



O₂ IT Services



IQRF IoT Hackaton

15. - 16. 11. 2016

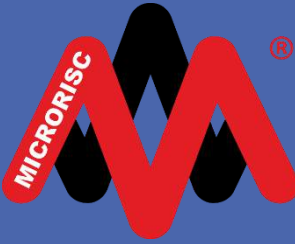
IQRF IoT Hackaton - agenda

- 11:00 - 14:00 přednášky
 - občerstvení
- 14:00 - 19:00 workshopy
 - občerstvení
- 19:00 - 9:00 zpracování soutěžního zadání
 - občerstvení
- 9:00 - 10:30 prezentace výsledků
- 10:30 - 11:00 vyhodnocení, ocenění

IQRF Technology

Short intro...

MICRORISC



- Author of the IQRF technology
- Founder of the IQRF Alliance
- Czech company founded in 1991
- 40+ employees
- Research, development and delivery of technology and components to electronic manufacturers
- 30+ patents
- Scientific award **Česká hlava** (2014) for the IQRF technology

IQRF Alliance

- International community of
 - developers, manufactures, system integrators,
 - sales professionals,
 - research and innovation centres,
 - technical high schools and universities .
- Members deliver complex solutions for M2M and IoT.

Commercial

IQRF® | Alliance



Schools

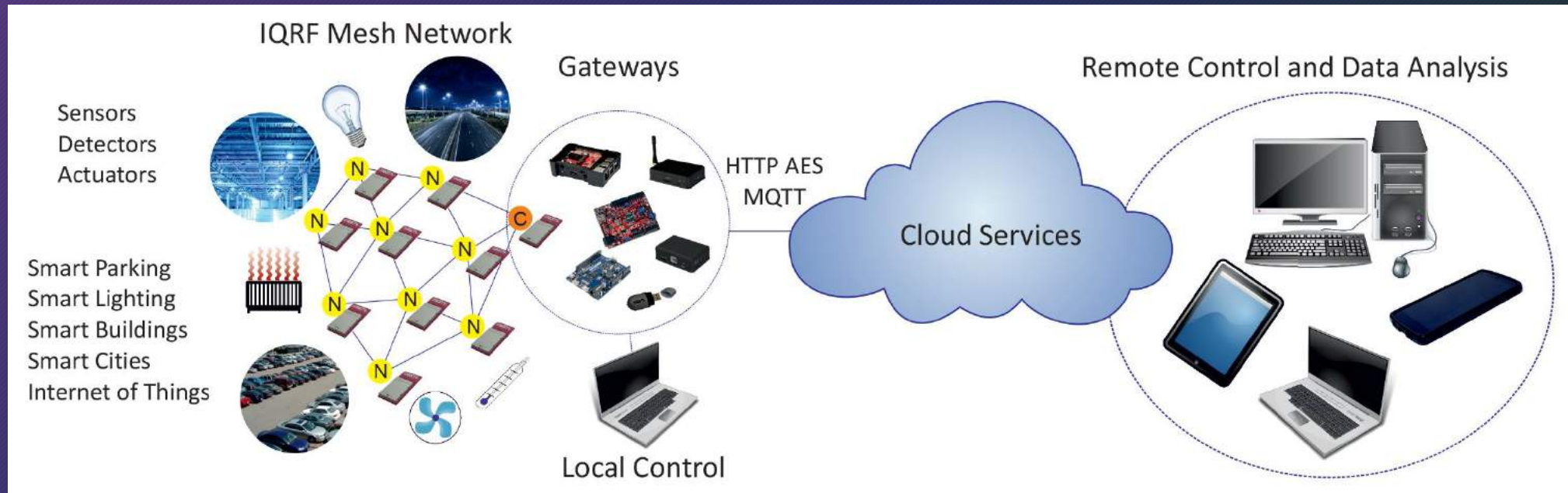


IQRF technology



- Transceivers with built-in operating system
- Frequency band: 868 MHz, 916 MHz and 433 MHz.
- Topology: MESH networks (max. 240 hops) - reliable data transfer thanks to routing method (synchronized directed flooding)
- Range: tens of metres in buildings, hundreds metres in an open space (500 m).
- Low current consumption (380 nA - 19 mA)
- The transmission speed suitable for controlling and data collecting (~19 kb/s).
- Transmission length: max 30 - 50 ms / packet.
- Packet-oriented communication (max. 64 user bytes / RF packet).
- No licence fees.

