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I2NSF Capability Yang Model  
draft-hares-i2nsf-capability-yang-01.txt

Abstract

This document defines a yang model that enables a I2NSF controller to control various network security functions in Network security devices.

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## 1. Introduction

[I-D.ietf-i2nsf-problem-and-use-cases] proposes two different types of interfaces:

- o North-bound interface (NBI) provided by the network security functions (NSFs)
- o Interface between I2NSF user/client with network controller:

This document provides a yang models that define the capabilities for security devices that can be utilized by I2NSF NBI between the I2RS network controller and the NSF devices to express the NSF devices capabilities. It can also be used by the IN2SF user application (or I2NSF client) to network controller to provide a complete list of the I2NSF capabilities the Network controller can control.

This document defines a yang data models based on the [I-D.xia-i2nsf-capability-interface-im], and initial work done in [I-D.xia-i2nsf-service-interface-dm]. Terms used in document are defined in [I-D.ietf-i2nsf-terminology].

This model is an attempt to merge draft-jeong-i2nsf-capability-interface-yang-02.txt, but it has not bene reviewed by this draft's authors. Hopefully, this is a good start for a merge. The Yang

module has not been changed to match the high-level-yang. This seemed prudent until we agreed upon the merge.

[I-D.xia-i2nsf-capability-interface-im] defines the following type of functionality in NSFs.

- o network security control
- o content security control, and
- o attack mitigation control

This document contains high-level yang for each type of control. The features in each section have been built up from the following sources:

open-source: firewalls, IDS, IPS. This includes ECA policy for

basic-firewalls: in router, switches, firewalls,

firewall products commercial level

specialized devices IDS, IPS

## 2. High-level Yang

This section provides an overview of the high level yang.

### 2.1. capability per NSF

The high level yang capabilities per NSF device, controller, or application is the following:

```
ietf-i2nsf-capability
+--rw nsf-capabilities
  +--rw capability* [name]
    +--rw nsf-name string
    +--rw cfg-net-secctl-capabilities
  | uses pkt-eca-policy:pkt-eca-policy-set
+--rw cfg-net-sec-content-capabilities
  | uses i2nsf-content-caps
  | uses i2nsf-content-sec-actions
+--rw cfg-attack-mitigate-capabilities*
  | uses i2nsf-mitigate-caps
+--rw ITResource [ITresource-name]
  | uses cfg-ITResources
```

Figure 1

Each of these section mirror sections in: [I-D.xia-i2nsf-capability-interface-im]. The high level yang for `cfg-net-secctl-capabilities`, `cfg-net-sec-content-capabilities`, and `cfg-attack-mitigate-capabilities`. This draft is also utilizes the concepts originated in Basile, Liroy, Pitscheider, and Zhao[2015] concerning conflict resolution, use of external data, and ITResources. The authors are grateful to Cataldo for pointing out this excellent work.

## 2.2. Network Security Control

This section defines the network security control capabilities for each NSF entity (device, controller, APP). The portion of the top level model that this explains is the following:

```

    +--rw cfg-net-secctl-capabilities
    |   uses pkt-eca-policy:pkt-eca-policy-set

```

Note that yang simply uses the `ietf-pkt-eca-policy-cfg` from [I-D.ietf-i2rs-pkt-eca-data-model].

```

module ietf-pkt-eca-policy
  +--rw pkt-eca-policy-cfg
  |   +--rw pkt-eca-policy-set
  |   |   +--rw policies* [policy-name]
  |   |   |   +--rw policy-name string
  |   |   |   +--rw vrf-name string
  |   |   |   +--rw address-family
  |   |   |   +--rw rule-list* [rule-name]
  |   |   |   |   +--rw rule-name
  |   |   |   |   +--rw rule-order-id uint16
  |   |   |   |   +--rw default-action-id integer
  |   |   |   |   +--rw default-resolution-strategy-id integer
  |   |   +--rw rules* [order-id rule-name]
  |   |   |   +--rw order-id uint16
  |   |   |   +--rw rule-name string
  |   |   |   +--rw policy-name string
  |   |   +--rw cfg-rule-conditions [rule-cnd-id]
  |   |   |   +--rw rule-cnd-id uint32
  |   |   |   +--rw support
  |   |   |   |   +--rw event-matches boolean
  |   |   |   |   +--rw pkt-matches boolean
  |   |   |   |   +--rw usr-context-matches boolean
  |   |   +--rw eca-events-match* [rule-event-id]
  |   |   |   +--rw rule-event-it uint16
  |   |   |   |   ... time-event match (see below)
  |   +--rw eca-condition-match

