INF FAKULTÄT FÜR INFORMATIK

17. December 2018

Advanced Frequency Hopping

Pham Huu Quang – 220477
Rahul Kodarapu – 220850

Supervisor:
Prof. Dr. rer . nat. Mesut Günes
M.Sc. Ali Nikoukar

Agenda

- Introduction
- Proposal
- Demonstration

Wireless Communication in IoT

Notable Characteristics:

- Dynamic Nature
- Heterogeneity
- Low Power
- Complex Network
- Data Quality

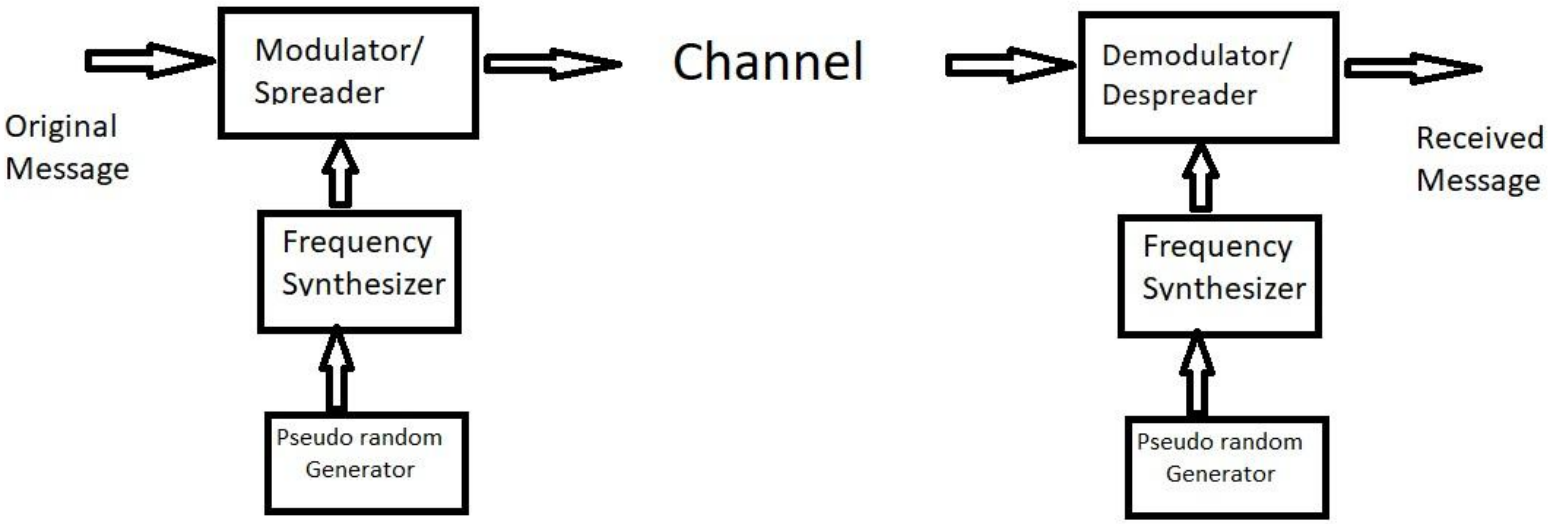
Data Quality

- Single Frequency Usage for transmission.
- There is data loss due to several issues while transmitting.
- Solution: Can be reduced to a considerable extent using techniques like Frequency Hopping.

Data Quality–FHSS

- It is a method of transmitting radio signals by rapidly switching a carrier among many frequency channels.
- It is done using a pseudorandom sequence known to both transmitter and receiver.

