



Alliance

Smart City

Smart Building

Industry 4.0

Internet of Things

A large graphic of several interlocking puzzle pieces in a light blue color, arranged in a roughly rectangular shape. The text "Internet of Things" is written in white across the center of the puzzle pieces. The background is a night-time aerial view of a city, with the Space Needle visible in the distance.

Interoperable Wireless Solutions

Smart City

- Street lighting and parking systems
- Traffic monitoring and control systems
- Infrastructure (bridges, tunnels, pipes,...) monitoring
- Environment, pollution, and noise monitoring
- Waste management



Smart Building

- Building automation systems
- Indoor lighting and heating
- Humidity, temperature, CO₂, vibrations, construction or snow depth monitoring
- Workplace occupancy and people counting



Industry 4.0

- Tool, machine and device monitoring
- Worker, forklift, and goods indoor tracking
- Infrastructure (e.g. ProfiBus) monitoring
- Coal wagons defrosting, turbine blades control



Other IoT applications

- Transport applications
- Railway embankments monitoring
- Water, electricity and gas metering
- Snowgun control, beehive monitoring, etc.



References

There are **300k+** running **IQRF devices** all over the world deployed since 2008: street lights in Israel, shopping mall lights in Mexico, nuclear power plant turbines in Poland, rail condition monitoring and control in UK, tools on automotive production line in Czech Republic, street parking in Hungary, coal defrosting in Slovakia, etc.

Simple Secure Reliable Interoperable

IQRF Alliance

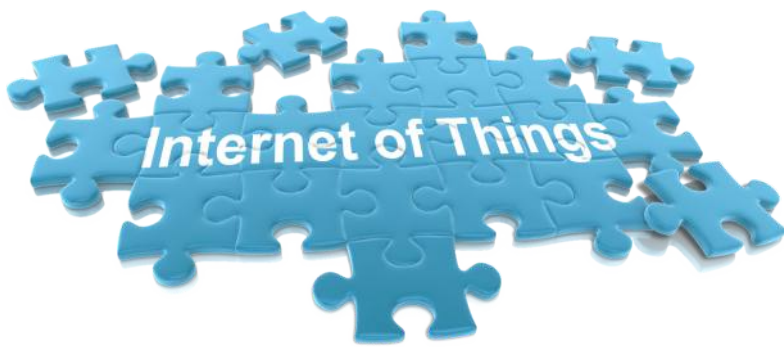
IQRF Alliance is an open international IoT alliance (including design houses, manufacturers, cloud providers, telco operators, system integrators, research and innovation centers, technical high schools and universities) with the mission to **deliver #1 wireless IoT devices and solutions based on the IQRF Technology.**



- IQRF Summit and local meetups
- Meetings and networking events
- Joint pilot projects
- On-line member zone

- IQRF Standard
- IQRF Interoperability certification
- Development support
- Reliable and secure wireless platform

- On-line marketplace and e-shop
- Joint stands on key exhibitions
- On-line and printed case studies
- International PR activities



Internet of Things

IoT is a big puzzle with hundreds of pieces that must fit one to each other.

IQRF Alliance members are building up an ecosystem of interoperable end-devices, gateway, software, clouds, mobiles apps, integration platforms etc. to enable their customers to realize a wide range of IoT project quickly and effectively.

Membership Benefits

New business opportunities

Easy interoperability

Shared marketing costs

Fast growing community

Mature technology

Ready products & solutions



IQRF Smart School

...program for academic institutions

IQRF Smart School is a program for academic institutions - especially technical high schools and universities. This program enables students to easily catch the fast-moving train of the Internet of Things and M2M wireless communication.



