL TECHNIQUE, and SALLE DE REUNION. The plan includes furniture like tables and chairs, and is annotated with red and blue markers.
- Bottom Left (Code Editor):** Contains a script for a process named 'process_0'. The code is as follows:

```
ON pir = pir . subscribe ( ) , hal = hal . subscribe ( ) ,  
  p = process_0 . get ( )  
  
IF pir == true and hall == close and t >= 25  
  
DO turn_on . act ( ) ;
```
- Bottom Right (Process Diagram):** A visual representation of the process logic. It shows a yellow box for 'process_0' containing a purple circle for 'average' and a yellow box for 'temperature'. The 'temperature' box is connected to 'average' with the label 't=temperature.get()'. Outside 'process_0', there are yellow boxes for 'pir' and 'hal'. 'pir' is connected to 'process_0' with 'pir=pir.subscribe()' and to a central orange condition box 'pir==true and hall==close and t>=25'. 'hal' is connected to 'process_0' with 'hal=hal.subscribe()' and to the same condition box. The condition box is connected to a yellow box 'turn_on', which is then connected to a yellow box 'turn_on.act()' with the label 'turn_on.act()'.
- Bottom Left (SensiNact Properties):** A table with columns for Property and Value, currently empty.
- Right Panel (Palette):** A vertical menu with categories: Resources, Resource, Region, BUTLER Com..., Operators, Condition, and Processor. It lists actions like GET, ACT, SUBSCRIBE, SET, and Transfer, along with icons for Condition and Processor.

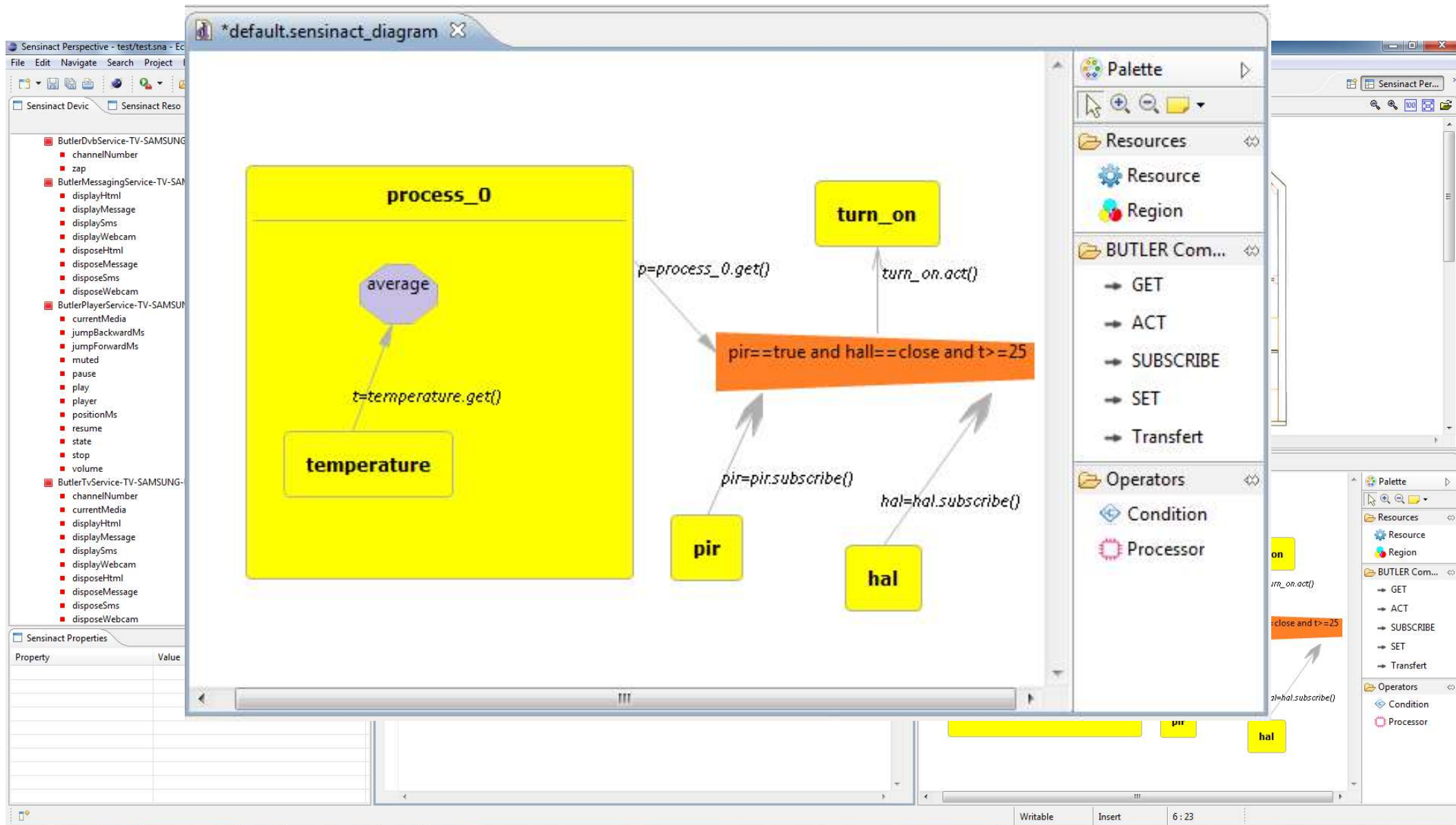
sensiNact Studio: tool for IoT application development and deployment

The screenshot displays the sensiNact Studio interface, which is divided into several main sections:

- Project Explorer (Left):** Lists project components such as `ButlerDvbService-TV-SAMSUNG-UE32ES5500-CPCGYQLKFS0VU` and `ButlerMessagingService-TV-SAMSUNG-UE32ES5500-CPCGYQLKFS0VU`, along with their associated actions like `displayHtml`, `displayMessage`, and `displaySms`.
- Indoor Services-Deployment (Center):** Shows a floor plan diagram of a room with IoT devices: a `Sona` speaker, a `Tou` (TV), a `Slid` (slide), and a `Forc` (headset). A red `PIR` sensor is also indicated.
- Outdoor Services-Deployment (Right):** Displays a Google Map of a city area with a red location pin and various street names like `Bd Clemenceau` and `Rue Jules Ferry`.
- Monitoring Graphs (Bottom Left):** Three graphs showing data evolution over time:
 - `xbec://1336310592` (PIR Evolution by time): A bar chart showing frequent pulses between 12:00:30 and 12:05:00.
 - `coap://[aaaa:0000:0000:0000:c30c:0000:0000:000a]` (SONAR Evolution by time): A line graph showing fluctuating values between 12:02:00 and 12:04:30.
 - `xbec://1336310592` (PIR Evolution by time): A step function graph showing discrete state changes between 11:28:45 and 11:29:25.
- Code Editor (Center):** Contains service interaction code:


```
presenceservice.presence.subscribe ( )
interface.service.display.act ( "John enter to school" ) ;
```
- Service Diagram (Bottom Right):** A UML-like diagram showing the interaction between `homeinterface.service` and `presenceservice`. The diagram includes:
 - A yellow box for `homeinterface.service`.
 - A yellow box for `presenceservice`.
 - An orange box labeled `true`.
 - Relationships: `homeinterface.service.display.act("John enter to school")` and `p=presenceservice.presence.subscribe()`.
- Palettes (Far Right):** A vertical toolbar with categories like `Resources`, `Region`, `BUTLER Com...`, `Operators`, and `Processor`.

sensiNact Studio: tool for IoT application development and deployment



- A DSL for building IoT applications based on Event Condition Action rules
- **ON** Event **IF** Condition **DO** Action

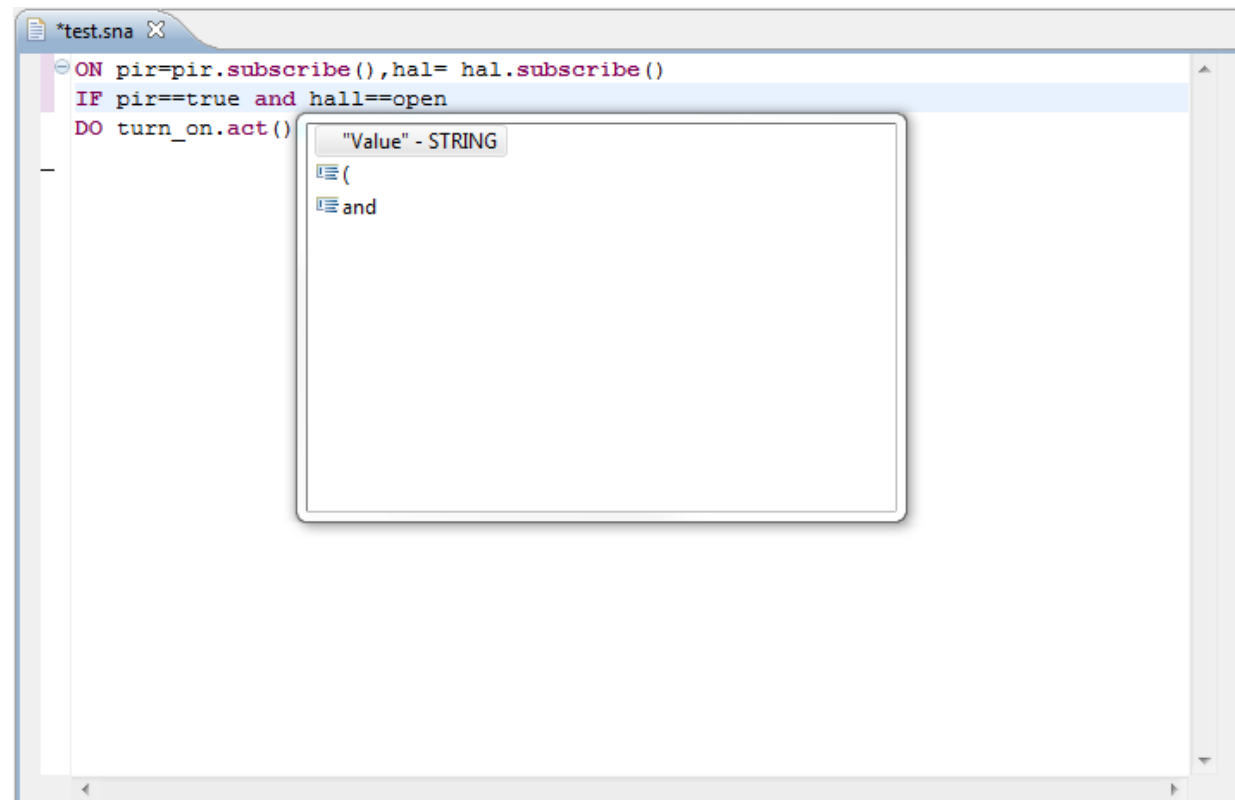
ON presence=PIRService.PIR.**subscribe**()

IF presence==true

DO LightService.lightOn.**act**();

IF presence==false

DO LightService.lightOff.**act**();



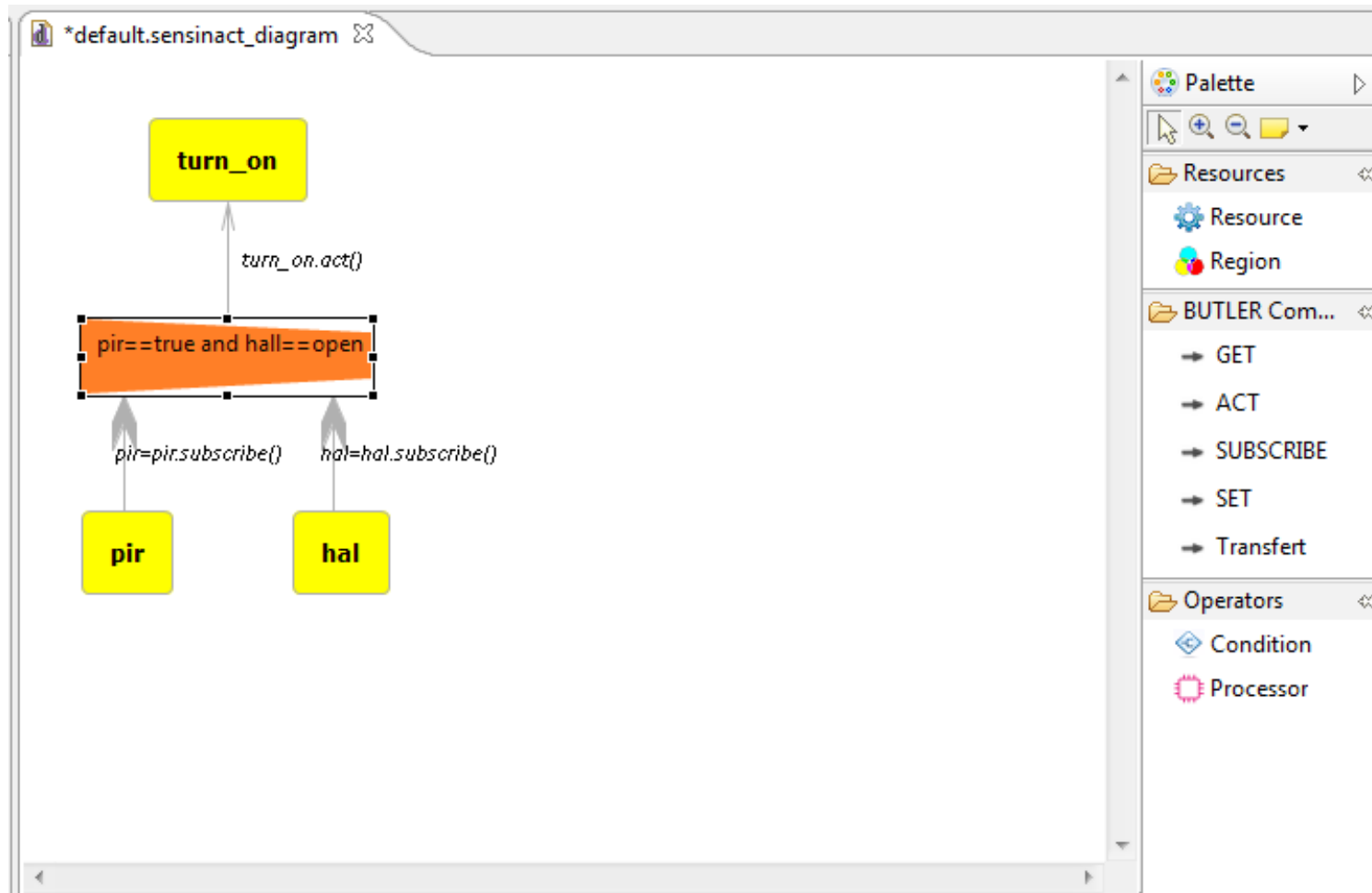
The screenshot shows a code editor window titled "test.sna". The code contains the following Event Condition Action rules:

```
ON pir=pir.subscribe(),hal= hal.subscribe()  
IF pir==true and hall==open  
DO turn_on.act()
```

A context menu is open over the code, showing the following options:

- "Value" - STRING
- (
- and

Graphical equivalence of the rule with GMF



IoT and smart city experience in European Projects

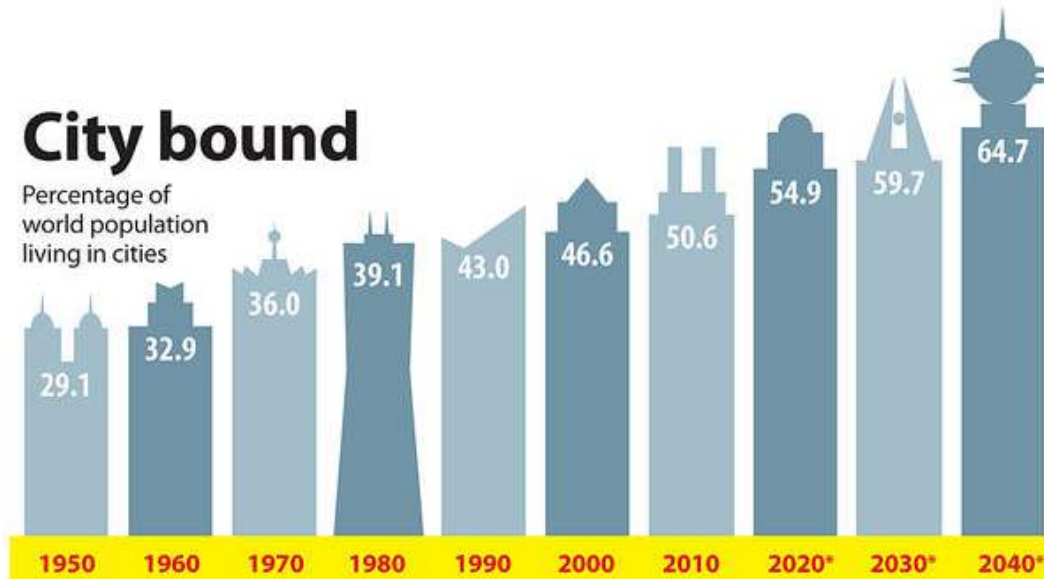
BUTLER
ClouT
OUTSMART

Context and motivation

Cities have been facing emerging challenges such as efficient energy management, economic growth and development, security and quality of life of its habitants

