Sentilo Case Study

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Introduction

Sentilo is an open source sensor and actuator platform designed to fit in the Smart City architecture of any city that looks for openness and easy interoperability. It has been sponsored by the Barcelona City Council, through the Municipal Institute of Informatics (IMI), as part of a project started in November 2011 conceived for define the strategy and the necessary actions in order to achieve global positioning Barcelona as a reference in the field of Smart Cities.

Since then the city has taken a unique position of not only advancing its own initiatives, but trying to provide support for the global smart cities movement. This has been manifested in a few key initiatives. Barcelona holds the premier global event for smart cities stakeholders, the Smart Cities Expo World Congress. Barcelona is also the driver behind the City Protocol initiative which seeks to connect global cities in pilot projects to address common challenges. Barcelona has also been testing all kinds of sensors on everything from noise and air contamination to traffic congestion and even waste management.

As part of the desigined Smart City IT architecture IMI has developed an open sensor and actuator platform, released as Open Source available to any city or organiztion who could benefit from it. Nowadays Sentilo (that's the name of the project) it's built, used, and supported by an active and diverse community of cities and companies that believe that using open standards and free software is the first smart decision a Smart City should take.

Quick Facts	
Project Name	Sentilo
Sector	Smart cities
Start Date	1/2014
End Date	Ongoing
Objectives	Sensor data management platform
Scope	City
Budget	N/A
Funding	Public
Achievements	Sentilo is the operational Barcelona City Council sensors and actuators platform

Objectives and origins

Almost all "SmartCity" visions nowadays share the idea that a City has to break its organizational silos and let their data and logic flow across its different domains to become "smart". But many propietary sensor data solutions are technological "silos", making cities too dependent on specific technologies, products or providers that create isolated compartments where applications cannot share their data among them. They also lead to duplicity and multiplicity of data and infrastructures and an upward trend in investment and maintenance costs. It's obvious that that silo structure can only

be avoided by creating horizontal and global platforms with a broad and multiorganization scope.

So the main idea that inspired the design of Sentilo is first and foremost the desire to create a cross-platform oriented infrastructure and data management service, escaping from vertical ITC “silo” solutions, for sharing information between heterogeneous systems and to easily integrate legacy applications.

Sentilo was also inspired from the start to use open source components, and in due course release the software to the community, for sharing between both public administration and providers wishing to provide sensor based “smart city” services to Cities and Municipalities.

Due to the open source licensing regime, any provider or user can take up Sentilo and implement the platform for managing sensor data:

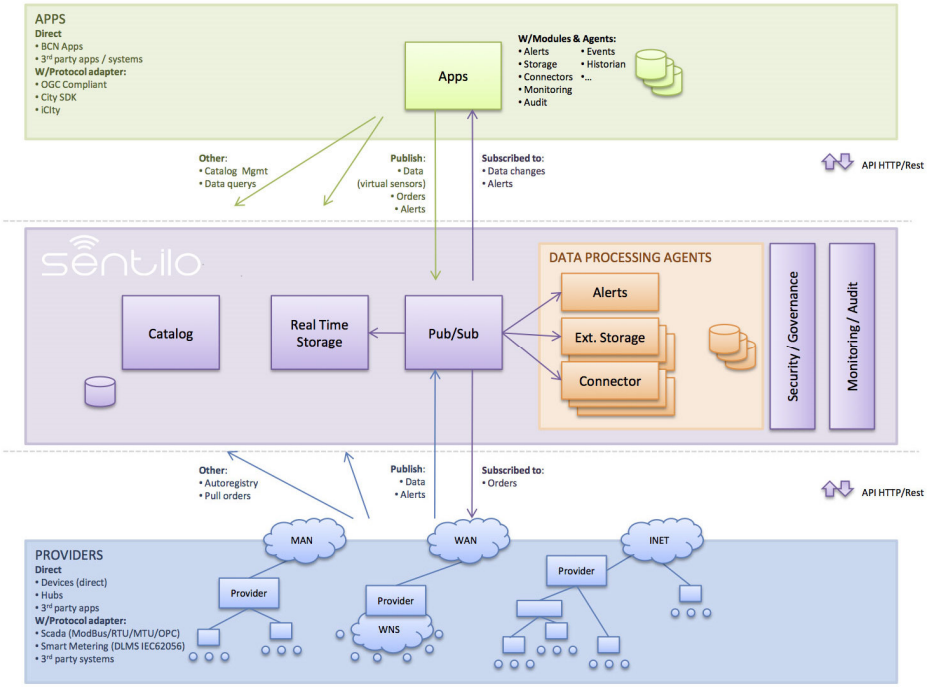
- Sentilo is aimed at municipalities or organizations who need to process lots of information received from the terrain generated by heterogeneous hardware and software devices (sensors, etc.), and who want a centralized and homogeneous way of managing and distributing these data across their information systems.
- It is also aimed at anyone from the IT world interested in contributing to the expansion of the "Internet of Things" and smart cities with the goal of improving citizens' quality of life.