Community



Educational sources



Promotion

- free membership in the IQRF Alliance
- professional events
- on-line member zone
- cooperation on commercial projects

- free learning materials
- professional training and support
- discount on hardware
- teachers and students certification

- marketing materials
- promotion on Alliance website
- competitions for students
- higher value for employers

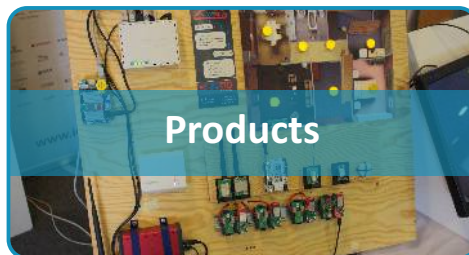
IQRF Start-up

...program for young companies

Young companies working on a product directly related to the IQRF Ecosystem can benefit from a two-year free-of-charge IQRF Alliance membership. IQRF Start-ups get excellent technical support, are linked to other Alliance members, are promoted through Alliance web site and social media and get a chance to demonstrate their products and solutions on IQRF Summits. Join the program to maximize your chance to succeed on the IoT Market.



Ideas



Products



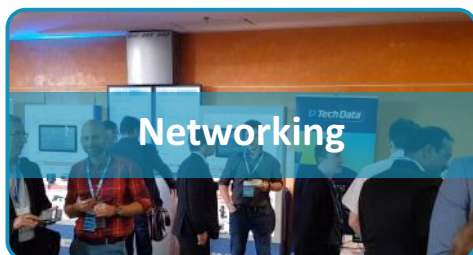
Opportunities

IQRF Summit and Meetups

...opportunity to meet partners

At joint events such as the IQRF Summit or IQRF Meetups, members of the IQRF Alliance can meet each other and discuss ongoing projects. They can find partners for their IoT projects, consult their ideas with IoT professionals and make their activities public, as well.

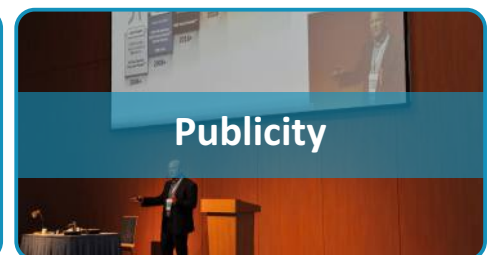
In an informal environment, such as networking dinner, it is often easier to face IoT challenges. Academic institutions can meet different type of companies on the IQRF events and that's where a number of joint development projects begin.



Networking



New projects

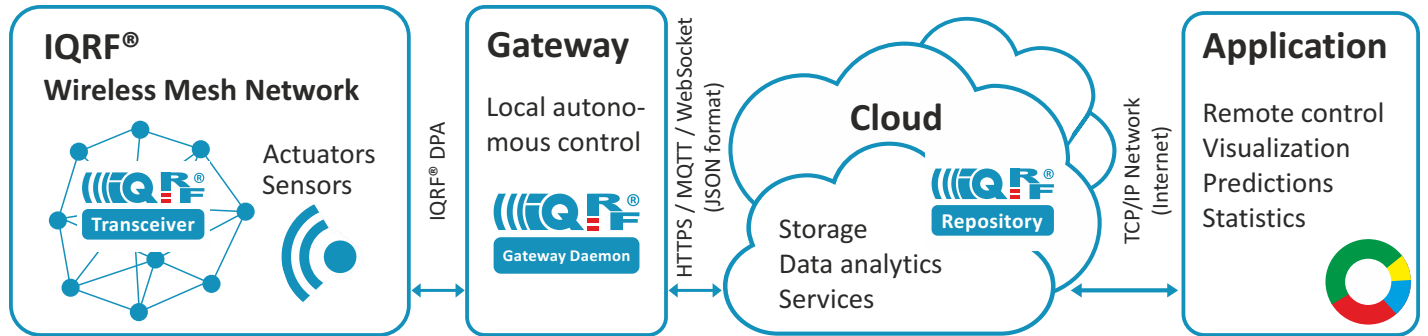


Publicity

IQRF Alliance connects the world of research and education to the world of business and experience.

