SMART CAMPUS
Experiencias de eficiencia energética en la UMU

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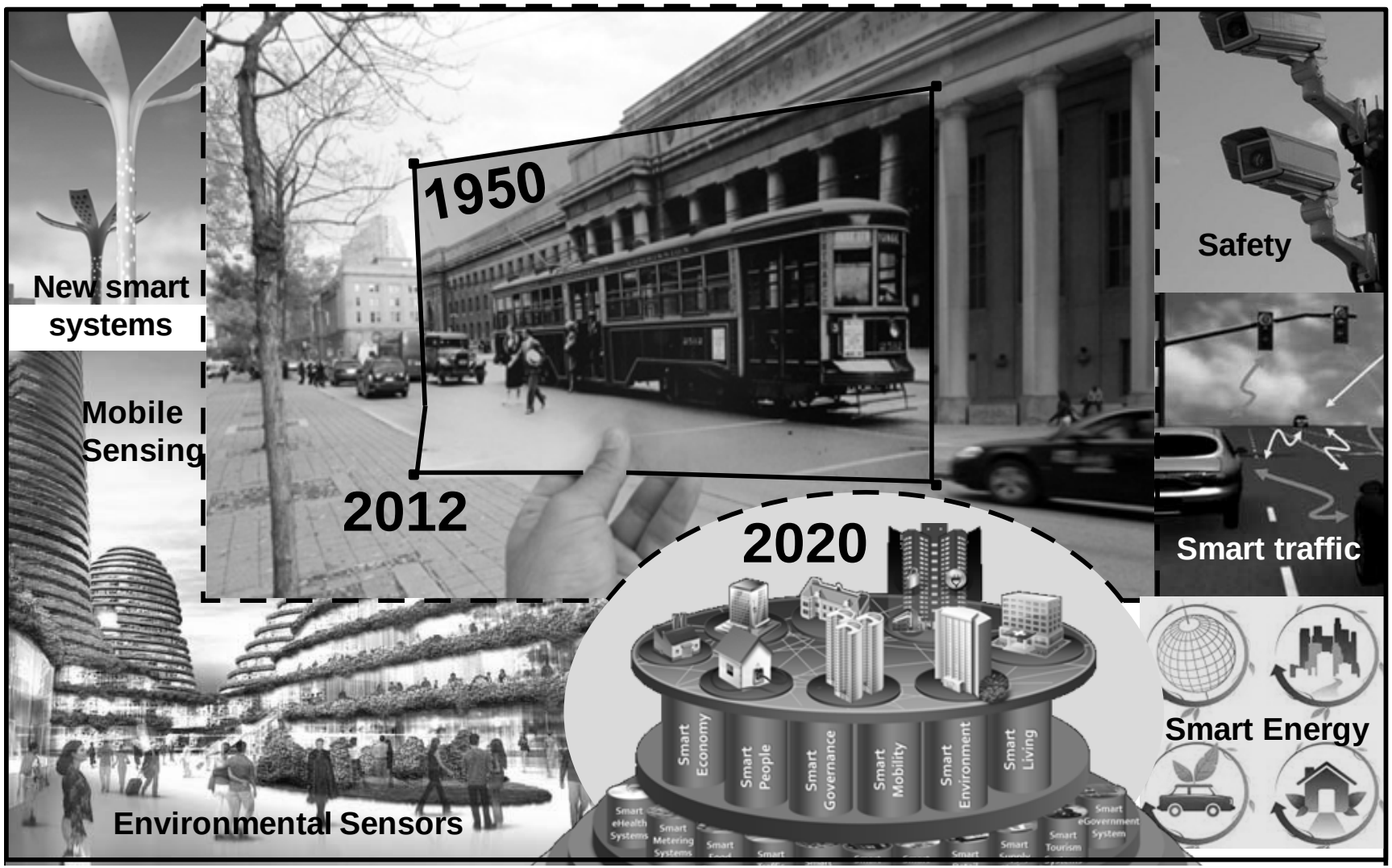
Smart Cities



Now, what's up?

