



IETF-113

IPWAVE Hackathon Project

March 19-20, 2022

Champion: Jaehoon (Paul) Jeong¹

Members: Bien Aime Mugabarigira¹, Yiwen (Chris) Shen¹, Hyeonah Jung¹, Junhee Kwon¹, and Gilteun Choi²

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IP Wireless Access in Vehicular Environments (IPWAVE) Basic Protocols Project

Champion: Jaehoon (Paul) Jeong (SKKU)

IETF-113 IPWAVE Hackathon Project:
Context-Aware Navigator Protocol (CNP) for drones



Professors:

- Jaehoon (Paul) Jeong (SKKU)
- Younghan Kim (SSU)

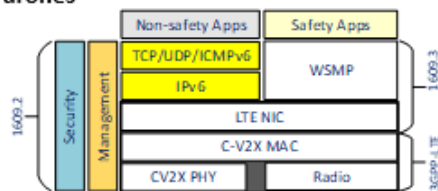
Researcher:

- Yiwen (Chris) Shen (SKKU)

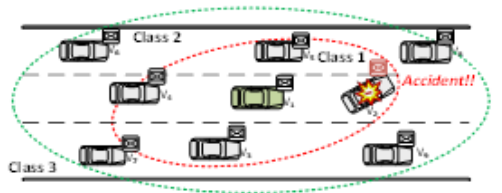
Students:

- Bien Aime Mugabarigira (SKKU)
- Junhee Kwon (SKKU)
- Hyeonah Jung (SKKU)
- Gilteun Choi (PNU)

WAVE Protocol Stack



IPv6 ND Option



Objectives

- To Demonstrate IPWAVE Basic Protocols
- To Send vehicle mobility information option to drone for context awareness
- Simulation of Context-Aware Navigation Protocol (CNP) over simu5G
- To Discover technology gaps for IPWAVE

Where to get source code:

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

How to set up a simulation environment:

- Software

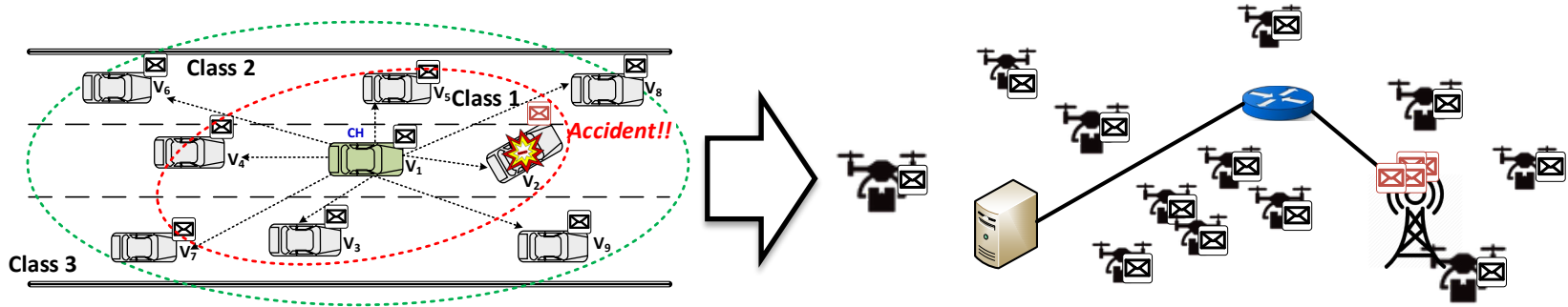
- OS: Ubuntu 16.04
- OMNeT++ 5.6.2 and INET 4.2.2

Implementation Contents:

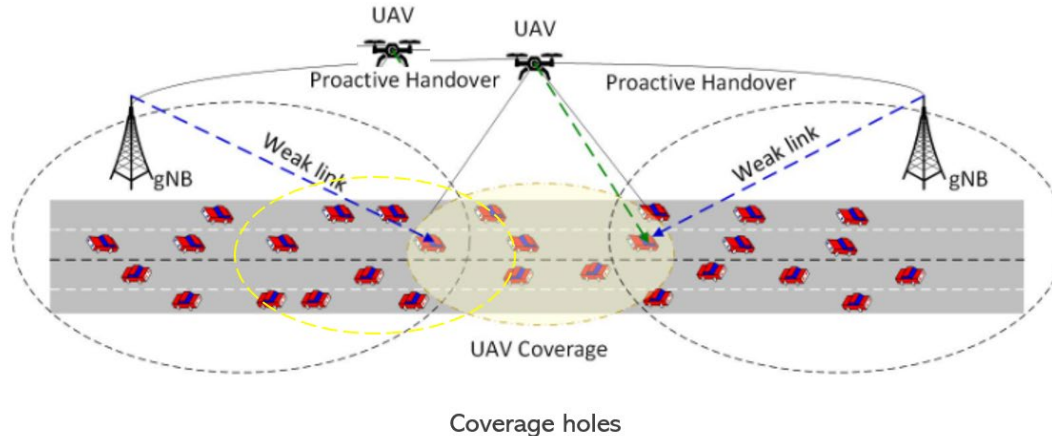
- To Develop a drone communication system for safe and secure flights using IETF IPWAVE protocols.
- To Support Vehicular Mobility Information (VMI) option in IPv6-based drone networks over 5G V2X
 - ✓ The New IPv6 ND options development and verification for drone networks
 - ✓ ND messages exchange with CCM and ECM options in a Flying Ad Hoc Network (FANET)

