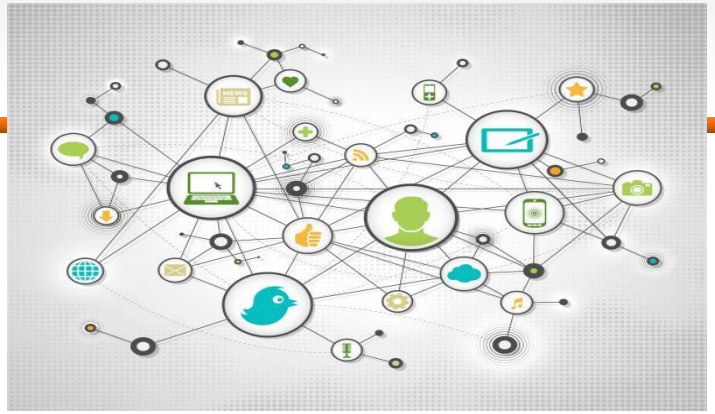


UMU-Eficacia Energética mediante IoT

Tenerife, Jornadas Técnicas RedIRIS

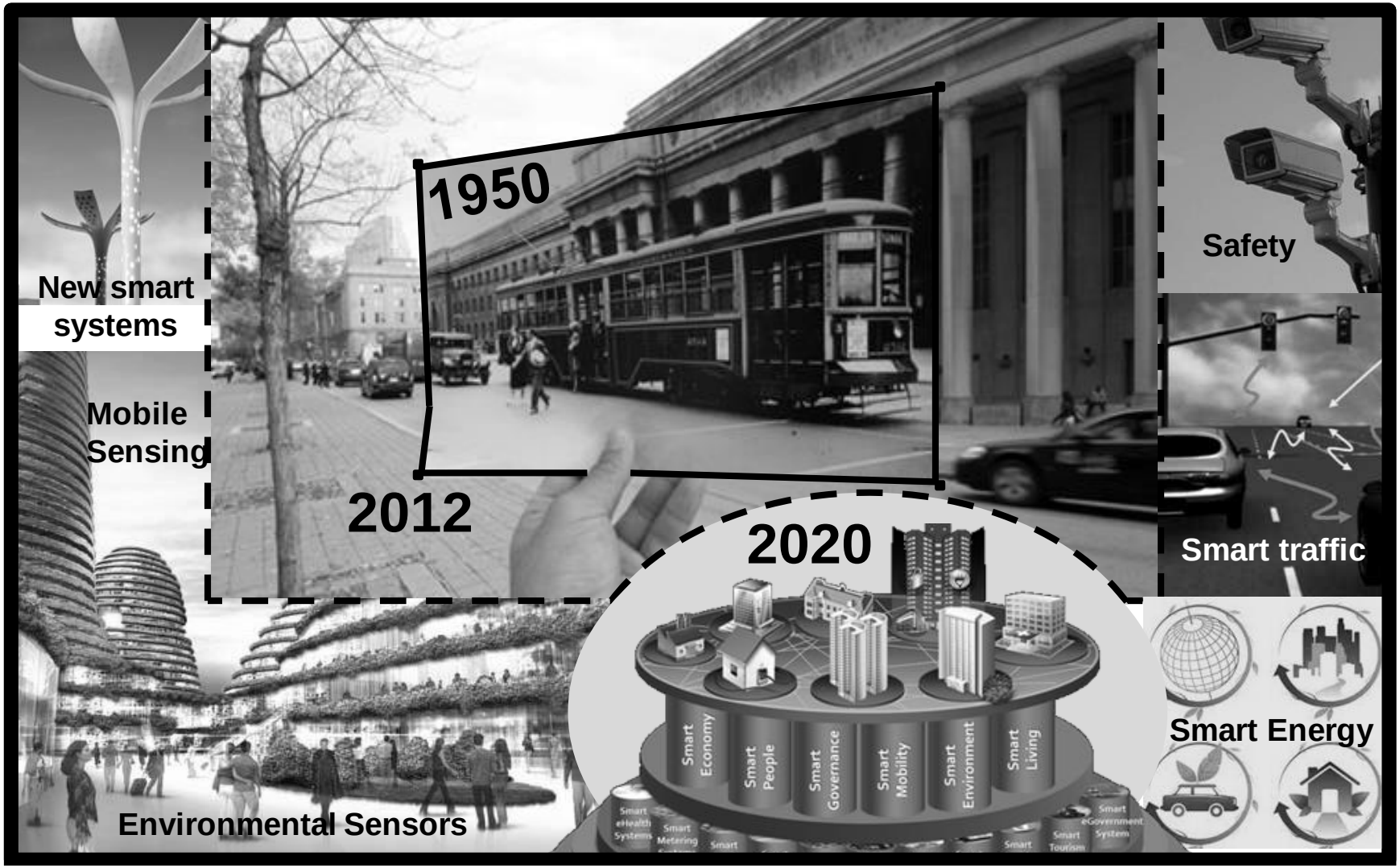
Antonio F. Skarmeta

<skarmeta@um.es>

University of Murcia (UMU)

SPAIN

Smart Cities



‘Smart’ solutions are instrumented, interconnected and intelligent

Instrumented + **Interconnected** + **Intelligent**

Event capture and filtering for timely response

Any to any linkage of people, process, and systems

Deep discovery, analysis and forecasting

= 

Now, what's up?