Internet-1
Internet-2
Internet-~~3~~
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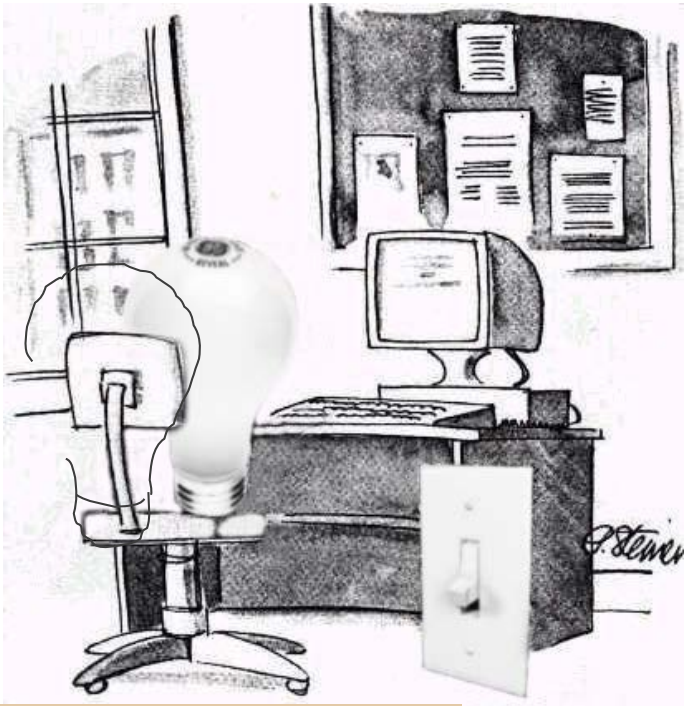
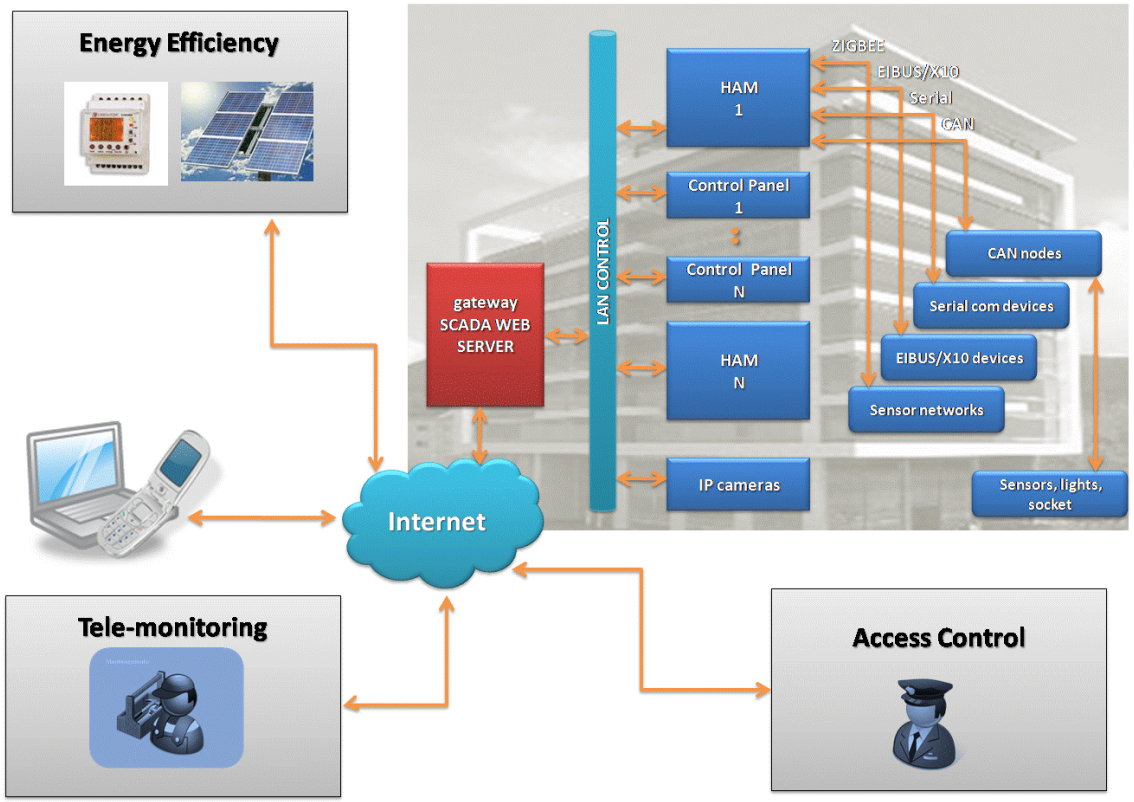
Internet-0: the Internet of Things