City bound

Percentage of world population living in cities



SOURCE: United Nations, Department of Economic and Social Affairs, Population Division

*Projected

RICH CLABAUGH/STAFF

- More than half of the world population lives in cities
- On 2% of the earth's surface, cities use 75% of the world resources
- Urban areas of the world are expected to absorb all the population growth expected over the next four decades while at the same time drawing in some of the rural population.
- Urban population percentage is around 75% in Europe

Europe should take immediate measures in order to transform cities into “smart cities” that better manage their resources, keep (and increase) the quality of life and security of their citizens

EU FP7 BUTLER Project



**uBiquitous, secUre inTernet-
of-things with Location and
contExt-awaReness**



FP7 call: FP7-ICT-2011-7

Integrated Project

October 2011 – September 2014

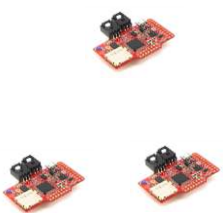
15 M€

1234 man-months



BUTLER Gateway – overall architecture

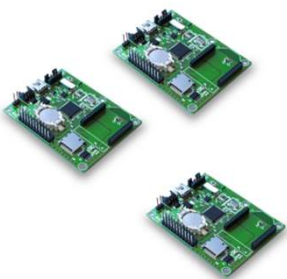
BUTLER
Devices



Zolertia (CoAP)



Wasmote (Zigbee,)



TST Motes (multi-protocol,
proprietary API)



Zigpos (Zigbee,
proprietary API)



SunSPOT (802.15.4,
JAVA APIs)



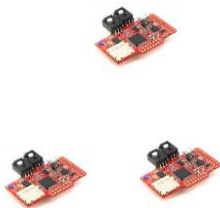
Smart TV (UPnP or
proprietary API)

BUTLER Gateway – overall architecture



**BUTLER
Gateway**

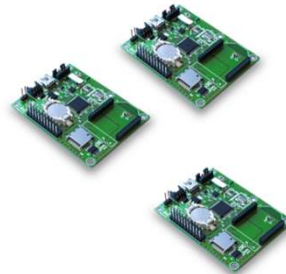
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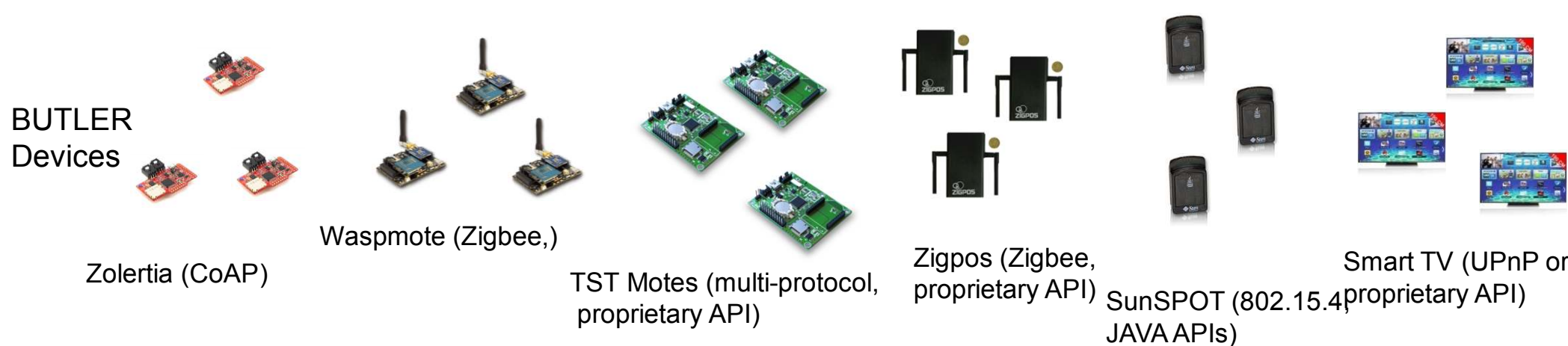
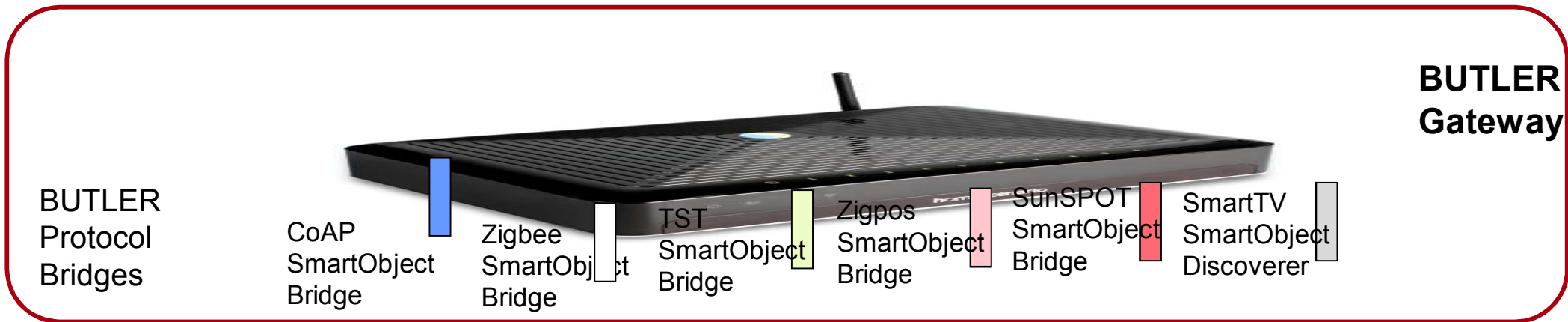


SunSPOT (802.15.4,
JAVA APIs)

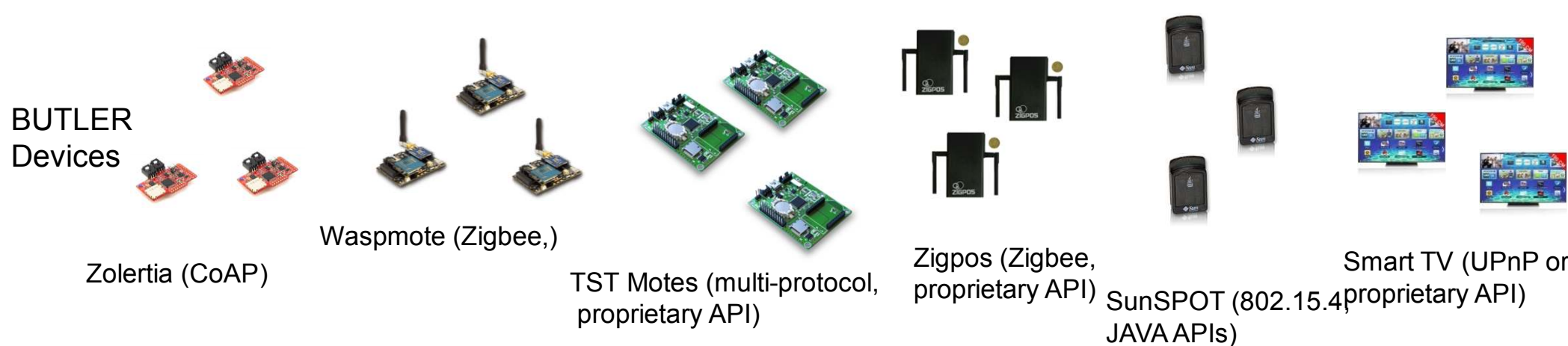
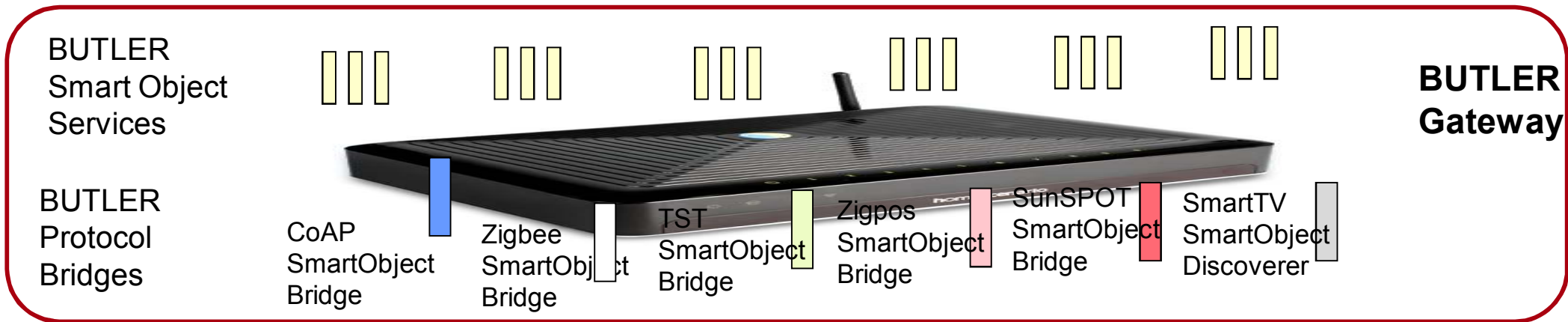


Smart TV (UPnP or
proprietary API)

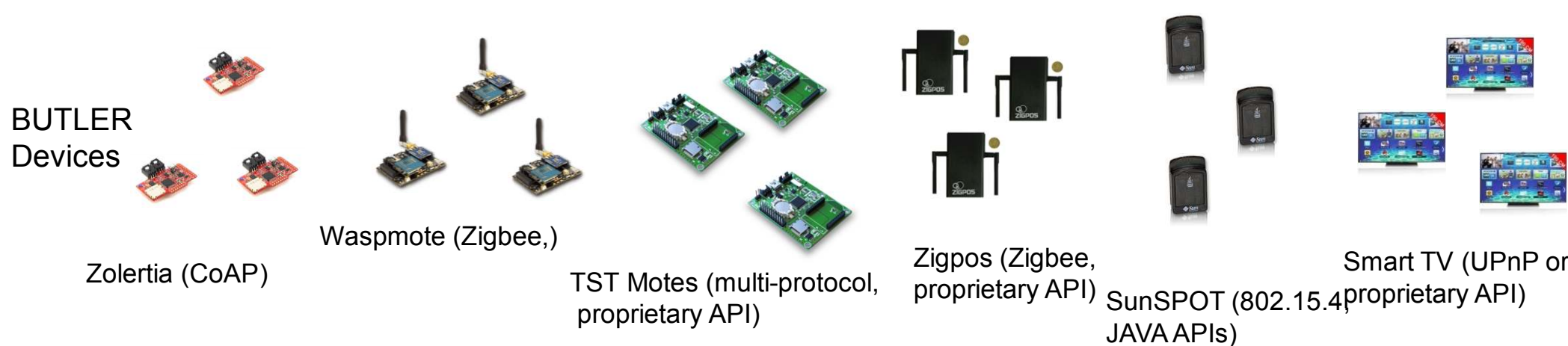
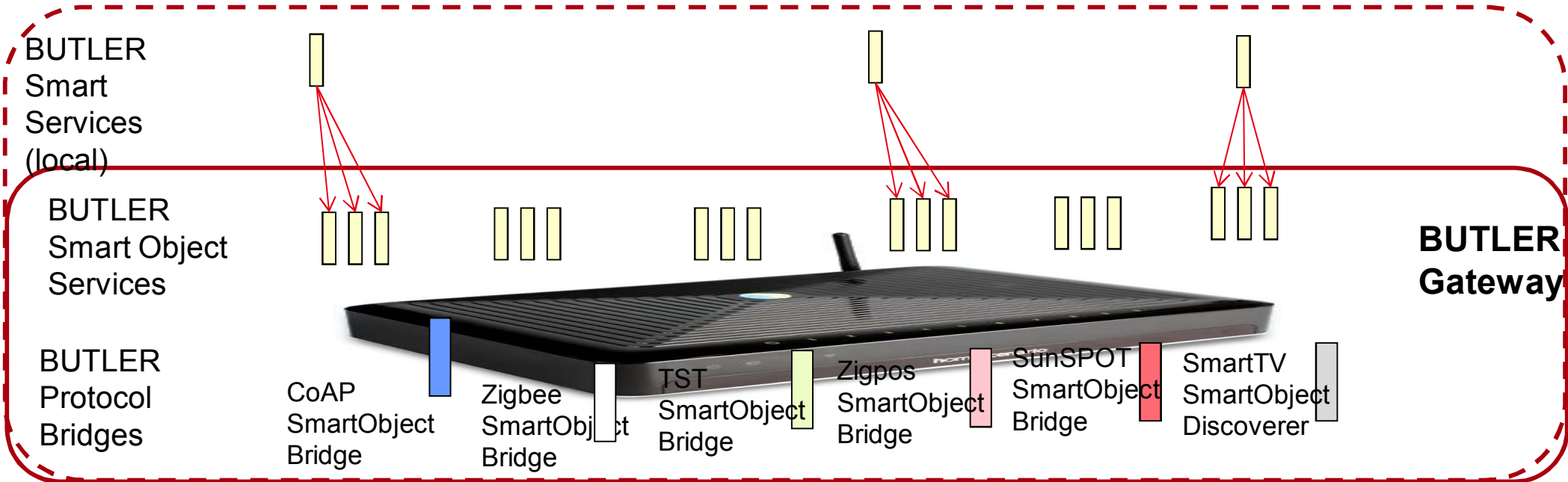
BUTLER Gateway – overall architecture



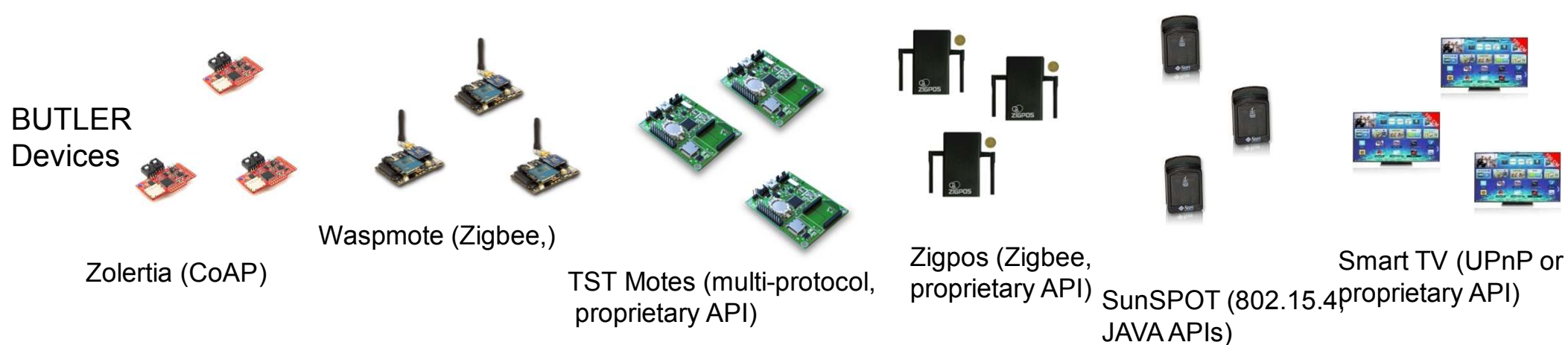
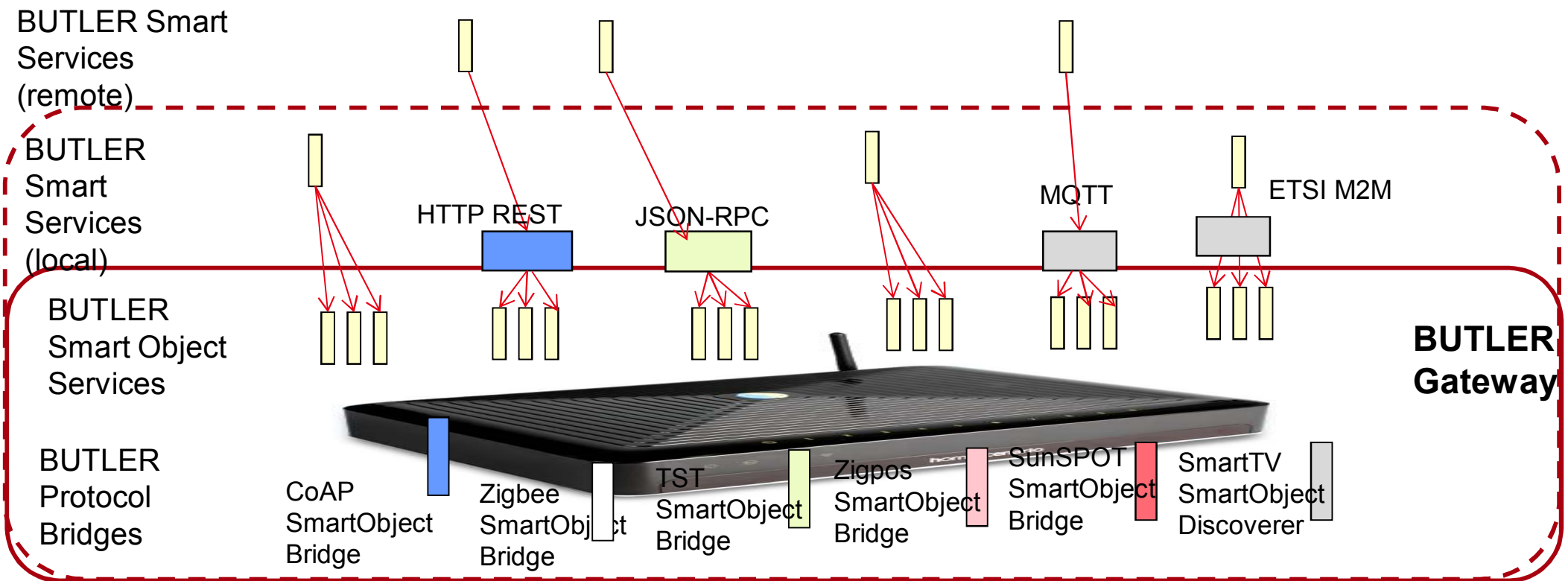
BUTLER Gateway – overall architecture



