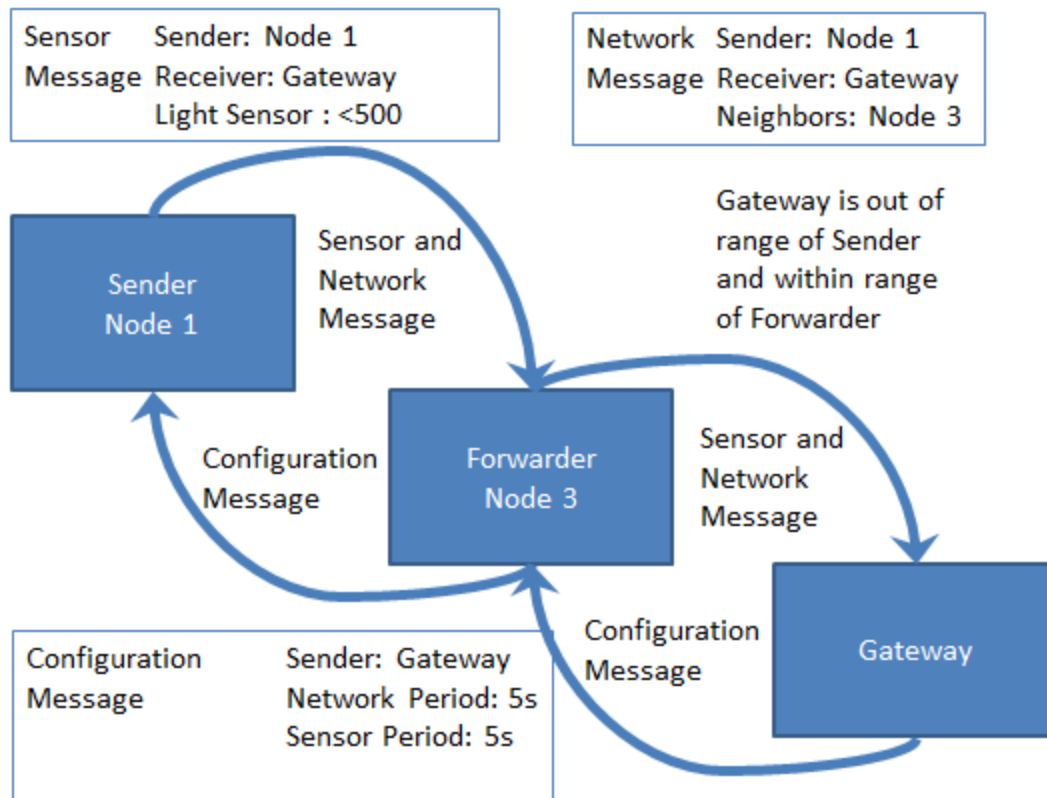


Architecture



Implementation

We chose to implement our network by allowing nodes to forward all their information towards the gateway. Intermediate nodes (shown above as a forwarder) may intercept messages and pass them along to the gateway. three different messages: sensor messages, network messages, and configuration messages. Sensor messages are meant for nodes to notify the gateway when an event occurs. In our case, this event is when the light value goes below 500. Network messages are sent periodically by nodes in order to provide information to the gateway. This information is expressed as an array of RSSI values received from different nodes. The default value for a node is 0 (given that no message is ever received from them). The last message can only originate from the gateway but is propagated throughout the network by each node. This message, the configuration message, allows the user to set how often each sensor polls its environment for information and thus, sets how often messages are sent between nodes.

In this way, the gateway is able to calculate how each node is set up based upon the neighbors that the other node's recognize.

Performance Metrics

What

While implementing this project, we decided to optimize for the following metrics:

- Energy
- Low Latency
- Mobility

Why

We chose these metrics because within our GPS - Denied Localization project, it is important for nodes to be mobile, conserve energy, and be able to send and forward messages relatively quickly.

How

Energy was optimized within this lab by keeping nodes within the active state (not active_rx or active_tx). This was accomplished by adjusting when nodes would send and receive messages based upon their network and sensor periods. The gateway has the highest energy use but we rationalized that since it was connected to the computer, the additional energy consumption would be okay.

Low Latency was optimized within this lab by reducing the total bandwidth necessary for every message to be sent. This was accomplished by limiting what messages would be sent at a particular time.

Mobility was optimized within this lab by allowing each node to report the neighbors it sensed around it. By seeing these updates, our gateway can more easily identify how the network nodes are organized.