bienaime
bienaime

IETF-114
IPWAVE Hackathon Project

July 23-24, 2022

Champion: Jaehoon (Paul) Jeong
Members: Bien Aime Mugabarigira and Junhee Kwon
Department of Computer Science and Engineering at SKKU
Email: {pauljeong, bienaime, juun9714}@skku.edu

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

Champion: Jaehoon (Paul) Jeong (SKKU)

IETF-114 IPWAVE Hackathon Project: Context-Aware Navigator Protocol (CNP)

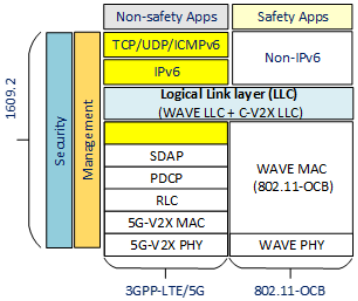
Professors:

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

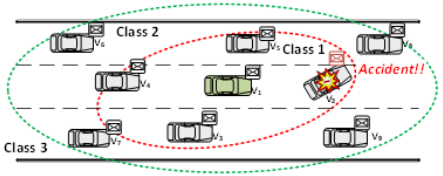
Students:

- Bien Aime Mugabarigira (SKKU)
- Junhee Kwon (SKKU)
- Yiwen (Chris) Shen (SKKU)
- Hyeonah Jeong (SKKU)

WAVE Protocol Stack



IPv6 ND Option



IPv6 ND with Cooperation Context Message (CCM)

IPv6 ND with Emergency Context Message (ECM)

Objectives

To Demonstrate IPWAVE Basic Protocols

- New IPv6 ND option for road safety
- Simulation of Context-Aware Navigation Protocol over C-V2X
- To Discover technology gaps for IPWAVE

Where to get source code:

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

How to set up an environment:

- OS: Ubuntu 16.04
- SUMO 1.0.0
- OMNeT++ 5.3
- GNU GCC7.3
- Veins 5.0
- INET 3.6.6

Implementation Contents:

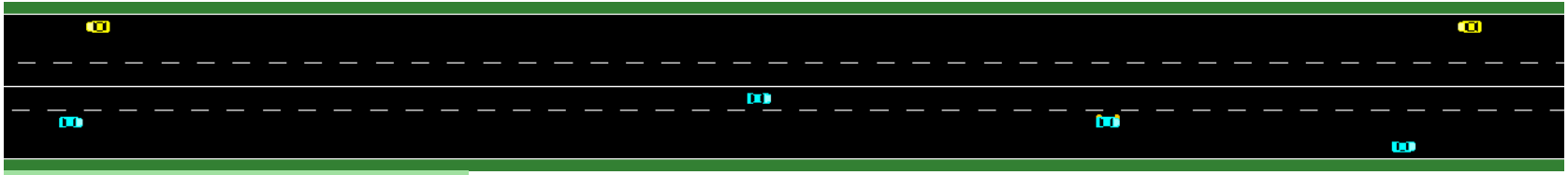
- To Support IETF Vehicular Mobility Information (VMI) Option in IPv6-based vehicular networks over C-V2X.
  - ✓ VMI: https://datatracker.ietf.org/doc/draft-jeong-ipwave-context-aware-navigator/
- To support the cooperation Context Message (CCM) and Emergency Context Message (ECM) for CNP application in 3GPP-LTE
- Text the adaptability of IEEE 802.11-OCB vehicular protocol stack to the C-V2X access layer.

