

Student: Ana Pejković ana.pejkovic@ferit.hr, Josip Spišić josip.spisic@ferit.hr, Matko Zrnić matko.zrnic@ferit.hr

Izv. prof. dr. sc. Krešimir Grgić

FERIT

Introduction

- IoT in agriculture have specific requirements
- long-range communication
- low energy consumption
 - LPWAN technologies (Low Power Wide Area Network)

LPWAN technologies

LoRa

- CSS (Chirp Spread Spectrum) modulation
- Spreading Factor (SF)
- Code Rate (CR)
- Class A,B and C

Sigfox

- BPSK modulation
- limited data packets
- 140 messages per day
- four messages psser day can be received

NB-IoT

- licensed cellular technology
- pre-existing LTE functionality
- Standalone operation;
- In-band operation,
- Guard band operation

Comparison

NB-IoT -> lowest range

-> highest data rate

Sigfox -> highest range

LoRa -> lowest latency

Technology	LoRa	Sigfox	NB-IoT
Range (km)	<20	<50	<10
Licensed spectre	No	No	YES
Bandwidth	150/250/500 kHz	100 Hz	180 kHz
Operating frequency (MHz)	868	868	800/900/1800
Data rate	50 kbps	100 bps	200 kbps
Latency	10 ms	30 ms	10 s
Battery life (years)	>10	<10	>10

Table 1. LPWAN COMPARISON

Application

- easily monitor environmental conditions in real-time and timely response to various climatic disasters.
- set up and applied to the cornfield.



- IoT in agriculture
- Cornfields
- LoRa technology
- moisture and temperature parameters
- application layer, a network layer, and various sensors

Conclusion

- Data collected from sensors in the field can be transferred over a large distance in relatively real-time with low power consumption and low expenses. Low power consumption is practical considering that devices used for IoT in agriculture need to have their power supply. Long-range is required considering that devices for agriculture are located in remote and vast areas.

References

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