Target Tracking using Drone Swarms

Project Members & Speaking Order

1. Benjamin Ireland – Drone Trajectory Control & Network Protocol Integration

2. Finlay Cross – Drone Swarm Lifecycle & Software Porting

3. Se Hyun Kim – Target Implementation

4. Ronniel Padua – Drone Management/Visualisation Application

Raith Fullam - Network Communication Protocol

(SENG, Assessed Separately)

Project Code: **E24**

Sponsor: **Wireless Research Centre (WRC)**

Background

Why?

How?

OTHER APPLICATIONS

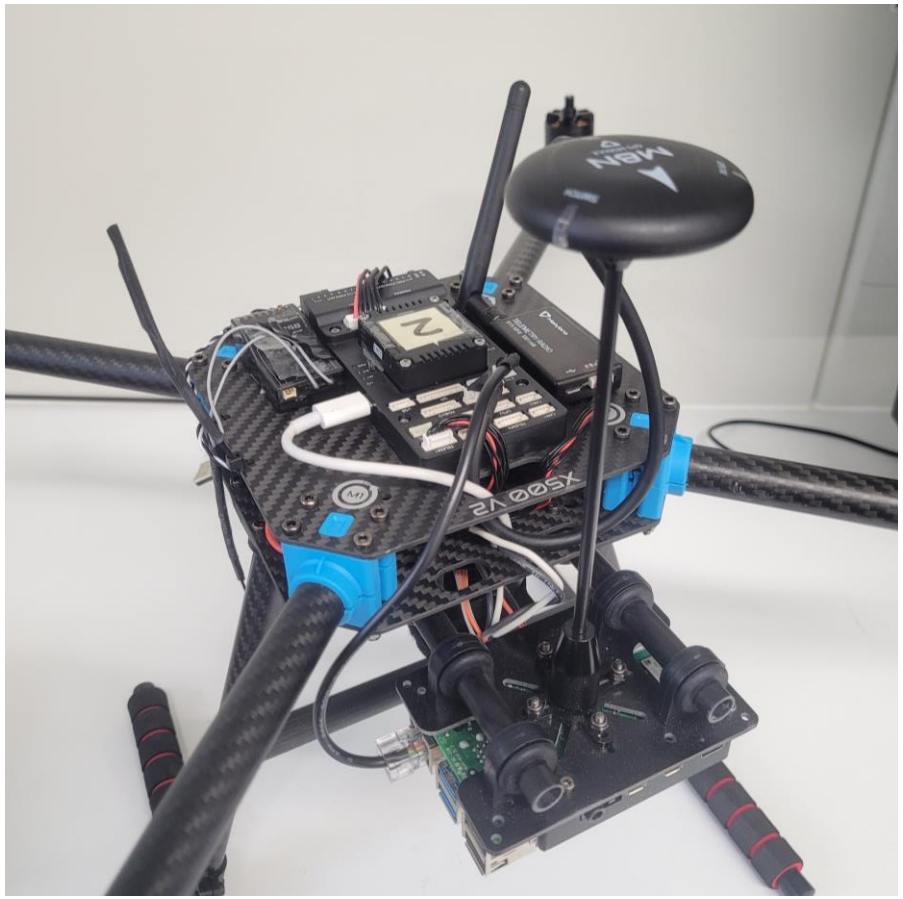
Search & Rescue, Infrastructure Monitoring, Surveillance

