IETF Hackathon

I2NSF Framework Project

IETF 111
July 19-23, 2021
Online

Champions:
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I2NSF (Interface to Network Security Functions) Framework Project

Champions: Jaehoon (Paul) Jeong and Patrick Lingga (SKKU)

I2NSF Hackathon Project

Professors:

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

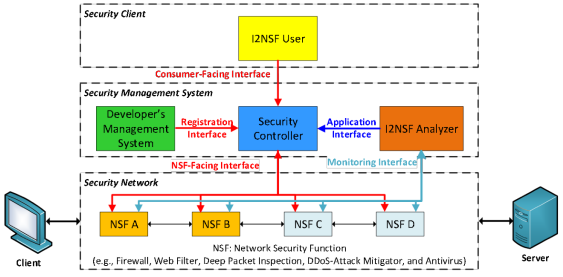
Researchers:

- Jinyong Kim (SKKU)
- Jung-Soo Park (ETRI)
- Yunchul Choi (ETRI)

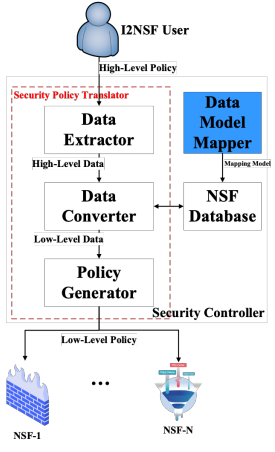
Students:

- Patrick Lingga (SKKU)
- Jeonghyeon Kim (SKKU)
- Mose Gu (SKKU)
- Yoseop Ahn (SKKU)
- Xiaohong Yu (SKKU)
- Kyungsik Kim (KNU)

I2NSF Framework



I2NSF Security Policy Translator



Where to get Code and Demo Video Clip

- Github – Source Code
  - ✓ https://github.com/jaehoonpaul/i2nsf-framework
- Youtube – Demo Video Clip
  - ✓ https://youtu.be/dAA1WTGhlXE

What to pull down to set up an environment

- OS: Ubuntu 16.04 LTS
- ConfD for NETCONF: 6.6 Version
- Jetconf for RESTCONF
- OpenStack: Queens version
- NSF: Suricata

Manual for Operation Process

- I2NSF-Manual-Hackathon-IETF110-v1.md contain detailed description about operation process. (It can be found in the GitHub)

Contents of Implementation

- Cloud-based Security Service System using I2NSF Framework
  - ✓ Web-based I2NSF User
  - ✓ Console-based Security Controller
  - ✓ Console-based Developer's Management System
  - ✓ I2NSF Framework in OpenStack NFV Environment
  - ✓ I2NSF Capability YANG Data Model
  - ✓ Registration Interface via NETCONF/YANG
  - ✓ Consumer-Facing Interface via RESTCONF/YANG
  - ✓ NSF-Facing Interface via NETCONF/YANG
  - ✓ Monitoring Interface via NETCONF/YANG
  - ✓ Web-based NSF Monitoring
  - ✓ Application Interface as Feedback from I2NSF Analyzer
- Network Security Functions
  - ✓ Firewall and Web-filter using Suricata
- Advanced Function
  - ✓ Security Policy Translation with Automatic Data Model Mapper
  - ✓ Security Policy Provisioning

성균관대학교 SUNG KYUN KWAN UNIVERSITY | ETRI | openstack. | ConfD tail-f a Cisco company | SURICATA

