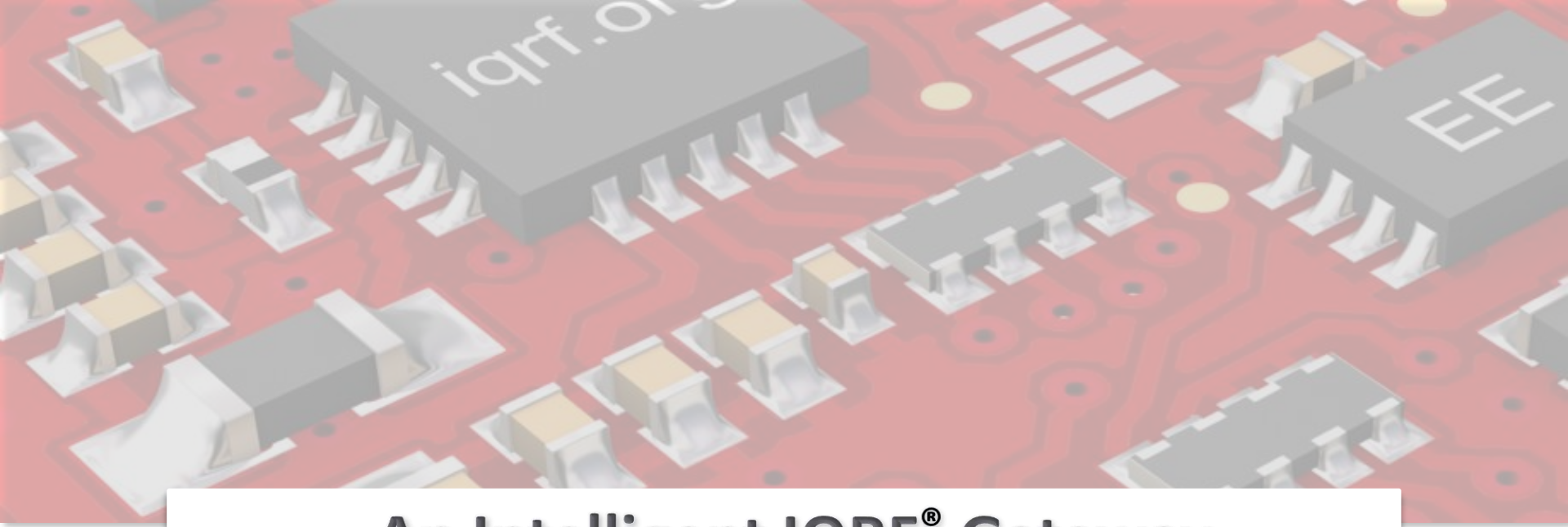

An Intelligent IQRF® Gateway

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MICRORISC ENABLING FUTURE INNOVATION

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The Sixteenth International Conference on Systems and Networks Communications

IARIA

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

IQRF **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

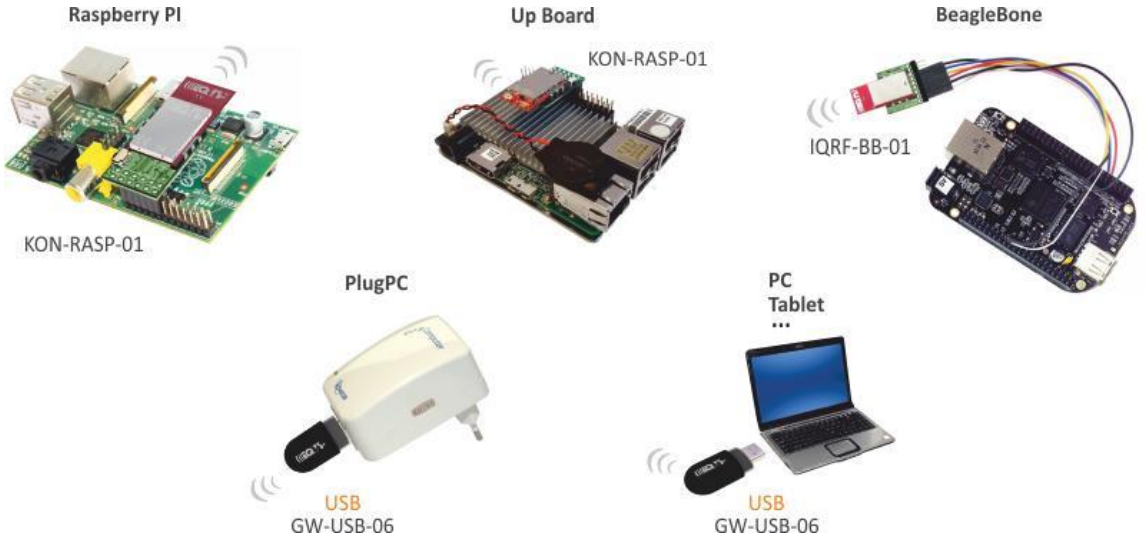
IQMESH features

IQMESH is implemented above the IQRF OS by the DPA Framework (layer).

