IETF-120 Hackathon

Interface to In-Network Functions (I2INF) Project

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Professors:

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- Yiwen (Chris) Shen (SKKU)
- Younghan Kim (SSU)
- Yong-Geun Hong (DJU)
- Joosang Youn (DEU)

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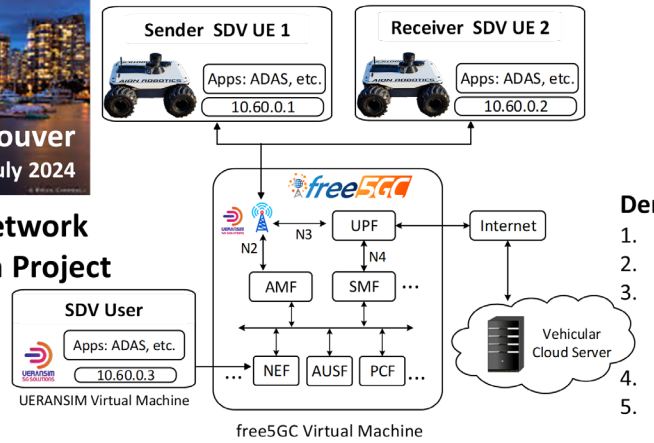
- Mose Gu (SKKU)
- Ju Won Hong (SKKU)
- EunJin Hwang (DJU)
- Jisuk Chae (DJU)

Architecture



Objectives

- Demonstrate Interface to In-Network Functions (I2INF).
- Set up In-Network Computing Functions for mobile objects such as Software-Defined Vehicles and Unmanned Aerial Vehicles (UAV) in terms of the configuration and monitoring of In-Network Functions.

What to pull down to set up an environment:

- OS: Ubuntu 20.04
- Free5GC VM: version 3.4.1
- UERANSIM VM (UE & RAN): version 3.2.6
- ROS2: Iron Irwini version
- GitHub Repository: https://github.com/jaehoonpauljeong/I2INF

Demonstration for free5GC Communication

1. Clone Ubuntu server as Free5GC VM and UERANSIM VM.
2. Modify hostname and IP Address on Free5GC VM.
3. Install Golang, MongoDB, All 5G network funtions (e.g., AMF, UPF, etc.), WebConsole on Free5GC VM and test the funtions.
4. Register UE's information on Free5GC Core WebConsole
5. Set yaml file parameters of UE1 and UE2 and start them. (UERANSIM: free5gc-gnb.yaml & free5gc-ue.yaml)
6. Install ROS2 and check the connectivity with 5G Core.
7. Run ROS2 on each UE and Send and recive message between SDV UE1 and SDV UE2.

Future Work:

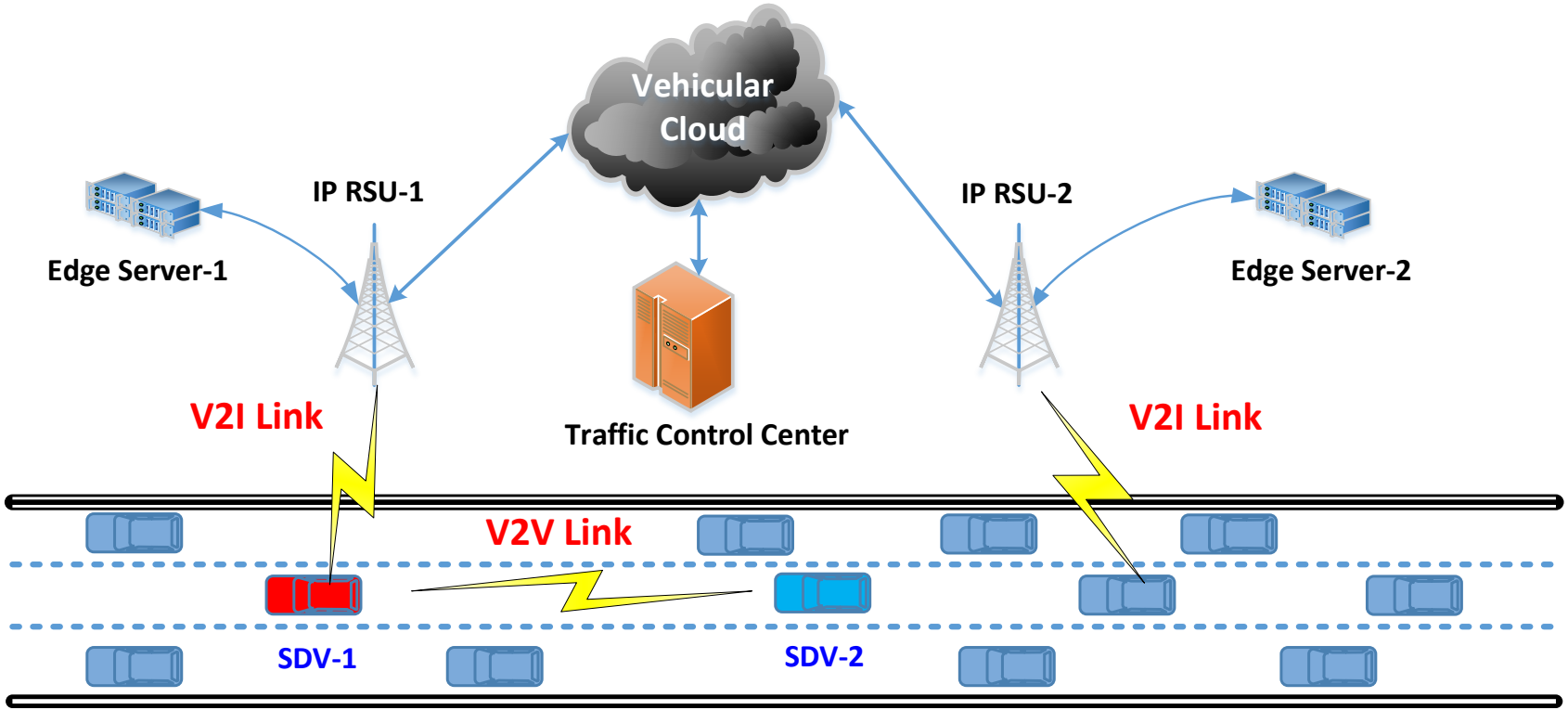
- Development and advancement of the V2X Scenario through 5G network.
- Interaction between Free5GC as 5G Cloud/Edge and AUTOSAR in Matlab Simulink as SDV with Cloud-Native.
- Control two Robot cars using ROS2 through 5G network.

Goal of Hackathon Project

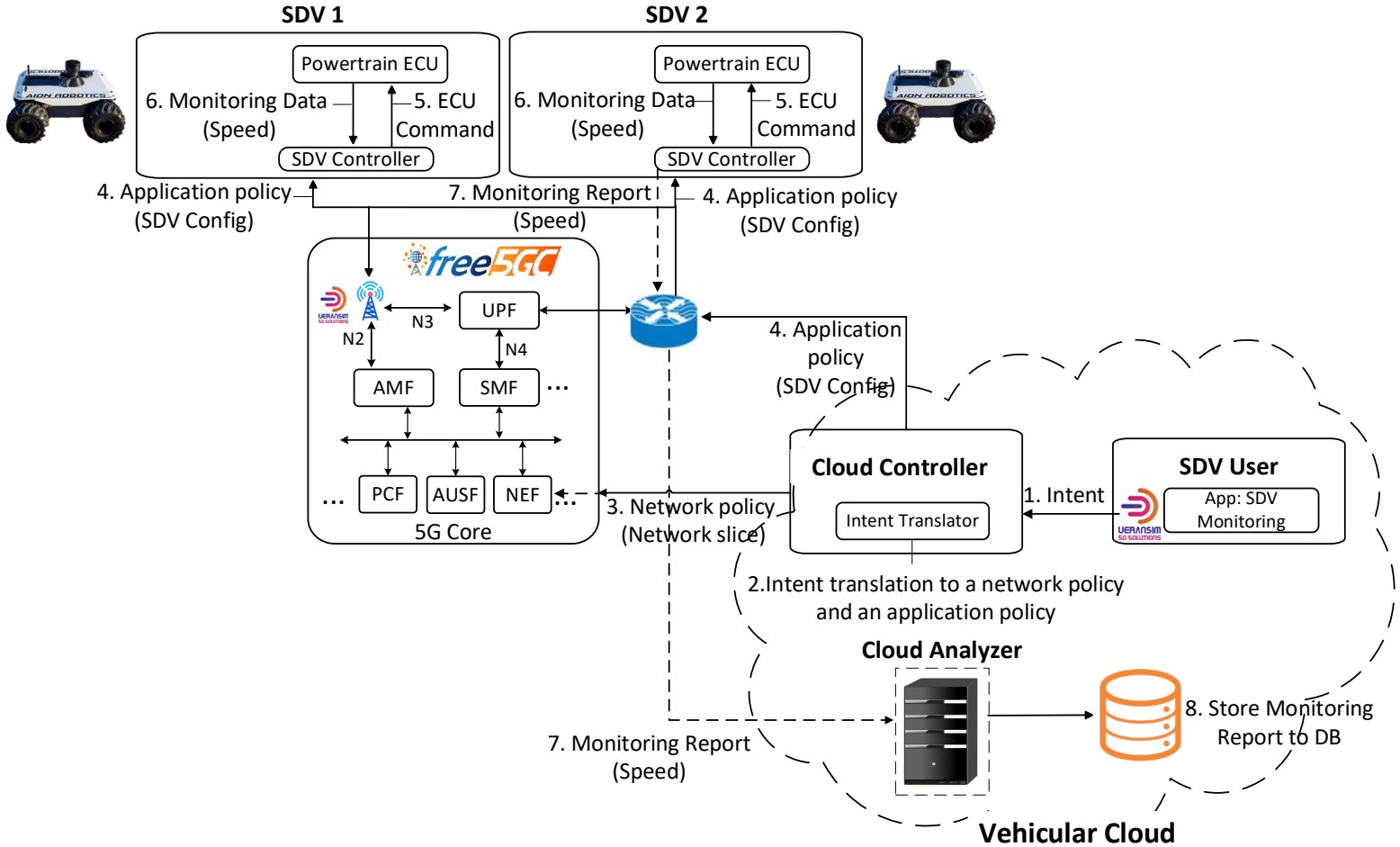
- The goal is to demonstrate the feasibility of the Framework and Interfaces to In-Network Functions (I2INF).
  - In-Network Functions (INF)
    - P4 Switch, NFV Failure Detector, and Firewall, etc.

