Report for I2NSF Framework Project
@ IETF-103 Hackathon

IETF 103, Bangkok
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Champion: Jaehoon Paul Jeong
pauljeong@skku.edu
Sungkyunkwan University
IETF-103 I2NSF Hackathon Project
Winner Award in IETF-103 Hackathon
(One of 3 teams selected among 21 teams)
IETF-103 Hackdemo Happy Hour
**I2NSF Framework: What Did We Do This Time?**

- **I2NSF: Data-Driven Security Policy Enforcement**
  - We implemented **I2NSF Framework** on top of **OpenStack** with **NFV Reference Architecture**.

- This work is an **Open Source Project**!
  - 8 graduate students (Sungkyunkwan University) and 4 graduate students (Soongsil University)
  - 4 professors (Sungkyunkwan, Soongsil, and Chosun Universities)
  - 2 researchers (ETRI and KT Corporation)
  - Open Source Code on Github
    - [https://github.com/kimjinyong/i2nsf-framework/tree/master/Hackathon-103](https://github.com/kimjinyong/i2nsf-framework/tree/master/Hackathon-103)
Champion: Jaehoon Paul Jeong (SKKU)

Professors
- Jaehoon (Paul) Jeong (Sungkyunkwan)
- Hyoungshick Kim (Sungkyunkwan)
- Younghan Kim (Soongsil)
- Sangwon Hyun (Chosun)

Collaborators
- Jung-Soo Park (ETRI)
- Tae-Jin Ahn (Korea Telecom)

Students
- Jinyong (Tim) Kim
- Eunsoo Kim
- Dongjin Hong
- Tae-Kyun Roh
- Sarang Wi
- Seungjin Lee
- Jinhuyuk Yang
- Jaehong Jeong
- Hyunsik Yang
- Kyoungjae Sun
- Jaewook Oh
- Xianjun Hong

Where to get code
- Github – Source code
  - https://github.com/kimjinyong/i2nsf-framework

What to pull down to set-up environment
- OS: Ubuntu 14.04TL
- Confd for NETCONF: 6.2 Version
- Apache2: 2.4.7 Version
- MySQL: 14.14 Version
- PHP: 5.5.9 Version
- OpenStack: Networking-SFC, Tacker
- Jetconf: Python Open API for RESTCONF

Manual for Operation Process
- Detailed descriptions about operation process in README.txt (can be found in the VM image)

Contents of Implementation
- I2NSF Framework for provisioning Network Security Functions (NSFs)
  - Consumer-Facing Interface via RESTCONF/YANG
  - NSF-Facing Interface via NETCONF/YANG
  - Registration Interface via NETCONF/YANG
  - I2NSF Framework in NFV Environment using OpenStack (New Feature)
- Network Security Functions
  - Firewall using SDN and Suricata
  - Mail-filter and Web-filter using Suricata
- Advanced Functions
  - Security Policy Translation
  - I2NSF Policy Provisioning
  - NSF-triggered Traffic Steering using OpenStack Networking-SFC (New Feature)
Goal of IETF-103 I2NSF Framework Project

- **Integration of IETF I2NSF Framework and ETSI NFV Reference Architecture**
  
  1. **Design** of I2NSF Framework in NFV Reference Architecture
  
  2. **Dynamic Creation** of Virtual NSFs according to Security Policy using OpenStack Tacker
  
  3. **Service Function Chaining** for Traffic Steering using OpenStack Networking-SFC
Limitations and Challenges of I2NSF Project

- **Limitations** of the Previous I2NSF Open Source
  - The I2NSF Framework was implemented in Mininet for Proof of Concept (POC).
  - So, it could not be used in the real world.