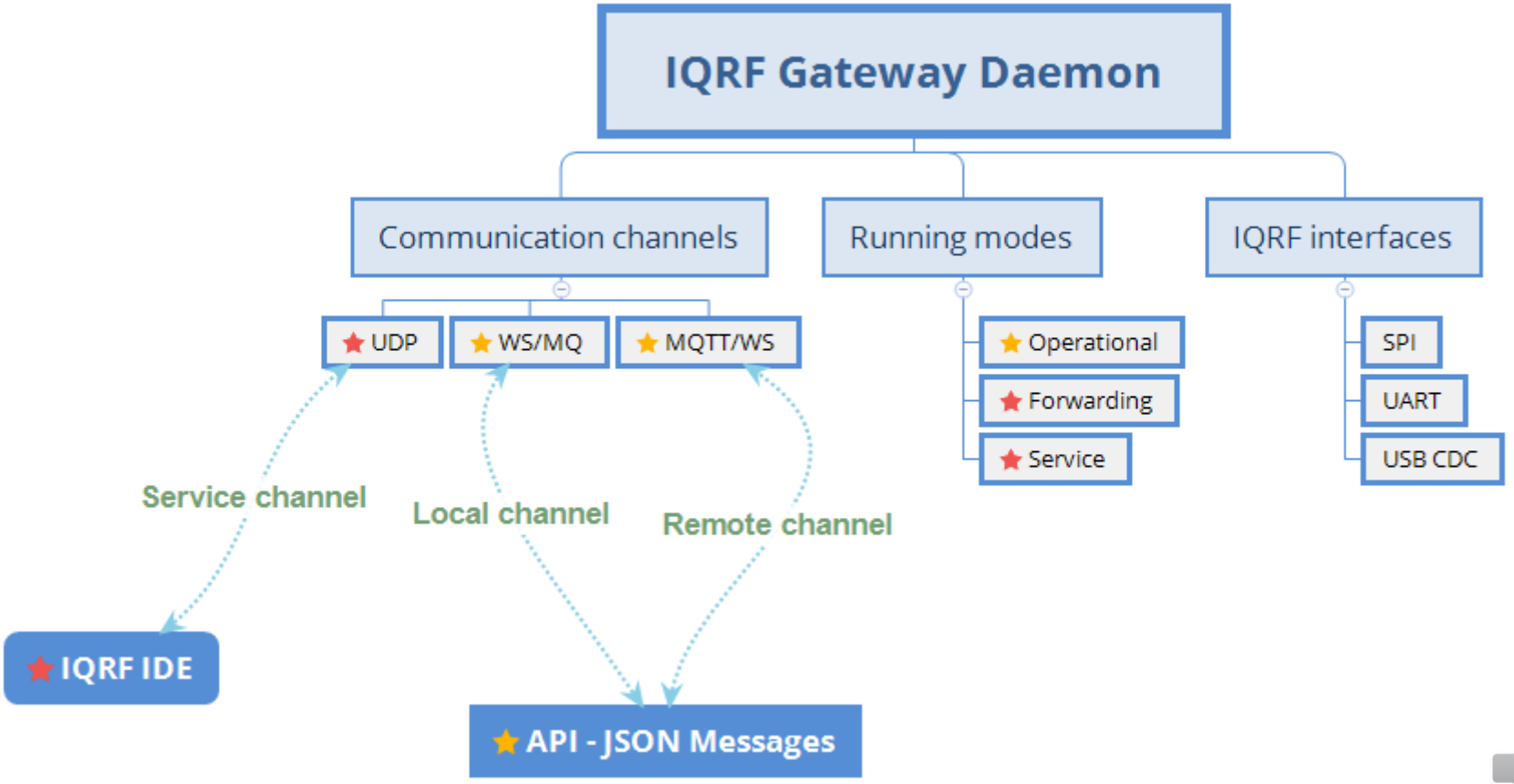
- Up to **240 devices** in the network (1 Coordinator + 239 Nodes)
- Up to **240 hops**
- **Routing** packets in background
- Low latency (**STD**) as well as low power (**STD+LP**) network types supported
- Routing in real time:
  - Max. **60 ms** per hop for STD network, based on the payload
  - Max. **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

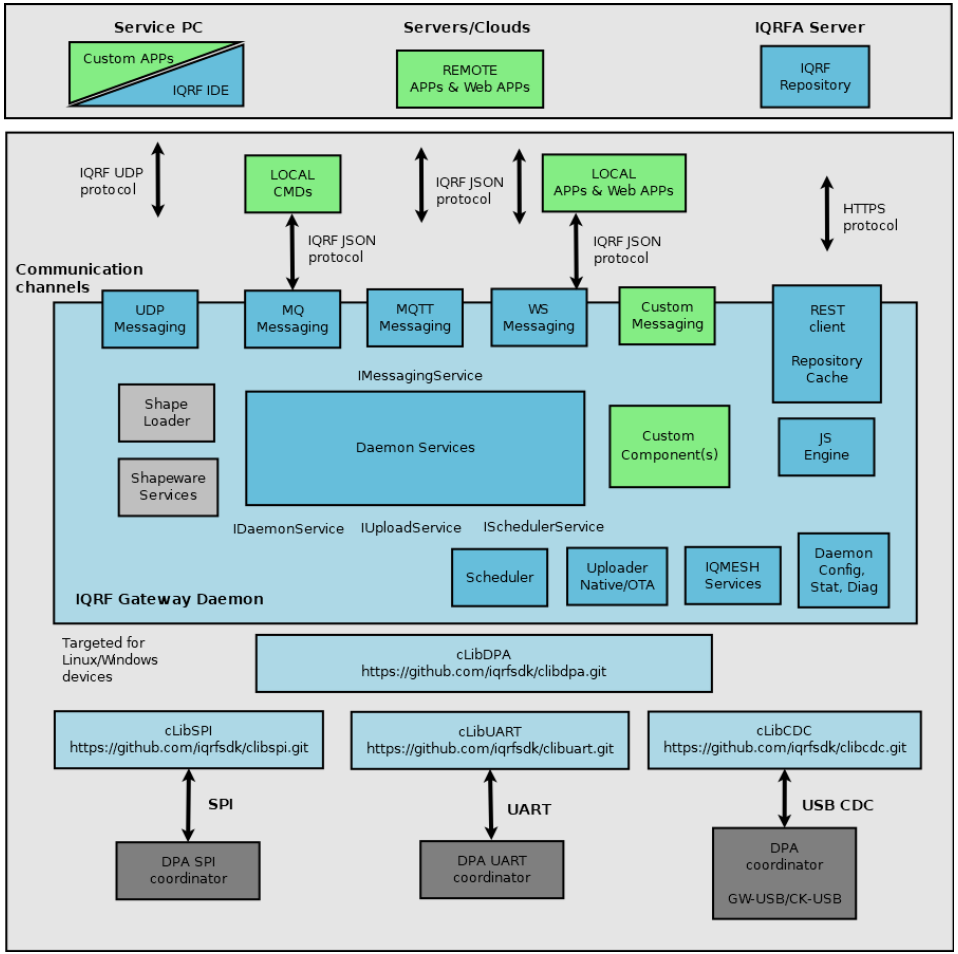
- Linux board
- Shield with IQRF transceiver
- IQRF daemon