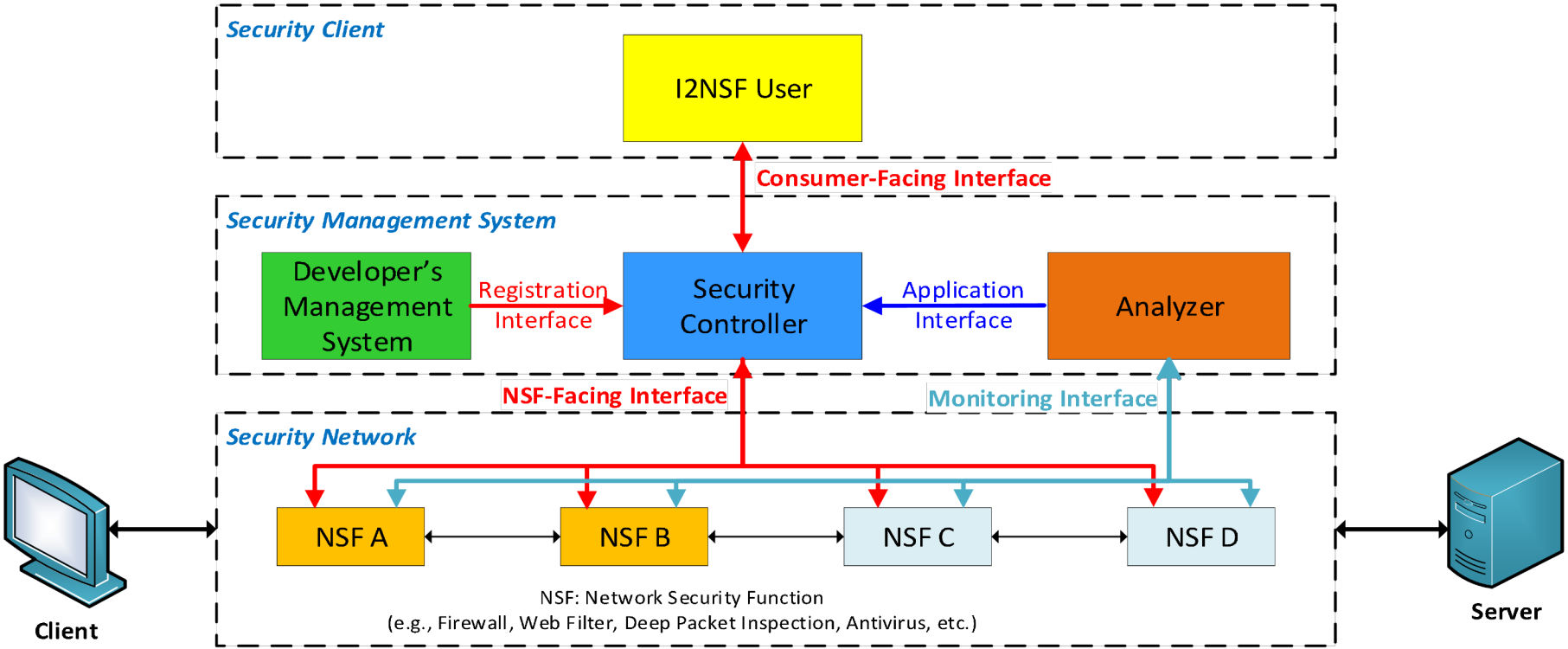
Hackathon Plan (1/2)

- The Implementation of the Internet Drafts for the I2NSF System for Cloud-based Security Services:
  - draft-ietf-i2nsf-capability-data-model-16
  - draft-ietf-i2nsf-consumer-facing-interface-dm-13
  - draft-ietf-i2nsf-nsf-facing-interface-dm-12
  - draft-ietf-i2nsf-registration-interface-dm-10
  - draft-ietf-i2nsf-nsf-monitoring-data-model-08
  - draft-yang-i2nsf-security-policy-translation-08
  - draft-jeong-i2nsf-security-management-automation-01

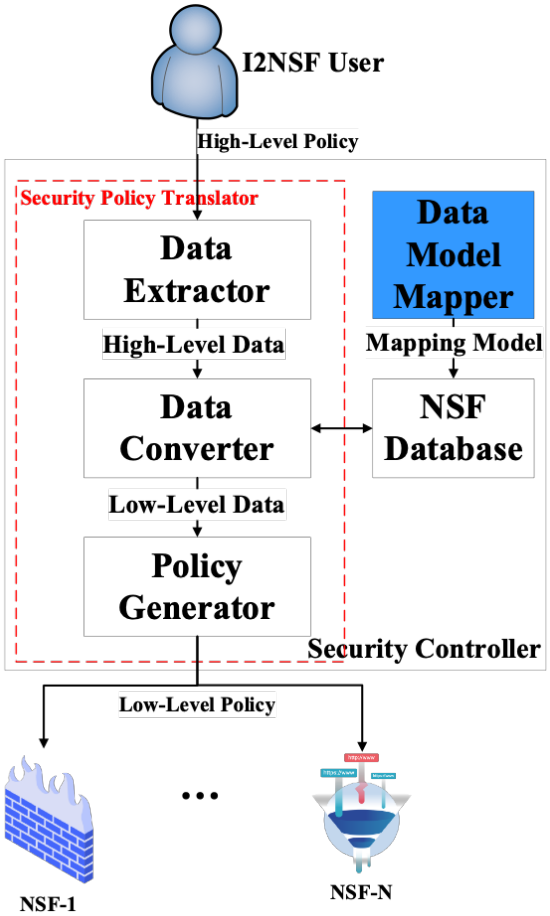
- Automatic Data Model Mapper for the I2NSF Security Policy Translator.

