AirQ Internet of Things Case Study

Introduction

Air Quality and the monitoring of pollutants that can cause health issues is becoming more important to our daily lives with governments and regulators keen to both monitor and manage the impacts of poor air quality caused by a range of pollutants.

AirQ from SmartSense in Croatia is an advanced air quality sensor that measures a range of pollutants, including data related to gaseous emissions (NO, NO2, CO, SO2,O3) and particulate matter (PM1, PM2.5 and PM10). Accurate and reliable data collection from these sensors is important to ensure that up to date information is available to the users of the connected SmartSense dashboard.

SmartSense have partnered with Deutsche Telekom, T-Systems, Hrvatski Telekom, local Greek operator Cosmote and Hub:Raum to introduce a new NB-IoT connected version of the AirQ sensor. Hub:Raum is the early stage incubator of Deutsche Telekom and it is through participation in their NB-IoT Prototyping Programme that the partner relationship was built and developed.

NB-IoT Deployment

To date, the AirQ sensor used 3G or WiFi connectivity to upload data from the deployed sensors. However, SmartSense has now developed an NB-IoT energy-efficient alternative and aim to evolve further with a version that can be fully off-grid to allow installation in any location.

The aim of this new initiative was to develop a new NB-IoT powered air quality sensor, that performs as well as the existing sensors and optimised for NB-IoT, meaning that it can be battery or solar powered in future. This will allow the sensor to be installed in many more locations, whilst keeping installation and operating costs low.

The first step that was taken with the AirQ sensor was to optimise the solution to meet NB-IoT bandwidth requirements and to re-design the devices firmware and hardware to support NB-IoT. The aim of the deployment is to test the performance of NB-IoT for collection of all the data currently collected by the AirQ sensor and to measure the power requirements for developing a battery powered sensor in the future.

The first NB-IoT pilot is now up and running in Xanthi, Greece with real data being collected as shown in the screenshots below.

Benefits to SmartSense

NB-IoT can deliver some significant benefits to the AirQ sensors from Smart Sense, compared to the existing 3G and WiFi powered sensors.

Battery Life – NB-IoT is designed for power optimisation, meaning that it can operate from battery power and maximise battery life span for up to 10 years, depending on the usage profile. Currently the AirQ sensor must be connected to a mains power supply, which restricts the locations that a sensor can be installed. A battery powered sensor doesn't need to have its location compromised in order to connect to a suitable power supply.

Coverage – NB-IoT is based on LTE, but is designed to offer improved coverage of up to -20dB over existing LTE networks. This means that an AirQ sensor designed for indoor spaces is being developed, with the extended coverage opening up new locations that can now be reached for air quality monitoring.

Real-time data – The SmartSense dashboard displays real-time information from the installed fleet of AirQ sensors. Therefore it is important that measurements from the sensors are relayed quickly. The new NB-IoT AirQ sensors have been optimised for NB-IoT so that the sensor readings can be delivered in real-time, and the user experience in no different to the existing connected sensors.

