IPWAVE Basic Protocols Project @ IETF-104 Hackathon

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Goal of IPWAVE Basic Protocols Project

- **Implementation of IPv6 Over IEEE 802.11-OCB and IPv6 Vehicular Neighbor Discovery**

1. Router and Prefix Discovery along with IPv6 Address Autoconfiguration

2. Address Registration and Duplicate Address Detection Procedure

3. Multihop DAD Procedure via V2V Communications

IPWAVE Hackathon Project Poster

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

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Professors

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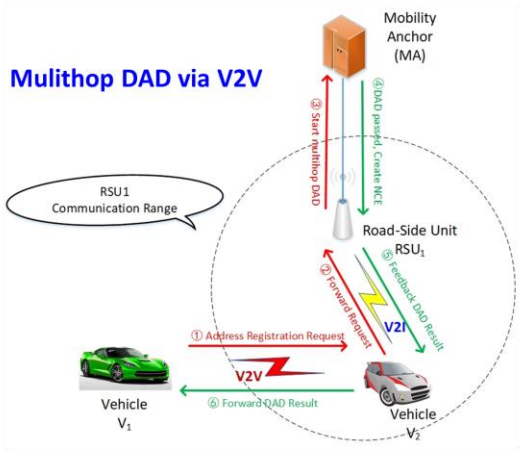
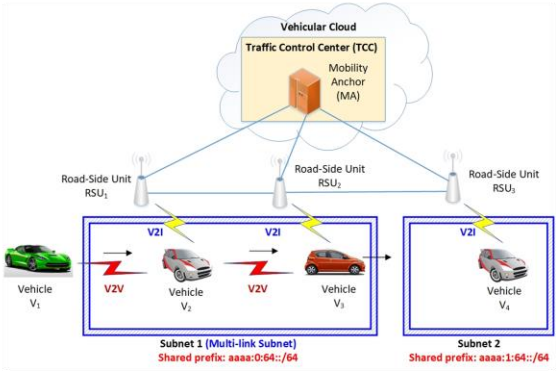
- Younghan Kim (SSU)

Students

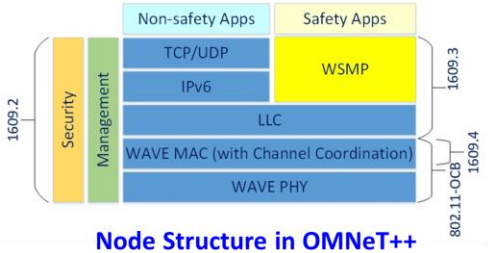
- Zhong Xiang (SKKU)
- Yiwen Chris Shen (SKKU)
- Kyoungjae Sun (SSU)



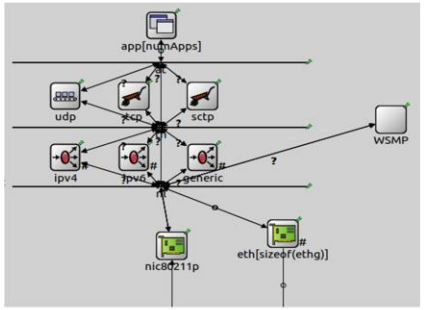
Vehicular Network Architecture



WAVE Stack



Node Structure in OMNeT++



Objective of this Hackathon

- Demonstrate IPWAVE basic protocols
- Discover technology gaps

Where to get code

- Github – Source Code
  - ✓ https://github.com/ipwave-hackathon-ietf

Where to get video clip

- Youtube – Demonstration
  - ✓ https://youtu.be/sKYfa0MC6Jg

What to pull down to set up an environment

- OS: Ubuntu 16.04
- OMNeT++: 5.4.1
- SUMO: 0.32.0
- Veins: 4.7.1
- INET Framework: 4.0.0

