Individual Lab Report- 7

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Team F: Falcon Eye

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1. Individual Progress:

As my contribution to the MRSD Project for progress review 8, I have successfully integrated the entire system ‘s network on to a mesh network of access points. Additionally, I have also helped Pratibha in developing the ROS software update to incorporate the new IMU for the AGV.

1.1 System Network Integration:

We procured two Ubiquiti Unifi AC mesh access points(AP) for setting up a mesh network that can handle the data with low-latency from the drone, husky PC and two laptop controllers, all connected through the same wireless network.

Since we are planning to use the mesh network without a DHCP enabled router, we first assigned static IP addresses to both the AP’s using the Unifi Controller software. The interface of the software is shown in figure 1.

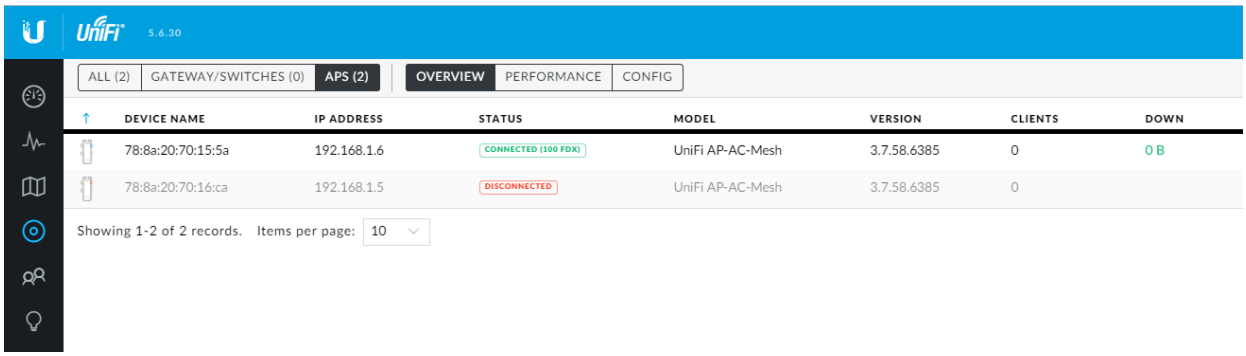

Figure 1: Unifi Controller Interface

We initially assigned the same IP addresses to both the AP devices. This caused a huge problem as both the AP’s were broadcasting the same SSID and IP at the same time and same place. As a result, Bebop drone was losing data packages by sending few packages to one AP and the remaining to the other AP.

After recognizing the problem, we changed the IP address of the other AP device using the controller as shown in figure 2. We kept the SSID and login credentials same for both the devices.

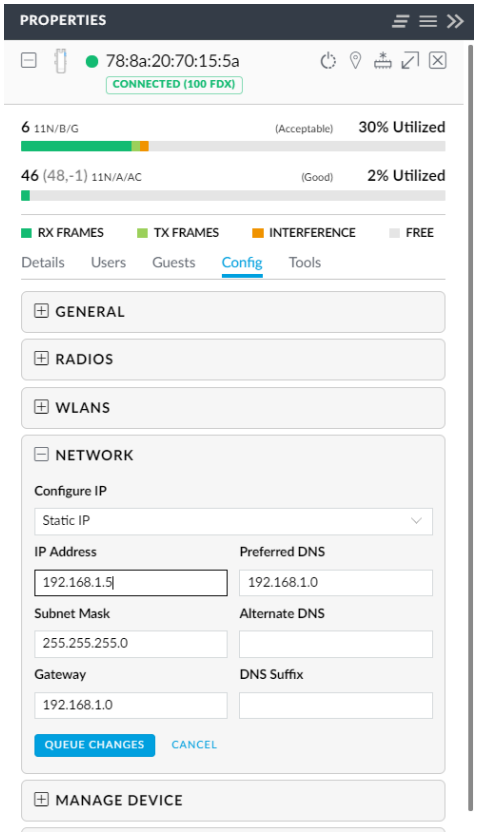

Figure 2: Changed IP configuration of AP.

1.2 Field Testing and Evaluation

To verify the robustness of our system's network, we performed field testing of the network topology with the main three systems i.e. the drone, control laptop and Husky PC connected.

