Interface to Network Security Functions (I2NSF)L. XiaInternet-DraftQ. LinIntended status: Standards TrackHuaweiExpires: April 24, 2019October 21, 2018

# I2NSF Security Policy Object YANG Data Model draft-xia-i2nsf-sec-object-dm-01

## Abstract

This document describes a set of policy objects which are reusable and can be referenced by variable I2NSF policy rules. And the YANG data models of these policy objects are provided.

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# Table of Contents

## **1**. Introduction

As described in [<u>RFC8329</u>], provisioning to NSFs can be standardized by using policy rules, and I2NSF uses Event-Condition-Action (ECA) model to represent policy rules. According to [I-D.ietf-i2nsf-terminology], an I2SNF condition is defined as a set of attributes, features, and/or values that are to be compared with a set of known attributes, features, and/or values in order to determine whether the set of actions in that I2NSF policy rules can be executed or not. Information Model of NSFs Capabilities [I-D.ietf-i2nsf-capability] describes attributes of different condition subclasses. When configuring I2NSF condition clause by attributes or features, it is common to see that the same value of an attribute or the same value set of several attributes are configured for many times. And modifications of the policy rules are also very tedious and time-consuming.

To facilitate the provisioning of NSF instances, this document describes a set of policy objects which are reusable. These policy objects can then be referenced in the condition clause of variable I2NSF policy rules. A policy object consists of a name attribute that identifies itself and one or several attributes that are typically used together to represent a certain condition. For example, protocol type and port number are usually used together to represent a certain service. Each policy object should be predefined

and named in order to be used in I2NSF policy rules. By defining policy objects, the creation and maintenance of policy rules are greatly simplified.

- o A policy object can be referenced in different policy rules as required to provide re-usability. And a policy rule can reference several policy objects.
- o The modification of a policy object will be propagated to the I2NSF policy rules that reference this object. No modification should be made to the related policy rules.

According to [I-D.ietf-i2nsf-terminology], there are two kinds of I2NSF policy rules, I2NSF Directly Consumable Policy Rule and I2NSF Indirectly Consumable Policy Rule. The former one can be executed by a network device without translating its content or structure, while the latter one can not be executed by a network device without first translating its content or structure. In this document, policy objects are defined for I2NSF directly consumable policy rules.

### **2**. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

## **3**. Terminology

This document uses the terms defined in [I-D.ietf-i2nsf-terminology] and [RFC7950].

## **<u>4</u>**. Tree Diagrams

Tree diagram defined in [RFC8340] is used to represent the policy objects defined in this document. The meaning of the symbols used in the tree diagrams of following sections and the syntax are as follows:

- o Groupings, offset by 2 spaces, and identified by the keyword "grouping" followed by the name of the grouping and a colon (":") character.
- o Each node in the tree is prefaces with "+--". Schema nodes that are children of another node are offset from the parent by 3 spaces.
- o Brackets "[" and "]" enclose list keys.

- o Abbreviations before data node names: "rw" means configuration (read-write) and "ro" means state data (read-only), and "-u" indicates the use of a predefined grouping.
- o Symbols after data node names: "?" means an optional node, "!" means a presence container, and "\*" denotes a "list" and "leaflist".
- o Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- o Curly brackets and a question mark "{...}?" are combined to represent the features that node depends on.

# 5. Policy Object

These document defines policy objects that are commonly used. Figure 1 shows all the defined policy objects and their relationships.

+							+
Policy Object							
+							+
++	++	++	++	+	+		I
Address	Service	Application	User	Secur	ity		
Group	Group	Group	Group	Group		+	+
++	++	++	++	+	+	Domai	in
						Objec	:t
			+	+		+	+
						l	
++	++	++	+	+	+	+	++
Address	Service	Application	Use	er	Time	Range	Region
Object	Object	Object	0bj	ject	Objec	ct	Object
++	++	++	+	+	+	+	++

Figure 1: The Policy Objects Overview

## 5.1. Address Object and Address Group

An address object is identified by a unique name, which contains a set of IPv4/IPv6 addresses or MAC addresses. Several address objects can be organized into an address group object.

This document defines groupings for address objects and address groups.

[Page 4]

```
The tree diagram of address object is:
grouping address-objects:
  +--rw address-object* [name]
    +--rw name
                                  address-set-name
    +--rw desc?
                                  string
    +--rw vpn-instance?
                                  string
    +--rw elements*
                      [elem-id]
       +--rw elem-id
                                  uint16
       +--rw (object-items)
           +--:(ipv4)
           | +--rw address-ipv4
                                  inet:ipv4-prefix
           +--:(ipv6)
           | +--rw address-ipv6
                                  inet:ipv6-prefix
           +--:(mac)
           | +--rw mac-address
                                  yang:mac-address
           +--rw mac-address-mask yang:mac-address
           +--:(ipv4-range)
           | +--rw start-ipv4
                                  inet:ipv4-address
           | +--rw end-ipv4
                                  inet:ipv4-address
           +--:(ipv6-range)
             +--rw start-ipv6
                                  inet:ipv6-address
             +--rw end-ipv6
                                  inet:ipv6-address
```

The tree diagram of address group is:

```
grouping address-groups:
+--rw address-group* [name]
+--rw name address-set-name
+--rw desc? string
+--rw vpn-instance string
+--rw elements* [elem-id]
+--rw elem-id uint16
+--rw addr-object-name address-set-name
```

## 5.2. Service Object and Service Group

A service object is a kind of service based on IP, or ICMP, or UDP, or TCP, or SCTP. Several related objects consist a service group. To identify different kinds of services, different kinds of attributes should be specified.

- UDP, TCP, or SCTP based service is recognized by port number. The source port number and destination port number are used to identify the sending and receiving service respectively.
- o ICMP or ICMPv6 based service is recognized by two header fields in the ICMP/ICMPv6 packets: type field and code field.