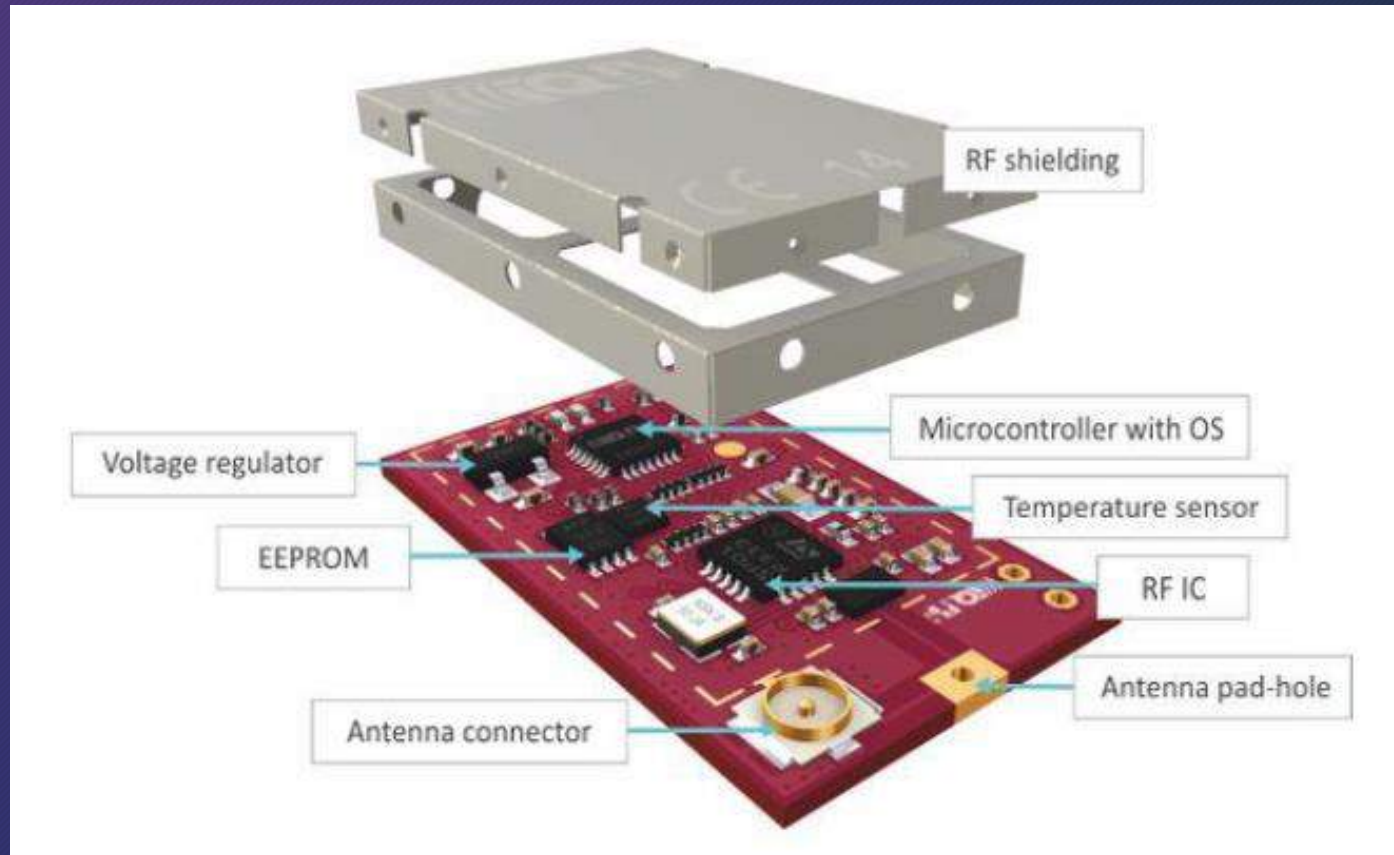
IQRF interoperable and complementary ecosystem