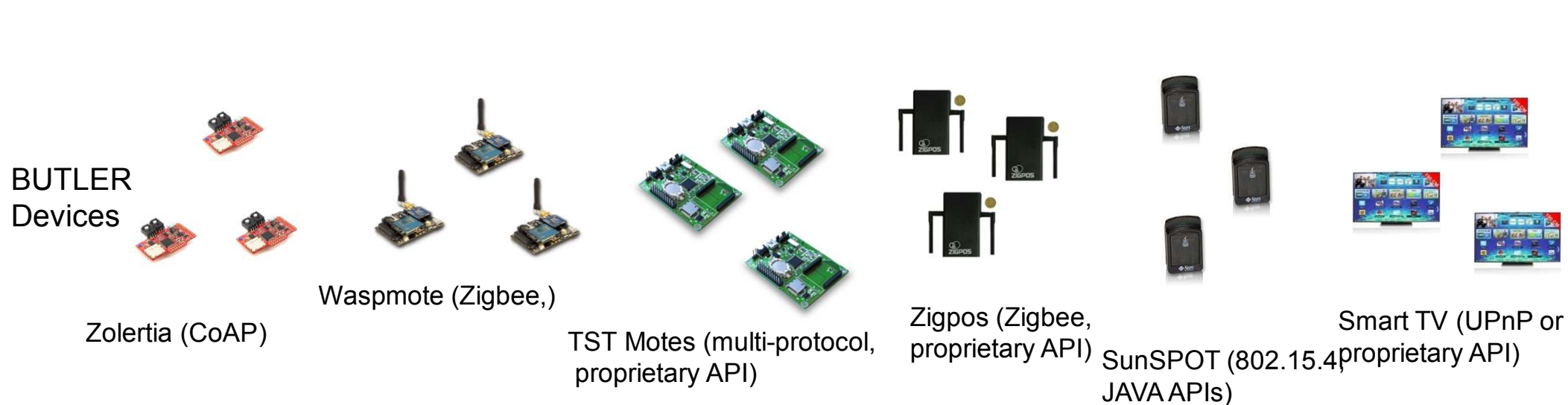
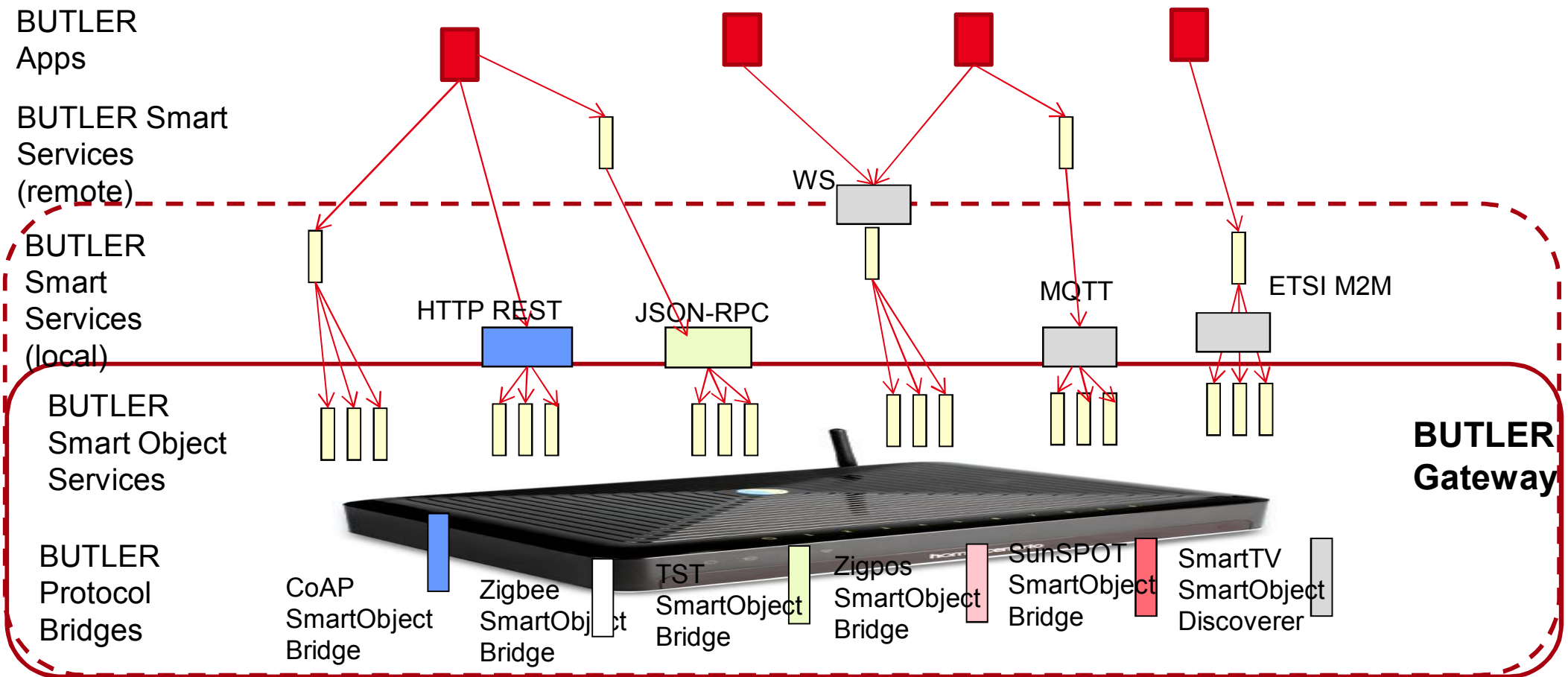
BUTLER Gateway – overall architecture



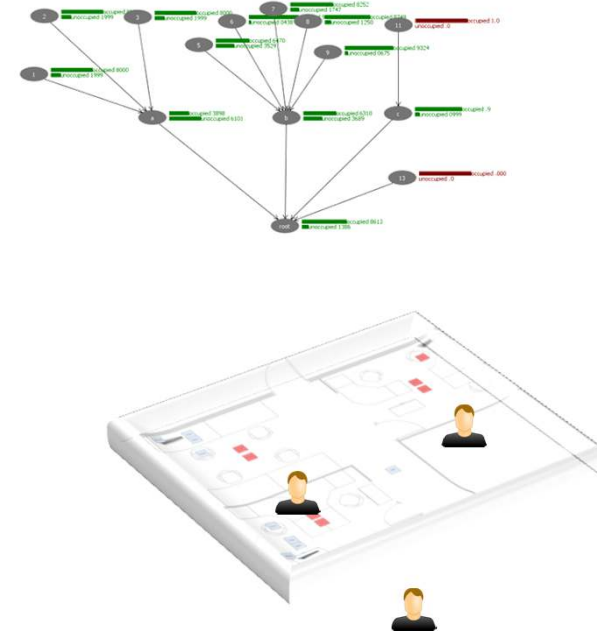
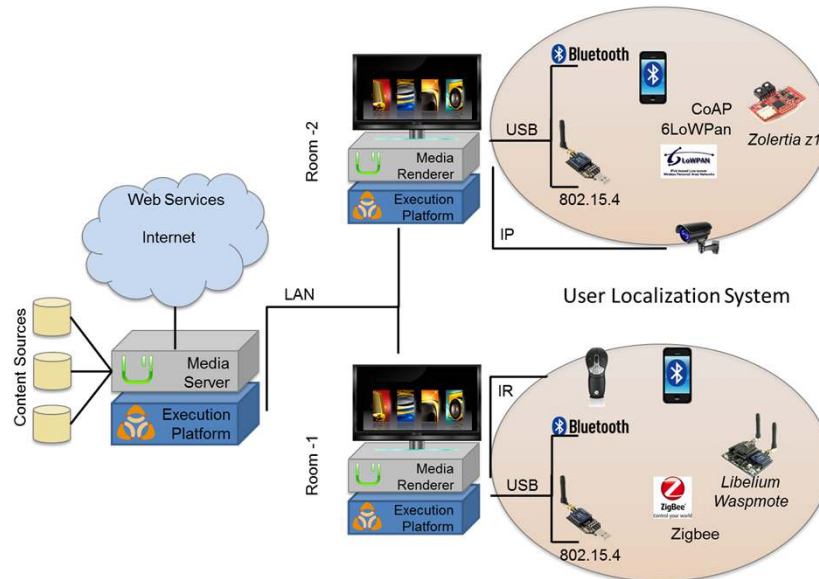
BUTLER Gateway – overall architecture



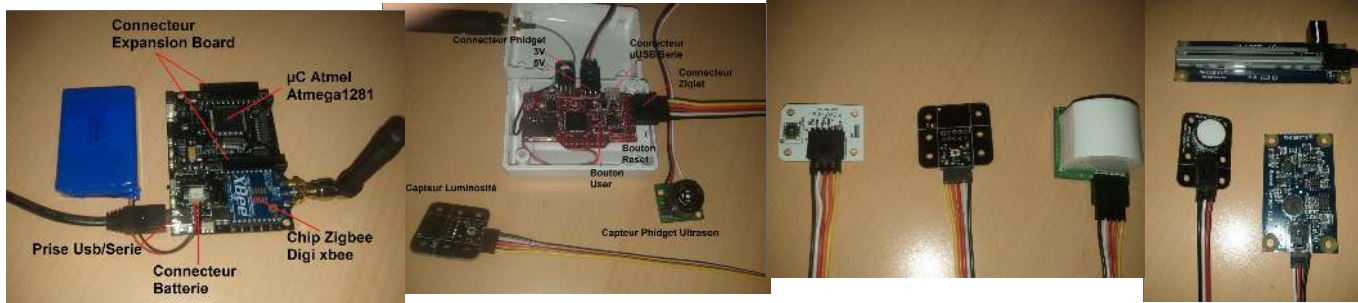
BUTLER Gateway – overall architecture



Smart Home – multimedia follow me and pick me



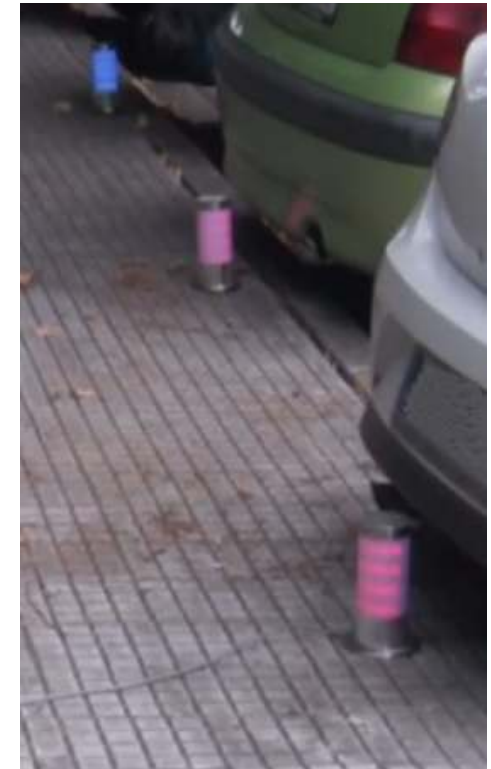
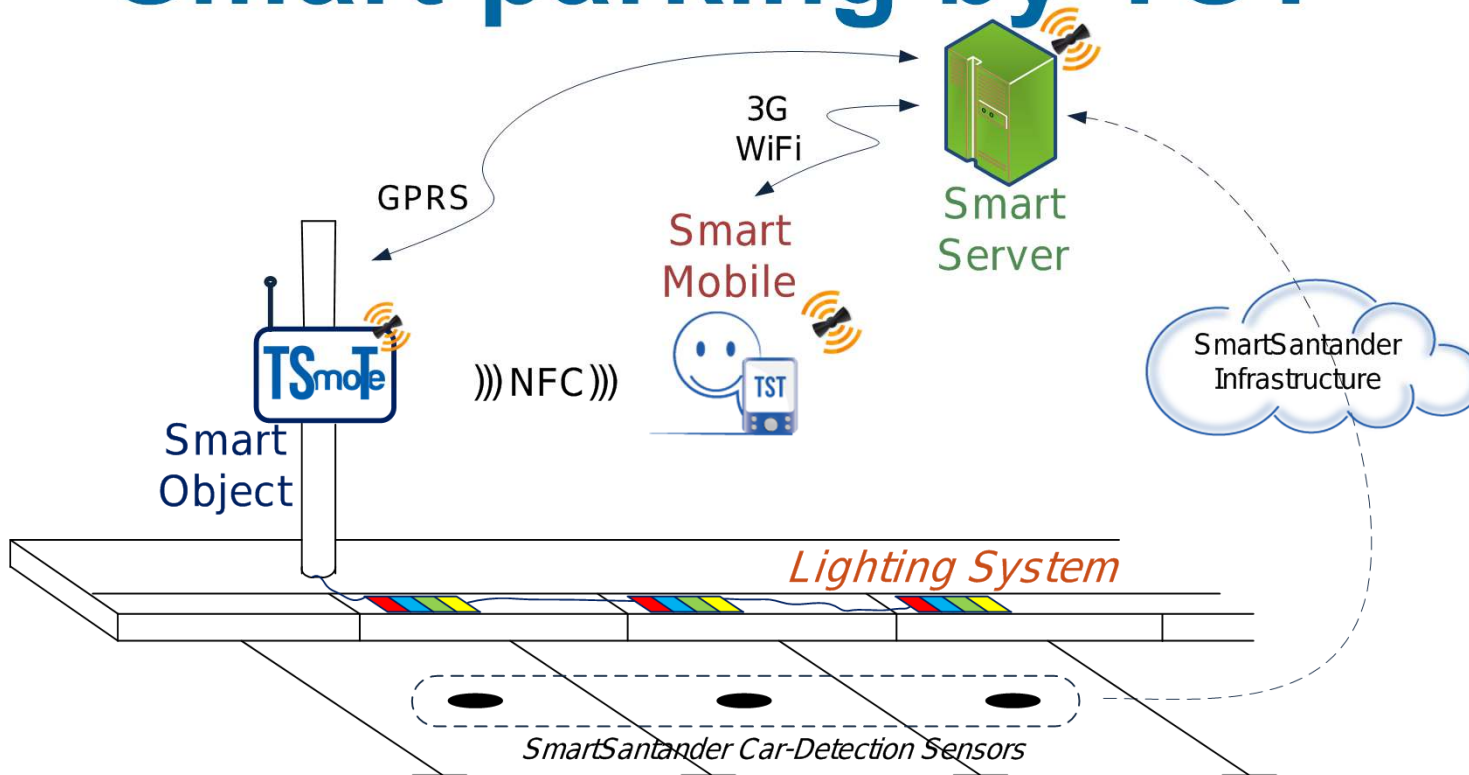
6LoWPAN and Zigbee based sensors for localisation



