SMART CITIES AND EHEALTH

Innovative eHealth device for air quality using FIWARE

With the contribution of

WOBCOM

Challenge & Context

During the Covid-19 pandemic, but also in pandemic-free periods, it is vital to pay attention to proper ventilation in order not to exceed prescribed CO_2 levels, and equally reduce the spread of viruses and bacteria. This seems particularly important and at the same time challenging in sensitive areas such as schools and daycare centers. Just to get started with: What does correct ventilation in line with requirements actually mean?

WOBCOM's WOB.smart service facilitates proper ventilation by automatically measuring CO2 levels via sensors in everyday situations. **Catholic daycare centers in Wolfsburg (Lower Saxony, Germany)[1] have already opted for** WOB.smart.

Solution

Sensors, as hardware components, are necessary for any air measurements which provide data and values from air composition, such as CO2, humidity or temperature. These hardware components work on the basis of a link with an encrypted, separate LoRaWAN radio network or the open, digital platform of WOBCOM. In the case of the CO2 measurement use case, the solution builds on WOBCOM's ODP[2] ecosystem.

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[1] Wolfsburg is the fifth largest city in the German state of Lower Saxony, located on the Aller River. It lies about 75 km (47 mi) east of Hanover and 230 km (143 mi) west of Berlin. As of "Germany's Motown is the country's richest city" (29 July 2013), Wolfsburg ranked as the richest city in Germany in 2013 due to its thriving auto industry. Wolfsburg is above all famous as the location of Volkswagen AG's headquarters and the world's biggest car plant.
[2] The Open Data Platform (ODP), developed by WOBCOM, is built and used for all sensor data and other relevant data in Wolfsburg, including environmental and weather data, mobility and traffic data, budget data, and even minutes from public meetings. All these data are consumed by the Orion Context Broker and the IoT Agent for its LoRaWAN technology. Together, they make up the two most important services of the platform. In combination with other services used, it is establishing not just the latest data but the whole data history. The platform is built in a way that other cities can easily be integrated, allowing for a big pool of open data and optimized collaboration.

With the ODP, WOBCOM has built a tailor-made ecosystem to be able to map as many individual use cases as required for the innovation-driven **Smart City of Wolfsburg**. **The heart of this ODP is represented by FIWARE technology , which significantly enables and powers up the respective applications.**

This includes the conditions for measuring critical data in real-time, depending on the individual use case, respecting General Data Protection Regulations (GDPR), and ultimately the analysis of the measured data. This is achieved through specially created dashboards, which are individually created depending on the specific use cases and customer requirements. The dashboards display the corresponding data and information on different technical devices, such as tablets, smartphones or conventional browsers.

In addition, data and information can be communicated to other linked devices via the open digital platform and further dashboards. For example, an LED cube can communicate with a measurement sensor and the WOBCOM platform to then display specific values in real-time throughout the premises where the sensor is measuring data.

The Catholic daycare centers in Wolfsburg, for example, are taking advantage of this system to ensure correct ventilation in an easy and comfortable way, to follow Covid-19 recommendations as well as following regular ventilation measures outside of pandemic times.

Although measurements can happen in any room of interest, the installed measuring devices in the daycare centers, in this case, measure CO_2 values in the play and recreation rooms. These communicate with each other via the WOBCOM platform using one or more LED Cubes. An LED Cube is a device that uses light indicators to visually display changes in the measurements which in turn helps the decision to immediately initiate appropriate measures. The data is sent to the foreseen LED Cube that is linked via LoRaWAN, which, in this case, continuously displays the CO_2 levels in the premises. An enormous benefit of working with such cubes is that they work like intuitive traffic lights: If the cube lights up green, the CO_2 value is OK, but if it lights up yellow, it should be aired soon. If it lights up red,

the appropriate CO2 value has been significantly exceeded and ventilation should be carried out immediately.

In addition to the information on CO2 levels, a dashboard can also be used to display other values such as temperature, humidity or movement over specific periods of time. The advantage of this is that heating costs, for example, can additionally be reduced in the long term.

Figure 1 - LWOB.smart sensors, dashboard and LED cube - complete equipment for fully automated air measurement

All data are of course handled in compliance with data protection laws.