[Page 5]

```
Security Policy Object Data Model October 2018
Internet-Draft
  o IP based service is recognized by the value of the protocol field
     in IP packet header.
  Besides, a set of well-known services should be predefined by NSFs as
  service objects to support direct usage.
  The tree diagram of service object is:
  grouping service-objects:
    +--ro pre-defined-service* [name]
    +--ro name
                                   string
    +--ro session-aging-time
                                   uint16
    +--rw service-object* [name]
       +--rw name
                                   service-set-name
       +--rw session-aging-time
                                  uint16
       +--rw desc?
                                   string
       +--rw items* [id]
          +--rw id
                                   uint16
          +--rw (item)
             +--:(tcp-item)
             | +--rw tcp
                  +---u port-items
             +--:(udp-item)
             +--rw udp
                  +---u port-items
             +--:(sctp-item)
               +--rw sctp
                  +---u port-items
             +--:(icmp-item)
             +--rw (icmp-type)
                  +--:(name-type)
             1
                 +--rw icmp-name
                                          icmp-name-type
                  +--:(type-code)
             +--rw icmp-type-code
             +--rw icmp-type-number
                                                 uint8
             +--rw icmp-code-number
                                                 string
             +--:(icmp6-item)
               +--rw (icmp6)
             +--:(name-type)
                  | +--rw icmp6-name
                                      icmp6-name-type
             +--:(type-code)
             +--rw icmp6-type-code
             +--rw icmp-type-number
             uint8
                        +--rw icmp-code-number
                                                 string
             +--:(protocol-id)
                +--rw proto-id
                                            proto-id-range
```

```
Security Policy Object Data Model
The "port-items" grouping reuses "port-range-or-operator" grouping
defined in [I-D.ietf-netmod-acl-model].
grouping port-items:
  +--rw source-port
  +---u pf:port-range-or-operator
 +--rw dest-port
    +---u pf:port-range-or-operator
The tree diagram of service group is:
grouping service-groups:
 +--rw service-group* [name]
     +--rw name
                                  service-set-name
    +--rw desc?
                                  string
     +--rw items* [id]
       +--rw id
                                  uint16
        +--rw service-set-name
                                  service-set-name
```

October 2018

## **5.3.** Application Object and Application Group

Internet-Draft

Due to the diversity and large amount of applications, it is not able to identify a certain application based on protocol type and port number. For example, there are many web applications with different risk levels run on ports 80 and 443 using HTTP and HTTPS, such as web gaming application and web chat application. Protocol type and port number could not distinguish applications using the same application protocol. In this document, category, subcategory, data transmission model, and risk level are used to describe an application. A set of well-known application objects should be predefined in NSFs to support direct reference.

The tree diagram of application object is:

```
grouping application-objects:
  +--rw user-defined-application {user-defined-application}?
    +--rw application* [name]
        +--rw name
                                   string
        +--rw label*
                                   string
       +--rw data-model?
                                   string
       +--rw category?
                                   string
       +--rw subcategory?
                                   string
        +--ro risk-value?
                                   uint32
        +--rw desc?
                      string
       +--rw rule* [name]
           +--rw name
                                    string
           +--rw protocol?
                                    protocol
           +--rw signature
           | +--rw mode?
                                    mode
                                    direction
           +--rw direction?
           +--rw pattern-type?
                                    pattern-type
           | +--rw pattern?
                                    string
           | +--rw field?
                                    identityref
           +--rw ip-address*
                                inet:ip-prefix
           +--rw port*
                                inet:port-number
           +--rw desc?
                         string
  +--ro predefined-application
     +--ro application* [name]
        +--ro name
                                    string
        +--ro protocol*
                                    string
        +--ro risk-value?
                                    uint32
        +--ro label*
                                    string
        +--ro abandon?
                                    boolean
        +--ro multichannel?
                                    boolean
        +--ro data-model?
                                    string
        +--ro category?
                                    string
        +--ro subcategory?
                                    string
```

string

The tree diagram of application group is:

```
grouping application-groups:
```

+--ro desc?

```
+--rw application-group* [name]
   +--rw name
                                        string
   +--rw desc?
                                        string
   +--rw items* [id]
                                        uint16
     +--rw id
      +--rw application-object-name
                                        string
```

[Page 8]

#### User Object, User Group and Security Group 5.4.

A user object identifies a person who may access network resources. It is the basis of implementing user-based policy control. The user objects may be created locally on the NSFs, or be imported from third parties, such as authentication servers. User objects that require the same policy enforcement are grouped as user group objects or security group objects. The user group objects are organized as a hierarchical structure. A security group object consists of user objects from different user group objects that require the same policy enforcement.



Figure 2: Example of User, User Group and Security Group Structure The tree diagram of user object is:

```
October 2018
```

```
grouping user-objects:
  +--rw user-object* [name aaa-domain]
    +--rw name
                       user-name
    +--rw aaa-domain
                       string
    +--rw desc?
                       string
    +--rw password?
                       ianach:crypt-hash
    +--rw parent-user-group
                             user-group-name
    +--rw parent-security-group user-security-group-name
     +--rw expiration-time
      +--:(expiration-type)
     +--rw (never-expire)
     +--rw never-expire
          +--rw (expire-after-this-time)
     L
     +--rw expiration-time yang:date-and-time
    +--rw ip-mac-binding
       +--: (bind-state)
          +--rw (no-binding)
           +--rw no-binding
          +--rw (binding)
             +--rw bind-mode
                                  ip-mac-binding-type
             +--rw ip-binding*
                                  inet:ipv4-address
             +--rw mac-binding*
                                  yang:mac-address
             +--rw ip-mac-bindings [ip-binding]
                +--rw ip-binding
                                   inet:ipv4-address
                +--rw mac-binding yang:mac-address;
The tree diagram of user group is:
grouping user-groups:
  +--rw user-group* [name]
    +--rw name
                             user-group-name
    +--rw desc?
                             string
    +--rw parent-user-group user-group-name
The tree diagram of security group is:
grouping security-groups:
  +--rw security-group* [name]
    +--rw name
                                  user-security-group-name
    +--rw desc?
                                  string
    +--rw parent-security-group*? user-security-group-name
    +--rw filter-action
       +--:(filter-type)
          +--rw (static)
           | +--rw static
          +--rw (dynamic)
             +--rw dynamic
             +--rw filter-rule* string
```

## 5.5. Time Range Object

There are two kinds of time ranges: periodic time range and absolute time range. A periodic time range occurs every week. An absolute time range occurs only once.

The tree diagram of time range object is:

```
grouping time-range-objects:
 +--rw time-range-object* [name]
                        time-range-name
    +--rw name
    +--rw period-time* [start end]
    | +--rw start hour-minute-second
                        hour-minute-second
    | +--rw end
    +--rw weekday weekday
    +--rw absolute-time* [start end]
      +--rw start yang:date-and-time
       +--rw end yang:date-and-time
```

## 5.6. Region Object and Region Group

A region object is a set of public IP addresses that are assigned to a certain geographic location. A region group consists of a set of region objects.