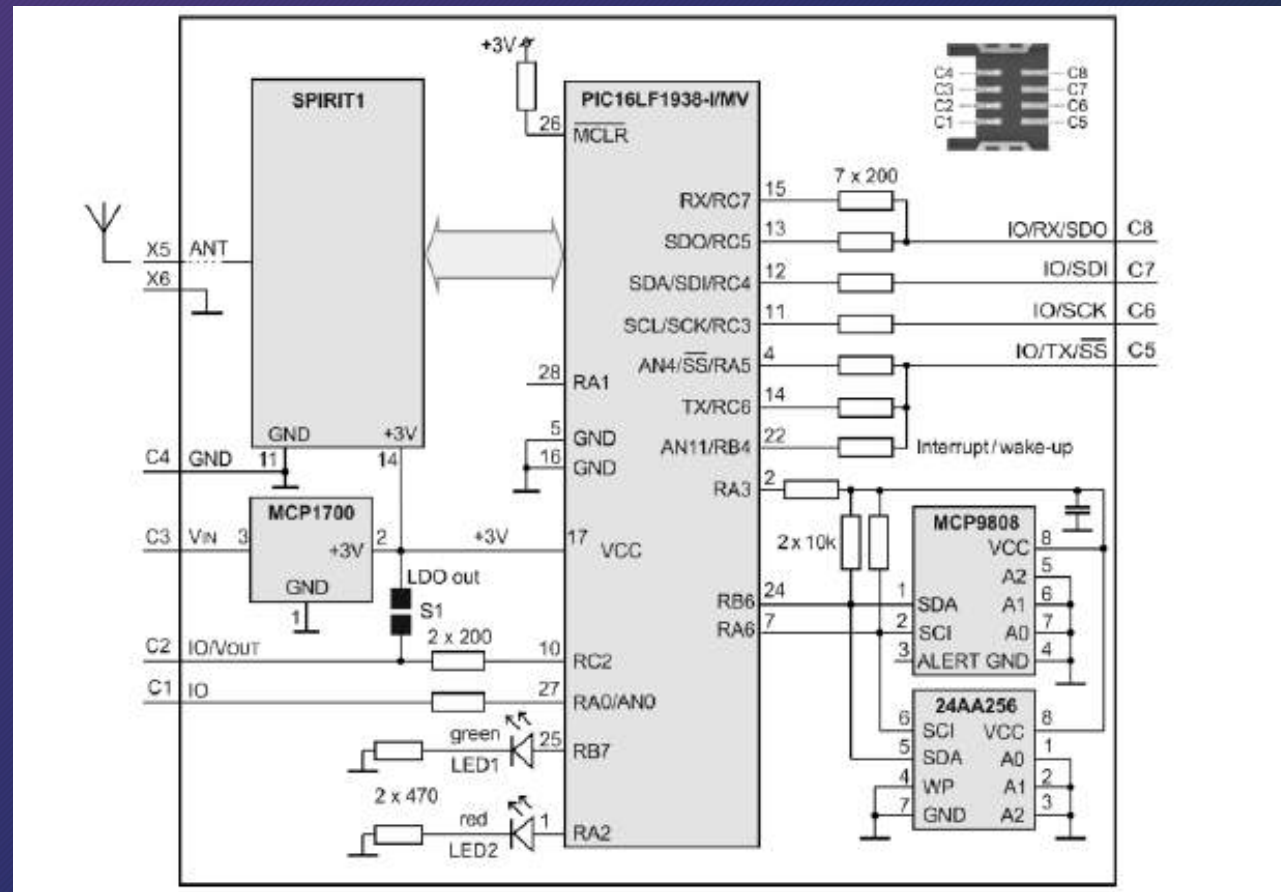
IQRF - wireless platform for data transmission