Internet-1

Internet-2

Internet-~~3~~ 0

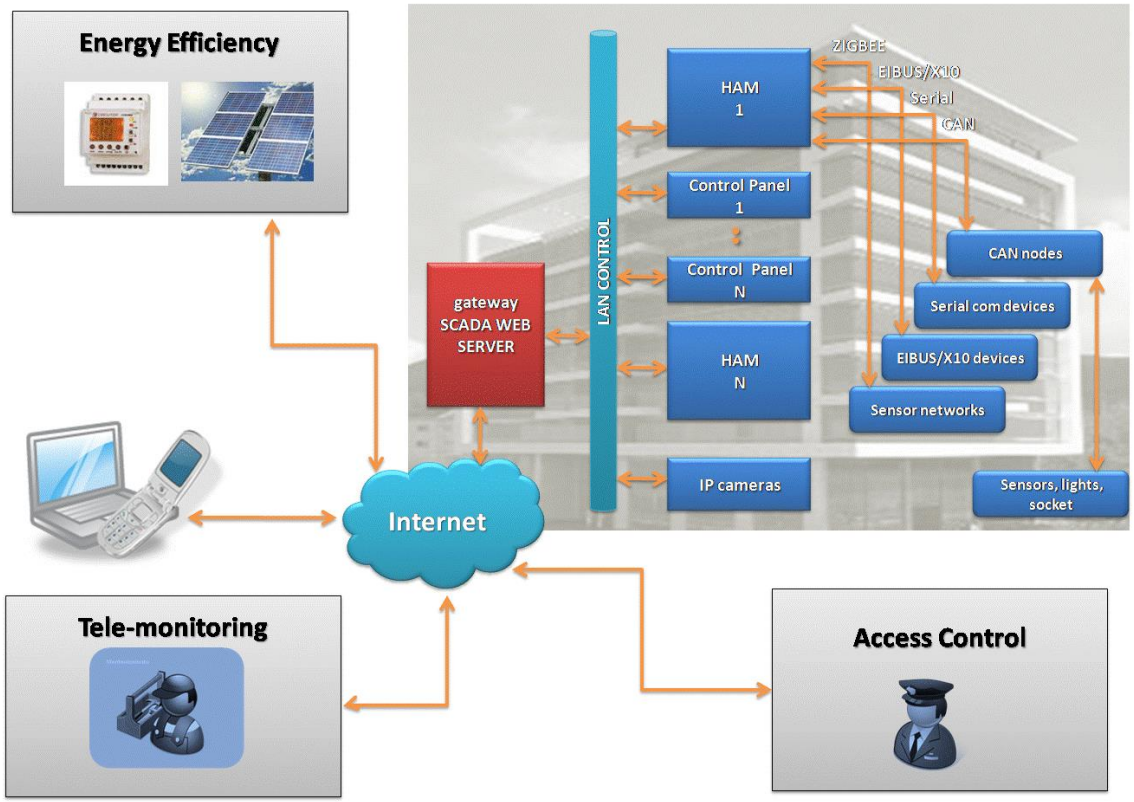
Internet-0: the Internet of Things

Borrowed from N. Gershenfeld

ON THE INTERNET NOBODY KNOWS YOU'RE A LIGHT BULB!

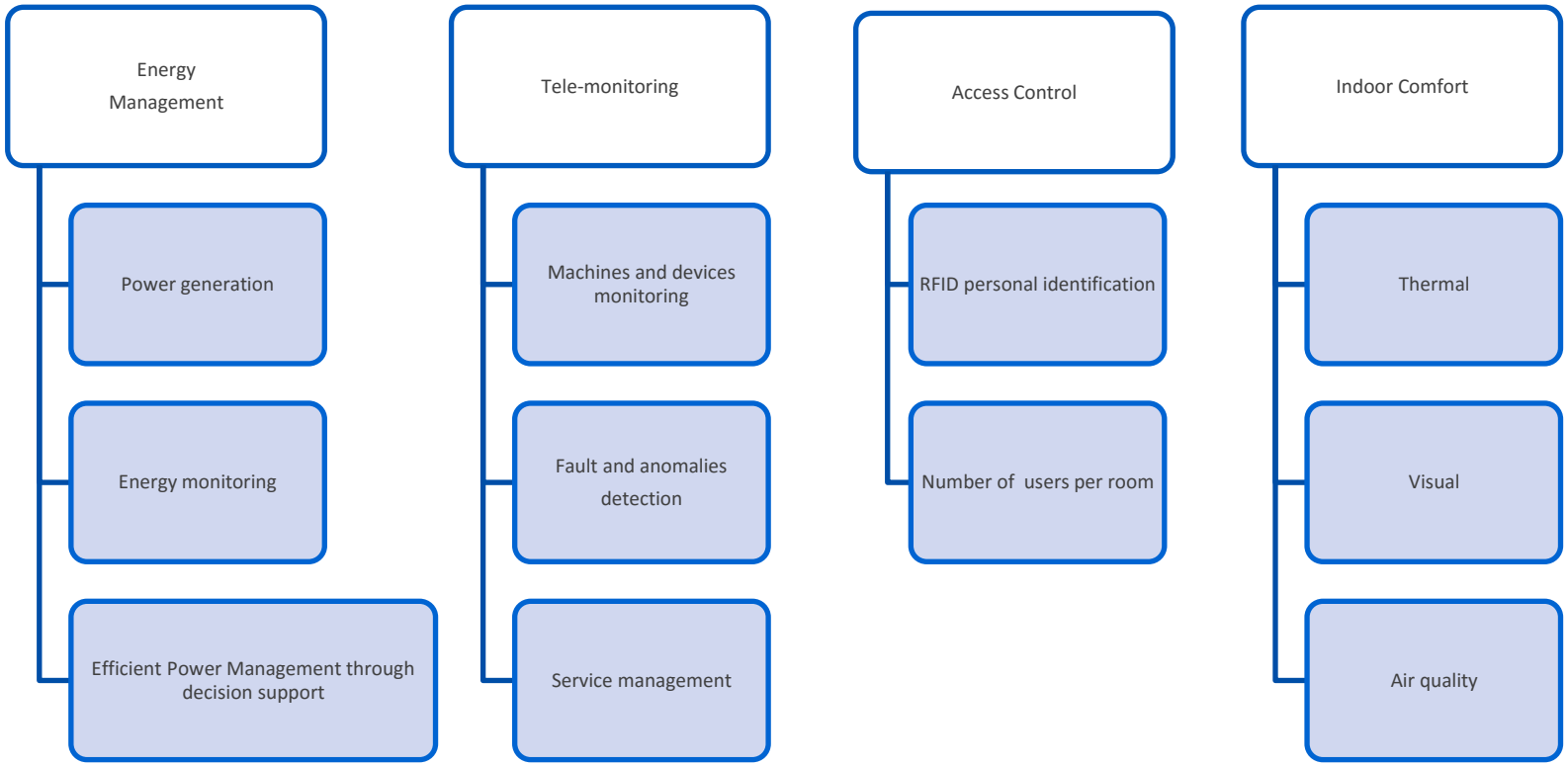
UMU Smart Building and Smart Campus Project

- Smart buildings. Open Data Project.



