



Using FPGAs for Spectrum Sensing and Modulation Recognition Project

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Project Overview

- Project seeks to use machine learning to recognize different wireless devices
- Use software defined radios (SDRs) to record various devices as training data for neural nets
- Classify type of device based on RF signature

Last Week

- Automate data collection using OEDL
- Using USRP hardware driver(UHD) to process several signals received inside a certain environment
- Learn the features for the GNU Radio software known as “flowgraphs” which supports USRP
- Analyze the plotting and data visualization delivered by GNU Radio

The Experiment

Goal: Mimic WiFi transmissions in a (mostly) controlled environment and be able to classify each transmission based on its modulation scheme.

Hardware: USRP X310, USRP B210

Software: MATLAB, UHD, OEDL

Target Modulations: BPSK, QPSK, 16QAM, 64QAM

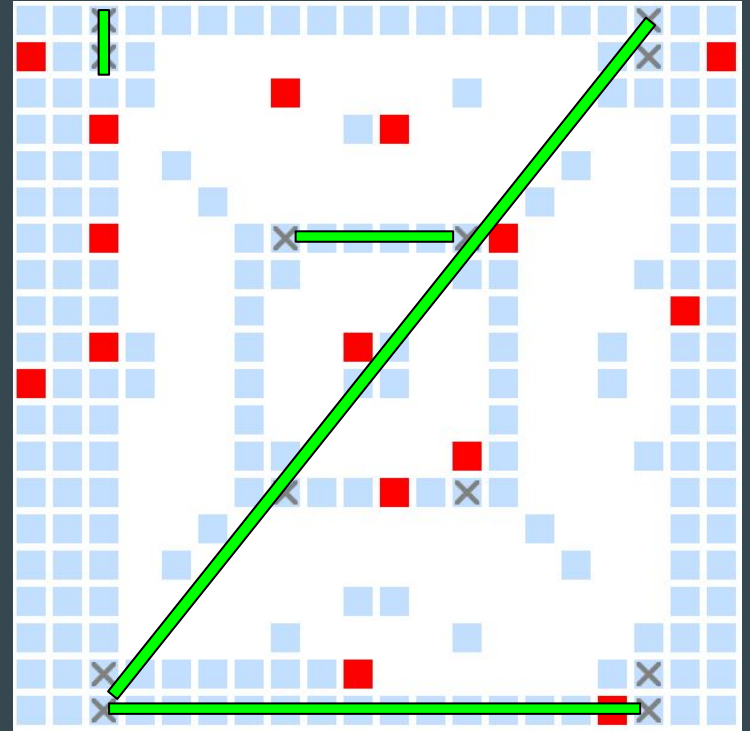
The Experiment

Constants

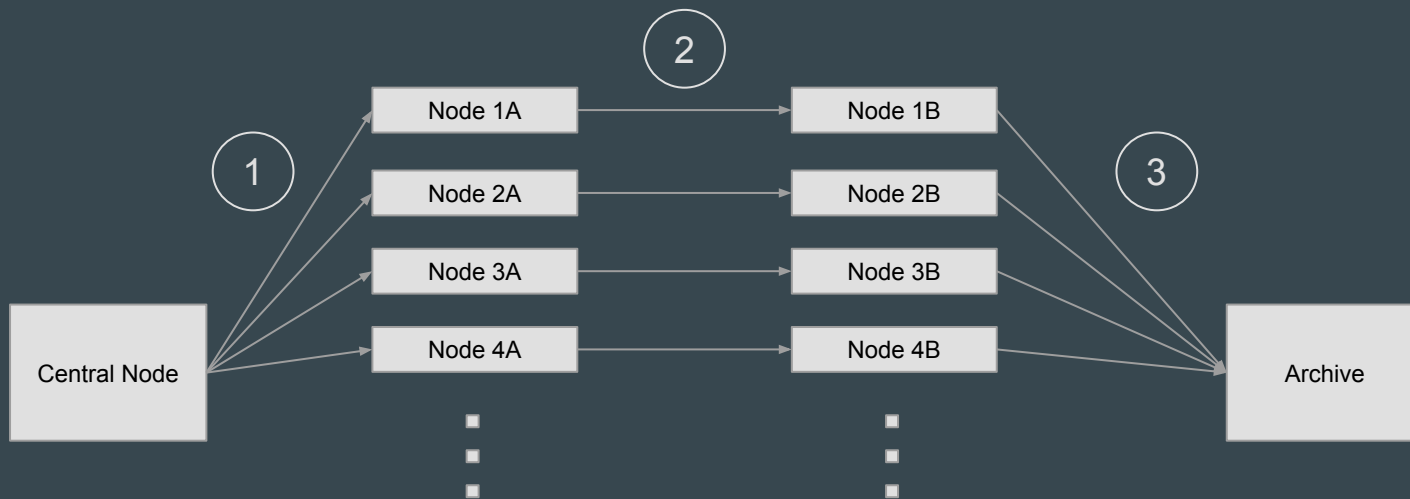
Transmitter Bandwidth	20 Mhz
Receiver Sampling Rate	40 MSps
Input/Output Binary File Format	Float32
Packet Payload Size	1500 Bytes

Variables

Gain	TBD
Distance (ft)	3, 15, 45, 72
Frequency (Mhz)	2412, 2437, 2462, 5180, 5240, 5745, 5825
Modulation and Coding Scheme (MCS)	0, 1, 2, 3, 4, 5, 6, 7



Experiment Flow



1 Copy WiFi IQ sample files to set “A” nodes (transmitters)

2 Transmit WiFi IQ sample files via USRP to set “B” nodes (receivers)

3 Copy received WiFi IQ sample files to archival storage

* Each A-B node pair represents a topology defined by the physical distance between the nodes

Plans for next week

- Research and learn more about how to implement and use matched filters, specifically RRC (root-raised cosine) matched filter
- Run OEDL script on grid, finish debugging

Questions?