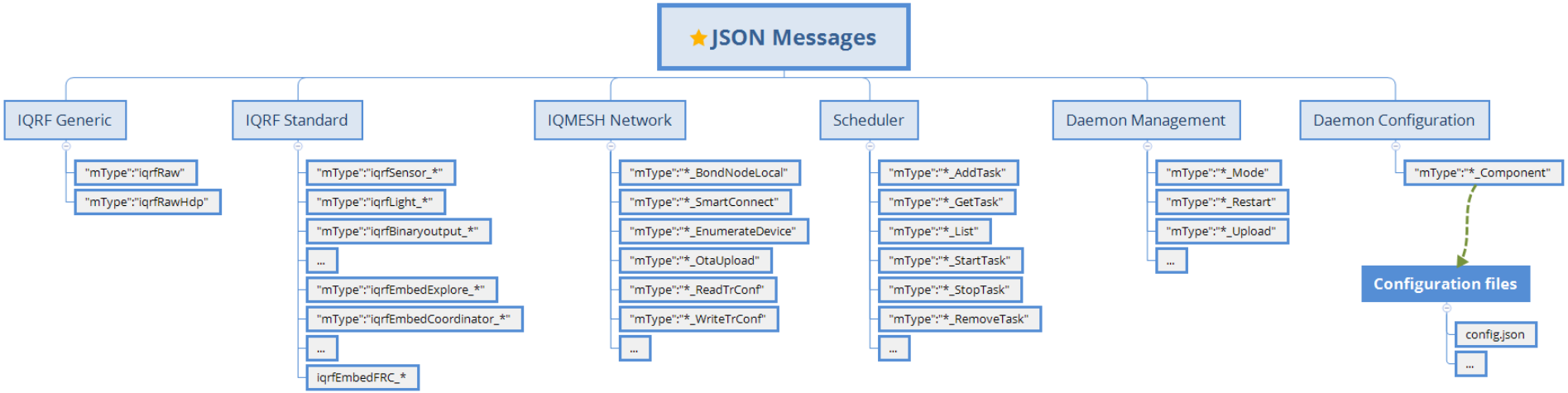
- Commercial solutions available
- Following the same architecture


IQRF Gateway Daemon
Communication channels
Running modes
IQRF interfaces
UDP
WS/MQ
MQTT/WS
Operational
Forwarding
Service
SPI
UART
USB CDC
Service channel
Local channel
Remote channel
IQRF IDE
API - JSON Messages

