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A Yang Data Model for IGMP and MLD Snooping
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Abstract

This document defines a YANG data model that can be used to configure and manage Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping devices.

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IGMP & MLD Snooping Yang Model

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Table of Contents

1.	Introduction.....	3
1.1.	Terminology.....	3
1.2.	Tree Diagrams.....	3
2.	Design of Data Model.....	4
2.1.	Overview.....	4
2.2.	IGMP Snooping Instances.....	4
2.3.	MLD Snooping Instances.....	7
2.4.	IGMP and MLD Snooping References.....	9
2.5.	Augment /if:interfaces/if:interface.....	10
2.6.	IGMP and MLD Snooping RPC.....	12
3.	IGMP and MLD Snooping YANG Module.....	12
4.	Security Considerations.....	42
5.	IANA Considerations.....	43
6.	Normative References.....	44
	Appendix A. Data Tree Example.....	45
	Authors' Addresses.....	49

1. Introduction

This document defines a YANG [[RFC6020](#)] data model for the management of Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping devices.

The YANG model in this document conforms to the Network Management Datastore Architecture defined in [I-D.ietf-netmod-revised-datastores]. The "Network Management Datastore Architecture" (NMDA) adds the ability to inspect the current operational values for configuration, allowing clients to use identical paths for retrieving the configured values and the operational values.

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)].

The terminology for describing YANG data models is found in [[RFC6020](#)].

1.2. Tree Diagrams

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in these diagrams is as follows:

- o Brackets "[" and "]" enclose list keys.
- o Abbreviations before data node names: "rw" means configuration (read-write), and "ro" means state data (read-only).

- o Symbols after data node names: "?" means an optional node, "!" means a presence container, and "*" denotes a list and leaf-list.
- o Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- o Ellipsis ("...") stands for contents of subtrees that are not shown.

[2. Design of Data Model](#)

The model covers Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches [[RFC4541](#)].

The goal of this document is to define a data model that provides a common user interface to IGMP and MLD Snooping. This document provides freedom for vendors to adapt this data model to their product implementations.

[2.1. Overview](#)

The IGMP and MLD Snooping YANG module defined in this document has all the common building blocks for the IGMP and MLD Snooping protocol.

The YANG module includes IGMP and MLD Snooping instance definition, instance reference in the scenario of BRIDGE, L2VPN. The module also includes the RPC methods for clearing IGMP and MLD Snooping group tables.

This YANG model follows the Guidelines for YANG Module Authors (NMDA) [[draft-dsdt-nmda-guidelines-01](#)]. This NMDA ("Network Management Datastore Architecture") architecture provides an architectural framework for datastores as they are used by network management protocols such as NETCONF [[RFC6241](#)], RESTCONF [[RFC8040](#)] and the YANG

[[RFC7950](#)] data modeling language.

[2.2](#). IGMP Snooping Instances

The YANG module defines `igmp-snooping-instance` which could be referenced in the BRIDGE or L2VPN scenario to enable IGMP Snooping.

All the IGMP Snooping related attributes have been defined in the `igmp-snooping-instance`. The read-write attribute is configurable data. The read-only attribute shows state data. The key attribute of the `igmp-snooping-instance` is `name`.

The value of `type` in `igmp-snooping-instance` is `bridge` or `l2vpn`. When it is `bridge`, the `igmp-snooping-instance` will be referenced in the BRIDGE scenario. When it is `l2vpn`, the `igmp-snooping-instance` will be referenced in the L2VPN scenario.

The value of `bridge-mrouter-interface`, `l2vpn-mrouter-interface-ac`, `l2vpn-mrouter-interface-pw` are filled by routing system dynamically. They are different from `static-bridge-mrouter-interface`, `static-l2vpn-`

`mrouter-interface-ac`, and `static-l2vpn-mrouter-interface-pw` which are configured statically.

```
module: ietf-igmp-ml-d-snooping
```

```
  +--rw igmp-snooping-instances
```

```
    |  +--rw igmp-snooping-instance* [name]
```

```
      |    +--rw name                                string
```

```
      |    +--rw type?                              enumeration
```

```
      |    +--rw enable?                            boolean {admin-enable}?
```

```
      |    +--rw forwarding-mode?                  enumeration
```

```
      |    +--rw explicit-tracking?                 boolean {explicit-track
```

```
      |    +--rw exclude-lite?                     boolean {exclude-lite}?
```