- Internet Draft for the I2INF Project
  - An Intent-Based Management Framework for Software-Defined Vehicles in Intelligent Transportation Systems
    - https://datatracker.ietf.org/doc/draft-jeong-opsawg-intent-based-sdv-framework/

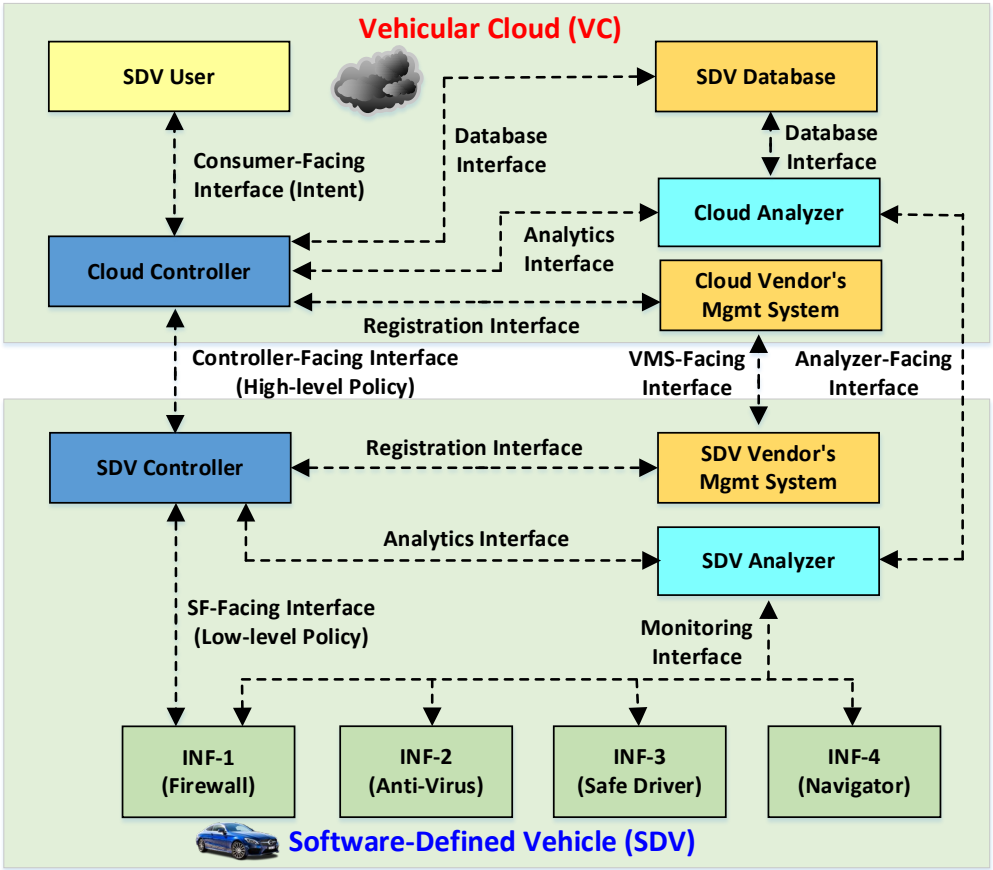
Intelligent Management for Mobile Objects (MNs)
(e.g., Software-Defined Vehicles (SDVs) and Drones)