The tree diagram of region object is:

Xia & LinExpires April 24, 2019[Page 11]

```
grouping region-objects:
  +--ro pre-defined-region* [name]
  | +--ro name
                            region-name
    +--ro desc?
                            string
    +--ro region-ipv4-address
    | +--ro address-ipv4*
                            inet:ipv4-prefix
      +--ro address-ipv4-range* [start-ipv4 end-ipv4]
    +--ro start-ipv4 inet:ipv4-address
    +--ro end-ipv4
                            inet:ipv4-address
    +--ro region-ipv6-address {support-ipv6-address}?
  L
       +--ro address-ipv6* inet:ipv6-prefix
       +--ro address-ipv6-range* [start-ipv6 end-ipv6]
          +--ro start-ipv6 inet:ipv6-address
          +--ro end-ipv6
                            inet:ipv6-address
  +--rw user-defined-region* [name]
    +--rw name
                            region-name
    +--rw desc?
                            string
    +--rw coordinate
    | +--rw longitude
                            region-longitude
    | +--rw latitude
                            region-latitude
    +--rw region-ipv4-address
      +--rw address-ipv4*
                            inet:ipv4-prefix
     +--rw address-ipv4-range* [start-ipv4 end-ipv4]
     L
          +--rw start-ipv4 inet:ipv4-address
     +--rw end-ipv4
                            inet:ipv4-address
     +--rw region-ipv6-address {support-ipv6-address}?
       +--rw address-ipv6* inet:ipv6-prefix
       +--rw address-ipv6-range* [start-ipv6 end-ipv6]
          +--rw start-ipv6 inet:ipv6-address
          +--rw end-ipv6
                            inet:ipv6-address
The tree diagram of region group is:
```

grouping region-groups: +--rw region-group\* [name] +--rw name region-name +--rw desc? string +--rw region-name\* region-name +--rw region-group-name\* region-name

## 5.7. Domain Object

The tree diagram of domain object is:

```
October 2018
```

```
grouping domain-objects:
+--rw domain-object* [name]
+--rw name domain-name
+--rw desc? string
+--rw domain* string
```

# 6. I2NSF Security Policy Object YANG Module

```
<CODE BEGINS> file "ietf-policy-object@2018-10-12.yang"
module ietf-policy-object {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-policy-object";
  prefix policy-object;
  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 6991 - Common YANG Data Types.";
  }
  import ietf-yang-types {
    prefix yang;
    reference
      "RFC 6991 - Common YANG Data Types.";
  }
  import iana-crypt-hash {
    prefix ianach;
    reference
      "RFC7317 - A YANG Data Model for System Management.";
  }
  import ietf-packet-fields {
    prefix pf;
    reference
      "draft-ietf-netmod-acl-model - Network Access Control List (ACL) YANG
Data Model.";
  }
  organization
    "IETF I2NSF (Interface To Network Security Functions) Working Group";
  contact
    "WG Web: <a href="http://tools.ietf.org/wg/i2nsf/">http://tools.ietf.org/wg/i2nsf/</a>
    WG List: i2nsf@ietf.org
    Editor: Liang Xia
            frank.xialiang@huawei.com
    Editor: Qiushi Lin
```

```
linqiushi@huawei.com";
```

```
description
```

"This YANG module defines groupings that are used by ietf-policy-object YANG module. Their usage is not limited to ietf-policy-object and can be used anywhere as applicable.";

```
revision 2018-10-12 {
   description "Initial version.";
    reference
     "draft-xia-i2nsf-sec-object-dm-01";
 }
 /*
  * Typedefs for address object and address group
 */
 typedef address-set-name {
   type string {
     length "1..63";
   }
   description
     "This type represents an address object or an address group name.";
 }
 /*
  * Typedefs for service object and service group
 */
 typedef service-set-name {
   type string {
     length "1..63";
   }
   description
     "This type represents a service object or a service group name.";
 }
 typedef port-range {
   type uint16;
   description
     "This type represents a port number, which may be a start port of a port
range or an end port of a port range.";
 }
 typedef proto-id-range {
    type uint8 {
     range "0..255";
   }
   description
      "This type represents the range of protocol id.";
```