WOB.smart is a modular system whose components (sensors, radio network and linked devices) are built on top of each other and use the FIWARE Context

Broker[3] as a central implementation element. The FIWARE Context Broker Generic Enabler is the core of such a solution and a mandatory component of any "Powered by FIWARE" solution or platform. It enables the management of context information in a highly decentralized and large-scale manner.

WOB.smart is a flexible system that can be installed according to individual customer requirements providing added value to a wide variety of companies and organizations in literally any industry looking to optimize its processes.

How it works

The solution is based on the WOBCOM Smart City ecosystem (ODP Wolfsburg.digital), a scalable and modular Open Data Platform that is open source-based. The FIWARE Context Broker plays a central role in this ecosystem. Connecting the IoT world with its sensors to data platforms and dashboards is not new and has already been successfully tested several times. Quite challenging, however, is the communication on the "way back", so the control of the actuators and in this case the LED cubes. They need to transform data into valuable and actionable information and create signals based on real-time and relevant measured values. Here, a special proprietary open source component was developed that takes over this control from the platform via the LoRaWAN network.

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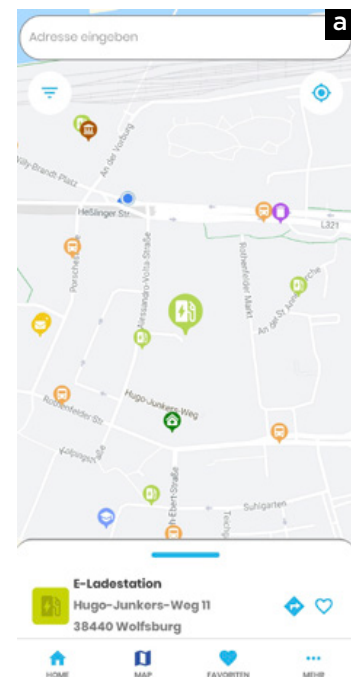
[3] Context Broker A Context Broker Generic Enabler is the core and mandatory component of any "Powered by FIWARE" platform or solution. It enables the management of context information in a highly decentralized and large-scale manner.
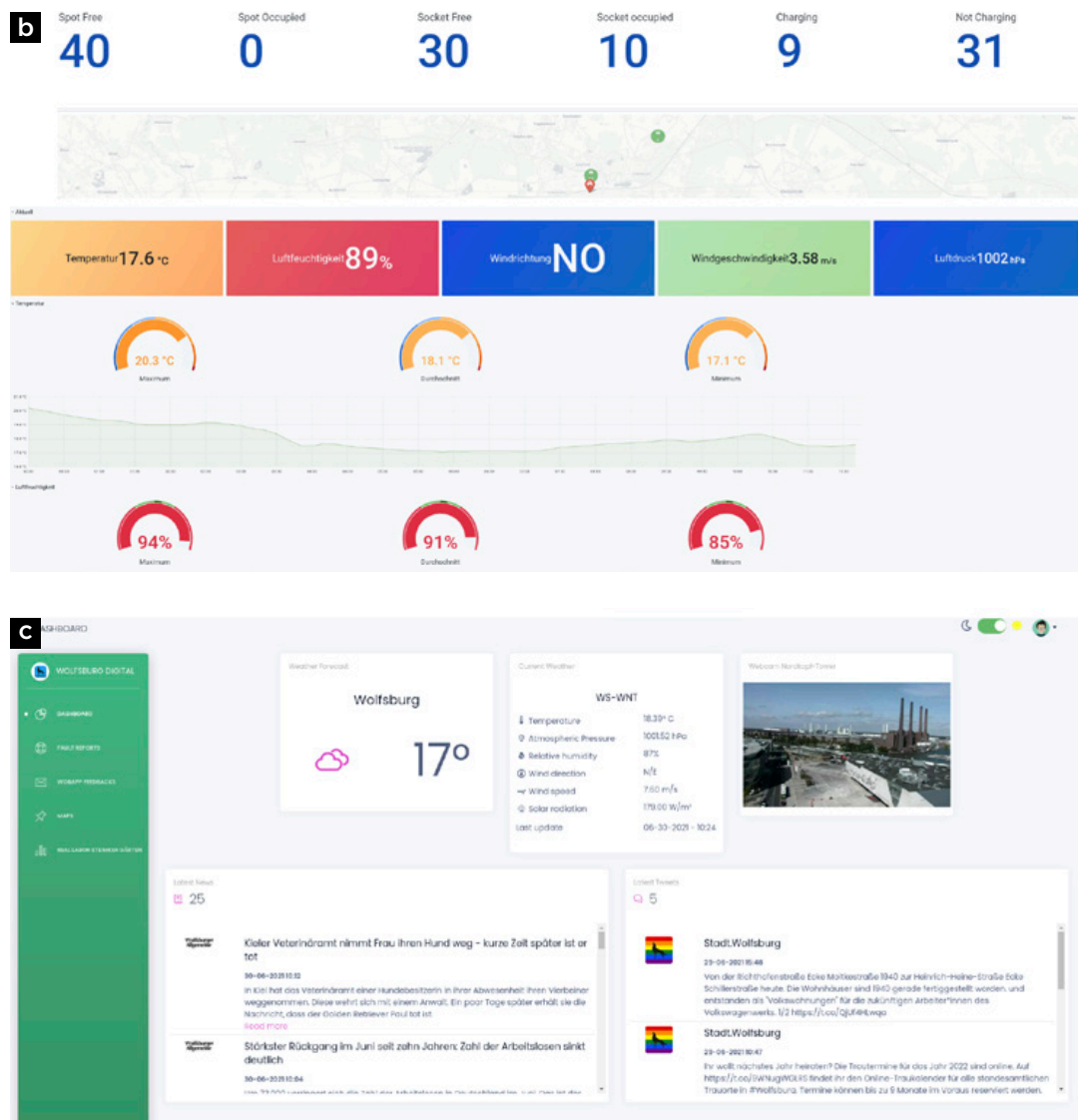
Figure 2 - a) Maps; b) Operations Dashboards; c) Wolfsburg.Digital