UPnP for media service



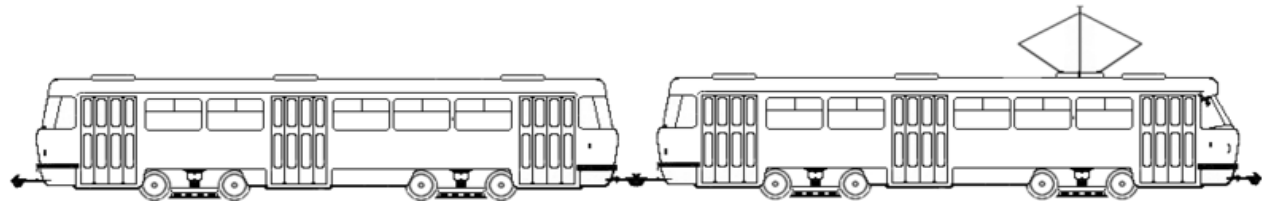
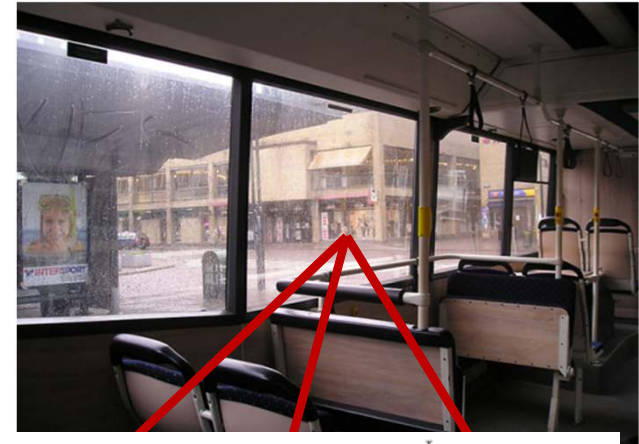
Smart parking by TST



Smart transport, Zigpos in Glacier Express (access right management for staff)



Smart transport, passenger localisation





ClouT: Cloud of Things for empowering the citizen clout in smart cities

AT A GLANCE

Project coordinator :

ClouT-EU: **Levent Gürgen, CEA-LETI, France**

ClouT-JP: **Yoshio Saito, NTT East, Japan**

Partners:

ClouT-EU
Engineering, Italy
Universidad de Cantabria, Spain
ST Microelectronics SRL, Italy
Ayuntamiento de Santander, Spain
Comune di Genova, Italy

ClouT-JP
NTT East
NTT R&D
Keio University
Panasonic System Solution
National Institute of Informatics

Duration: 36 months

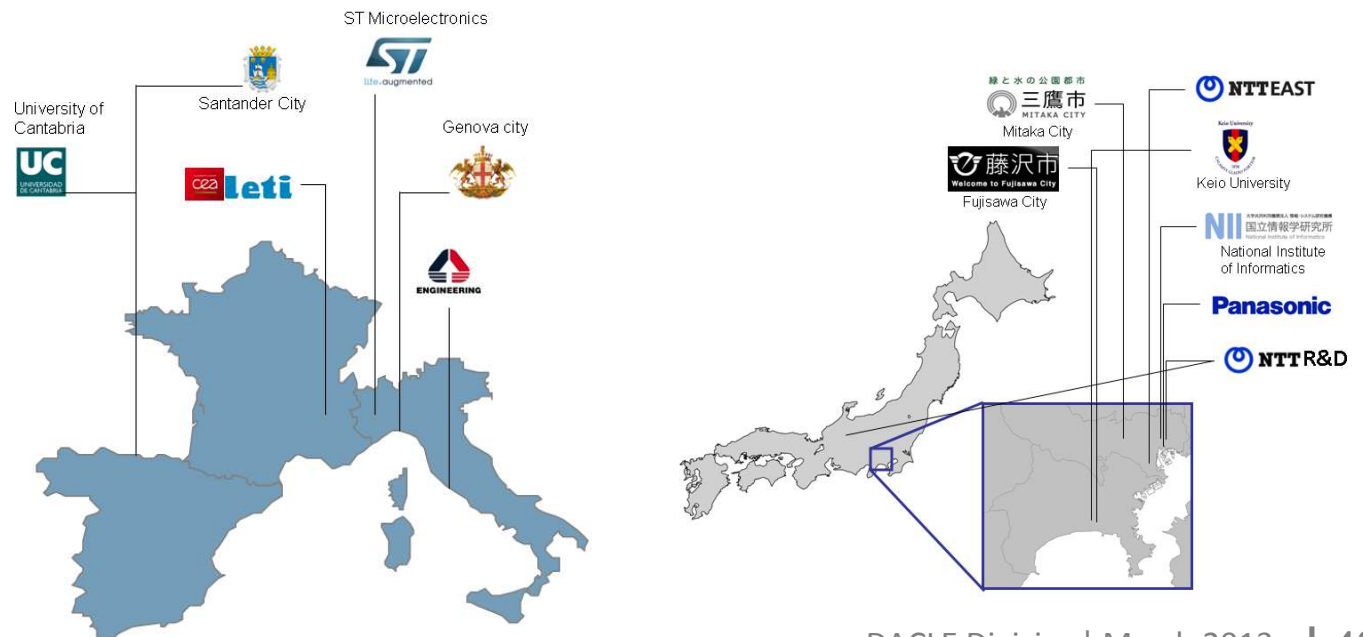
Total cost: €2,32M for ClouT-EU
€1,5M for ClouT-JP, funded by NICT

Programme: FP7-ICT-2013- EU-Japan

Further information:

<http://clout-project.eu>

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ClouT Objectives

1. Bridging Internet of Things and Internet of People by exploiting the Cloud paradigm, enabling end to end business and social scenarios
(*Cloud+IoT = ClouT*)

- Extend the IoT with Cloud capabilities
- Enable secure and easy access to city resources via services
- Support mash-up and integration of city services

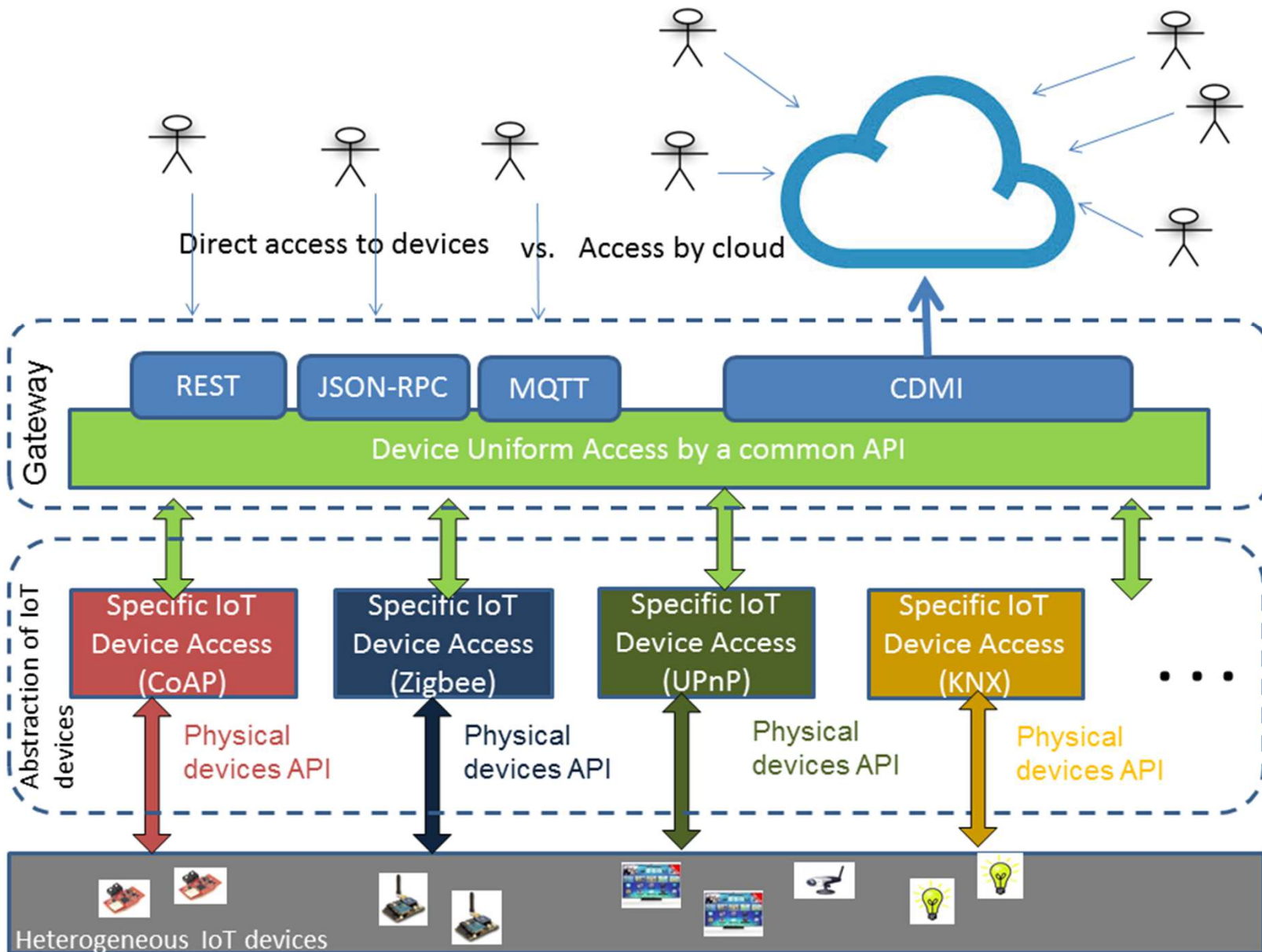
2. Prototyping and validating the ClouT Reference Architecture to enable Smart City ecosystems

- Support development and execution of apps for cities
- Deployments on 4 pilot cities
- Show feasibility of new business models

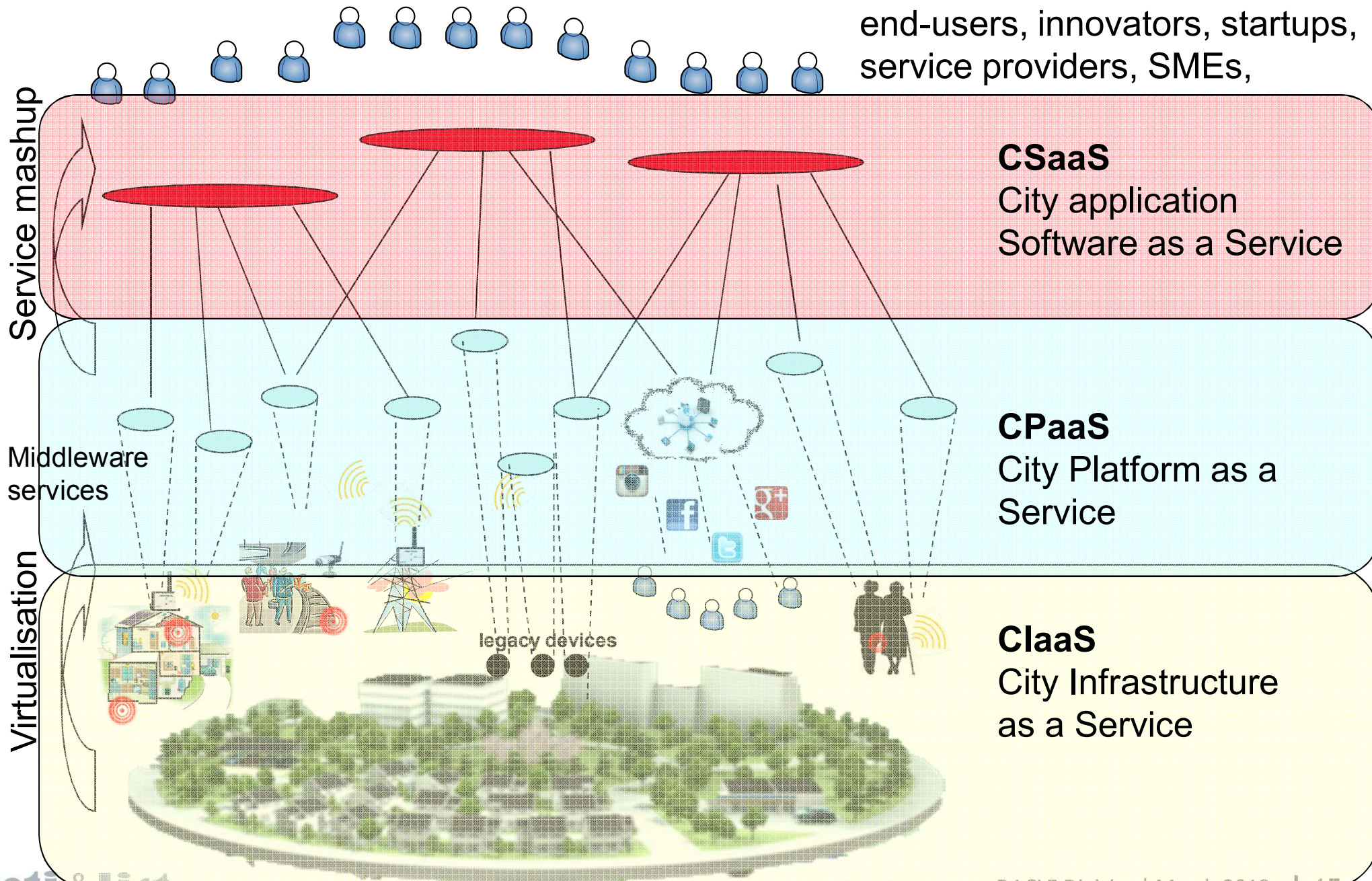
3. Join the forces and create a long lasting synergy for Smart City initiatives between Europe and Japan

- Exchange of best practices and lessons learned
- Joint development of sustainable solutions
- Establish mutual understanding and trust