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

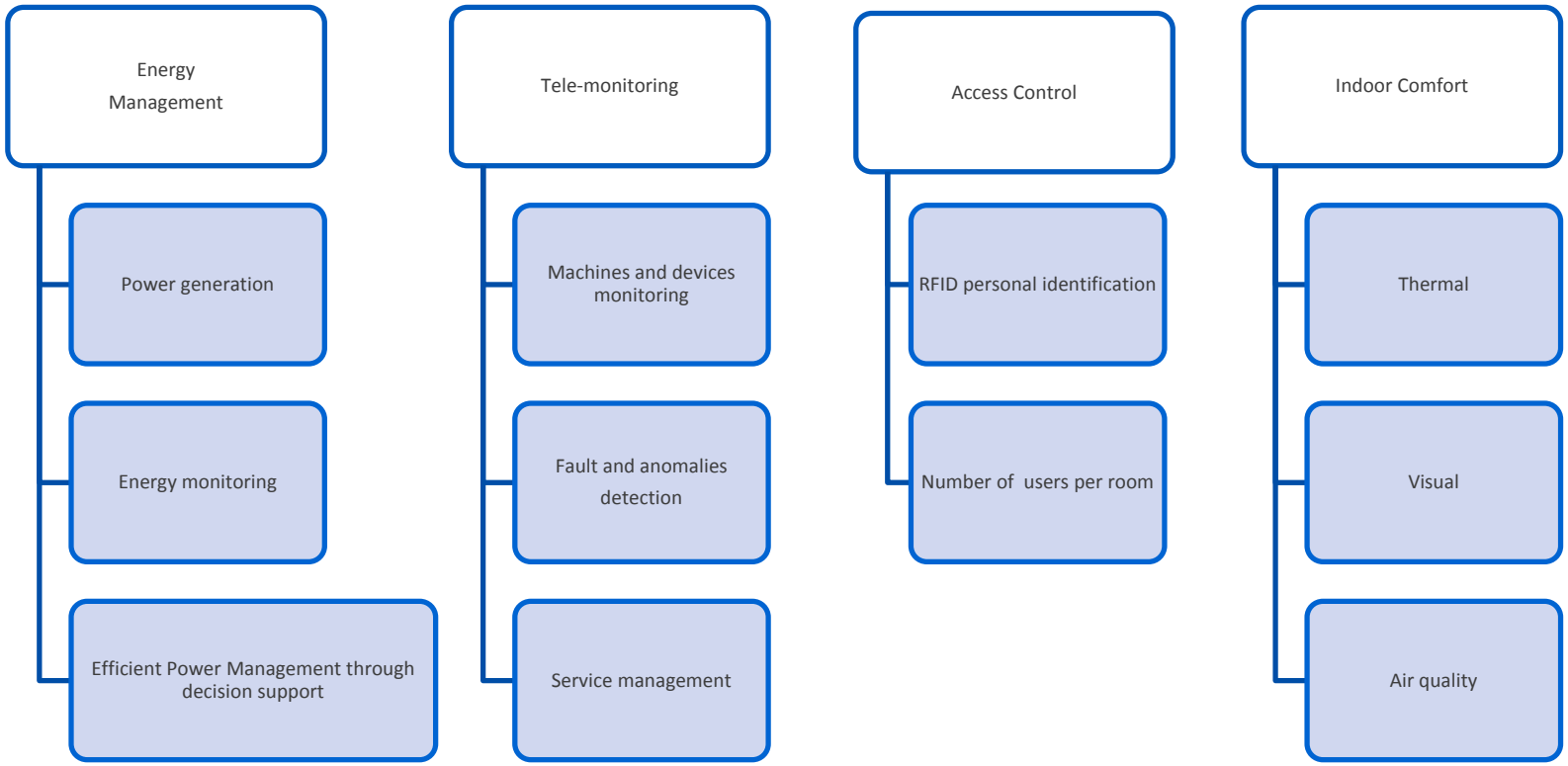
UMU Smart Building and Campus Project

- Smart buildings. Open Data Project.
  - Joint work between department, IT Services and Infrastructure Services of UMU (yes it is true ☺)



