I2NSF Data Model of Consumer-Facing Interface for Security Management

(draft-jeong-i2nsf-consumer-facing-interface-dm-00)

IETF 97, Seoul, Korea

November, 2016

Jaehoon Paul Jeong, Mahdi Daghmehchi (Presenter),
Tae-Jin Ahn, Rakesh Kumar, and Susan Hares

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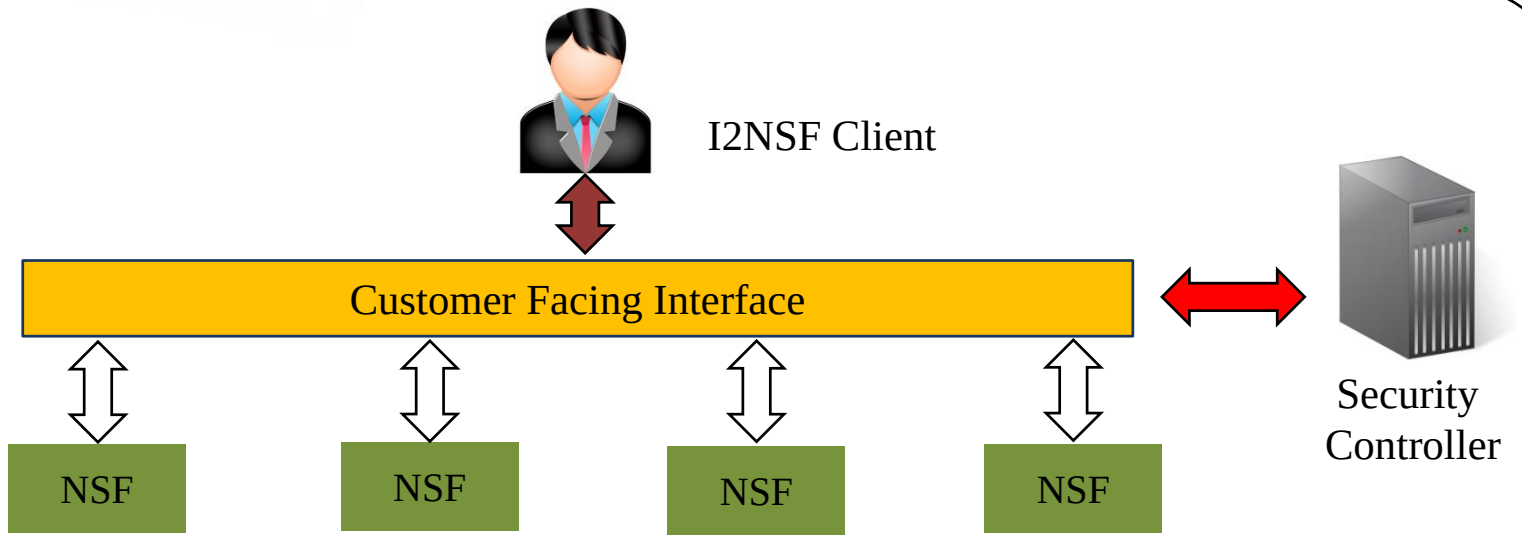
Introduction

- This document describes a data model for security management based on I2NSF framework by using NFV

