Group 10
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Z-VALS

PHASE 1 PRESENTATION

Phase 1 Deliverables

1. Drone build: finalize parts list, order all components
2. Robust Simplex RF link:
   - Constant reception at the receiver (rx) from a moving transmitter (tx)
   - Rx chain - bandpass, time synchronization by preamble detection (matched filtering), CFO estimation (via pilots), slot based packet detection
   - Consistent (precise, not accurate) time of arrival and CFO estimation
   - Demonstration of TDMA waveform verification of preamble, pilots, and dummy bytes

Phase 1 Implementation

1.

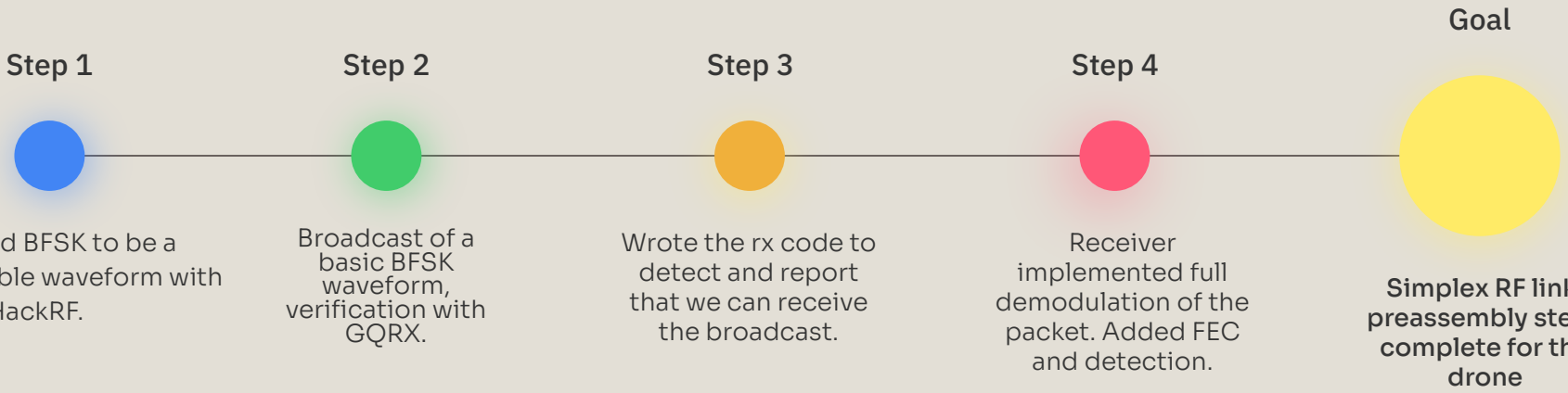
Drone: parts list finalized, components ordered – met

2.

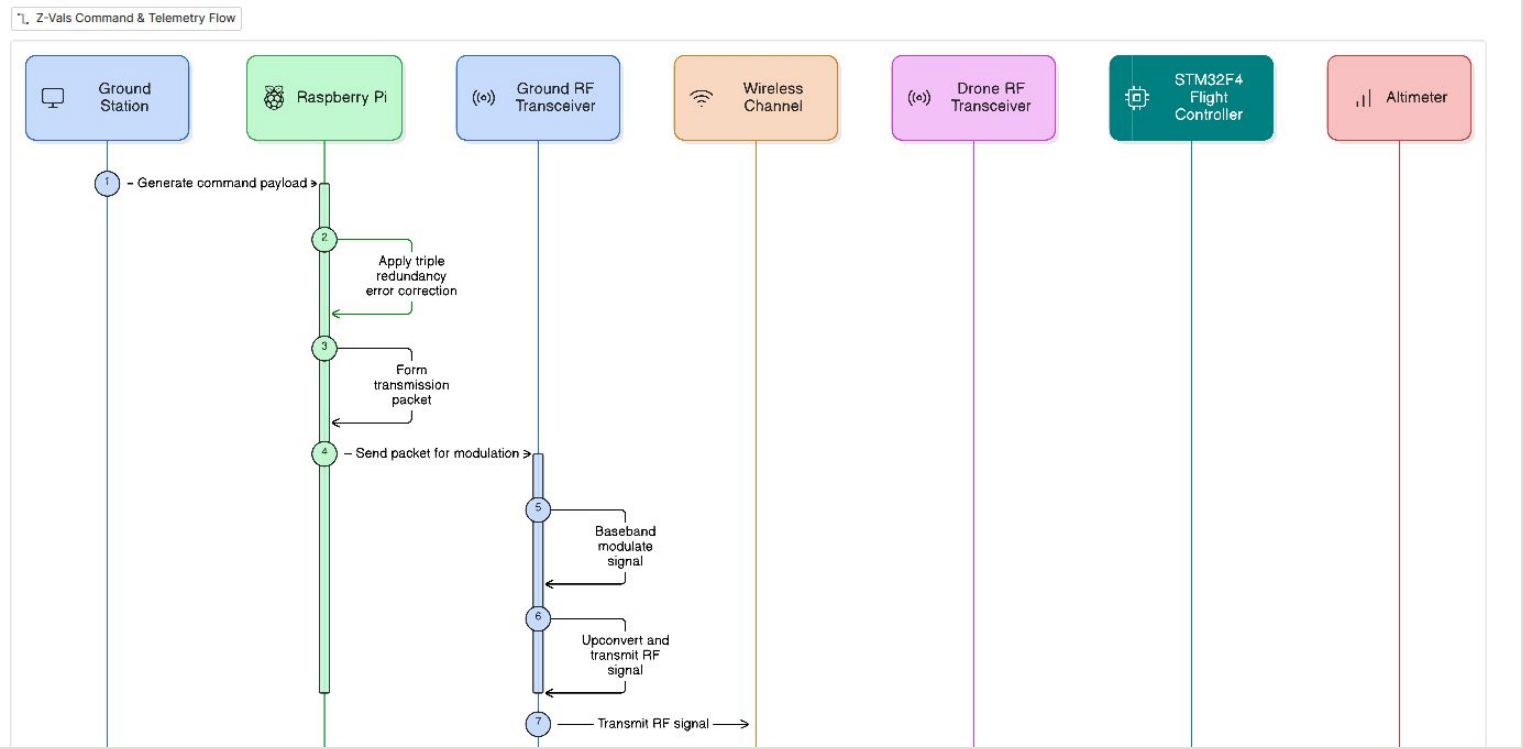
Robust Simplex RF link:

- Constant reception at the receiver (rx) from a moving transmitter (tx) – met
- Rx chain: bandpass, preamble detection, implicit slots - Hackrf SDRs could not handle more complex waveforms → CFO estimation and pilots eliminated
- RSSI based distance estimation – due to a simpler waveform → requires two way ranging which is outside the scope of a simplex link
- Demonstration of Implied TDMA waveform, verification of preamble and dummy bytes → pilots eliminated by simpler waveform

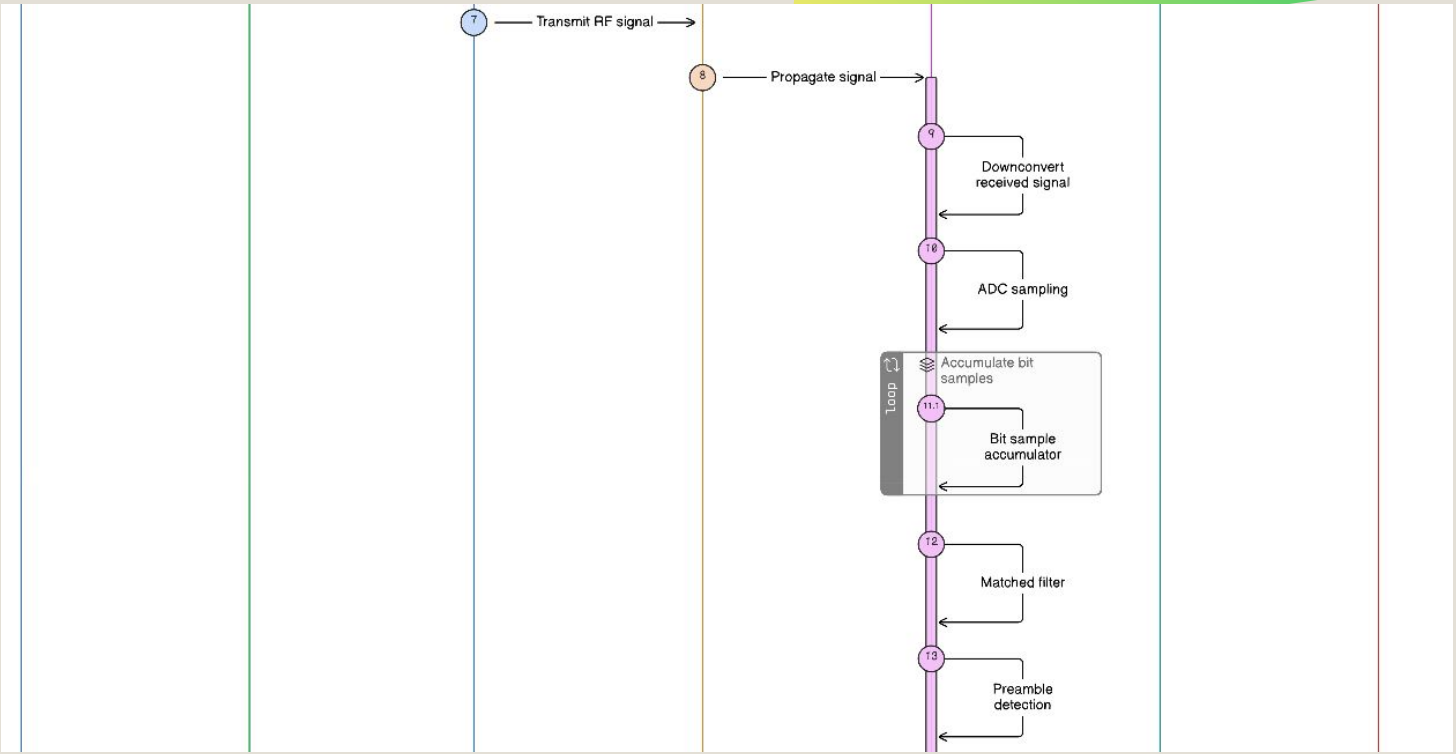
Phase 1 Sequencing Chart