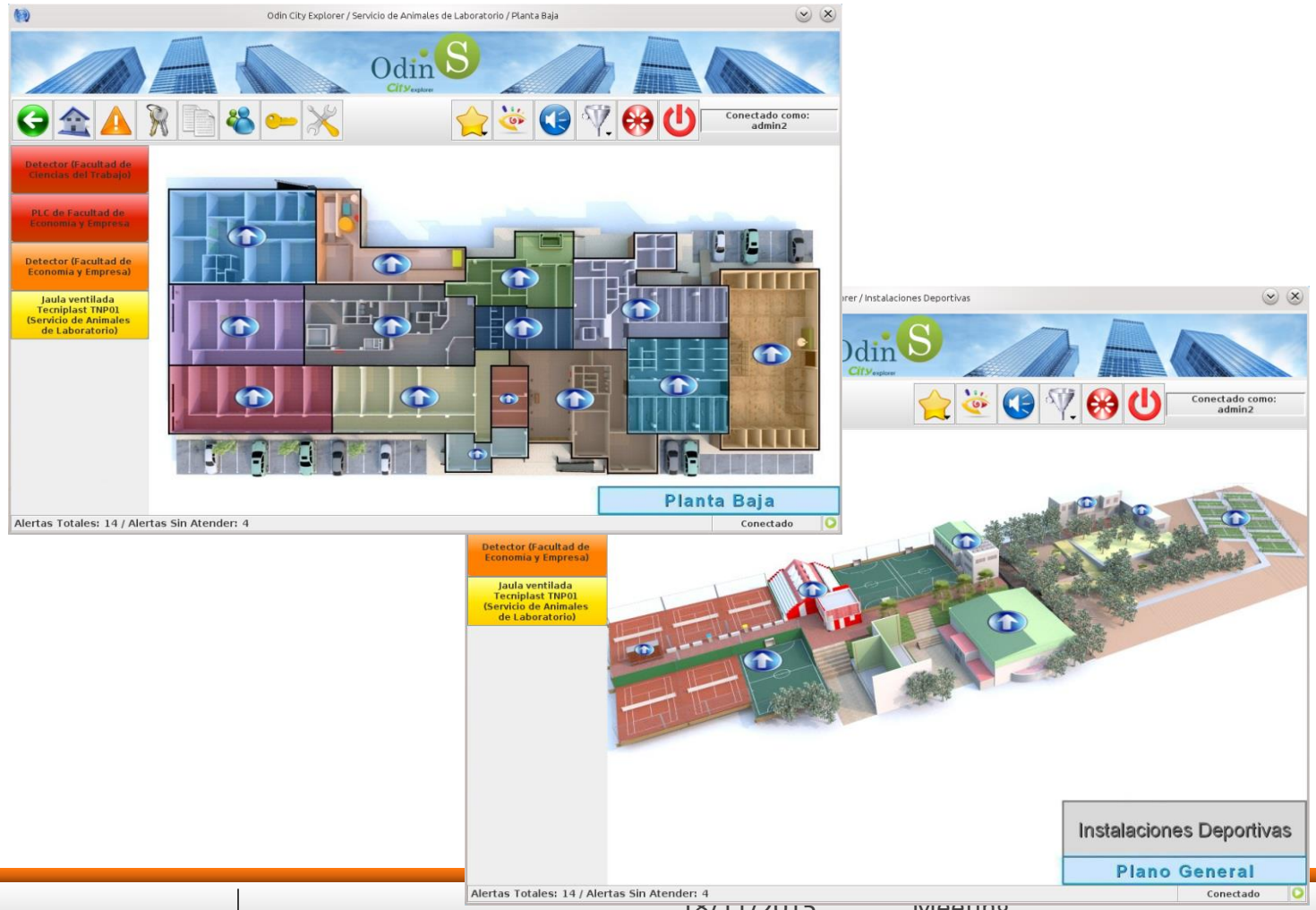
Smart Campus Use Case

Example of the Services Provided



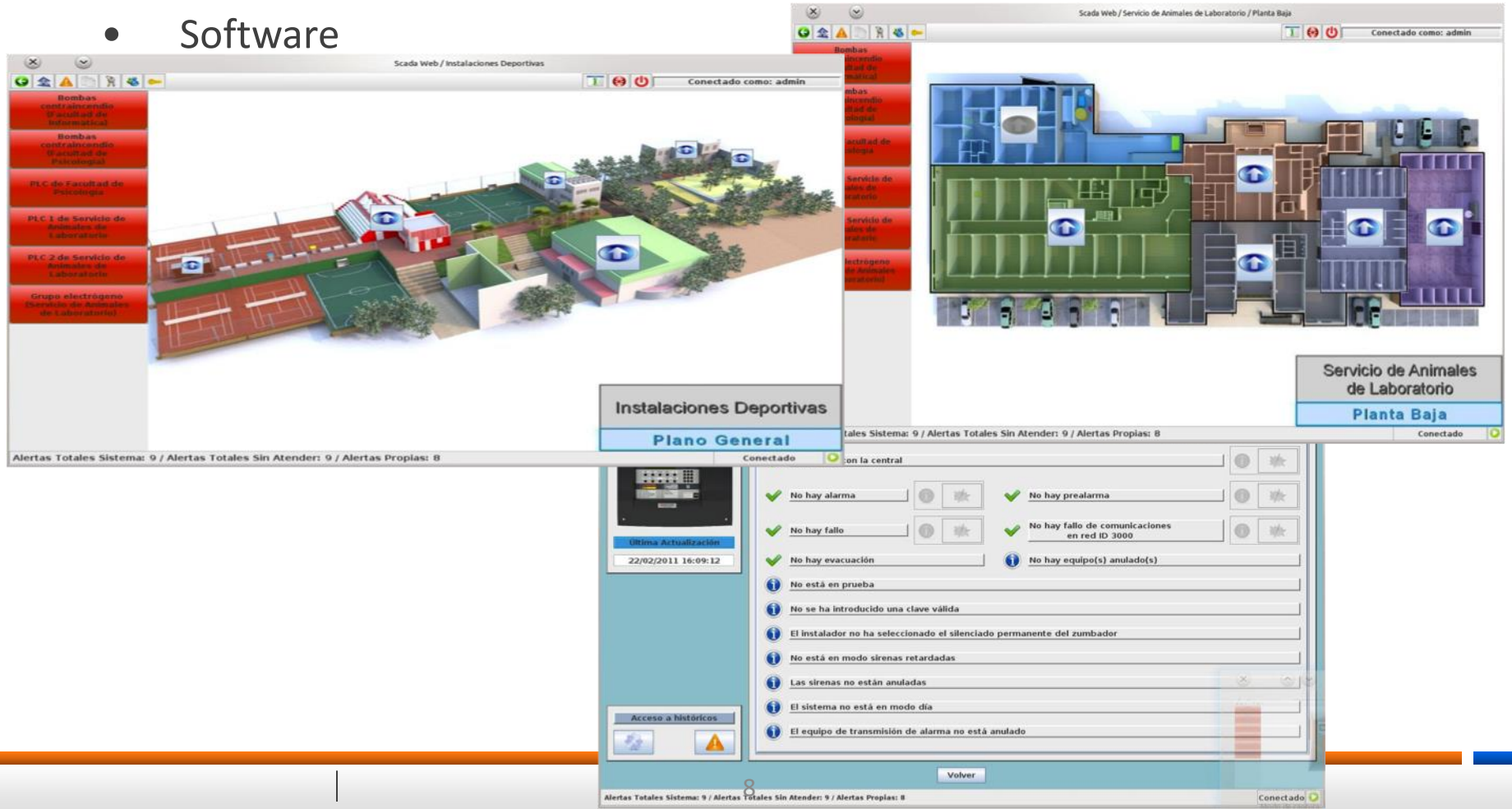
Smart Campus Use Case

Example of the Scenario – Data Collection Software



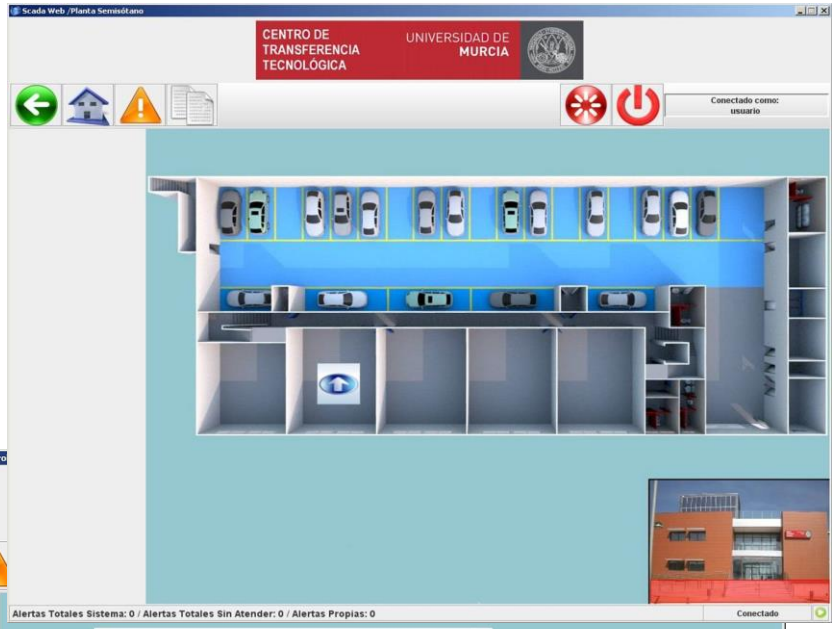
UMU Smart Building and Smart Campus Project