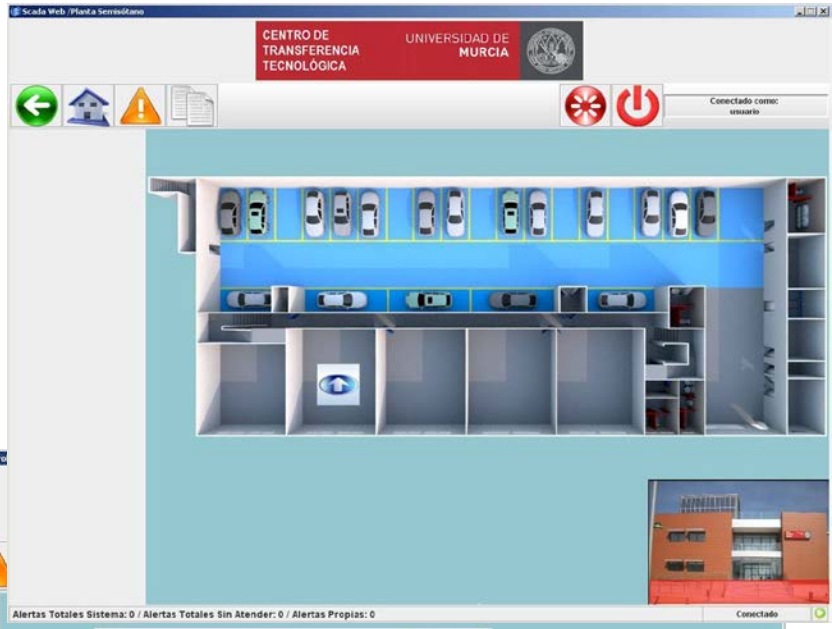
UMU Smart Building and Campus Project

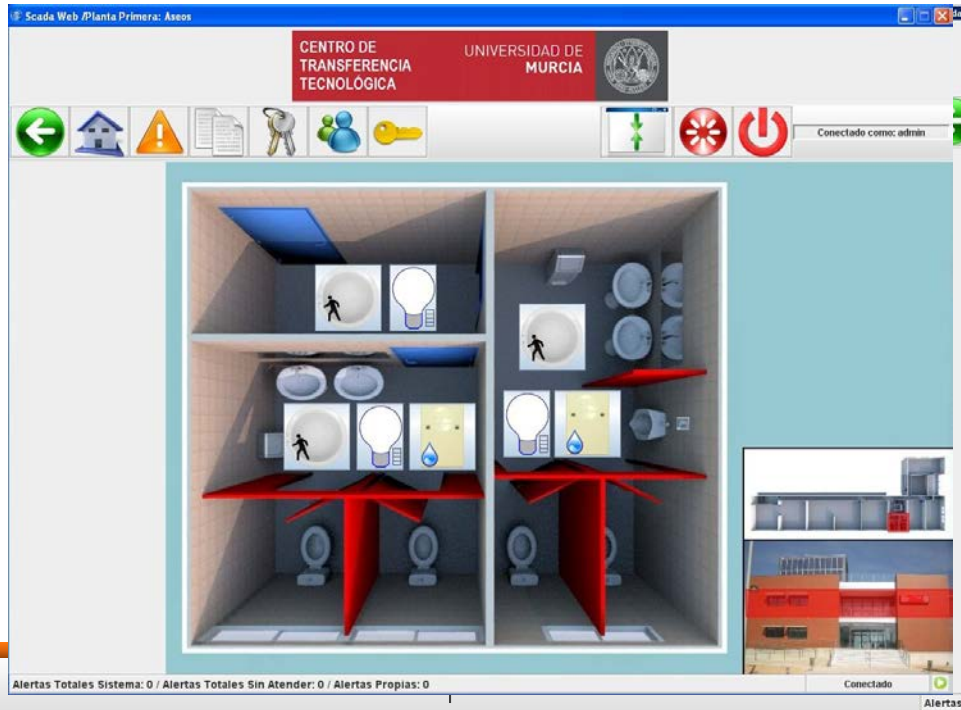
Example of the Services Provided

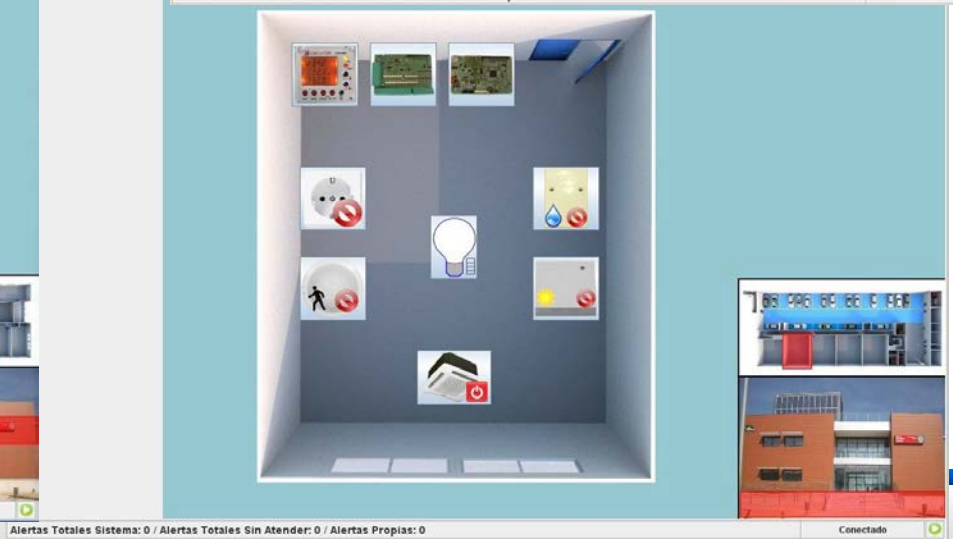


UMU Smart Building and Smart Campus Project

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







Smart Campus Use Case

Example of the Scenario – Data Collection Software

Validation

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

UMU Smart Building and Smart Campus Project

Energy efficiency in Smart Building

- **Current situation:** buildings represent the 40 % of total energy consumption as well as the 36% of the total gases emission at atmosphere.