Internet of Things with IQRF®

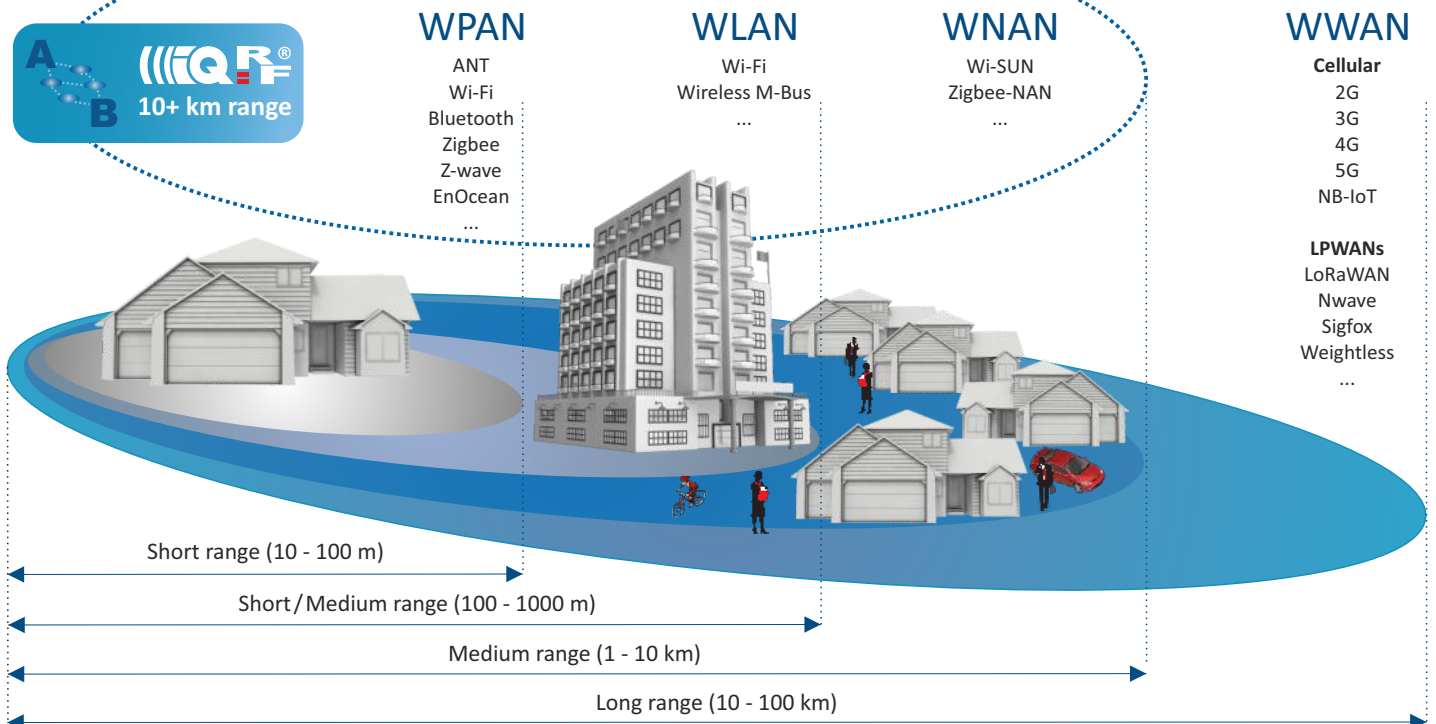
Typical design of IoT application with IQRF® network



IQRF® Features



Positioning



Wireless your device. Simply.