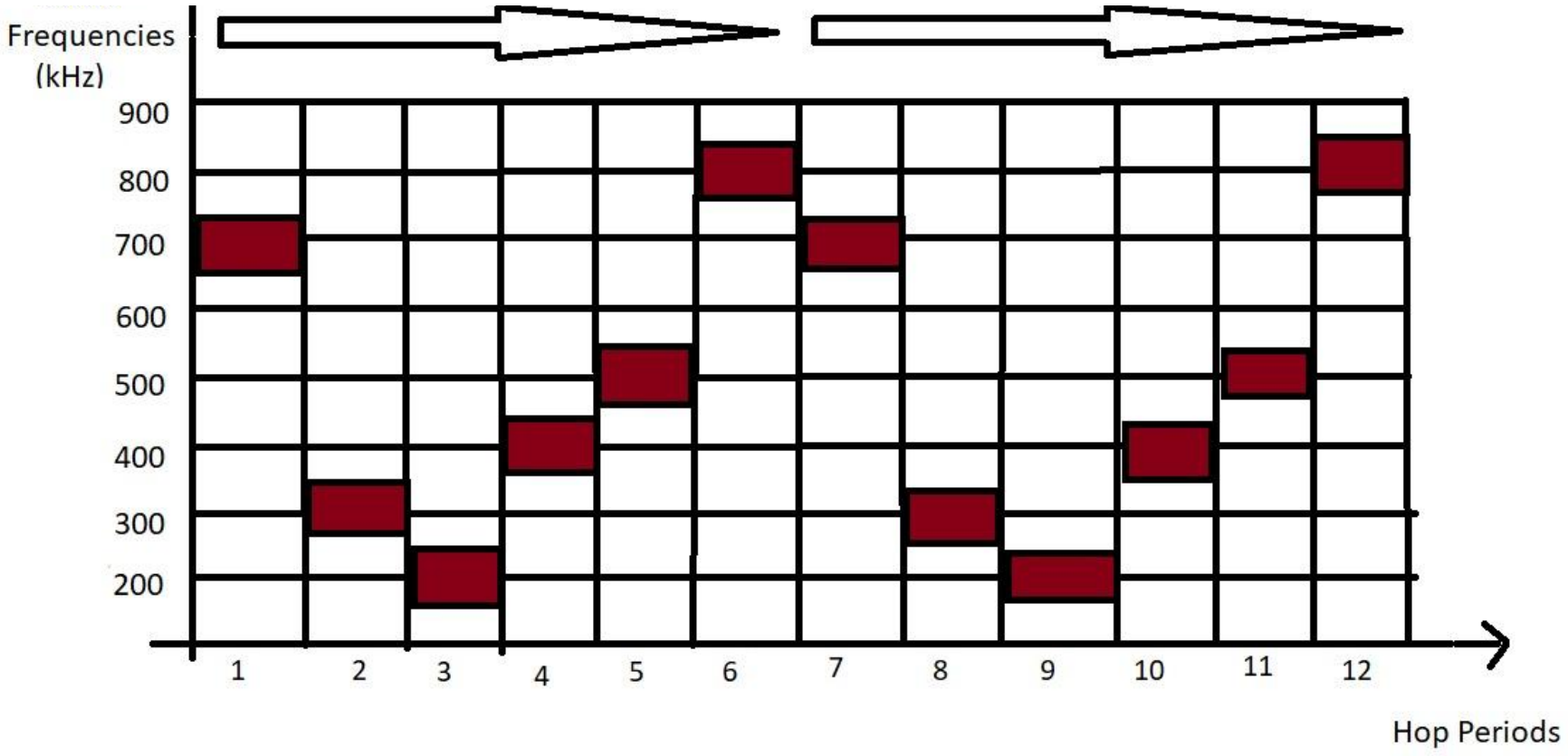
Data Quality–FHSS (Block Diagram)



Data Quality–FHSS

- The pseudo random code generator generates a hopping sequence.
- The frequency synthesizer converts the code and passes it on to the modulator for transmission.
- In the receiver section, the result can be obtained by using same hopping sequence.