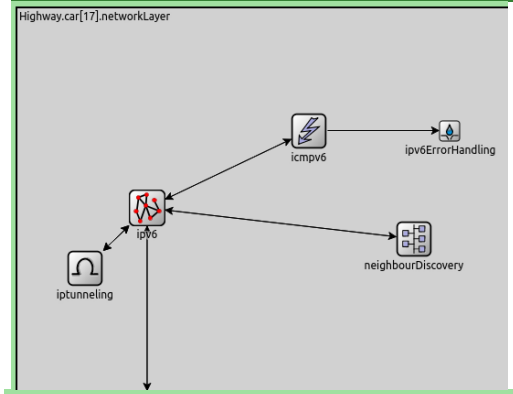
성균관대학교 SUNG KYUN KWAN UNIVERSITY

Hackathon Plan

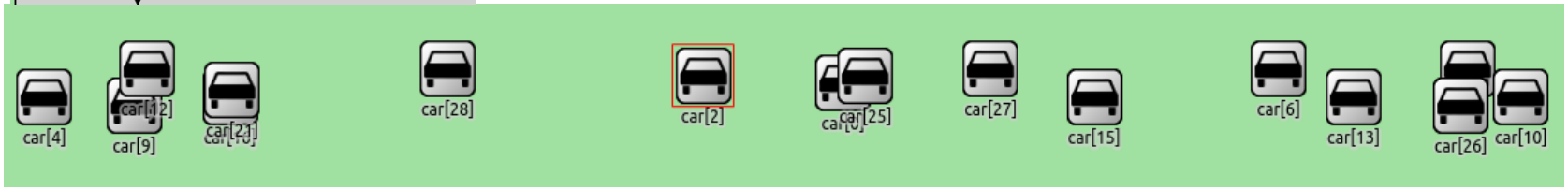
- Simulation
  - To test the applicability of IPWAVE protocols in C-V2X
  - To simulate Context-Aware Navigation Protocol (CNP) with C-V2X
    - draft-jeong-ipwave-context-aware-navigator-05
- Cooperation Context Message (CCM) and Emergency Context Message (ECM) for CNP application in 3GPP-LTE Mode 4
- Test of the coexistence of IEEE 802.11-OCB protocol layer and 3GPP V2X protocol layer

What got done (1/2)





- A highway scenario simulation in SUMO & OMNeT++ for IPWAVE Networking
- Implementation of IPv6 Network Layer

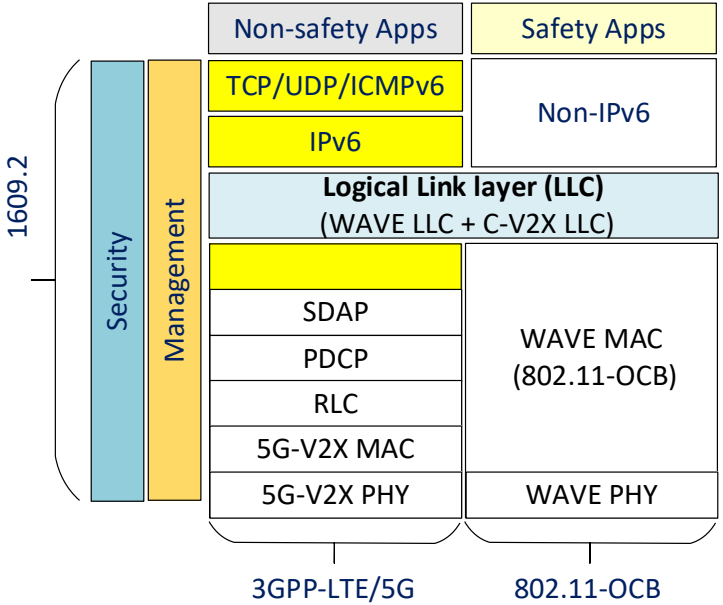


What got done (2/2)

- Simulation Implementation of IPWAVE Context-Aware Navigation Protocol (CNP) with C-V2X
  - Adaptation of Cooperation Context Message (CCM) by V2V within the Mode4 application.
  - Exchange of Emergency Context Message (ECM) with higher priority over CCM within IPv6 enabled vehicular network.

