



# A Web of Sensors approach for integrating and exploiting sensors data in Smart Cities (SmartSantander EU Project)



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## The SmartSantander FP7 project

The SmartSantander FP7 project proposes a unique in the world city-scale experimental research facility in support of typical applications and services for a Smart City.

The project envisions the deployment of 20,000 sensors in Belgrade, Guildford, Lübeck and Santander (12,000 sensors).

## The InterDataNet middleware

InterDataNet (IDN) is a middleware that offers capabilities for representing and managing information units and their structural and semantic relations as Web-addressable resources; it is developed since 2008 by the research team of CNIT-University of Firenze.

In the directed graph of IDN-Information Model (IDN-IM), information units are globally web-addressable and can be combined and aggregated across organization boundaries, while retaining reference to the originating organization responsible of a given information.

The IDN-IM leverages Web standard specifications (e.g., URI, HTTP) and the architectural guidelines based on REST (REpresentational State Transfer) and Linked Data, two paradigms characterizing the emerging interdisciplinary field of Web Science.

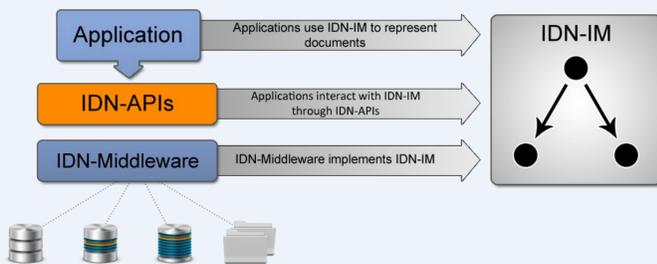


Figure 1 - The InterDataNet architecture

## InterDataNet and Experiment Objectives

This experiment aims at contributing to the SmartSantander project allowing an easy integration of IoT generated data into the service layer of the Internet, by extending the SmartSantander testbed facilities.

The objectives of the experiment consist in exposing the SmartSantander sensors as a Web of Resources, allowing users to browse it and create new Resources by assembling parts of existing ones. The web developer is also provided with the IDN APIs, IDN Studio, a web-based GUI easing the management of this Web of Resources, and IDN Search.

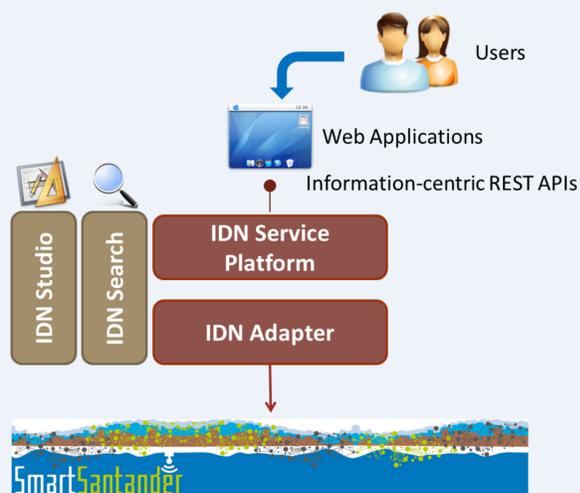


Figure 2 - Experiment configuration

## Virtual Sensors for Quality of Life monitoring

The SmartSantander experimental facilities offer a large variety of fixed-position sensors providing information such as temperature, CO, noise, light intensity, parking occupancy, and mobile sensors providing measures of NO2, ozone, particulate and participatory sensing events.

We define a Virtual Sensor (VS) as a graph representation of a sensor, whose output derives from a number of sensors' outputs processed through an analytical model.

The Case Study aims at demonstrating the usefulness of the VS paradigm and defining new value-added services, such as the creation and geographical displacement of VSs capable of measuring the Apparent Temperature (AT) in strategic locations like schools, public gardens, hospitals, depending on the values of humidity and temperature detected by physical sensors.

To this end this case study includes the design, development and testing of a Sensor Map web application.



Figure 3 - The Sensor Map application view

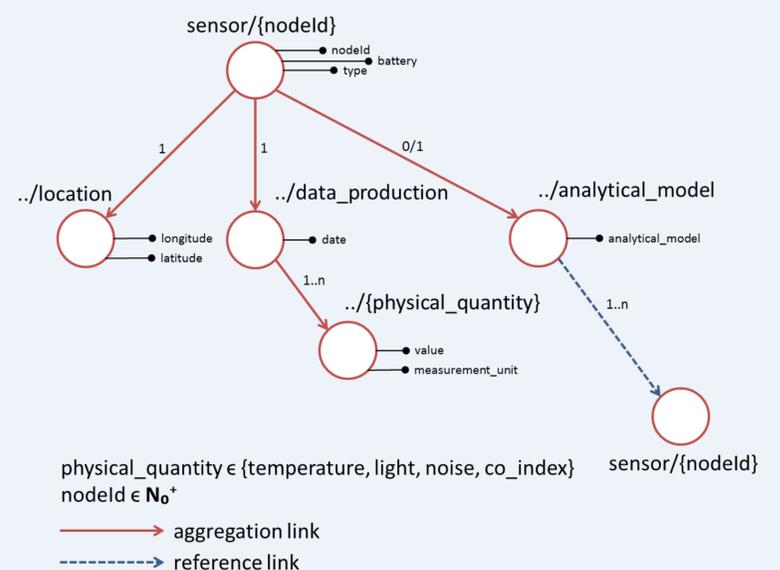


Figure 4 - Virtual Sensor Information Model

## References

S. Turchi, L. Bianchi, F. Paganelli, F. Pirri, D. Giuli "Towards a Web of Sensors built with Linked Data and REST", Second IEEE WoWMoM Workshop on the Internet of Things: Smart Objects and Services (IoT-SoS 2013), colocated with the 14th IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks Madrid, 4 June 2013.



SmartSantander Website  
<http://www.smartsantander.eu/>



IDN Website  
<http://idn.dinfo.unifi.it/smartsantander>