universidade de aveiro

MOBILE COMMUNICATIONS

LORA – LOPY 2 LOPY

JOAO AFONSO FERREIRA
JOAO PEDRO FERREIRA
EDUARDO LOPES
RAFAEL CURADO

2023

Table Of Contents

- LORA, What is it?
- Our Vision And Mission
- LoPy 2 LoPy bilateral Communication
- Real World Testing and Results

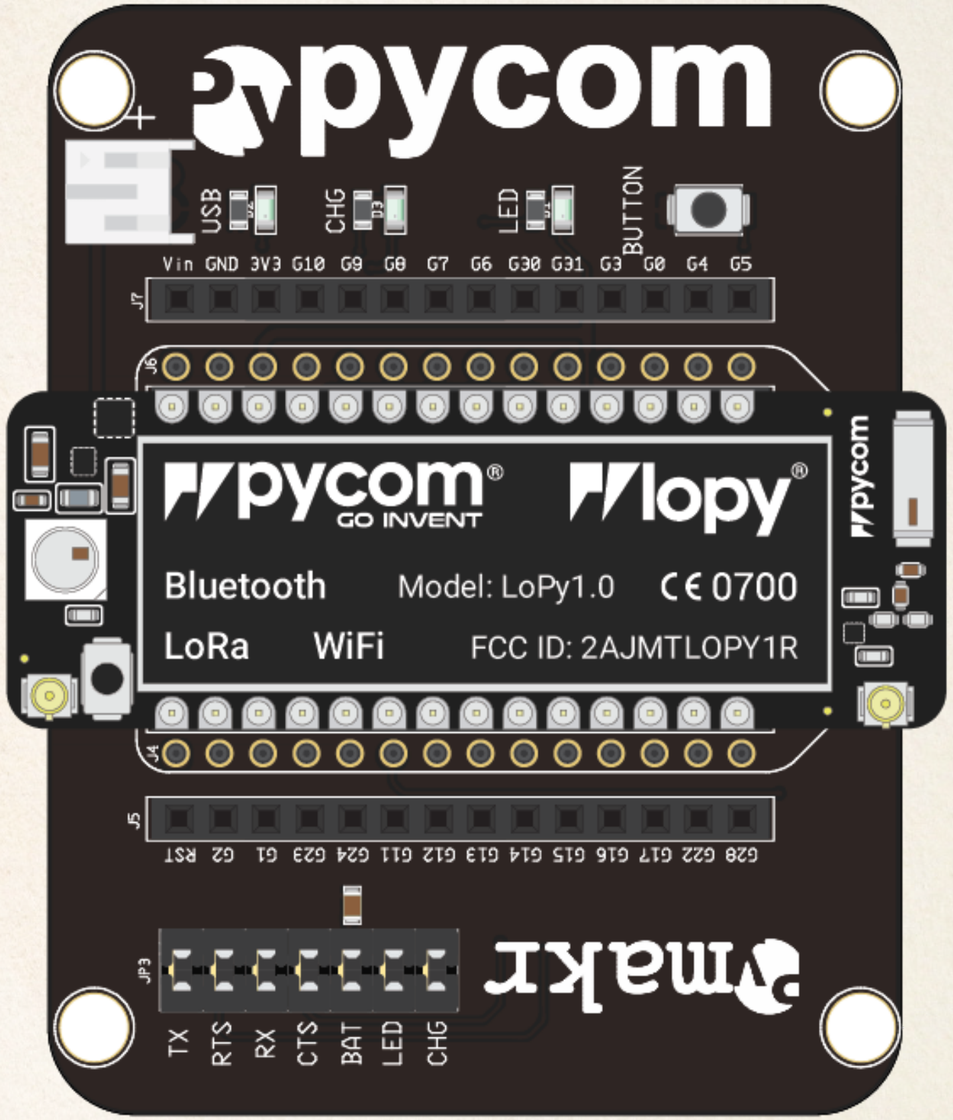


Fig. 1 - Pycom Architecture (LoPy device used for this project)

What is LoRa?

- **LoRa**, an abbreviation for "**long-range**," stands out as a **radio frequency** carrier for transmission.
- **LoRa** is a **long-range**, **low-power**, **low-bitrate**, wireless telecommunications system, promoted as an infrastructure solution for the Internet of Things (**IoT**)
- LoRa is a **key** enabler for the seamless connectivity of diverse **IoT devices**.