- **Challenges** of I2NSF Framework Project
  1. Design: How to place the elements of I2NSF Framework in NFV Environment (NFV-I2NSF)?
     - I2NSF User, Security Controller, Developer’s Management System, and Network Security Functions
  2. Dynamic Creation of Virtual NSFs in NFV-I2NSF
     - Procedure of Security Policy Translation and Enforcement
  3. Service Function Chaining in NFV-I2NSF
     - Traffic Steering Control for Security Policy in NFV-I2NSF
I2NSF Framework in NFV Reference Architecture

I2NSF Framework

1. Consumer-Facing Interface
2. Registration Interface
3. NSF-Facing Interface

NFV Orvchestrator (NFVO)

VNF Manager(s) (VNFM)

Virtualized Infrastructure Manager(s) (VIMs)

NFVI

Virtualization Layer

Compute Virtualization
Storage Virtualization
Network Virtualization

Compute
Storage
Network
Infrastructure

I2NSF User (OSS/BSS)

Security Controller (EM)

Developer's Management System (EM)
I2NSF Framework in NFV Reference Architecture:
NFV-I2NSF System

- Management Subjects and Objects in NFV-I2NSF
  - Network Service Provider
    - I2NSF User, Security Controller, NSFs, and NFV MANO
  - NSF Vendors
    - Developer’s Management System

I2NSF User run by Network Service Provider

Security Controller

EM

Registration interface

Developer’s Mgmt System

EMs

Ve-Vnfm interface

NSF

VNFs

run by NSF vendors

run by Network Service Provider

OSS/BSS

NFV MANO Stack

Run by NSF Vendors
I2NSF Operations in NFV-I2NSF System

- Procedure of Security Policy Enforcement in NFV-I2NSF System (Case: NSF is De-activated in NFV)

I2NSF User → Security Controller → Developer’s Mgmt VNFM → NSF

High-level policy request

Translation: Data Conversion

Case 2: NSFs Available (De-activated)

NSF initiation Request (Registration Interface)

Low-level policy request

Translation: Policy Generation

NSF initiation Response (Ve-Vnfm) (with NSF info)

NSF initiation Request (Ve-Vnfm)

NSF initiation Response (Registration Interface)

Low-level policy response

High-level policy response
Cloud-Based Security Service System

- **NFV-I2NSF Framework** for Security Services (e.g., Time-Based Firewall, Web Filter, and Attack Mitigator).
Network Topology of this Hackathon Project

- **NFV-I2NSF Framework** for Time-Based Firewall and Web Filter works in the network below.
Proof of Concept (POC) of I2NSF Framework
- I2NSF Interfaces (Consumer-Facing, NSF-Facing, and Registration Interface)
- I2NSF Security Policy Translator

Design and Implementation of I2NSF in NFV
- Design of I2NSF Framework in NFV
- Dynamic Creation of Virtual NSFs
- Service Function Chaining for Traffic Steering

Hands-on Experience of OpenStack
- Dynamic NSF Creation: Tacker
- SFC-based Traffic Steering: Networking-SFC
Hackathon at IETF-Korea

➢ Preparation for IETF-103 Hackathon
Appendix

- Hackathon Development Environment
- Open-Source Depository of I2NSF Project
- Demonstration Video Clip of I2NSF Project
## Build Environment

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<tbody>
<tr>
<td>1. OS</td>
<td>Ubuntu 14.04 TL</td>
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<tr>
<td>2. ConfD</td>
<td>6.2 Version</td>
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<td>3. Apache2</td>
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<tr>
<td>5. OpenStack</td>
<td>Networking-SFC, Tacker</td>
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<tr>
<td>6. Suricata</td>
<td>3.2.1 RELEASE</td>
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<tr>
<td>7. Jetconf</td>
<td>Python Open API for RESTCONF</td>
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</tbody>
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Open-Source Depository of I2NSF Project

Github for I2NSF Framework Project

- Documents and Source Code
  https://github.com/kimjinyong/i2nsf-framework/tree/master/Hackathon-103

- kimjinyong / i2nsf-framework

Branch: master

i2nsf-framework / Hackathon-103 /

Latest commit 2fbd62 Nov 3, 2018

- KyleOh Uploaded Security Controller Files

- DMS/Developer-mgmt-system
  Uploaded DMS Files
  Nov 3, 2018

- NSF
  Uploaded NSF Files
  Nov 3, 2018

- SecurityController
  Uploaded Security Controller Files
  Nov 3, 2018

- VNFM
  Uploaded VNFD
  Nov 3, 2018

- README.md
  Added Hackathon 103
  Nov 3, 2018
Demonstration Video Clip of I2NSF Project

Youtube for I2NSF Framework Project

- https://youtu.be/2fTzrDRVqsg

IETF 103 - I2NSF Hackathon