```

```

|         |         | +--rw eca-pkt-matches* [pkt-match-id]
|         |         | | ... (see packet matches below)
|         |         | | ... (address, packet header, packet payload)
|         |         | +--rw eca-user-context-matches* [usr-match-id]
|         |         | | ... (see user context match below)
+--rw cfg-rule-actions [cfgr-action-id]
| +--rw cfgr-action-id
+--rw eca-actions* [action-id]
| +--rw action-id uint32
| +--rw eca-ingress-actions*
| | ... (permit, deny, mirror)
+--rw eca-fwd-actions*
| | ... (invoke, tunnel encap, fwd)
+--rw eca-egress-acttions*
| | . . .
+--rw eca-qos-actions*
| | ...
+--rw eca-security-actions*
+--rw policy-conflict-resolution* [strategy-id]
| +--rw strategy-id integer
+--rw filter-strategy identityref
| | .. FMR, ADTP, Longest-match
+--rw global-strategy identityref
+--rw mandatory-strategy identityref
+--rw local-strategy identityref
+--rw resolution-fcn uint32
+--rw resolution-value uint32
+--rw resolution-info string
+--rw associated-ext-data*
| | +--rw ext-data-id integer
+--rw cfg-external-data* [cfg-ext-data-id]
| +--rw cfg-ext-data-id integer
+--rw data-type integer
+--rw priority uint64
| | uses external-data-forms
| | ... (other external data)
+--rw pkt-eca-policy-opstate
+--rw pkt-eca-opstate
+--rw policies-opstat* [policy-name]
| +--rw rules-installed;
| +--rw rules_opstat* [rule-name]
| | +--rw strategy-used [strategy-id]
+--rw rules_opstate* [rule-order rule-name]
| +--rw status
| +--rw rule-inactive-reason
+--rw rule-install-reason
+--rw rule-installer
+--rw refcnt

```

```

+--rw rules_pktstats* [rule-order rule-name]
|   +--rw pkts-matched
|   +--rw pkts-modified
|   +--rw pkts-forward
|       +--rw op-external-data [op-ext-data-id]
|           +--rw op-ext-data-id integer
|           +--rw type identityref
|           +--rw installed-priority integer
|           | (other details on external data )

```

figure 2

### 2.3. Security Content Capabilities

This section expands the

```

+--rw cfg-net-sec-content-capabilities
|   uses i2nsf-content-caps
|   uses i2nsf-content-sec-actions

```

#### Content Security Control

```

+--rw cfg-netsec-content-caps*
|   +--rw cfg-groups* [group-name]
|       +--rw group-name string
|       +--rw group-rule-list* [rule-name]
|           +--rw rule-name string
|           +--rw rule-order-id integer
|           +--rw default-action-id integer
|           +--rw default-resolution-strategy-id integer|
+--rw cfg-netsec-content-rules* [rule-order-id rule-name]
|   +--rw cfg-netsec-content-rule
|       +--rw rule-order-id integer
|       +--rw rule-name string
|       +--rw cfg-filter-rules
|           +--rw cfg-anti-virus-rule
|               +--rw antivirus-support? Boolean
|               +--rw source string
|       +--rw cfg-IPS-rule
|           +--rw ips-support? boolean
|           +--rw source string
|       +--rw cfg-IDS-rule
|           +--rw ids-support? boolean
|           +--rw source string
|       +--rw cfg-url-filter-rule
|           +--rw url-filtering-support? boolean