We understood that in an outdoor scenario, the AP device might not be able to find an AC power port to run via the power over ethernet (PoE) Switch device. Hence we, procured two PoE injectors that could be directly powered by a 24V DC battery. The power setup we used for our outdoor AP is shown in figure 3.

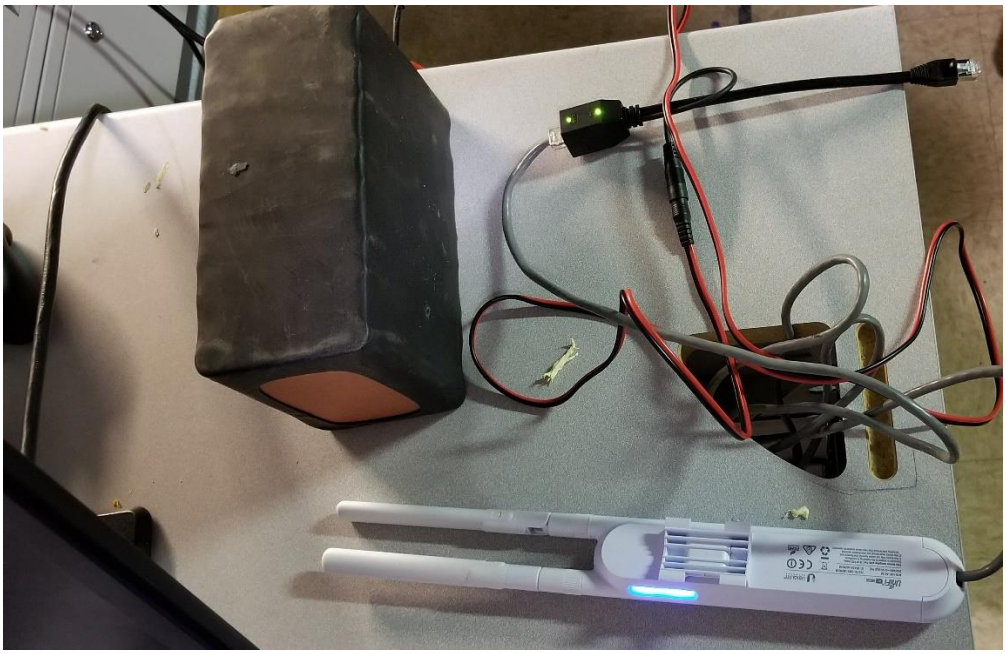

Figure 3: Outdoor Setup for the AP

We recorded a connectivity range of approximately 140m on testing both the devices connected in a mesh network outdoors. The video we received from Bebop was with insignificant lag. Figure 4 shows the data pinging on the drone and figure 5 shows video received from the drone in real time.

