Experience with IQRF Technology at Department of Cybernetics and Biomedical Engineering

Martin Pieš, Radovan Hájovský

VŠB-Technical university of Ostrava

Department of Cybernetics and Biomedical Engineering

Who we are

- VSB-Technical University of Ostrava, FEECS, Department of Cybernetics and Biomedical Engineering (CBE VSB-TUO)
- CBE is the 2nd largest department in FEECS with ~40 employees and ~200 students in all programs

What we do

- Teaching; R&D in sensors, measurement systems, control, alternative energy sources, biomedical engineering
- Cooperation with significant companies in the geotechnical field (Strix Chomutov a.s., SG-Geotechnika a.s.)
- On association with IQRF technology
  - thermal processes monitoring on mining dumps
  - R&D in monitoring of the states of the retaining networks and dynamic barriers

Bod
71 4 °C
FLIR

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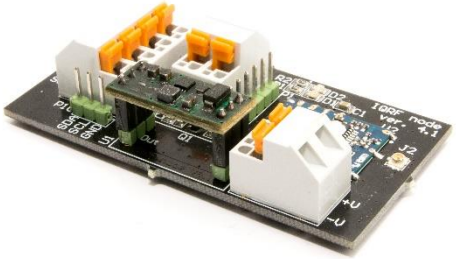
Previous developed sensors

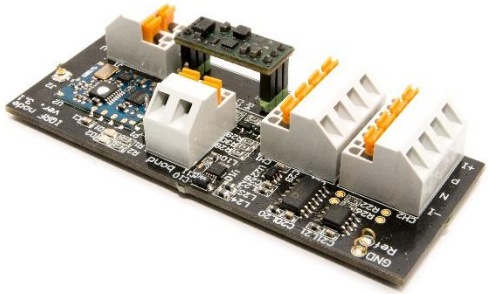
0x0B12 - Analog Input (U) - 2 Channel



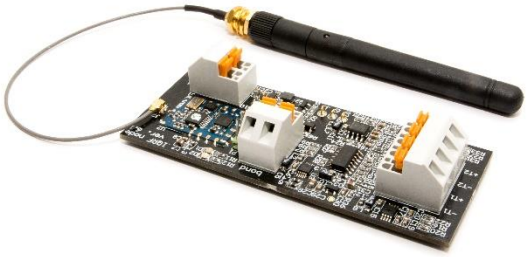
0x0A12 - Relative Humidity/Temperature

0x0912 - Carbon Monoxide

CO_2-EVAL (v1)



0x0612 - Pt100 2 Channel



0x0512 - Thermocoupler 2 Channel

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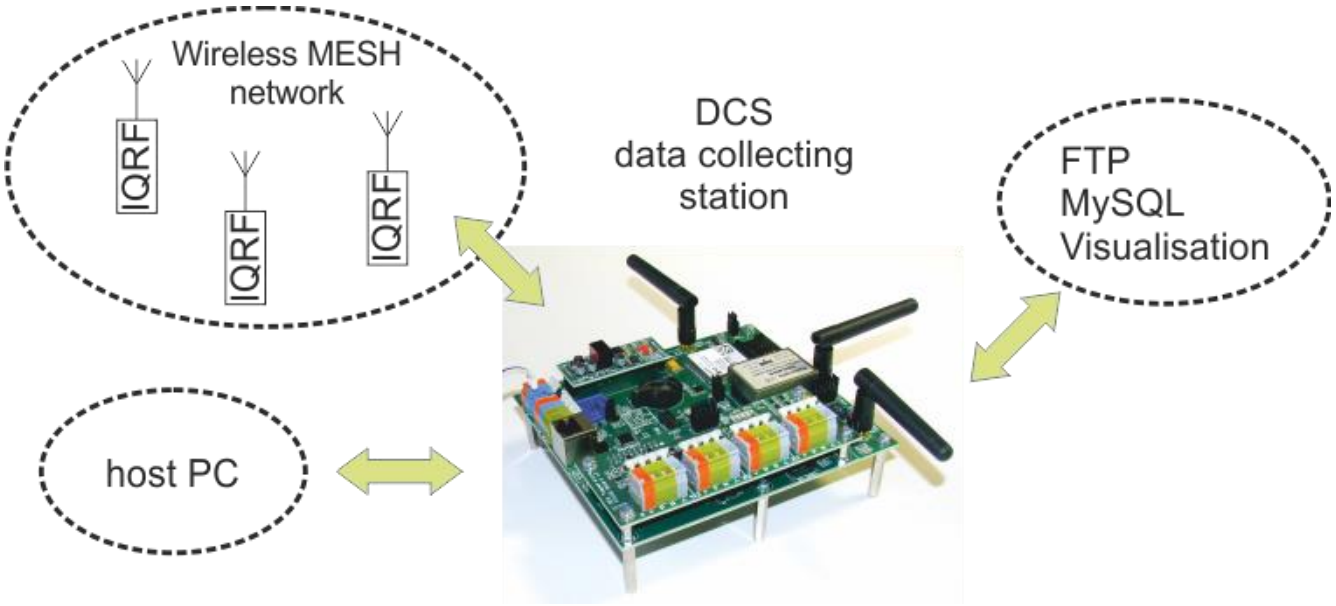
Data collecting station