- Real-time Monitoring Data Visualization via Web-Based Monitoring.

Hackathon Plan (2/2)



What got done



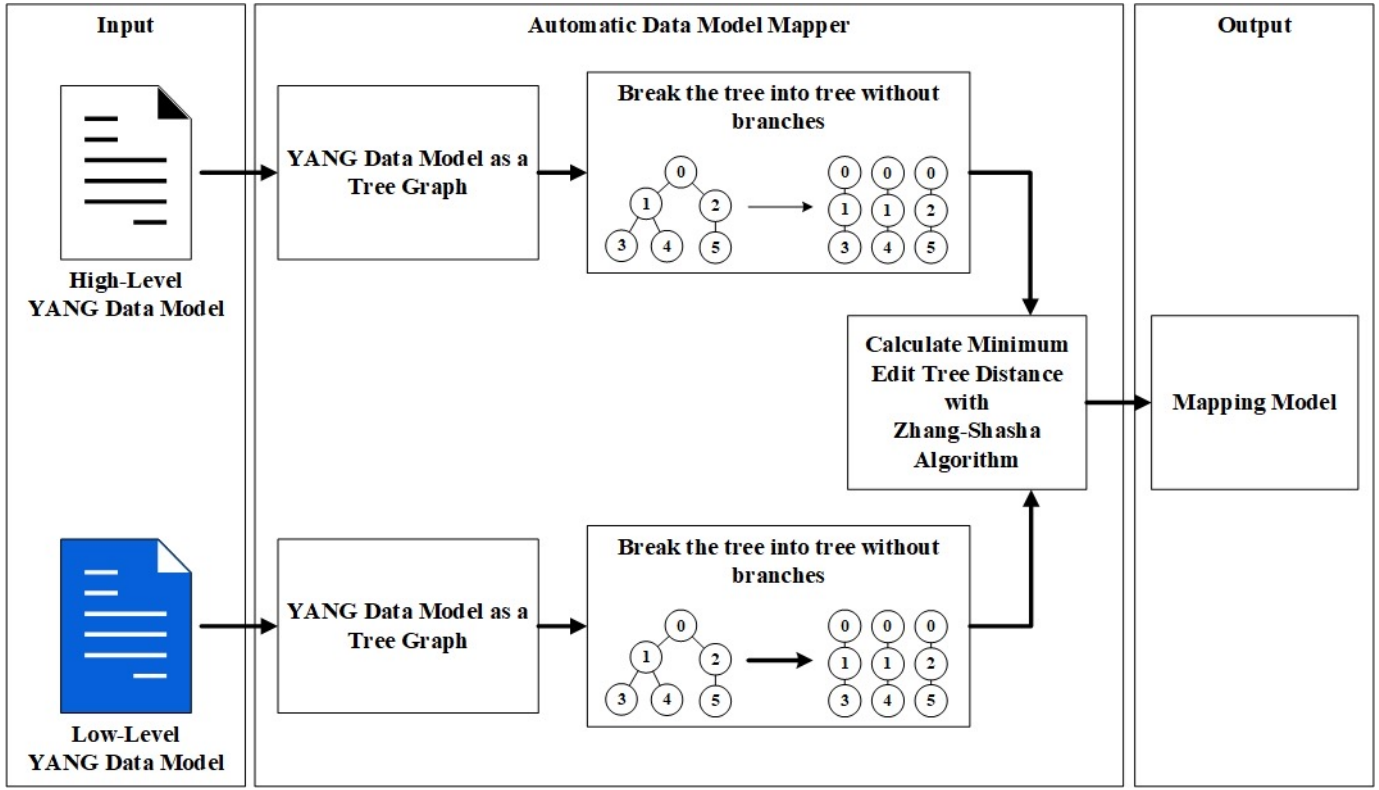
- The overall architecture of our scheme consists of five components:
  - Data Extractor
  - Data Converter
  - NSF Database
  - Policy Generator
  - Data Model Mapper
- Automatic Data Model Mapper
  - Data Model Mapper provides an automatic mapping between the high-level and low-level data models.