- Ideal for static networks
- Stable network of routers for monitoring moving end devices
- 1 coordinator per network + up to 239 routing nodes + X other end devices
- Distance between network elements
 - Open space - up to 500 m
 - In buildings - tens of metres

Transceiver module

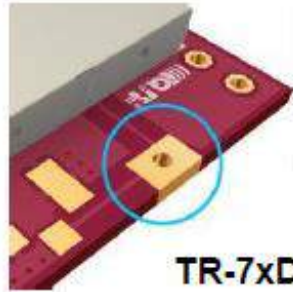


TR-72Dx schematics

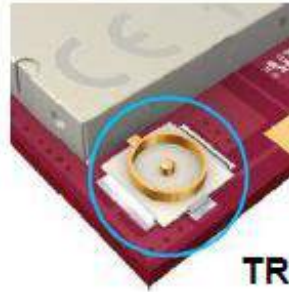


Several types of TR modules

Antenna options



TR-7xD



TR-7xDC

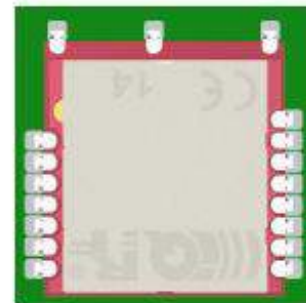


TR-7xDA

Mounting options



TR-72Dx



TR-76Dx

Fast Response Command (FRC)

Coordinator



30 B (user data or DPA request)
+
239 bit field for Node selection

All Nodes



2 bits from all **239 Nodes**
or
1 byte from max. **62 Nodes**
or
2 bytes from max. **30 Nodes**

HW development tools - kits



CK-USB-04A



DK-EVAL-04A



DDC-IO-01



DDC-RE-01



DDC-SE-01



DDC chain

Development sets



DS-START-04

DS-DPA-02



Downloads - www.iqrf.org

The screenshot shows a web browser window displaying the 'Downloads' page on the IQRf website. The browser's address bar shows the URL 'http://www.iqrf.org/support/download'. The website's navigation menu includes 'Contacts', 'Downloads', 'Price list', and 'E-shop'. The IQRf logo and the tagline 'Technology for wireless' are prominently displayed. The main navigation bar contains 'Home', 'About', 'Technology', 'Products', 'Support', and 'Sales', with 'Support' being the active page. A search bar is located in the top right corner. The left sidebar features a list of categories, with 'Downloads' selected. The main content area is titled 'Downloads' and includes a search bar and four categorized lists of resources: 'Basic materials', 'Brochures', 'Operating system', and 'Development / service SW'. Each list contains several links to documents and software packages, with a '» more' link at the end of each category.

http://www.iqrf.org/support/download

Downloads

Contacts Downloads Price list E-shop MyIQRf Login

IQRf Technology for wireless

Home About Technology Products **Support** Sales

Search

Home » Support » Downloads

Downloads

Search in Downloads

Basic materials

- IQRf Quick start guide
- Pricelist
- IQRf Startup package, OS v3.08D for TR-7xD
- IQRf Startup package, OS v3.08D for TR-5xD

» more

Brochures

- MICRORISC company profile
- IQRf Technical Guide
- IQRf Alliance Solutions
- IQRf Alliance interoperability

» more

Operating system

- IQRf OS v3.08D User's guide for TR-7xD
- IQRf OS v3.08D Ref. guide for TR-7xD
- IQRf OS v3.08D User's guide for TR-5xD
- IQRf OS v3.08D Ref. guide for TR-5xD

Development / service SW

- IQRf IDE v4.36
- IQRf SDK package v2.10
- IQRf USB drivers - Custom and CDC
- IQRf USB drivers Installation guide

SW development tool - IQRF IDE 4

The screenshot displays the IQRF IDE 4.34 interface for a project named "PWM-test". The main window, "IQMESH Network Manager", shows a network diagram with a central green node labeled "0 C" (Coordinator) connected to six peripheral blue nodes labeled "1 1" through "6 6". The interface includes a menu bar (File, Edit, View, Project, Programming, Debug, USB Device, Tools, Window, Help), a toolbar, and a status bar at the bottom. The status bar indicates the device is "Module ready - communication mode" and shows details for "DCTR-72Dx" with MID: 81004AD6 and OS 3.08D (0879). The left sidebar shows the project structure, including "TR Module", "Source", "Output HEX", "Plug-ins", and "TR Configuration". The bottom status bar also shows "Upload Log" and "Communication Log" tabs.