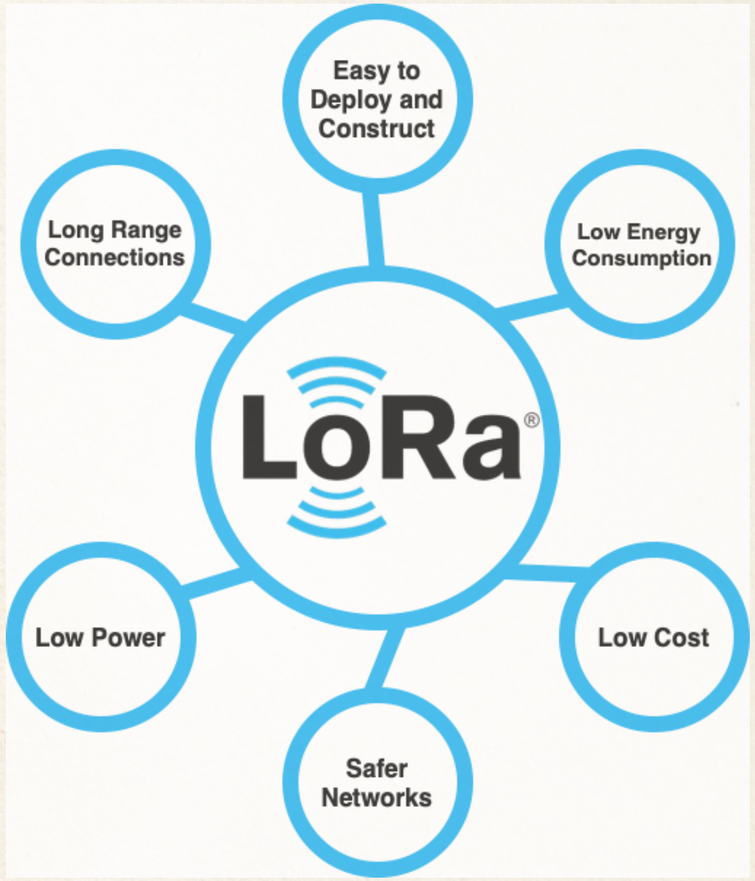


Fig. 2 - Advantages of using LoRa technology and communication

LoRa

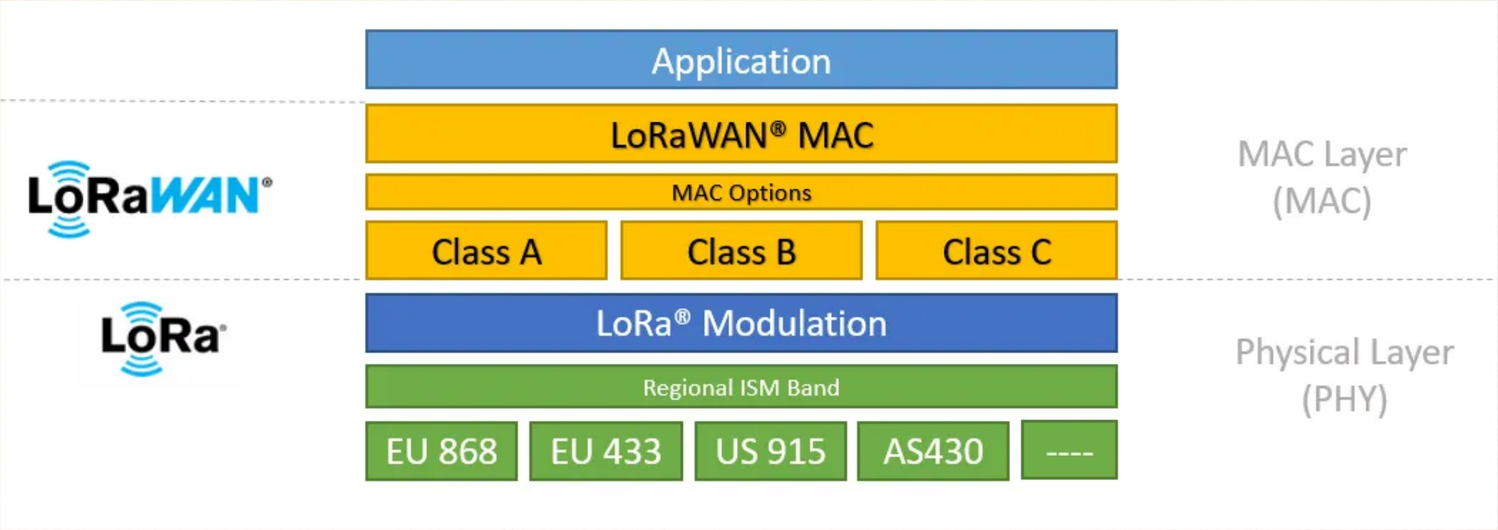


Fig. 3 - LoRaWAN Vs LoRa

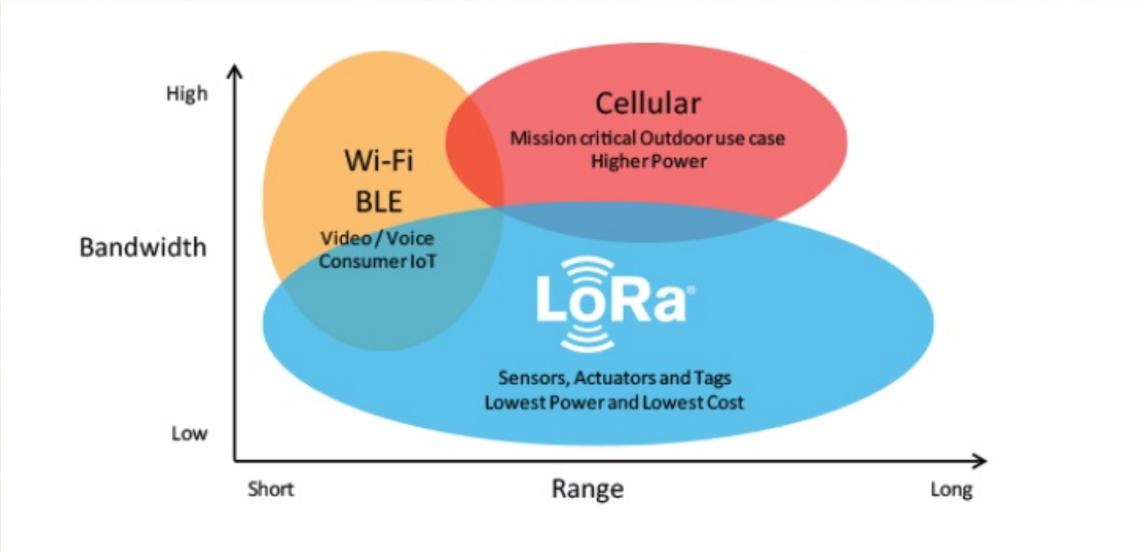


Fig. 4 - Technologies Vs Range

Our Mission

- **Bilateral Communication:**
  - Involving the **exchange of data** between **LoPys** (Pycom device)