- **Three generations of development**
- **To collect data from the sensors and send them to the database via FTP**



Case study: mining dump monitoring

Testing operation – Mining Dump Hedvika – Petřvald and Krimich Tlučná

- **5 IQRF nodes (1-Wire 1 channel)**
- **sampling each 4 hours**
- **running from 06/2015 till 11/2015**
- **continuous testing new DCS firmware versions**
- **possibility of operatively fixing occurring problems**
- **further extension of the monitoring very high temperatures occurring in the rear part of the dump by use of thermocouple measurement nodes**

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Current projects

- **Monitoring of retaining steel nets and dynamic barriers**
  - Ministry of Industry and Trade (Strix Chomutov, a.s.)
  - Use of accelerometer and gyroscope sensors for monitoring the state of steel nets
  - Use of vibrating wire strandmeters and own developed processing unit with IQRF data transfer (in development)

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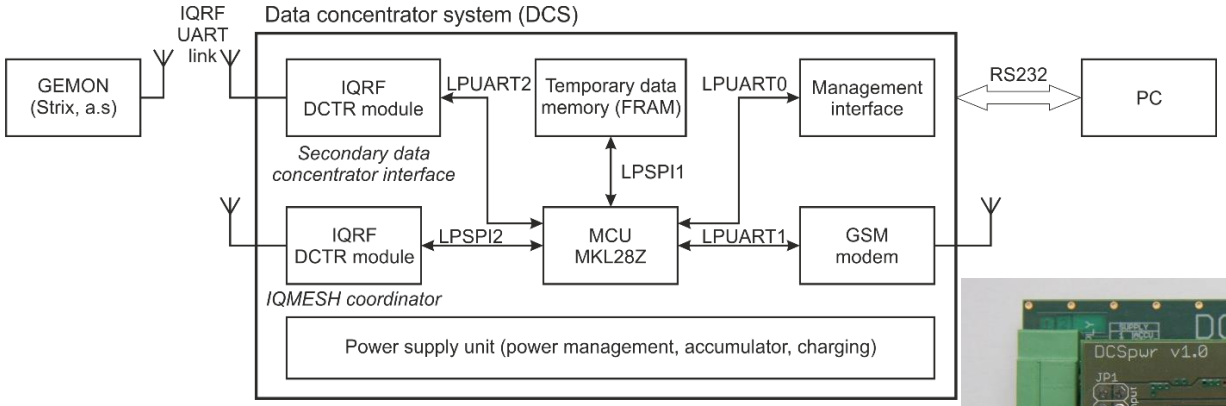
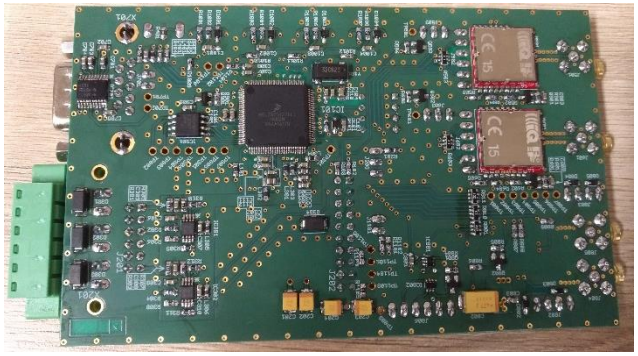
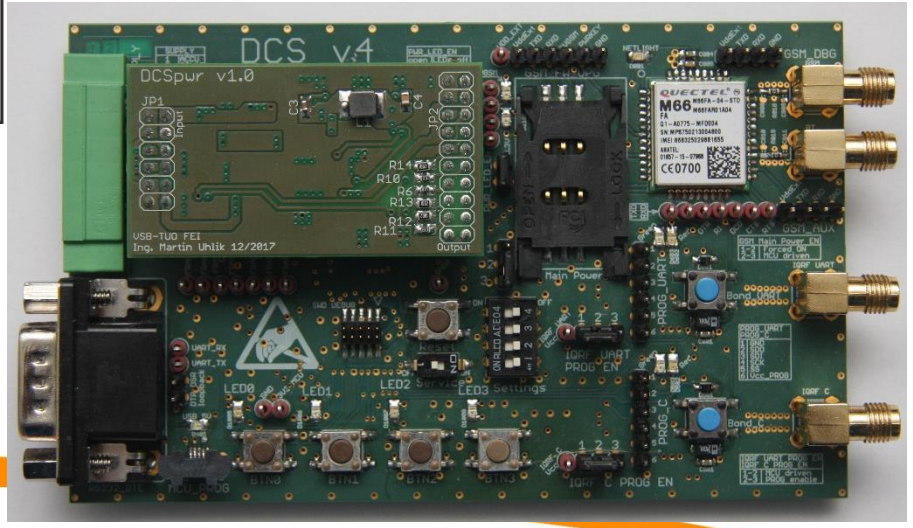
Data Collecting Station v4