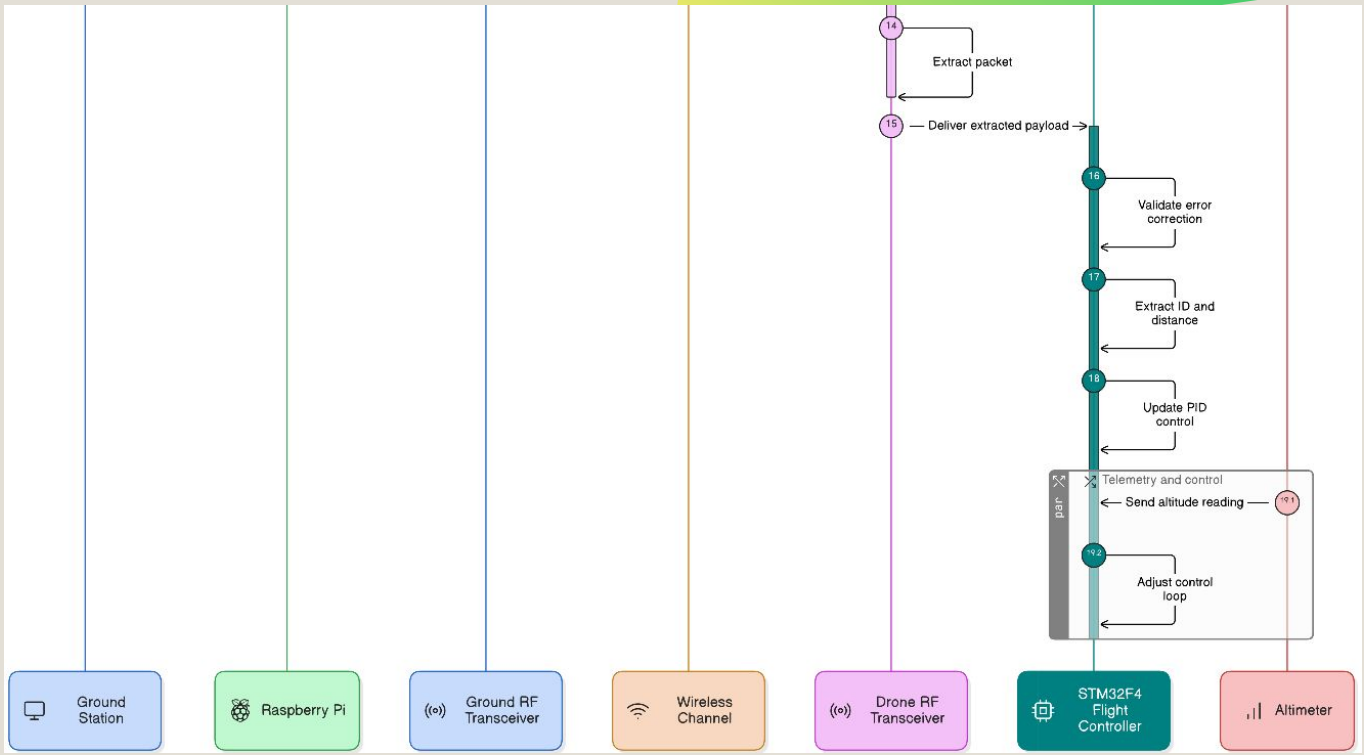
Phase 1 UML Chart (Ground)



Phase 1 UML Chart (Air)



Phase 1 UML Chart (Control)



Work Distribution

Connor Klies & Matt Calim

- Figured out a robust, realistic, and reliable waveform
- Debugging HackRF SDR setup
- Prototyped, tested, and deployed the simplex RF link

Reshmi Nilus & Pranav Venugopalan

- Researched multiple open-source drones
- Ordered parts for the drone
- Started on drone assembly

Sam Mansouri & Asaf Iron-Jobes

- Created draft control algorithm
- Optimized data delivery parameters

Thank you