Data Quality–FHSS



Data Quality– Advanced Frequency Hopping

- Avoid synchronizing effect of similar pattern.
- Decrease the chance of operating in crowded frequencies in the hopping sequence.
- The key idea is to use only the “good”(non–busy) frequencies, by blacklisting the "bad" frequency channels.
- Can be done by implanting a mechanism to recognise quality of a channel

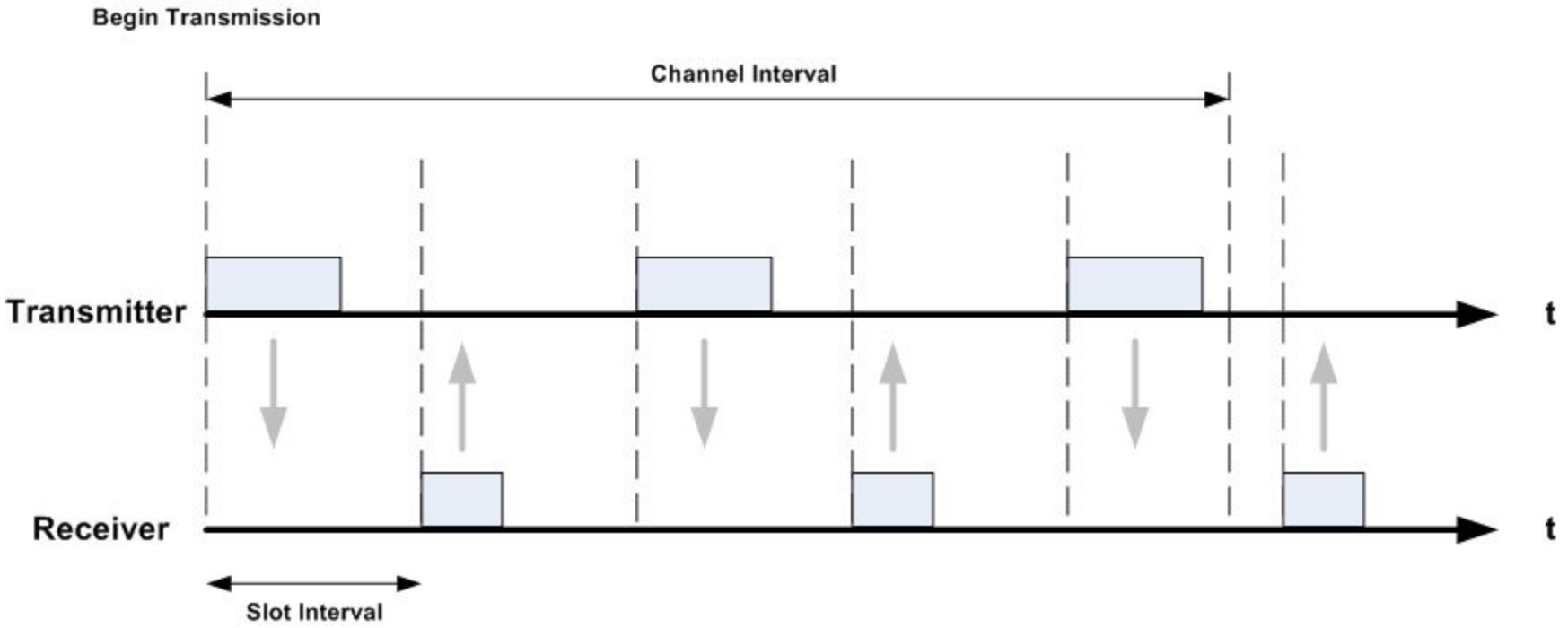
Our Proposal

- Transmit smartly using the network conditions information.
- Adapt to the changes of the environment.
- Make sure to not overreact.