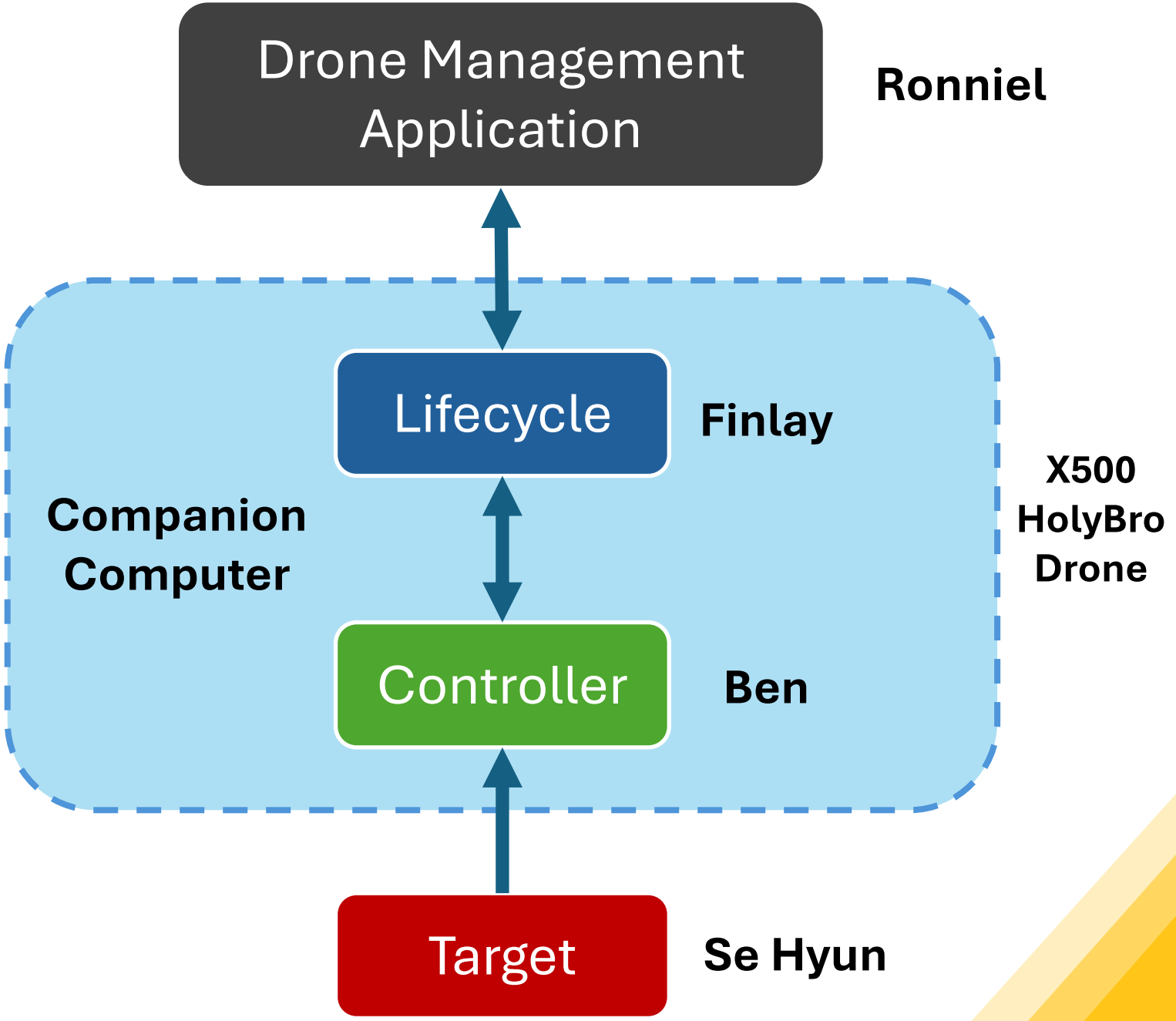
Project Breakdown

Subprojects

- Flight Controller
  - Drone Control System
  - Drone Swarm Lifecycle Manager
- Temporary Target Implementation
- Drone Management Application
- *Drone Coordination Protocol ~ SENG*

System Hierarchy





Results

Results

Drone Controller & Network Protocol Integration

Sub-project Goals

- Provide reliable target tracking capability.
- Address performance and scalability issues of the previous iteration.
- Decoupling of formation and trajectory.

Sub-project Objectives

- Design of the drone’s controller and swarm configuration.
- Integration with the drone coordination protocol.

