Air Quality Monitoring System using Cloudino based on FIWARE

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1. Introduction Nowadays, the air pollution is one of the most important factor affecting the quality of life and health of the increasingly urban population of societies [1]. Besides, the consequences that pollution has on the air quality is both scientific ad social interest, specially to countries with rapidly developing economies where the exposure to concentrations of airborne pollutants has been shown to cause negative health effects in both the short and long term [2]. In this research, we present an air quality monitoring system using Cloudino1, and based on FIWARE2. Cloudino is a WiFi cloud connector developed in INFOTEC3, which is not an Arduino4 shield, is other processor working in parallel dedicated only to the network layer, incluidig the IoT protocols, leaving Arduino dedicated to the connectivity with the sensors and actuators, while allows reprogramming Arduino via WiFi or cloud. FIWARE is an emerging IoT platform, funded by the European Comission (EU), which is pushing for an ecosystem providing APIs and open source implementations for lightweight and simple means to gather, publish, query and suscribe context-based, real-time "things" information [3]. Thus, the air quality monitoring system measures the CO2, VOC, NH3 and NOx pollutants. Also, it measures the altitude, barometric preassure, relative humidity, temperature, and with a GPS it obtains the geolocalization. Finally, the measurements are sent to the Orion Context Broker5 (OCB), which is a FIWARE component that allows the management of the data, through the Cloudino API.

2. Air Quality Monitoring System The Air Quality Monitoring System has been designed with the components shown in the Image 1. The components are described below: Main module: This module implements de functionality of the Air Quality Monitoring System through the Arduino. Data acquisition module: This module obtains the measures from the different sensors, the date and time from the real time clock and the location from the GPS unit. Cloud connection:

3. Results and Discussion The Air Quality Monitoring System provides the implementation of hardware and software for air pollution monitoring. Besides, the data is available in the FIWARE OCB, so that, any application can query the measurements. In addition, the Cloudino allows the directly connection from the Air Quality Monitoring Unit to the FIWARE OCB in the cloud. In fact, one of the most important things is that the Cloudino allows to reprogramming the Arduino via WiFi or Cloud, thus, it is not necessary for the user to be close to the Air Quality Monitoring System to reprogramming it. 4. Conclusions The air quality monitoring system presented in this paper allows to measure the CO2, VOC, NH3 and NOx pollutants. Also, it measures the altitude, barometric preassure, relative humidity, temperature, and with a GPS it obtains the geolocalization. This kind of monitoring systems can provide enough information to generate statistics and understanding of the way pollutants affect the environment. Besides, many people could benefit by knowing the air quality and try to avoid the places with more pollution.

5. References [1] P. Völgyesi, A. Nádas, X. Koutsoukos y Á. Lédeczi, «Air Quality Monitoring with SensorMap,» de International Conference on Information Processing in Sensor Networks, 2008. [2] A.-C. Firculescu y D. Ș. Tudose, «Low-Cost Air Quality System for Urban Area Monitoring,» de 20th International Conference on Control Systems and Computer Science, 2015. [3] A. Ahmad, F. Bouquet, E. Fourneret, F. Le Gall y B. Legeard, «Model-Based Testing as a Service for IoT Platforms,» de 7th International Symposium on Leveraging Applications on Formal Methods. Verification and Validation (ISoLA), 2016.