Task 1: Automatic Data Model Mapper

- Key Idea: We use Zhang-Shasha algorithm to calculate the Tree Edit Distance between the high-level YANG tree and the low-level YANG tree.

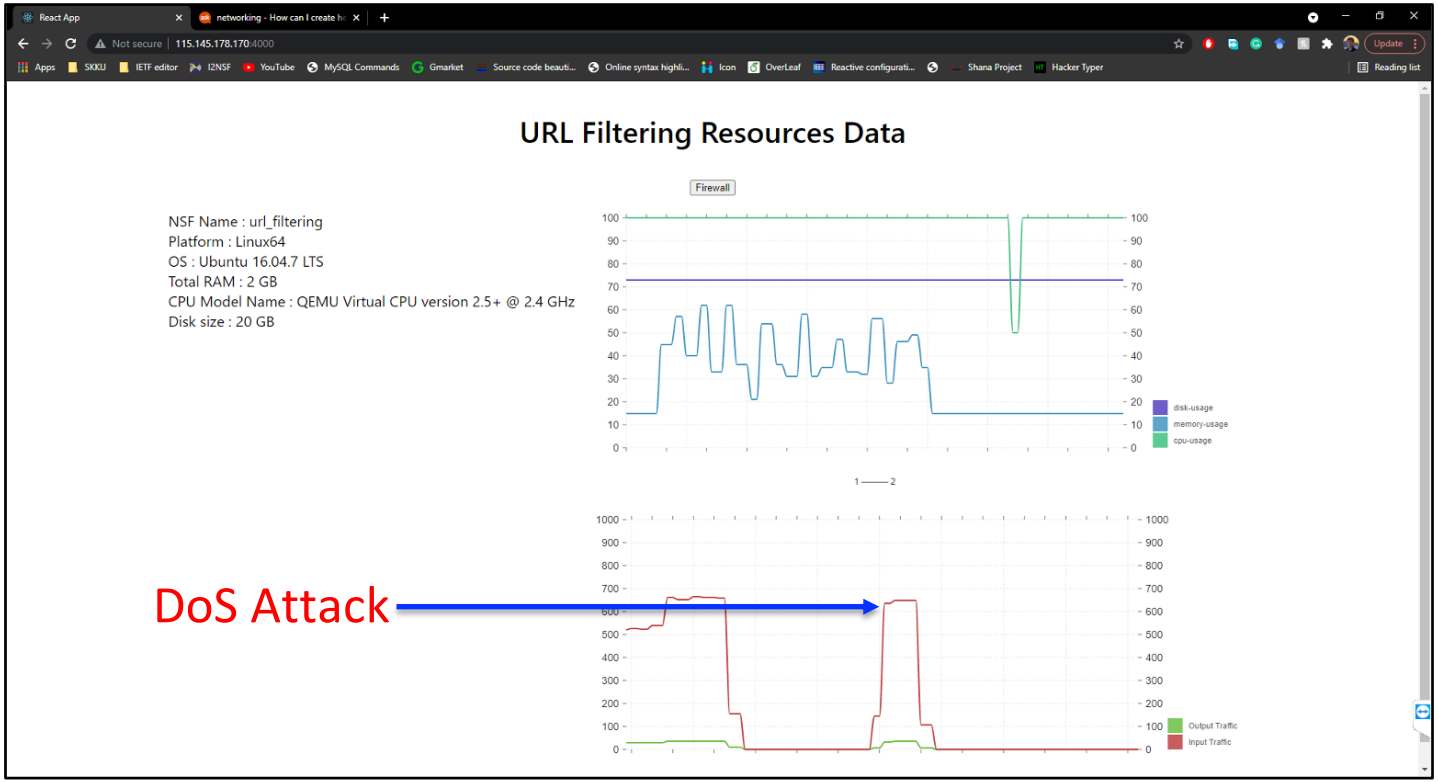
Consumer-Facing Interface Data Model

NSF-Facing Interface Data Model



Task 2: Real-time Monitoring Data Visualization

- We visualize the utilization of resources (i.e., disk, memory, and CPU) and the volume of input and output data traffic to detect a security attack (e.g., DoS attack).



What we learn

- The Security Policy Translator can automatically translate a high-level security policy into the corresponding low-level security policy with the help of an automatic data model mapper.