- **EU 20-20-20 goals (2020):** reduce the 20% of the gases emission, the 20% of energy consumption and increase the green energy consumption in the 20%.

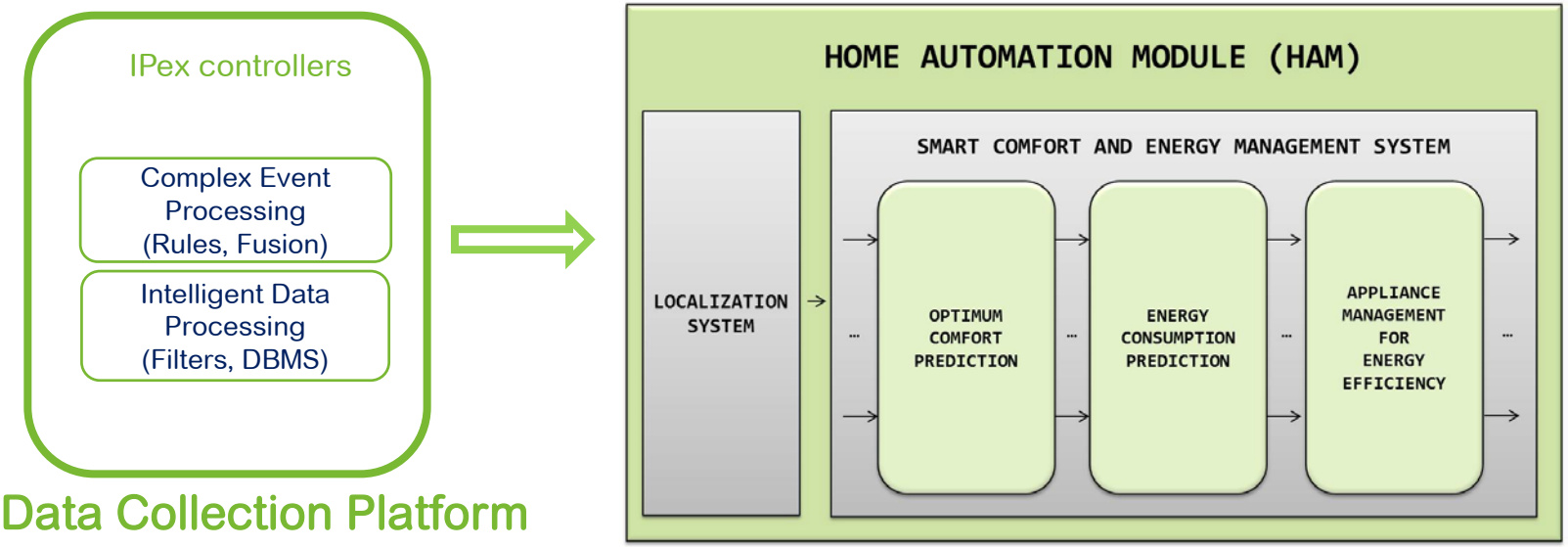
Energy efficiency in Smart Building

Factors affecting energy consumption in buildings

- HVAC
- Lighting
- Weather conditions in the area
- Variability of energy cost
- User behaviour
- Peaks in electricity consumption

UMU Smart Building and Smart Campus Project

- Smart Buildings Service: Smart Energy Control System
  - Estimate **customized comfort conditions** of occupants depending on their preferences and environmental conditions
  - Estimate **energy consumption** of appliances involved in occupants comfort preferences
  - Provide **optimal comfort settings** to achieve satisfying occupants comfort requirements and energy efficiency