- **Range Testing For Different Scenarios:**
  - Annotate different values for different environments

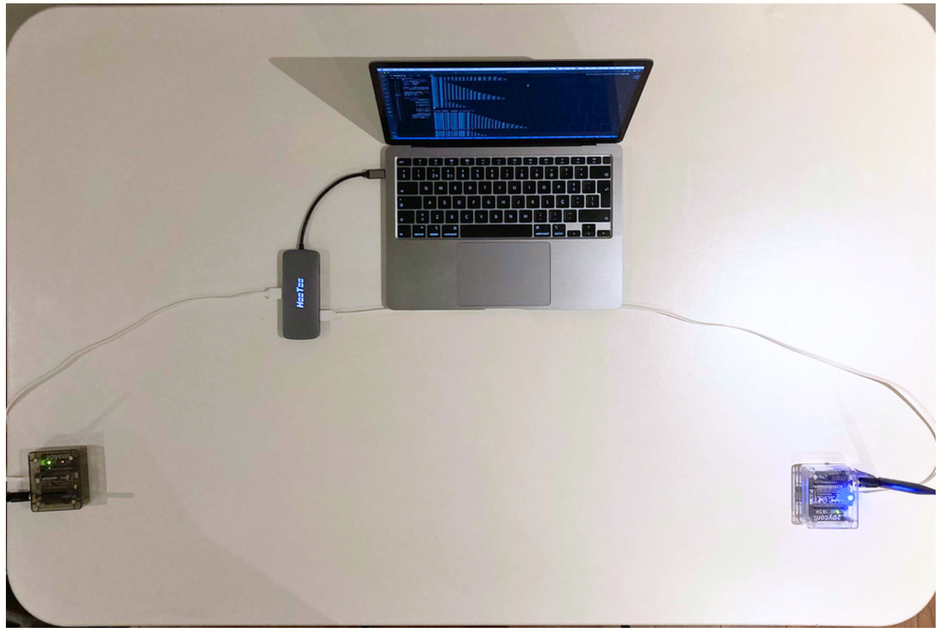
- **Functionality Study of LoPy Devices:**
  - Study the LoPy devices capabilities

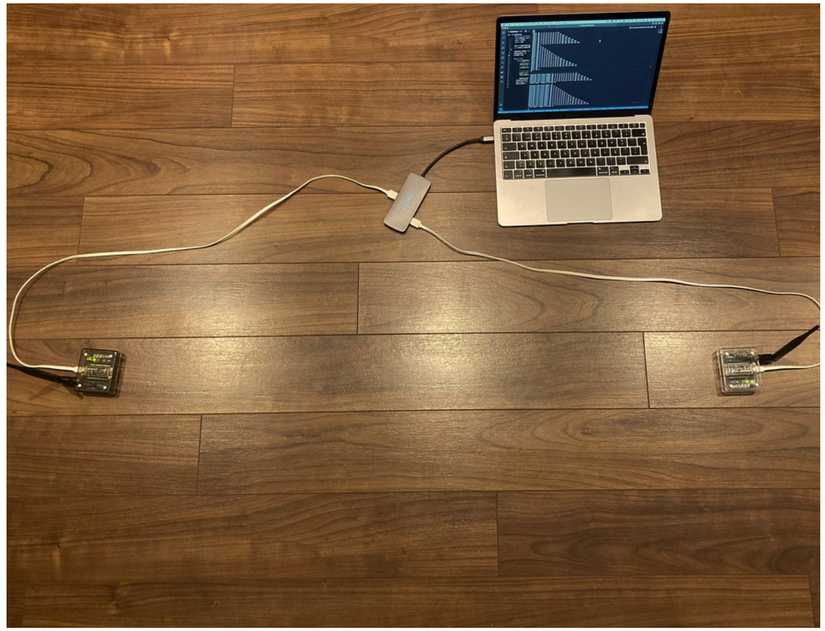
- **LoPy GPIO Integration:**
  - Integrate **GPIO** for enhanced communication capabilities (**temperature sensor**).

