I2NSF Framework Project @ IETF-103 Hackathon



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Sungkyunkwan University

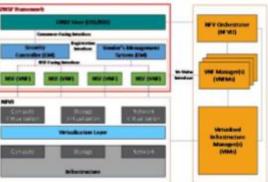
I2NSF Framework: What Did We Do This Time?

- ❖I2NSF: <u>Data-Driven</u> 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/i2nsfframework/tree/master/Hackathon-103

IETF I2NSF (Interface to Network Security Functions) Working Group: I2NSF Framework Project Champion: Jaehoon Paul Jeong (SKKU)



12NSF Architecture in NFV Reference



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
- MvSQL: 14.14 Version
- PHP: 5.5.9 Version
- OpenStack: Networking-SFC, Tacker
- Jetconf: Python Open API for RESTCONF

Professors

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

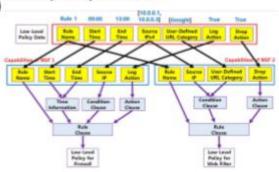
Collaborators

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

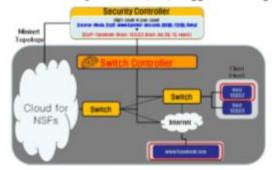
Students

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

Security Policy Translation



Network Security Functions (NSF) -Triggered Steering



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)









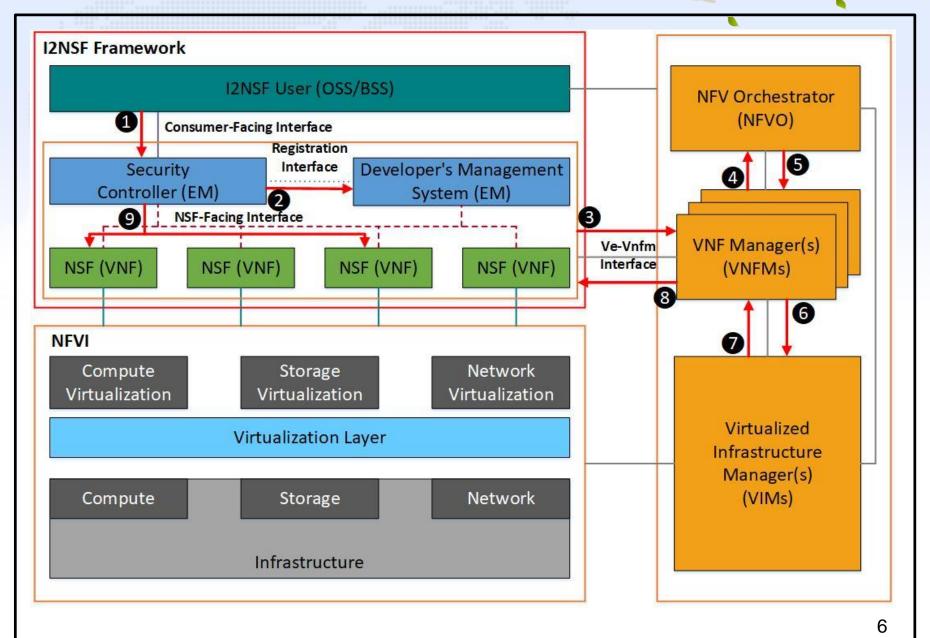
Goal of IETF-103 I2NSF Framework Project

- **❖ Integration of IETF I2NSF Framework and ETSI NFV Reference Architecture**
 - 1. <u>Design</u> of I2NSF Framework in NFV Reference Architecture
 - 2. <u>Dynamic Creation</u> of Virtual NSFs according to Security Policy using OpenStack Tacker
 - 3. <u>Service Function Chaining</u> 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 <u>I2NSF Framework in NFV Environment</u> (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

12NSF Framework in NFV Reference Architecture



12NSF 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 run by network run by NSF vendors run by network service provider service provider OSS/BSS I2NSF User **EMs EM** NFV Developer's Security Registration Ve-Vnfm MANO interface **Mgmt System** Controller interface Stack **NSF VNFs**

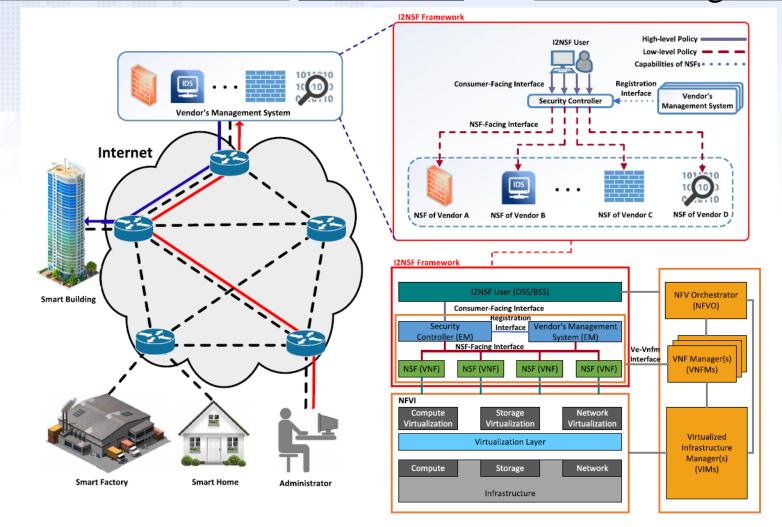
I2NSF Operations in NFV-I2NSF System

Procedure of Security Policy Enforcement in NFV-I2NSF System (Case: NSF is De-activated in NFV) **I2NSF** Security Developer's **VNFM NSF** Controller User Mgmt High-level policy request **Translation: Data Conversion** Case 2: NSFs Available (De-activated) **NSF** initiation Request (Registration Interface) **NSF** initiation Request (Ve-Vnfm) **NSF** initiation NSF initiation Response (with NSF info) (Ve-Vnfm) **NSF** initiation Response (Registration Interface) **Translation: Policy Generation** Low-level policy request Low-level policy response High-level policy 8 response