Sentilo was initially built to be used as the sensor platform for the City of Barcelona, with an aim of openness from its beginning, using only open source components. After its local deployment, Barcelona City Council released the Sentilo code under a free and open source software license, available at www.sentilo.io. Several companies from CatPL, the Catalan Open Source Enterprise Association have colaborated in the project since its inception.

Technology and features

Sentilo is a software architecture that isolates the applications that exploit the information "generated by the city" from the layer of sensors deployed across the city to collect and broadcast this information. In other words, the platform isolates applications that use the sensor data from the layer that provides the data.

Sentilo is open and makes it easy to integrate data from sensors and actuators of any manufacturer without purchasing the proprietary platform of a particular manufacturer, while at the same time providing an open API for applications that use the data from the platform.



Sentilo is developed entirely with open source components such as the Redis, MySQL, and Mongo databases, Hibernate, JSON or JQuery.

Sentilo includes:

- A front-end for message processing, with a simple REST API
- A administration console for configure the systrem and manage the catalog
- A memory database, aimed to acomplish high performance rates
- A non-SQL database, in order to get a more flexible and scalable system
- A universal viewer, provided as a public demo what can be used as a start point for specific business visualizers.
- A basic statistics module that records and display basic platform performance indicators.
- An extensible component architecture, to enlarge the platform funcionality without modifying the core system. Sentilo starts with an initial set of agents: one for exporting data to relational databases and another to process internal alarms based on basic rules

Key Features:

- High performance: designed to process thousands of messages
- Modular and extensible: agents architecture allows adding funcionality without modifying the core system
- Horizontal scalability: from single servers to big clusters
- Cross platform: developed with java, redis and mongodb
- Simple REST Interface: to send and receive sensors data, orders and alarms
- Agents / Triggers: new values can trigger alerts, calculations, stats, messages,…
- Frontend App: sensor Viewer, Catalogue, Stats & Admin console
- It's Open Source ;-)

Licensing

Sentilo is licensed under a dual licensing regime, under the EUPL 1.1 and/or LGPL3 licenses (or later versions). Both these licenses are “weak copyleft”, in the sense that they maintain the core code free in all circumstances, but also enable third parties to build upon Sentilo, and provide both FOSS and proprietary extensions for added value.

This regime also promotes uptake by private solution providers, although on distribution of the platform and any derivative works, they must comply with the terms of either of the above licenses and ensure the municipality (end-user) has access copy of the source code of the code (and its modifications).

There are no restrictions to commercial use of Sentilo, particularly building a commercial product on top of (or that uses) Sentilo. Providers may build and install Sentilo and sell services or license software extensions to third parties. They may also install Sentilo and provide services on a (for payment) SaaS basis.

Both cities and their providers can also build plug-ins, extensions, and other software that adapts or integrates or interacts with Sentilo through its APIs and other interfaces (with no copyleft conditions on use of these extensions).

Evolution

Nowadays the Sentilo community is supported for more than 10 cities and more than 15 companies, some of them worldwide leaders in the Smart Cities arena.

The next version of the platform is currentlly in development, pushed by the Barcelona City Council and the other sponsors of the Sentilo community. Actually Sentilo is open to receiving suggestions and new functionalities from any organization collaborating with Sentilo project.

The current roadmap (for 2014) includes:

- Security enhancements
- Monitoring of sensors
- Sensors incident management

The pipeline of other improvements includes:

- High availability
- Interoperability with the standards of the OGC Sensor Web Enablement
- Improvements in the installation process
- Improvements in the universal viewer

Sentilo Marketplace

Sentilo has conceived for 2014 a “marketplace”, a space where cities will be able to express their needs about Sentilo or look for a company that could provide them with any kind of service related to the platform. In the same way, the Sentilo marketplace will be a space where companies will offer their services and products to the cities and will look for other partners.

Sentilo marketplace can also become a space where knowledge and ideas can be shared between cities and companies, to promote innovation in Smart Cities concepts and architectures.