- **Performance Impact Analysis**:
  - Assess the **impact** of various **parameters** on the resilience and overall **performance** of **LoRa** wireless **communication**.

Bilateral Communication

- OutDoors
- InDoors





Bilateral Communication & Range Testing (OutDoors)

Fig. 5 - Google Maps for Distance Measures

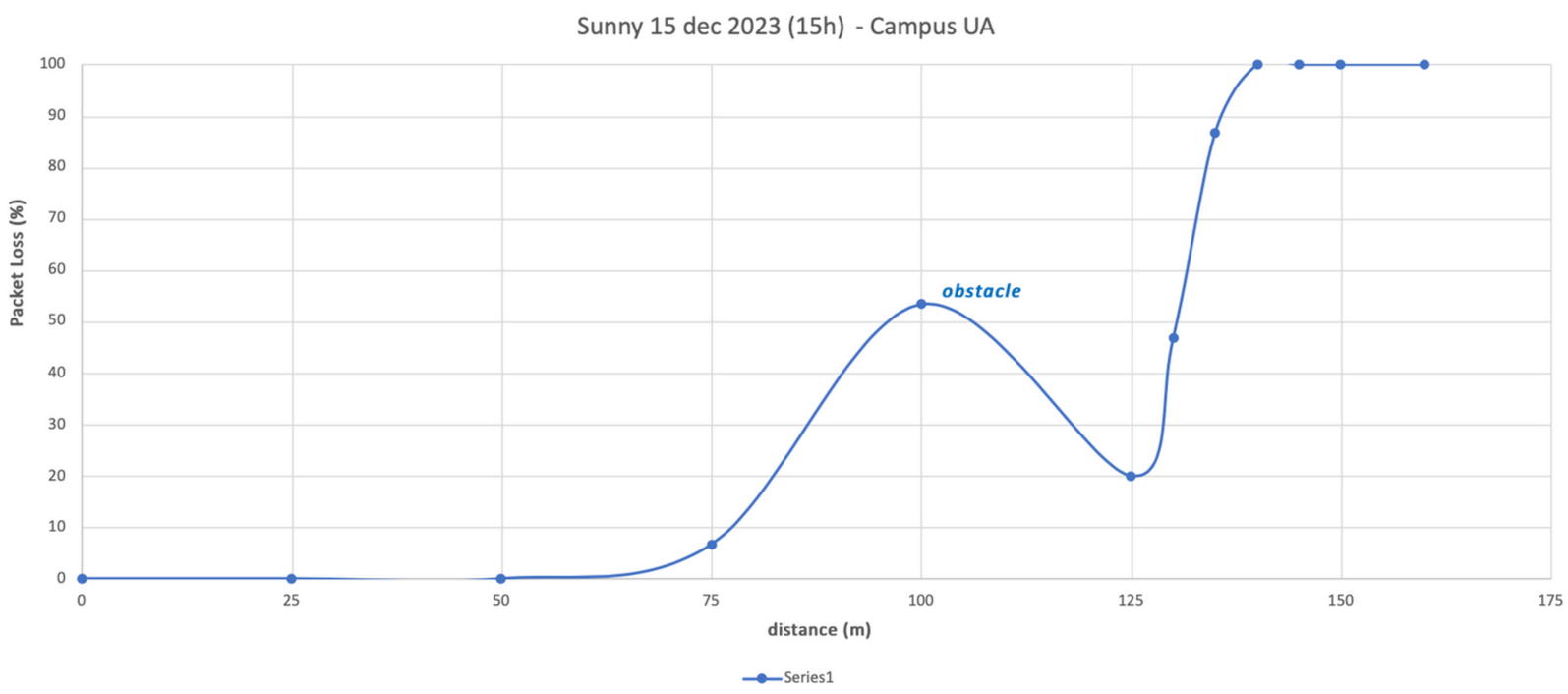


Fig. 6 - Campus UA (Distance Vs Packet Loss)

Bilateral Communication & Range Testing (OutDoors)