	+++rw send-query?	boolean
	+++rw immediate-leave?	empty {immediate-leave}
	+++rw last-member-query-interval?	uint16
	+++rw query-interval?	uint16
	+++rw query-max-response-time?	uint16
	+++rw require-router-alert?	boolean {require-router-alert}?
	+++rw robustness-variable?	uint8
	+++rw version?	uint8
	+++rw static-bridge-mrouter-interface*	if:interface-ref {static-mrouter-interface}?
	+++rw static-l2vpn-mrouter-interface-ac*	if:interface-ref {static-mrouter-interface}?
	+++rw static-l2vpn-mrouter-interface-pw*	l2vpn-instance-pw-ref {static-mrouter-interface}?
	+++rw querier-source?	inet:ipv4-address
	+++rw static-l2-multicast-group* [group source-addr] {static-l2-multicast-group}?	

		+++rw group	inet:ipv4-address
		+++rw source-addr	source-ipv4-addr-type
		+++rw bridge-outgoing-interface*	if:interface-ref
		+++rw l2vpn-outgoing-ac*	l2vpn-instance-ac-ref
		+++rw l2vpn-outgoing-pw*	l2vpn-instance-pw-ref
		+++ro entries-count?	uint32
		+++ro bridge-mrouter-interface*	if:interface-ref

```

|      +---ro l2vpn-mrouter-interface-ac*          if:interface-ref
|
|      +---ro l2vpn-mrouter-interface-pw*          l2vpn-instance-pw-ref
|
|      +---ro group* [address]
|
|          +---ro address          inet:ipv4-address
|
|          +---ro mac-address?      yang:phys-address
|
|          +---ro expire?           uint32
|
|          +---ro up-time?          uint32
|
|          +---ro last-reporter?    inet:ipv4-address
|
|          +---ro source* [address]
|
|              +---ro address          inet:ipv4-address
|
|              +---ro bridge-outgoing-interface*  if:interface-ref
|
|              +---ro l2vpn-outgoing-ac*          l2vpn-instance-ac-ref
|
|              +---ro l2vpn-outgoing-pw*          l2vpn-instance-pw-ref
|
|              +---ro up-time?                   uint32
|
|              +---ro expire?                     uint32
|
|              +---ro host-count?                  uint32 {explicit-tracking}
|
|              +---ro last-reporter?               inet:ipv4-address
|
|              +---ro host* [host-address] {explicit-tracking}?
|
|                  +---ro host-address          inet:ipv4-address

```

Zhao & Liu, etc

Expires November 28, 2018

[Page 6]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```

|          +---ro host-filter-mode?  enumeration

```

[2.3.](#) MLD Snooping Instances

The YANG module defines `mld-snooping-instance` which could be referenced

in the BRIDGE or L2VPN scenario to enable MLD Snooping.

The mld-snooping-instance is the same as IGMP snooping except changing IPV4 addresses to IPV6 addresses.

```
module: ietf-igmp-mld-snooping

  +--rw mld-snooping-instances
    |   +---rw mld-snooping-instance* [name]
    |     +---rw name                               string
    |     +---rw type?                             enumeration
    |     +---rw enable?                           boolean {admin-enabl
    |     +---rw forwarding-mode?                  enumeration
    |     +---rw explicit-tracking?                boolean {explicit-
tracking}}?
    |     +---rw exclude-lite?                     boolean {exclude-lit
    |     +---rw send-query?                        boolean
    |     +---rw immediate-leave?                  empty {immediate-lea
    |     +---rw last-member-query-interval?       uint16
    |     +---rw query-interval?                   uint16
    |     +---rw query-max-response-time?         uint16
    |     +---rw require-router-alert?            boolean {require-rou
alert}}?
    |     +---rw robustness-variable?              uint8
    |     +---rw version?                          uint8
    |     +---rw static-bridge-mrouter-interface* if:interface-ref {st
mrouter-interface}?

```



```

|      +---rw static-l2vpn-mrouter-interface-ac*   if:interface-ref {st
mrouter-interface}?

|      +---rw static-l2vpn-mrouter-interface-pw*   l2vpn-instance-pw-re
{static-mrouter-interface}?