Clouds & Services



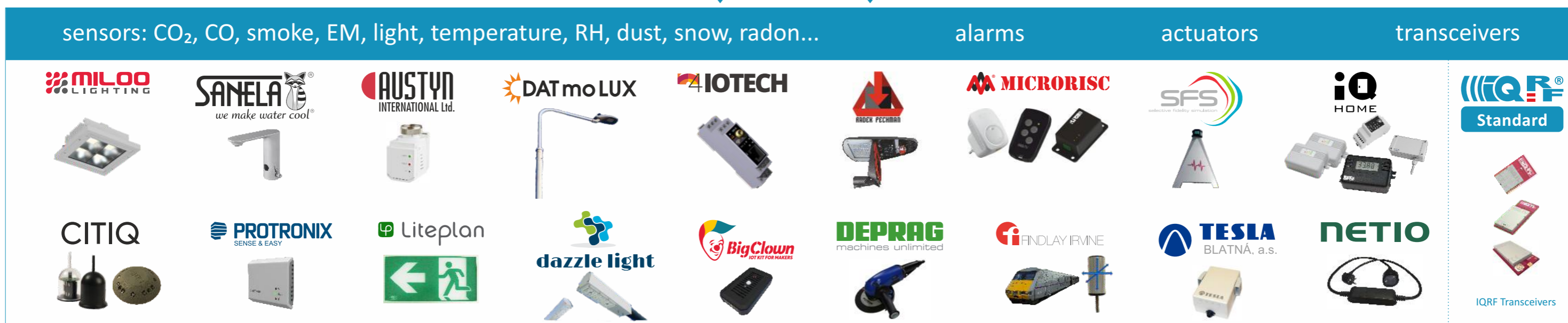
↑ HTTPS / MQTT / WebSocket ↓
JSON format

Gateways



↑ IQRF DPA ↓

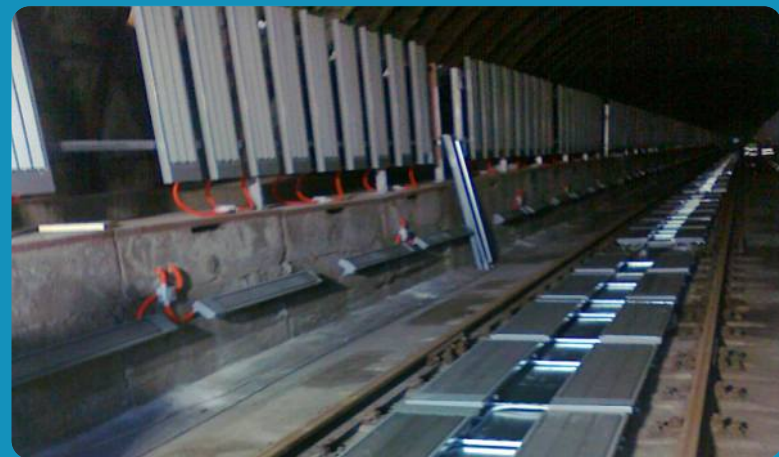
End Devices



Defrosting of coal wagons in Slovak powerplant



ilersen Central Heating - industrial automation sys.



1

over 500

over 1.8

Austyn Global Supervisor system for control

infrared heaters controlled by the IQRF network

MW of input power for infrared heaters

1

up to 50



modular control system

industrial heaters per zone

unlimited number of zones

The defrosting system consists of

1) **450 infrared heaters** with 3.6 kW output and **108 heaters** with 1.2 kW output,

2) **automatic RS AGS system** controlling defrosting based on data from temperature sensors in the tunnel and on the wagons. Data are transferred wirelessly through the IQRF mesh network.

