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# InterOP

Interference Analysis of LoRaWAN Systems



EUROPEAN UNION

Harald Eigner BSc

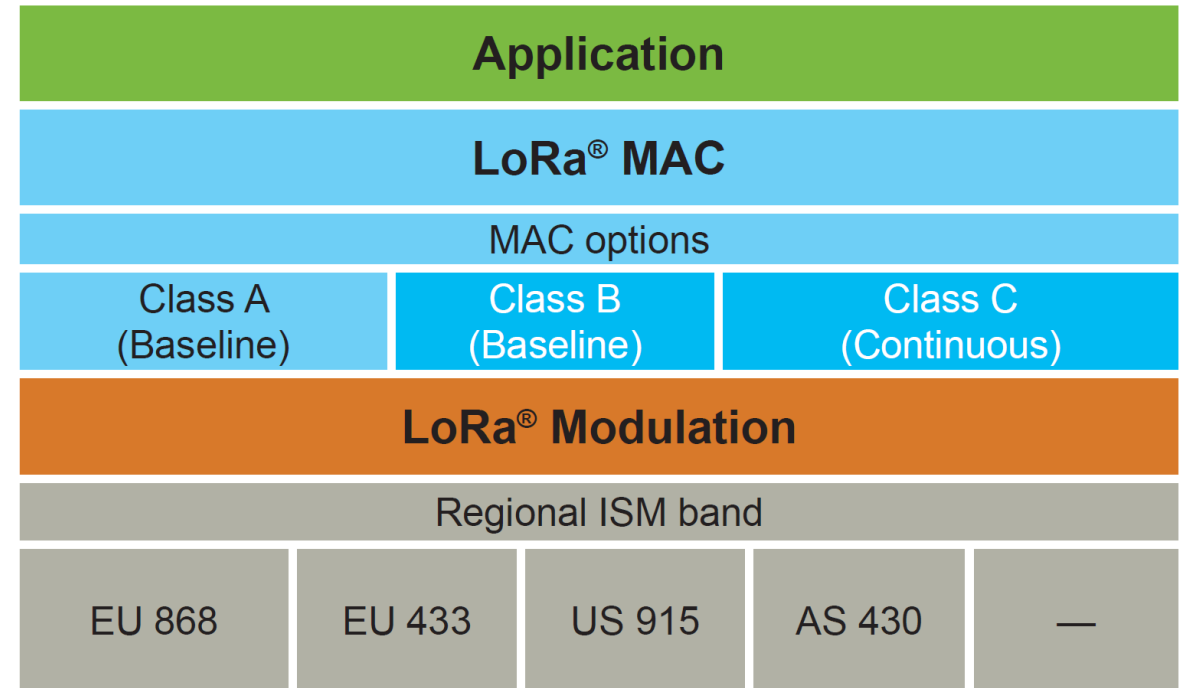
harald.eigner@tuwien.ac.at

Assoc. Prof. DI Dr. Holger Arthaber

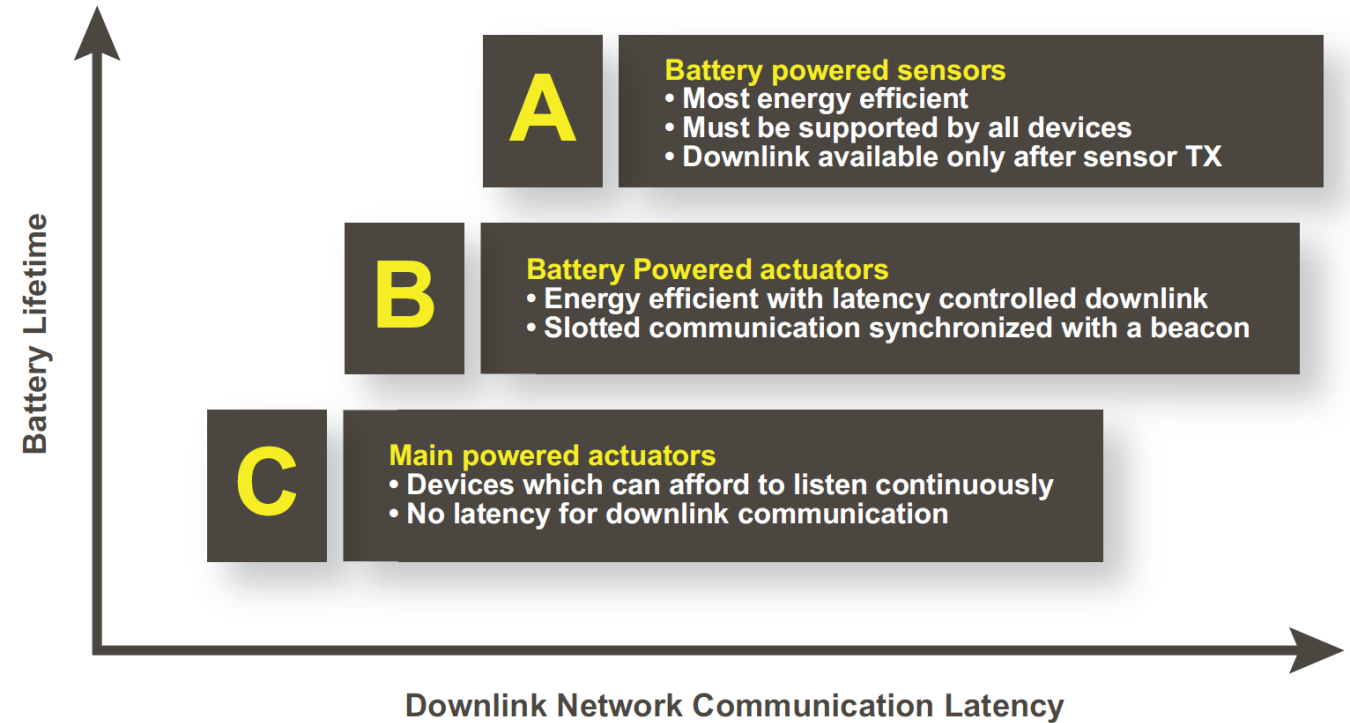