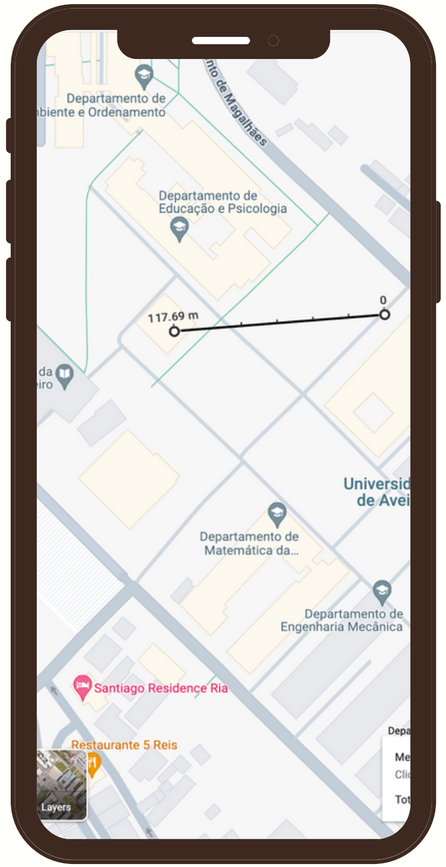


Fig. 7 - Google Maps for Distance Measures

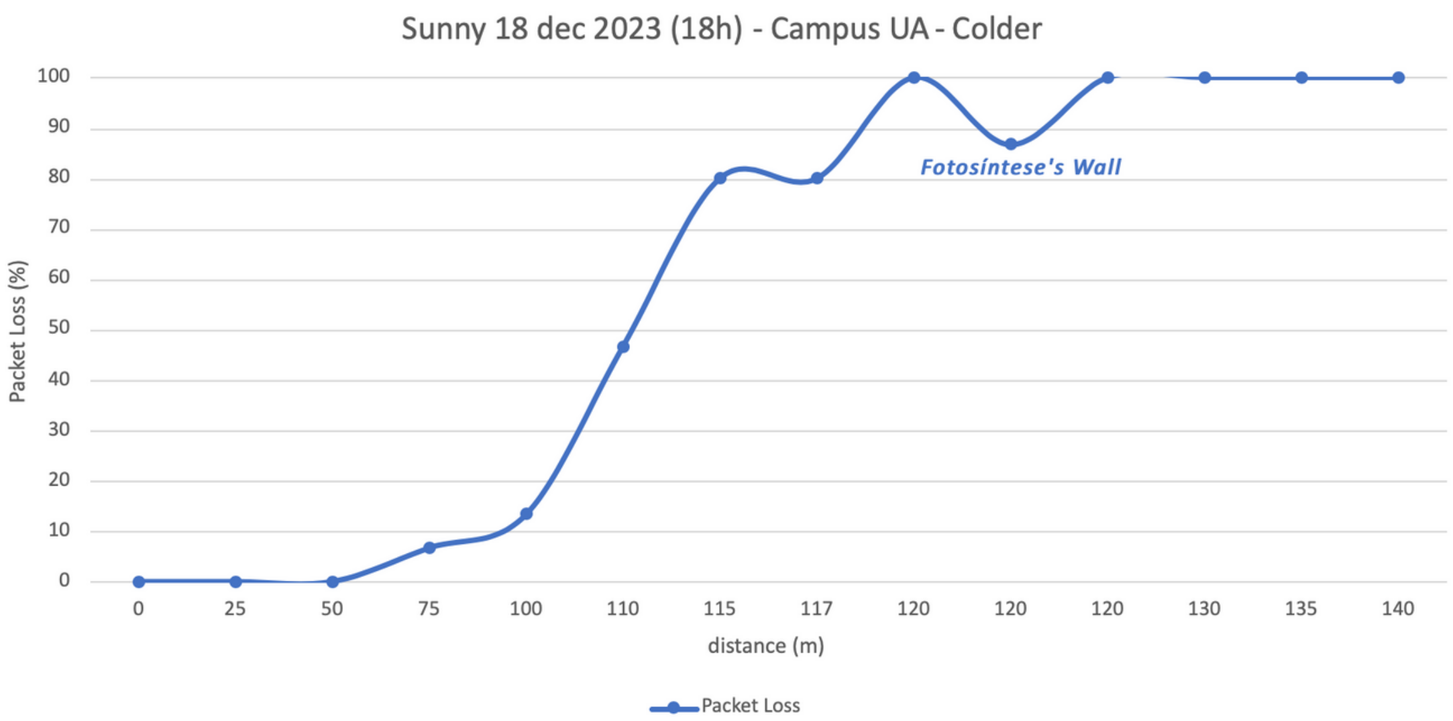


Fig. 8 - Campus UA (Distance Vs Packet Loss) Colder Temperature

Bilateral Communication & Range Testing (inDoors)