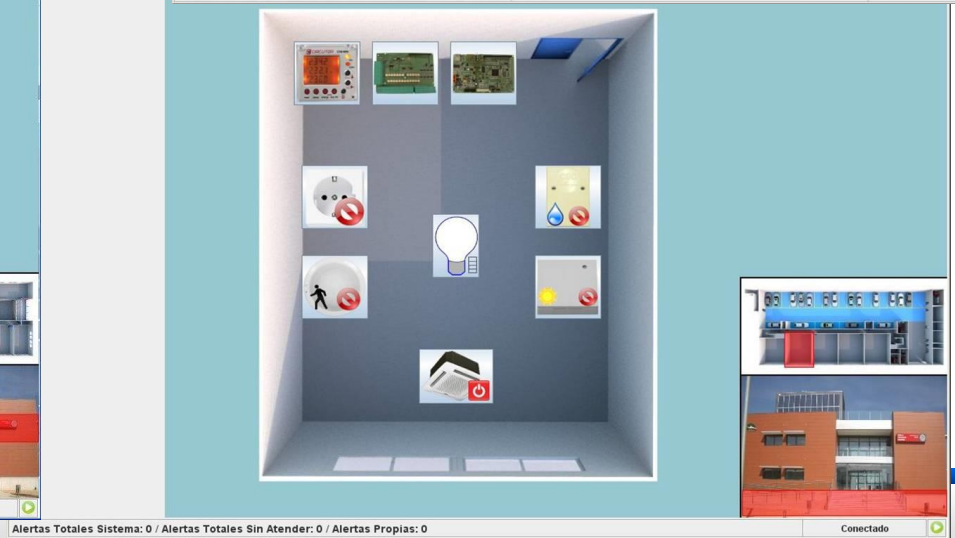
- Smart buildings: Heterogeneous distributed control system design
  - Software



UMU Smart Building and Smart Campus Project

- Smart Building Service: telemonitoring. SCADA web can be operated from any computer with a web server and JVM. Visual and Layered design



