NSF-Triggered Traffic Steering Framework
(draft-hyun-i2nsf-nsf-triggered-steering-02)

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Sangwon Hyun, Jaehoon Paul Jeong, SangUk Woo, YunSuk Yeo, and Jung-Soo Park
Introduction

Packet Forwarding with SFC

Our Proposal

Update of Version

Next Step
This document describes an architecture of the I2NSF framework to enable packet forwarding between NSFs. Such traffic steering enables composite inspection of network traffic through various types of NSFs. It can also provide load balancing over NSF instances combined with dynamic NSF instantiation with NFV.
Packet Forwarding with SFC

- Determination of the NSF path of a packet
- Re-classification for changing the existing path

**Classifier**

NSF includes
- Path Identifier
- Service Index

**SFF**

- Interpretation of the NSF path information
- Identification of the next NSF on the path
- Steering of the packet through the NSF path

NSF includes
- NSF payload
- Packet

NSF

- NSF1
- NSF2
SFC for I2NSF: Pros & Cons

- In I2NSF, the NSF path for a packet is dynamically constructed, not pre-determined.

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
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<tbody>
<tr>
<td>✓ Existing standard</td>
<td>✓ Re-classification overhead under the circumstance of <em>dynamic</em> and <em>frequent</em> change of NSF path</td>
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<tr>
<td>✓ Good for enforcing a static service function path</td>
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Our Proposal: Case 1 (Non-Caching in NSFF)

1. Capability-based packet forwarding request
   - PFH includes
     - Capability description

2. Query based on the Capability description

3. NSF’s information (e.g., NSF₂)
   NSF discovery

4. NSF₂’s IP address

PFH: Packet Forwarding Header
NSFF: NSF Forwarder
Our Proposal: Case 2 (Caching in NSFF)

Capability-based packet forwarding request

1. PFH includes - Capability description
2. Already knows the NSF with the required capability
3. NSF2’s IP address

Capability-based NSF discovery

Security Controller
Our Proposal: Conformance with SFC Architecture

I2NSF-SF (Service Function)

1. Capability-based packet forwarding request
   PFH includes:
   - Capability description

2. Already knows the NSF with the required capability
   NSF$_2$'s IP address

3. NSF$_2$'s IP address
   NSF$_1$ to NSF$_2$
   NSF$_2$ to NSF$_1$
   Capability-based NSF discovery
Our Proposal

• **Traffic Steering** by only the next hop-by-hop NSF’s identifier instead of the whole NSF path information.

• **Capability-based Packet Forwarding Request**
  – Each NSF can trigger an advanced security action for a suspicious packet.
  – The NSF adds the description of the capabilities required for the advanced action to the suspicious packet.

• **Capability-based NSF Discovery**
  – The NSFF sends a query of an NSF with the required security capabilities to the Security Controller.
  – The Security Controller finds a matching NSF and informs the NSFF of the found NSF.
Update of Version

- The changes from draft-hyun-i2nsf-triggered-steering-in-i2nsf-01:
  - Explanation of Packet Forwarding Header is polished concretely.
  - We specified the details of NSF Forwarding Information for capability-based NSF discovery.
Next Step

- Clarification of our Traffic Steering scheme under SFC Architecture
- Design of **PFH Format** to specify the capability of the next-hop SF
- Design and Implementation of a **YANG Data Model** for NSFF’s query of the next-hop SF toward the Security Controller with a given capability
Architecture & Components

I2NSF User

NSF Operation Manager

Network Operator Mgmt
Security Controller

Registration Interface

Developer's Mgmt System

NSF Facing Interface

NSFF

- Forwards packets from one NSF instance to another.
- Consults with NSF Operation Manager about the next NSF instance to forward a packet.

Security Client

Security Management

Security Network

NSFF

- NSF1
- NSF2
- NSF3
Architecture & Components

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**NSF Operation Manager**
- Maintaining the information of NSF instances.
  - NSF Profile
  - Forwarding information (i.e., IP, VxLAN etc.)
  - Capacity & load status
- Provides the forwarding information of the select NSF instance to NSFF.
- Requesting Developer's Management System for the dynamic instantiation or elimination.

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**NSF Facing Interface**
- NSF1
- NSF2
- NSF3

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**Registration Interface**

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**Instance Layer Interface**

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**Consumer Facing Interface**

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**Network Operator Mgmt Security Controller**
- NSF Operation Manager
- I2NSF User

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**Security Management**
- Security Client

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**Security Network**
- NSF1
- NSF2
- NSF3

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**NSFF**
- NSFF1
- NSFF2
Packet Forwarding Header (1)

- **Packet Forwarding Header** is used to forward a packet from one NSF to another for further inspection.

<Legend>
- : Logical connection line between NSFF and NSF
- : Traffic flow line
Packet Forwarding Header (2)

- Packet Forwarding Header is inserted between IP Header and IP Payload.

![Diagram showing the insertion of the Packet Forwarding Header between IP Header and IP Packet]
NSF Forwarding Information (1)

NSF_1 has no info of next NSF.

NSF Operation Manager

<Legend>
- : Logical connection line between NSFF and NSF
- : Packet flow line
- : NSF Facing Interface

Security Controller

Query Message

Response Message

NSFF

NSF_1

NSF_2
The NSF Forwarding Information consists of IPv4 address, IPv6 address, supported transport protocols, and location information.