}

typedef icmp-name-type {

Xia & LinExpires April 24, 2019[Page 14]

```
type enumeration {
 enum echo {
           description
      "ICMP type number 8, ICMP code number 0";
      }
 enum echo-reply {
           description
      "ICMP type number 0, ICMP code number 0";
      }
 enum fragmentneed-DFset {
           description
      "ICMP type number 3, ICMP code number 4";
      }
 enum host-redirect {
           description
      "ICMP type number 5, ICMP code number 1";
      }
 enum host-tos-redirect {
           description
      "ICMP type number 5, ICMP code number 3";
      }
 enum host-unreachable {
           description
      "ICMP type number 3, ICMP code number 1";
      }
 enum information-reply {
           description
      "ICMP type number 16, ICMP code number 0";
      }
 enum information-request {
           description
      "ICMP type number 15, ICMP code number 0";
      }
 enum net-redirect {
           description
      "ICMP type number 5, ICMP code number 0";
      }
 enum net-tos-redirect {
           description
      "ICMP type number 5, ICMP code number 2";
      }
 enum net-unreachable {
            description
      "ICMP type number 3, ICMP code number 0";
      }
 enum parameter-problem {
           description
      "ICMP type number 12, ICMP code number 0";
```

```
}
   enum port-unreachable {
             description
        "ICMP type number 3, ICMP code number 3";
        }
   enum protocol-unreachable {
              description
        "ICMP type number 3, ICMP code number 2";
        }
   enum reassembly-timeout {
              description
        "ICMP type number 11, ICMP code number 1";
        }
   enum source-quench {
              description
        "ICMP type number 4, ICMP code number 0";
        }
   enum source-soute-failed {
              description
        "ICMP type number 3, ICMP code number 5";
        }
   enum timestamp-reply {
              description
        "ICMP type number 14, ICMP code number 0";
        }
   enum timestamp-request {
              description
        "ICMP type number 13, ICMP code number 0";
        }
   enum ttl-exceeded {
              description
        "ICMP type number 11, ICMP code number 0";
        }
  }
 description
   "This type is an enumeration of ICMP type names.";
}
typedef icmp6-name-type {
  type enumeration {
   enum redirect {
              description
        "ICMPv6 type number 137, ICMPv6 code number 0";
        }
   enum echo {
              description
        "ICMPv6 type number 128, ICMPv6 code number 0";
        }
```

```
enum echo-reply {
          description
    "ICMPv6 type number 129, ICMPv6 code number 0";
    }
enum err-Header-field {
          description
    "ICMPv6 type number 4, ICMPv6 code number 0";
    }
enum frag-time-exceeded {
         description
    "ICMPv6 type number 3, ICMPv6 code number 1";
    }
enum hop-limit-exceeded {
         description
    "ICMPv6 type number 3, ICMPv6 code number 0";
    }
enum host-admin-prohib {
          description
    "ICMPv6 type number 1, ICMPv6 code number 1";
    }
enum host-unreachable {
          description
    "ICMPv6 type number 1, ICMPv6 code number 3";
    }
enum neighbor-advertisement {
          description
    "ICMPv6 type number 136, ICMPv6 code number 0";
    }
enum neighbor-solicitation {
          description
    "ICMPv6 type number 135, ICMPv6 code number 0";
    }
enum network-unreachable {
          description
    "ICMPv6 type number 1, ICMPv6 code number 0";
    }
enum packet-too-big {
          description
    "ICMPv6 type number 2, ICMPv6 code number 0";
    }
enum port-unreachable {
          description
    "ICMPv6 type number 1, ICMPv6 code number 4";
    }
enum router-advertisement {
          description
    "ICMPv6 type number 134, ICMPv6 code number 0";
    }
```

```
enum router-solicitation {
              description
        "ICMPv6 type number 133, ICMPv6 code number 0";
        }
    enum unknown-ipv6-opt {
              description
        "ICMPv6 type number 4, ICMPv6 code number 2";
        }
    enum unknown-next-hdr {
              description
        "ICMPv6 type number 4, ICMPv6 code number 1";
        }
  }
  description
    "This type is an enumeration of ICMPv6 type names.";
}
/*
* Typedefs for application object and application group
*/
typedef protocol {
  type enumeration {
    enum tcp {
              description
        "tcp protocol";
        }
    enum udp {
              description
        "udp protocol";
        }
    enum any {
              description
        "any protocol";
        }
  }
  description
    "The protocol of user-defined application rule:tcp/udp/any.";
}
typedef mode {
  type enumeration {
    enum flow {
              description
        "Keyword exists in multiple packets";
        }
    enum packet{
              description
        "Keyword exists in one packet";
```

```
Security Policy Object Data Model October 2018
Internet-Draft
          }
    }
    description
      "The mode of keyword identification to identify user-defined
applications. If the keyword exists in one packet, the mode is Packet. If the
keyword exists in multiple packets, the mode is Flow.";
 }
  typedef direction {
    type enumeration {
     enum request {
        description
          "Request indicates that data to the server is monitored to detect
applications.";
      }
     enum response {
        description
          "Response indicates that data from the server is monitored to detect
applications.";
     }
     enum both {
        description
          "Both indicates that data from and to the server is monitored to
detect applications.";
     }
    }
    description
      "The data flow direction that is monitored to identify user-defined
applications:request/response/both. Request indicates that data to the server
is monitored to detect applications, Response indicates that data from the
server is monitored to detect applications, and Both indicates that data from
and to the server is monitored to detect applications.";
 }
```

```
typedef pattern-type {
   type enumeration {
      enum regular {
        description
        "Regular indicates that the keyword of the match pattern is not a
   fixed string, it is represented by regular expression.";
     }
     enum plain {
        description
        "Plain indicates that the keyword of the match pattern is a fixed
   string.";
     }
   }
}
```

```
description
```
"The match pattern of the user-defined application rule. If the keyword is a fixed string, the pattern type is Plain. If the keyword is not a fixed string, the pattern type is Regular Expression."; } /\* \* Typedefs for user object, user group, and security group \*/ typedef user-name { type string { length "1..63";

Xia & Lin Expires April 24, 2019 [Page 19]

```
Security Policy Object Data Model
Internet-Draft
                                                      October 2018
    }
    description
     "This type represents a user name.";
  }
  typedef user-group-name {
    type string {
     length "1..63";
    }
    description
     "This type represents a user group name.";
  }
  typedef user-security-group-name {
    type string {
     length "1..63";
    }
    description
     "This type represents a security group name.";
  }
  typedef ip-mac-binding-type {
    type enumeration {
     enum bidirectional {
        description
          "Bidirectional binding indicates that a user must use the specified
IP and MAC addresses to log in. The same IP and MAC addresses cannot be used by
other bidirectional binding users.";
      }
     enum unidirectional {
        description
          "Unidirectional binding indicates that a user must use the specified
IP and MAC addresses to log in. The same IP and MAC addresses can also be used
by other users.";
     }
    }
    description
      "The user and IP/MAC address binding mode: bidirectional, or
unidirectional. In unidirectional binding, a user must use the specified IP and
MAC addresses to log in. The same IP and MAC addresses can also be used by
other users. In bidirectional binding, a user must use the specified IP and
MAC addresses to log in. The same IP and MAC addresses cannot be used by other
bidirectional binding users.";
 }
  /*
```

\* Typedefs for time range object

```
*/
typedef time-range-name {
   type string {
      length "1..32";
   }
   description
    "This type represents a time-range name.";
}
```