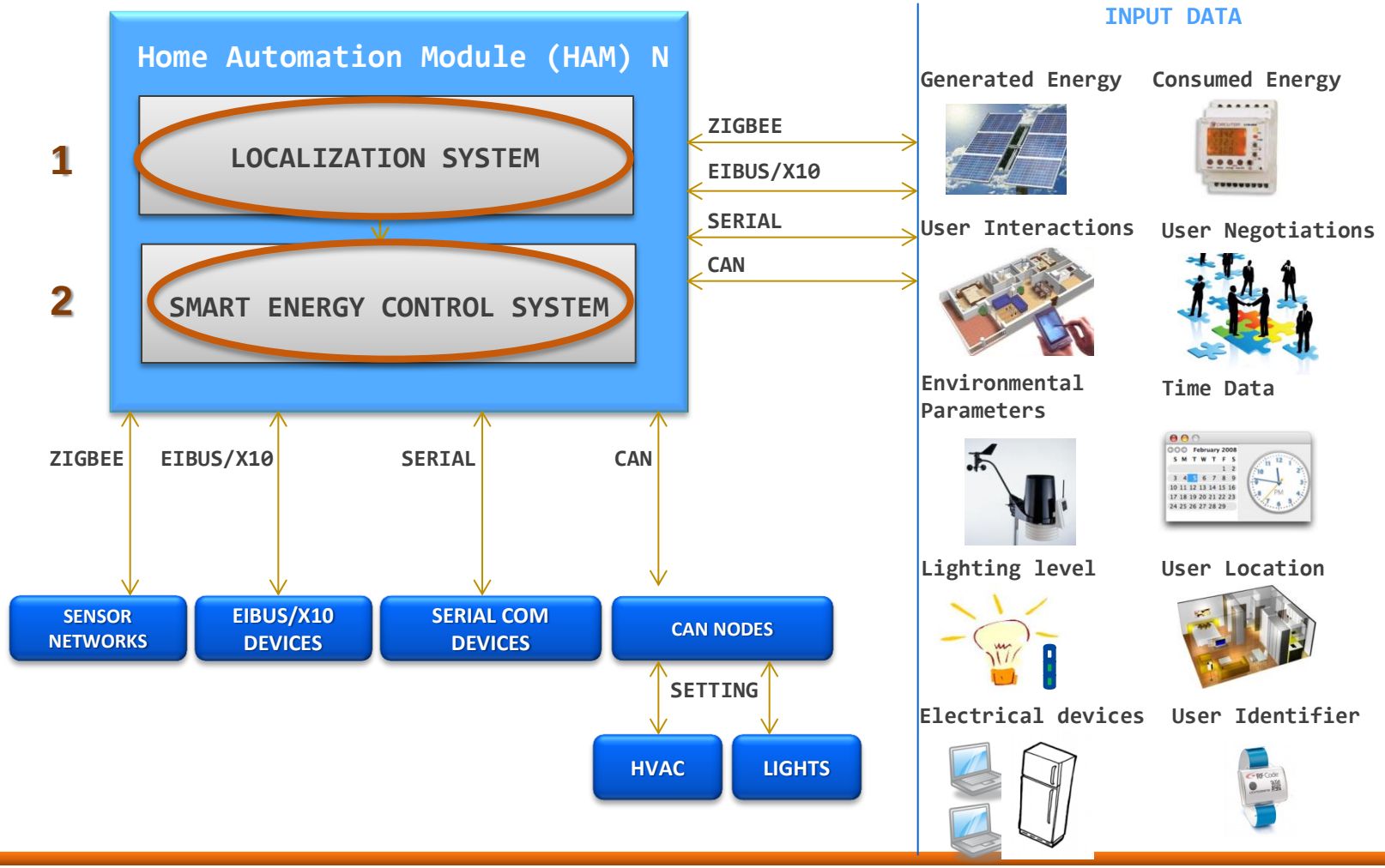


Validation

More of 30 buildings of the University of Murcia connected to City explorer

UMU Smart Building and Smart Campus Project

- Smart Buildings Service: Smart Energy Control System



11

UMU Smart Campus Features

Total services provided for energy efficiency

- **Access control management**. Services features:
  - Presence detection
- **Comfort.** Services features:
  - HVAC management.
  - Lighting management.
- **Air quality monitoring.** Services features:
  - Monitor of Environmental Sensors.
- **Electrical consumption monitoring in some test areas.**
  - Info about voltage
  - Info about current
  - Info about active power
  - Info about reactive power
  - Info about energy
- **Energy production monitoring.**
  - Monitoring of inverters connected to solar panels in different areas along the Campus.

UMU Smart Campus Features

Lighting and HVAC Management for Energy Efficiency (Energy Efficiency Service)

- **Sensors involved:**
  - Power Meters
  - Temperature and lux meters
  - Presence sensors
- **Actuators involved:**
  - ON/OFF lighting
  - ON/OFF HVAC
  - Temperature set point HVAC

“How to connect to the platform…”