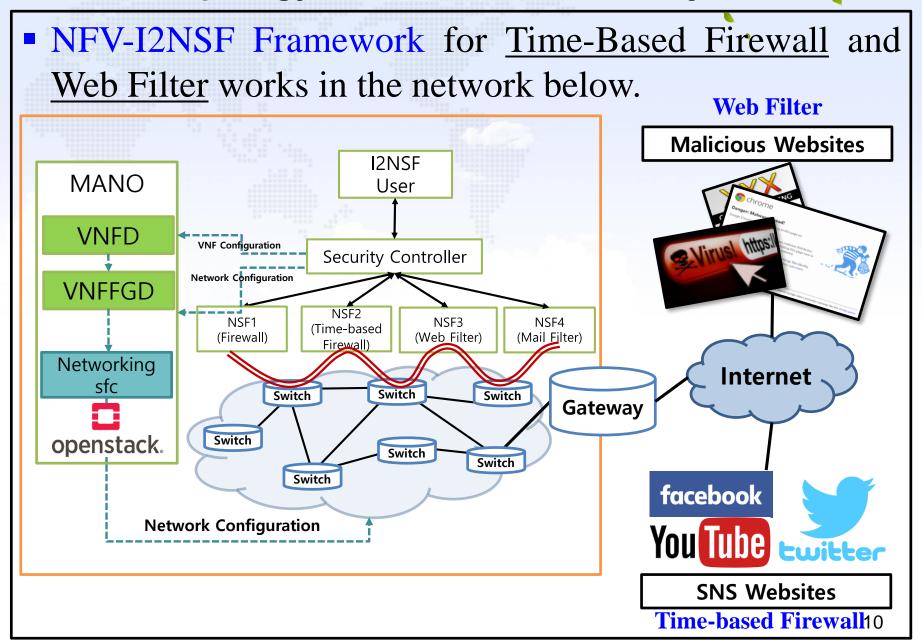
Cloud-Based Security Service System



■ NFV-I2NSF Framework for Security Services (e.g., Time-Based Firewall, Web Filter, and Attack Mitigator).



Network Topology of this Hackathon Project



Lessons from IETF-103 Hackathon

- > Proof of Concept (POC) of I2NSF Framework
 - **I2NSF Interfaces** (Consumer-Facing, NSF-Facing, and Registration Interface)
 - I2NSF <u>Security Policy Translator</u>
- Design and Implementation of I2NSF in NFV
 - <u>Design</u> 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

- Video clip of I2NSF Project

Hackathon Development Environment

Build Environment

- 1. **OS**
 - Ubuntu 14.04TL
- 2. ConfD
 - 6.2 Version
- 3. Apache2
 - 2.4.7 Version
- 4. MySQL
 - 14.14 Version
- 5. PHP
 - 5.5.9 Version







- - Networking-SFC, Tacker
- Suricata
 - 3.2.1 RELEASE
- **Jetconf**
 - Python Open API for **RESTCONF**





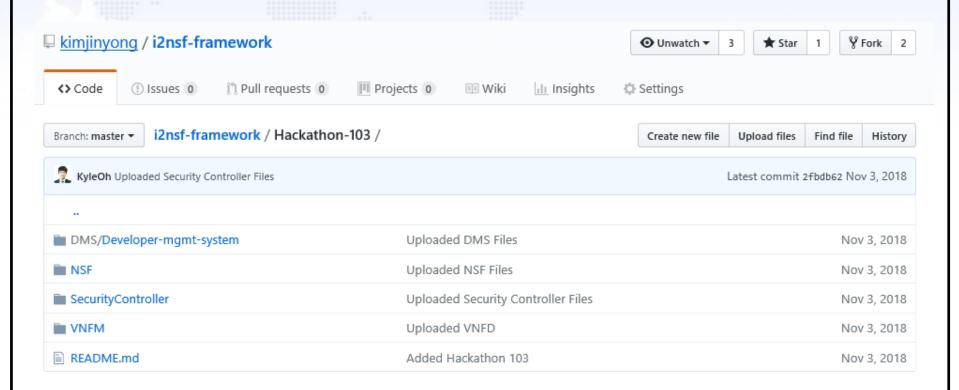


Open-Source Depository of I2NSF Project

Github for I2NSF Framework Project

Documents and Source Code

https://github.com/kimjinyong/i2nsf-framework/tree/master/Hackathon-103



Demonstration Video clip of I2NSF Project

Youtube for I2NSF Framework Project

https://www.youtube.com/watch?v=txkCmlgUvpc&feature=youtu.be

