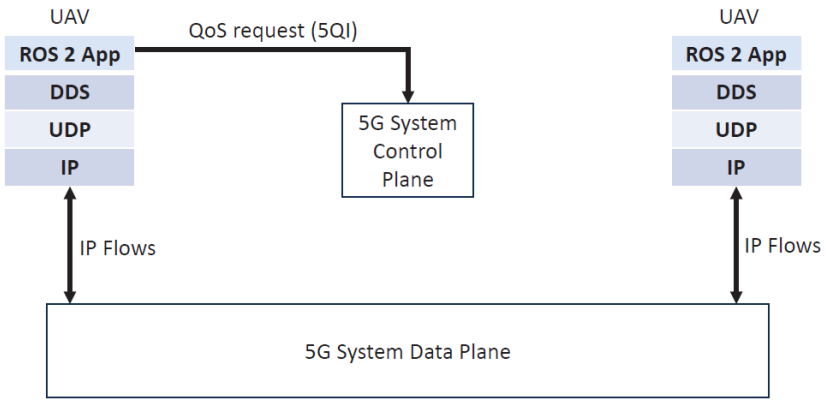
Enabling 5G for UAV Networks: A Performance and Security Analysis--Year 2 Support

CRUSER
Consortium for Robotics and Unmanned Systems Education and Research



System Architecture that includes two UAVs running the ROS2 application, communicating over the 5G control and data planes. Adapted from https://design.ros2.org/articles/unique_network_flows.html

Problem Statement

- Continuing our FY23 efforts, we plan to fully simulate the ROS 2-5G network, and experiment with the different quality of service (QoS) identifiers and security suites that are available.
- We are using a ROS 2 system architecture developed by a student from a CRUSER funded thesis to add 5G endpoints to the IP network.
- We will then isolate the 5G endpoints and study the performance between 5G at a UAV endpoint and its connecting tower (5G dot).
- We will examine a variety of mobility and radio characteristics.
- We will examine the 5G security apparatus and its impact on this UAV system in terms of data security.

Impact

- Enabling a UAV network to use 5G, particularly for offloading data is a critical need.
- 5G introduces a number of benefits, including higher data rates, lower latency and increased coverage.
- To use 5G, we must understand how 5G can be integrated into a robotic platform (i.e., autonomous vehicles) that relies on the DDS middleware and ROS 2.
- Modeling a UAV network with 5G endpoints that can be analyzed from a performance and security perspective will lead to further understanding on how to enact secure autonomous communications.

Transition

- The PI is currently the lead on an ONR Code 31 project that is studying 5G integration for expeditionary energy systems.
- Sponsors and stakeholders, including ONR and DASN-OE are highly interested in understanding how 5G and next generation wireless protocols can be integrated to enhance connectivity of autonomous assets.
- This Year 2 funding will allow us to complete a full security and performance analysis that will showcase the feasibility of 5G for a UAV network.

PI: Dr. Preetha Thulasiraman, Electrical and Computer Engineering