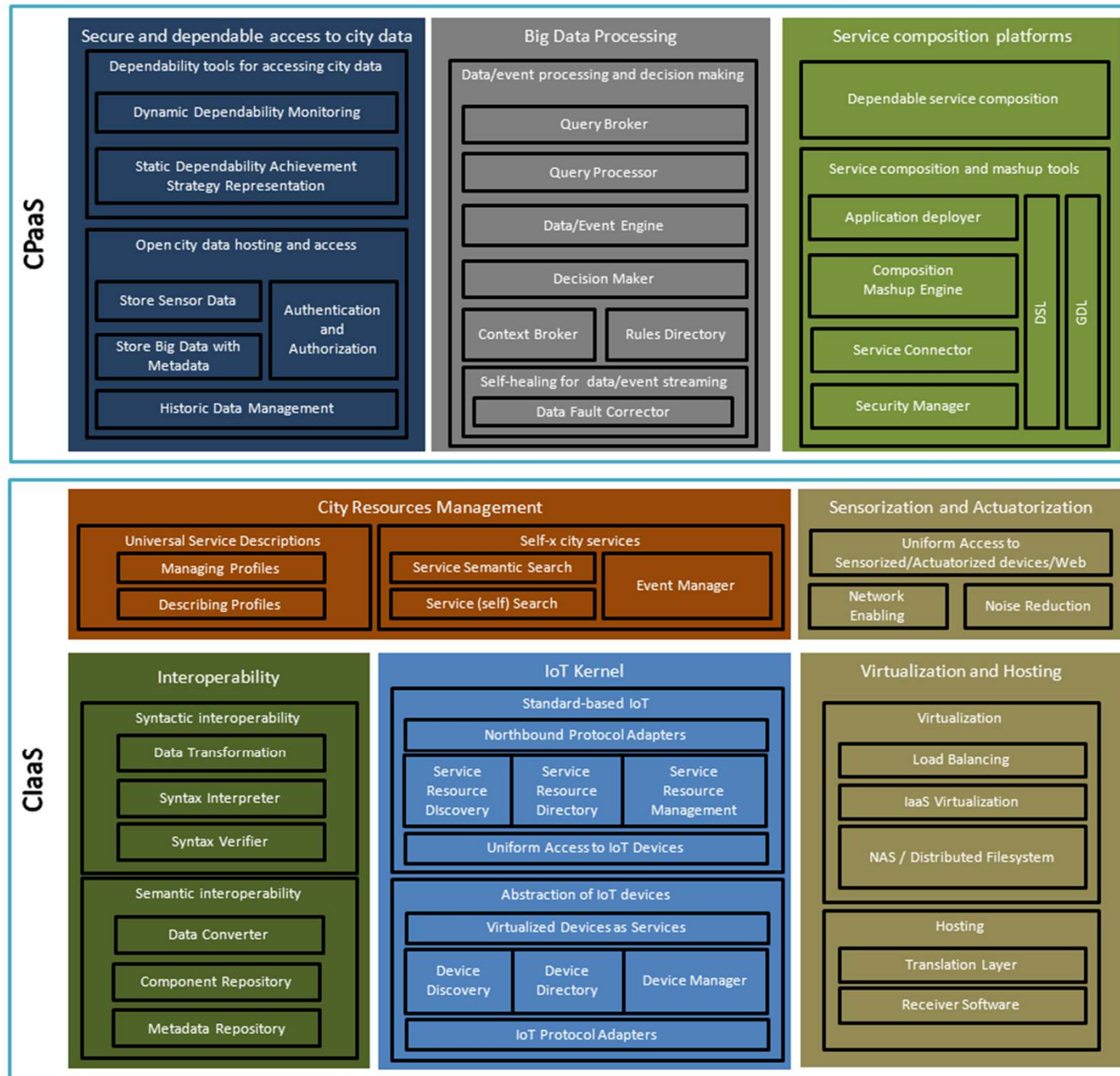
From IoT to Cloud



Cloud model for IoT Services

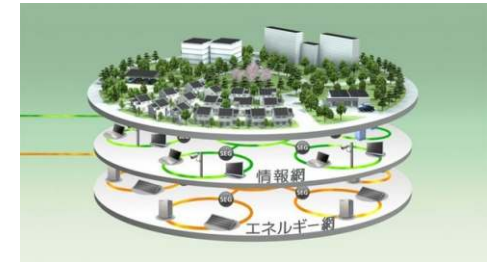


ClouT Architecture



Use cases and field trials in 4 pilot cities

- Participatory sensing
 - Participatory citizen
 - Sensing loop citizens
- Urban context-aware
 - Multi-modal transportation
 - Event perception support
 - Interactive city infrastructures
 - Sharing IoT devices in the Cloud
 - Augmented mobility
- Safety, emergency and health management
 - Risk warning and management
 - Caring of elderly people
 - Health and active walking support



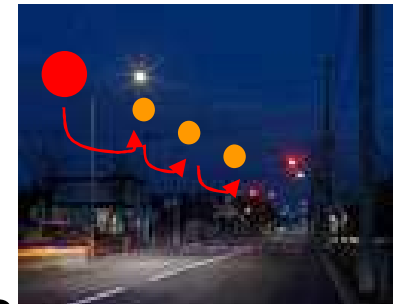
Santander

Fujisawa



Genova

Mitaka



Santander



maps.smartsantander.eu

Santander, existing infrastructure

Environmental monitoring



Smart irrigation



mobile nodes on city buses and taxis



Parking sensors



Guiding drivers



Traffic sensors

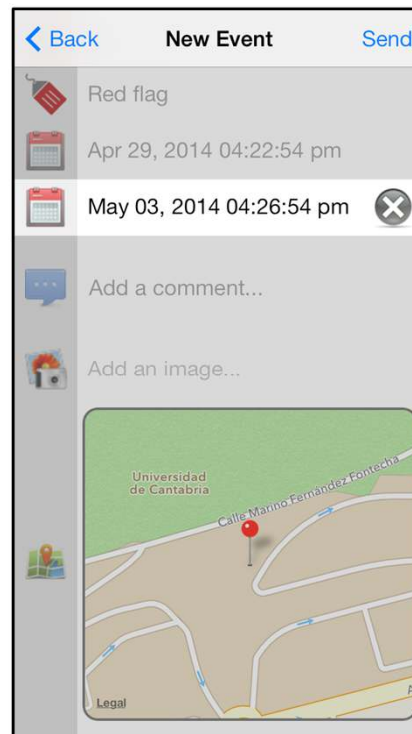


Participatory sensing in Santander

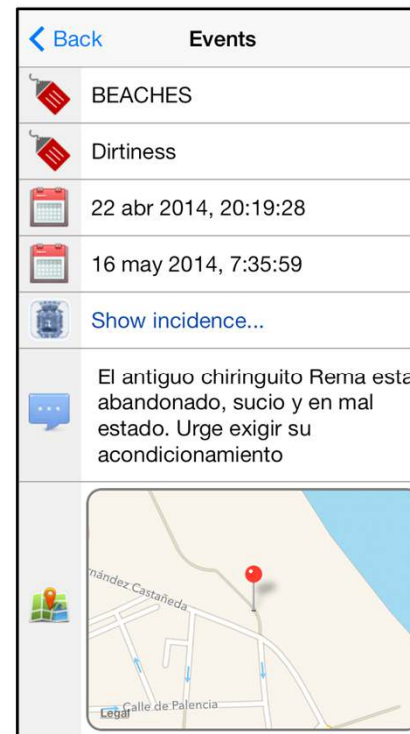
1. Reported events



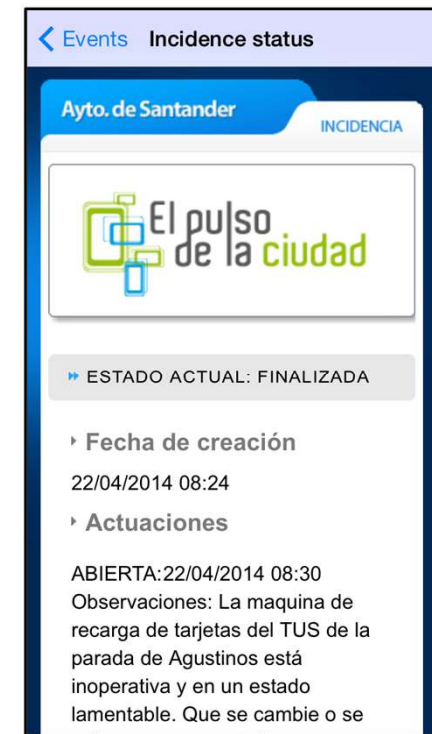
2. New event



3. Event information



4. Incidence status



Genova



Smart port

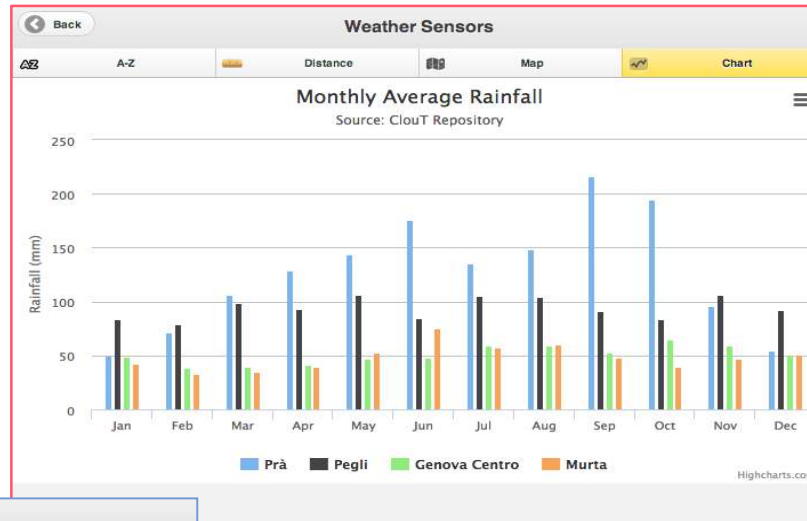


Flooding detection and alerts

Genova environmental data in the Cloud

ioNonRischio
Powered by ClouT

- VMS (Video Message System)**: It is the management system of the variable messaging panels.
- Webcam System**: Infomobility Webcam System.
- Weather Sensors**: Weather Sensors can export a series of detailed informations.



Weather Sensors

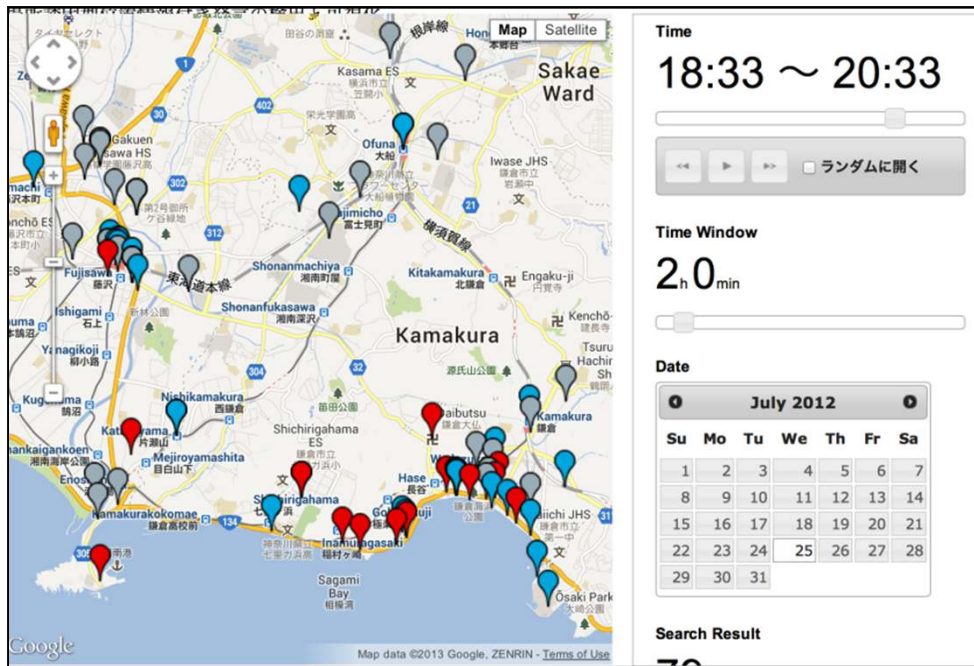
Station Name	Rain (mm/h)	Wind (km/h)	Temperature (°C)	Distance (meters)
Pegli	0.0	0.0	15.1°	983
Sestri Ponente	0.0	0.0	14.4°	1,363
Pra	0.0	1.7	14.1°	3,684
Borzoli	0.0	0.0	13.0°	3,850
Sampierdarena	0.0	0.0	14.6°	4,591
Pra Cep	0.0	0.0	13.4°	5,078
Scarpino	0.0	0.0	9.2°	5,342

Webcam
Webcam: Piazza Corvetto

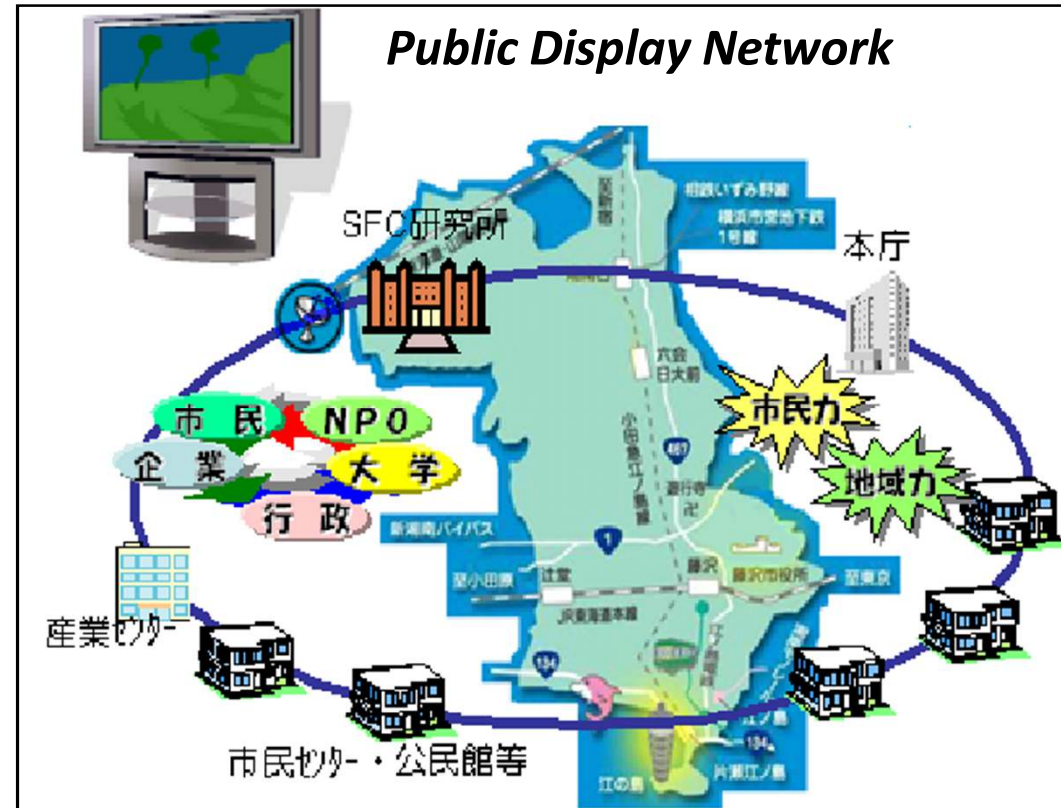
24/04/2014 02.35.30

Fujisawa

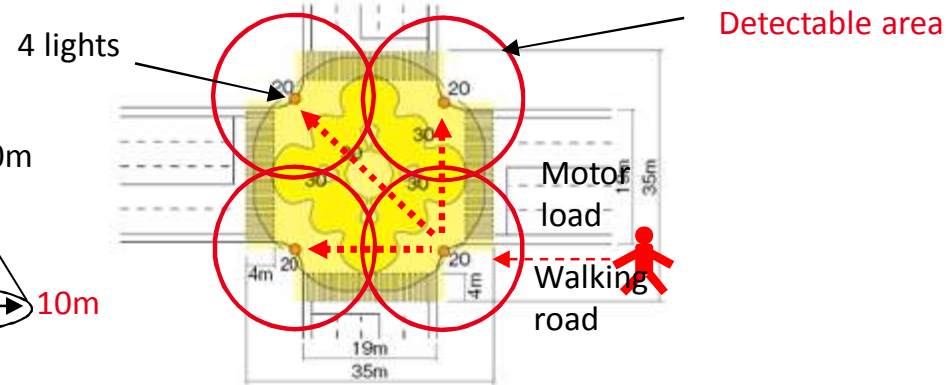
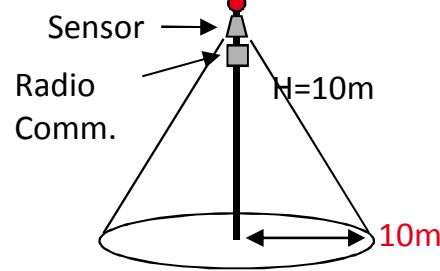
Event analysis



Public Display Network



Smart light and camera system





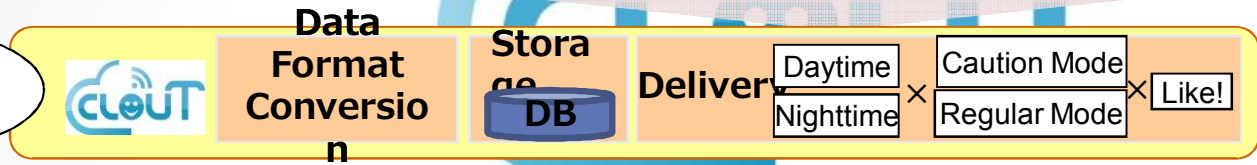
Create new space value
by fusion of visual projection & lighting

Projection Lighting

Fujisawaoooo!-Interactive Street @ Subana-

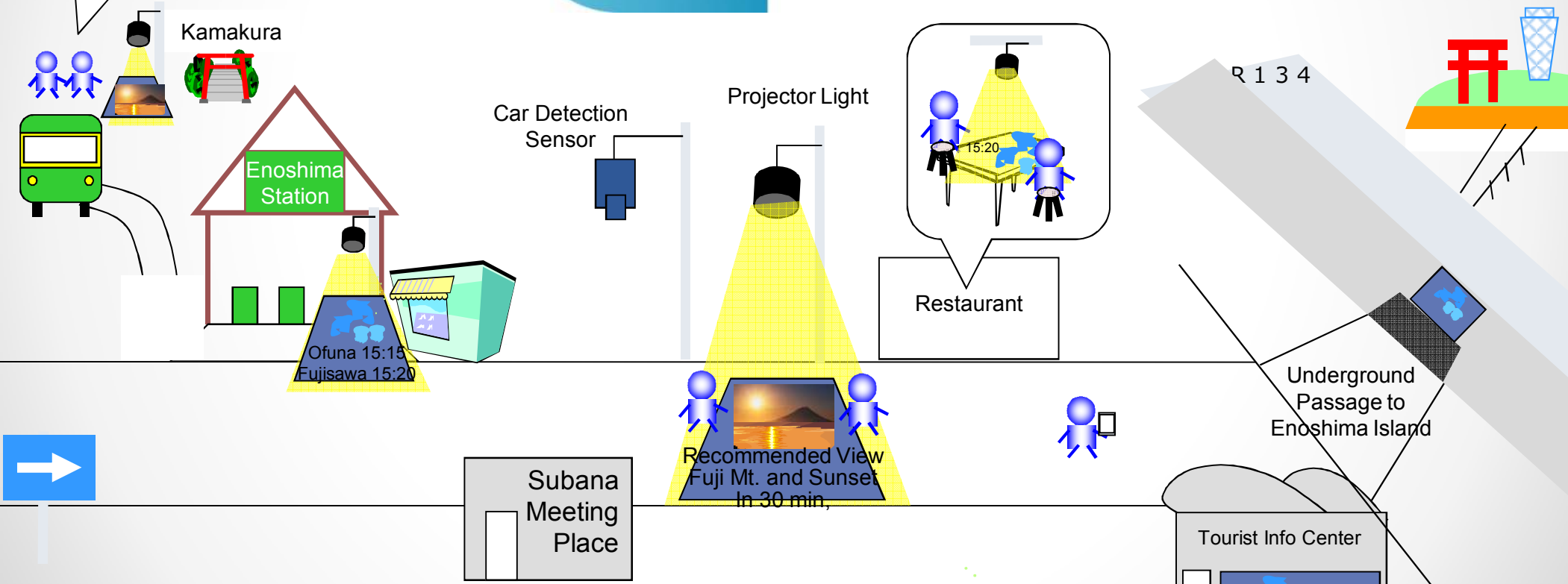


Input Data from Sensor or Database



慶應義塾 (Keio University) | NTT
 Info from Sensor and Citizens | Analysis | Anonymity

Let's go to Enoshima to see the sunset!

