# 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


### Professors:

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

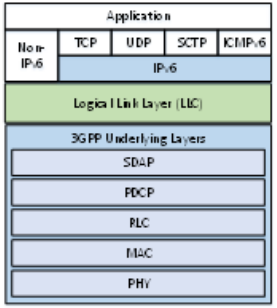
### Researchers:

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

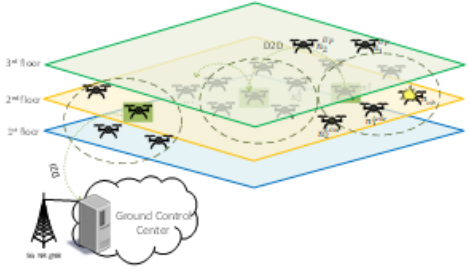
### Students:

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

## 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)

INET FRAMEWORK

SIMU5G

성균관대학교 SUNG KYUN KWAN UNIVERSITY

숭실대학교 Soongsil University

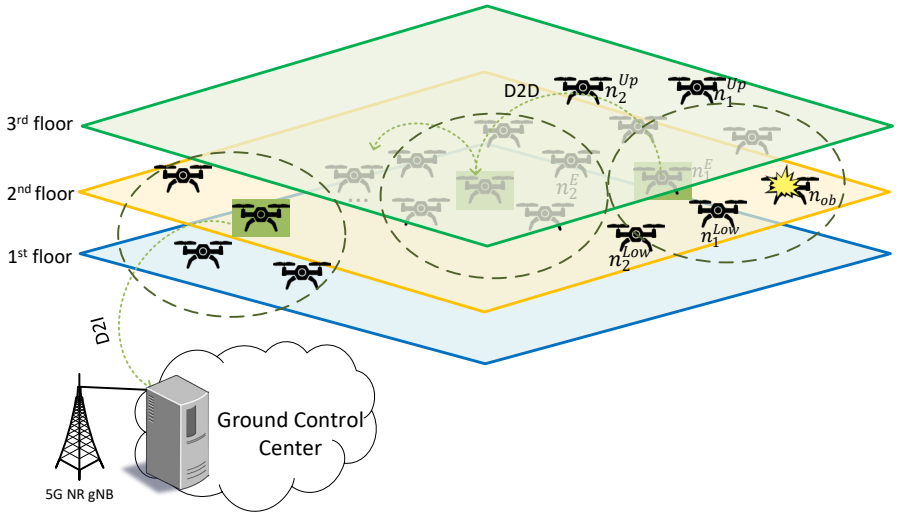
ETRI 한국전자통신연구원

# Hackathon Plan

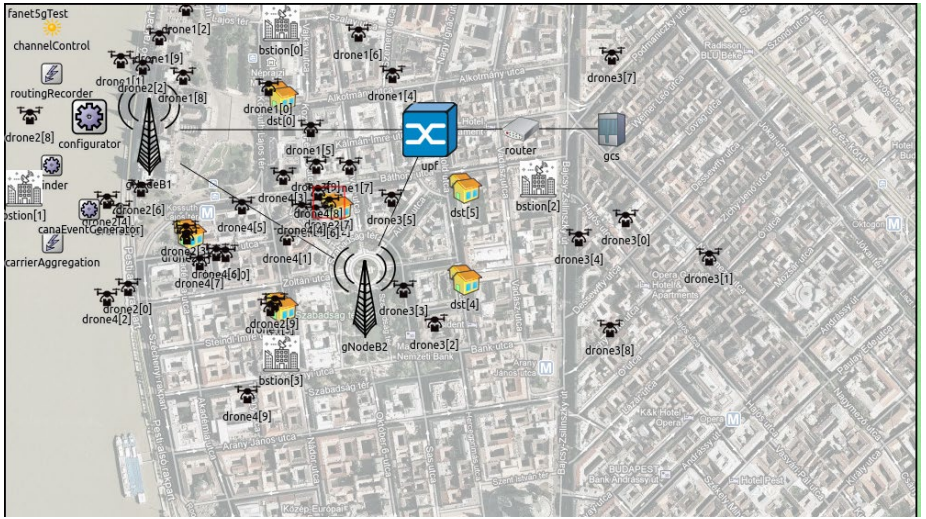
- Drafts for this Project
  - https://datatracker.ietf.org/doc/html/draft-jeong-6man-ipv6-over-5g-v2x-02
  - https://datatracker.ietf.org/doc/html/draft-jeong-ipwave-context-aware-navigator-08
  - https://datatracker.ietf.org/doc/html/draft-jeong-6man-ipmon-problem-statement-01
- Goals of this Project
  - 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