|      +---rw querier-source?                       inet:ipv6-address

|      +---rw static-l2-multicast-group* [group source-addr] {static-l2
multicast-group}?

|      |      +---rw group                           inet:ipv6-address
|      |      +---rw source-addr                     source-ipv6-addr-type
|      |      +---rw bridge-outgoing-interface*     if:interface-ref
|      |      +---rw l2vpn-outgoing-ac*             l2vpn-instance-ac-ref
|      |      +---rw l2vpn-outgoing-pw*             l2vpn-instance-pw-ref
|      +---ro entries-count?                         uint32
|      +---ro bridge-mrouter-interface*             if:interface-ref
|      +---ro l2vpn-mrouter-interface-ac*           if:interface-ref
|      +---ro l2vpn-mrouter-interface-pw*           l2vpn-instance-pw-re
|      +---ro group* [address]

|      +---ro address                               inet:ipv6-address
|      +---ro mac-address?                          yang:phys-address
|      +---ro expire?                               uint32
|      +---ro up-time?                             uint32
|      +---ro last-reporter?   inet:ipv6-address
|      +---ro source* [address]

|      +---ro address                               inet:ipv6-address
|      +---ro bridge-outgoing-interface*           if:interface-ref
|      +---ro l2vpn-outgoing-ac*                   l2vpn-instance-ac-ref
|      +---ro l2vpn-outgoing-pw*                   l2vpn-instance-pw-ref

```

Internet-Draft	IGMP & MLD Snooping Yang Model	May 29, 2018
	+++ro up-time?	uint32
	+++ro expire?	uint32
	+++ro host-count?	uint32 {explicit-track
	+++ro last-reporter?	inet:ipv6-address
	+++ro host* [host-address] {explicit-tracking}?	
	+++ro host-address	inet:ipv6-address
	+++ro host-filter-mode?	enumeration

[2.4.](#) IGMP and MLD Snooping References

The igmp-snooping-instance could be referenced in the scenario of BRIDGE or L2VPN to configure the IGMP Snooping. The name of the instance is the key attribute.

When the igmp-snooping-instance is referenced under the bridge view, it means IGMP Snooping is enabled in the whole bridge. When the igmp-snooping-instance is referenced under the VLAN view, it means IGMP Snooping is enabled in the certain VLAN of the bridge.

The mld-snooping-instance could be referenced in concurrence with igmp-snooping-instance to configure the MLD Snooping.

```

+++rw bridges
|  +++rw bridge* [name]
|
|      +++rw name                name-type
|
|      +++rw igmp-snooping-instance?  igmp-snooping-instance-ref
|
|      +++rw mld-snooping-instance?   mld-snooping-instance-ref
|
|      +++rw component* [name]
|
|          +++rw name            string

```

	+++rw bridge-vlan	
	+++rw vlan* [vid]	
	+++rw vid	vlan-index-type
	+++rw igmp-snooping-instance?	igmp-snooping-instance-ref

Zhao & Liu, etc Expires November 28, 2018 [Page 9]

Internet-Draft	IGMP & MLD Snooping Yang Model	May 29, 2018
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```

|          +++rw mld-snooping-instance?    mld-snooping-instance-ref
+++rw l2vpn-instances
    +++rw l2vpn-instance* [name]
        +++rw name                        string
        +++rw igmp-snooping-instance?    igmp-snooping-instance-ref
        +++rw mld-snooping-instance?    mld-snooping-instance-ref

```

2.5. Augment /if:interfaces/if:interface

This model augment /if:interfaces/if:interface and then add the IGMP and MLD Snooping related attributes under it. The attributes include enable, version, etc.

The static-mrouter-interface and static-l2-multicast-group could be configured statically under the /if:interfaces/if:interface/ims:igmp-mld-snooping view. Meanwhile, you can configure them under the IGMP and MLD Snooping instance view.