Contents of Implementation

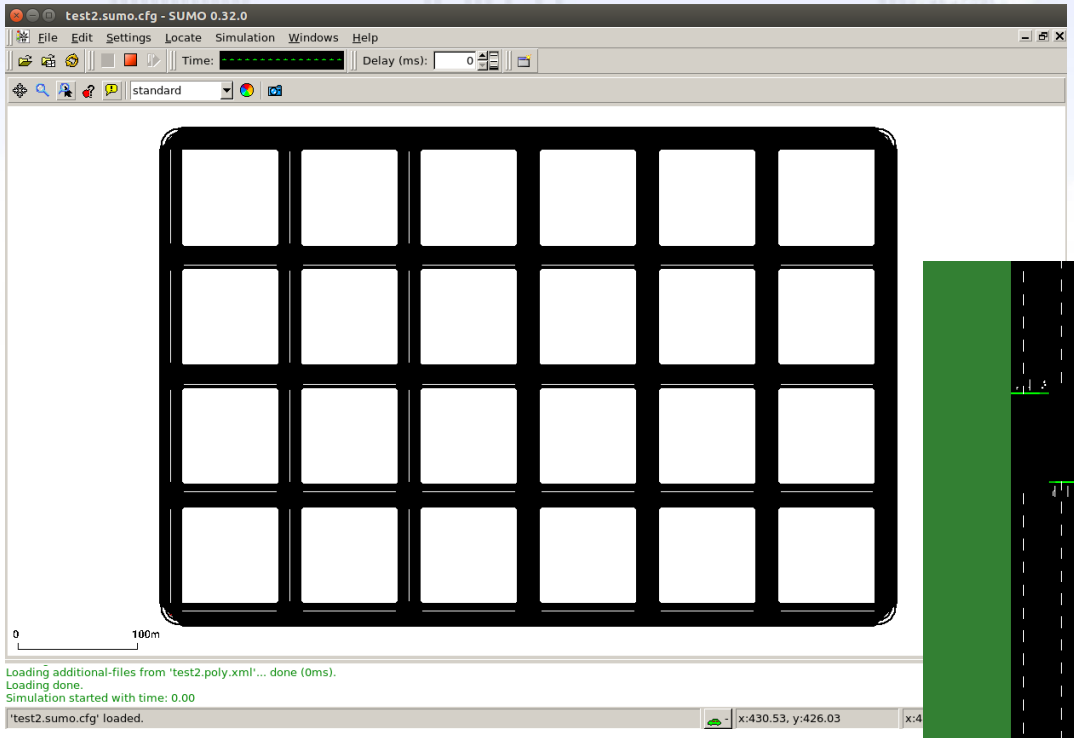
- Transmission of IPv6 Packets over IEEE 802.11-OCB
- IPv6 Neighbor Discovery for IP-Based Vehicular Networks
  - ✓ Router and Prefix Discovery along with IPv6 Address Autoconfiguration
  - ✓ Address Registration and Duplicate Address Detection Process
  - ✓ Multihop DAD Process via V2V communications
- Build IPv6/TCP/UDP protocol stack based on VEINS-4.7.1 and INET-4.0
- Build a basic IPWAVE running scenario via V2I and V2V based on VEINS-4.7.1 and SUMO-0.32.0