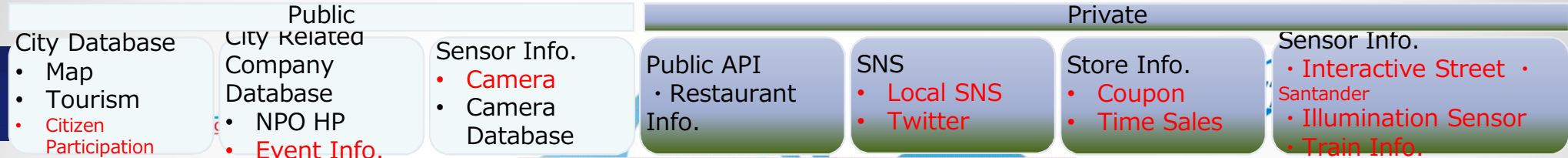


【Regular Mode】

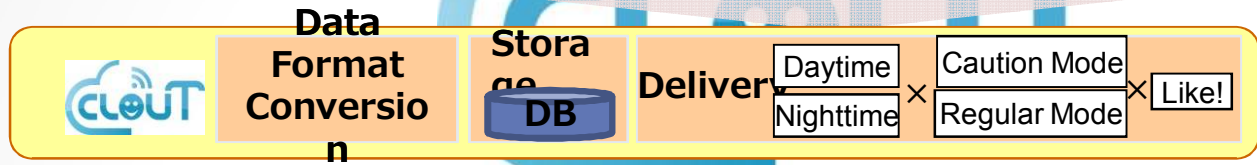
- Shop/Tourism Info.
- Info from Citizens
- Train/Station Info.

Tourist Info Center
 For Ofuna 15:15
 For Fujisawa 15:20

Fujisawaoooo!-Interactive Street @ Subana-

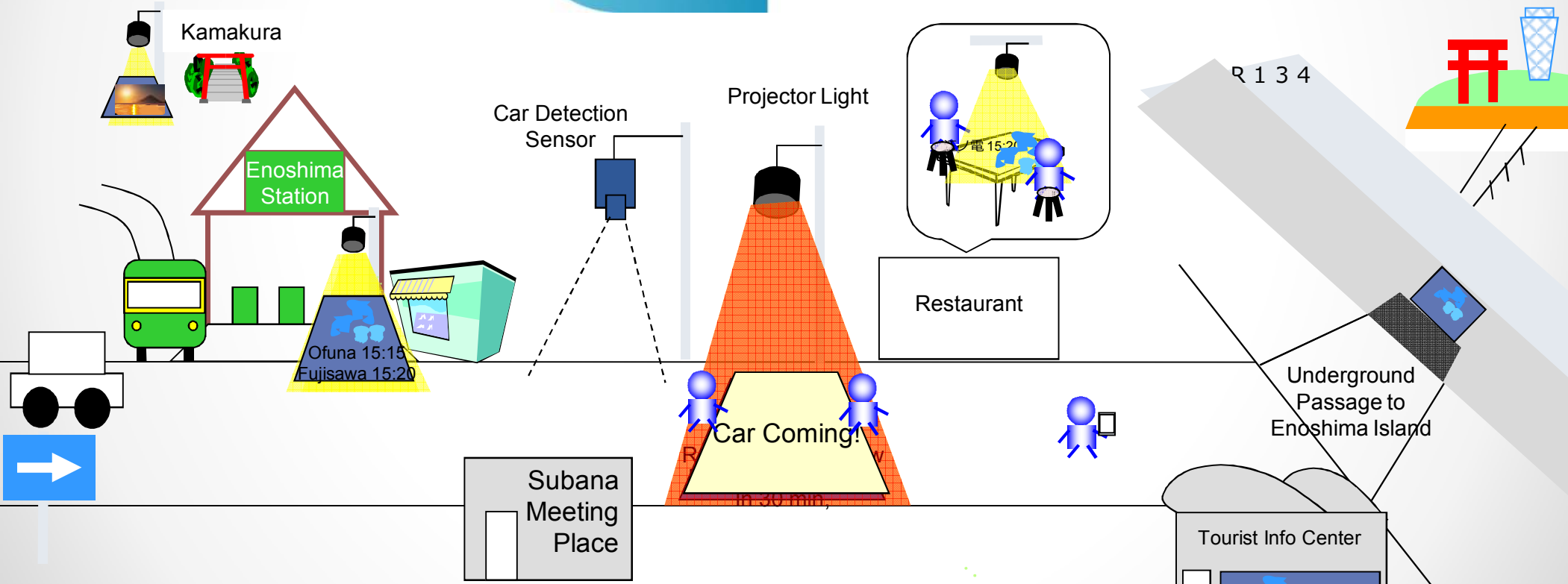


Input Data from Sensor or Database

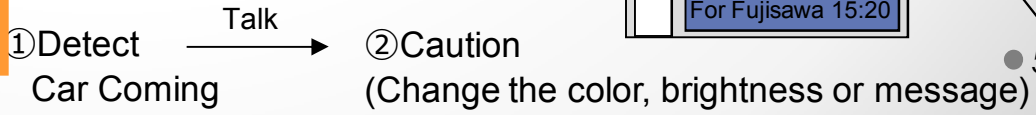


慶應義塾 (Keio University) | NTT

Info from Sensor and Citizens | Analysis | Anonymity



[Caution Mode]



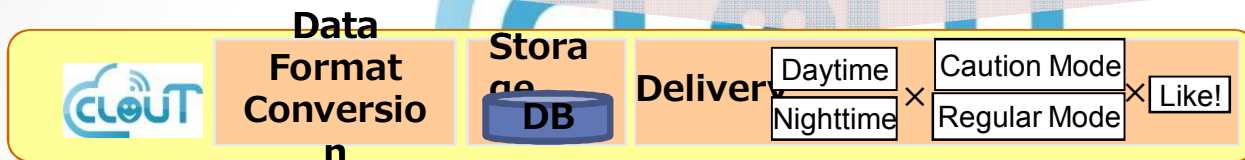
Fujisawaoooo!-Interactive Street @ Subana-



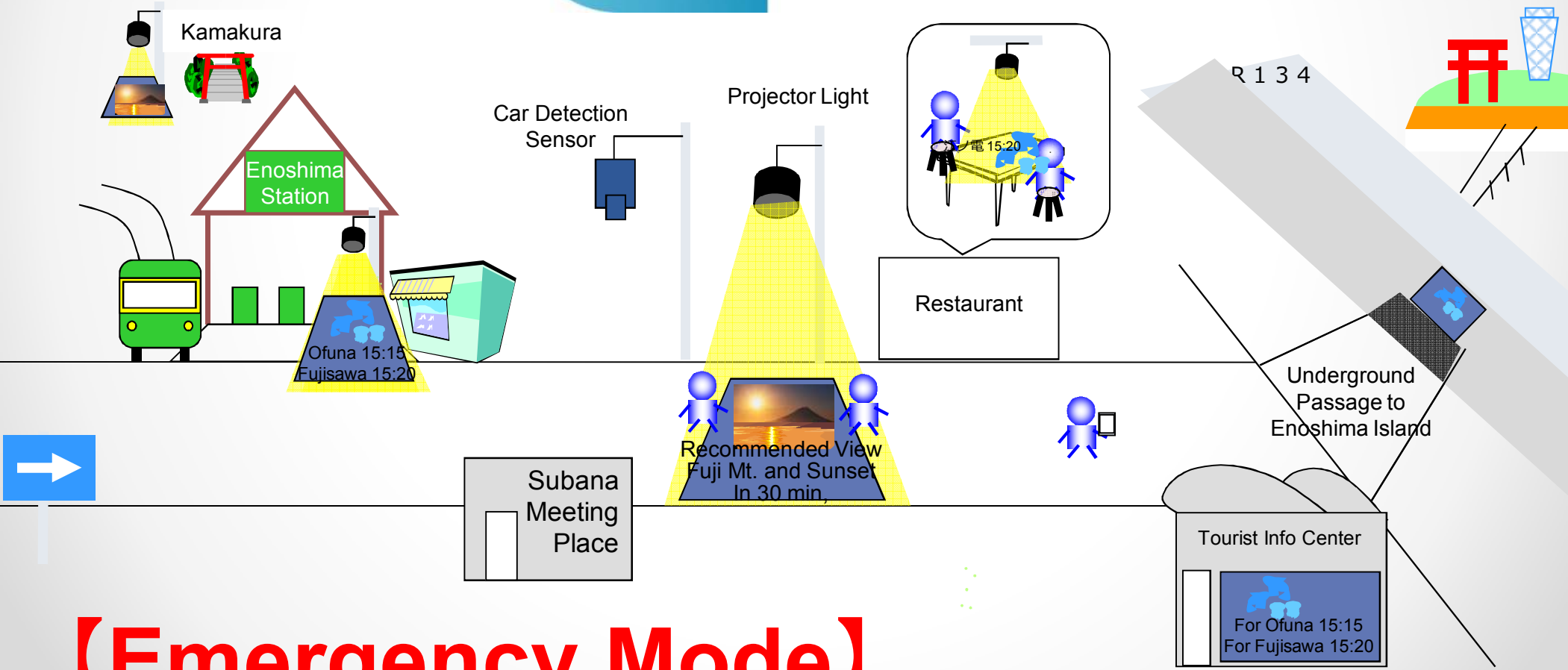
目指せ！
東京利光°ツ採用
CodeName:おもてな
Things



Input Data from Sensor or Database



慶應義塾 (Keio University) | NTT
 Info from Sensor and Citizens | Analysis | Anonymity

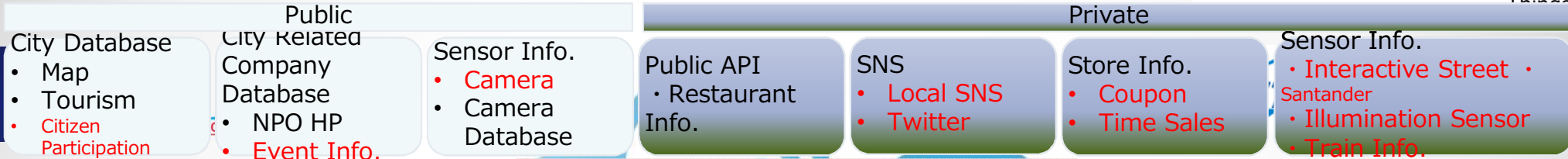


[Emergency Mode]

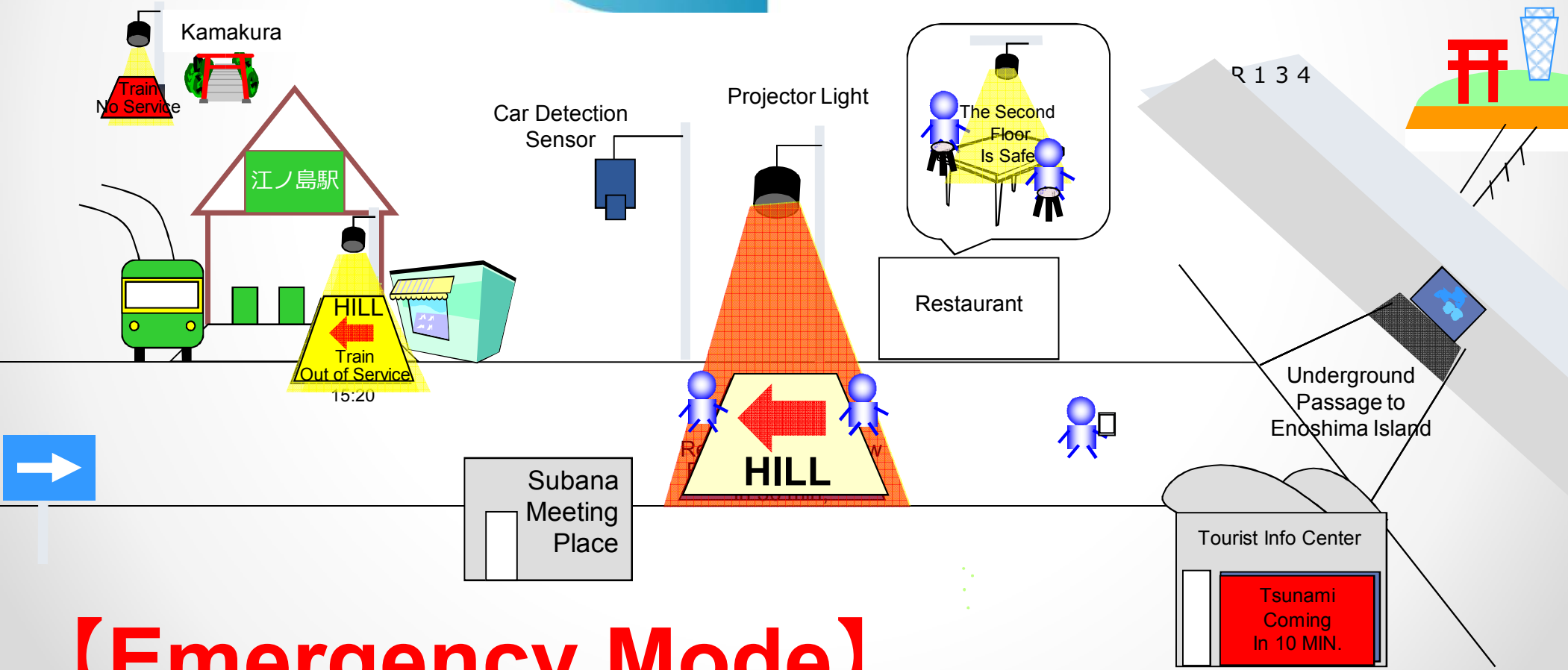
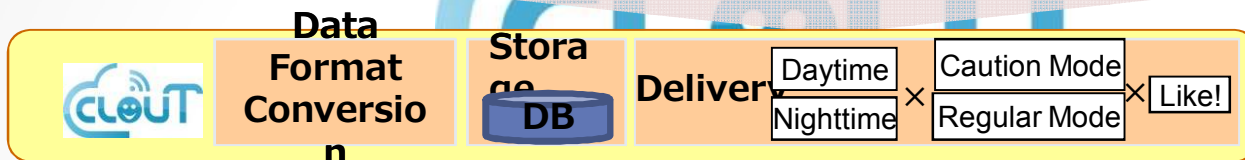
Fujisawaoooo!-Interactive Street @ Subana-