Xia & Lin

Expires April 24, 2019

[Page 20]

```
Internet-Draft
                    Security Policy Object Data Model
                                                       October 2018
  typedef hour-minute-second {
    type string {
      pattern '\d{1,2}:\d{1,2}:\d{1,2}';
    }
    description
      "The representation of Hour, Minute, Sencond - hh:mm:ss";
 }
  typedef weekday {
    type enumeration {
      enum sunday {
        description
          "Sunday of the week";
      }
      enum monday {
        description
          "Monday of the week";
      }
      enum tuesday {
        description
          "Tuesday of the week";
      }
      enum wednesday {
        description
          "Wednesday of the week";
      }
      enum thursday {
        description
          "Thursday of the week";
      }
      enum friday {
        description
          "Friday of the week";
      }
      enum saturday {
        description
          "Saturday of the week";
      }
    }
    description
      "A type modeling the weekdays in the Greco-Roman tradition.";
 }
  /*
  * Typedefs for region object and region group
  */
  typedef region-name {
```

```
Security Policy Object Data Model
                                                       October 2018
Internet-Draft
    type string;
    description
     "This type represents a location or location set name.";
 }
 typedef region-longitude {
   type string;
   description
      "This type represents a region longitude number(-180.00 - 180.00).";
 }
 typedef region-latitude {
    type string;
   description
      "This type represents a region latitude number(-90.00 - 90.00).";
 }
 typedef domain-name {
   type string {
     length "1..63";
   }
   description
     "This type represents a domain object name.";
 }
 /*
  * Identities for application object and application group
 */
 identity protocol-field {
   description
      "Base type of protocol field.";
 }
 identity general-payload {
   base protocol-field;
   description
      "The field of signature is general-payload.";
 }
 identity http-method {
   base protocol-field;
   description
     "The field of signature is http.method.";
 }
 identity http-uri {
    base protocol-field;
```

```
Security Policy Object Data Model
Internet-Draft
                                                       October 2018
    description
      "The field of signature is http.uri.";
 }
 identity http-user-agent {
   base protocol-field;
   description
      "The field of signature is http.user-agent.";
 }
 identity http-host {
    base protocol-field;
   description
      "The field of signature is http.host.";
 }
 identity http-content-type {
   base protocol-field;
   description
      "The field of signature is http.content-type.";
 }
 identity http-cookie {
   base protocol-field;
   description
      "The field of signature is http.cookie.";
 }
 identity http-body {
   base protocol-field;
   description
     "The field of signature is http.body.";
 }
 /*
  * Features for application object
 */
 feature user-defined-application {
    description
     "This feature means the NSF supports user-defined application function
that can be used to define application rule.";
 }
  /*
  * Features for region object
 */
 feature support-ipv6-address {
    description
```

```
"This feature means the NSF support configuring IPv6 addresses for Region
Object.";
 }
  /*
  * Groupings for address object and address group
  */
  grouping address-objects {
    list address-object {
      key "name";
      leaf name {
        type address-set-name;
        description
          "The name of the address object.";
      }
      leaf desc {
        type string{
          length "1..127";
        }
        description
          "The description of the address object.";
      }
      leaf vpn-instance {
        type string;
        description
          "The name of the vpn-instrance.";
      }
      list elements {
        key "elem-id";
        leaf elem-id {
          type uint16;
          description
            "The id of the element in address object.";
        }
        choice object-items {
          case ipv4 {
            leaf address-ipv4 {
              type inet:ipv4-prefix;
              description
                "A set of IPv4 addresses that are represented by an IPv4
address prefix.";
            }
          }
          case ipv6 {
            leaf address-ipv6 {
              type inet:ipv6-prefix;
              description
                "A set of IPv6 addresses that are represented by an IPv6
```



Xia & LinExpires April 24, 2019[Page 24]

```
case mac {
            leaf mac-address {
              type yang:mac-address;
              description
                "MAC address. This leaf is combined with the mac-address-mask
leaf to represent a single MAC address or a set of MAC addresses. If the mac-
address-mask leaf is not presented, this leaf represents a single MAC address.
If the mac-address-mask leaf is setted, this leaf represents a range of
contiguous MAC addresses.";
            }
            leaf mac-address-mask {
              type yang:mac-address;
              description
                "If this leaf is not presented, the mac-address leaf represents
a single MAC address. If this leaf is setted, the mac-address leaf represents a
range of contiguous MAC addresses.";
            }
          }
          case ipv4-range {
            leaf start-ipv4 {
              type inet:ipv4-address;
              description
                "The start IPv4 address of an IPv4 address range.";
            }
            leaf end-ipv4 {
              type inet:ipv4-address;
              description
                "The end IPv4 address of an IPv4 address range.";
            }
          }
          case ipv6-range {
            leaf start-ipv6 {
              type inet:ipv6-address;
              description
                "The start IPv6 address of an IPv6 address range.";
            }
            leaf end-ipv6 {
              type inet:ipv6-address;
              description
                "The end IPv6 address of an IPv6 address range.";
            }
          }
              description
            "Diffrent types of addresses: IPv4, IPv6, MAC.";
        }
                description
          "A list of addresses that belong to a specific address object.";
      }
```

```
description
       "A list of address objects.";
   }
   description
     "This grouping represents a list of address objects. An address object is
identified by a unique name and contains a set of IPv4/IPv6 addresses or MAC
addresses. This grouping reuse the predefined address-object-item grouping.";
 }
```

Xia & Lin Expires April 24, 2019 [Page 25]

```
grouping address-groups {
    list address-group {
      key "name";
      leaf name {
        type address-set-name;
        description
          "The name of the address group.";
      }
      leaf desc {
        type string{
          length "1..127";
        }
        description
          "The description of the address group.";
      }
      leaf vpn-instance {
        type string;
        description
          "The name of the vpn-instrance.";
      }
      list elements {
        key "elem-id";
        leaf elem-id {
          type uint16;
          description
            "The id of the element in address group.";
        }
        leaf addr-object-name {
          type address-set-name;
          mandatory true;
          description
            "The name of the address object that consists the address group.";
        }
                description
          "A list of address objects that consists the address group object.";
      }
          description
        "A list of address group objects.";
    }
    description
      "An address group object is comprised of several address objects that
require the same policy enforcement. This grouping represents a list of address
groups.";
 }
```

\*/ grouping port-items {

Xia & LinExpires April 24, 2019[Page 26]

```
Security Policy Object Data Model
Internet-Draft
                                                       October 2018
    container source-port {
      uses pf:port-range-or-operator;
      description
        "Source port definition from range or operator.";
    }
    container dest-port {
      uses pf:port-range-or-operator;
      description
        "Destination port definition from range or operator.";
    }
    description
      "This grouping consists of the source port numbers and destination port
numbers that represent UDP, TCP or SCTP based services.";
 }
  grouping service-objects {
    list pre-defined-service {
      key "name";
          config false;
      leaf name {
        type service-set-name;
        config false;
        description
          "The name of the predefined service object.";
      }
      leaf session-aging-time {
       type uint16;
       units second;
       config false;
        description
          "The aging time of the predefined service object.";
      }
      description
        "A list of the predefined service objects.";
    }
    list service-object {
      key "name";
      leaf name {
        type service-set-name;
       description
          "The name of the service object.";
      }
      leaf session-aging-time {
       type uint16;
       units second;
        description
          "The aging time of the service object.";
```