Hardware Profile

- CustomDpaHandler-ChangeIQRFOS-7xD-V226-160303.iqrf
- GeneralHWP-Coordinator-LP-SPI-7xD-V226-160303.iqrf
- GeneralHWP-Coordinator-LP-UART-7xD-V226-160303.iqrf
- GeneralHWP-Coordinator-STD-SPI-7xD-V226-160303.iqrf
- GeneralHWP-Coordinator-STD-UART-7xD-V226-160303.iqrf
- GeneralHWP-Node-LP-7xD-V226-160303.iqrf
- GeneralHWP-Node-STD-SPI-7xD-V226-160303.iqrf
- GeneralHWP-Node-STD-UART-7xD-V226-160303.iqrf

- Hardware Profile (HWP) is ready to use application which offers some peripherals and services
- No programming!
- Need to modify? → **CustomDPA Handler**

- CustomDpaHandler-UART.c
- CustomDpaHandler-UARTrepeater.c
- CustomDpaHandler-UserPeripheral.c
- CustomDpaHandler-UserPeripheral-18B20.c
- CustomDpaHandler-UserPeripheral-18B20-Idle.c
- CustomDpaHandler-UserPeripheral-18B20-Multiple.c
- CustomDpaHandler-UserPeripheral-ADC.c
- CustomDpaHandler-UserPeripheral-i2c.c
- CustomDpaHandler-UserPeripheral-McuTempIndicator.c
- CustomDpaHandler-UserPeripheral-PWM.c
- CustomDpaHandler-UserPeripheral-PWMandTimer.c


```
break;

// -----
case DpaEvent_DpaRequest:
// Called to interpret DPA request for peripherals
// -----
// Peripheral enumeration
if ( IsDpaEnumPeripheralsRequest() )
{
    // We implement 1 user peripheral
    _DpaMessage.EnumPeripheralsAnswer.UserPerNr = 2;
    _DpaMessage.EnumPeripheralsAnswer.HWPID = 0x000F;
    _DpaMessage.EnumPeripheralsAnswer.HWPIDver = 0xabcd;
```



DPA protocol

- Direct Peripheral Access (DPA) is a simple byte oriented protocol used to control services and peripherals of IQMESH network devices by SPI or UART interfaces.