目指せ！
東京利光°の採用
CodeName:おもてな
Things



Input Data from Sensor or Database



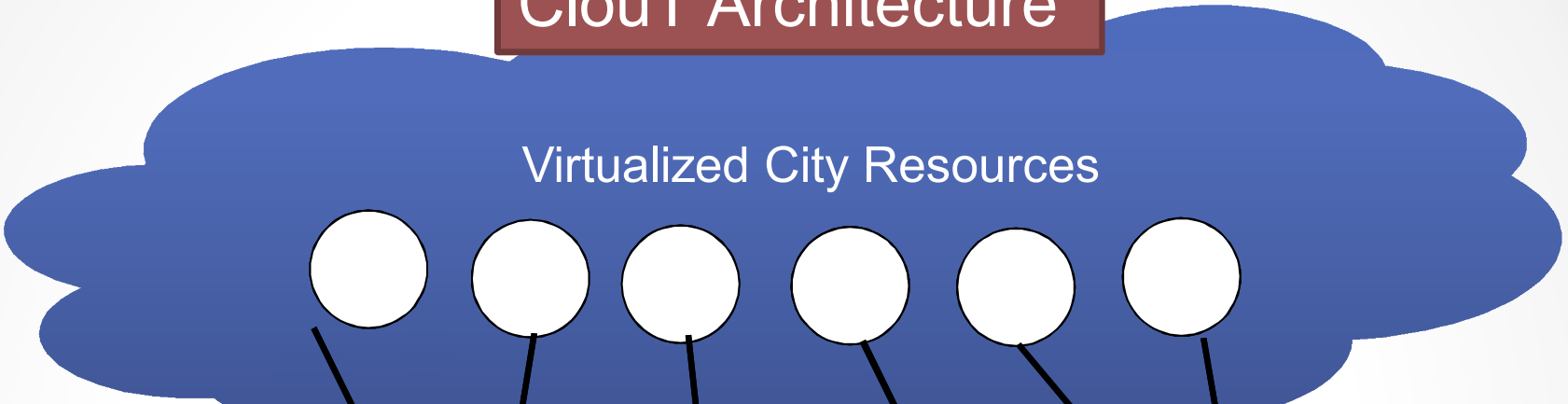
[Emergency Mode]



Fujisawa Dashboard

ClouT Architecture

Virtualized City Resources



FUJISAWA SURFBOARD 6月4日(水) 13:43:05
ライブマップ 都市を変更

STATION	WIND SPEED	WIND GUSTS	DIRECTION	TEMPERATURE	HUMIDITY	RAIN TODAY	PRESSURE	FORECAST
藤沢橋	7 mph	8 mph	S ↑	9.1 °C	78%	0.0 mm	1019.3 mbar	Clear Night
湘南台駅	6.3 mph	6.3 mph	SW ↙	8.3 °C	85%	0.0 mm	1018.1 mbar	Clear Night
江ノ島展望台	2.4 mph	4.3 mph	SW ↙	7.5 °C	81%	0.0 mm	1020.0 mbar	Clear Night

天気: くもり / 19°C

今日の天気: 明日の天気:

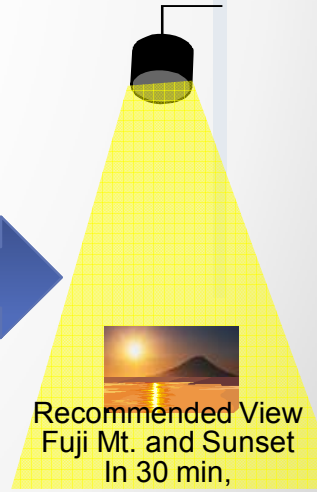
可燃ごみ・ビン 羽鳥一丁目 地域をかえる

江ノ島カメラ USTREAM LIVE

お知らせ(藤沢市役所) 市職員を名乗る不審な電話にご注意ください

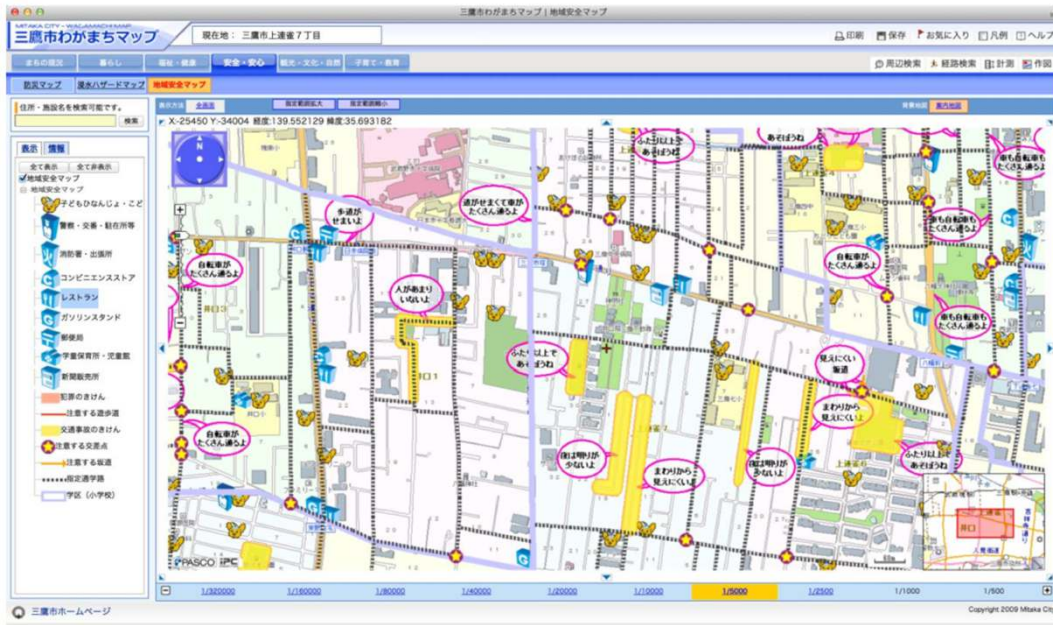
Twitter Topics for FUJISAWA #花火大会 #江ノ島 #猫 #台風 #梅雨

FUJISAWA Statistics

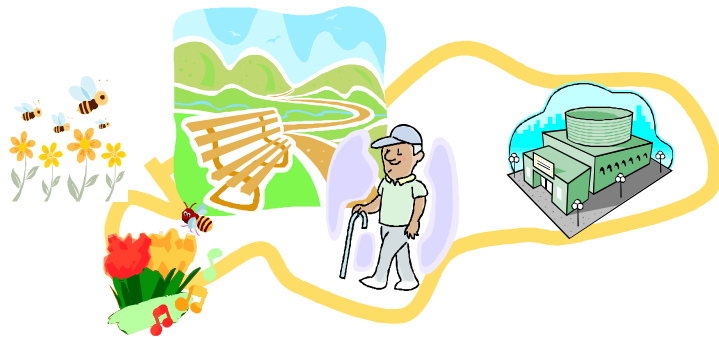
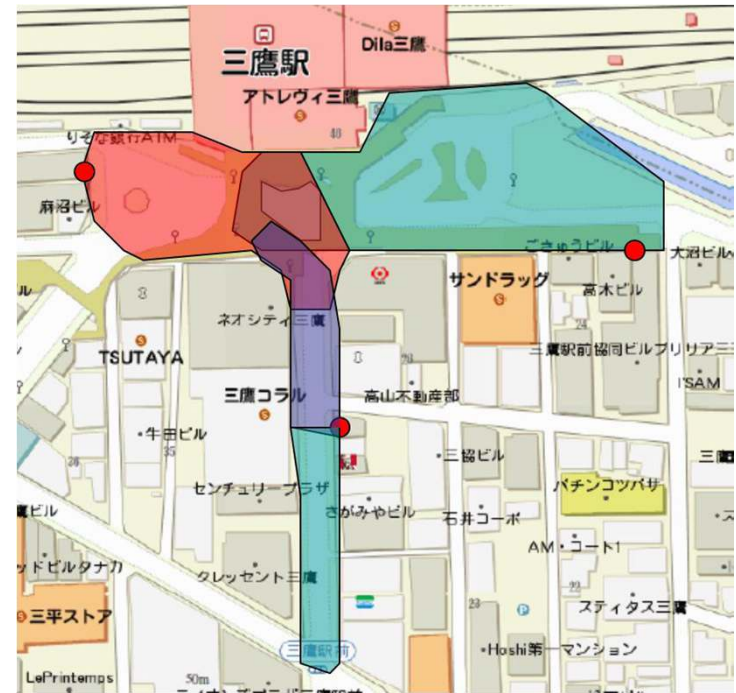


Mitaka

Mitaka GIS System



Station WiFi System

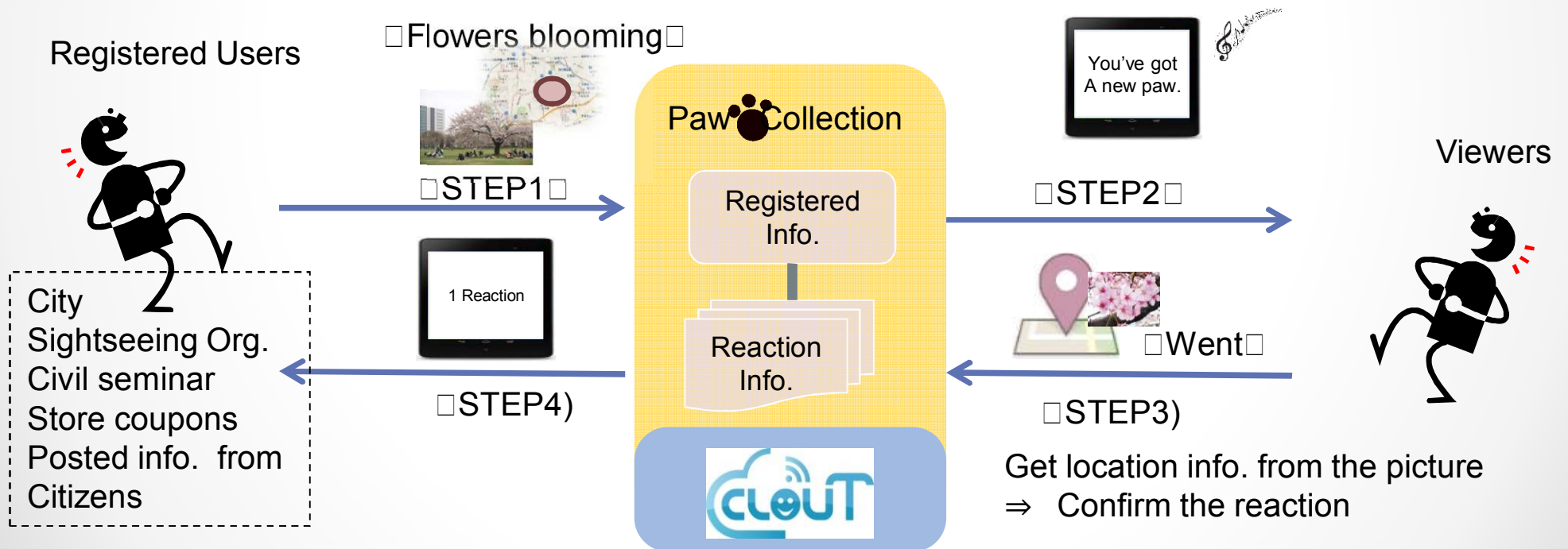


Going Out Support



Care giving with participatory sensing and city data

- Going out support for active seniors
 - Motivate them to go walking and participate community events for preventing elderly people's isolation, vitalizing stores or promoting health.
- Exchange information by smartphones and tablets



OUTSMART, FP7 FI-PPP Usage area project



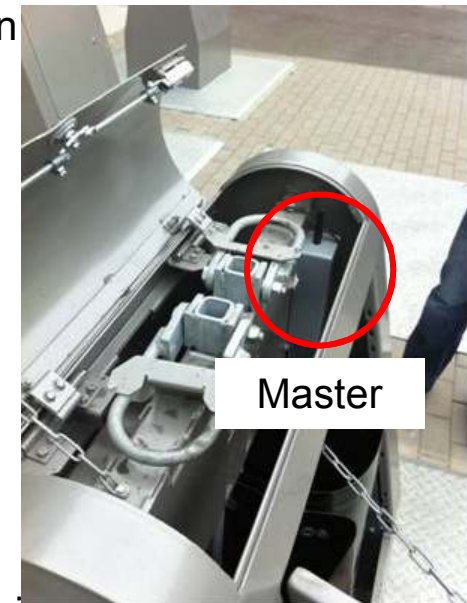
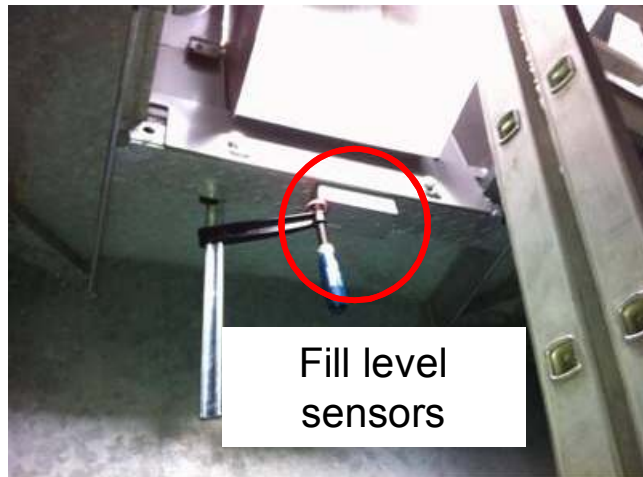
OUTSMART addresses five essential Smart City services:

- Water and Sewage – Aarhus DK
- Street Lighting – Santander ES
- Waste Management – Berlin DE
- Water and Environment – Trento IT
- Sustainable Urban Transport – Birmingham UK

Smart Waste Basket and Subsurface Containers (BERLIN)



- Ad hoc **fill level** measurements; data transmission to the collection vehicle when it approaches
- Develop assisted application for maintenance and fill level visualisation



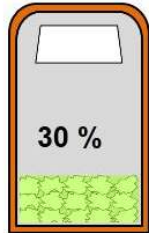
- **Continuous fill level measurement** every 30 min. and data transmission once or twice a day to the utility network
- Additional notification of the fill level data when an **alarm fill level** has been reached
- **Historical fill level data analysis** for fill level prognosis and optimization of logistics.

Seen at MWC!

| 25 - 28 February 2013

OUTSMART Waste Management System
Start Database Debug

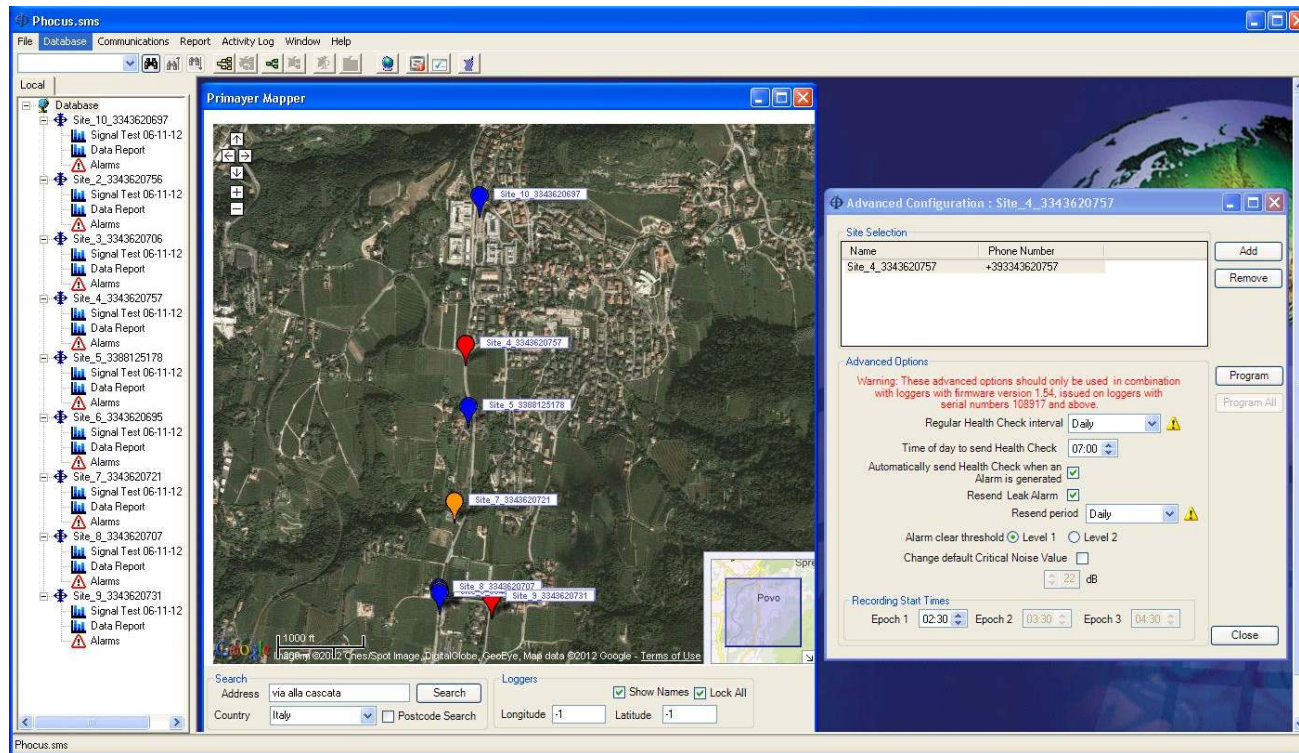
OUTSMART



Garbage Can Information	
ID	1
Street	Carrer Pedrosa A 64
Fill Level	30
Defect	False
Longitude	41.354605049472
Latitude	2.1280178359984



ACTIVE LEAK DETECTION SERVICE (TRENTO)



- **Location detection of leakages;** integration of flow sensors to detect variations in the minimum level at night in a sector and a leakage identification system that progressively scales down the area.