The attributes under the statistics are read-only. They show the statistics of IGMP and MLD Snooping related packets.

```
augment /if:interfaces/if:interface:
```

```

+++rw igmp-mld-snooping
    +++rw enable?                boolean {admin-enable}?
    +++rw version?               uint8
    +++rw type?                  enumeration

```

```

+--rw static-mrouter-interface
|
|  +--rw (static-mrouter-interface)?
|
|    +--:(bridge)
|
|      |  +--rw bridge-name?          string
|
|      |  +--rw vlan-id*              uint32
|
|    +--:(l2vpn)
|
|      +--rw l2vpn-instance-name?    string

```

```

+--rw static-l2-multicast-group
|
|  +--rw (static-l2-multicast-group)?
|
|    +--:(bridge)
|
|      |  +--rw bridge-name?          string
|
|      |  +--rw bridge-group-v4* [group source-addr]
|
|      |    |  +--rw group              inet:ipv4-address
|
|      |    |  +--rw source-addr        source-ipv4-addr-type
|
|      |    |  +--rw vlan-id*          uint32
|
|      |  +--rw bridge-group-v6* [group source-addr]
|
|      |    +--rw group                  inet:ipv6-address
|
|      |    +--rw source-addr            source-ipv6-addr-type
|
|      |    +--rw vlan-id*              uint32
|
|    +--:(l2vpn)
|
|      +--rw l2vpn-group-v4* [group source-addr]
|
|        |  +--rw group                  inet:ipv4-address

```

```

|      |  +---rw source-addr          source-ipv4-addr-type
|      |  +---rw l2vpn-instance-name?  string
|      +---rw l2vpn-group-v6* [group source-addr]
|          +---rw group                inet:ipv6-address
|          +---rw source-addr          source-ipv6-addr-type
|          +---rw l2vpn-instance-name?  string
+---ro statistics
    +---ro received
        |  +---ro query?                yang:counter64
        |  +---ro membership-report-v1?  yang:counter64
        |  +---ro membership-report-v2?  yang:counter64

```

```

|  +---ro membership-report-v3?  yang:counter64
|  +---ro leave?                  yang:counter64
|  +---ro non-member-leave?       yang:counter64
|  +---ro pim?                    yang:counter64
+---ro sent
    +---ro query?                  yang:counter64
    +---ro membership-report-v1?  yang:counter64
    +---ro membership-report-v2?  yang:counter64
    +---ro membership-report-v3?  yang:counter64
    +---ro leave?                  yang:counter64
    +---ro non-member-leave?       yang:counter64
    +---ro pim?                    yang:counter64

```

[2.6.](#) IGMP and MLD Snooping RPC

IGMP and MLD Snooping RPC clears the specified IGMP and MLD Snooping group tables.

```
rpcs:
  +---x clear-igmp-snooping-groups {rpc-clear-groups}?
  |   +---w input
  |   +---w name?      string
  |   +---w group?     inet:ipv4-address
  |   +---w source?    inet:ipv4-address
  +---x clear-mlt-snooping-groups {rpc-clear-groups}?
      +---w input
          +---w name?      string
          +---w group?     inet:ipv6-address
          +---w source?    inet:ipv6-address
```

[3.](#) IGMP and MLD Snooping YANG Module

```
<CODE BEGINS> file ietf-igmp-mlt-snooping@2018-05-03.yang
module ietf-igmp-mlt-snooping {
    namespace "urn:ietf:params:xml:ns:yang:ietf-igmp-mlt-snooping";
```

Zhao & Liu, etc

Expires November 28, 2018

[Page 12]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```
// replace with IANA namespace when assigned
prefix ims;
```

```
import ietf-inet-types {
    prefix inet;
}
```

```
import ietf-yang-types {
    prefix "yang";
}
```

```
import ietf-interfaces {
    prefix "if";
}
```

```
import ietf-l2vpn {
```

```

    prefix "l2vpn";
}

import ietf-network-instance {
    prefix "ni";
}

organization
    "IETF PIM Working Group";

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    WG List:    <mailto:pim@ietf.org>

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    ";

```

description

"The module defines a collection of YANG definitions common for all Internet Group Management Protocol (IGMP) and Multicast

Zhao & Liu, etc

Expires November 28, 2018

[Page 13]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

Listener Discovery (MLD) Snooping devices.

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(<http://trustee.ietf.org/license-info>).

This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.";

```
revision 2018-05-03 {  
  description  
    "Initial revision.";  
  reference  
    "RFC XXXX: A YANG Data Model for IGMP and MLD Snooping";  
}
```