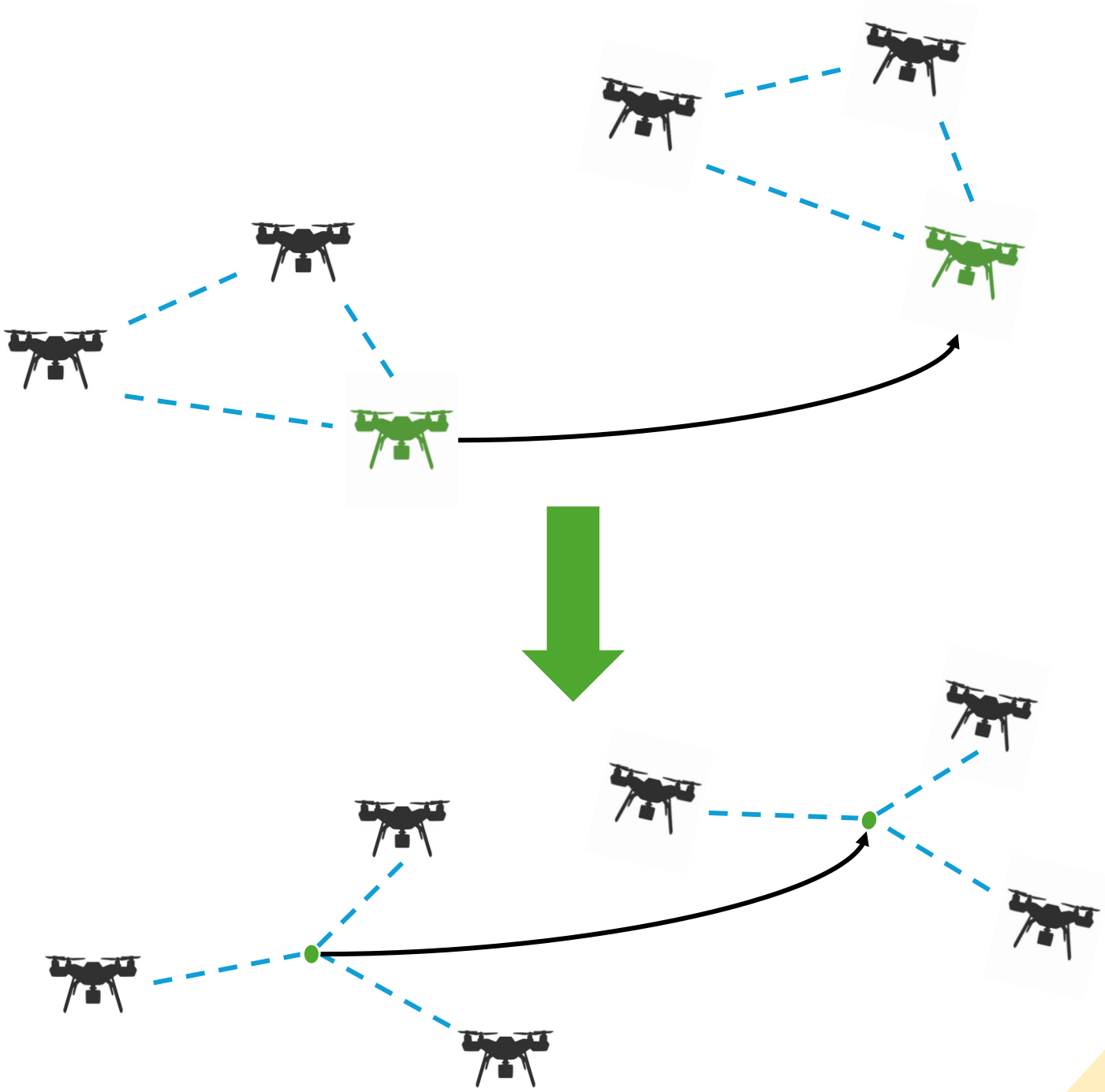
Swarm Design

Previous Design

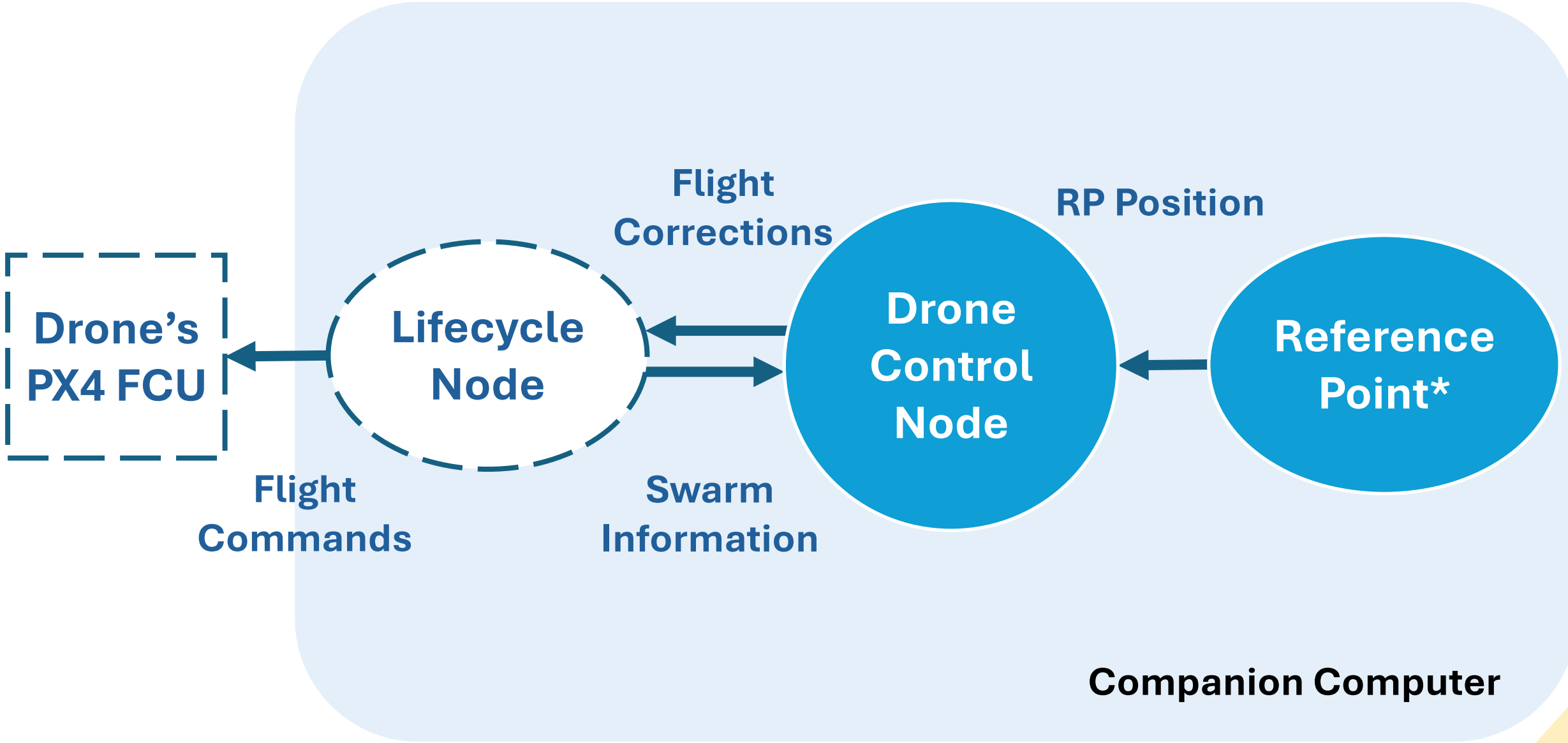
- Leader-Follower
- No Target Tracking
- Performance/Scalability Issues

Proposed Solution

- Virtual Reference Point
- Target Agnostic
- Improve Performance
- Scalable Config
- Tradeoffs