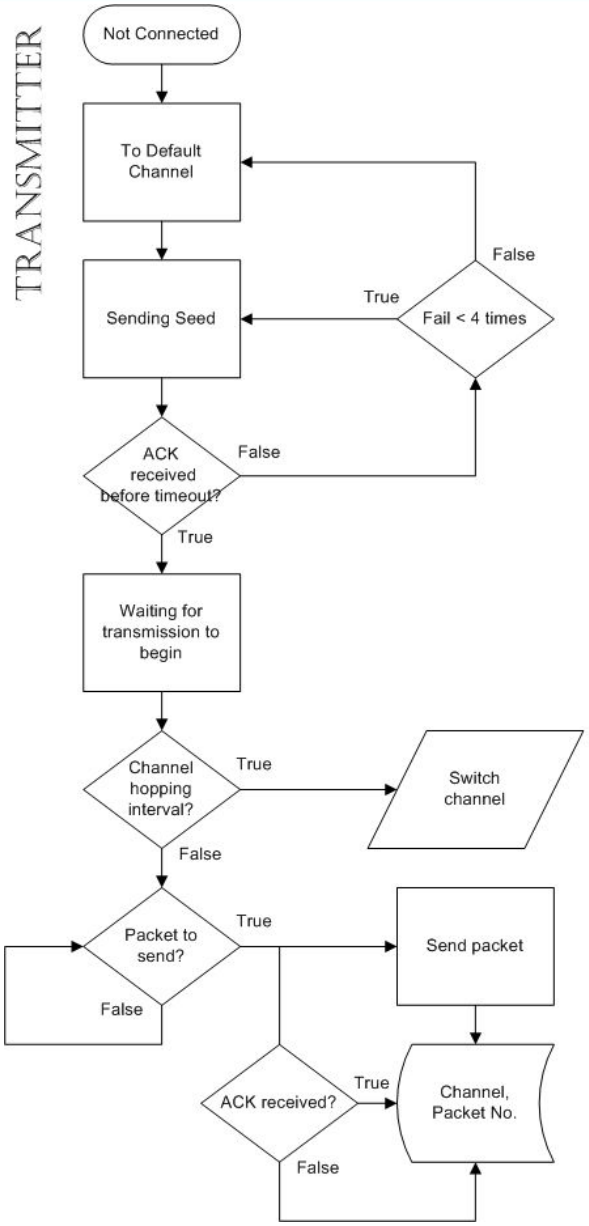
Our Proposal – Implementation

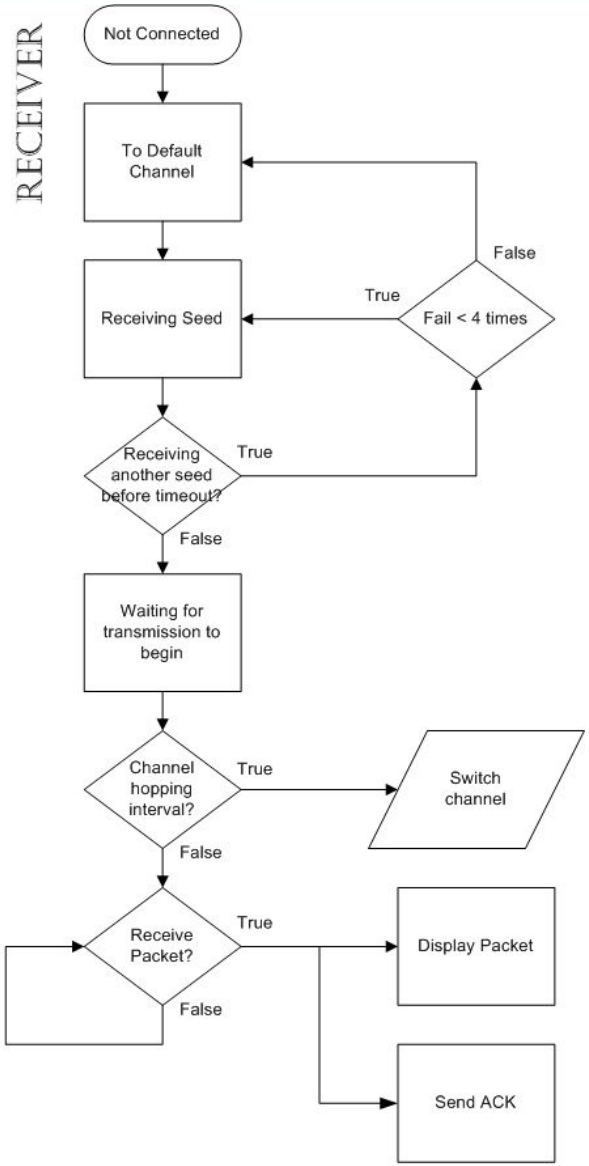
- Experiment on self–created platform using Arduino.
- Bluetooth transmission simulated using NRF24L01.
- Simulation of the network environment next stage.