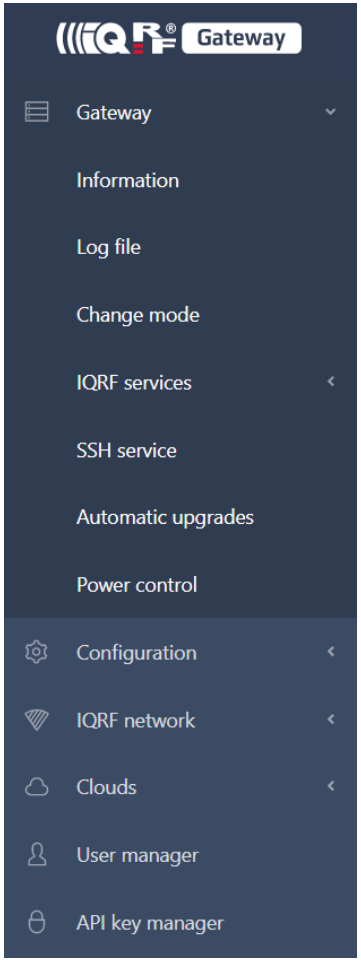
IQRF Gateway Daemon

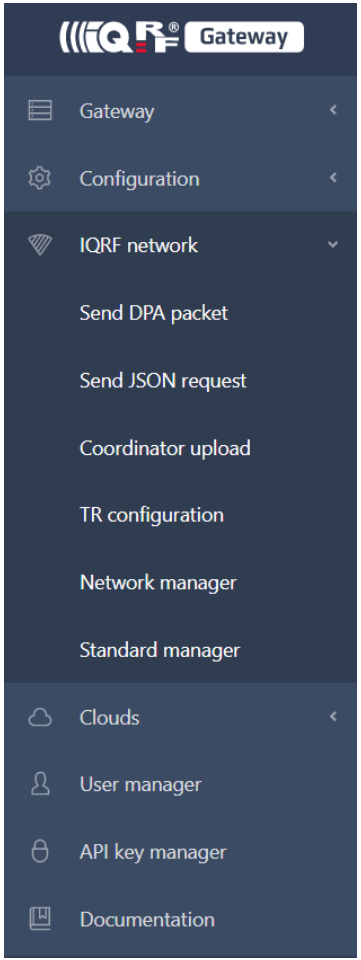


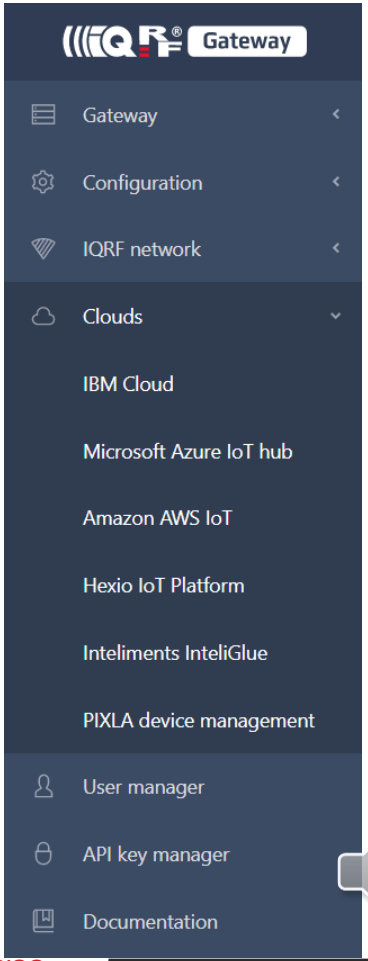
IQRF Gateway Daemon API



IQRF Gateway WebApp







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

+

armbian

or

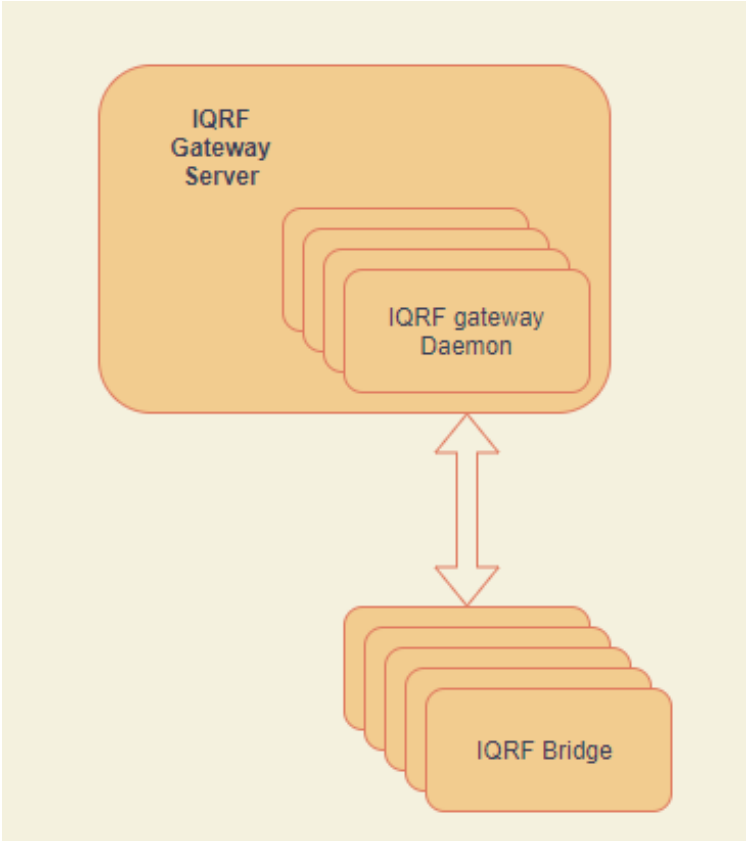
yocto PROJECT

Next extension?

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

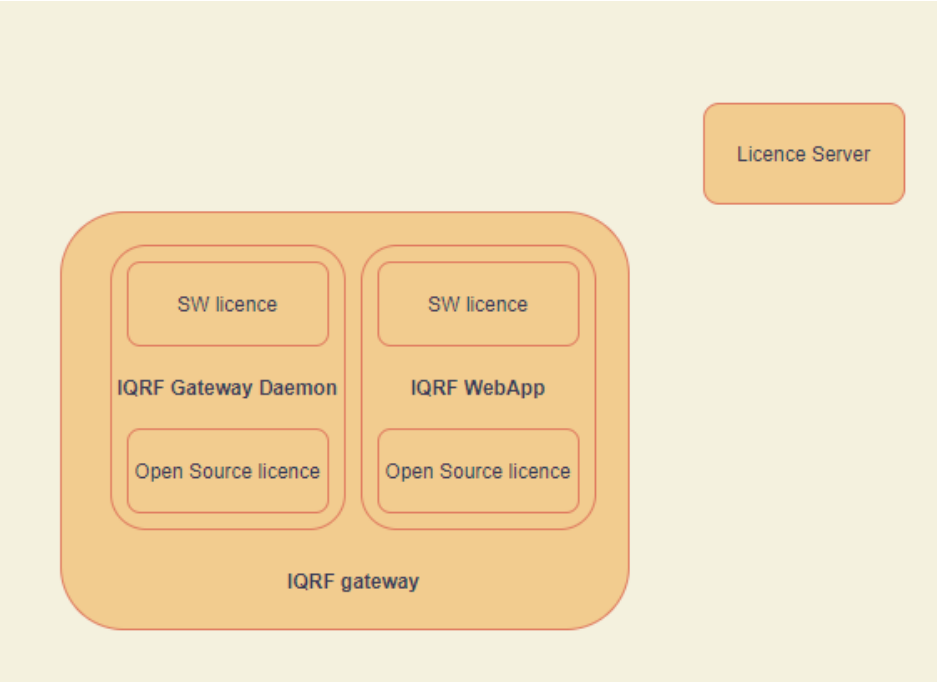
- IQRF gateway daemon hosted on a gateway or server