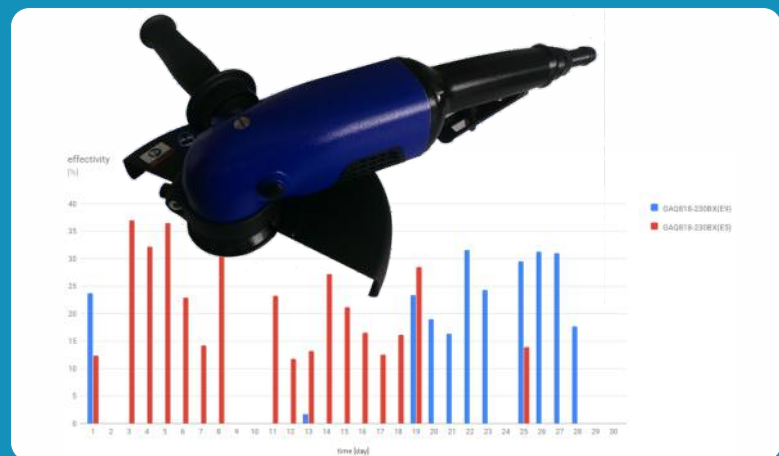
This system ensures reliable electricity production and heating for the town of Prievidza with more than 47,000 inhabitants.

Logimic industrial automation system monitors and controls the **heating** of industrial halls based on **temperature profiles**, indoor/outdoor **temperature**, working **hours**, etc. Each hall is fitted with an **IoT Gateway** (Aurora Hub IoT), divided into **zones** with one wireless temperature **sensor** and a set of wirelessly controlled **heaters** located on the ceiling of the hall. Data is stored in the **AWS** cloud. Thanks to continuous analysis, recommendations, and alerts, the client gains valuable inputs to **optimize heating and reduce costs**.

Wireless pneumatic grinding tools



Wireless control of 1.5 MW turbine blades



0

over 100

over 1,000

no need for external electricity

meters wireless range in open space

EUR savings per device

2

over 4

over 40

transceivers in every rotor for redundancy and higher reliability

years trouble-free operation

systems equipped with this control

The solution consists of **wireless pneumatic grinding tools** equipped with an electricity generator and **online dashboard** with information about tools status, a whole history, recommendations for a maintenance, comparison of workers and tools and a visualization of the working process in a timescale.

The **efficiency** of workers and tools is improved by continuous monitoring and recommendations. There are significant **cost savings** due to warning of the **upcoming malfunction** of tools.

There was a request to **control turbine blades** wirelessly (because of previous unreliable wired solution) in the **power plant JAWORZNO III** in Poland. The solution was provided as a custom development project by IQRF experts for Sigma Group.

Blade angle and **rotation speed** are remotely wirelessly monitored and controlled.

IQRF wireless technology is highly robust and reliable so it is possible to use it also in this very harsh environment.

Hotel heating optimization Hotel Patria - Slovakia



1

reservation system
controlling
heating

9

floors with rooms
in a hotel
controlled

over 180

electronic digital
thermostatic
heads installed

The smart heating system consists of

- 1) electronic digital radio **thermostatic heads** with protective covers
- 2) **gateways** in the technical room of each floor
- 3) a **control software** of the heating system connected to the **existing hotel booking system**.

The system automatically sets up room temperature based on check-in and check-out information from the booking system. This significantly helps to **reduce costs** in hotel Patria in Slovakia.

Lighting control in cinema, church, sports&industry hall



over 10

different sections
in halls for comfortable
operation

over 7

preset scenes
for different
occasions

1

system for
remote
wireless control

The light control system consists usually of

- 1) **LED lights**, wirelessly controlled in IQRF network,
- 2) **user interface** with pre-set **scenes** for different **occasions** and control of different **sections** in the hall,
- 3) settings of parameters like **light intensity**, **duration**, **time schedules**, and others.

The system works in **cinemas**, **sports halls**, and **production hall JULI Motorenwerk** in the Czech Republic.

Monitoring of CO₂ levels in kindergartens in Brno



over 3

months
of air-quality
measurement

3

kindergartens
had learned how
to ventilate properly

100%

scalable system for
additional sensors
and other devices

The **air-quality monitoring system** consists of:

- 1) **IQRF CO2 sensors**
- 2) **AuroraHub IoT Gateway**
- 3) central **IoT application** for data processing
- 4) wirelessly controlled **RGB light**

Based on the CO₂ level the IoT application controls the color of the RGB light. Within 3 months the staff had learned when to open windows to keep the optimal air quality.

