

IETF-118 IPMON Hackathon Project

November 4~5, 2023

Champions: Jaehoon (Paul) Jeong

Members: Bien Aime Mugabarigira and Yiwen (Chris) Shen

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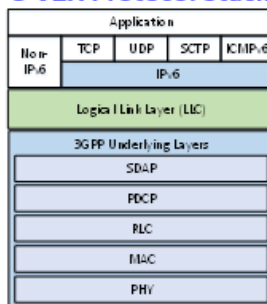
IPv6 Mobile Object Networking (IPMON) Project

Champion: Jaehoon (Paul) Jeong (SKKU)

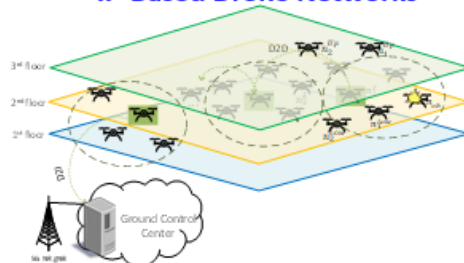
IETF-118 IPMON Hackathon Project



C-V2X Protocol Stack



IP-Based Drone Networks



Objectives

- To demonstrate IPv6 over 5G-V2X for IPMON
- To let drones exchange their mobility information options for context-awareness
- Simulation of Context-Aware Navigation Protocol (CANA) in simu5G
- To discover technology gaps for IPv6 and IPMON

Where to get source code:

- GitHub: <https://github.com/ipwave-hackathon-ietf>

System requirements:

- Software

- OS: Ubuntu 20.04
- OMNeT++ 6.0.1 and INET 4.5.2
- SIMU5G

Implementation Contents:

- Development of a 5G-enabled drone communication system for safe and secure flight using IETF IP and routing protocols.
- Vehicular Mobility Information (VMI) option in IP-based drone networks over 5G V2X
 - ✓ Support of safe flight in Flying Ad Hoc Networks (FANET)
 - ✓ Light-weight message exchange with Cooperation Context Message (CCM) and Emergency Context Message (ECM)

Professors:

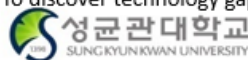
- Jaehoon (Paul) Jeong (SKKU)
- Yiwen (Chris) Shen (SKKU)
- Younghun Kim (SSU)

Researchers:

- Jung-Soo Park (ETRI)
- Yunchul Choi (ETRI)
- Bin Yeong Yoon (ETRI)

Students:

- Bien Aime Mugabarigira (SKKU)
- Junhee Kwon (SKKU)
- Hyeonah Jung (SKKU)