```

```

| | | | |--rw source string
|--rw cfg-file-block-rule
| | | | |--rw file-blocking-support? boolean
| | | | |--rw source string
|--rw cfg-data-filter-rule
| | | | |--rw data-filtering-support? boolean
| | | | |--rw source string
| | | | | ... description
|--rw cfg-APP-behave-rule
| | | | |--rw app-control-support? boolean
| | | | |--rw source string
|--rw cfg-mail-filter-rule
| | | | |--rw mail-filter-support? boolean
| | | | |--rw source string
|--rw cfg-pkt-capture-rule
| | | | |--rw pkt-capture-support? boolean
| | | | |--rw source string
|--rw cfg-file-isolate-rule
| | | | |--rw file-isolation-support? boolean
| | | | |--rw source string
|--rw voip-volte-rule
| | | | |--rw voip-volte-support? boolean
|--rw cfg-sec-content-actions
|--voip-volte-rules* [voip-volte-rule-id]
| | | | |--rw voip-volte-rule-id uint16
|--rw voip-volte-event
| | | | |--rw called-voip boolean
| | | | |--rw called-volte boolean
|--rw condition-match
| | | | |--rw sip-header* [sip-header-uri]
| | | | |--rw sip-header-uri string
| | | | |--rw sip-header-method string
| | | | |--rw expire-time yang:date-and-time
| | | | |--rw sip-header-user-agent uint32
| | | | |--rw cell-region* [cell-id-region]
| | | | | |--rw cell-id-region uint32
|--rw action
| | | | |--rw action-type identityref
| | | | |--rw (action-type)?
| | | | | |--: (ingress-action)
| | | | | | |--rw ingress-permit boolean
| | | | | | | |--rw ingress-deny boolean
| | | | | | | |--rw ingress-mirror boolean
| | | | | |--: (egress-action)
| | | | | | |--rw egress-redirection boolean

```

figure 3

## 2.4. Attack Mitigation Capabilities

The high level yang below expands the following section of the top-level model:

```

    +--rw cfg-attack-mitigate-capabilities
       | uses cfg-attack-mitigate-caps

```

Attack mitigation

```

+--rw cfg-attack-mitigate-caps
|
| +--rw cfg-groups* [group-name]
| |
| | +--rw group-name string
| | +--rw group-rule-list* [rule-name]
| | |
| | | +--rw rule-name string
| | | +--rw rule-order-id integer
| | | +--rw default-action-id integer
| | | +--rw default-resolution-strategy-id integer|
+--rw cfg-netsec-content-rules* [rule-order-id rule-name]
+--rw rule-order-id integer
+--rw attack-mitigation-type identityref
+--:(network-attack-type)?
|
| +--:sync-flood
| | +--rw syn-flood-supported boolean
| | +--rw sync-flood* [sync-flood-fcn]
| | +--rw sync-flood-fcn uint16
| | +--:(udp-flood)
| | | +--rw udp-flood-supported boolean
| | | +--rw udp-flood-fcn string //std or vendor name
| | +--:(icmp-flood)
| | | +--rw icmp-flood-supported boolean
| | | +--rw cfg-icmp-flood* [icmp-flood-fcn]
| | | +--rw icmp-flood-fcn string
| | +--:(ip_frag_flood)
| | | +--rw ipfrag-flood-fcn-supported boolean
| | | +--rw cfg-ip-frag-flood* [ipfrag-flood-fcn]
| | | +--rw ipfrag-flood-fcn string //std/vendor name
| | +--:(http_flood)
| | | +--rw http-flood-fcn-supported boolean
| | | +--rw cfg-http-flood* [http-flood-fcn]
| | | +--rw http-flood-fcn string
| | +--:(dns-flood)
| | | +--rw dns-flood-fcn-supported boolean
| | | +--rw cfg-dns-flood* [dns-flood-fcn]
| | | +--rw dns-flood-fcn string //std or vendor name
| | +--:(dns-amplify)
| | | +--rw dns-amp-fcn-supported boolean

```





```
| | | | | | | | | | +--rw tracert-attack-support boolean
| | | | | | | | | | +--rw tracert-attack-fcn string
```

figure 4

## 2.5. IT Resources linked to Capabilities

This section provides a link between capabilities and IT resources. This section has a list of IT Resources by name. Additional input is needed.

```
+--rw cfg-ITResources
|   +--ITResources* [ITresource-name]
|   |   +--rw ITresource-name string
|   |   ..
```

## 2.6. actions

The following notifications indicate when rules are added or deleted.

(to be completed after discussion with Paul Jeong, Jin-Yong Kim, and Dae-Young Hyun, and Jung-Soo Park, and Taei-Jin Ahn.)