Air quality monitoring in a Prague school



4

months of
continuous
measurement

over 47%

of the school time
students spent in a bad-quality
air with high CO₂ (>1000 ppm)

over 74%

of the school time
students spent in
dry air (RH<30%)

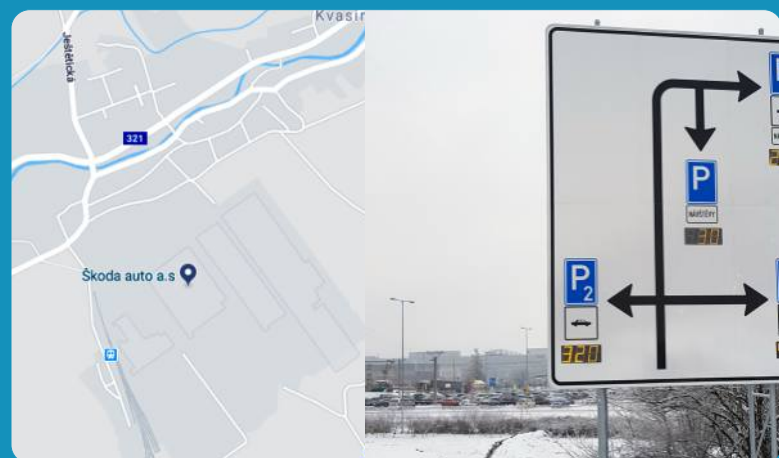
The entire large school for 600 students was covered by a network with only **10 combined sensors of CO₂, T, and RH**.

After a long-term **4-months** measurement, it was found that minimum recommended values of **relative air humidity** had not been reached for most of the school time and maximum allowed **CO₂** values had been exceeded for almost half of the time.

These variables and their values are directly linked to the concentration and health of students.

Traffic flow and parking control around Skoda Auto

CITIQ



over **80**
parking detectors in parking lots

over **140**
traffic flow detectors in adjacent villages

8,000
employees per day navigated to an empty parking place

Traffic flow and **parking occupancy** detectors are based on the electromagnetic field change monitoring. Traffic flow detectors sense the load on roads near the **Škoda-Auto Kvasiny** production plant. In the **GIS** application continuous data on **traffic flow, speed, and length** of cars are available online with a resolution for any **5-minute** time slot. Data on parking space occupancy are used for **navigation** boards located around the plant. This simplifies and speeds up parking process of coming employees. Sensors could be upgraded over-the-air.

Railway embankments monitoring system

fi FINDLAY IRVINE



1
reliable system for early warning

over **5**
years on battery for wireless sensors work

over **5,000**
sensors located along the length of the railway

Earthworks monitoring system consists of 1) multiple **wireless tilt sensors** monitoring railway embankments, 2) **automatic alerts** sent through a large wireless mesh network and 3G network to a central server, 3) **auto-triggered onsite day/night IR cameras** sending images to a central office. The system provides a remote early warning system of **slippages at railways**. It reduces the need to send staff to potentially dangerous locations. The system is deployed in the **United Kingdom**.

Wireless lighting management in Poland

MILOO LIGHTING



up to **128**
luminaires connected in a mesh with only one gateway

over **11**
years of uninterrupted operation

up to **200**
meters distance between luminaires in a mesh

Thanks to the use of RF technology in Miloo luminaires, it is possible to create a mesh of 128 lamps with only one gateway (access point). The user can connect to the gateway via WiFi, Ethernet, and GSM which enables remote real-time control and diagnostics.

This solution **reduces costs** associated with control and diagnostics of individual luminaries and saves service time.