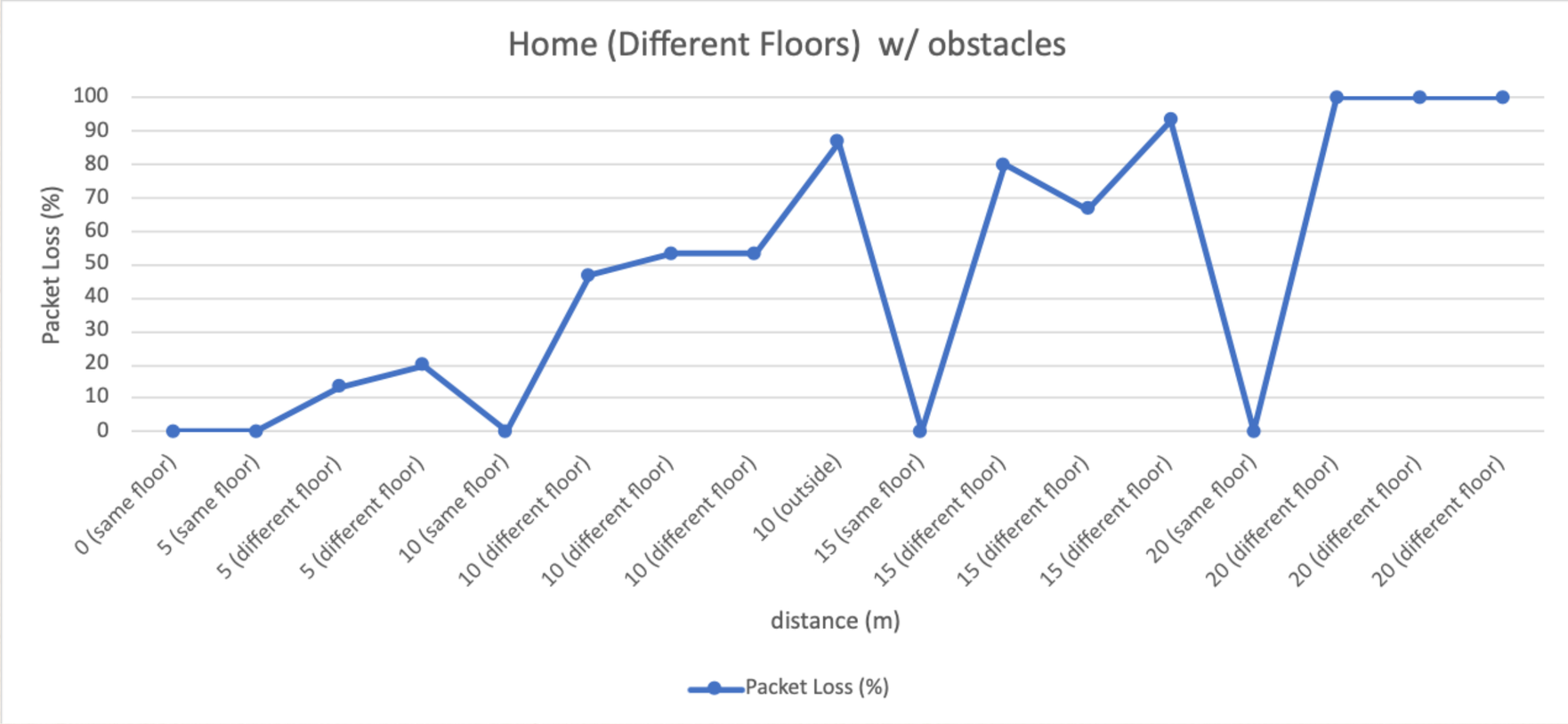


Fig. 9 - Evaluation of Testing Range in the Presence of Various Obstacles - In this scenario, the Sender transmits an array of numerical data every second, while the Receiver systematically assesses the received data by comparing it to the expected values.