Interface to In-Network Functions (I2INF) for SDVs



An I2INF Framework for Software-Defined Vehicles



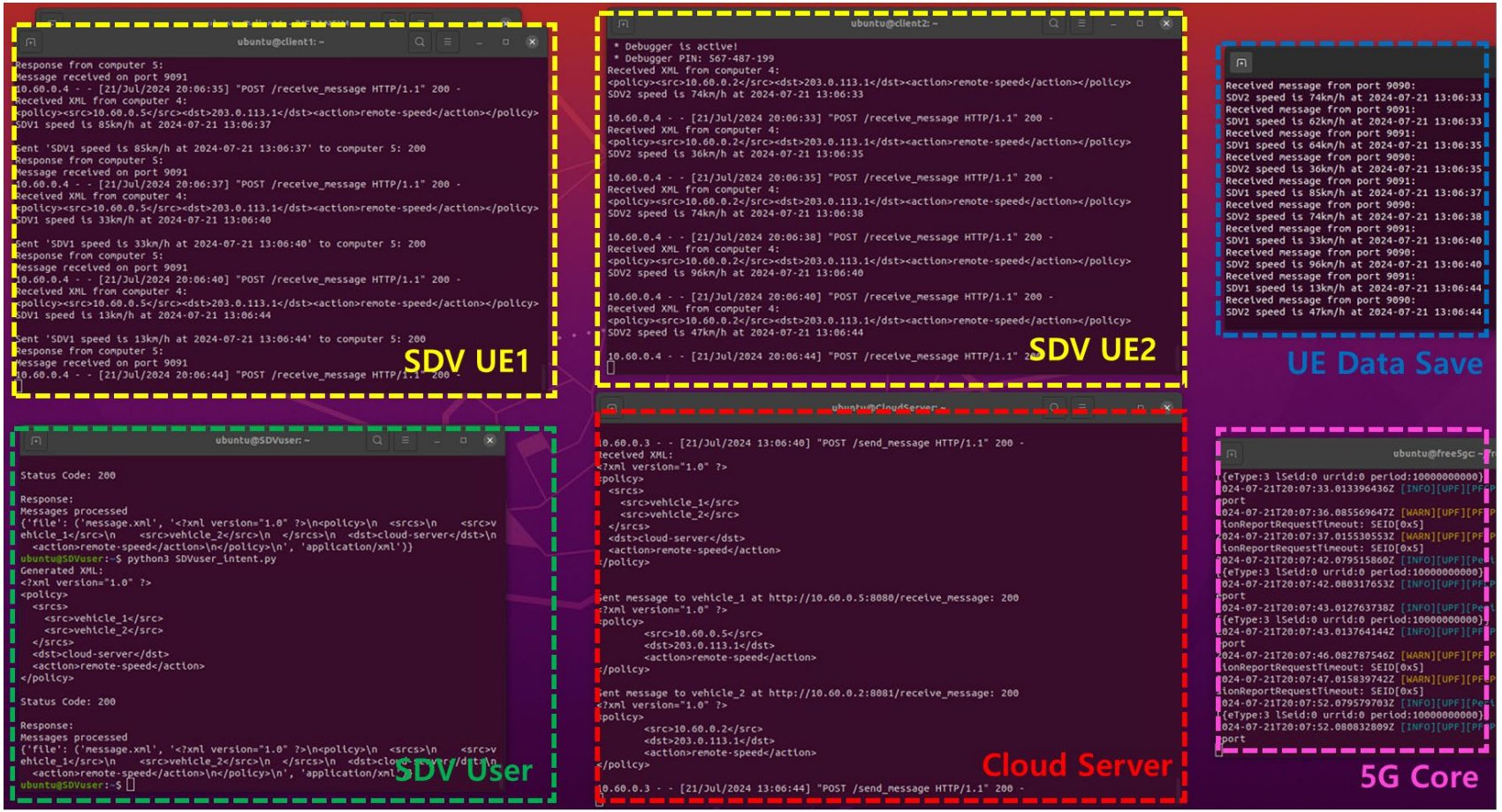
[URL] https://datatracker.ietf.org/doc/draft-jeong-opsawg-intent-based-sdv-framework/

What we learned

- We implemented an I2INF Framework for Software-Defined Vehicles (SDV) in 5G Mobile Networks with Free5GC and UERAMSIM.