Software Architecture



Testing & Integration

Simulation

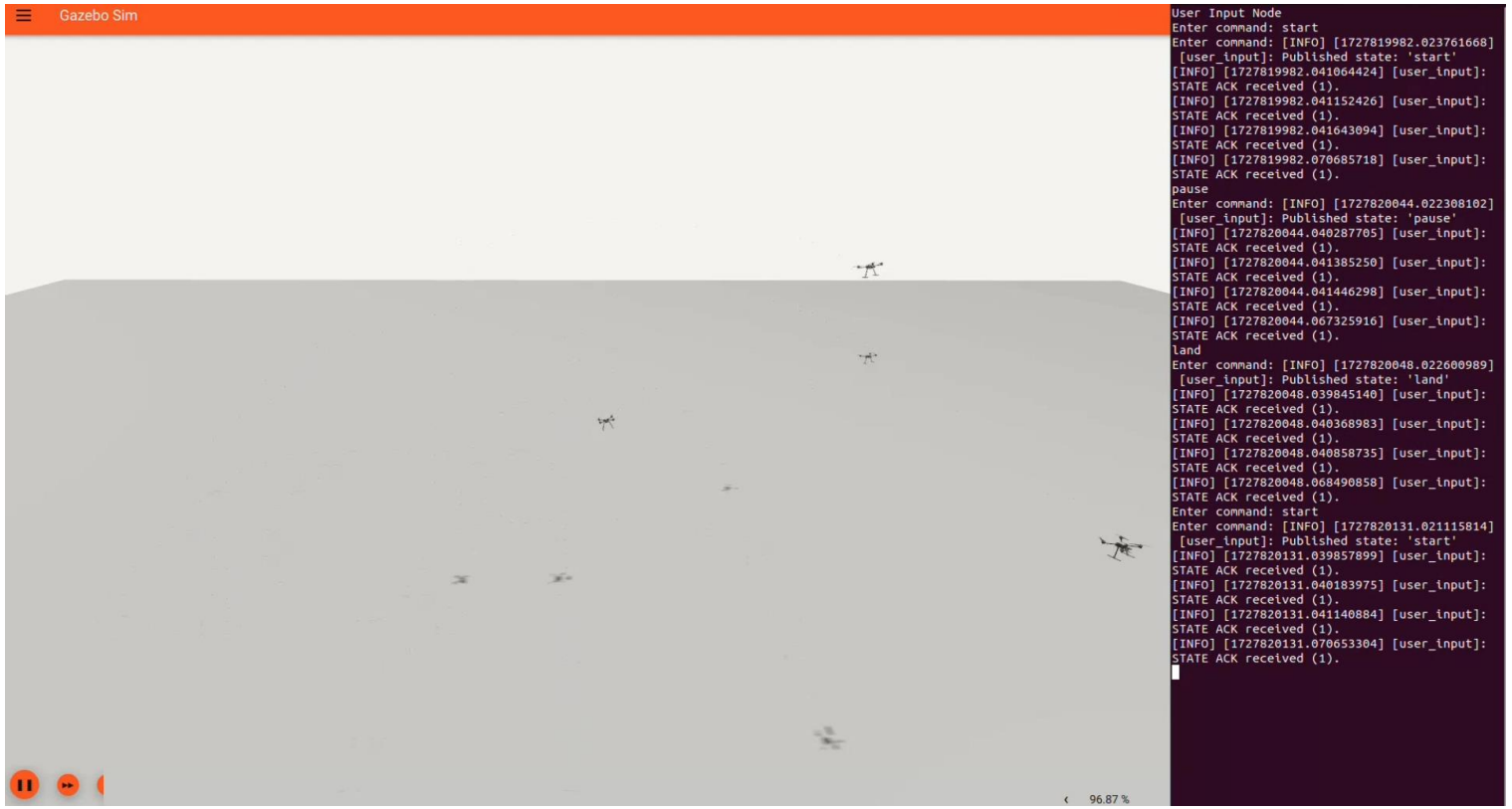
- Gazebo SW – Drone Models

Hardware Integration

- FCU Updates & Configuration
- Companion Computer -> FCU Communications
- Drone Calibration

Field Testing & Validation

- Test Plans
- Flight Logs



Conclusion

Achievements

- Simplified swarm configuration to improve scalability & performance.
- Fully operational simulation of the drone swarm.
- Separation of trajectory and formation activities.
- Shown the target tracking capabilities and formation forming of the swarm using our virtual reference point design.

Future Recommendations

- Complete Network Protocol Integration
- Real World Performance Estimation
- Collision Detection

Config Layout

Constraints

- Heading, Position, and Altitude.