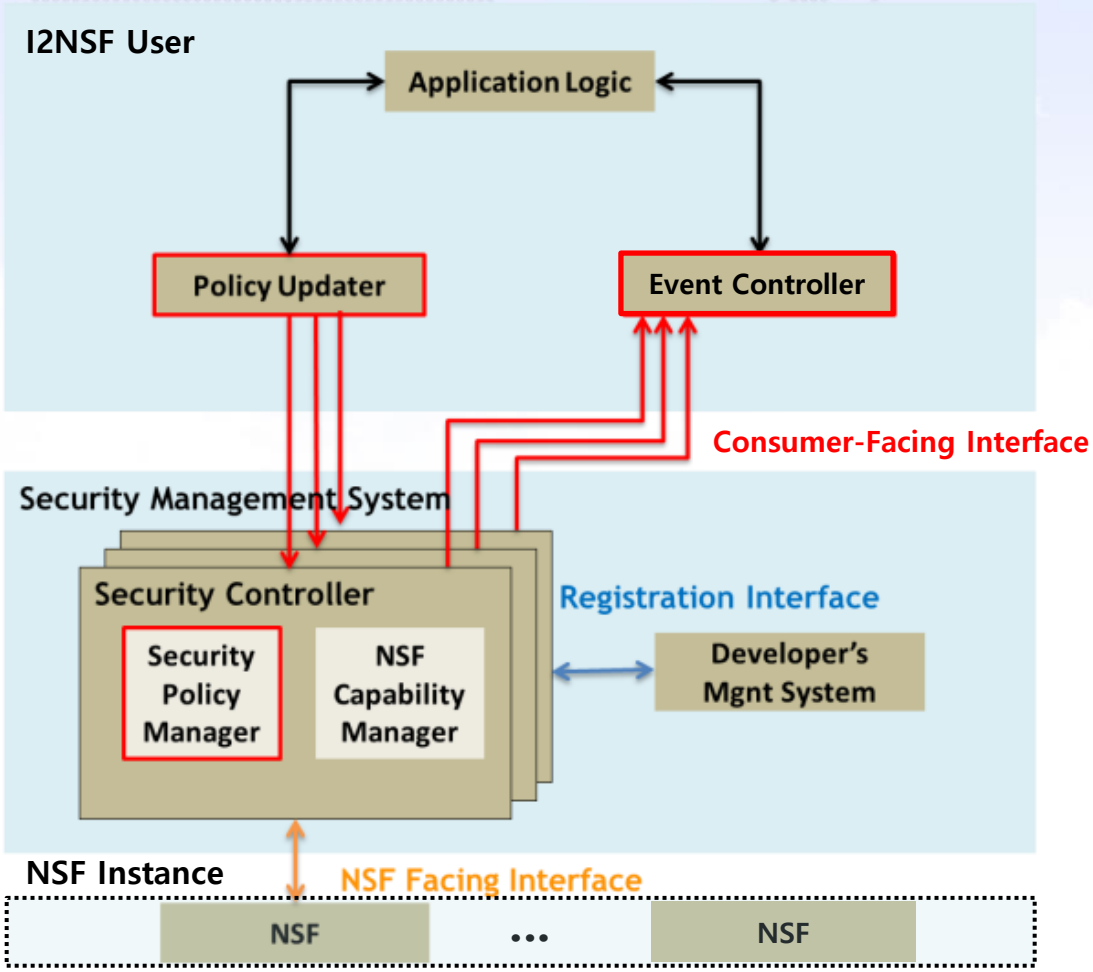
- A data model to perform VoIP-VoLTE security service

Motivation

- Defining high level policies and translate them to several low level policies
- Updating low level policies based on NSF capabilities
- Monitoring network's events and implementing security functions based on NFV
- Data modeling for I2NSF Customer-Facing Interface