Xia & Lin

```
leaf desc {
        type string{
          length "1..127";
        }
        description
          "The description of the service object.";
      }
      list items {
        key "id";
        leaf id {
          type uint16;
          description
            "The id of the element in service object.";
        }
        choice item {
          case tcp-item {
            container tcp {
              uses port-items;
              description
                "TCP based service is recognized by source port number and
destination port number. This container reuse the port-items grouping.";
            }
          }
          case udp-item {
            container udp {
              uses port-items;
              description
                "UDP based service is recognized by source port number and
destination port number. This container reuse the port-items grouping.";
            }
          }
          case sctp-item {
            container sctp {
              uses port-items;
              description
                "SCTP based service is recognized by source port number and
destination port number. This container reuse the port-items grouping.";
            }
          }
          case icmp-item {
            choice icmp-type {
              case name-type {
                leaf icmp-name {
                  type icmp-name-type;
                  mandatory true;
                  description
                    "The ICMP based service is identified by the predefined
ICMP name type.";
```

} } case type-code { container icmp-type-code {

Xia & LinExpires April 24, 2019[Page 28]

```
October 2018
```

```
leaf icmp-type-number {
                    type uint8;
                    mandatory true;
                    description
                      "The ICMP type number.";
                  }
                  leaf icmp-code-number {
                    type string;
                    mandatory true;
                    description
                      "The ICMP code number.";
                  }
                  description
                    "The ICMP based service is recognized by two header fields
in the ICMP packets: type field and code field.";
                }
              }
                      description
                "The ICMP based service object and its attributes.";
            }
          }
          case icmp6-item {
            choice icmp6-type {
              case name-type {
                leaf icmp6-name {
                  type icmp6-name-type;
                  mandatory true;
                  description
                    "The ICMPv6 based service is identified by the predefined
ICMPv6 name type.";
                }
              }
              case type-code {
                container icmp6-type-code {
                  leaf icmp6-type-number {
                    type uint8;
                    mandatory true;
                    description
                      "The ICMPv6 type number.";
                  }
                  leaf icmp6-code-number {
                    type string;
                    mandatory true;
                    description
                      "The ICMP code number.";
                  }
                  description
                    "The ICMPv6 based service is recognized by two header
```

fields in the ICMPv6 packets: type field and code field."; } }

Xia & LinExpires April 24, 2019[Page 29]

```
description
                "The ICMPv6 based service object and its attributes.";
            }
                    description
              "The ICMPv6 based service object and its attributes.";
          }
          case protocol-id {
            leaf proto-id {
              type proto-id-range;
              mandatory true;
              description
                "IP based service is identified by the value of the protocol
field in IP packet header.";
            }
          }
              description
            "Diffrent types of protocols for service definition.";
        }
                description
          "A list of service items that consist an service object.";
      }
      description
        "A list of user defined service objects.";
    }
    description
      "A list of the predefined service objects and user defined service
objects.";
  }
  grouping service-groups {
    list service-group {
      key "name";
      leaf name {
        type service-set-name;
        description
          "The name of the service group.";
      }
      leaf desc {
        type string{
          length "1..127";
        }
        description
          "The description of the service group.";
      }
      list items {
        key "id";
        leaf id {
          type uint16;
```

description "The id of the element in service group.";

Xia & Lin

Expires April 24, 2019 [Page 30]

```
October 2018
```

```
}
        leaf service-object-name {
          type service-set-name;
          mandatory true;
          description
            "The name of the service object that consists the service group.";
        }
                description
          "A list of service objects that consists the service group object.";
      }
          description
        "A list of service group objects.";
    }
    description
      "A service group object is comprised of several service objects that
require the same policy enforcement. This grouping represents a list of service
groups.";
 }
  /*
  * Groupings for application object and application group
  */
  grouping application-objects {
    container user-defined-application {
      if-feature user-defined-application;
      container applications {
        list application {
          key "name";
          leaf name {
            type string;
            description
              "The name of user-defined application object.";
          }
          leaf-list label {
            type string;
            description
              "A list of labels for user-defined application.";
          }
          leaf data-model {
            type string;
            description
              "The data transmission model of user-defined application.
Examples are client/server, peer-to-peer. Data transmission models are
predefined in the NSF.";
          }
          leaf category {
            type string;
```

description "The category of user-defined application. The value of this leaf is selected from a predefined set of categories, e.g., general category, network category."; }

leaf subcategory {

Xia & Lin

Expires April 24, 2019 [Page 31]

```
type string;
            description
              "The subcategory of user-defined application. ";
          }
          leaf risk-value {
            type uint32;
            config false;
            description
              "The risk value of predefined application.";
          }
          leaf desc {
            type string;
            description
              "The description information of user-defined application.";
          }
          list rule {
            key "name";
            leaf name {
              type string;
              description
                "The name of the user-defined application rule.";
            }
            leaf protocol {
              type protocol;
              description
                "The protocol that user-defined application is based on.";
            }
            container signature {
              leaf mode {
                type string;
                description
                  "The mode of keyword identification. If the keyword exists in
one packet, the mode is Packet. If the keyword exists in multiple packets, the
mode is Flow.";
              }
              leaf direction {
                type direction;
                description
                  "The traffic direction for application identification.
Request indicates that data to the server is detected, Response indicates that
data from the server is detected, and Both indicates that data from and to the
server is detected.";
              }
              leaf pattern-type{
                type pattern-type;
                description
                  "The match pattern of the user-defined application rule. If
the keyword is a fixed string, the pattern type is Plain. If the keyword is not
```

```
a fixed string, the pattern type is Regular Expression.";
    }
    leaf pattern {
        type string;
        description
        "The keyword of user-defined application rule.";
}
```

Xia & Lin	Expires April 24,	2019	[Page 32]
	=//p=/ 00 //p/ == =//		[]

```
October 2018
```

```
leaf field {
                type identityref {
                  base protocol-field;
                }
                default general-payload;
                description
                  "The protocol field to search for a signature. The default
protocol field is General-payload.";
              }
              description
                "The signature/characteristics of user-defined application.";
            }
            description
              "The rule used to identify the user-defined application.";
          }
          leaf-list ip-address {
            type inet:ip-prefix;
            description
              "The destination IPv4/IPv6 address of user-defined application.";
          }
          leaf-list port {
            type inet:port-number;
            description
              "The destination port number of user-defined application.";
          }
          description
            "A list of user-defined application objects.";
        }
                description
          "When the NSF supports user-defined application function, these are a
list of user-defined application objects.";
      }
      description
        "When the NSF supports user-defined application function, this
container is used to configure application objects.";
    }
    container predefined-application {
      config false;
      list application {
        key "name";
        leaf name {
          type string;
          config false;
          description
            "The name of the predefined application.";
        }
        leaf-list protocol {
          type string;
```

config false; description "The protocol information of application.";