- Multiple instances

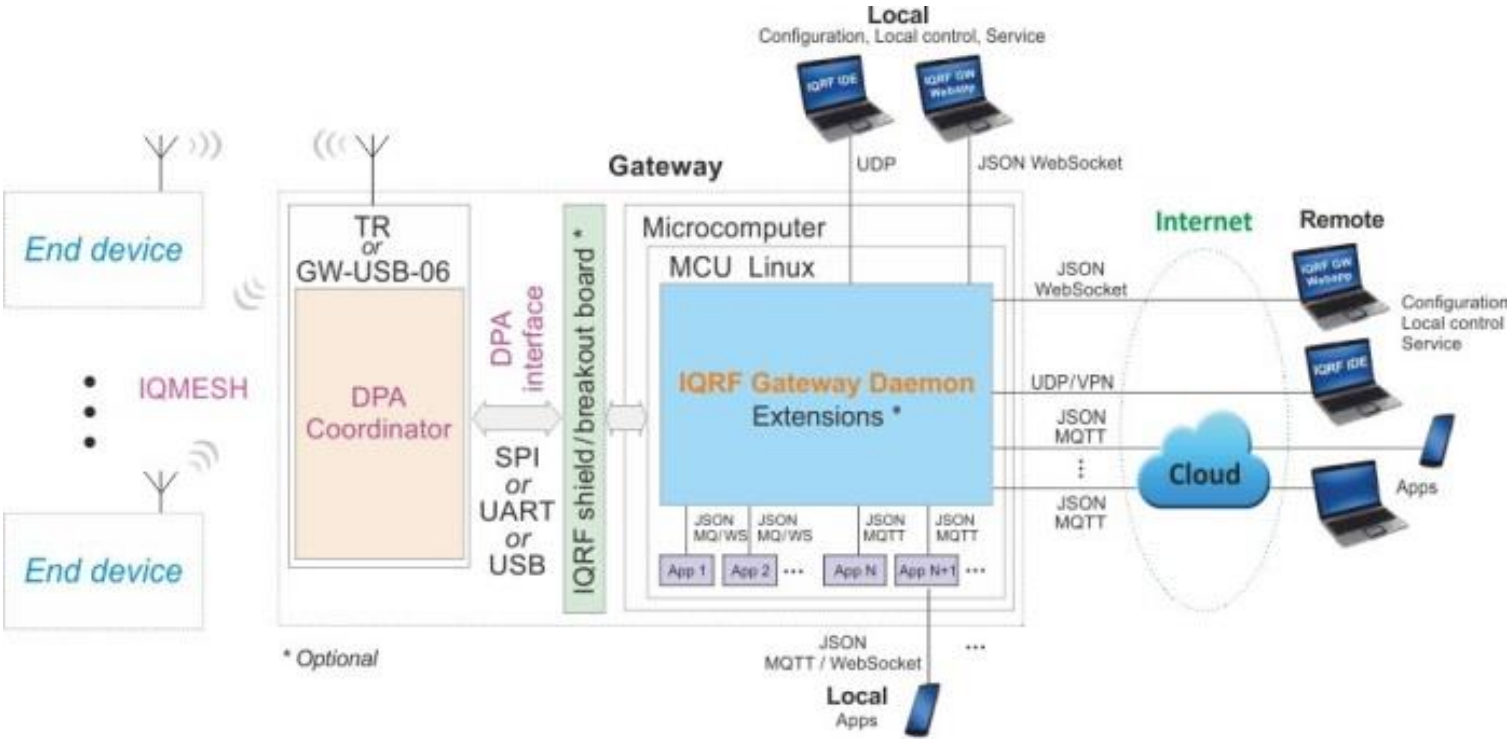


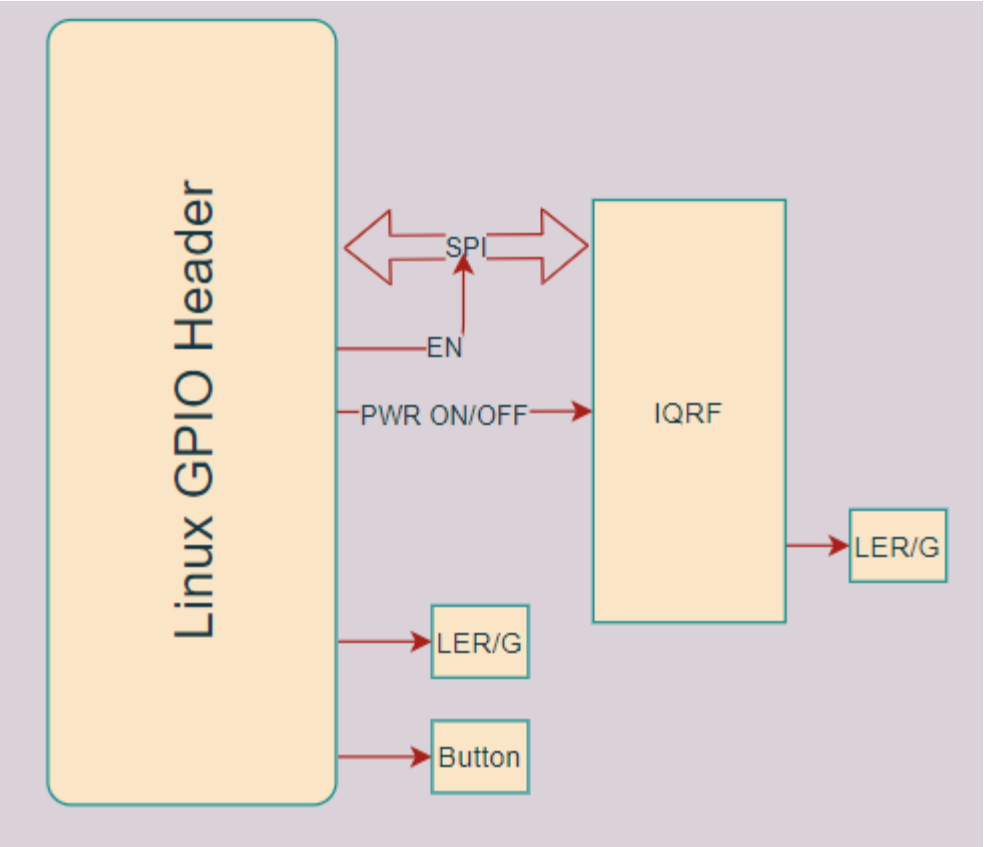
Plans with IQRF Gateway daemon

- Basic functionality as OpenSource
- Further extensions planned under SW licence
- Web based server will provide licence management