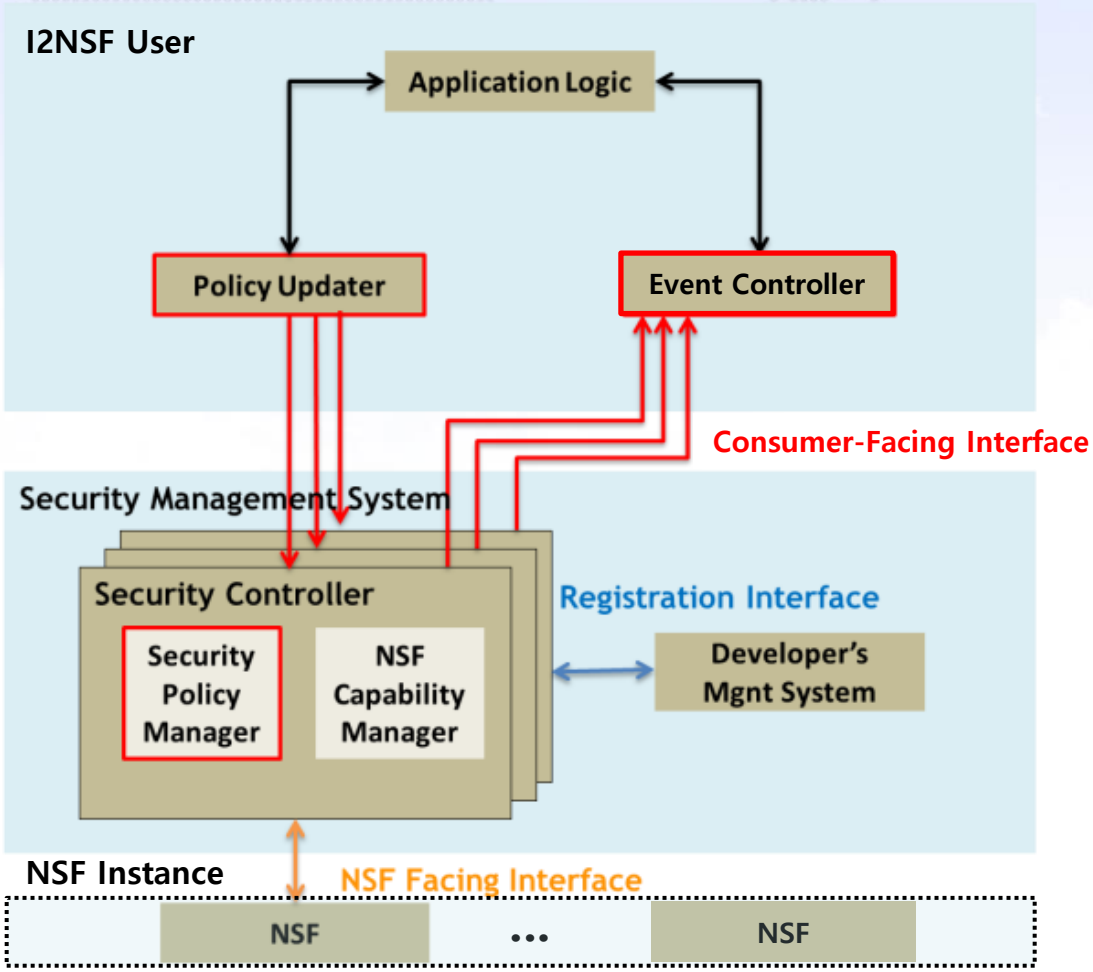


Security Management Architecture (1/3)



