2nd Buffalo Day *for* 5G and Wireless Internet of Things

AeriNet: A Software-defined Experimentation Platform for Aerial-Ground Wireless Networks

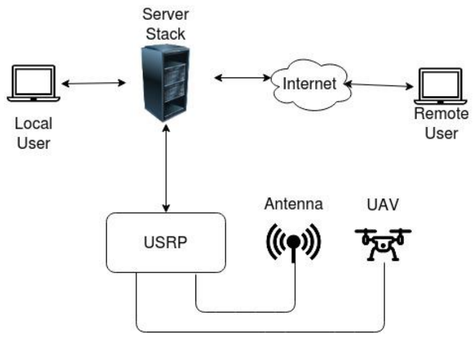
Ankush Hari, Pranita Mor

Introduction

AeriNet is a software-defined experimentation platform for aerial to ground wireless communication, networking and sensing.

Architecture

The testbed consists of Server, SDR, and Drones to allow users to deploy and control wireless networks on a drone platform.



Schematic of testbed architecture

Server

- The server consists of Dell EMC machines. These systems are the main point of control for the entire testbed.
- They provide remote users with access to virtual machines allowing for remote control and deployment of the testbed.
- They are interfaced with the USRPs allowing for deployment of user code onto the USRP testbed.

SDR

- The SDR used is the USRP N210 from Ettus Research. The USRPs are connected to a switched PDU allowing for full remote control of power.

Server stack with networked USRPs

Drones

- The drones used are Intel Ready-to-Fly (RtF) drones.
- Indoor real time location systems are used to help position the drones within the indoor netted enclosure.

Netted enclosure used to fly the drones

Operation

The testbed runs with the help of all of the individual components described earlier. Once the testbed is fully operational, a user can customize the testbed to run any experiment on the wireless network with the drones.

Database

- We use an SQL database to store and retrieve information about status of USRP in the network.
- SQL databases allow us to reserve the USRPs and remotely control their power.

Drone API

- The drone API provides an interface for the users to send coordinates to the drones for flight within the provided enclosure.
- The API is provided in Python allowing for easy integration into user code.

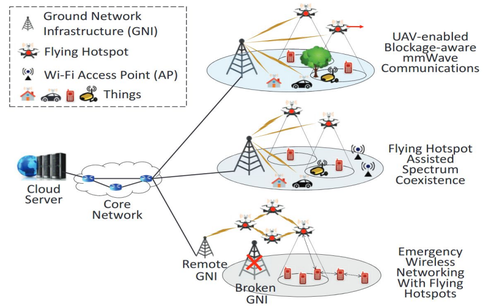
Virtual Machines

- The servers provide virtual machines to give the users an environment to operate GNU radio.
- These virtual machines also allow the user to remotely control the drones and set parameters for flight.

Video Feed

- A video feed of the drone enclosure is live streamed to allow remote users to view the drones operating.
- This is achieved through a networked raspberry pi that transmits video feed to the servers in lab.

Enabled Research



UAV wireless networking scenarios

- Spectrum Optimization in Drone Networks - There are strong incentives to deploy wireless networks in a single service provider. For example, in mmWave communications, UAVs could be used to bypass blockages in the path of communications.
- Spectrum Coexistence in Heterogeneous Wireless Network, to allow coexistence between wireless networks, spectrally coefficient network management should be executed.
- Emergency networking with Networked Flying Hotspots is the utilization of a swarm of drone networks to achieve multihop or mesh network to extend network coverage.

University at Buffalo The State University of New York

Department of Electrical Engineering
School of Engineering and Applied Sciences
ankushhabuffalo.edu