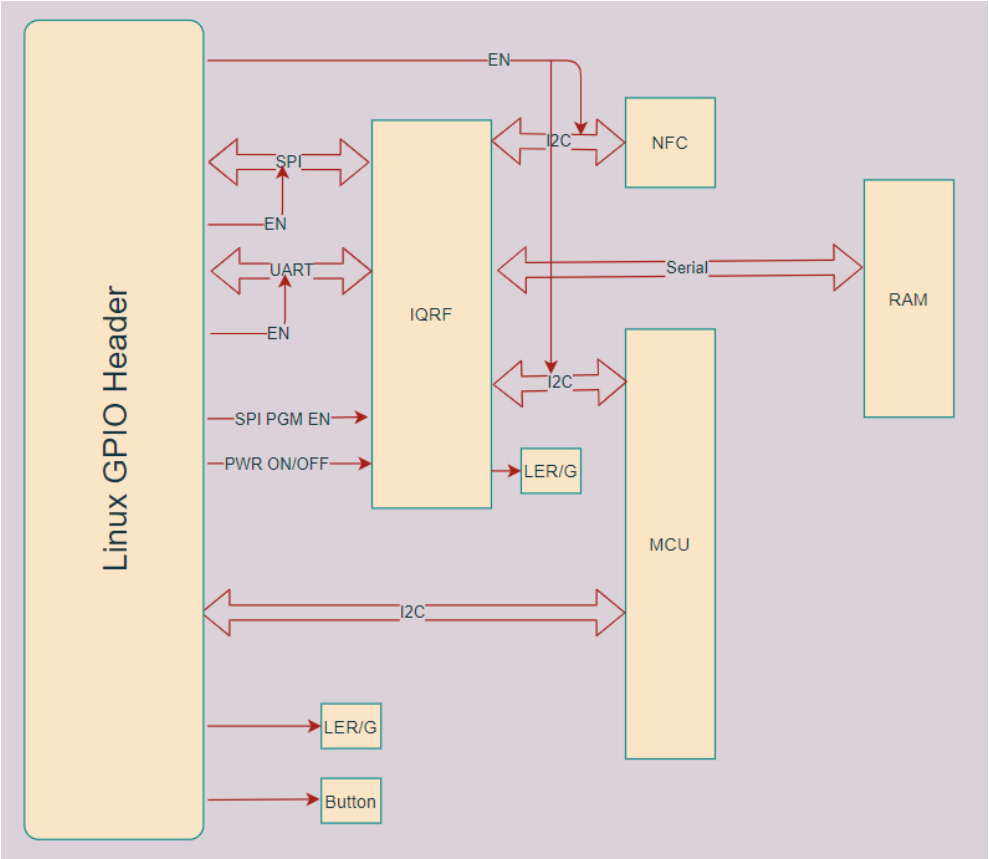


IQRF Gateway – Overall scheme

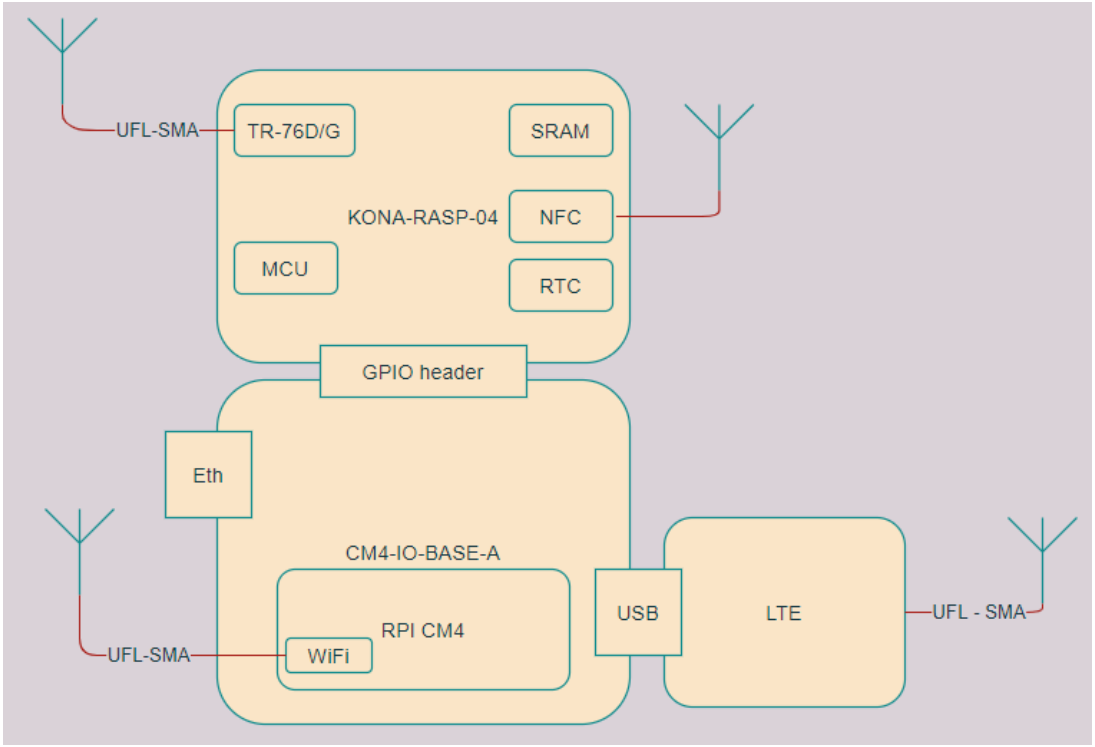



Linux GPIO Header
SPI
EN
PWR ON/OFF
IQRF
LER/G
LER/G
Button

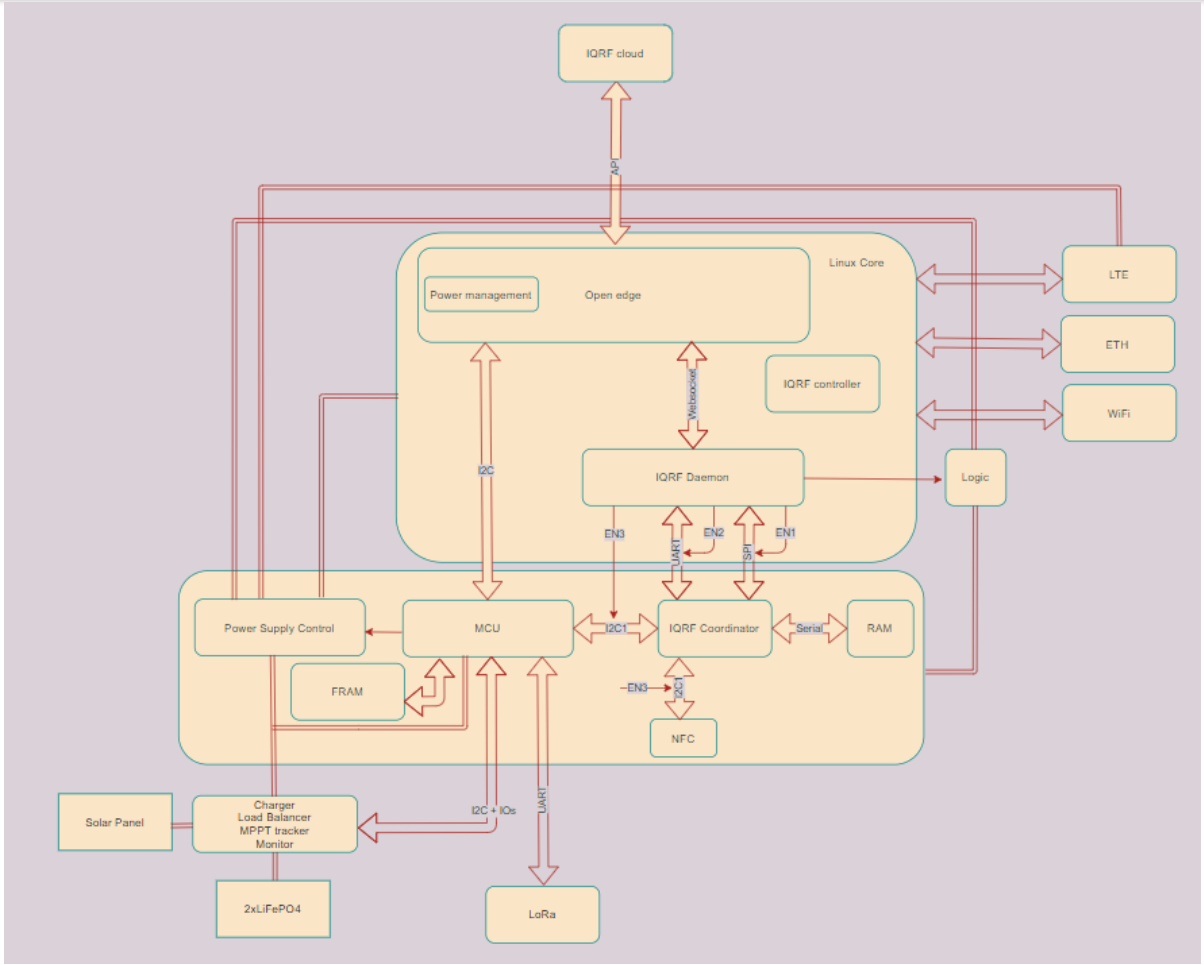
Advanced IQRF shield

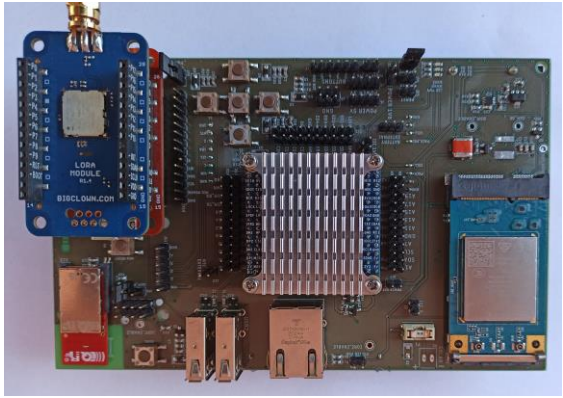


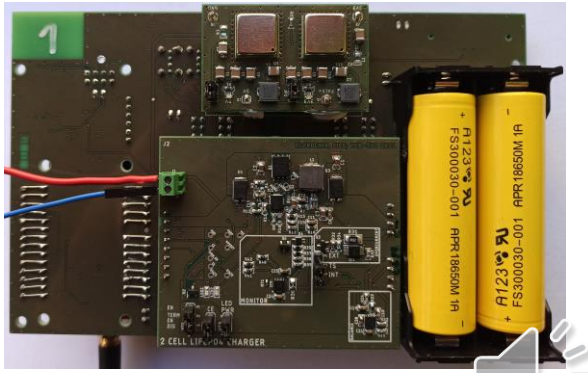
IQRF shield for an Industrial gateway