Hackathon Plan (1/2)

- Part 1: Simulation a Context-Aware Navigator Protocol (CNP) for drones



- Part 2: Drone-assisted handover mechanism in vehicular networks for a highway



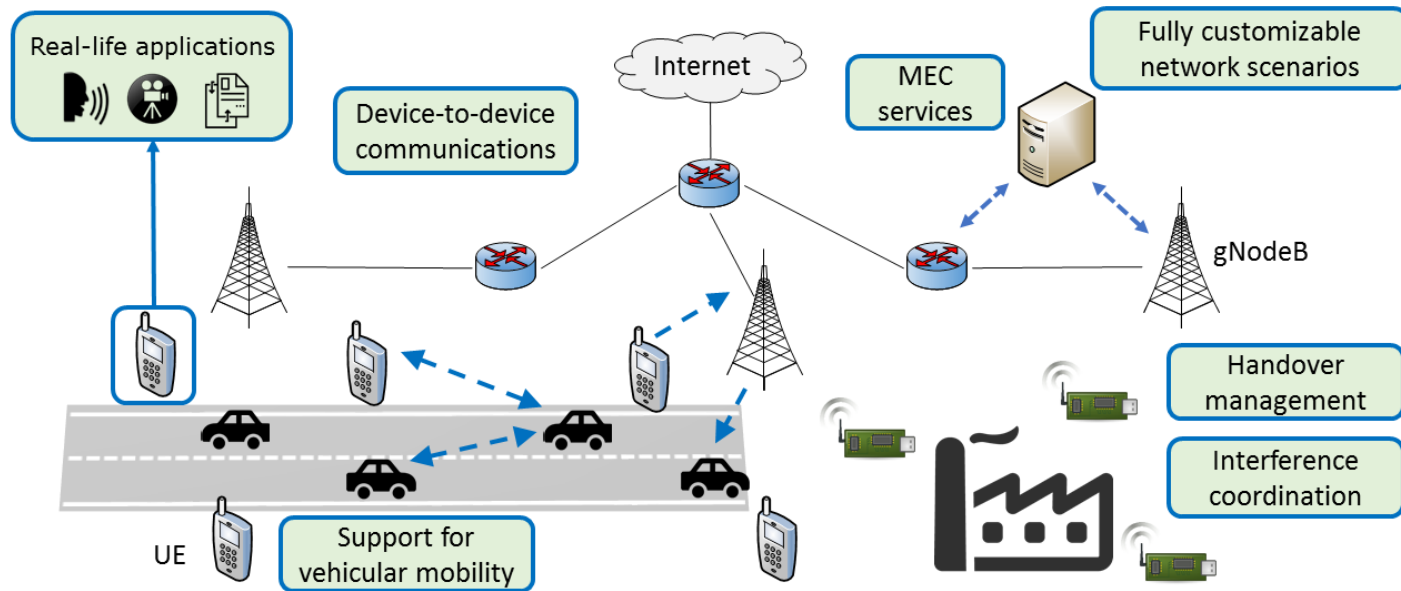
- UAV Coverage
- gNB Coverage

Hackathon Plan (2/2)

- **Part 1: Simulation of Context-Aware Navigator Protocol (CNP) for Drones**
 - A drone communication system for safe and secure flight using IPWAVE protocol, such as CNP.
 - ✓ **draft-jeong-ipwave-context-aware-navigator-05**
 - Support of Vehicle Mobility Information (VMI) option in IPv6-based drone networks over 5G V2X.
- **Part 2: Drone-assisted Handover Mechanism in Vehicular Networks**
 - Accuracy Improvement of Handover Decision using Kalman Filter

Simulation Environment

- OS: Ubuntu 16.04
- Simulators:
 - OMNeT++ 5.6.2
- Open-Sources:
 - INET 4.2.2
 - Simu5G