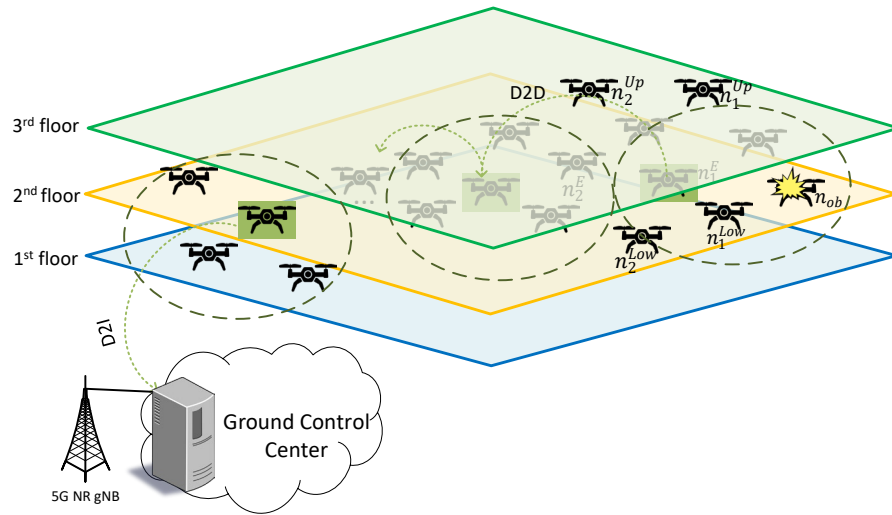


Hackathon Plan

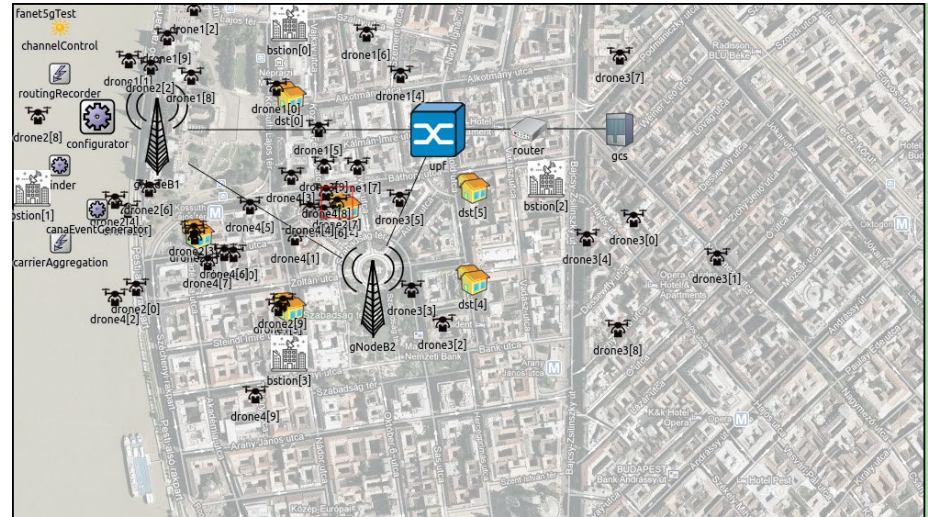
- Drafts for this Project
 - <https://datatracker.ietf.org/doc/html/draft-jeong-6man-ipv6-over-5g-v2x-02>
 - <https://datatracker.ietf.org/doc/html/draft-jeong-ipwave-context-aware-navigator-08>
 - <https://datatracker.ietf.org/doc/html/draft-jeong-6man-ipmon-problem-statement-01>
- Goals of this Project
 - To simulate a 5G-enabled drone (or UAM) communication system for safe and secure flight using IETF protocols.
 - To support Vehicular Mobility Information (VMI) option for IP-based drone networks over 5G V2X
 - Safety Message Exchange with Cooperation Context Message (CCM) and Emergency Context Message (ECM) for safety in Flying Ad Hoc Networks (FANET)

What got done (1/3)

- The implementation of (1) IPv4-Based Drone Networks and (2) Context-Aware Navigation Protocol (CNP)