DATmoLUX
Indoor lighting



TECO
Switch




Status
Light: ON
Intensity: 5

DPA Message

NADR	PNUM	PCMD	HWPID	PData
0400	20	03	1106	

Request: switch C

PROTRONIX
CO₂, temperature and relative humidity sensor



Status
CO₂: 443 ppm
Temperature: 18,3 °C
Relative humidity: 43 %

DPA Message

NADR	PNUM	PCMD	HWPID	PData
0100	0C	02	3201	0A 47 44 03
0100	0C	82	3201	00 4A 01 B8 01 B0 00 B7 BF

Request: sensor reading
Response: sensor reading

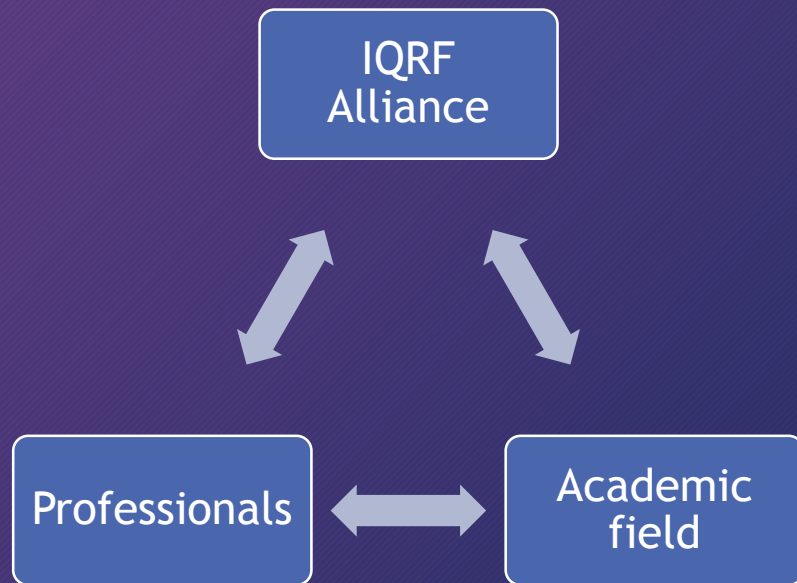
IQRF Smart School



We cooperate with schools



Schools



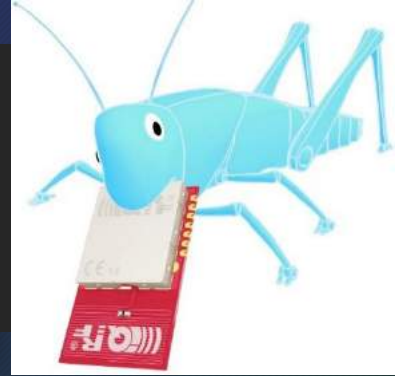
- Free membership in the IQRF Alliance
- Networking with other members on Alliance events
- Common projects and practice
- No fee for trainings and teacher certifications
- Student certifications at schools
- Free access to educational materials
- Sponsored equipment for education and research
- Promotion of school projects
- Opportunity to compete in professional contests



Academic members



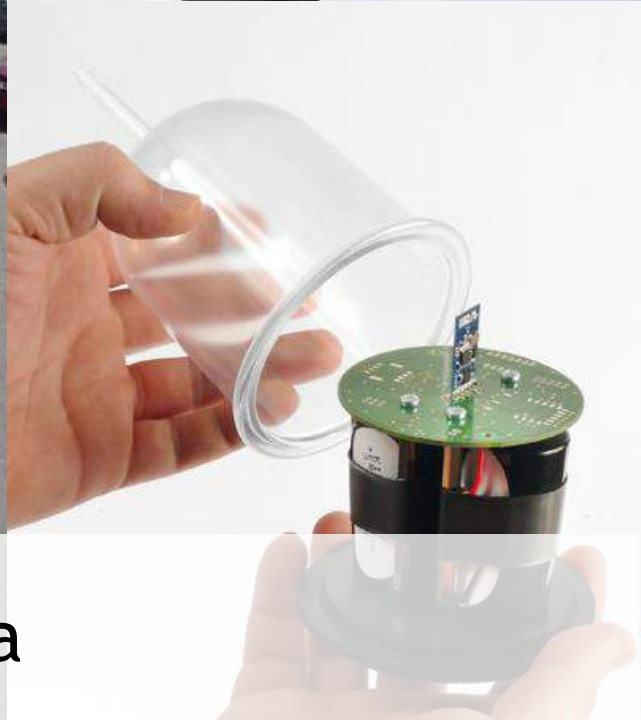
IQRF Wireless Challenge



- Design the best application for IQRF wireless technology
- Categories
 - Student - topic Lighting - intended for the IQRF Smart School program
 - Developer - free topic, for the general public
- Prizes worth more than 3.700 EUR
- Final round - May 27, 2016 (Prague)