holger.arthaber@tuwien.ac.at

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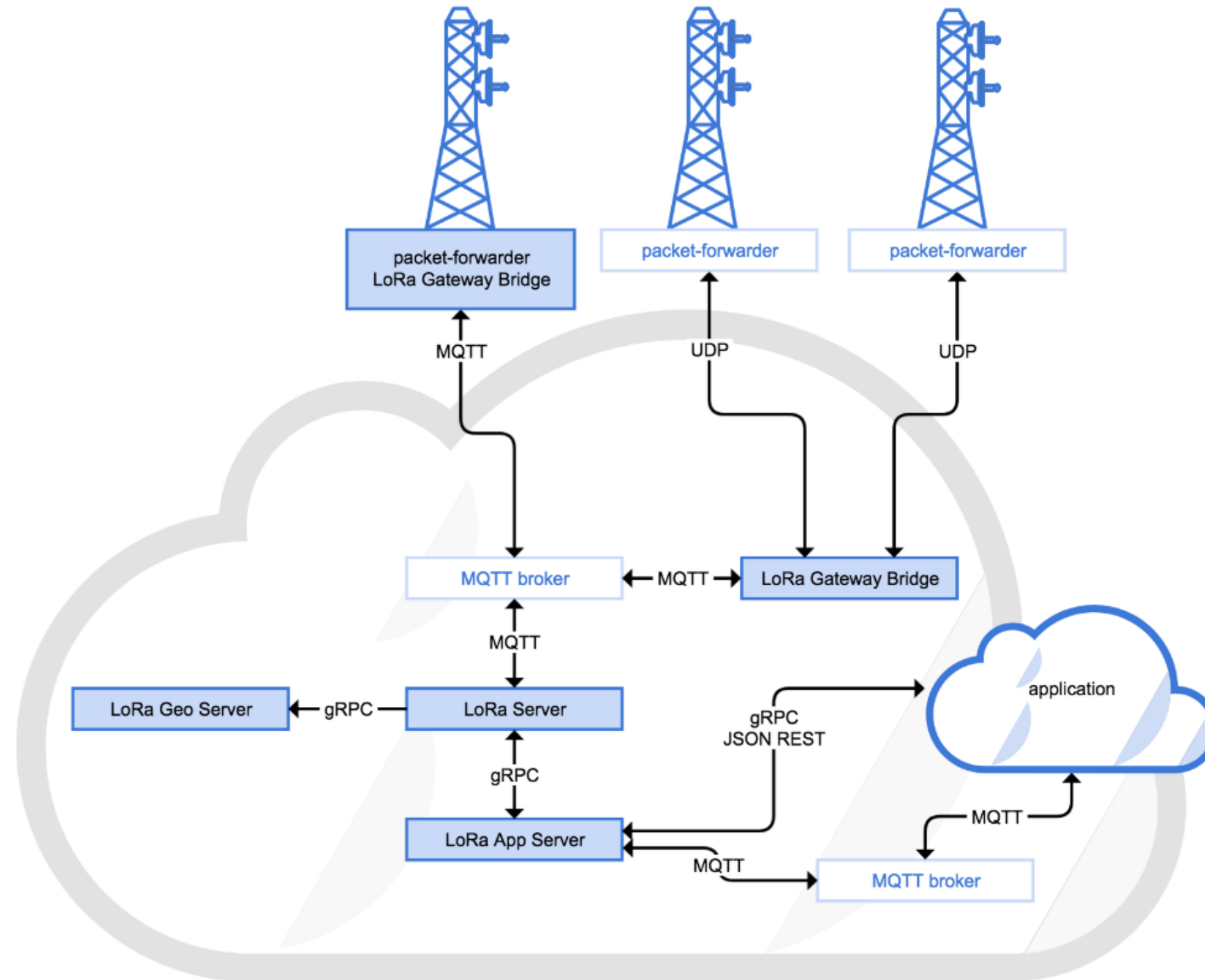
- LoRa modulation
  - Physical layer
  - Based on chirp spread spectrum (CSS)
- LoRaWAN (Long Range Wide Area Network)
  - Defines communication protocol and network architecture