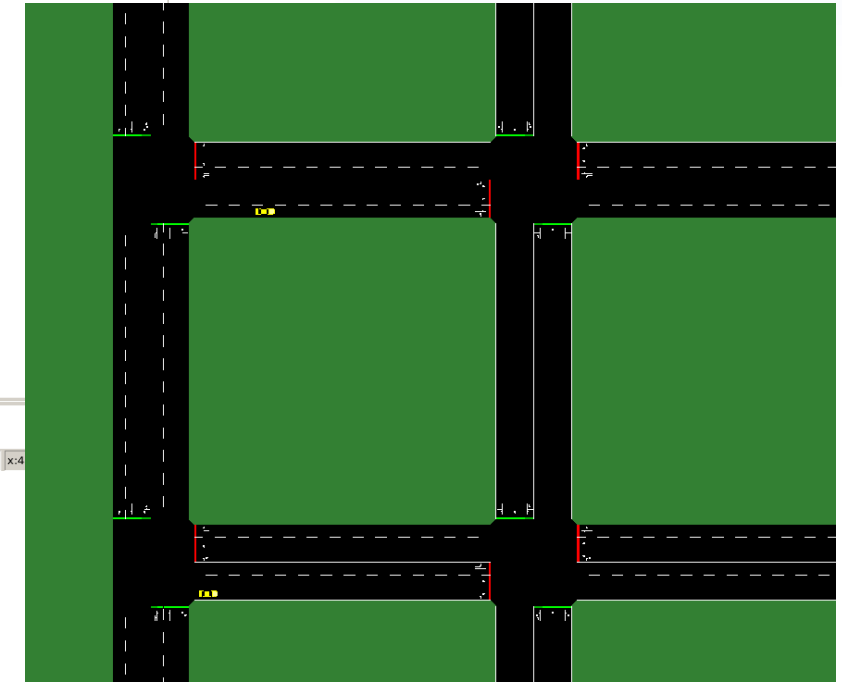
성균관대학교 SUNG KYUN KWAN UNIVERSITY

숭실대학교 Soongsil University

Road Network Architecture (1/2)

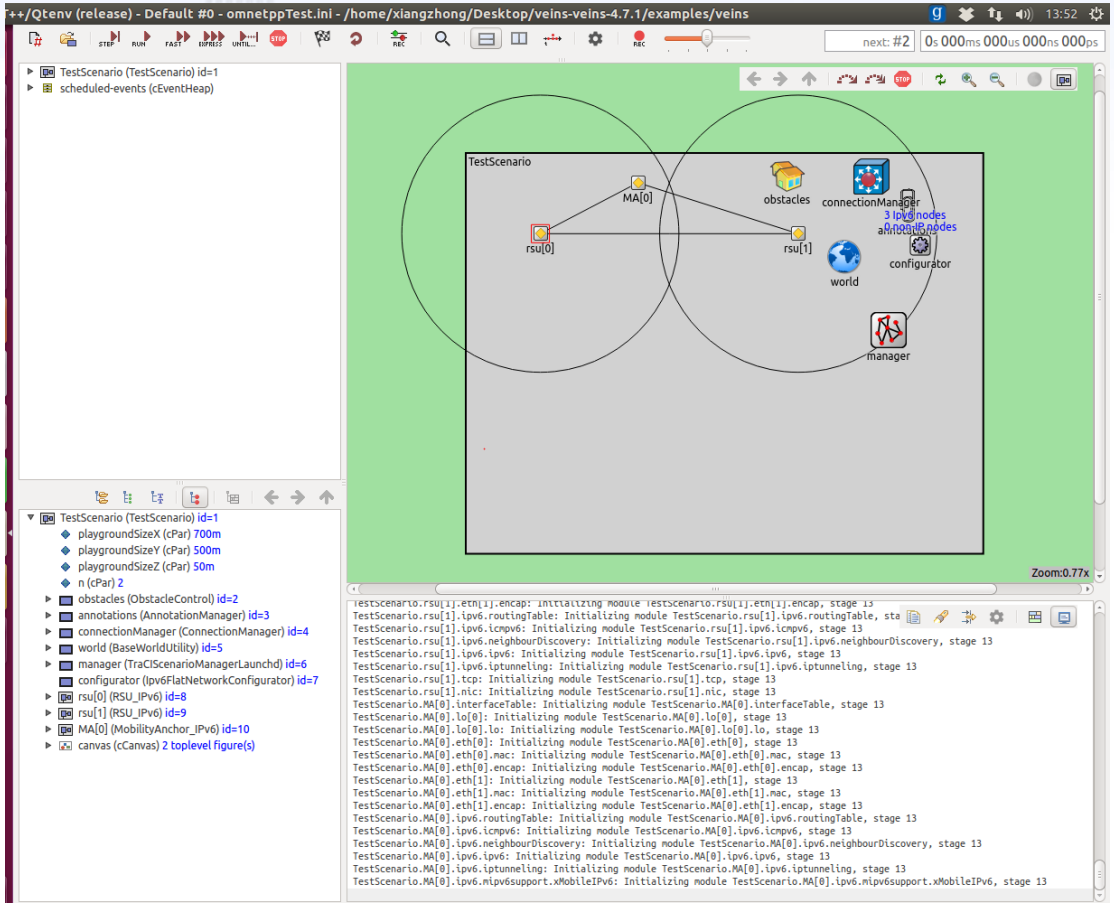
- ✓ A 7*6 grid map with 3 lanes for a road network