Some use cases

Parking system



100k+ parking places with IQRF being installed in China

Parking system



100k+ parking places with IQRF being installed in China

Parking system



100k+ parking places with IQRF being installed in China

Embankments monitoring



Preventing train accidents in UK based on 130k IQRF sensors

Embankments monitoring



Preventing train accidents in UK based on 130k IQRF sensors

Embankments monitoring



Preventing train accidents in UK based on 130k IQRF sensors

Lights control and monitoring



100k+ street lights controlled with IQRF since 2008

Lights control and monitoring



Significant energy savings

Lights control and monitoring



100k+ street lights controlled with IQRF since 2008

Lights control and monitoring



Significant energy savings

Environment control and monitoring



Increased work efficiency and employees health

Environment control and monitoring



Increased work efficiency and employees health

Environment control and monitoring



Increased work efficiency and employees health

Environment control and monitoring



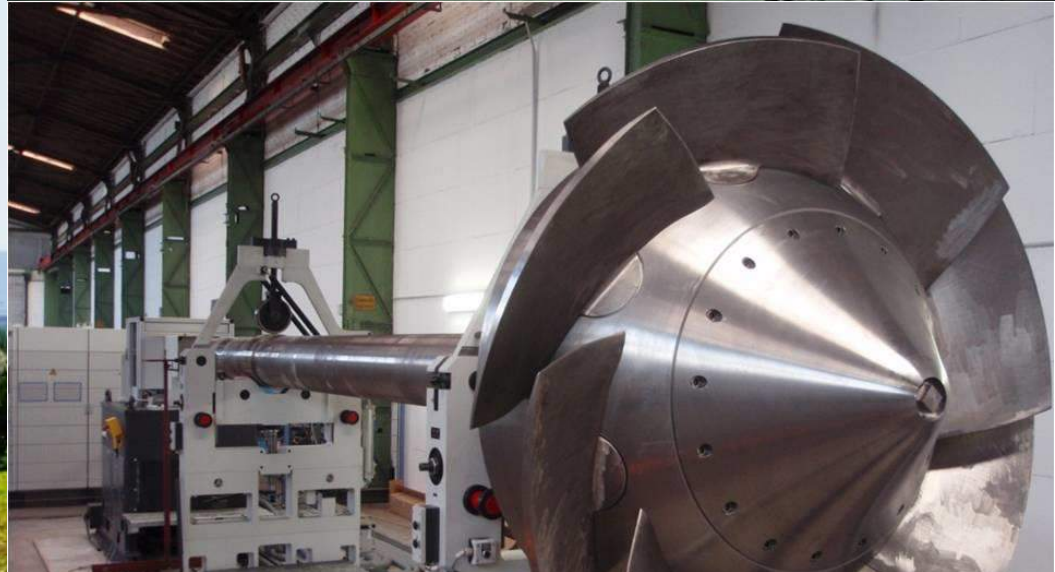
Increased work efficiency and employees health