## 3. Use of filter-based RIBS

The packet-eca policy is kept for configuration, I2RS ephemeral state, and BGP stored policy state in filter-based RIBS. These RIBS have the high-level yang structures below and are described in [I-D.ietf-i2rs-fb-rib-data-model]. These filter-ribs may be leveraged in I2NSF storage devices for the policy storage.

```

+--rw fb-ribs
  +--rw fb-rib* [rib-name]
    |   +--rw rib-name string
    |   |   rw fb-type identityref /config, i2rs, bgp
    |   +--rw rib-afi rt:address-family
    |   +--rw fb-rib-intf* [name]
    |   |   +--rw name string
    |   |   +--rw intf if:interface
    |   +--rw default-ribs
    |   |   +--rw rt-rib string           // routing kernel rib
    |   |   +--rw config-rib string;      // static rt-rib
    |   |   +--rw i2rs-rib string;        // ephemeral rt-rib
    |   |   +--rw bgp-instance-name string // bgp instance
    |   |   +--rw bgp-rib string         // bgp rib
    |   +--rw fb-rib-refs
    |   |   +--rw fb-rib-update-ref uint32 //count of writes
    |   +--rw mounts-using*
    |   |   +--rw mount-name string      //
    |   +--use pkt-eca:pkt-eca-policy-set

```

figure 5

#### 4. YANG Modules

```

<CODE BEGINS> file "ietf-i2nsf-capability@2016-10-01.yang"
module ietf-i2nsf-capability {
  namespace "urn:ietf:params:xml:ns:yang:ietf-i2nsf-capability";
  // replace with iana namespace when assigned
  prefix "i2nsf-capability";
  import ietf-pkt-eca-policy {
    prefix pkt-eca-policy;
  }
  // meta

  organization "IETF I2NSF WG";

  contact
    "email: Susan Hares: shares@ndzh.com
     email: Robert Moskowitz rgm@htt-consult.com;
     email: Frank Xia
     email: Aldo Basile cataldo.basile@polito.it";

  description
    "This module describes a capability model
     for I2NSF devices .";

  revision "2016-10-01" {

```

```
        description "second revision";
        reference "draft-hares-i2nsf-capability-yang-01.txt";
    }

    grouping ITResources {
        list ITResource {
            key ITResource-id;
            leaf ITResource-id {
                type uint64;
                description "ID for ITResource";
            }
            leaf ITResource-name {
                type string;
                description "ITResource name.";
            }
            description "list of IT Resources.";
        }
        description "IT Resource grouping.";
    }

    grouping cfg-sec-content-caps {
        list cfg-fcn-groups { // functions in 2 lists:
            key "group-name"; // group and functions
            leaf group-name {
                type string;
                description " name of function
                    group";
            }
            list group-fnc-list {
                key "fnc-name";
                leaf fnc-name {
                    type string;
                    description "security content
                        function name";
                }
                leaf fcn-order-id {
                    type uint64;
                    description "function order
                        in list of functions.";
                }
                leaf default-action-id {
                    type uint64;
                    description "default
                        extended action id";
                }
                leaf default-cr-resolve-id {
                    type uint32;
                }
            }
        }
    }
}
```

```

        description "default
        policy conflict resolution
        policy identifier.";
    }
    description "list of
    functions per group.
    e.g. group A has
    5 functions.";
}

description "list of
groups with associated
security content functions.";
}

list cfg-sec-content-fcns {
    key "fcn-order-id function-name";
    leaf fcn-order-id {
        type uint64;
        description "order id for rule";
    }
    leaf function-name {
        type string;
        description "rule name";
    }
}
list anti-virus {
    key "anti-virus-name";
    leaf anti-virus-name {
        type string;
        description "name of
        anti-virtus functionality";
    }
    leaf anti-virus-supported {
        type boolean;
        description "anti-virus
        feature supported";
    }
}
description "anti-virus functions";
}
list IPS {
    key "IPS-name";
    leaf IPS-name {
        type string;
        description "name of
        anti-virtus functionality";
    }
    leaf IPS-supported {
        type boolean;
    }
}