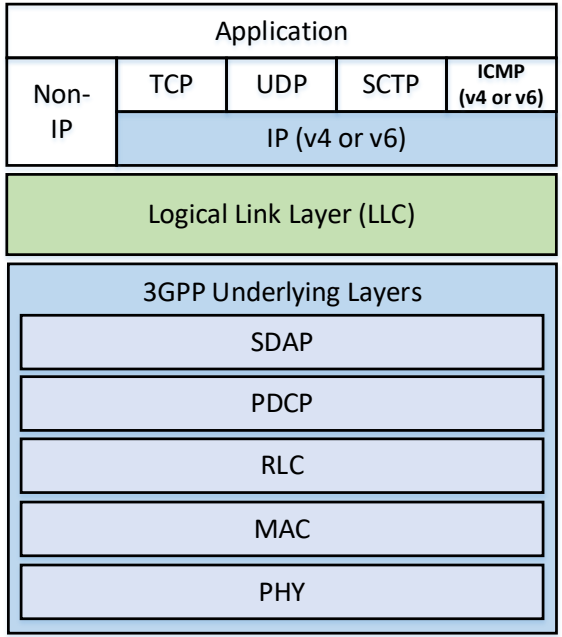



5G V2X Drone NetworksIn OMNeT++

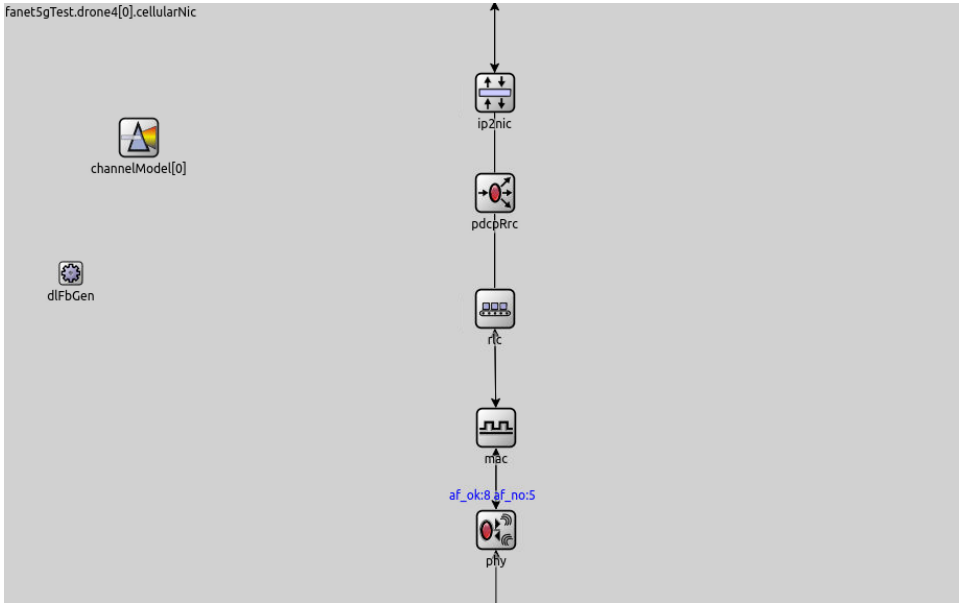
OMNeT++ SIMU5G INET FRAMEWORK

# What got done (2/3)

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



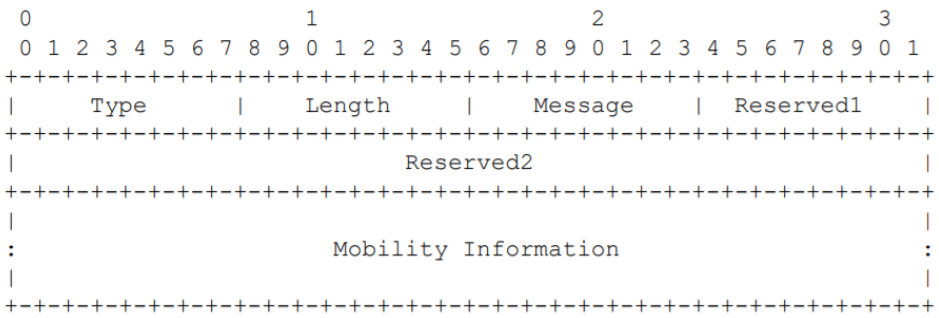

5G V2X UE Protocol Stack (Data Plane)




