An Intelligent IQRF® Gateway
I have been working in MICRORISC for 12 years, currently in the position of FAE leader.

In addition to regular technical support of MICRORISC customers I am responsible for hardware development and especially development of IQRF gateways.

I have been involved in many projects related to IQRF technology. Currently I am leading the project Development of an autonomous off-grid system for bidirectional communication with wireless nodes.
Agenda

- **Introduction**
  - What is IQRF
  - What is IQMESH protokol
  - Features of IQMESH
- **IQRF gateway basic architecture**
- **IQRF Gateway Daemon**
  - IQRF Gateway Daemon API
  - IQRF Gateway WebApp
  - Armbian vs Yocto Linux
  - IQRF Gateway Daemon Licences
  - Extensions of Gateway Daemon
- **IQRF gateway design**
  - Basic IQRF shield
  - Advanced IQRF shield
  - IQRF shield for an Industrial Gateway
  - Off-Grid IQRF Gateway
- **IQRF Cloud**
What is IQRF?

IQRF® is a wireless MESH technology in sub-GHz ISM radio bands.

It requires no infrastructure by external providers, no license and no carrier fees.
IQMESH

Routing extends the range and enable to deliver data to difficult areas.

IQMESH routing protocol

IQR Mesh routing protocol is called IQMESH®. It is based on an optimized directional flooding. Its main advantages are higher throughput and much higher robustness which primarily becomes apparent in industrial and other applications where a high reliability is a must.
IQRF network
- 239 nodes / sensors / actuators
- 1 coordinator device / gateway
- Synchronous communication controlled by coordinator
- request/response communication
- bonding, network construction, timing - coordinator controlled

IQMESH features
IQMESH is implemented above the IQRF OS by the DPA Framework (layer).
- Up to 240 devices in the network (1 Coordinator + 239 Nodes)
- Up to 240 hops
- Routing packets in background
- Low latency (STD) as well as low power (STD+LP) network types supported
- Routing in real time:
  - Max. 60 ms per hop for STD network, based on the payload
  - Max. 100 ms per hop for STD network, based on the payload
- Payload up to 64 B
- All communication is automatically encrypted by AES-128
- Autonetwork functionality for automated network build-ups
- Discovery functionality to discover / recover topology
Architecture of an IQRF gateway

- Linux board
- Shield with IQRF transceiver
- IQRF daemon
• Commercial solutions available
• Following the same architecture
IQRF Gateway WebApp

- Gateway
  - Information
  - Log file
  - Change mode
  - IQRF services
  - SSH service
  - Automatic upgrades
  - Power control
- Configuration
- IQRF network
  - Send DPA packet
  - Send JSON request
  - Coordinator upload
  - TR configuration
  - Network manager
  - Standard manager
- Clouds
  - IBM Cloud
    - Microsoft Azure IoT hub
    - Amazon AWS IoT
    - Hexio IoT Platform
    - Inteliments IntelliGlue
    - PIXLA device management
- User manager
- API key manager
- Documentation
IQRF gateway – Armbian / Yocto

- Yocto Linux
  - Increased stability
  - Read Only
  - Support for Mender IO

- Armbian Linux
  - Versatility
Next extension?

- IQRF Bridge
  - ETH/WiFi
  - Simple Low-cost Device

- IQRF gateway daemon hosted on a gateway or server

- Multiple instances
Plans with IQRF Gateway daemon

• Basic functionality as OpenSource

• Further extensions planned under SW licence

• Web based server will provide licence management
IQRF Gateway – Overall scheme
Basic IQRF shield

Linux GPIO Header

SPI
EN
PWR ON/OFF
LER/G
LER/G
Button

IQRF
LER/G

LER/G

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Off grid IQRF gateway

Diagram showing the components of an IQRF gateway, including Power Supply Control, MCU, IQRF Coordinator, RAM, Linux Core, OpenGML, Power management, Logic, LTC, ETH, WIFI, and NFC. The diagram also includes a picture of the physical implementation of the gateway.
Current consumption
- 208mA booting / online [60 s]
- 360uA sleep [9 min, 19min , ...]
- Up to 17 days online [ 4.4 Ah]

<table>
<thead>
<tr>
<th>On / Off Cycle</th>
<th>Mean current consumption</th>
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<tbody>
<tr>
<td>10 min</td>
<td>21 mA</td>
</tr>
<tr>
<td>20 min</td>
<td>10.6 mA</td>
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Thank You