- **Focused on low power solution**







- **2x DCTR-76D modules, GSM modem**
- **Data in FRAM memory**
- **Communication via TCP**

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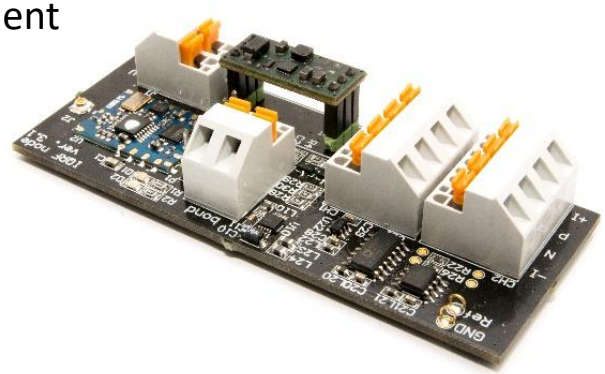
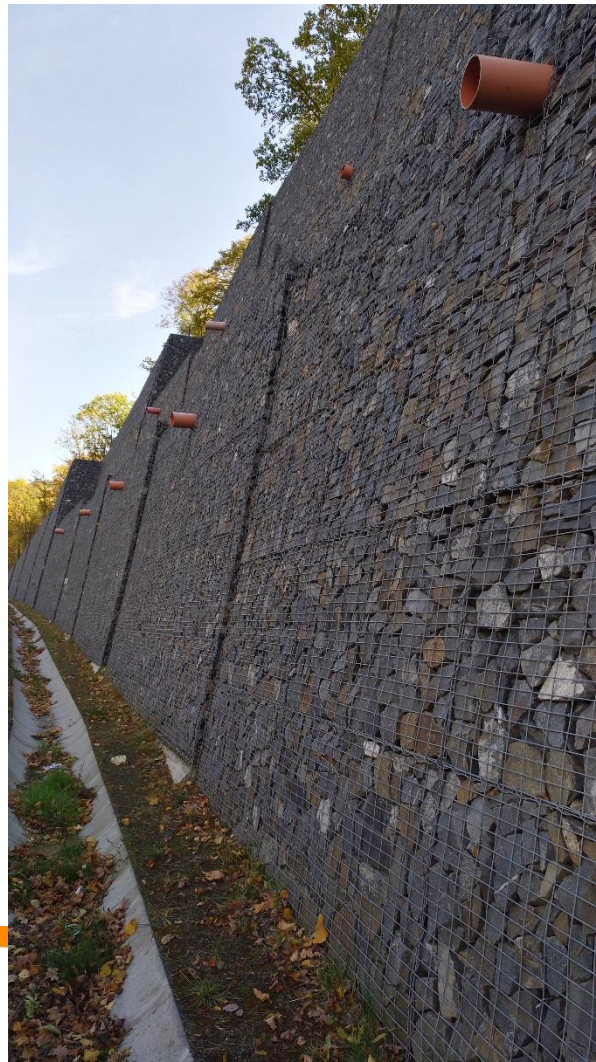
Current projects

