Long Range Radio Data Transfer

Cody Spring MSI Intern | Innovation Lab

Drummond Wengrove Innovation Lab Manager

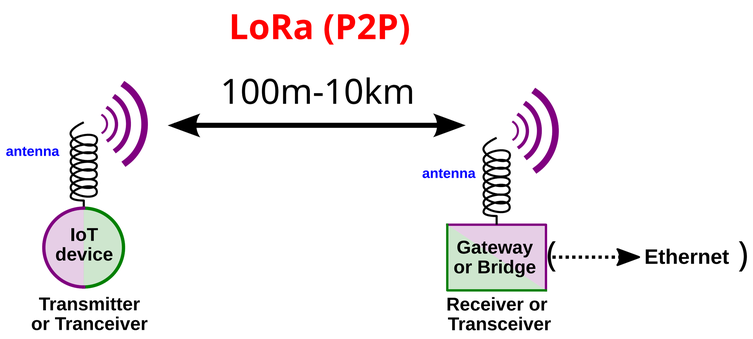
Oregon State University Marine Studies Initiative

Oregon State University Hatfield

Arduino Uno With LoRa
Shield Attached

LoRa Overview

LoRa, which stands for Long Range, is a wireless communication technology specifically designed for long-range, low-power communication between devices. It operates in the sub-GHz frequency bands, allowing it to achieve extended communication ranges while consuming minimal energy. LoRa employs a modulation technique that enables it to transmit data over distances of several kilometers, even in challenging environments with obstacles and interference.

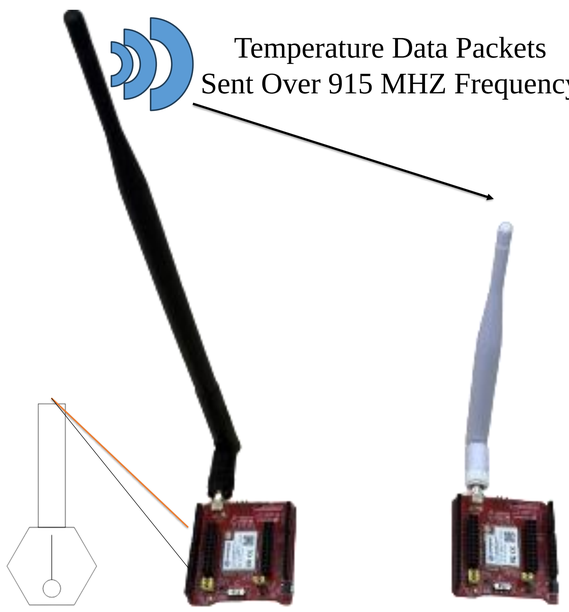


Project Objective

The primary objective of this project is to harness the capabilities of LoRa technology for the transmission of data collected from various applicable sensors, stored on an SD card. This will be accomplished by integrating Arduino Shields equipped with the SX1276 chip, renowned for its remarkable communication range of up to 10 km. By capitalizing on the SX1276 chip's long-range capabilities, the project aims to establish a reliable and energy-efficient communication channel, facilitating the seamless transfer of sensor-derived information from an SD card to a receiving server.

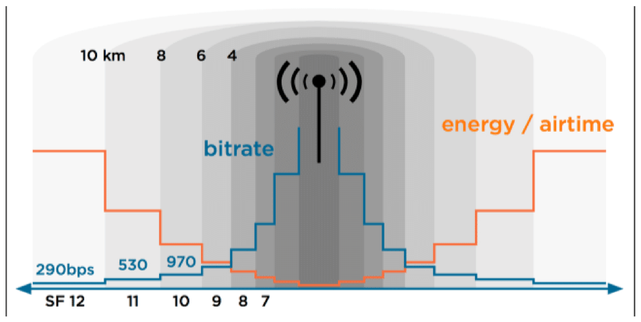
Application

The project envisions its integration into an actual research initiative focused on remote data collection. By deploying the LoRa-enabled system in the field, the project aims to demonstrate its practical value in real-world scenarios. This research endeavor could involve areas such as environmental monitoring in remote or hazardous locations, wildlife tracking, or geological studies. The project's LoRa solution would empower researchers to gather critical data without the constraints imposed by traditional wired systems or the limitations of shorter-range wireless technologies. This can all be achieved using two inexpensive Arduino's armed with LoRa capabilities, shown below as a client and a receiving server.



Limitations

The limitations of LoRa do become apparent when dealing with large file sizes and dense data, however. The longer the required range of any one device, the slower the data will be transmitted over the frequency. With a maximum of 290 bps over 10 km a large file could take hours to transmit depending on the conditions. This solution is best intended for data which is not very information dense such as temperature, GPS locations, humidity, etc.



Data Transmit Speed over

Conclusion

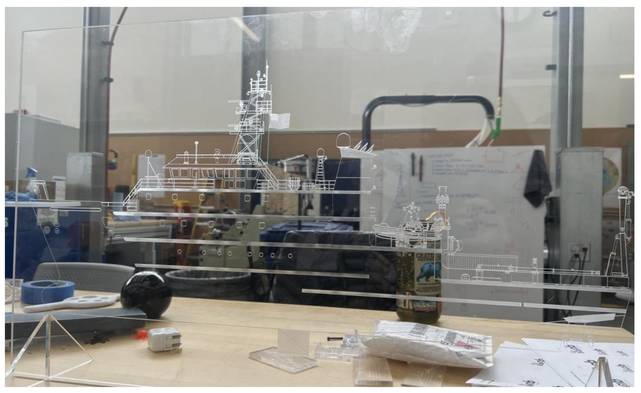
LoRa technology's capacity for long-range, low-power communication makes it a valuable asset for various applications. The project's integration of LoRa with the SX1276 chip highlights its potential for establishing efficient communication channels in remote data collection scenarios. While LoRa's effectiveness is clear for less data-dense applications, challenges arise with larger files due to slower transmission rates. Nonetheless, LoRa remains a cost-effective and versatile solution for bridging the gap between long-range wireless communication and practical data transfer.

What the Final Product
Could Look Like

Other Projects Within the iLab

Over the summer, I engaged in projects that advanced my technical skills and streamlined our operations. One of the highlights was implementing OctoPrint, enhancing our 3D printer farm's management by centralizing control through a user-friendly web interface. Additionally, I contributed to laser engravings on our latest vessel, the R/V Taani, showcasing the fusion of technology and craftsmanship to create intricate designs that symbolize the synergy between tradition and innovation.

OrangePi Comptuers Used for
OctoPrint



R/V Taani Laser Engraving on
Acrylic