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

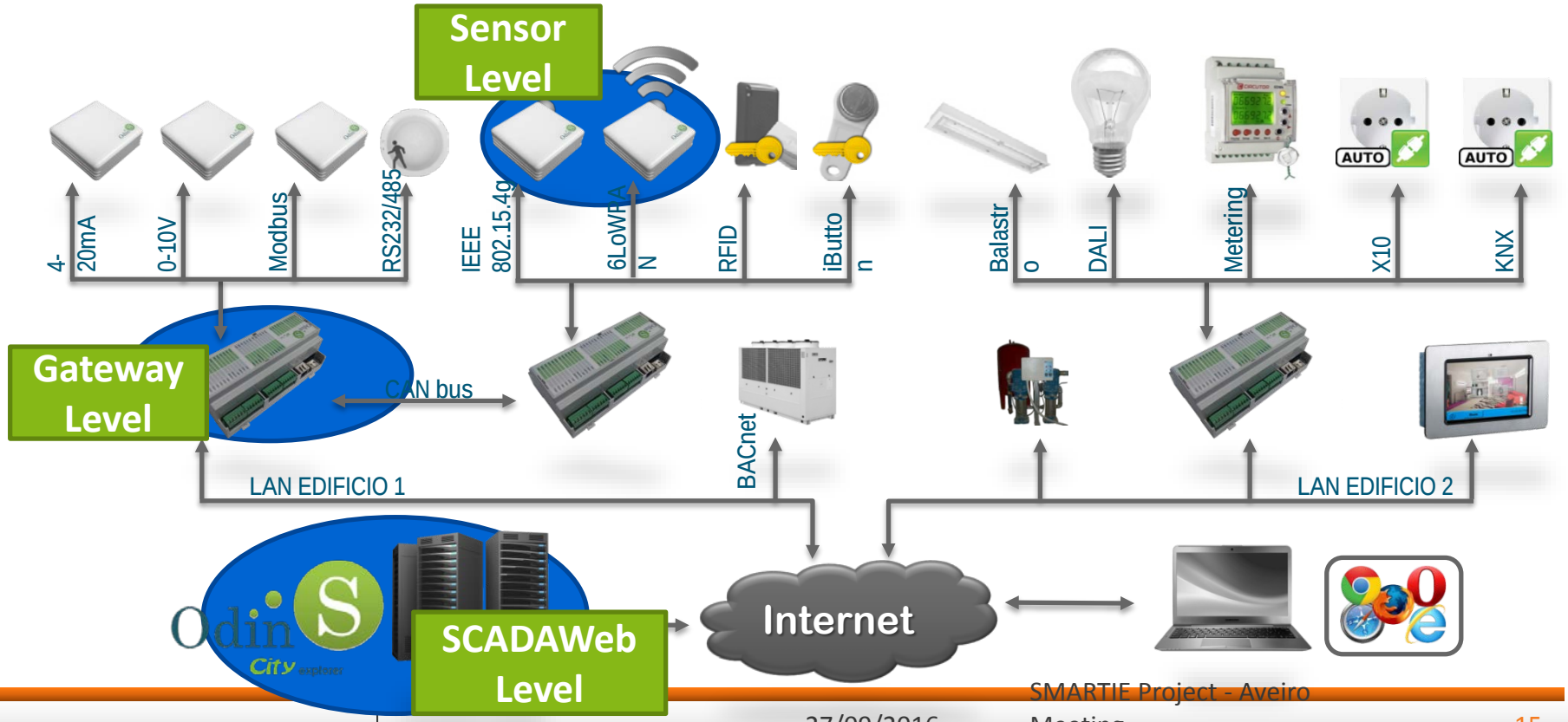
“How to connect to the platform…”

The Smart Energy Management use case includes i**nterfaces to connect with the platform at three levels**

- **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…”