FREQUENCY & BANDWIDTH

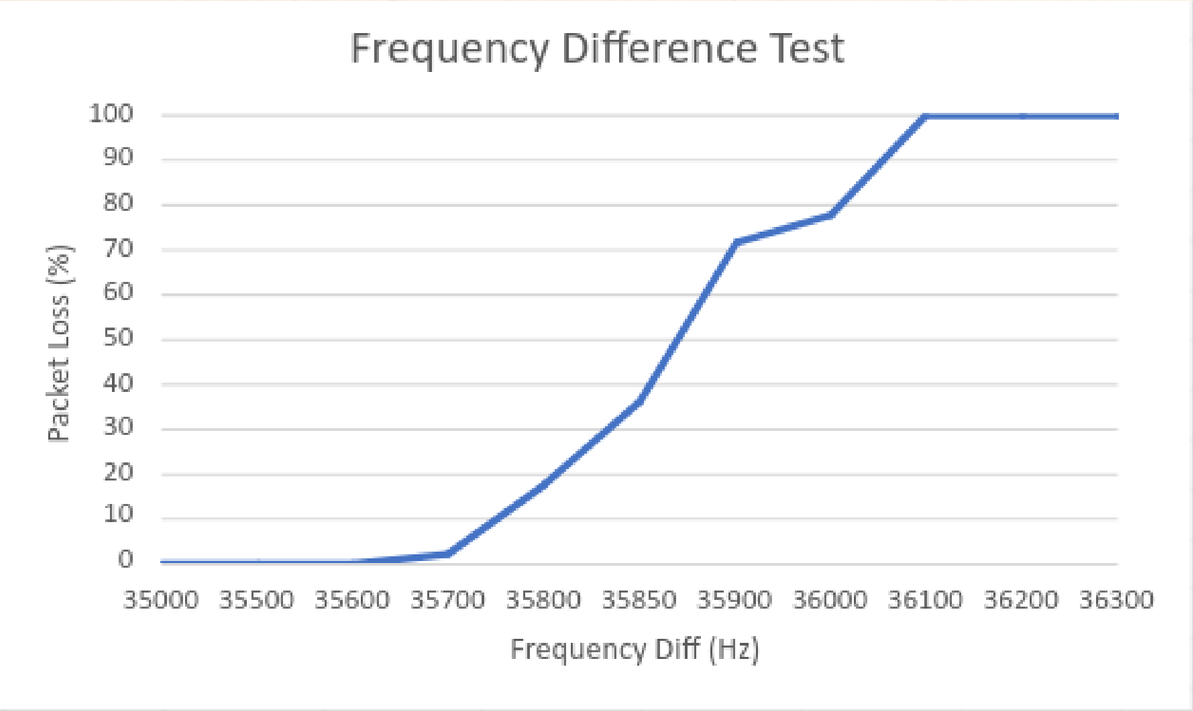


Fig. 9 - Impact of frequency difference between 2 nodes

- Environment: UA Library
- Time: 6PM
- Nodes distance: 1m

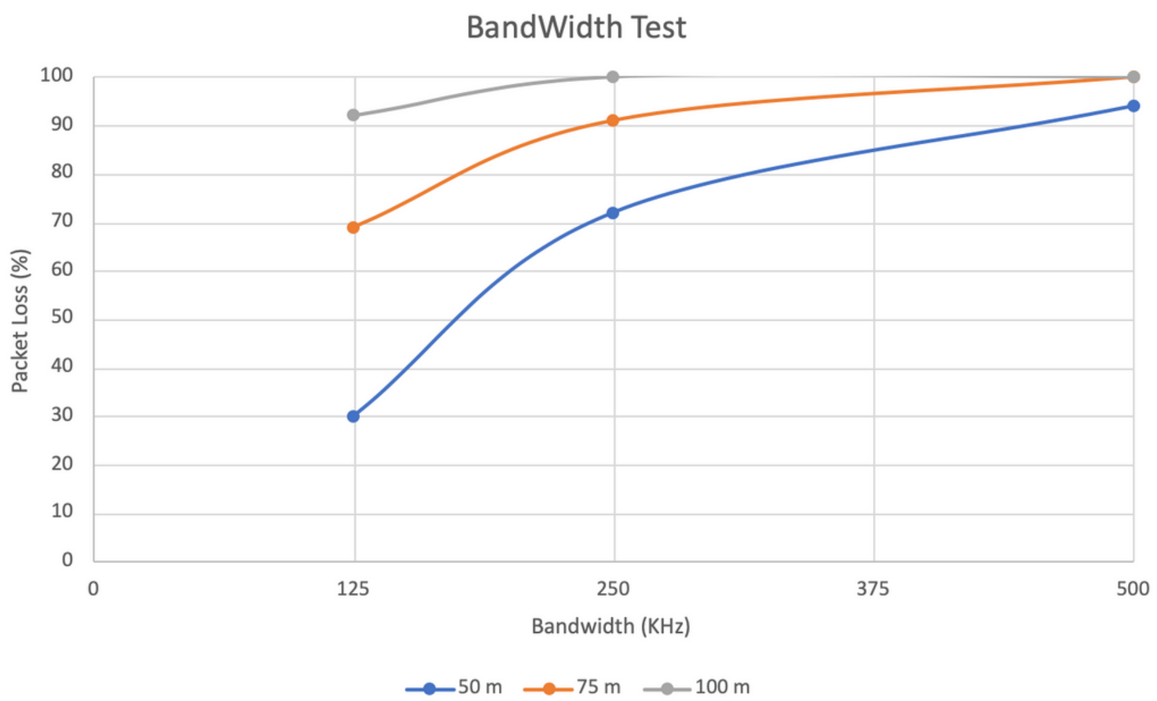


Fig. 10 - Impact of Bandwith Vs Distance

- Environment: UA Campus (outdoor)
- Time: 2PM
- Nodes distances: 50m, 75m, 100m

LOPY GPIO INTEGRATION

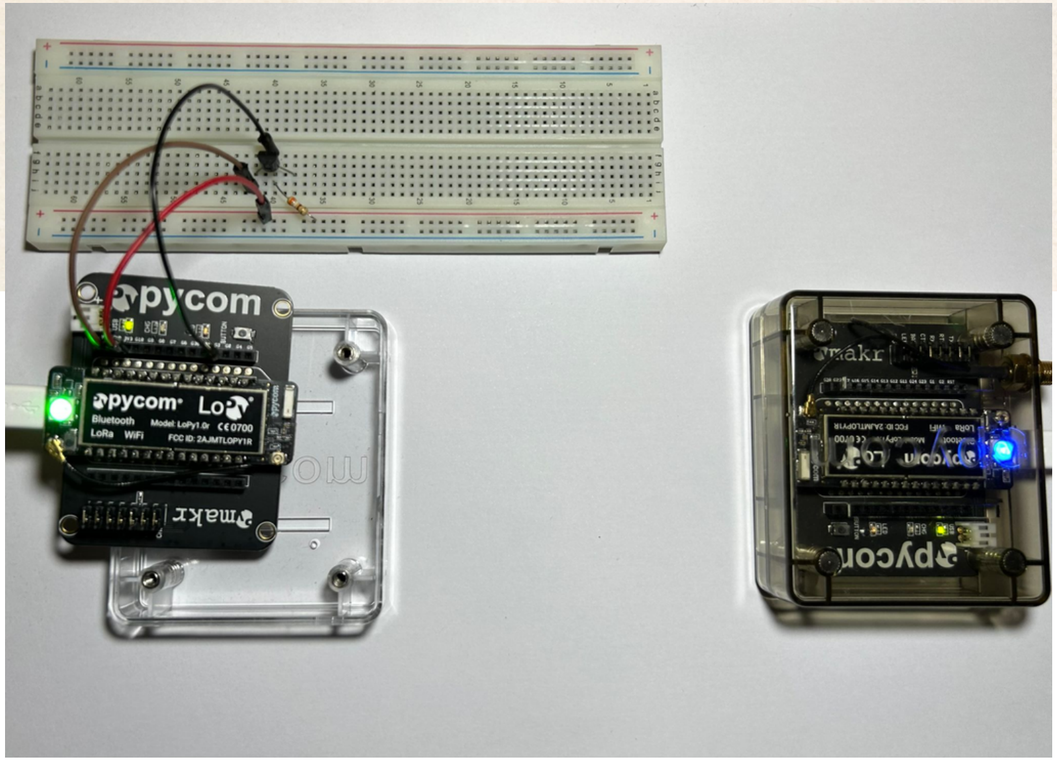


Fig. 10 - Temperature Sensor GPIO Integration Circuit

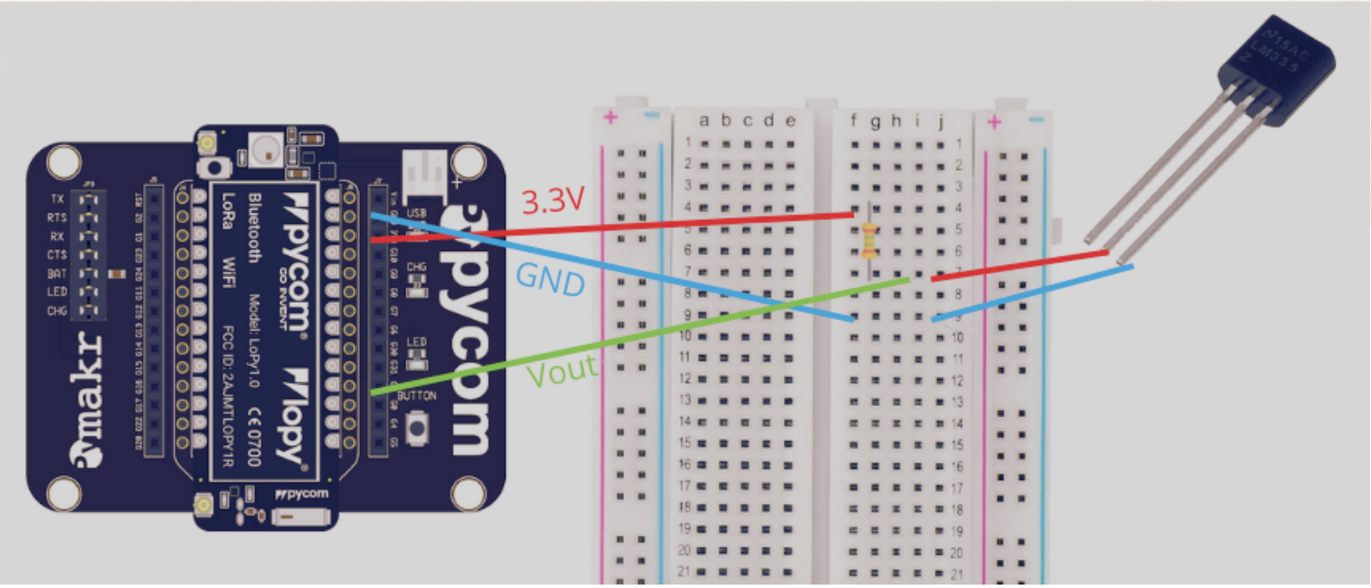


Fig. 11 - Circuit Assembly

Overall LoRa Performance is affected by:

- DISTANCE
- ENVIRONMENTS
- OBSTACLES
- NOISE
- FREQUENCY
- BANDWIDTH
- ANTENNA
- TEMPERATURE & WEATHER CONDITIONS

DEMO

universidade
de aveiro

Bibliography

- Semtech. What Is LoRa? Retrieved from: https://www.semtech.com/lora/what-is-lora#:~:text=What%20Is%20LoRa®%3F,Internet%20of%20Things%20(IoT)

- Pycom Ltd. (n.d.). LoRa: Module to Module Communication. Pycom Documentation, https://docs.pycom.io/tutorials/networks/lora/module-module/

- *Yi, J., Clausen, T., & Townsley, W. M. (2016). A Study of LoRa: Long Range & Low Power Networks for the Internet of Things, _ https://doi.org/10.3390/s1609146*

universidade
de aveiro

Thank You!

Authors:

Eduardo Lopes
edu.fernandes@ua.pt

Jo□ão Afonso Ferreira
ferreiraafonsojoao@ua.pt

João Pedro Ferreira
joaop.ferreira@ua.pt

Rafael Curado
rafael.curado@ua.pt

MOBILE COMMUNICATIONS
2023/2024