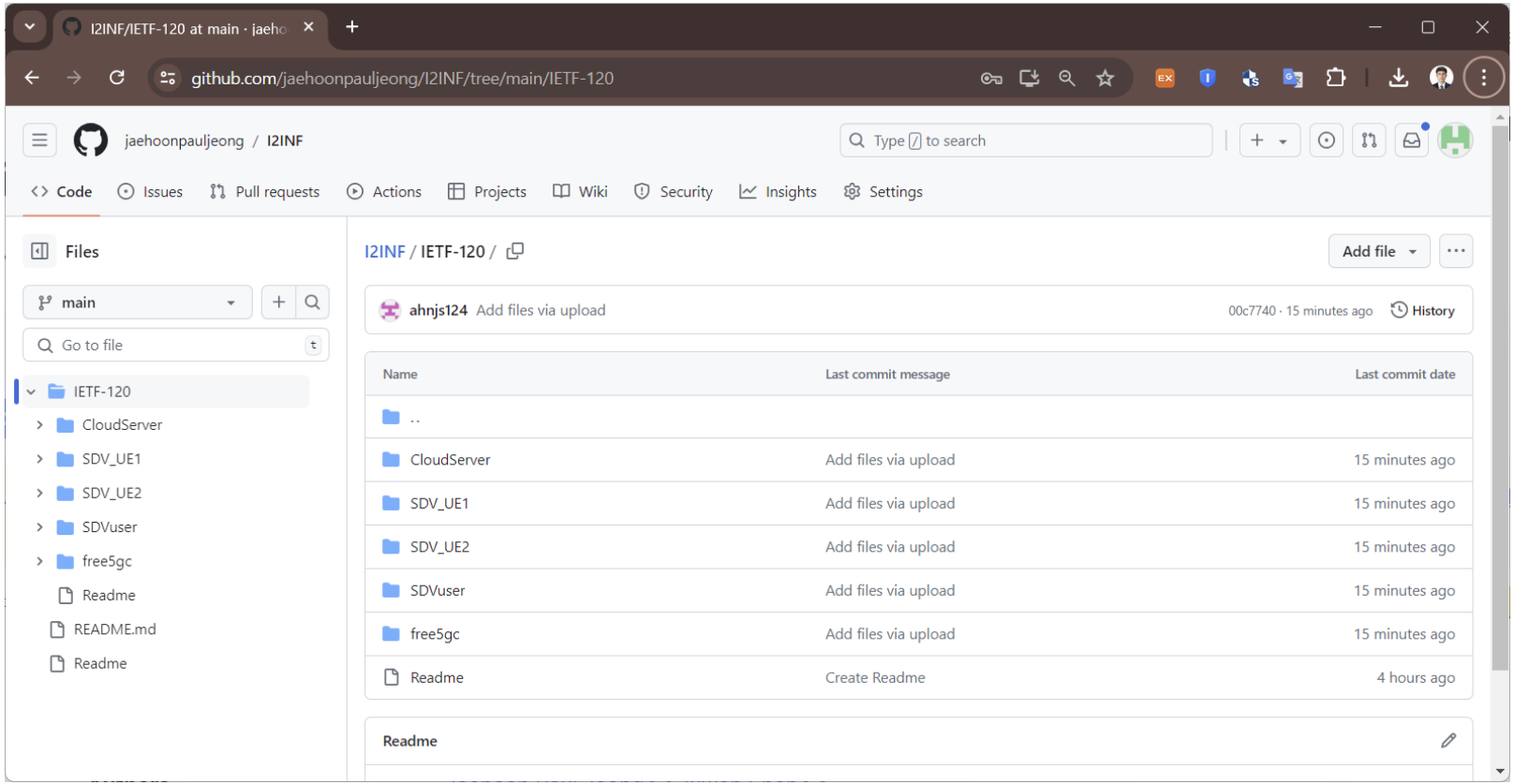
- We demonstrated Intent-Based Networking (IBN) for the configuration and monitoring of SDVs through the I2INF Framework.