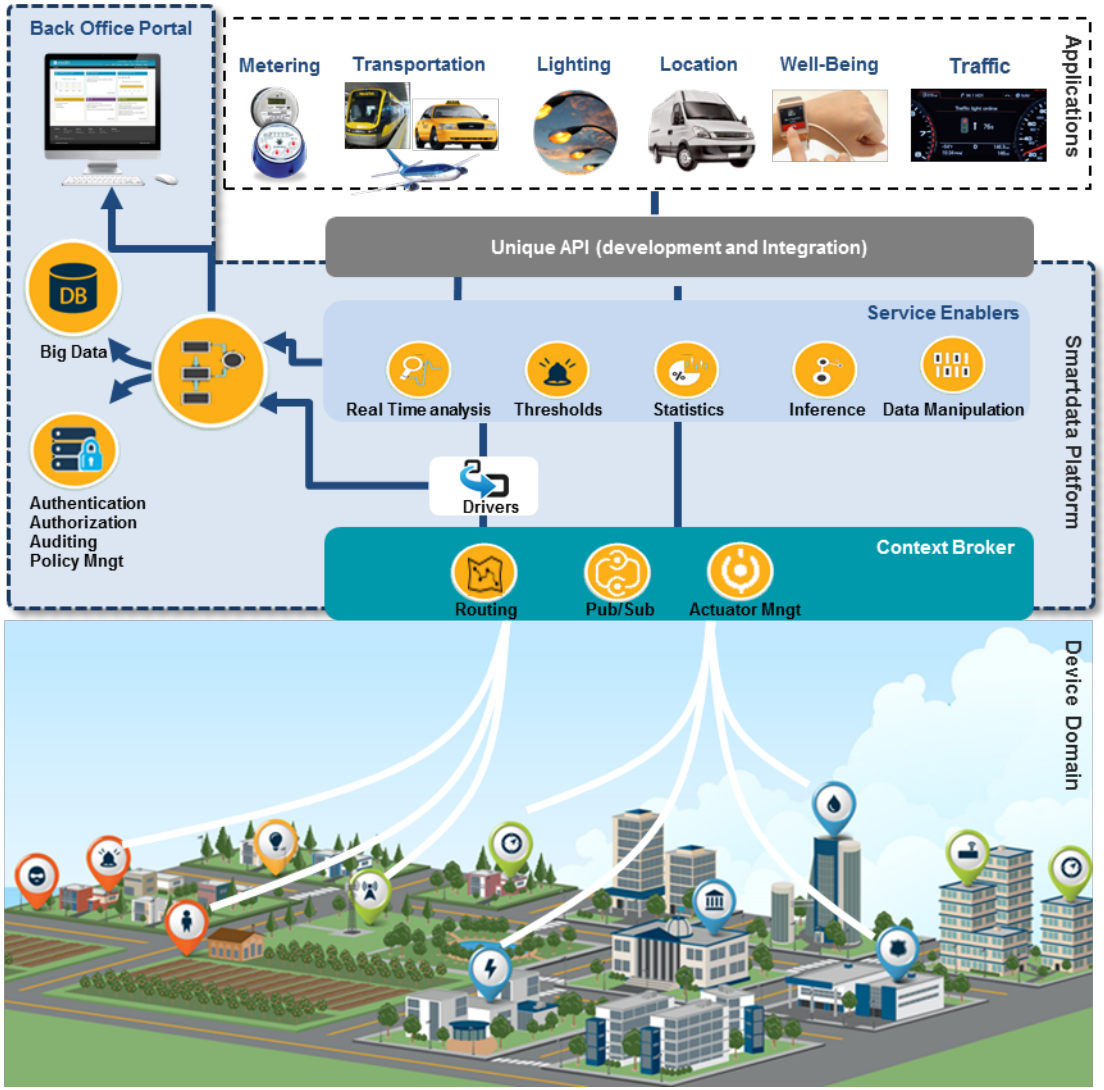
- **Sensor to platform**: IP sensors and actuators.
- **Gateways to platform:** both hardware and software gateways.
- **SCADAweb to platform**: Data Collection Software.



Secure Smart City Platform SMARTIE

- 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



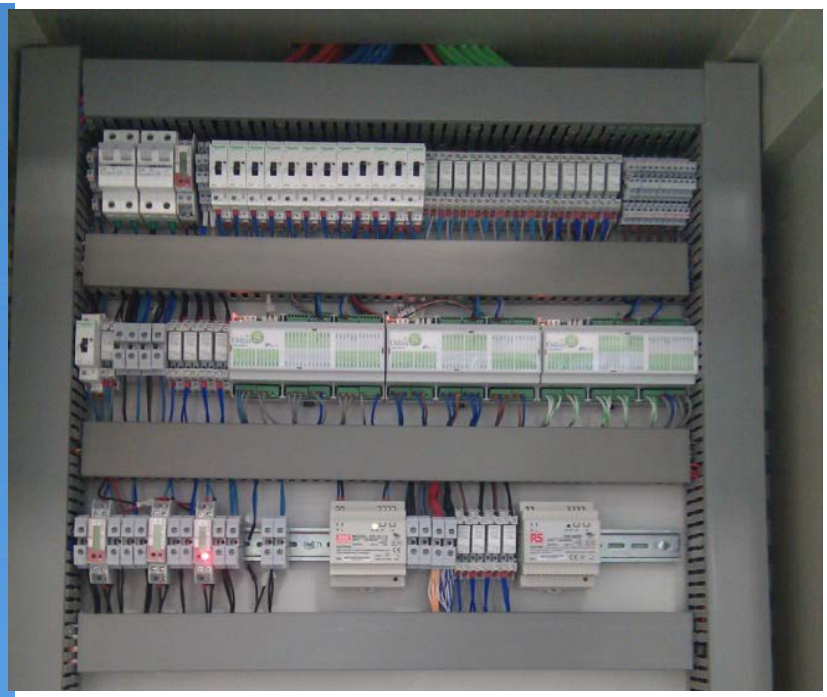
European Commission

Smart Campus Deployments

- Energy consumption reduction

Smart Campus Deployments

- Smart Street-Lighting



Smart Campus Deployments

- Smart classroom (patented)