- **Development of MEMS sensors for monitoring the surface structures**
  - Ministry of Industry and Trade (SG Geotechnika, a. s. + SG-Geoinženýring, s.r.o.)
  - Use of **dynamometers** as the sensors for monitoring the state of **gabion walls**
  - Measuring of resistance with constant current 4 mA → modified Pt100 node
  - Another sensors in development





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CO2-EVAL module (v2) + BME280-EVAL module + RMCD

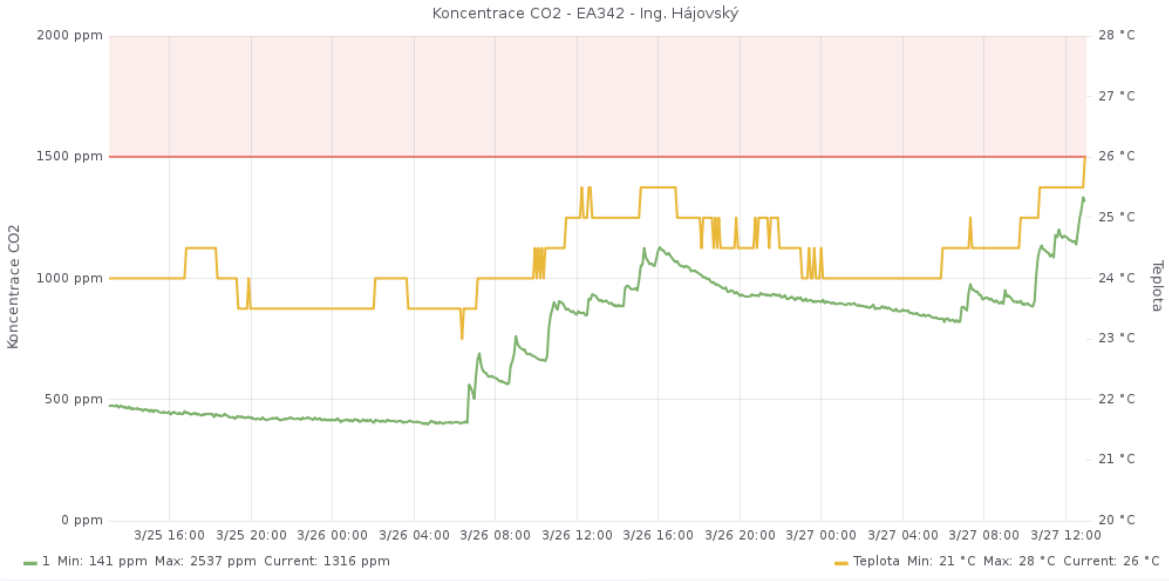
- **Competitor project for**

  IQRF Wireless challenge by Jan Velička

- **10+ RMCD devices at the department**

  -A: Better office environment

  -D: Attendance system



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Interconnection of wireless and control

