

## THE INTERNET OF THINGS

### THE IOTNET PLATFORM

The Internet of Things paradigm – IoT – involves using the web to connect objects of different kinds, probes, detection systems, actuators etc., enabling them to exchange data autonomously with the aim of creating cooperative mechanisms that function without the need for human intervention. In general these objects are designed to gather and deliver data or carry out operations on the basis of information gathered and processed on the web.

As part of its research and development activities CSP has developed a platform capable of gathering, managing and visualising the various different devices installed in a given area and the data harvested from them.

### GENERAL ARCHITECTURE

The system architecture is based on a number of basic elements. The sensors located throughout an area that are the sources of the data can be organised into homogeneous or heterogeneous Wireless Sensor Networks.

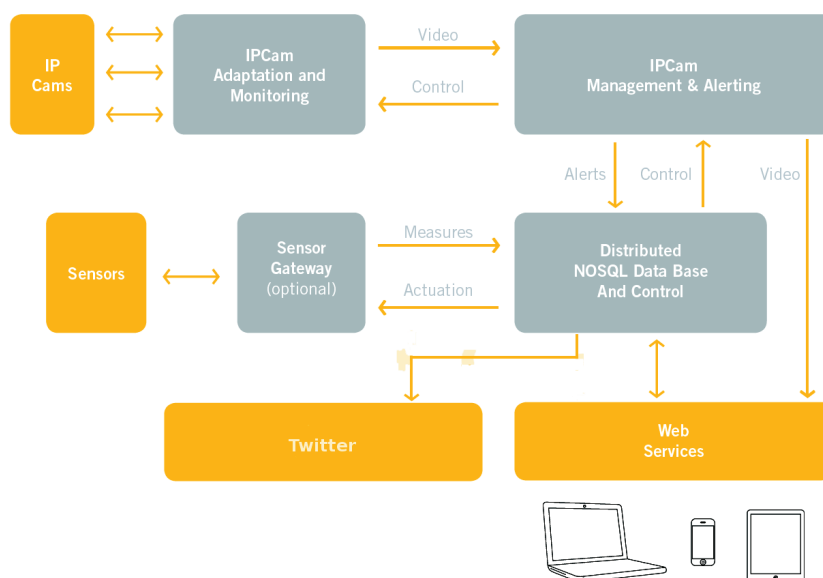


Figure 1 - The architecture of the IoT platform

These networks are connected to the IP network by devices called gateways, which packet the data from the WSN – which usually function using proprietary protocols and frequencies suited to the individual setting – and transmit it to the web. Some nodes, however, access the IP network directly and therefore do not require gateways. The data from the sensors is gathered by the IoTNet platform, which carries out a number of functions, including storing the information, presenting it in a uniform format, and detecting glitches and the presence of unreliable data. The data gathered is made available in real time on different platforms, visualised on the web and retweeted at every refresh.

The platform also features an Android widget to visualise data from different sensors on multitouch surfaces, smartphones and tablets.



## TECHNICAL CHARACTERISTICS

The system features:

- an NOSQL database powered by the open source driver MongoDB;
- a layer of web services based on PHP using the REST model, that enables those producing the sensors to submit the data gathered using an open format based on JSON; these web services also offer functions that make the data accessible to third party applications and services;
- the data is validated by the system, which sorts its into three categories: valid, incorrect, borderline;
- a software component in C/C++, based on the multimedia platform GStreamer which enables data from IP webcams to be gathered, adapted and transmitted on a streaming server in real time;
- a software component in Java, to publish data from sensors on Twitter;
- a software component in Java, to import data from external sources.

## FUNCTIONS OF THE WEB INTERFACE

The IoTNet web portal is one of the access channels to the platform and enables a representative selection of data to be visualised, in particular:

- the sensors by type of data gathered and subject area;
- projects and their geolocation;
- data in different formats, in particular: via twitter, downloadable in .csv format according to a set interval of time, online with the latest data in real time;
- webcam and video streaming;
- open data: data published on external platforms with a Creative Commons licence.

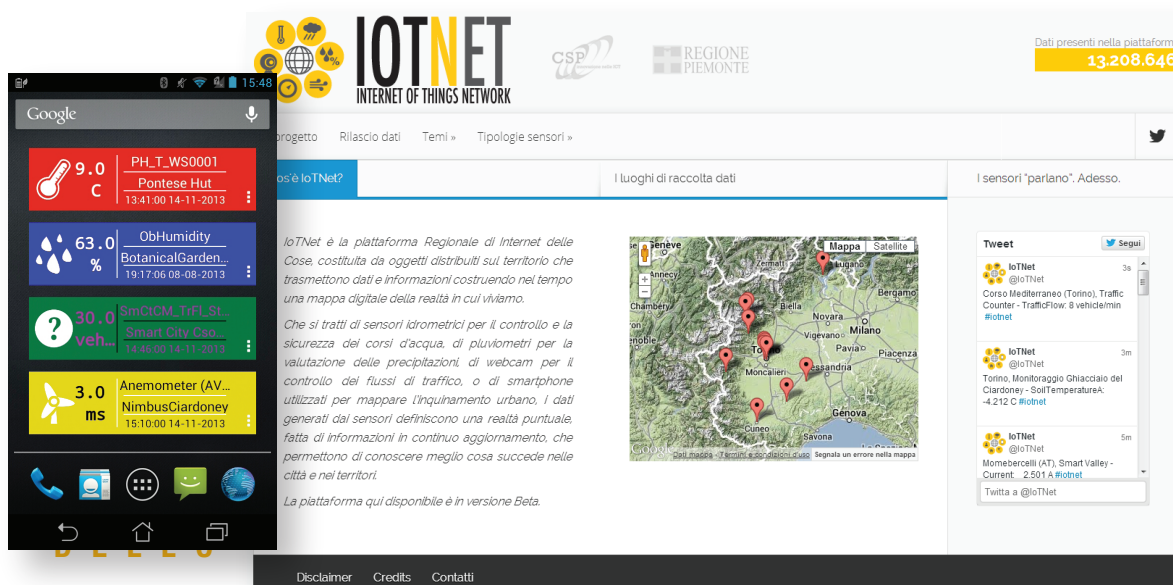


Figure 2 - The IoTNet platform and the widgets

## FUNCTIONS OF THE VIDEO STREAMING

The system architecture enables the inclusion of a test card or other customised image in the case of malfunctions, temporary shutdowns or standby of the device with overlaid information in text form that the user can customise. The compatible formats are:

- acquisition MJPEG and RTSP (H.264);
- publication: WebM (IceCast), RTMP/FLV for Flash streaming and MJPEG/HTTP.

<http://www.iotnet.it>