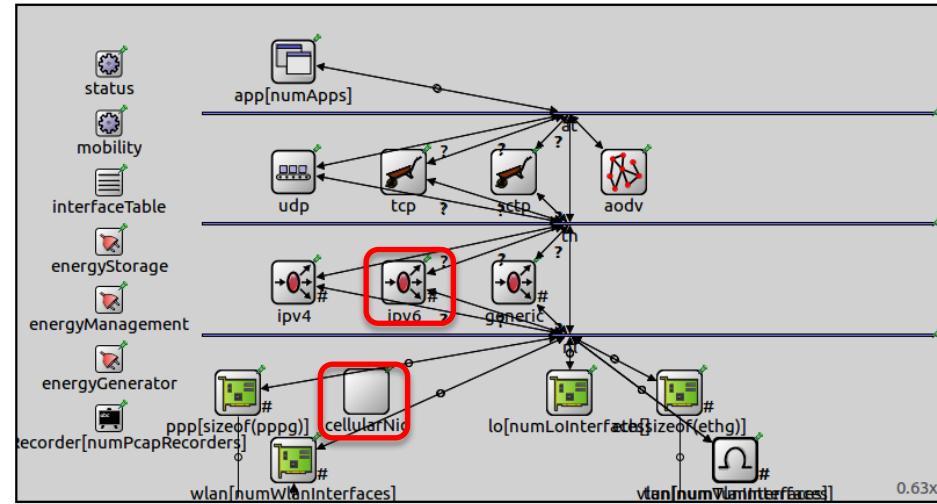


<http://simu5g.org/>



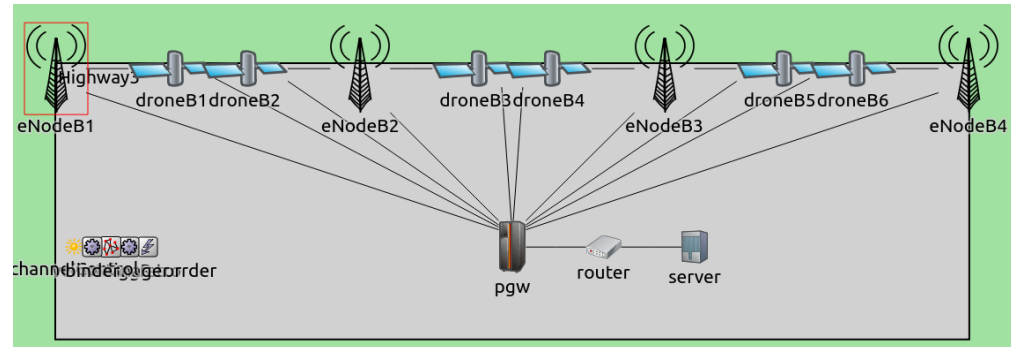
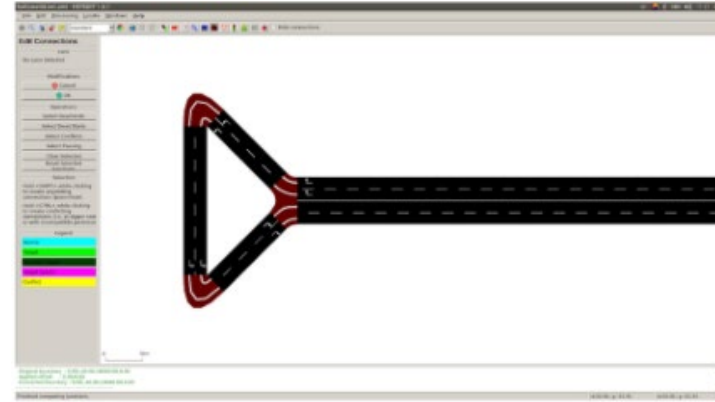
What got done (1/2)

- Integration of SIMU5G simulation along with the Drone Context-Aware Navigation simulation.
- Adoption of a cellular link for Drone-to-Drone communication.
- Usage of IPv6 for Drone-to-Infrastructure communication.



What got done (2/2)

- Simulation Environment:
 - A simulation of a highway scenario in SUMO and a C-V2X based vehicular communication in OMNeT++.
 - Accuracy Improvement of Handover Decision using Kalman Filter



What we learned

- Context-Aware Navigator Protocol (CNP) for Drones
 - A 5G Cellular Infrastructure can be used to handle safety message communication in a complex drone network.
 - IPv6 NA messages (i.e., CNP VMI Options) can be used for sharing drone mobility information for collision avoidance in IPv6-based drone networks.
- Drone-Assisted Handover for Vehicular Networks
 - The accurate signal power of the received messages from eNB increased the accuracy of the handover decision through Kalman Filter.

Project Github

The screenshot shows the GitHub web interface for the repository `ipwave-hackathon-ietf/ipwave-hackathon-ietf-113`. The repository is public and has 1 branch (master) and 0 tags. The commit history shows 4 commits by user `mubienaim`. The commit list includes:

File	Commit Message	Time
CANA	commit updates	12 hours ago
inet	commit updates	12 hours ago
simu5G	initial hackathon commit	14 hours ago
.gitattributes	commit updates	12 hours ago

URL: <https://github.com/ipwave-hackathon-ietf/ipwave-hackathon-ietf-113>

Wrap-Up

Team Members

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