Xia & Lin

Expires April 24, 2019 [Page 33]

```
}
        leaf risk-value {
          type uint32;
          config false;
          description
            "The risk value of predefined application.";
        }
        leaf-list label {
          type string;
          config false;
          description
            "The label of predefined application, an application may have
multiple labels.";
        }
        leaf abandon {
          type boolean;
          config false;
          description
            "The abandon flag of predefined application.";
        }
        leaf multichannel {
          type boolean;
          config false;
          description
            "The multi channel flag of predefined application.";
        }
        leaf data-model {
          type string;
          description
            "The data transmission model of user-defined application. Examples
are client/server, peer-to-peer. Data transmission models are predefined in the
NSF.";
        }
        leaf category {
          type string;
          config false;
          description
            "The category of user-defined application. The value of this leaf
is selected from a predefined set of categories, e.g., general category,
network category.";
        }
        leaf subcategory {
          type string;
          config false;
          description
            "The name of application subcategory.";
        }
        leaf desc {
```

```
type string;
config false;
description
   "The description information of application.";
}
```

Xia & Lin

Expires April 24, 2019

[Page 34]

```
description
          "The attributes of a predefined application.";
      }
      description
        "The information of all predefined applications.";
    }
        description
      "A list of predefined application objects.";
  }
  grouping application-groups {
    list application-group {
      key "name";
      leaf name {
        type string;
        description
          "The name of the application group.";
      }
      leaf desc {
        type string{
          length "1..127";
        }
        description
          "The description of the application group.";
      }
      list items {
        key "id";
        leaf id {
          type uint16;
          description
            "The id of the element in application group.";
        }
        leaf application-object-name {
          type string;
          mandatory true;
          description
            "The name of the application object that consists the application
group.";
        }
                description
          "A list of application objects that consist an application group
object.";
      }
          description
        "A list of application group objects.";
    }
    description
      "An application group object is comprised of several application objects
```

that require the same policy enforcement. This grouping represents a list of application groups."; }

Xia & LinExpires April 24, 2019[Page 35]

```
Security Policy Object Data Model
                                                       October 2018
Internet-Draft
  /*
  * Groupings for user object, user group and security group
  */
  grouping user-objects {
    list user-object {
      key "name aaa-domain";
      leaf name {
        type user-name;
        description
          "The name of the user.";
      }
      leaf aaa-domain {
        type string {
          length "1..64";
        }
        description
              "The name of the domain to which the user belong.";
      }
      leaf desc {
        type string {
          length "1..127";
        }
        description
          "The description of the user.";
      }
      leaf password {
        type ianach:crypt-hash;
        description
          "If user is authenticated locally on the NSF, this attribute is
mandatory. It defines the password corresponding to the user name.";
      }
      leaf parent-user-group {
        type user-group-name;
        description
          "The name of the parent group. User objects and user groups are in a
hierarchical structure. A user object can only belong to one user group.";
      }
      leaf-list parent-security-group {
        type user-security-group-name;
        max-elements 40;
        description
          "The name of the parent security group. A user object can belong to
several security groups.";
      }
      container expiration-time {
        choice expiration-type {
          case never-expire {
            leaf never-expire {
```

type empty; description "This case indicates that the user never expire.";

Xia & Lin

Expires April 24, 2019 [Page 36]

```
}
          }
          case expire-after-this-time {
            leaf expiration-time {
              type yang:date-and-time;
              description
                "User expired time.";
            }
          }
                  description
            "Two types of user expiration configurations.";
        }
        description
          "User expiration time.";
      }
      container ip-mac-binding {
        choice bind-state {
          case no-binding {
            leaf no-binding{
              type empty;
              mandatory true;
              description
                "No binding: Indicates that a user is not bound to any IP or
MAC address.";
            }
          }
          case binding {
            leaf bind-mode{
              type ip-mac-binding-type;
              description
                "The user and IP/MAC address binding mode: bidirectional, or
unidirectional. In unidirectional binding, a user must use the specified IP and
MAC addresses to log in. The same IP and MAC addresses can also be used by
other users. In bidirectional binding, a user must use the specified IP and
MAC addresses to log in. The same IP and MAC addresses cannot be used by other
bidirectional binding users.";
            }
            leaf-list ip-binding {
              type inet:ipv4-address;
              description
                "The IP address bound to the user.";
            }
            leaf-list mac-binding {
              type yang:mac-address;
              description
                "The MAC address bound to the user.";
            }
            list ip-mac-bindings {
```

Security Policy Object Data Model

October 2018

Internet-Draft
key "ip-binding"; unique "mac-binding"; leaf ip-binding { type inet:ipv4-address; description "The bound IPv4 address";

Xia & Lin

Expires April 24, 2019

[Page 37]

```
}
              leaf mac-binding {
                type yang:mac-address;
                description
                  "The bound mac address";
              }
              description
                "Configure the IP address and MAC address pairs bound to the
user.";
            }
          }
                  description
            "The binding state: no-binding, binding.";
        }
        description
          "Whether there are IP/MAC addresses bound to the user.";
      }
      description
        "User Object and its attributes.";
    }
    description
      "A list of user objects.";
  }
  grouping security-groups {
    list security-group {
      key "name";
      leaf name {
        type user-security-group-name;
        description
                  "The name of the security-group.";
      }
      leaf desc {
        type string {
          length "1..127";
        }
        description
          "The description of the security-group.";
      }
      leaf-list parent-security-group {
        type user-security-group-name;
        max-elements 40;
        description
          "Configure the name of the parent-security-group.";
      }
      container filter-action {
        choice filter-type {
          case static {
```

leaf static {

Xia & Lin

Expires April 24, 2019 [Page 38]

```
type empty;
              mandatory true;
              description
                "Empty leaf indicates that this is a static security group.";
            }
          }
          case dynamic {
            leaf dynamic {
              type empty;
              mandatory true;
              description
                "Empty leaf indicates that this is a dynamic security group.";
            }
            leaf-list filter-rule {
              type string {
                length "1..256";
              }
              max-elements 5;
              description
                "Filter rules for dynamic security group.";
            }
          }
          description
            "The filter type: static, dynamic.";
        }
        description
          "The filter type of the security group, static and dynamic. For
dynamic security group, an filter rule needs to be configured.";
      }
      description
        "Security group and its attributes.";
    }
    description
      "A list of security groups.";
  }
 grouping user-groups {
    list user-group {
      key "name";
      leaf name {
        type user-group-name;
        description
          "The name of the user group.";
      }
      leaf desc {
        type string {
          length "1..63";
        }
```