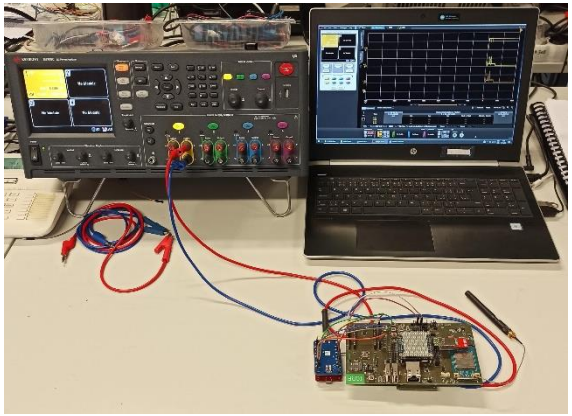


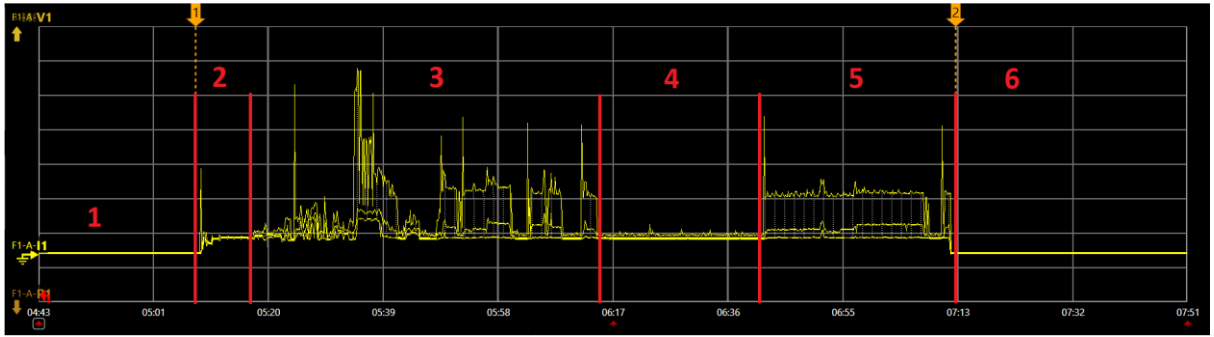
Off grid IQRF gateway









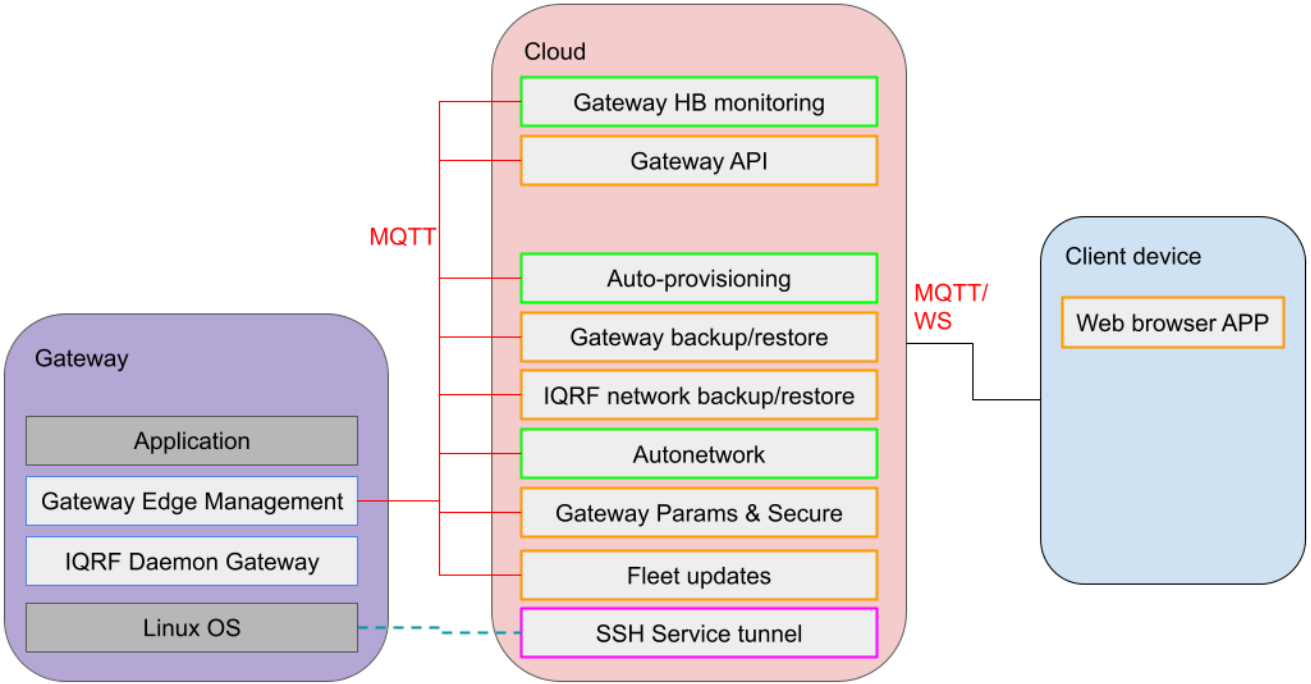


Current consumption

- 208mA booting / online [60 s]
- 360uA sleep [9 min, 19min , …]
- Up to 17 days online [4.4 Ah]

On / Off Cycle	Mean current consumption
10 min	21 mA
20 min	10,6 mA

IQRF cloud


Cloud
Gateway HB monitoring
Gateway API
MQTT
Auto-provisioning
Gateway backup/restore
IQRF network backup/restore
Autonetwork
Gateway Params & Secure
Fleet updates
SSH Service tunnel
MQTT/
WS
Client device
Web browser APP
Gateway
Application
Gateway Edge Management
IQRF Daemon Gateway
Linux OS

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Thank You