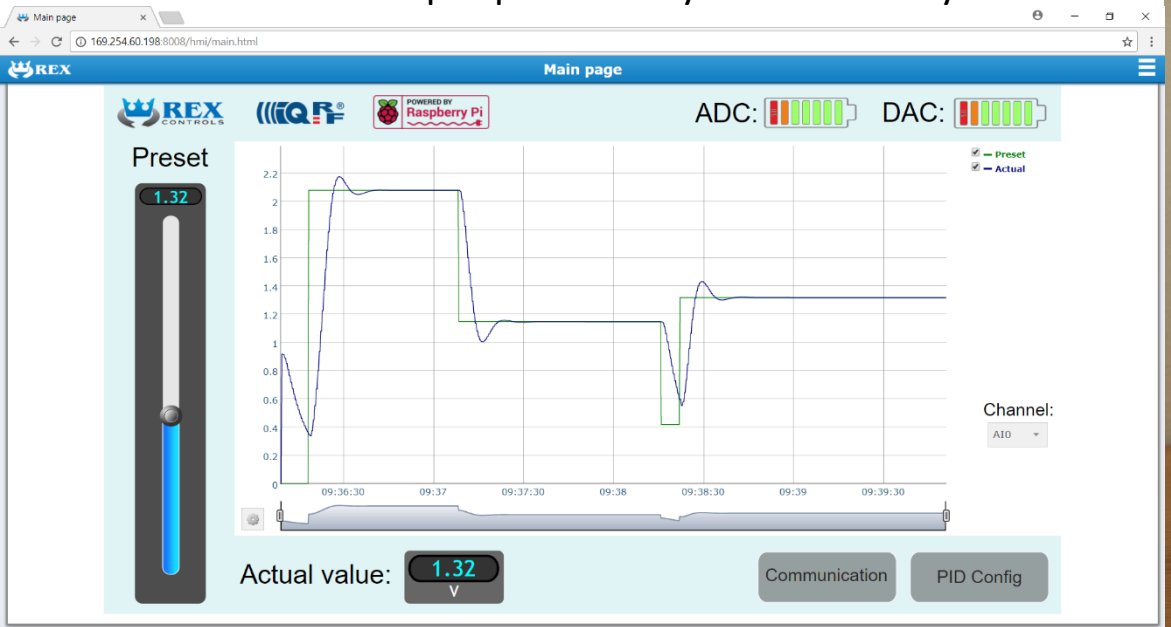
- **Competitor project for**

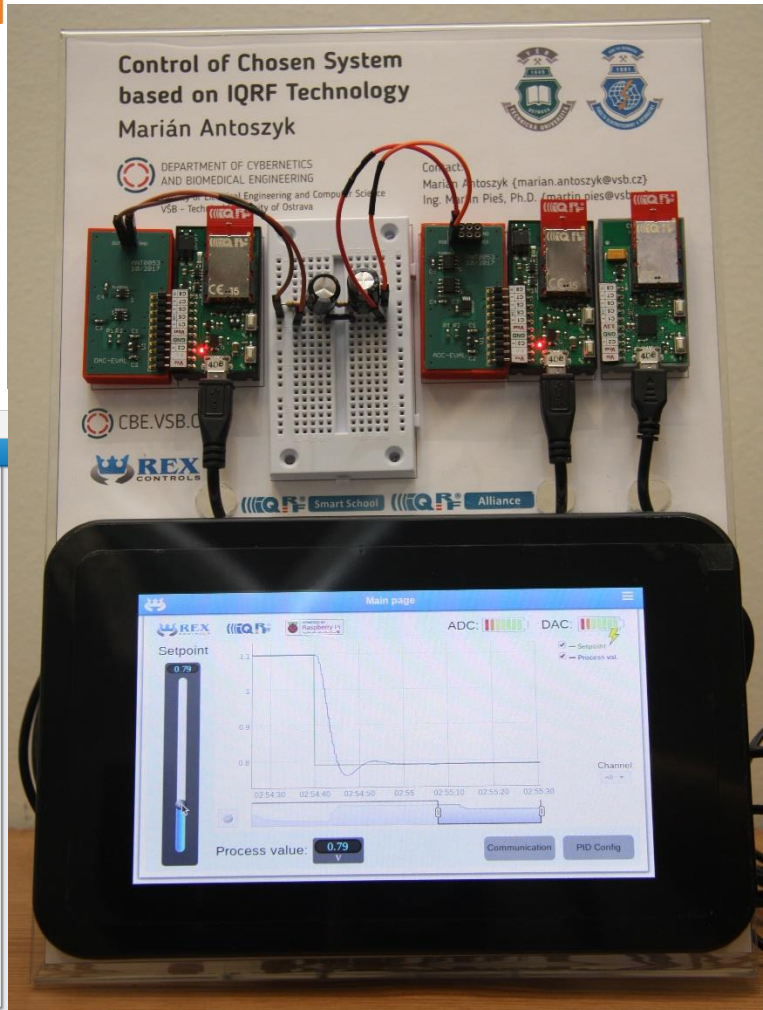
  IQRF Wireless challenge by Marián Antoszyk