This control component has potential for further application scenarios, which WOBCOM is particularly proud of, because scaling successfully and creating additional synergies to further use cases always stand in the foreground.

Benefits & Impact

The city of Wolfsburg is on its way to becoming an even smarter city. WOBCOM is making a significant contribution to this path, among other projects, by setting up its own fiber optic network and by initiating and implementing the WOB.smart solution making use of the LoRaWan technical radio solution. Anatoli Seliwanow, Head of Operations at WOBCOM GmbH, states, "With projects under the name WOB. smart, such as the installations in the daycare centers, we contribute to a digital and innovative ecosystem in Wolfsburg. This open source project, with the LoRaWAN system used, also pays into future smart city solutions, well-being and quality of life, for the city's citizens."

Added Value through FIWARE

The Municipality recognizes the importance of innovation to the technology industry and the global economy as a whole. The changing landscape of disruptive technologies, provides perspectives on technology innovation trends, top barriers to commercialize innovation, and insight into technology innovation leading practices.

FIWARE technologies are the key enabler of the WOB.smart and WOBApp solution due to the fact that FIWARE Internet of Things Agent for LoRaWAN protocol enables data and commands to be exchanged between IoT devices and FIWARE NGSI[4] **Context Brokers using LoRaWAN protocol. It is based on the FIWARE IoT Agent Node.js Library.**

The proposed Network Architecture for a LoRaWAN based system relies on a mesh network architecture composed of End nodes, Concentrators, Network Servers and

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[4] All interactions between applications or platform components and the Context Broker get realized using the FIWARE NGSI RESTful API – a simple, yet powerful open standard.