- Frequency band 867–869 MHz
- 10 channels with BW 125/250 kHz
- Spreading factor 7–12
- Data rates from 250 bps to 50 kbps
- Maximum transmit power 20 dBm
- Adaptive Data Rate



- Gateway
- Gateway Bridge
- LoRa Server
- LoRa App Server
- LoRa Geo Server

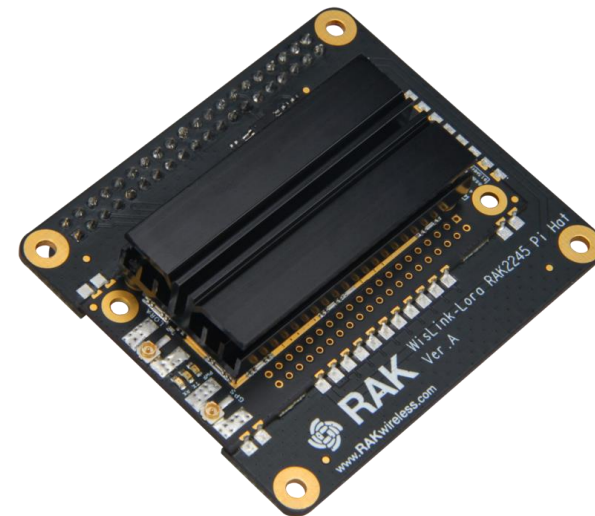


## LoRaWAN Concentrators:

- RPI based with
  - iC880A, or
  - RAK2245/RAK831
  
- RPi with LoRa Gateway OS on flash card ~ 40 €
- Price iC880A/RAK2245 ~150 €
- Optional GPS receiver ~12 € (China)
- Adapter PCB for iC880A ~15 €
- PoE supply ~15 €
- Outdoor box, mounting, consumables ~50 €



Test Setup with an iC880A



RAK2245 LoRaWAN Concentrator

## LoRaWAN Concentrators (cont.)

- LORIX One LoRaWAN Gateway
  - IP43 or IP65
  - Price 750 €
  - Capable of booting from SD Card
  - Supports Gateway OS
  - No GPS
  
- MultiConnect Conduit IP67 Base Station
  - Price 1,300 €
  - mLinux – open source Linux distribution
  - GPS receiver included
  - Supports Gateway OS



- Establishment of a LoRaWAN system
- Detection and simulation of a LoRa signal
- Interference Measurement with CW signal
- Further steps
  - Collision detection of multiple LoRa frames
  - Noise interference
  - Single/Multiple Gateways