Implementation – Single Thread Operation

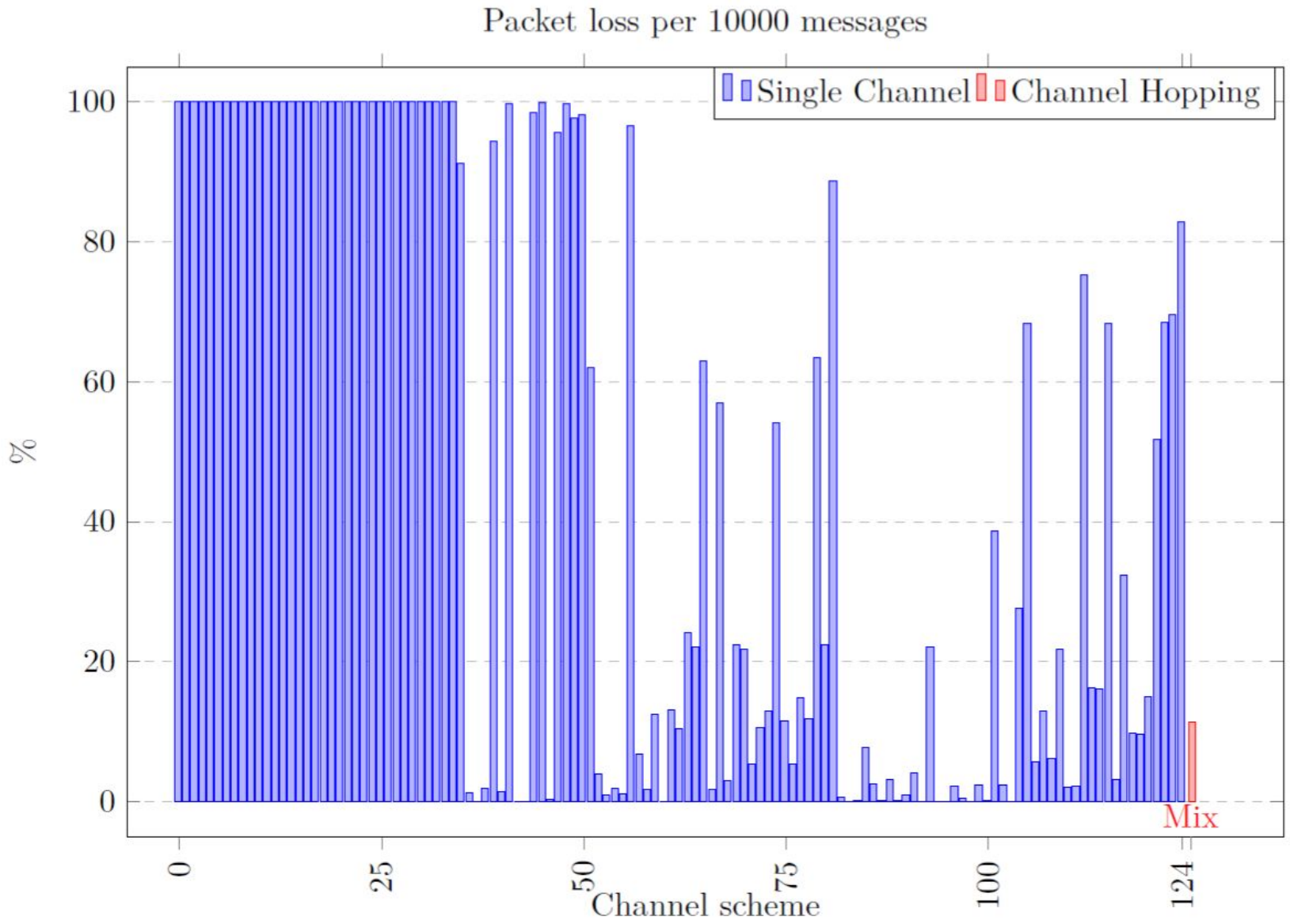


Implementation – Operation Flow Charts





Implementation – Packet-loss statistics



Demonstration

Questions?

References

- https://www.linkedin.com/pulse/internet-things-iot-characteristics-kavyashree-g-c/
- https://en.wikipedia.org/wiki/Interference_(communication)
- https://en.wikipedia.org/wiki/Frequency-hopping_spread_spectrum