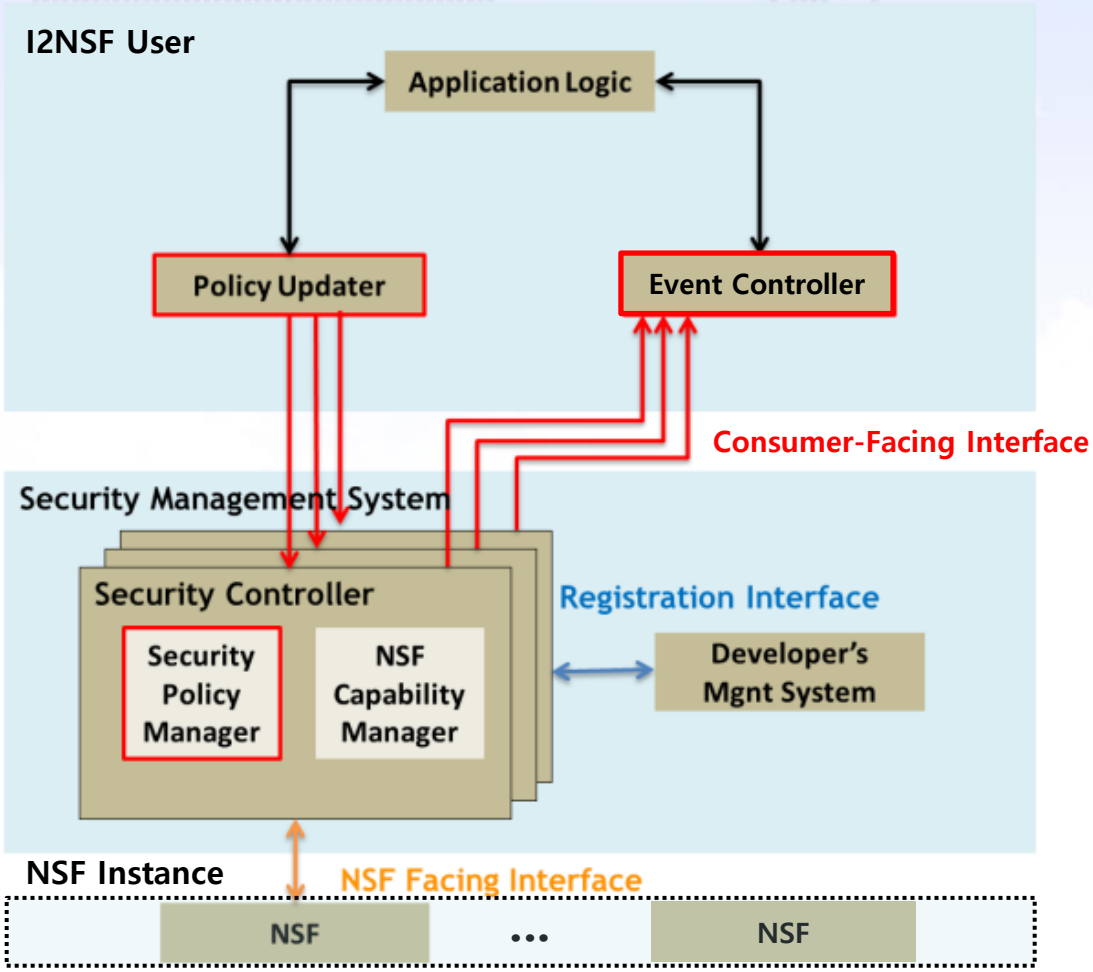
- **Application Logic**
  Generating high level security policies
- **Event Controller**
  Event monitoring and sending to Application logic
- **Policy Updater**
  Distributing high level policies to the Security Controller

Security Management Architecture (2/3)



- **Security Policy Manager**
  - Mapping high level policies into several low level policies
  - Delivering low level policies to NSF(s)
- **NSF capability manager**
  Storing the NSF's capability and sharing it with Security policy manager
- **Developer's Mgnt system**
  Registering new NSF's capabilities into NSF capability manager

Security Management Architecture (3/3)



- **NSF Instance**
  Exploiting low level policies delivered by the Security policy manager

Use Case: Security Management for VoIP-VoLTE Service

VoIP-VoLTE Security Management: Application Logic

- Defining security conditions
  (e.g., blacklists of IP addresses & source ports, expire time, user agents)
- Updating the illegal devices information (manually/automatically)
- Generating new high-level security policies
- Updating the VoIP-VoLTE database based on the NSF's anomalous detection

Information Model for Consumer-Facing Interface

Information Model for:

- Threat Prevention
  To reduce the attack surface (e.g., Botnet)
- Policy endpoint groups
  Where a security policy is to be applied
- Policy Instance
  A complete information for any policy instance (e.g., where/when a policy need to be applied)

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Data Modeling for VoIP-VoLTE Security Service (1/2)

High level policies basements:

- Blacklisting countries
- Time interval specification
- Caller's priority levels

The data model consists of:

- Policy life cycle management
- Policy rule
- Action

```
+--: (policy)
   +--rw policy-lifecycle  *(policy-lifecycle-id)
   |  +--rw policy-lifecycle-id uint 16
   |  +--rw expiration-event
   |  |  +--rw enabled boolean
   |  |  +--rw event-id  uint 16
   |  +--rw expiration-time
   |     +--rw enabled   boolean
   |     +--rw time      date-and-time
   +--rw policy-rule   *[policy-rule-id]
   |  +--rw policy-name  string
   |  +--rw policy-rule-id   uint 16
   |  +--rw service
   |  |  +--voip-handling  boolean
   |  |  +--volet-handling boolean
   |  +--rw condition  *[condition-id]
   |     +--rw condition-id uint 16
   |     +--rw caller
   |     |  +--rw caller-id  uint 16
   |     |  +--rw caller-location
   |     |     +--rw country   string
   |     |     +--rw city      string
   |     +--rw callee
   |     |  +--rw callee-id  uint 16
   |     |  +--rw callee-location
   |     |     +--rw country   string
   |     |     +--rw city      string
   |     +--rw valid-time-interval
   |        +--rw start-time   date-and-time
   |        +--rw end-time     date-and-time
   +--rw action
      +--rw (action-type)?
         +--: (ingress-action)
         |  +--rw permit?  boolean
         |  +--rw mirror?  boolean
         |  +--rw log?     boolean
         +--: (engress-type)
            +--rw redirection?   boolean
```