CITY MAPS, LIGHT & POWER CONSUMPTION (SANTANDER)



AMM System (Eon-Spain)

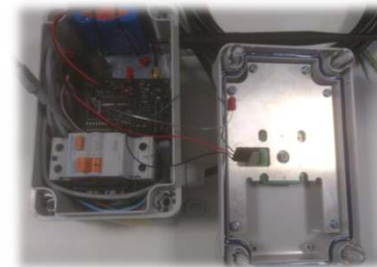


Light Sensor Nodes



Power Regulator's Intelligent Module (Ingequr)

- **Estimated light level:** obtained from real power consumption data and the kind of lamps installed □ from Utility resources (AMMS) and Authority devices (power regulators). Generate the *power consumption city map*.
- **Real light level** measurements, collected from a light level sensors network deployed all over the city (or areas that want to be covered), and will show the current status of city illumination.
- **Authority system power regulators:** controls the power provided to lamp post lines
- **Pedestrian flow sensors network:** based on radar technology. Detect people presence on a specific area (city centre street or square)



RADAR sensor node



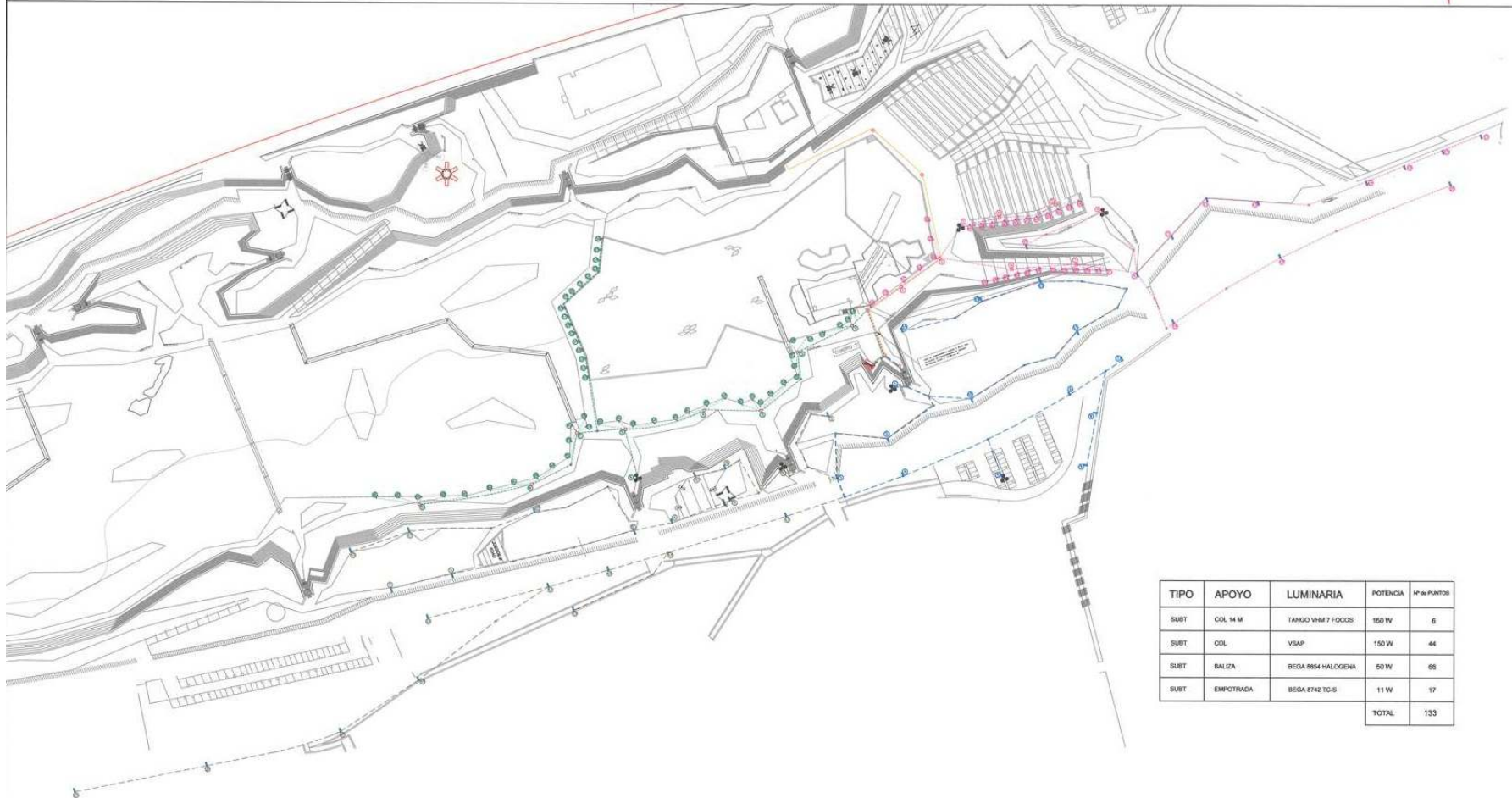
Power Regulator (Ingequr)

Public Street lighting Map



AYUNTAMIENTO DE SANTANDER
INGENIERÍA INDUSTRIAL

ALUMBRADO PÚBLICO DE SANTANDER



TIPO	APOYO	LUMINARIA	POTENCIA	Nº de PUNTOS
SUBT	COL 14 M	TANGO VM 7 FOCOS	150 W	6
SUBT	COL	VSAP	150 W	44
SUBT	BALIZA	BEGA 8654 HALOGENA	50 W	66
SUBT	EMPOTRADA	BEGA 8742 TC-S	11 W	17
TOTAL				133

Potencia S/colores

- 400 W
- 200 W
- 150 W
- 100 W

SUBTERRANEO

- V. M. 025 W

FACHADA

- ARGENTA 8.420x30 m.
- ARGENTA 8.420x45 m.

POSTE HORMIGON

- 100 W
- 150 W
- 200 W
- 150 W

OTROS

- BIO SENSOR 800 de 100 W
- PANEL FOTOVOLTAICO
- Proprietario
- Proprietario

SIMBOLOGIA

- Planta general
- Edificios
- Cuadro

SITUACIÓN DEL CUADRO:
PARQUE LAS LLAMAS CM 2

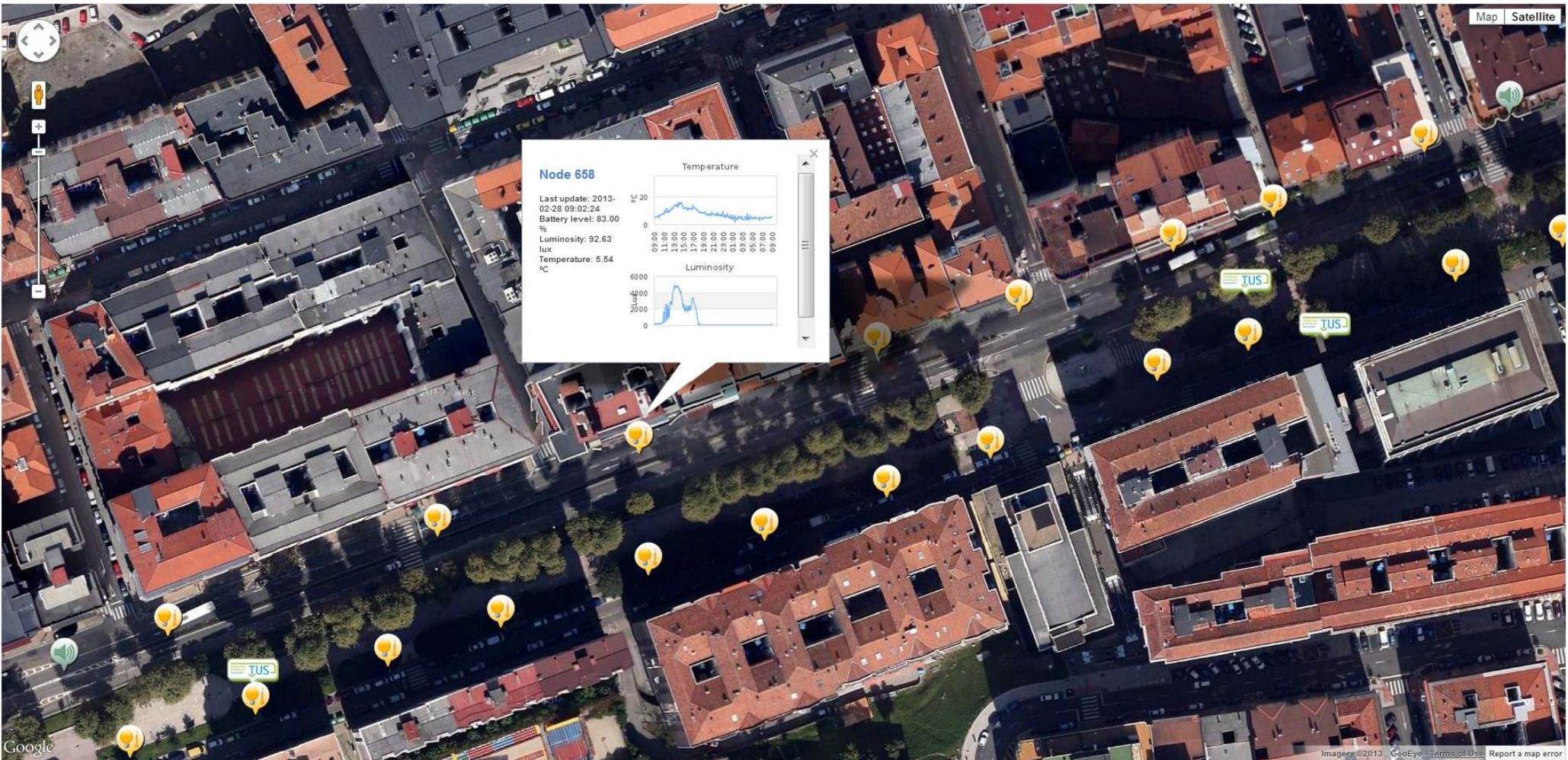
Escala: 1/1500

Dibujado: Fernando Herrero
Fecha: OCTUBRE 2011
Modif: MAYO 2012

Ingeniero Industrial Jefe del Servicio
D. JOSÉ MANUEL GÓMEZ REVUELTA

Plano N° 299

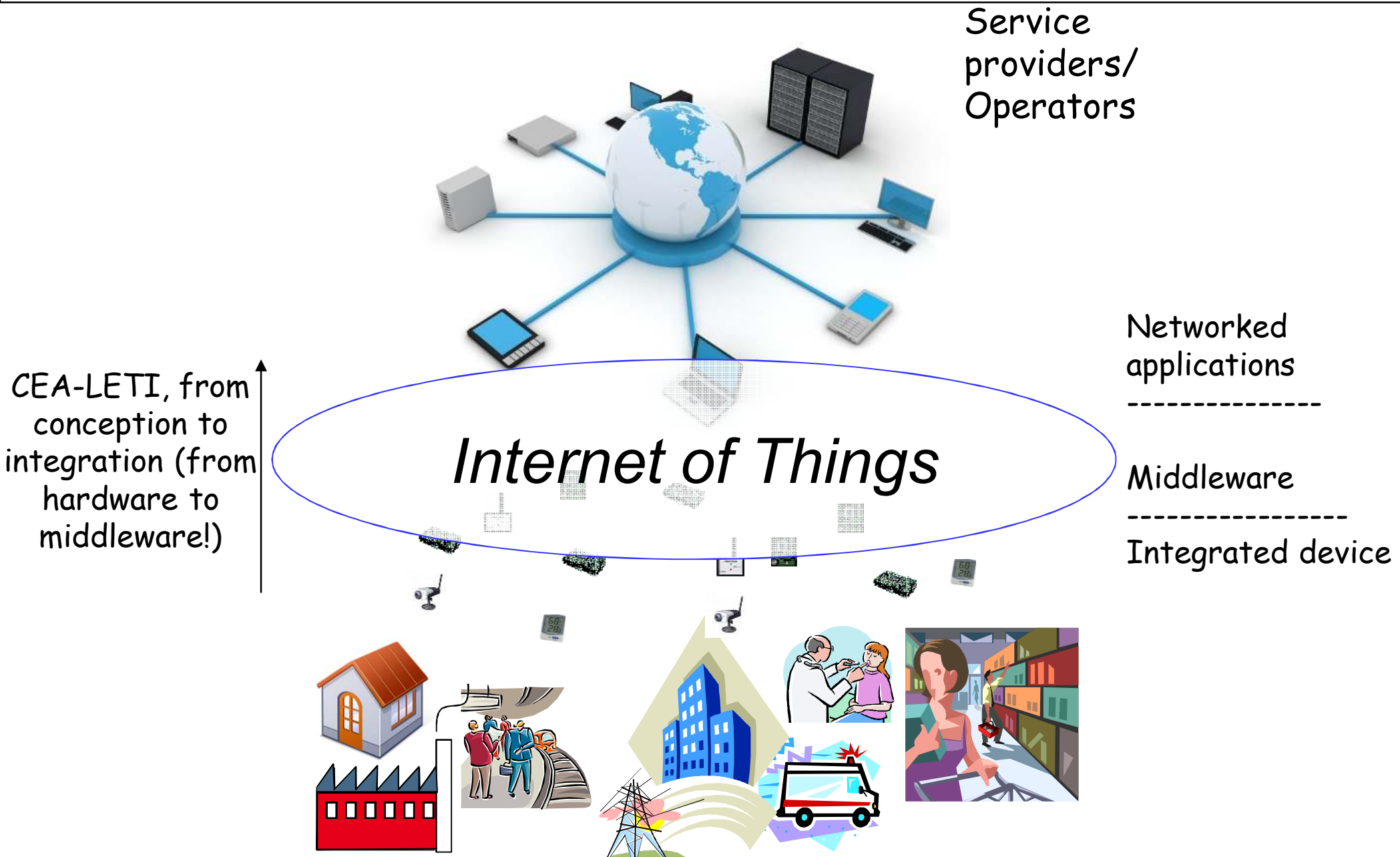
Visualization on Google Maps



Summary

- The ICT has the potential of turning the cities into smarter ones.
- Key Technologies: IoT (Internet of Things) + Cloud
 - IoT for collecting real-world information in real-time
 - Cloud for storing/processing the information with elasticity, reliability and agility
- Efficient communication and collaboration mechanisms are needed to exploit all information sources to make the cities smarter
- Open platforms for creating a synergy between various stakeholders (citizens, municipalities, utilities, service providers, application developers, etc.)
- Service oriented approach for handling heterogeneity and dynamicity of the internet of Things
 - Easy creation and maintenance of dynamic IoT applications.
 - Middleware services for virtualization, data processing, device management, etc.
- Tools to design, deploy and supervise robust and dependable IoT applications

Internet of Things - Convergence of the physical and the virtual world





Thanks!

Special thanks to sensiNact contributors: Ozan Günalp, Mathieu Gallissot, Thomas Genet, Etienne Sorel, Yazid Benazzouz, Youssef Zatout, Diana Moreno Garcia, Christophe Munilla



leti

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list

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