```

```
        description "IPS
        capability
        supported";
    }
    description "IPS capability";
}

list IDS {
    key "IDS-name";
    leaf IDS-name {
        type string;
        description "name of IDS";
    }
    leaf IDS-supported {
        type boolean;
        description "anti-virus
        feature supported";
    }
    description "IDS
    capabilities";
}

list url-filter {
    key "url-filter-name";
    leaf url-filter-name {
        type string;
        description "name of IDS";
    }
    leaf url-filter-supported {
        type boolean;
        description "url filter
        feature supported";
    }
    description "URL filter
    capabilities";
}

list file-block {
    key "fblock-name";
    leaf fblock-name {
        type string;
        description "name of
        file block function";
    }
    leaf fblock-supported {
        type boolean;
        description "anti-virus
```

```
        feature supported";
    }
    description "file block
capabilities";
}

list data-filter {
    key "dfilter-name";
    leaf dfilter-name {
        type string;
        description "name of
data filer";
    }
    leaf dfilter-supported {
        type boolean;
        description "anti-virus
feature supported";
    }
    description "data filter
capabilities";
}

list app-behave {
    key "app-behave-name";
    leaf app-behave-name {
        type string;
        description "name of
application behavior
control function.";
    }
    leaf app-behave-supported {
        type boolean;
        description "application
behavior control
security capability
supported.";
    }
    description "Application
behavior control security
capabilities";
}

list mail-filter {
    key "mfilter-name";
    leaf mfilter-name {
        type string;
        description "name of
data filer";
    }
}
```

```
    }
    leaf mfilter-supported {
      type boolean;
      description "mail filter
supported";
    }
  }
  description "mail filter";
}

list pkt-capture {
  key "pkt-capture-name";
  leaf pkt-capture-name {
    type string;
    description "name of
data filer";
  }
  leaf pkt-capture-supported {
    type boolean;
    description "pkt capture
facility supported";
  }
  description "packet capture
facility supported ";
}

list file-isolate {
  key "f-isolate-name";
  leaf f-isolate-name {
    type string;
    description "name of
file isolate capability";
  }
  leaf f-isolate-supported {
    type boolean;
    description "file isolate
capability supported ";
  }
  description "file isolate
capability ";
}
description "list of
security content capabilities.";
}
description "configured
security content capabilities";
}
```



```
grouping cfg-content-sec-actions {
  list content-sec-actions {
    key "action-name";
    leaf action-name {
      type string;
    }
    description "name of extra
      content security action
      beyond function policy";
  }
  description "list
    of content security actions";
}

description "configure
content security actions
configured beyond capability
function existance";
}

grouping cfg-attack-mitigate-caps {
  // group and then rules
  list cfg-mitigate-fncs-groups {
    key "group-name";
    leaf group-name {
      type string;
    }
    description " name of function
      group";
  }
  list group-mitigate-fncs-list {
    key "fcn-name";
    leaf fcn-name {
      type string;
    }
    description "security content
      function name";
  }
  leaf fcn-order-id {
    type uint64;
    description "function order
      in list of functions.";
  }
  leaf default-action-id {
    type uint64;
    description "default
      extended action id";
  }
  leaf default-cr-resolve-id {
    type uint32;
    description "default
      policy conflict resolution";
  }
}
```

```
        policy identifier.";
    }
    description "list of
functions per group.
e.g. group A has
5 functions.";
}

description "list of
groups with associated
attack mitigate functions.";
}

list cfg-attack-mitigate-rule {
    key "rule-order-id rule-name";
    leaf rule-order-id {
        type uint64;
        description "order id for
configured mitigate
function";
    }
    leaf rule-name {
        type string;
        description "mitigate
rule name";
    }
    list cfg-sync-flood {
        key sync-flood-fcn;
        leaf sync-flood-fcn {
            type string;
            description "name of
sync flood functionalty";
        }
        leaf sync-flood-fcn-supported {
            type boolean;
            description "sync-flood
mitigation fcn supported";
        }
        description "list of
sync flood mitigation
functions ";