- **Interfaces to connect with the platform are divided in three levels**

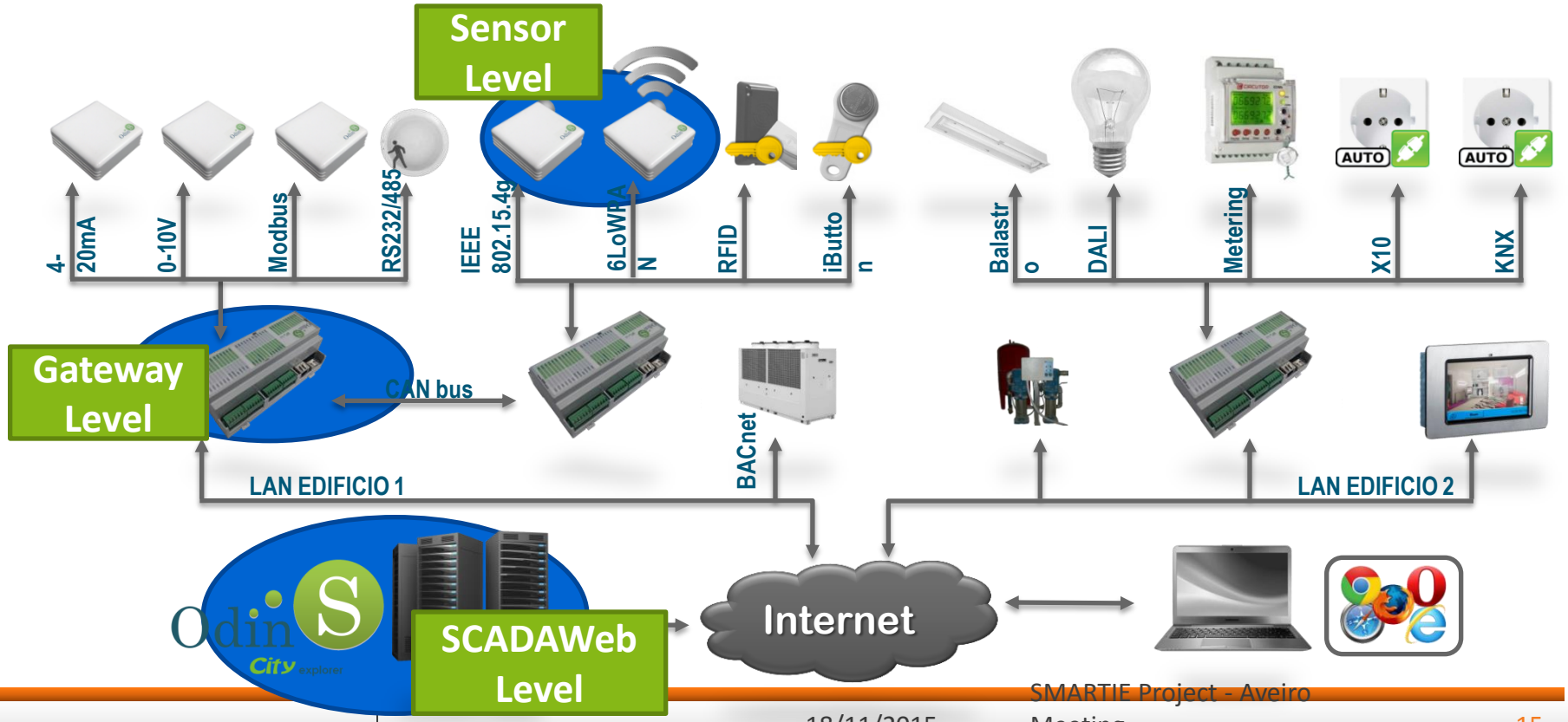
  The Smart Energy Management use case includes three different levels of communication, that are Sensor Level, Gateway Level and SCADAWeb Level, each with their interfaces.

  The interfaces to interact with each level have been set in accordance with the load each device is able to manage. In this sense, sensors as constrained devices will support little load in contrast with the server.

  - **Sensor Level:** At this level a CoAP interface can be used to interact with the sensors. CoAP is a protocol targeted for constrained devices due to their special needs.
  - **Gateway Level**: This devices are more capable, and are enabled with both MQTT and CoAP interfaces.
  - **SCADA Web Level:** At this level supported protocols for the interfaces are MQTT, CoAP and REST.

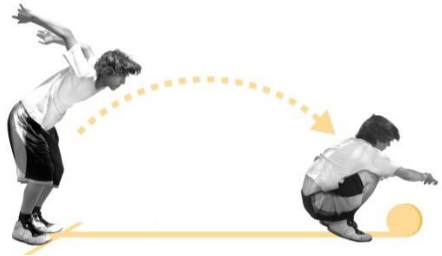
“How to connect to the platform…”

- **Sensor to platform**: IP sensors and actuators.
- **Gateways to platform:** both hardware and software gateways.
- **SCADAweb to platform**: Data Collection Software.



Odin Solutions

Spin-off of the University of Murcia (Spain) with more of 10 years of experience on the design and development of monitoring and control products