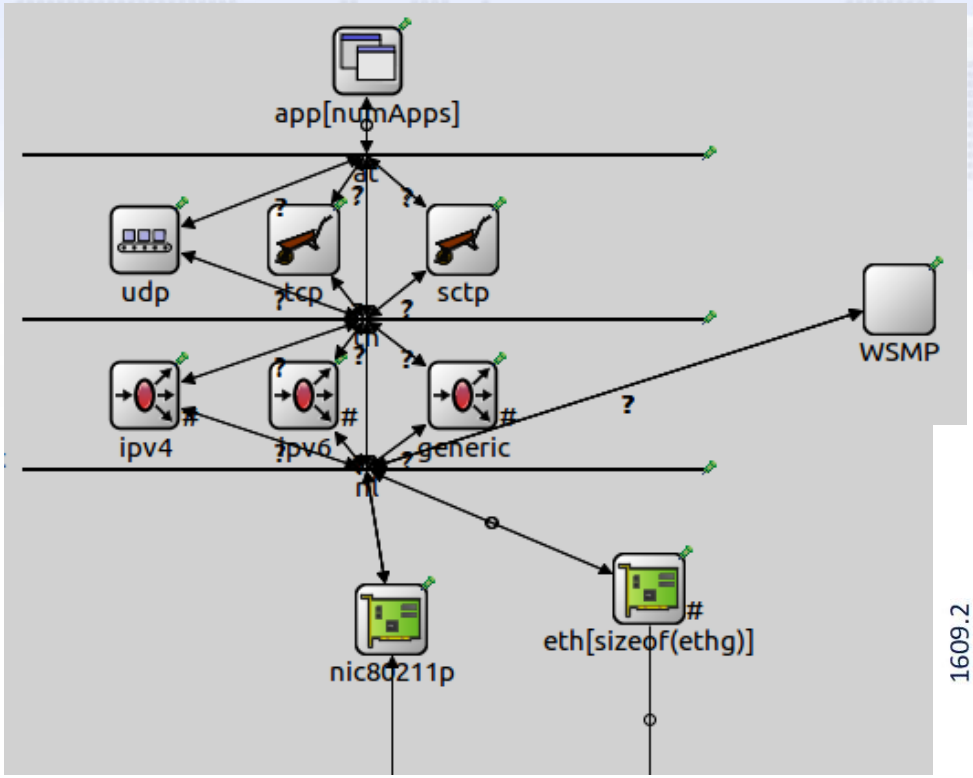


Road Network Architecture (2/2)

- ✓ Two RSUs :
  - Belong to one subnet.
  - Connect with each other through Ethernet.
- ✓ Two Vehicles :
  - One is outside the coverage of RSUs.
- ✓ Mobility Anchor:
  - Manage RSUs and Vehicles.