Power plants



Cooling control and battery monitoring

Power plants



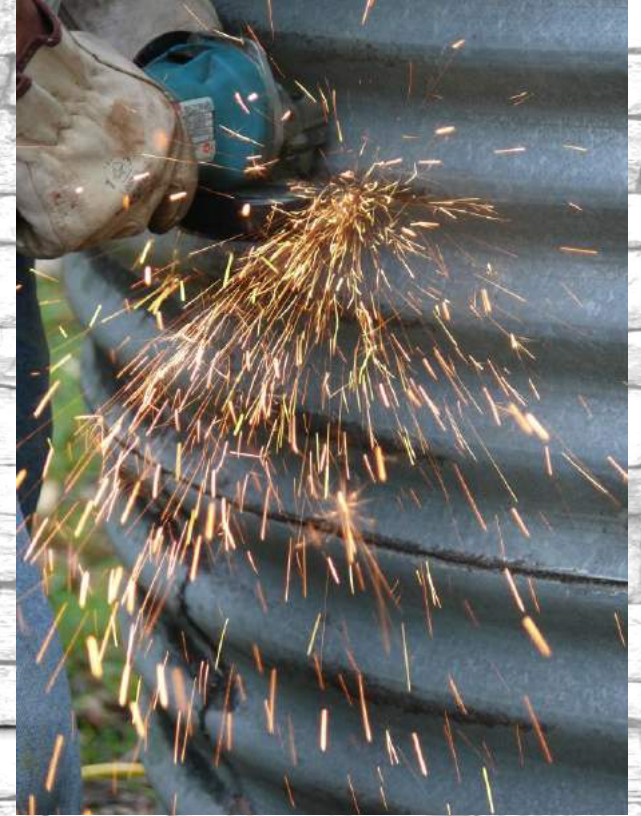
Cooling control and battery monitoring

Power plants



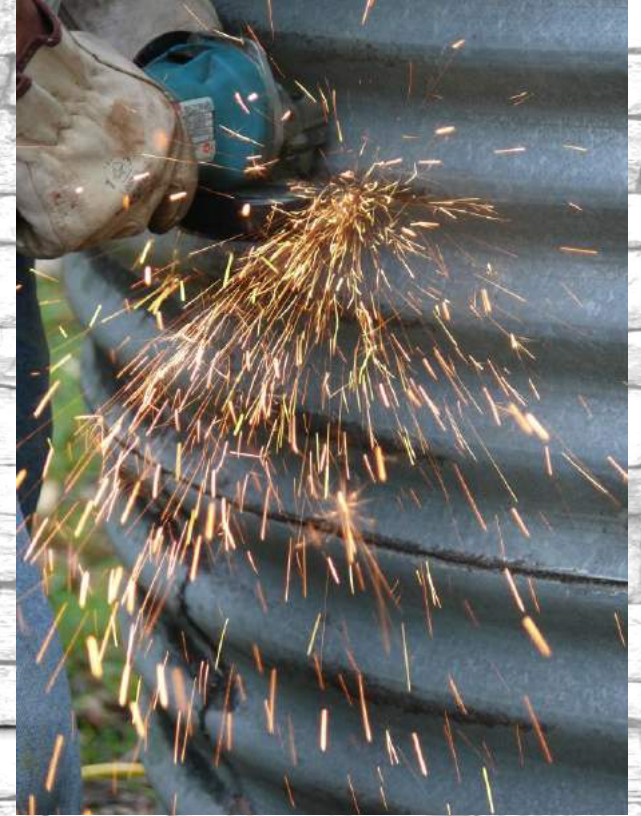
Cooling control and battery monitoring

Wireless heavy duty tools



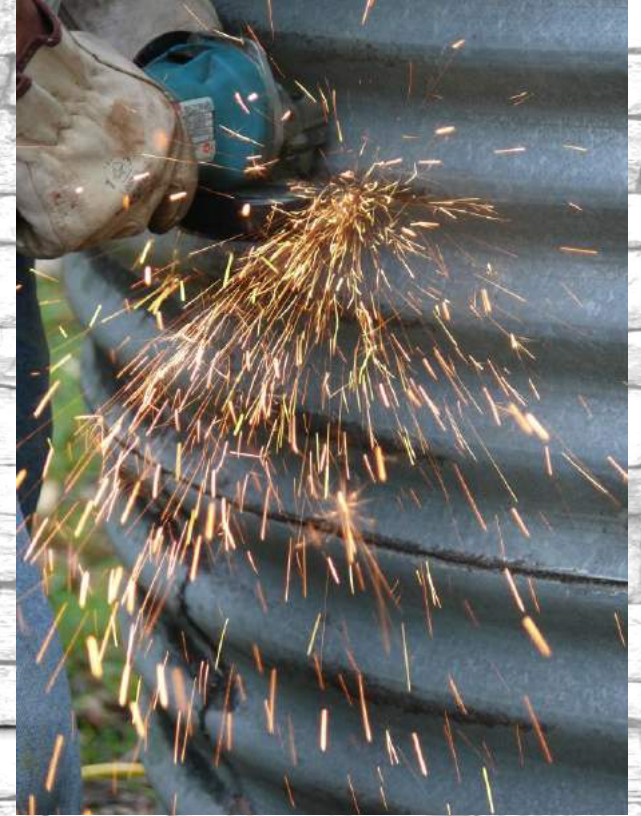
Monitoring of strained components, data reading and processing

Wireless heavy duty tools



Monitoring of strained components, data reading and processing

Wireless heavy duty tools



Monitoring of strained components, data reading and processing

One technology...



...endless possibilities

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