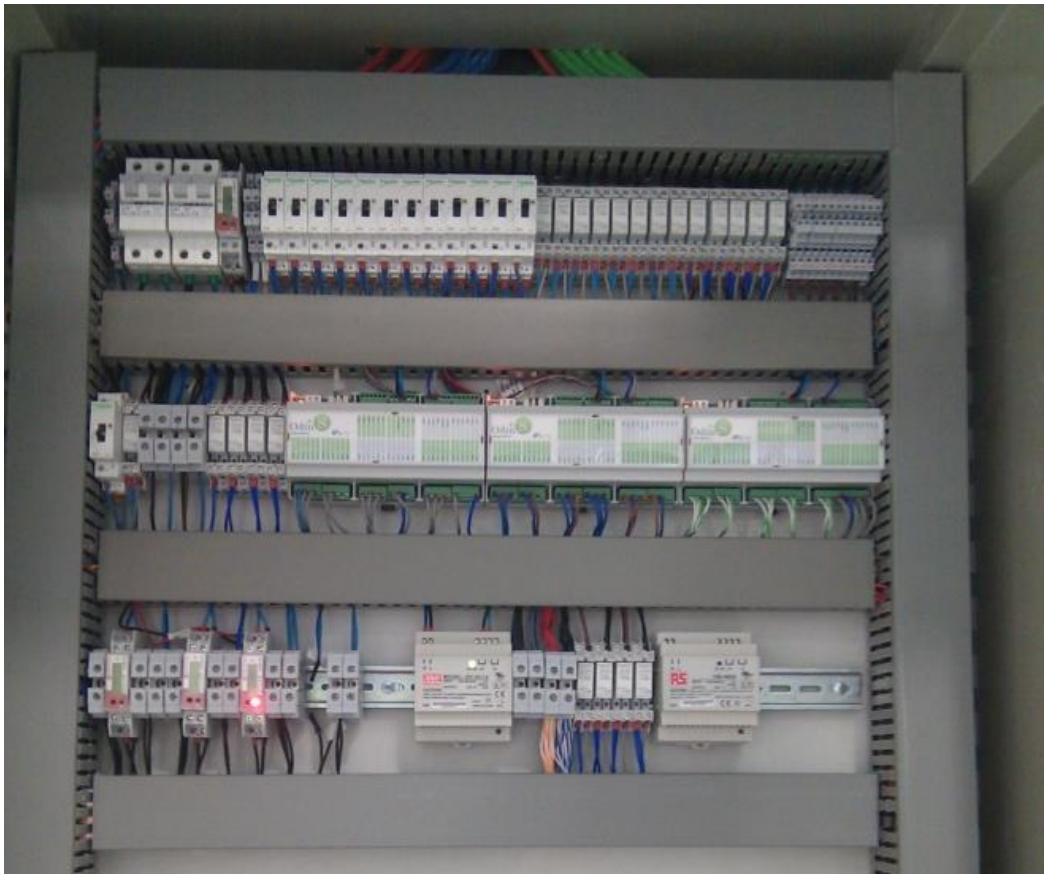


UNIVERSIDAD DE MURCIA

Odin S

Smart Campus Deployment

Example of the Scenario 1 – Automation IP Controllers



Smart Campus Deployment

- ✓Integral Management
- ✓Energy

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Smart Campus Deployment

Example of the Scenario 1 – Platform Components

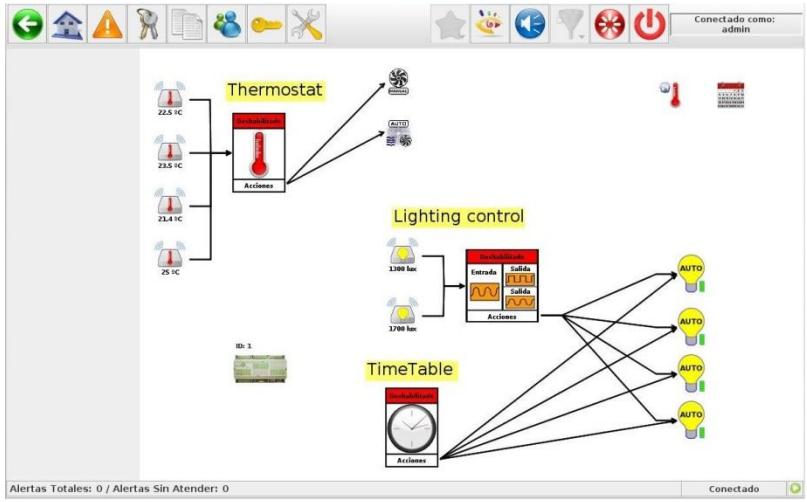
- **Sensors**: temperature, humidity, lighting, power meter, presence sensor, RFID System, etc.

- **Control Panel:**

Smart Campus Deployment

Example of the Scenario 1 – Graphic Editor to define Energy Saving Strategies

Rules Designer



HVAC Control

Lighting Control

23,12% of Annual Energy Saving in Buildings

Partners

Funded by:

European Union Total budget: 4,862,363 €;
EU contribution: 3,286,144 €

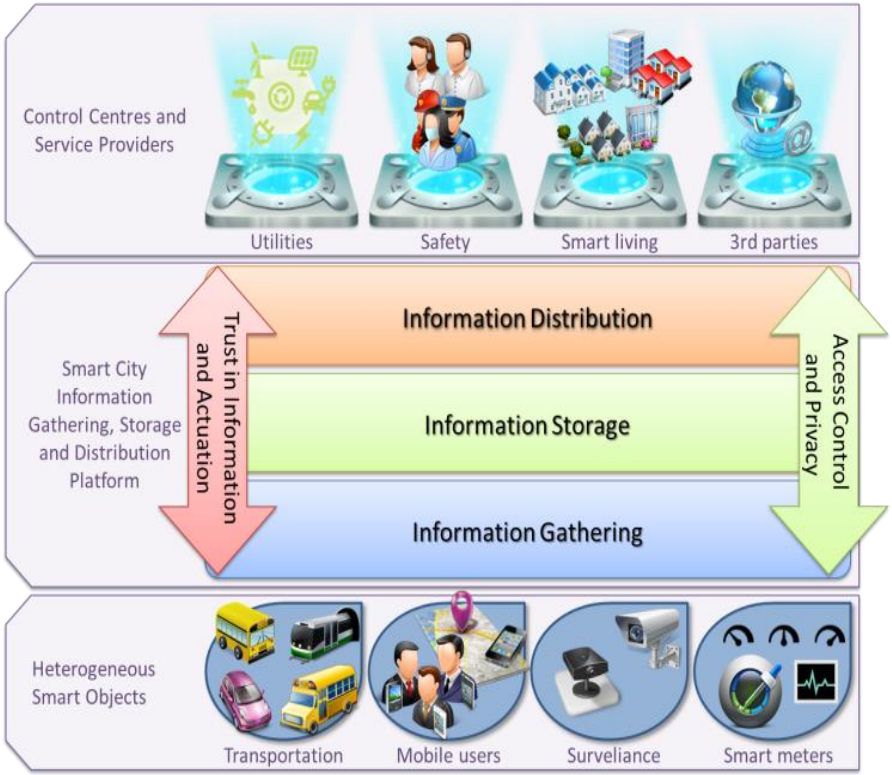
Area of Activity:

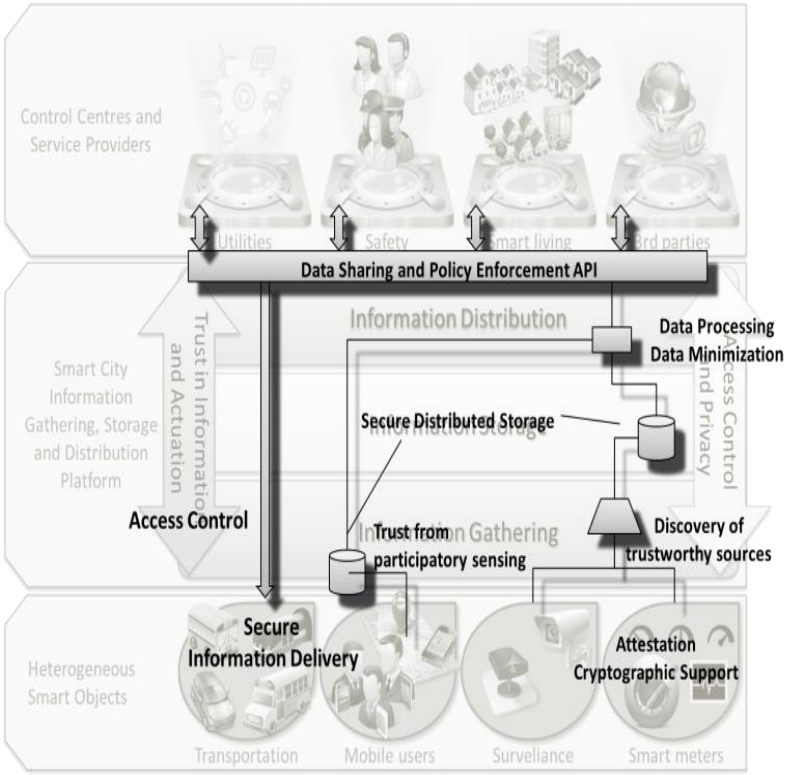
Framework Programme 7 ICT Objective 1.4 IoT (Smart Cities)

Period:

1st September 2013 - 31st August 2016

Smart Cities and Security

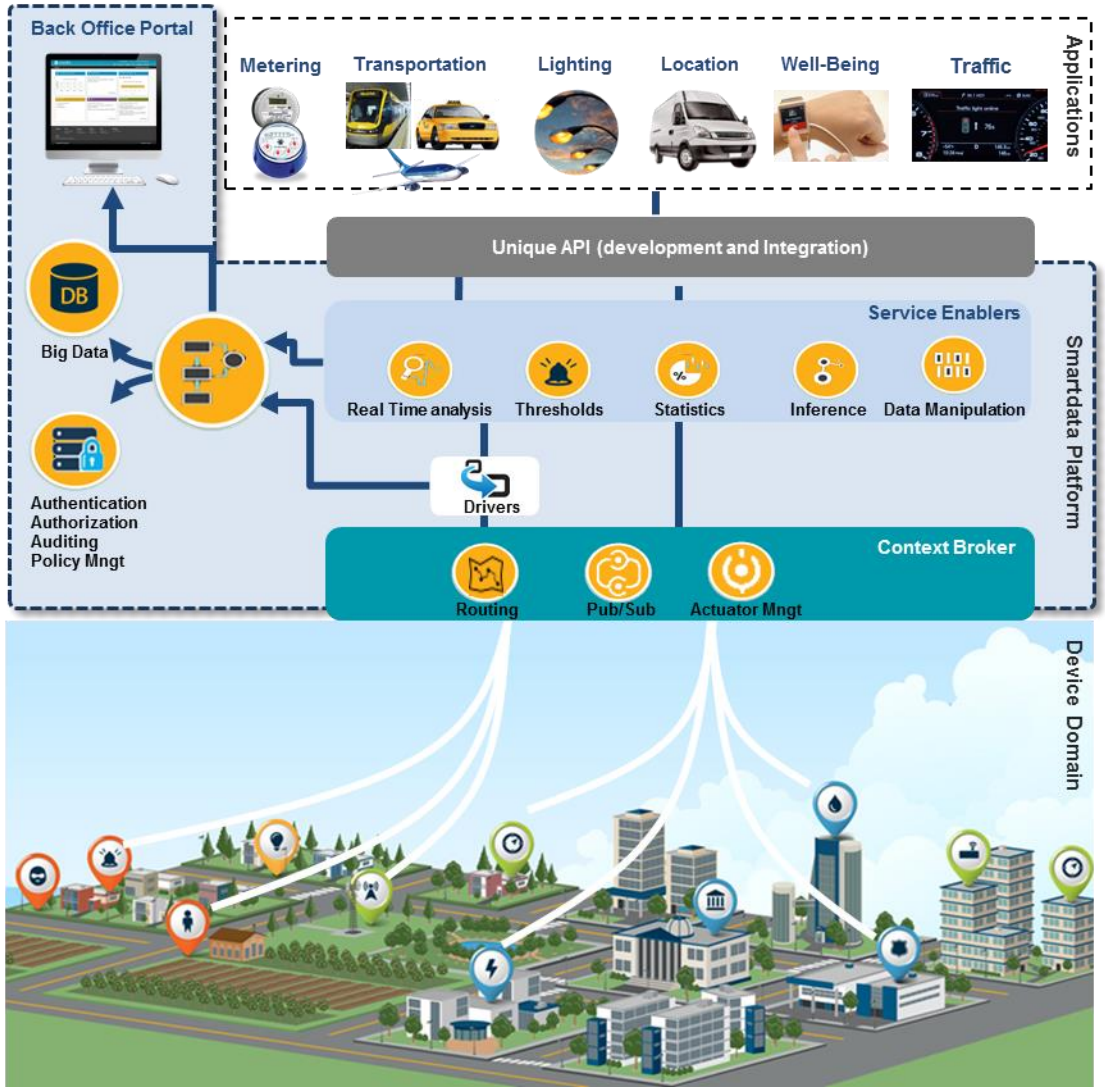




Smartdata Platform

- Big Data Infrastructure
- Fine-grained access control for privacy-sensitive data, based on attribute-based encryption (ABE)
- Minimal disclosure

- Authentication
- Authorization
- API Token issuer
- Delegation
- Identity Governance



SMART ENERGY CONTROL SYSTEM
Evaluation/Validation and Next Work Line

✓ Impact of **users implication** with the system operation (understanding system feedback and through their interaction) in terms of:

- ✓Changes in their behaviour
- ✓Learning and adaptation of the system
- ✓Energy consumption
- ✓ Assessments of the system

Next Work Line:

➢ Integrate **Mobile Crowd-Sensing** Techniques in our mechanism for considering occupant's devices data.

European Commission