OMNeT++ 5G V2X UE Protocol Stack

# What got done (3/3)

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



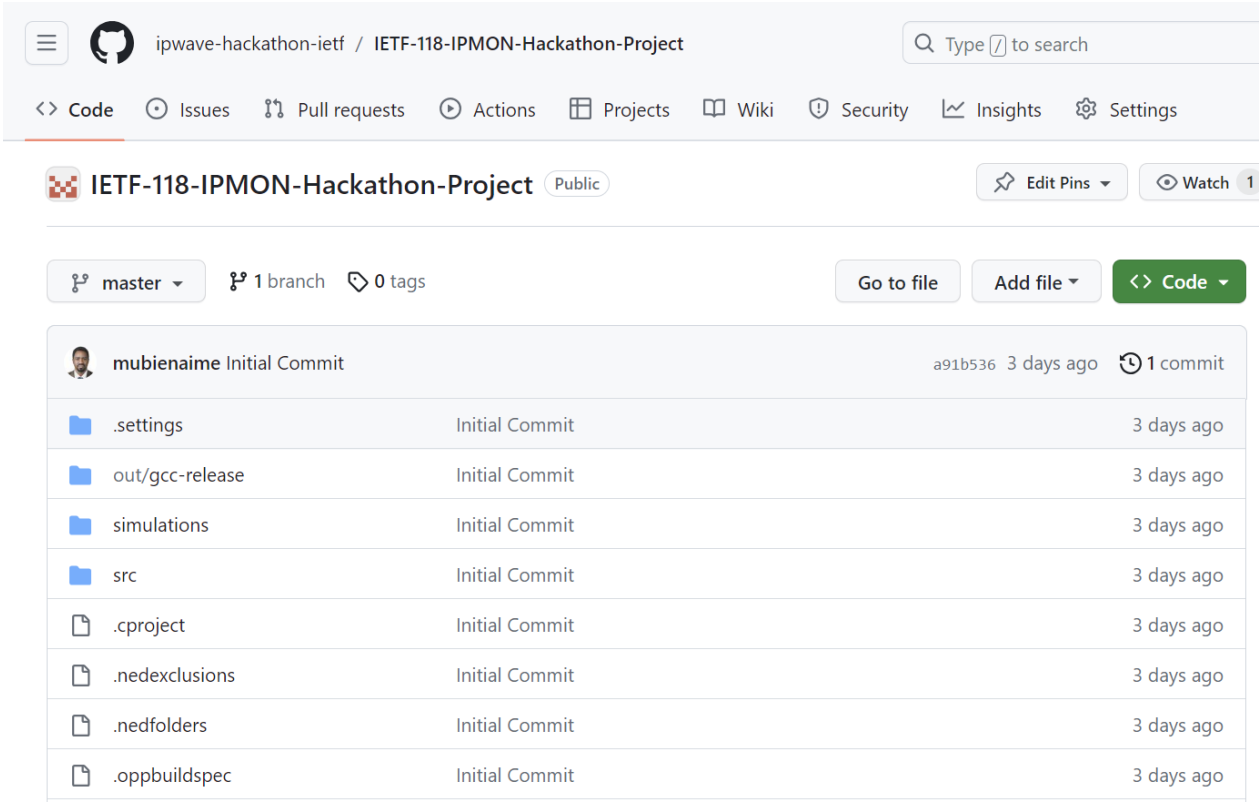

VMI Format


CANA-Based Safe Flying in FANET

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

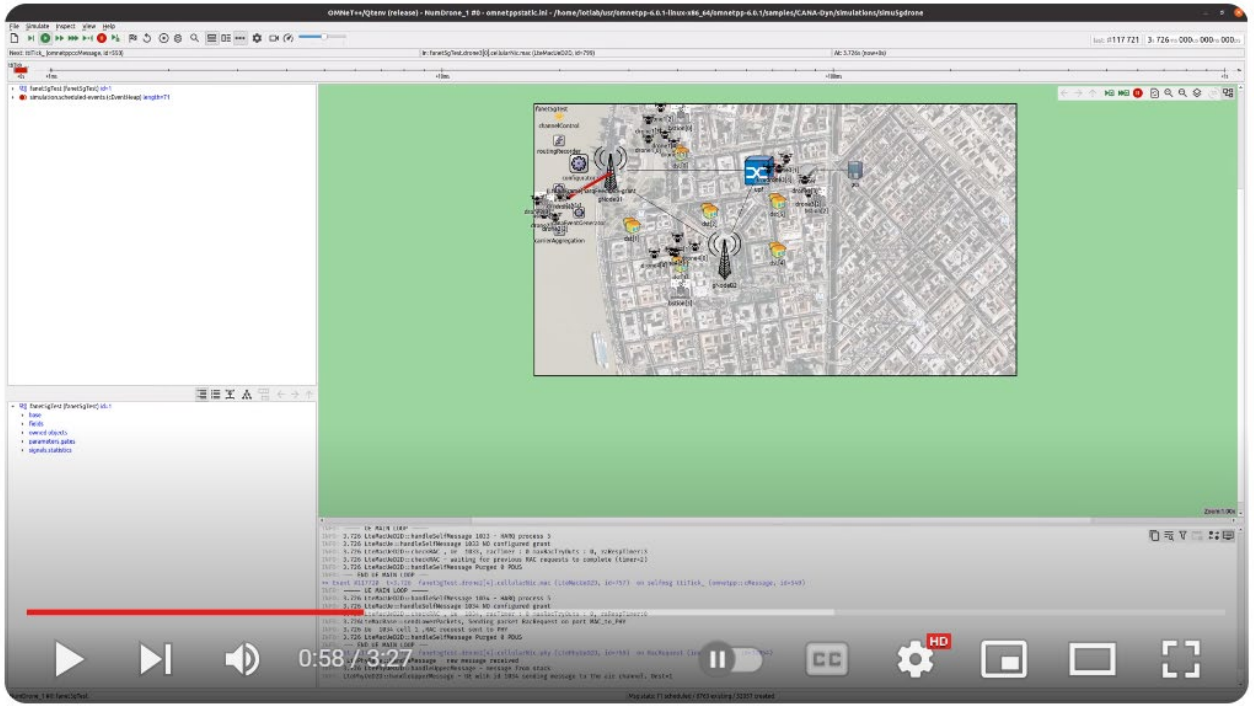
# Open Source Project in GitHub

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



# 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

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- 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)
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## Hackathon Team Photo