    }
    list cfg-udp-flood {
        key "udp-flood-fcn";
        leaf udp-flood-fcn {
            type string;
            description "name of
```

```
    udp flood mitigation function ";
  }
  leaf udp-flood-fcn-supported {
    type boolean;
    description "udp flood
prevent function
capability supported";
  }
  description "list of
udp-flood mitigation
functions node
(configured capability).";
}

list cfg-icmp-flood {
  key "icmp-flood-fcn";
  leaf icmp-flood-fcn {
    type string;
    description "name of
icmp flood prevention
function";
  }
  leaf icmp-flood-fcn-supported {
    type boolean;
    description "icmp
flood mitigation
feature supported";
  }
  description "list for
icmp flood prevention
functions part of
attack mitigation
capabilities.";
}

list cfg-http-flood {
  key "http-flood-fcn";
  leaf http-flood-fcn {
    type string;
    description "name of
http flood
mitigation function";
  }
  leaf http-flood-fcn-supported {
    type boolean;
    description "support
for http flood function
```

```
    capability is active.";
  }
  description "list of
http flood
mitigation functions
configured ";
}

list cfg-dns-flood {
  key "dns-flood-fcn";
  leaf dns-flood-fcn {
    type string;
    description "name of
dns flood mitigation
function";
  }
  leaf dns-flood-fcn-supported {
    type boolean;
    description "dns flood
mitigation support is
active.";
  }
  description "list of
dns flood
mitigation functions
configured.";
}

list cfg-dns-amplify {
  key "dns-amplify-fcn";
  leaf dns-amplify-fcn {
    type string;
    description "name of
dns amplify mitigation
function.";
  }
  leaf dfilter-supported {
    type boolean;
    description "dns
amplification mitigation
function is active.";
  }
  description "list of
dns amplification
mitigation functions
configured.";
}
```

```
list SSL-DoS {
  key "ssl-dos-fcn";
  leaf ssl-dos-fcn {
    type string;
    description "name of
SSL DoS mitigation
function";
  }
  leaf ssl-dos-supported {
    type boolean;
    description "SSL DoS
mitigation function is
active.";
  }
  description "List of
SSL DoS functions configured.";
}

list cfg-IP-Sweep {
  key "ipsweep-fcn";
  leaf ipsweep-fcn {
    type string;
    description "name of
ip sweep mitigation
function.";
  }
  leaf ipsweep-fcn-supported {
    type boolean;
    description "IP Sweep
mitigation function
active.";
  }
  description "list of
IP Sweep mitigation
functions in NSF device.";
}

list cfg-Port-scanning {
  key "port-scan-fcn";
  leaf port-scan-fcn {
    type string;
    description "name of
port-scan mitigation
function.";
  }
  leaf port-scan-fcn-supported {
    type boolean;
    description "port scanning
```

```
        mitigation fcn supported.";
    }
    description "List of
port scanning mitigation
functions. ";
}

list cfg-ping-of-death {
    key "pingd-fcn";
    leaf pingd-fcn {
        type string;
        description "name of
ping of death
mitigation function";
    }
    leaf pingd-fcn-supported{
        type boolean;
        description "active support
for this ping of death
mitigation function";
    }
    description "List of ping of
death mitigation
functions.";
}
description "attack
mitigation rule .";
} // rules
description "configured
attack mitigation functions.";

} // cfg-attack-mitigate-policy-set

container i2nsf-capabilities {
    list capabilty {
        key "nsf-name";
        leaf nsf-name {
            type string;
            description "name of
nsf or nsf group
capabilities drawn from.";
        }
    }
    container cfg-net-secctl-capabilities {
        uses pkt-eca-policy:pkt-eca-policy-set;
        description "network security
control capabilities configured.";
    }
    container cfg-sec-content-capabilities {
```

```

        uses cfg-sec-content-caps;
        uses cfg-content-sec-actions;
        description "security content
        capabilities configured.";
    }
    container cfg-attack-mitigate-capabilites {
        uses cfg-attack-mitigate-caps;
        description "attack mitigation capabilities";
    }
    container cfg-ITResources {
        uses ITResources;
        description "IT Resources
        associated with NSF.";
    }
    description "List of NSF
    capabilities per nsf, nsf group
    or nsf application.";
} //end of list

description "I2NSF capabilities";
} // end of container
}
<CODE ENDS>

```

## 5. IANA Considerations

No IANA considerations exist for this document at this time. URL will be added.

## 6. Security Considerations

Security of I2NSF is defined in (need reference here).

## 7. References

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