```
/*  
 * Features  
 */
```

```
feature admin-enable {  
  description  
    "Support configuration to enable or disable IGMP and MLD  
Snooping.";  
}
```

```
feature immediate-leave {  
  description  
    "Support configuration of immediate-leave.";  
}
```

```
feature join-group {  
  description  
    "Support configuration of join-group.";  
}
```

```
feature require-router-alert {  
  description  
    "Support configuration of require-router-alert.";  
}
```

```
feature static-l2-multicast-group {  
  description  
    "Support configuration of L2 multicast static-group.";
```

```
}
```



```

feature static-mrouter-interface {
    description
        "Support configuration of mrouter interface.";
}

feature per-instance-config {
    description
        "Support configuration of each VLAN or l2vpn instance or EVPN
instance.";
}

feature rpc-clear-groups {
    description
        "Support to clear statistics by RPC for IGMP and MLD
Snooping.";
}

feature explicit-tracking {
    description
        "Support configuration of per instance explicit-tracking
hosts.";
}

feature exclude-lite {
    description
        "Support configuration of per instance exclude-lite.";
}

/*
 * Typedefs
 */
typedef name-type {
    type string {
        length "0..32";
    }
    description
        "A text string of up to 32 characters, of locally determined
significance.";
}
typedef vlan-index-type {
    type uint32 {
        range "1..4094 | 4096..4294967295";
    }
    description
        "A value used to index per-VLAN tables. Values of 0 and 4095
are not permitted. The range of valid VLAN indices. If the
value is greater than 4095, then it represents a VLAN with
scope local to the particular agent, i.e., one without a
global VLAN-ID assigned to it. Such VLANs are outside the

```

```
    scope of IEEE 802.1Q, but it is convenient to be able to
    manage them in the same way using this YANG module.";
reference
    "IEEE Std 802.1Q-2014: Virtual Bridged Local Area Networks.";
}

typedef igmp-snooping-instance-ref {
    type leafref {
        path "/igmp-snooping-instances/igmp-snooping-instance/name";
    }
    description
        "This type is used by data models that need to reference igmp
snooping instance.";
}

typedef mld-snooping-instance-ref {
    type leafref {
        path "/mld-snooping-instances/mld-snooping-instance/name";
    }
    description
        "This type is used by data models that need to reference mld
snooping instance.";
}

typedef l2vpn-instance-ac-ref {
    type leafref {
        path "/ni:network-instances/ni:network-instance/l2vpn:endpoint/l2vp
    }
    description "l2vpn-instance-ac-ref";
}

typedef l2vpn-instance-pw-ref {
    type leafref {
        path "/ni:network-instances/ni:network-instance/l2vpn:endpoint/l2vpn:n
    }
    description "l2vpn-instance-pw-ref";
}

typedef source-ipv4-addr-type {
    type union {
        type enumeration {
            enum '*' {
                description
                    "Any source address.";
            }
        }
        type inet:ipv4-address;
```

```
}  
description
```

```
    "Multicast source IPV4 address type.";
} // source-ipv4-addr-type

typedef source-ipv6-addr-type {
    type union {
        type enumeration {
            enum '*' {
                description
                "Any source address.";
            }
        }
        type inet:ipv6-address;
    }
    description
    "Multicast source IPV6 address type.";
} // source-ipv6-addr-type

/*
 * Identities
 */

/*
 * Groupings
 */

grouping general-state-attributes {
    description "General State attributes";

    container received {
        config false;
        description "Statistics of received IGMP and MLD Snooping
related packets.";
        uses general-statistics-sent-received;
    }
    container sent {
        config false;
        description "Statistics of sent IGMP and MLD Snooping related
packets.";
        uses general-statistics-sent-received;
    }
}
```

```

    }

} // general-state-attributes

grouping instance-config-attributes-igmp-snooping {

```

```

    description "IGMP snooping configuration for each VLAN or l2vpn
instance or EVPN instance.";

```

```

    uses instance-config-attributes-igmp-mld-snooping;

```

```

    leaf querier-source {
        type inet:ipv4-address;
        description "Use the IGMP snooping querier to support IGMP
snooping in a VLAN where PIM and IGMP are not configured.
The IPV4 address is used as the source address in
messages.";
    }

```