Data Modeling for VoIP-VoLTE Security Service (2/2)

Policy life cycle management
Specifies an expiration time and/or event to determine the life-time of the policy itself

Policy rule
Represents the specific information about a high-level policy
e.g., service types, conditions and valid time interval

Action
Specifies the actions which should be performed when a policy rule is matched by NSF

```
+--: (policy)
   +--rw policy-lifecycle  *(policy-lifecycle-id)
   |  +--rw policy-lifecycle-id uint 16
   |  +--rw expiration-event
   |  |  +--rw enabled boolean
   |  |  +--rw event-id  uint 16
   |  +--rw expiration-time
   |     +--rw enabled   boolean
   |     +--rw time      date-and-time
   +--rw policy-rule   *[policy-rule-id]
   |  +--rw policy-name  string
   |  +--rw policy-rule-id   uint 16
   |  +--rw service
   |  |  +--voip-handling  boolean
   |  |  +--volet-handling boolean
   |  +--rw condition  *[condition-id]
   |     +--rw condition-id uint 16
   |     +--rw caller
   |     |  +--rw caller-id  uint 16
   |     |  +--rw caller-location
   |     |     +--rw country   string
   |     |     +--rw city      string
   |     +--rw callee
   |     |  +--rw callee-id  uint 16
   |     |  +--rw callee-location
   |     |     +--rw country   string
   |     |     +--rw city      string
   |     +--rw valid-time-interval
   |        +--rw start-time   date-and-time
   |        +--rw end-time     date-and-time
   +--rw action
      +--rw (action-type)?
         +--: (ingress-action)
         |  +--rw permit?  boolean
         |  +--rw mirror?  boolean
         |  +--rw log?     boolean
         +--: (engress-type)
            +--rw redirection?   boolean
```

YANG Data Model for VoIP-VoLTE Security Service

```
//Groupings
grouping policy {

  list policy-lifecycle {
    key "policy-lifecycle-id";
    description
      "The ID of the policy lifecycle for each policy.
      This must be unique.";

    leaf policy-lifecycle-id {
      type uint16;
      mandatory true;
      description
        "This is policy lifecycle-id.";
    }

    container expiration-event {
      description
        "The event which makes the policy expired.";

      leaf enabled {
        type boolean;
        mandatory true;
        description
          "This represents whether the policy is
          enabled or disabled.";
      }

      leaf event-id {
        type uint16;
        mandatory true;
        description
          "The ID of the event. This must be unique.";
      }
    }
```

```
container service {
  description
    "The services which NSFs could perform to manage the
    security attacks.
    This consists of voip-handling and volte-handling.
    This will be extended in later version.";

  leaf voip-handling {
    type boolean;
    mandatory true;
    description
      "This field represents whether the policy contains
      handling the voip packet flow.";
  }

  leaf volte-handling {
    type boolean;
    mandatory true;
    description
      "This field represents whether the policy contains
      handling the volte packet flow.";
  }
}

list condition {
  key "condition-id";
  description
    "The ID of the condition. This must be unique.";

  leaf condition-id {
  type uint16;
  mandatory true;
  description
```

Next Step

- **Testing our YANG data model**
  Testing our YANG data model in our I2NSF Framework Code (used in IETF-97 I2NSF Hackathon)

- **Implementing more use cases**
  e.g., untrusted domain (malware distributer) detecting and access control function (time/location depended)