Application Servers. One major added-value to be noted is that this IoTA is fully compliant with the used architecture, providing interoperability between **FIWARE NGSI Context Brokers and LoRaWAN devices**.
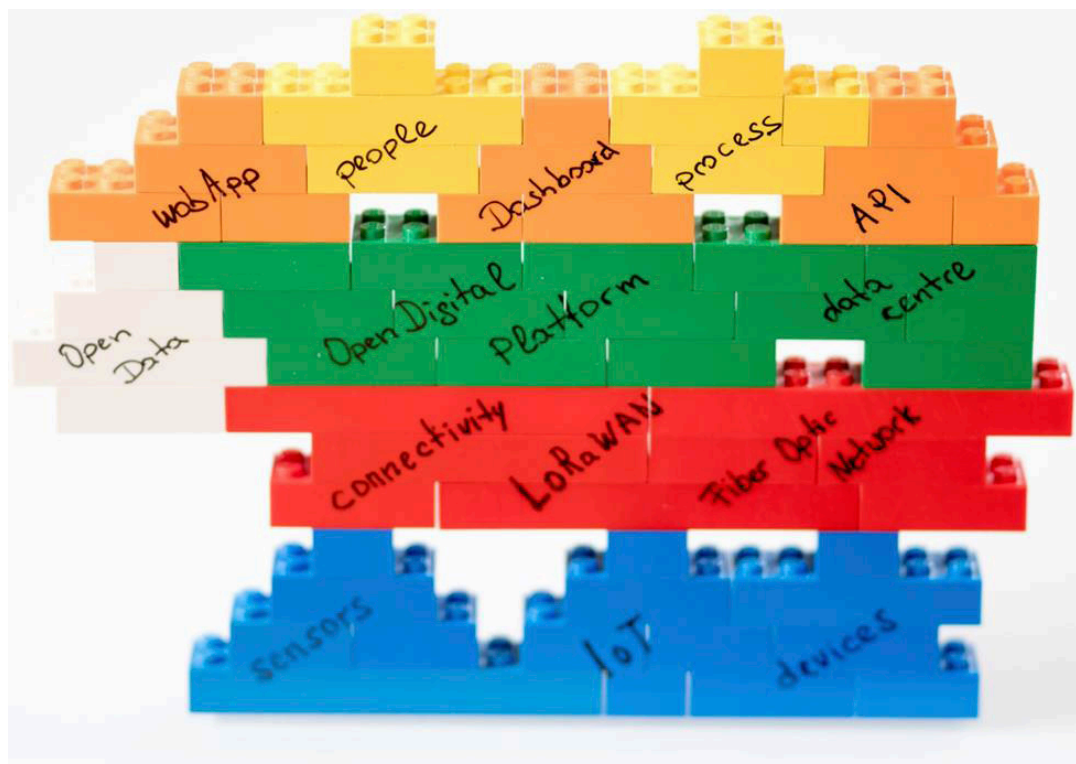
Figure 3 - Architecture Open Digital Platform with FIWARE IoT Agent

WOB.smart is one of many in-house projects, that, thanks to the FIWARE ASTRID iHUB (astrid.dev), showcases additionally the success of a wider ecosystem, and thus, the rise of new connecting communities of incubators, accelerators, and mentoring activities. Such initiatives and projects are becoming the beating heart of innovation in the city of Wolfsburg. With stakes so high to compete in a national technology industry ecosystem, constant contact with the Open Source community through the FIWARE Accelerator Program has proven to be vital.

Next steps

In the future, WOBCOM and Stadtwerke Wolfsburg AG, will address additional companies as target customers with the WOB.smart solution and introduce them to the possibilities for process optimization using sensor technology combined withLoRaWan technology. The special feature here is that the service, in combination with mobile gateways, is technically not limited to be used in the city of Wolfsburg and the surrounding area only, where WOBCOM usually acts as a local telecommunications and connectivity service provider (private customer area).

In this period of strong digital transformation, the German government has created a strategic "Digital Agenda", and, together with Gaia-X, is pushing the country's innovation potential to ensure growth and employment, supporting the development of a nationwide high-speed network, and improving IT security to generate trust within the society. WOBCOM is part of this great initiative.

We believe in cooperation and Open Source. Now more than ever, companies across a broad array of industries are being impacted by the rapid pace of change in digital arenas. European and cross-industry collaborations and partnerships are key to staying ahead, as is learning how to embrace change in a nimble way to avoid the status quo for fear of failure or uncertainty.

Dalibor Dreznjak – CSO Stadtwerke Wolfsburg AG

References

- [GITLAB WOBCOM](#)
- [GITHUB WOBCOM](#)
- [IOT WOB.SMART](#)
- [FIWARE LORAWAN IOT AGENT](#)
- [ASTRID iHUB](#)

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