FIGURE 1: Examples of data collected from Xanthi deployment
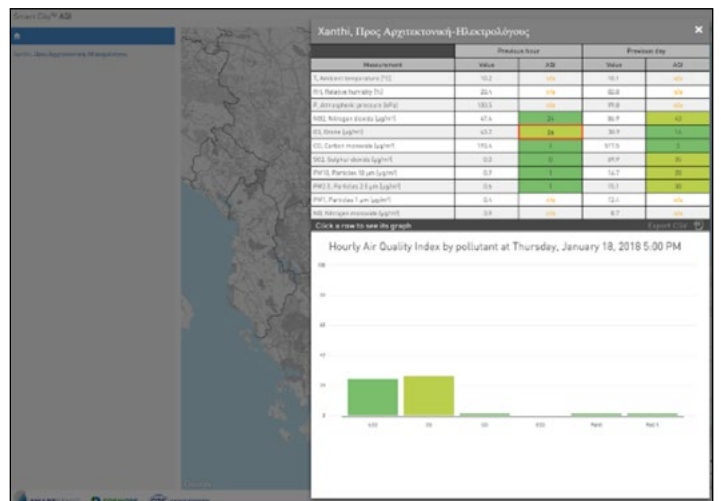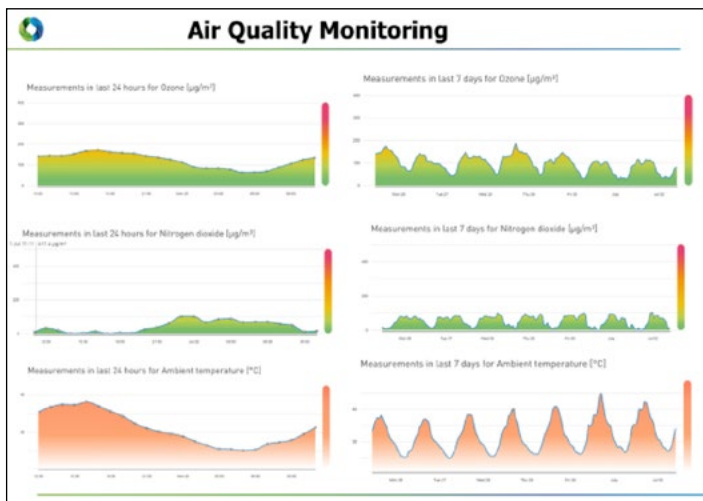
Outcomes

Energy Consumption – The power used by the sensors for communications has been much reduced, allowing the sensors to be fully battery powered. This opens up new installation locations, where the enhanced coverage offered by NB-IoT will be doubly beneficial

Flexibility – NB-IoT is very adaptable to a range of different use cases. The AirQ sensor is able to be positioned in locations previously inaccessible due to NB-IoTs improved coverage and battery life. New sensors can be developed as a result meaning additional areas such as indoors can be monitored. The sensors are also able to continue monitoring the full range of pollutants and sensors deployed to collect additional information such as weather conditions which will affect air quality day to day.

Bandwidth – NB-IoT offers enough bandwidth to transmit all collected data as it is needed.   The service has not been downgraded at all compared to the existing 3G and Wifi solution.

Conclusion

This NB-IoT deployment for the AirQ sensors in partnership with Deutsche Telekom, Cosmote and Hub:Raum has shown that there are significant benefits for SmartSense. The AirQ

sensors can now be installed in many more locations, whilst still maintaining the same quality of service as before. This means that data collected is more accurate and any locations suffering from high pollution can be more thoroughly highlighted and monitored.

NB-IoT offers a flexible, future-proofed solution for monitoring air quality at multiple sites throughout a city. The installation of these sensors is more straightforward with battery power and all required data can be collected as needed. In turn this means that the customer experience is improved, and the costs of maintenance and installation are reduced, creating a strong proposition for the city wishing to improve the quality of their air.

Moving forward Deutsche Telekom, T-Systems and SmartSense believe that a number of new use cases and business opportunities will arise with the data obtained from Air Quality Monitoring. The data will not only be used to generate direct revenue for exceeding Air Quality levels but also indirectly when automatic decisions and actions can be triggered depending on the data received. For example, traffic management systems can be controlled to ease pollution for a better user experience and congestion or pollution charges could be invoked using various Smart City solutions.

The GSMA Internet of Things programme is an initiative to help operators add value and accelerate the delivery of new connected devices and services in the IoT. This is to be achieved by industry collaboration, appropriate regulation, optimising networks as well as developing key enablers to support the growth of the IoT in the longer term. Our vision is to enable the IoT, a world in which consumers and businesses enjoy rich new services, connected by an intelligent and secure mobile network

For more information visit the website:
www.gsma.com/smartcities

GSMA, Floor 2, The Walbrook Building, 25 Walbrook, London EC4N 8AF UK
Tel: +44 (0)207 356 0600
smartcities@gsma.com
www.gsma.com/smartcities
©GSMA January 2018