Street lighting network - ideal backbone for IoT

RADER PECHMAN



over **10**
types of LED luminaires

over **20**
types of sensors, meters and actuators

over **10,000**
installed end devices and gateways

Radek Pechman company produces all major active parts of street lighting network. **Luminaires, switchboards, drivers, control systems, actuators, sensors, electric vehicle charging stations** and many more. The production consists of everything that is connectable to the street lighting network through the IQRF network. The target of this solution is to **connect systems** and **services** through the existing street lighting network using the IQRF to get **information** which can be used to inform people and to live in a healthier and better functioning city.

Air-quality monitoring in city streets



4

weather parameters monitored

5

air pollutants measured

up to 240

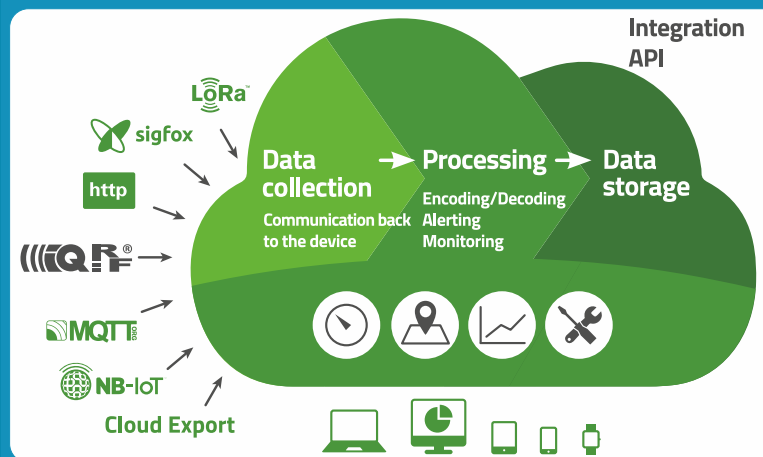
sensors in one network

The combined environmental module contains all necessary sensors for outdoor monitoring.

- | | |
|-------------------------------|-------------------------------------|
| 1) CO (0-500 ppm) | 2) SO ₂ (0-50 ppm) |
| 3) NO ₂ (0-20 ppm) | 4) O ₃ (0-20 ppm) |
| 5) humidity (0-100% RH) | 6) dust (25-500 µg/m ³) |
| 7) light VIS/UVA/UVB | 8) temperature (-40 °C to +125 °C) |
| 9) pressure (260-1260 hPa) | |

Other IQRF interoperable devices can be added to a network.

IoT Cloud with Smart Services



over 10

communication protocols

100

projects per organization

up to 10,000

devices per organization

This software and related services enable you to operate public city IoT network as well as private corporate one.

IoT Cloud is focused on various fields and solutions:

- Smart city
- Smart agriculture
- Smart energy
- Industry IoT
- Smart metering
- Data collection
- Message processing
- Data analytics
- Visualization
- API ready

Smart municipal radio - IoT backbone in a village



1

communication wireless IoT network

avg

150

meters of distance between speakers

over

230

network elements per 1 network

A network made up of **smart speakers** serves as a **backbone** for other **sensors** (air quality, traffic,...). The municipality does not pay for their connection to the Internet of Things.

Smart radio allows **broadcasting** from comforts of home, sending **SMS** and **e-mail** in bulk to citizens.

From connected sensors, you can get information about **noise**, a **number of cars, trucks, speed**, or air parameters as **oxides of sulfur, nitrogen or carbon, ozone, dust, temperature or relative humidity**.

Wireless torque wrenches in Skoda Auto production



X

kilometers of expensive and impractical wires spared

over

8

years of proven functionality

over

300

torque wrenches operate in a field

During 8 years more than 10 sets with over 300 torque wrenches have been delivered to **Skoda Auto**, saving kilometers of cabling and high costs. Cables were replaced by IQRF wireless transmission.

1 production base station operates typically with 20 **torque wrenches**. All data are delivered reliably and safely via IQRF wireless network. Data are being transmitted wirelessly to the documentation of all produced cars enabling **high product quality tracking**.



Alliance

Sponsor



Contributors



Adopters

and many others...

Join us! Together we are stronger.



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