A self-scheduled TDMA MAC protocol for onehop dynamic low-power wireless networks Pere Tuset-Peiró, Xavier Vilajosana-Guillén Distributed Parallel and Collaborative Systems Group



- High number of nodes (1000s nodes)
- Small size messages (10s bytes)
- Large coverage areas (10 km² per gateway)
- Different mobility patterns (static/mobile nodes)
- Different traffic patterns (constant/bursty traffic)



Universitat Oberta de Catalunya

Long battery life (>5 years with)

Hardware platform: OpenMote-433

- Texas Instruments CC430
 - MSP430 (16 bits, 24 MHz, 4 KB RAM, 32 KB Flash) - CC1101 (Sub-1GHz, 600 kbps, FSK/MSK/OOK)
- Sensirion SHT21
 - Temperature + Humidity digital sensor (I2C)
- STMicroelectronics LIS3DH
 - 3-axis Acceleration digital sensor (I2C)





- Targeted at active RFID systems:
 - Frequency band: 433 MHz
 - Data rate: 31.25, 100, 250 kbps
 - Modulation scheme: MSK
 - Available channels: 15, 5, 3
 - Channel bandwidth: 108, 324, 540 kHz



Data-link layer: Frame Slotted ALOHA

- Currently used in ISO 18000-7 for active RFID systems (employed in container tracking)
- Maximum performance of 36.8% due to contention between nodes
- Optimal only when number of nodes is equal to the number of slots/frame

Data-link layer: Low-Power DQ

- Based on preamble sampling, distributed queuing and channel hopping
- Maximum performance of ~100% thanks to the blocked tree-splitting algorithm
- Optimal regardless the number of nodes present in the network
- Unfair in terms of resource assignment due to the capture effect of MSK modulation
- Fair in terms of resource assignment to nodes in the network (even with MSK)

