

CONTROLLING A SWARM OF DRONES



THE PROJECT

The SLU AirCRAFT Lab has created a software and hardware pipeline for controlling a swarm of drones, including virtual reality (VR) devices, a main Air Traffic Control (ATC) center, and numerous drones that were built in the lab. The pipeline is currently broken, the legacy code is out of date, and the AirCRAFT Lab has not been able to diagnose or repair these problems.

OUR FOCUS

Currently, the main focus of our team is to fix the pipeline to be able to control multiple drones using VR. We are establishing communication between various software programs, and ensuring that the physical connections are properly configured. Ultimately, our goal is to make the pipeline more robust than it was previously, so that it doesn't break again and can be expanded with more drones, commands, distance, and usage.

THINGS WE HAVE ACCOMPLISHED

- Redeveloped the flow of data between the VR and drones by adding in a Master Pi to receive, interpret, and send data from the VR devices to the drones
- Established communication and acknowledgement of commands by individual drones from the Master Pi
- Captured and shared real-time position coordinates, velocity, and altitude from each drone to the Air Traffic Controller through the use of motive software
- Built a connection between the ATC, and the Pi and Pixhawk on the drones which allows users to manually send commands to the flight controls on the drone

THINGS WE NEED TO DO NEXT

- Create a connection between the Master Pi, and the Pi and Pixhawk on the drones to be able to send commands between Pis without the use of the ATC
- Connect the VR devices into the pipeline so they can receive data from the ATC and send commands to the Master Pi
- Enable GPS tracking on the drones and cut the dependency on the ATC and motive software cameras to allow the drones to be flown outside of the lab
- Create a "free form" flight method to allow the VR users to specify how they want the drones to fly

PROJECT ARCHITECTURE

VR HEADSET:

- Acts as the main controller
- Receives audio or physical input from the user(s)

MASTER PI:

- Acts as the intermediary between drones and VR
- Commands are piped through MPI to be executed on drone(s)
- Stores IP address of drones

DRONES:

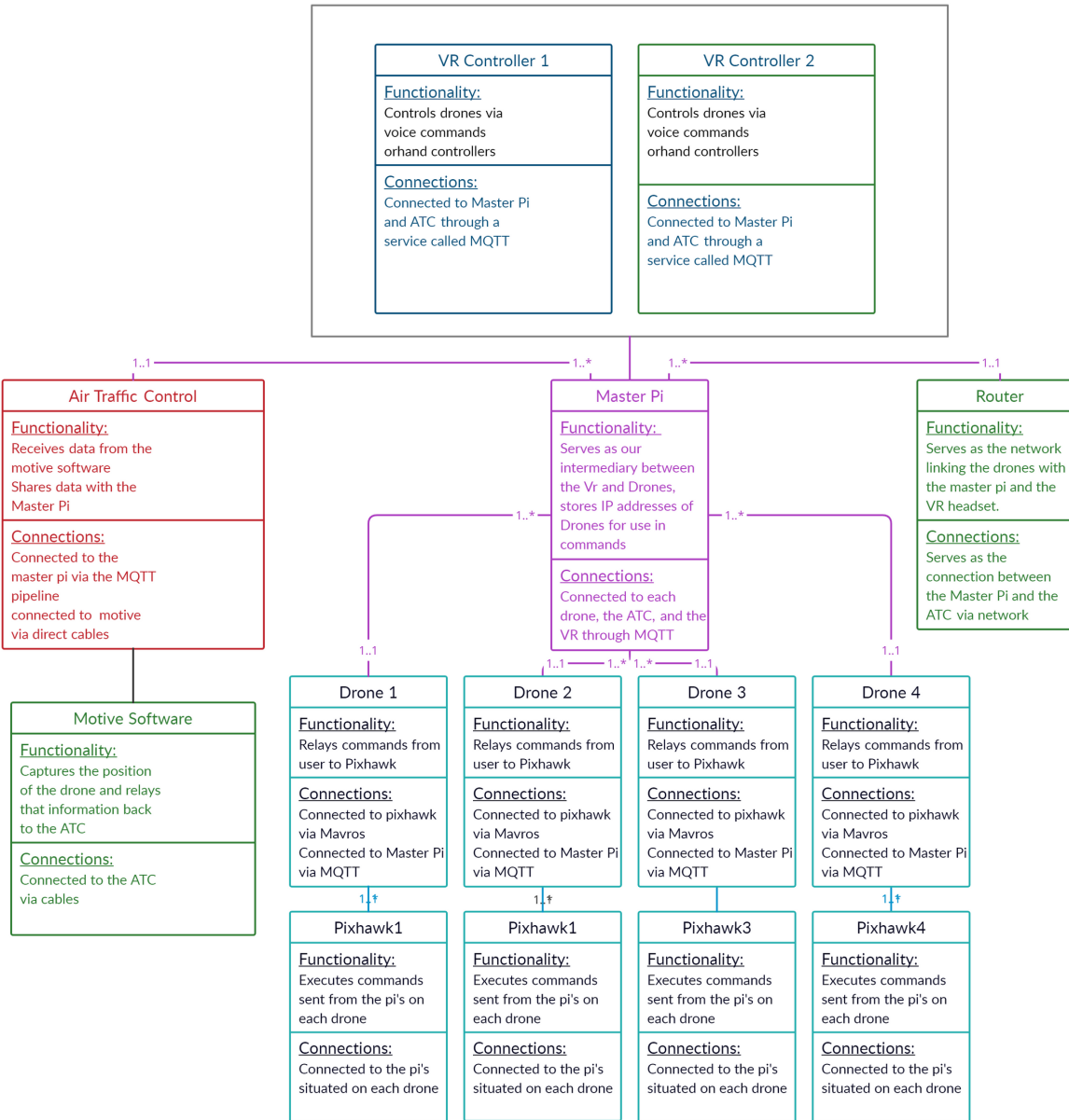
- Executes commands given by Master Pi
- Direct Connection to Pixhawk (flight controller) through MAVROS and physical connection

MQTT:

- Pipeline (highlighted pink) which publishes info through a broker (MPI) to Subscribers (Drones/ATC)

MAVROS:

- Package enabling computers running ROS and MAVLINK enabled autopilot devices to communicate



CURRENT AND FUTURE USAGE

Our client is Dr. Srikanth Gururajan and the SLU AirCRAFT Lab.

The intended outcome of this project is to develop the technology enough to be used for **aerial surveillance and security** purposes. Being able to control multiple drones via a VR device would allow one person to patrol multiple areas at once to keep the community safe. This technology can also be deployed in areas that are unsafe or unavailable for people to enter. We would also like to see this project become integrated into **emergency response and search and rescue** operations.



AirCRAFT Lab
The Future is Fixed Wing

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SOURCE CODE