```

    list static-l2-multicast-group {
        if-feature static-l2-multicast-group;
        key "group source-addr";
        description
            "A static multicast route, (*,G) or (S,G).";
    }

```

```

    leaf group {
        type inet:ipv4-address;
        description
            "Multicast group IPV4 address";
    }

```

```

    leaf source-addr {
        type source-ipv4-addr-type;
        description
            "Multicast source IPV4 address.";
    }

```

```

    leaf-list bridge-outgoing-interface {
        when "../type = 'bridge'";
        type if:interface-ref;
        description "Outgoing interface in bridge forwarding";
    }

```

```

}

leaf-list l2vpn-outgoing-ac {
    when "../..//type = 'l2vpn'";
    type l2vpn-instance-ac-ref;
    description "Outgoing AC in L2VPN forwarding";
}

leaf-list l2vpn-outgoing-pw {
    when "../..//type = 'l2vpn'";
    type l2vpn-instance-pw-ref;
    description "Outgoing PW in L2VPN forwarding";
}

```

```

} // static-l2-multicast-group

} // instance-config-attributes-igmp-snooping

grouping instance-config-attributes-igmp-mld-snooping {
    description
        "IGMP and MLD Snooping configuration of each VLAN.";

    leaf enable {
        if-feature admin-enable;
        type boolean;
        default false;
        description
            "Set the value to true to enable IGMP and MLD Snooping in
the VLAN instance.";
    }

    leaf forwarding-mode {
        type enumeration {
            enum "mac" {
                description
                    "MAC-based lookup mode";
            }
            enum "ip" {
                description
                    "IP-based lookup mode";
            }
        }
    }
}

```

```

    }
}
default "ip";
description "The default forwarding mode for IGMP and MLD
Snooping is ip.
        cisco command is as below
        Router(config-vlan-config)# multicast snooping lookup
{ ip | mac } ";
}

leaf explicit-tracking {
    if-feature explicit-tracking;
    type boolean;
    default false;
    description "Tracks IGMP & MLD Snooping v3 membership reports
from individual hosts.
        It contributes to saving network resources and
shortening leave latency.";
}

leaf exclude-lite {
    if-feature exclude-lite;

```

Zhao & Liu, etc

Expires November 28, 2018

[Page 19]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```

    type boolean;
    default false;
    description
        "lightweight IGMPv3 and MLDv2 protocols, which simplify the
        standard versions of IGMPv3 and MLDv2.";
    reference "RFC5790";
}

leaf send-query {
    type boolean;
    default true;
    description "Enable quick response for topo changes.
        To support IGMP snooping in a VLAN where PIM and IGMP are
not configured.
        It cooperates with param querier-source. ";
}

/**
leaf mrouter-aging-time {
    type uint16 ;
    default 180;

```

```

        description "Aging time for mrouter interface";
    }
    **/

    leaf immediate-leave {
        if-feature immediate-leave;
        type empty;
        description
            "When fast leave is enabled, the IGMP software assumes that
no more than one host is present on each VLAN port.";
    }

    leaf last-member-query-interval {
        type uint16 {
            range "1..65535";
        }
        units seconds;
        default 1;
        description
            "Last Member Query Interval, which may be tuned to modify
the
            leave latency of the network.";
        reference "RFC3376. Sec. 8.8.";
    }

    leaf query-interval {
        type uint16;
        units seconds;
        default 125;

```

```

        description
            "The Query Interval is the interval between General
Queries
            sent by the Querier.";
        reference "RFC3376. Sec. 4.1.7, 8.2, 8.14.2.";
    }

    leaf query-max-response-time {
        type uint16;
        units seconds;
        default 10;
        description
            "Query maximum response time specifies the maximum time

