ECUcomm: End of Cable Unit Communications

Overview

ECUcomm is a communication module designed for the End of Cable Unit (ECU) in the Strateole2 project. It facilitates reliable data exchange between the main board and the ECU using LoRa technology. The module is responsible for handling both low-level communication protocols and higher-level data structures and messaging.

Key Features

- **LoRa Communication**: Utilizes LoRa radios for long-range, low-power communication.
- **Data Structures**: Defines and manages data structures for efficient data handling.
- **Messaging Protocol**: Implements a robust messaging protocol to ensure data integrity and reliability.

LoRa

A LoRa radio cannot transmit and receive simultaneously. If both ends of the link transmit at the nearly same time, the packets will interfere with each other and both will be lost. A scheme has been devised to simulate a full-duplex link in this scenario.

Different modes are designated:

- **LEADER**: The node transmits messages periodically and continuously. These messages may simply perform a "keep-alive" function. The node which has a higher message bandwidth should use this mode.
- **FOLLOWER**: The node will transmit a queued message immediately after receiving a message.
- **FREERUN**: The node will receive and transmit messages, without any other consideration. Using this mode could lead to lossy communications, but is necessary for applications not using the LEADER/FOLLOWER mechanism.

The LEADER/FOLLOWER scheme relies on these rules:

- The LEADER has some "dead" time to receive a message, after it has sent one.
- The FOLLOWER does not require more than one message to reach the LEADER for every message sent by the LEADER.