- The monitoring data visualization can support the monitoring of multiple NSFs in real time in terms of resources and traffic.

- This monitoring data visualization will be useful to perform the analysis of an NSF's behavior (e.g., security attack detection).

Next Step

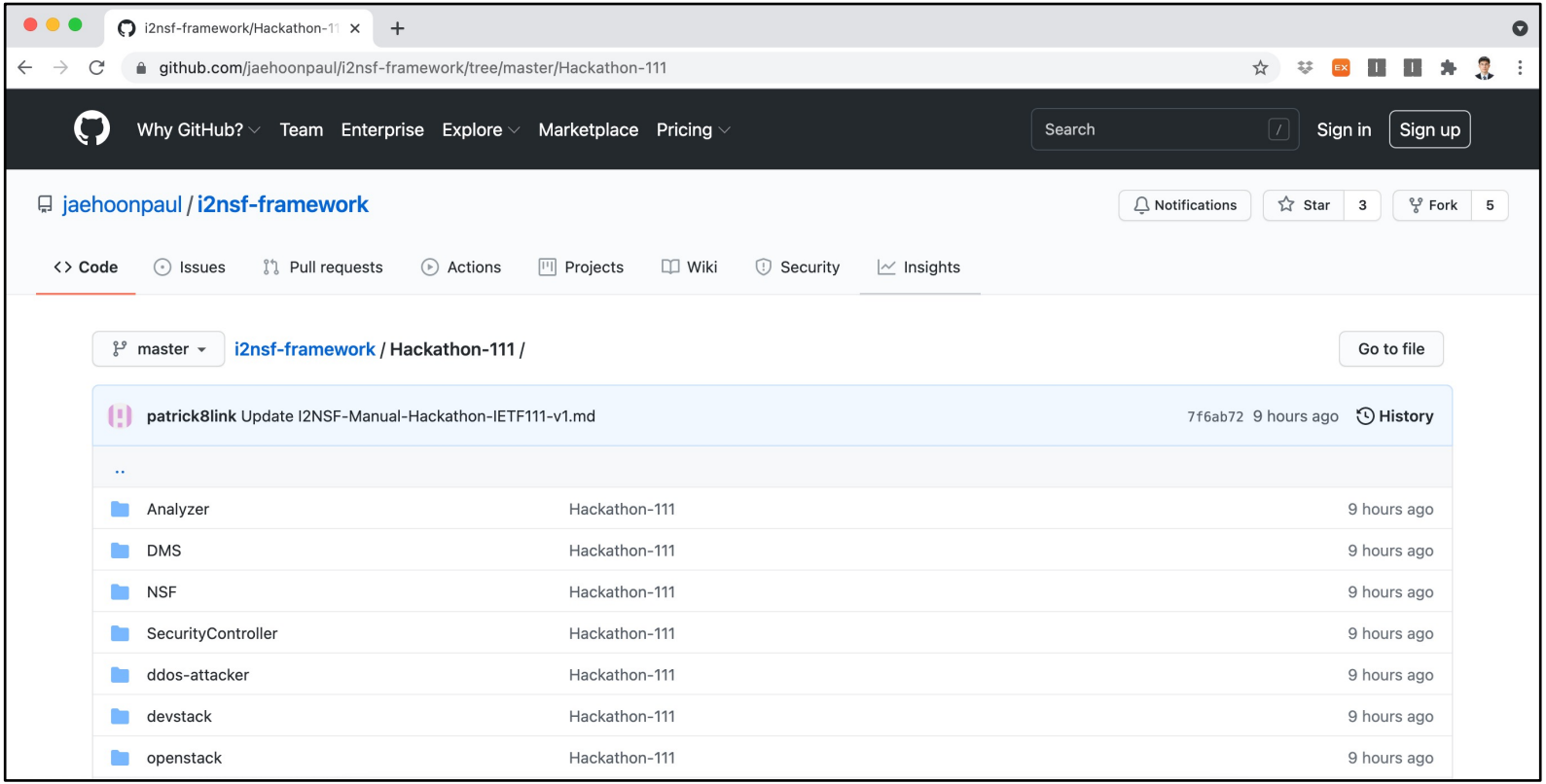
- Security Policy Translator needs to be improved with Context-Free Grammar Auto-Construction for Policy Generator.