Smart Campus Deployments

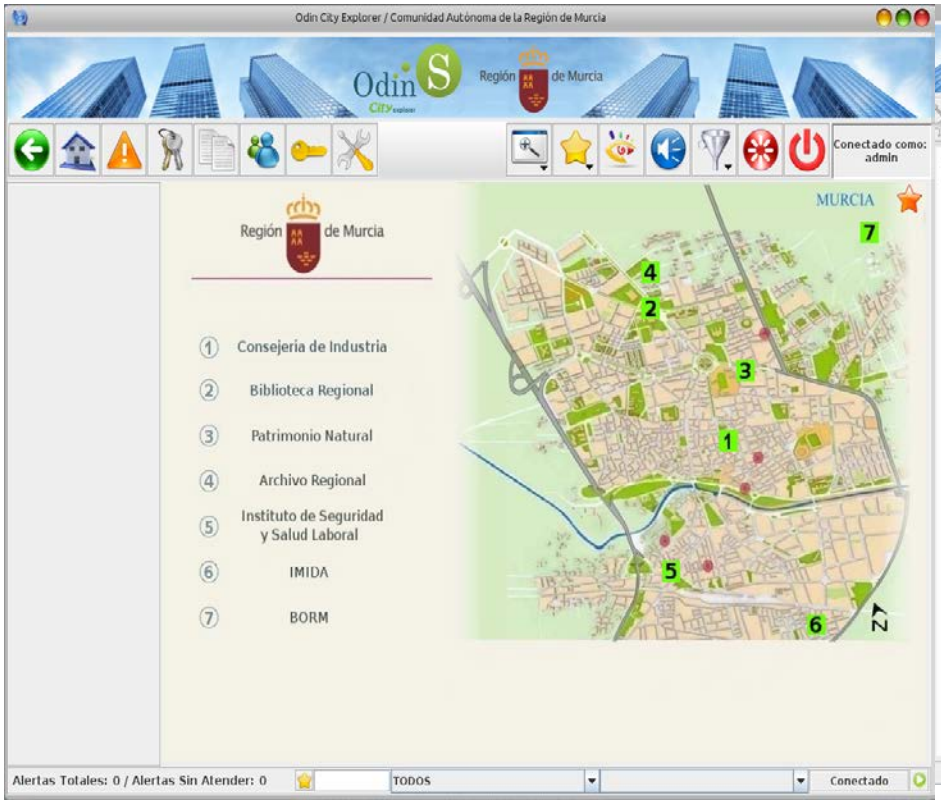
- Access control y some of the UMU buildings

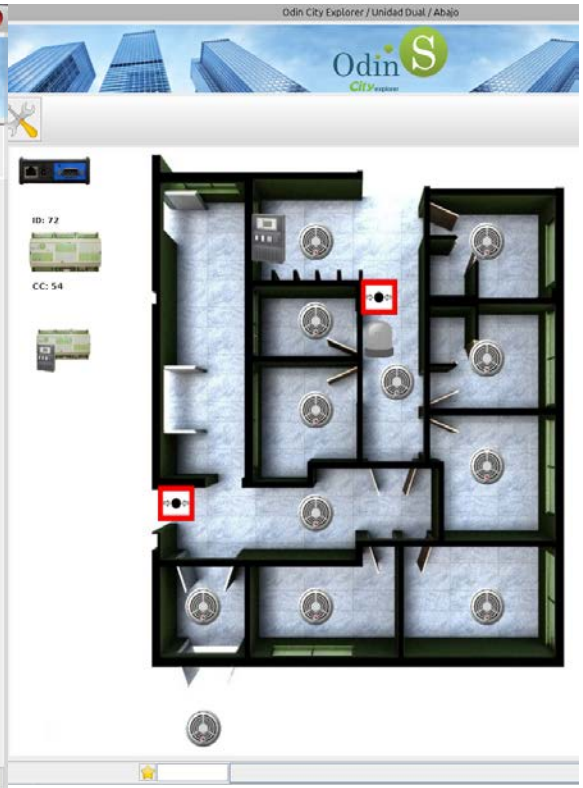
Smart Campus Deployments

- Predictive maintenance

Smart Campus Deployments

- Security (Centralized Fire Alarms)





Smart Campus Deployments

- Temperate alarm systems (laboratories)

Smart Campus Deployments

- Solar Panels Monitoring