Demonstration of an I2INF Framework



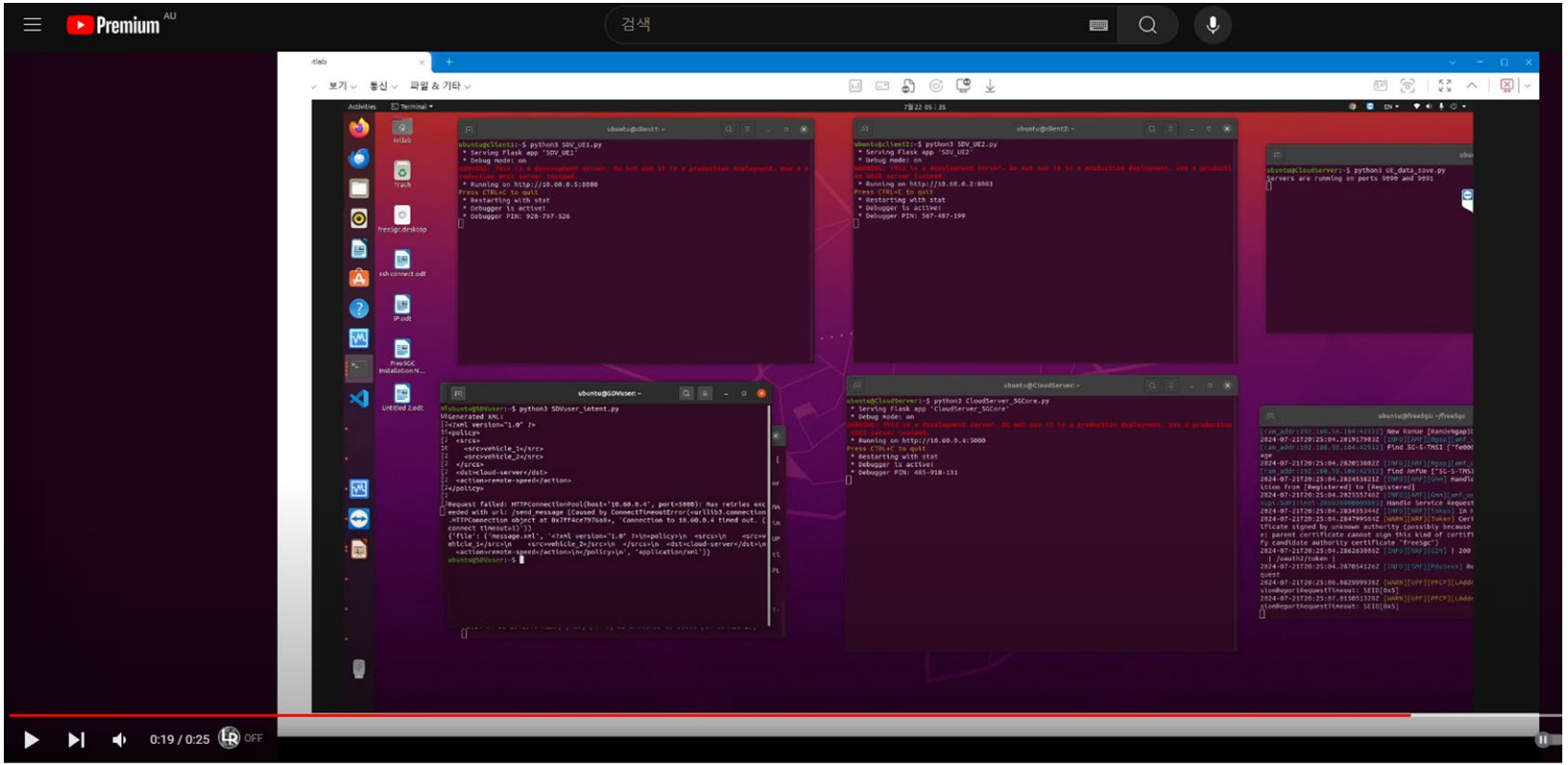
Open-Source Project for I2INF

[URL] https://github.com/jaehoonpauljeong/I2INF



Demonstration Video Clip for I2INF

[URL] https://youtu.be/Lf9hhI6ABcc



Next Steps

- We learned how to design and implement **a Framework for Interface to In-Network Functions (I2INF) for SDVs in 5G Mobile Networks.**

- In IETF 121, we will design and develop **an Intent Translator** for the I2INF Framework for **IBN-Based System** in the 5G networks.

- Also, we will design **YANG Data Models for the Main I2INF Interfaces**.

I2INF Hackathon Team

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Hackathon Team Photo