- Improvement of I2NSF Analyzer with Machine Learning to update and create a security policy.

- Migration from VNF-based Virtualization to Container-based Virtualization for the I2NSF Framework

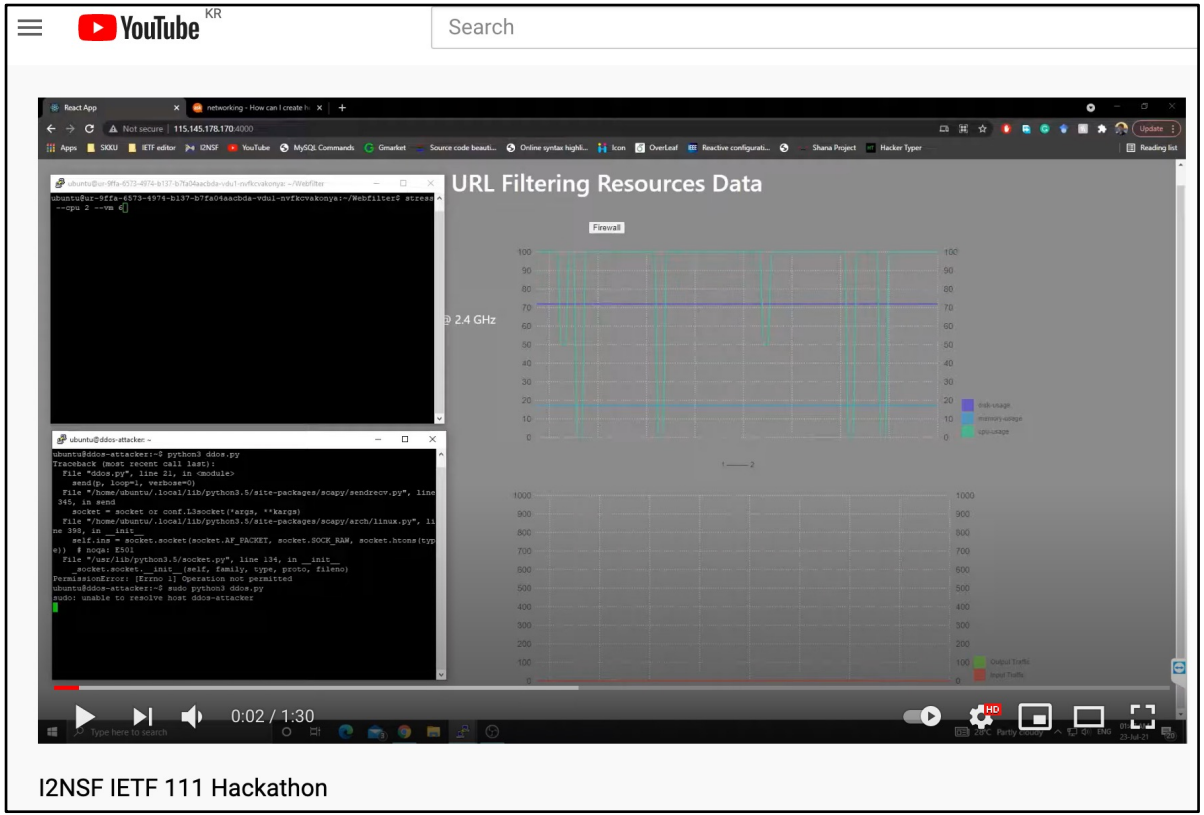
Open Source Project at Github

- URL: https://github.com/jaehoonpaul/i2nsf-framework



Demo Video Clip at YouTube

- URL: https://youtu.be/gHzZKpJ9zak



Wrap Up

Hackathon Team

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Our I2NSF Hackathon Team worked with IPWAVE and BMWG Hackathon Teams in the Westin Josun Busan Hotel in Korea this hackathon week.

Sponsors


NRF
National Research
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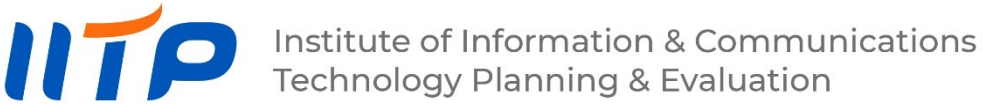
IITP
Institute of Information & Communications
Technology Planning & Evaluation


TTA
한국정보통신기술협회
Telecommunications Technology Association


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IETF Korea Hackathon Teams