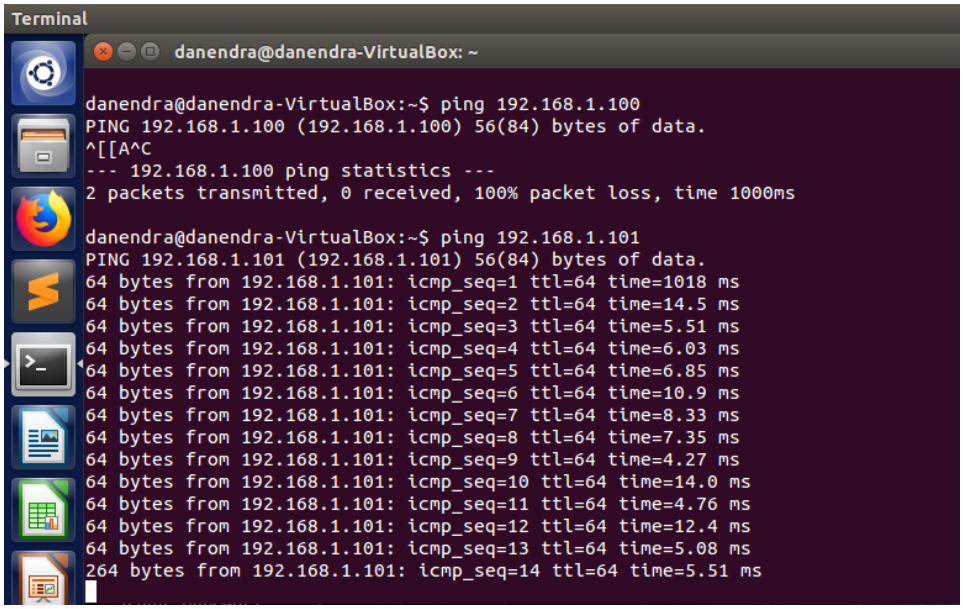

Figure 4: Pinging data from drone

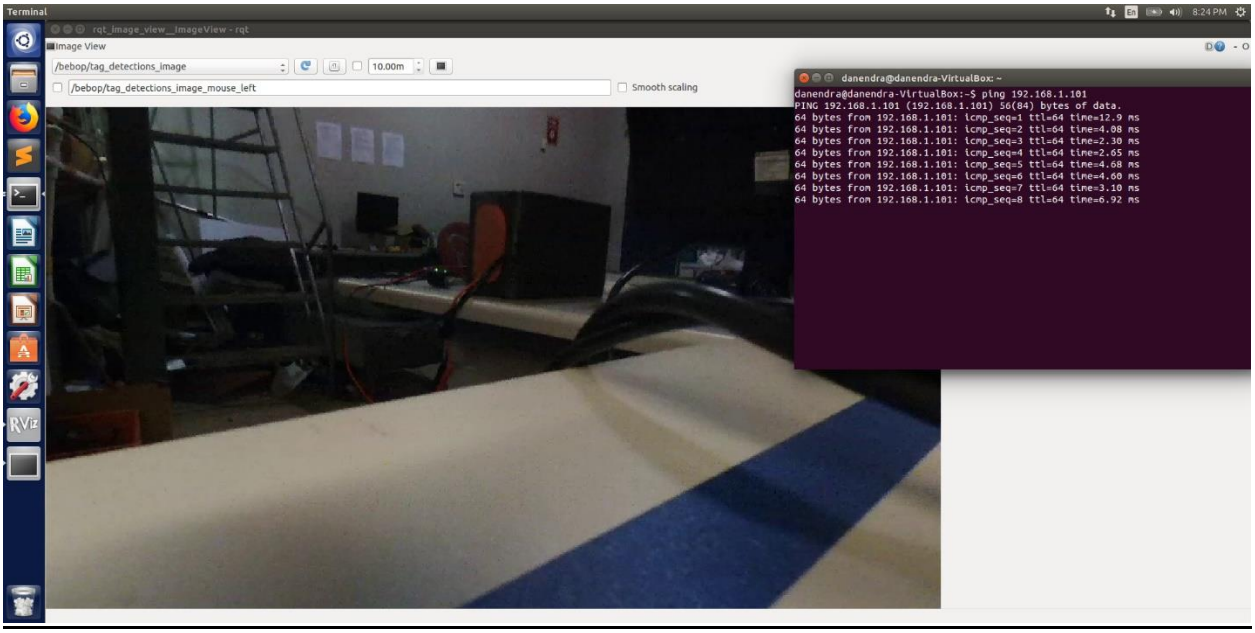

Figure 5: Live Video data from drone

2. Challenges

For this PR, the biggest challenge we faced was the difficulty in syncing work with other teammates. All of us are taking different courses and thus have different deadlines for assignments which makes working together challenging.

We encountered initially a problem of drone not being able to transfer data packets continuously to the control laptop. It randomly got connected and disconnected to the network, thus making us judge the reliability of our network configuration. We soon figured out that we were doing a major blunder by assigning the same static IP addresses to both the AP's. Reassigning each AP device with a different IP solved this problem.

3. Teamwork

Yuchi worked on developing a robust method to detect april tags by eliminating the background glare. We have been able to achieve good improvements in glare rejection using anti-glare aerosol spray.

Pratibha worked to integrate and update IMU data transfer to the Husky's ROS node. Pulkit and Rahul worked on Lidar's point cloud data processing for obstacle registration.

Thus, by defining each member’s goal successfully and working together as a strong team, we could achieve all the tasks for the PR-8.

4. Future plans

I am planning to work on updating the software stack of Husky and perform multiple outdoor tests to tweak calibration parameters of the IMU, Pratibha will help me in this. I also will work with Yuchi for developing software on the drone to send commands to Husky for navigation. Pulkit and Rahul will work on integrating the processed obstacle data into husky's navigation stack to enable obstacle avoidance on Husky. Yuchi will work on developing the exploration algorithm for the drone to find and connect the April Tags in the field.