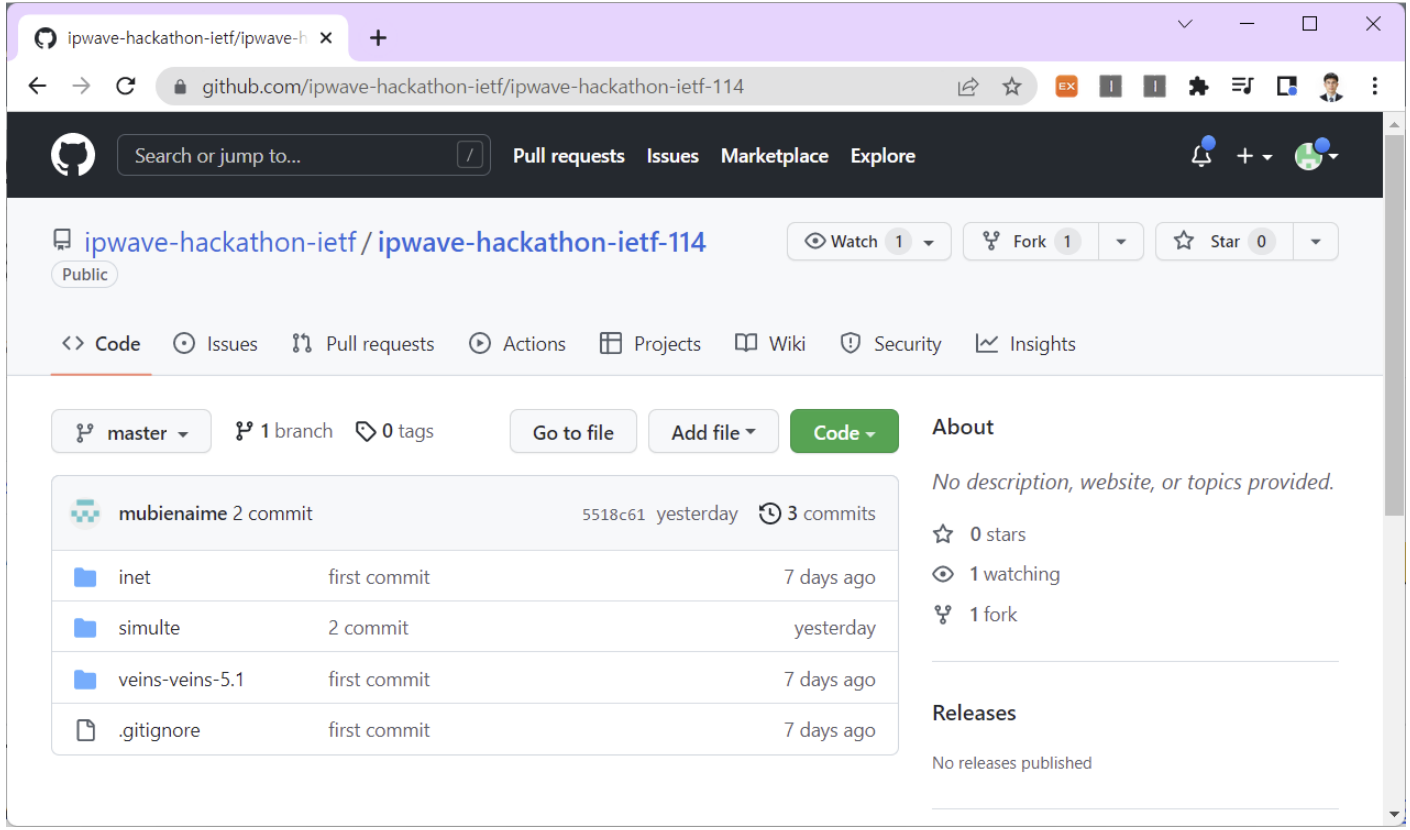
What we learned

- Feasibility of Heterogenous Vehicular Networks with WAVE and 5G V2X
  - Coexistence of IEEE 802.11-OCB based IPWAVE and C-V2X-based IPWAVE
- Cooperation Context Message (CCM) and Emergency Context Message (ECM) for CNP can be transmitted over 3GPP-LTE mode 4.



Open Source

URL: https://github.com/ipwave-hackathon-ietf/ipwave-hackathon-ietf-114



Wrap Up

Professors:

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

Team members:

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

Appendices

(1) Simulation Environment Preparation Guide

(2) Implementation Environment

Simulation Environment

- OS: Ubuntu 16.04
- Simulators:
  - SUMO 1.0.0
  - OMNeT++ 5.4.1
- GNU GCC 7.3
- Open Sources:
  - https://github.com/ipwave-hackathon-ietf/ipwave-hackathon-ietf-114
  - Veins 5.0
  - INET 3.6.6

Configurations

- Install OMNeT++ following the procedure in the installation manual: https://doc.omnetpp.org/omnetpp/InstallGuide.pdf
- Install proper SUMO version
- Import projects in OMNeT++ workspace
  - Import INET by

  –File → Import → General → Existing projects into workspace
  - Similarly, as INET, import SimuLTE
  - Import veins:

  »Specifically, search for nested project and install both veins and veins_inet3 projects.

Project References

- Activate project features to ensure SimuLTE runs correctly.
- Right-click on lte project and choose Properties
- Then, Project References and tick inet, veins and veins_inet3
- Run the scenario in veins:
- *python2 sumo-launchd.py*
- Run the simulation by:
  - *lte → simulations → mode4 → omnetpp and in set inifile configuration, choose Hachathon112*

- Reference:
  - http://www.cs.ucc.ie/cv2x/media/OpenCV2X_Documentation.pdf