Xia & Lin

Expires April 24, 2019

[Page 39]

```
Internet-Draft
                    Security Policy Object Data Model
                                                       October 2018
          "The description of the user group.";
      }
      leaf parent-user-group {
        type user-group-name;
        description
          "The name of the user group. A user group can only belong to one
parent user group.";
      }
      description
        "User group and its attributes.";
    }
    description
      "A list of user groups";
 }
  /*
  * Groupings for time range object
  */
  grouping time-range-objects {
    list time-range-object {
      key "name";
      leaf name {
        type time-range-name;
        description
          "The name of the time range object.";
      }
      list period-time {
        key "start end";
        leaf start {
          type hour-minute-second;
          mandatory true;
          description
            "Start time of the periodic time range.";
        }
        leaf end {
          type hour-minute-second;
          mandatory true;
          description
            "End time of the periodic time range.";
        }
        leaf-list weekday {
          type weekday;
                  min-elements 1;
          max-elements 7;
          description
            "The weekday to which the periodic time range belongs.";
        }
```

Xia & Lin

Expires April 24, 2019

[Page 40]

```
Security Policy Object Data Model October 2018
Internet-Draft
          "Periodic time that the associated function starts going into
effect.";
      }
      list absolute-time {
        key "start end";
       leaf start {
          type yang:date-and-time;
          description
            "Absolute start time and date";
        }
        leaf end {
          type yang:date-and-time;
          description
            "Absolute end time and date";
        }
        description
          "Absolute time and date that the associated function starts going
into effect.";
      }
      description
        "The time range object and its attributes.";
    }
    description
      "A list of time range objects";
 }
 /*
  * Groupings for region object and region group
  */
  grouping region-objects {
    list pre-defined-region {
      key "name";
          config false;
      leaf name {
        type region-name;
        config false;
        description
          "The name of the predefined region.";
      }
      leaf desc {
       type string;
       config false;
        description
          "The description of the predefined region.";
      }
      container region-ipv4-address {
        leaf-list address-ipv4 {
```

type inet:ipv4-prefix; config false;

Xia & LinExpires April 24, 2019[Page 41]

```
description
      "IPv4 address.";
  }
  list address-ipv4-range {
    key "start-ipv4 end-ipv4";
    leaf start-ipv4 {
      type inet:ipv4-address;
      config false;
      description
         "Start ipv4 address.";
    }
    leaf end-ipv4 {
      type inet:ipv4-address;
      config false;
      description
        "End ipv4 address.";
    }
        description
      "A list of ipv4 address ranges";
  }
  description
    "The IPv4 addresses of the predefined region.";
}
container region-ipv6-address {
      if-feature support-ipv6-address;
  leaf-list address-ipv6 {
    type inet:ipv6-prefix;
    config false;
    description
      "IPv6 address.";
  }
  list address-ipv6-range {
    key "start-ipv6 end-ipv6";
    leaf start-ipv6 {
      type inet:ipv6-address;
      config false;
      description
         "Start ipv6 address.";
    }
    leaf end-ipv6 {
      type inet:ipv6-address;
      config false;
      description
        "End ipv6 address.";
    }
        description
      "A list of ipv6 address ranges";
  }
```

```
description
      "The IPv6 addresses of the predefined region.";
 }
 description
    "A list of predefined region objects.";
}
list user-defined-region {
 key "name";
 leaf name {
   type region-name;
   description
      "The name of the user-defined region.";
  }
 leaf desc {
   type string;
    description
      "The description of the user-defined region.";
 }
 container coordinate {
    leaf longitude {
      type region-longitude;
      description
        "The latitude of the user-defined region.";
    }
    leaf latitude {
      type region-latitude;
      description
        "The longitude of the user-defined region.";
    }
    description
      "The latitude and longitude of the user-defined region.";
  }
 container region-ipv4-address {
    leaf-list address-ipv4 {
      type inet:ipv4-prefix;
      description
        "IPv4 address.";
    }
    list address-ipv4-range {
      key "start-ipv4 end-ipv4";
      leaf start-ipv4 {
        type inet:ipv4-address;
        description
           "Start ipv4 address.";
      }
      leaf end-ipv4 {
        type inet:ipv4-address;
        description
```

```
"End ipv4 address.";
          }
              description
            "A list of ipv4 address ranges";
        }
        description
          "The IPv4 addresses of the predefined region.";
      }
     container region-ipv6-address {
            if-feature support-ipv6-address;
        leaf-list address-ipv6 {
          type inet:ipv6-prefix;
          description
            "IPv6 address.";
        }
        list address-ipv6-range {
          key "start-ipv6 end-ipv6";
          leaf start-ipv6 {
            type inet:ipv6-address;
            description
               "Start ipv6 address.";
          }
          leaf end-ipv6 {
            type inet:ipv6-address;
            description
              "End ipv6 address.";
          }
              description
            "A list of ipv6 address ranges";
        }
        description
          "The IPv6 addresses of the user-defined region.";
     }
     description
        "A list of user-defined region objects.";
   }
       description
     "A list of predefined region objects and a list of user-defined region
objects.";
 }
 grouping region-groups {
    list region-group {
     key "name";
     leaf name {
        type region-name;
        description
          "The name of the region group.";
```

Xia & Lin

```
October 2018
```

```
leaf desc {
      type string;
      description
        "The description of the region group.";
    }
   leaf-list region-name {
     type region-name;
      description
        "A list of region objects.";
   }
   leaf-list region-group-name {
      type region-name;
      description
        "A list of region groups.";
   }
   description
      "Region group consists of a set of region objects or region groups.";
 }
     description
   "A list of region group objects.";
}
/*
* Groupings for domain object
*/
grouping domain-objects {
 list domain-object {
   key "name";
   leaf name {
     type domain-name;
      description
        "The name of the domain object.";
   }
   leaf desc {
     type string;
      description
        "The description of the domain object.";
    }
   leaf-list domain {
     type string;
      description
        "A list of domains that consists the domain objects.";
    }
   description
      "Domain object and its attributes.";
  }
 description
   "A list of domain objects.";
```

} }

#### 7. Acknowledgements

#### 8. IANA Considerations

This document requires no IANA actions.

# <u>9</u>. Security Considerations

Secure transport should be used to retrieve the current status of management plane security baseline.

# **10**. References

#### <u>10.1</u>. Normative References

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Xia & LinExpires April 24, 2019[Page 47]