  -DAC-EVAL as the actuator

  -ADC-EVAL as the sensor

  -Control loop is provided by REX Control system





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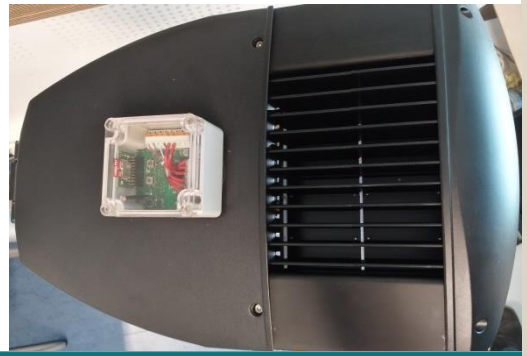
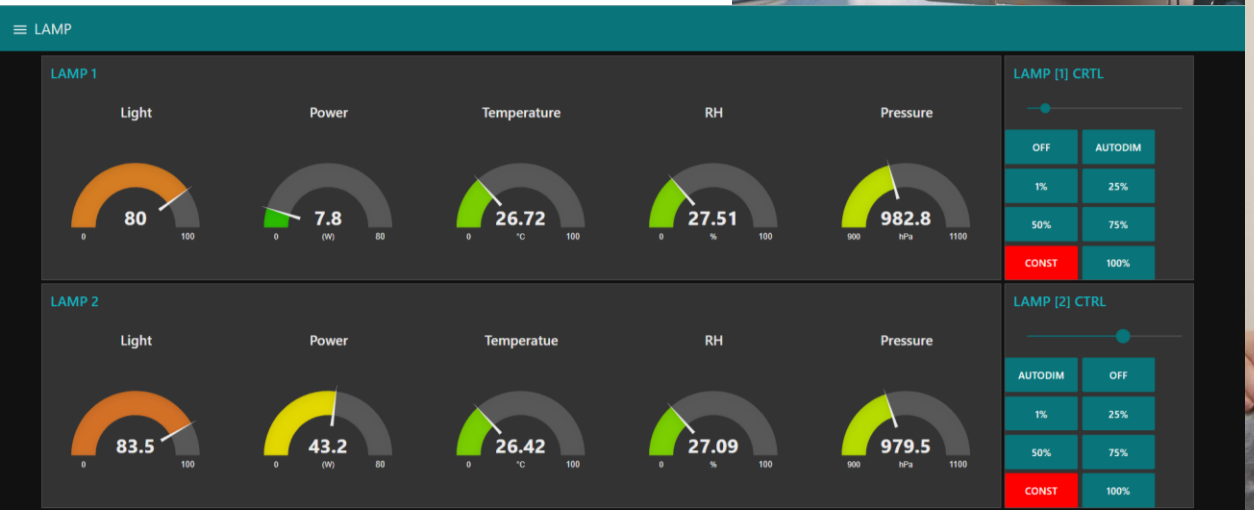
Another project

- **Monitoring of the environmental quantities through street lamps**
  - -Temperature
  - -Relative humidity
  - -Pressure
  - -Light intensity
  - -Power consumption of the lamp
- **Wi-Fi hotspot**





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What we can do?

- Research and development of wireless sensors and complex monitoring systems from design to realization
- Long-term experience based on R&D projects and cooperation with significant companies
- We are able to arrange the R&D projects → Financial support

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Our vision

- Development and implementation of complex monitoring systems based on wireless sensor networks
- Focusing on the smallest possible energy consumption
- Have a unified graphic visualization extensions, including an alarm state subsystem
- Developing cooperation with major domestic and foreign partners in the application of monitoring of environmental and physical-mechanical quantities

That‘s all by use of IQRF technology

Our problems

- Lack of time – our primary task is to teach ...
- Lack of people – a general problem – the skilful are already dismantling at the beginning of the study
- This is why ... we are looking for potential cooperation for:
  - Hardware design
  - Software design
  - Finalization and production of monitoring systems and another good ideas

Thank You for Your attention