5G V2X Drone Networks
with 3-D Layout



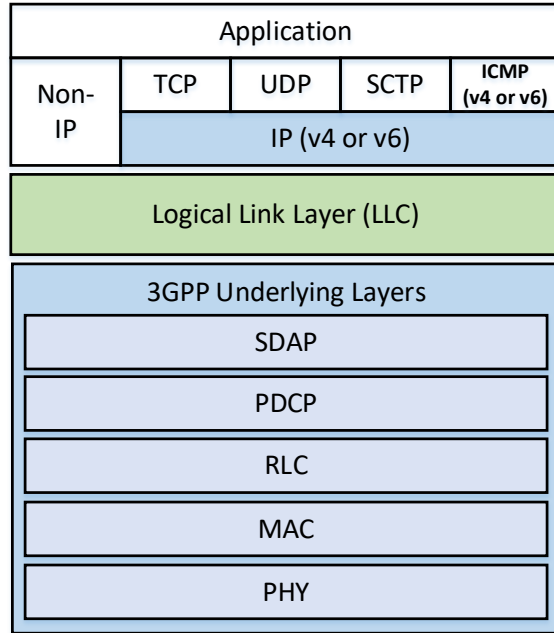
5G V2X Drone
NetworksIn OMNeT++

OMNeT++

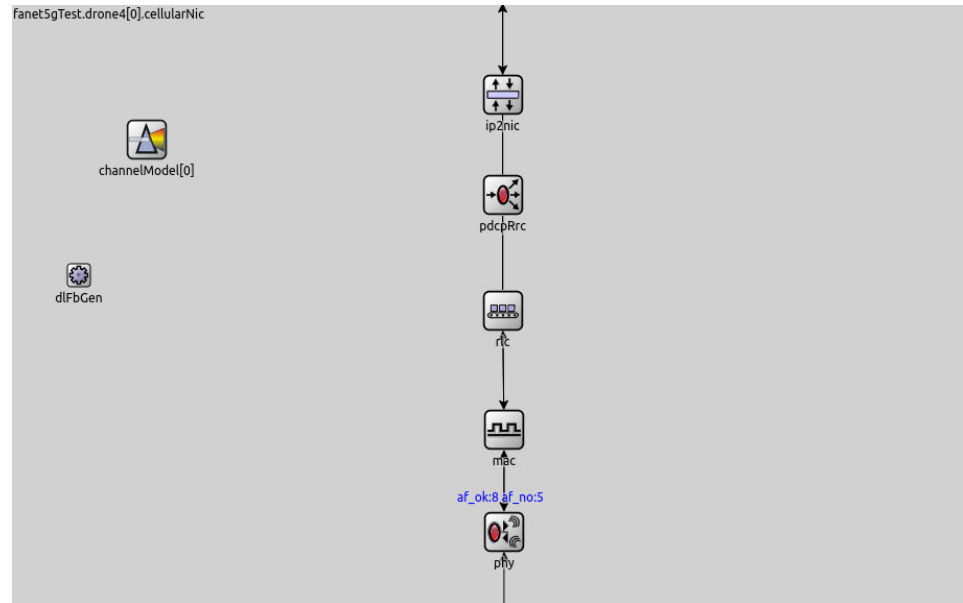


What got done (2/3)

- OMNeT++ Protocol Stack for IPv4-Based Drone Networks



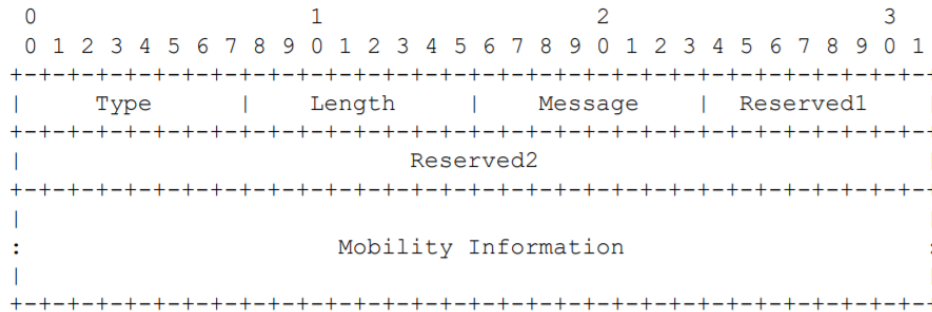
5G V2X UE Protocol Stack (Data Plane)



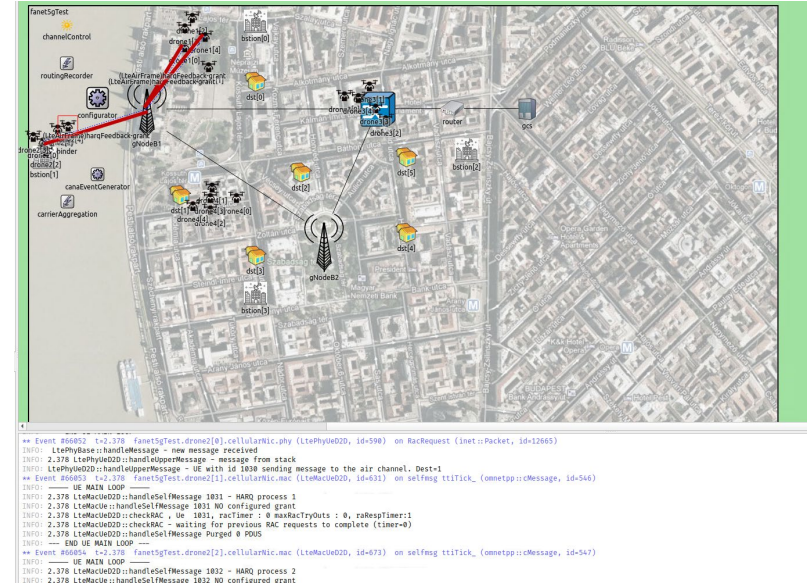
OMNeT++ 5G V2X UE Protocol Stack

What got done (3/3)

- Vehicular Mobility Information (VMI) option for CANA (Collision-Avoidance Navigation Algorithm) Protocol



VMI Format



CANA-Based Safe Flying in FANET

URL: <https://datatracker.ietf.org/doc/html/draft-jeong-ipwave-context-aware-navigator-08>

Open Source Project in GitHub

URL: <https://github.com/ipwave-hackathon-ietf/IETF-118-IPMON-Hackathon-Project>

The screenshot shows the GitHub interface for the repository 'ipwave-hackathon-ietf / IETF-118-IPMON-Hackathon-Project'. The repository is public and has 1 branch (master) and 0 tags. The commit history shows a single initial commit by mubienaime, dated 3 days ago, with a commit hash of a91b536. The commit message is 'Initial Commit'. The file list includes folders .settings, out/gcc-release, simulations, and src, and files .cproject, .nedexclusions, .nedfolders, and .oppbuildspec, all added in the initial commit.