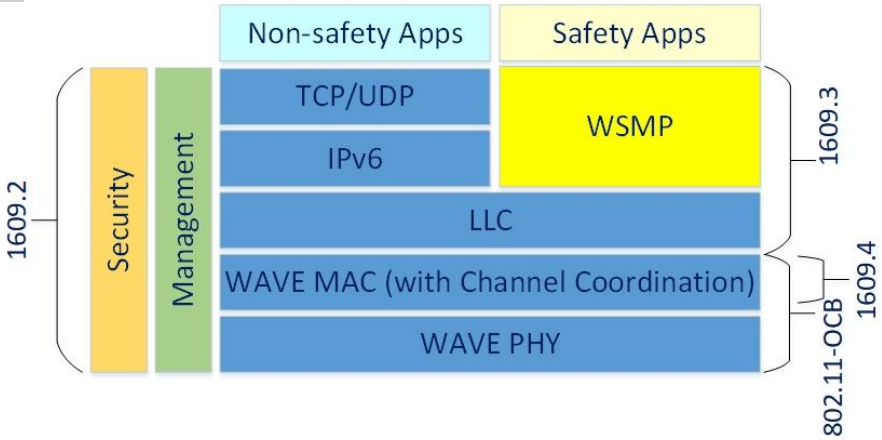


Vehicular Network Architecture



Vehicle Structure

WAVE Stack



Lessons from IETF-104 Hackathon Project

- **Proof of Concept (POC) of IPWAVE-VND Protocol**
  - **IPWAVE- Vehicular Neighbor Discovery (VND)**
- **Design and Implementation of IPWAVE-VND in OMNeT++ and SUMO**
  - **Design of IPWAVE-VND Framework in OMNeT++**
  - **Implementation of IPv6 over IEEE 802.11-OCB**
- **Proposal of Flexible Mobility Management for IPWAVE-VND**
  - **Simplify handover procedure between adjacent RSUs**
  - **Alleviate flow pressure at Mobility Anchor**

Appendix

-Hackathon Development Environment

-Open-Source Depository of IPWAVE Basic Protocols Project

-Demonstration Video Clip of IPWAVE Basic Protocols Project

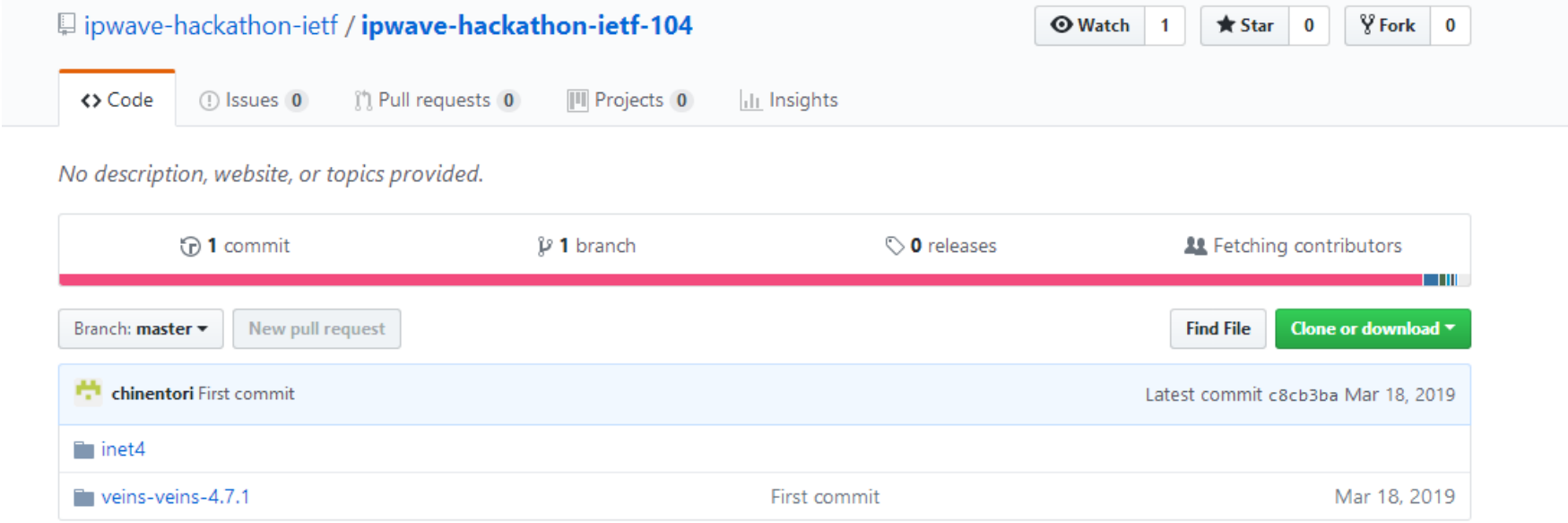
Hackathon Development Environment

OS	Ubuntu Linux 16.04
OMNeT++	Version 5.4.1
SUMO	Version 0.32.0
Veins	Version 4.7.1
INET Framework	Version 4.0.0

Open-Source Depository of IPWAVE Basic Protocols Project

Github link:

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



Demonstration Video Clip of IPWAVE Basic Protocols Project

Youtube link:

https://youtu.be/sKYfa0MC6Jg