ipwave-hackathon-ietf / IETF-118-IPMON-Hackathon-Project

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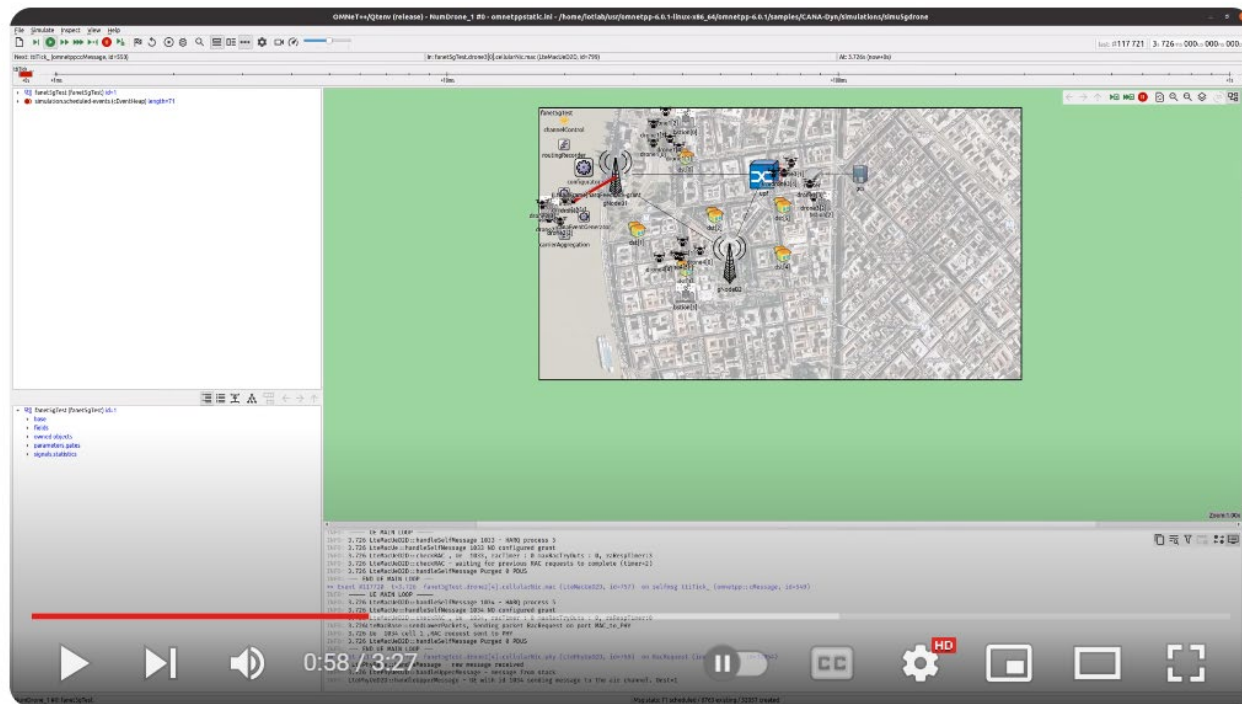
master 1 branch 0 tags Go to file Add file <> Code

mubienaime Initial Commit a91b536 3 days ago 1 commit

.settings	Initial Commit	3 days ago
out/gcc-release	Initial Commit	3 days ago
simulations	Initial Commit	3 days ago
src	Initial Commit	3 days ago
.cproject	Initial Commit	3 days ago
.nedexclusions	Initial Commit	3 days ago
.nedfolders	Initial Commit	3 days ago
.oppbuildspec	Initial Commit	3 days ago

Demo Video Clip in YouTube

URL: <https://youtu.be/7Vqo6GtZ0CA>



IETF 118 IPMON Hackathon Project Demo

What we learned

- We learned that drones can exchange the location information via IP over 5G V2X for flight safety.
- We learned how to transform the IPv4's address-based Simu5G into IPv6's address-based Simu5G.
- However, this work needs to be continued to the completion of restructuring of 3GPP underlying layers.

Next Step

- The continuation of the restructuring of 3GPP underlying layers to support the IPv6 message options.
- We will demonstrate the CANA Protocol via IPv6 over 5G V2X in IETF 119.

Wrap Up

Hackathon Team

Champion:

- Jaehoon Paul Jeong (SKKU)

Professors:

- Younghan Kim (SSU)
- Yiwen (Chris) Shen

Researchers:

- Jung-Soo Park (ETRI)
- Yunchul Choi (ETRI)
- Bin Yeong Yoon (ETRI)
- Robert Moskowitz (HTT Consulting)

Students:

- Bien Aime Mugabarigira (SKKU)
- Junhee Kwon (SKKU)
- Hyeonah Jung (SKKU)

Hackathon Team Photo