```

```
        allowed before sending a responding report.";
        reference "RFC3376. Sec. 4.1.1, 8.3, 8.14.3.";
    }
```

```
    leaf require-router-alert {
        if-feature require-router-alert;
        type boolean;
        default false;
        description
            "When the value is true, router alert should exist in the IP
head of IGMP or MLD packet.";
    }
```

```
    leaf robustness-variable {
        type uint8 {
            range "1..7";
        }
        default 2;
        description
            "Querier's Robustness Variable allows tuning for the
expected
            packet loss on a network.";
        reference "RFC3376. Sec. 4.1.6, 8.1, 8.14.1.";
    }
```

```
    leaf version {
        type uint8 {
            range "1..3";
        }
        description "IGMP and MLD Snooping version.";
    }
```

```
    leaf-list static-bridge-mrouter-interface {
```

```
        when "../type = 'bridge'";
```

```
        if-feature static-mrouter-interface;
        type if:interface-ref;
        description "static mrouter interface in bridge forwarding";
    }
```

```
    leaf-list static-l2vpn-mrouter-interface-ac {
```



```

    when "../type = 'l2vpn'";
    if-feature static-mrouter-interface;
    type if:interface-ref;
    description "static mrouter interface whose type is interface
in l2vpn forwarding";

}

leaf-list static-l2vpn-mrouter-interface-pw {

    when "../type = 'l2vpn'";
    if-feature static-mrouter-interface;
    type l2vpn-instance-pw-ref;
    description "static mrouter interface whose type is pw in l2vpn
forwarding";

}

} // instance-config-attributes-igmp-mld-snooping

grouping instance-config-attributes-mld-snooping {
    description "MLD snooping configuration of each VLAN.";

    uses instance-config-attributes-igmp-mld-snooping;

    leaf querier-source {
        type inet:ipv6-address;
        description
            "Use the MLD snooping querier to support MLD snooping where PIM
and MLD are not configured.
            The IPV6 address is used as the source address in messages.";
    }

    list static-l2-multicast-group {
        if-feature static-l2-multicast-group;
        key "group source-addr";
        description
            "A static multicast route, (*,G) or (S,G).";

        leaf group {
            type inet:ipv6-address;
            description

```

```

        "Multicast group IPV6 address";
    }

    leaf source-addr {
        type source-ipv6-addr-type;
        description
            "Multicast source IPV6 address.";
    }

    leaf-list bridge-outgoing-interface {
        when "../.. /type = 'bridge'";
        type if:interface-ref;
        description "Outgoing interface in bridge forwarding";
    }

    leaf-list l2vpn-outgoing-ac {
        when "../.. /type = 'l2vpn'";
        type l2vpn-instance-ac-ref;
        description "Outgoing AC in L2VPN forwarding";
    }

    leaf-list l2vpn-outgoing-pw {
        when "../.. /type = 'l2vpn'";
        type l2vpn-instance-pw-ref;
        description "Outgoing PW in L2VPN forwarding";
    }

} // static-l2-multicast-group

} // instance-config-attributes-mld-snooping

grouping instance-state-group-attributes-igmp-mld-snooping {
    description
        "Attributes for both IGMP and MLD snooping groups.";

    leaf mac-address {
        type yang:phys-address;
        description "Destination MAC address for L2 multicast
forwarding.";
    }

    leaf expire {
        type uint32;
        units seconds;
        description
            "The time left before multicast group timeout.";
    }
}

```

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```
    leaf up-time {
      type uint32;
      units seconds;
      description
        "The time elapsed since the device created L2 multicast
record.";
    }

  } // instance-state-group-attributes-igmp-mld-snooping

  grouping instance-state-attributes-igmp-snooping {

    description
      "State attributes for IGMP snooping for each VLAN or l2vpn
instance or EVPN instance.";

    uses instance-state-attributes-igmp-mld-snooping;

    list group {

      key "address";

      config false;

      description "IGMP snooping information";

      leaf address {
        type inet:ipv4-address;
        description
          "Multicast group IPV4 address";
      }

      uses instance-state-group-attributes-igmp-mld-snooping;

      leaf last-reporter {
        type inet:ipv4-address;
        description
          "Address of the last host which has sent report to join
the multicast group.";
      }
    }
  }
```

```

    list source {
        key "address";
    description "Source IPV4 address for multicast stream";
        leaf address {
            type inet:ipv4-address;
            description "Source IPV4 address for multicast stream";
        }
    }

```

Zhao & Liu, etc

Expires November 28, 2018

[Page 24]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```

        uses instance-state-source-attributes-igmp-ml-d-snooping;

    leaf last-reporter {
        type inet:ipv4-address;
        description
            "Address of the last host which has sent report to join
the multicast group.";
    }

    list host {
        if-feature explicit-tracking;
        key "host-address";
        description
            "List of multicast membership hosts
            of the specific multicast source-group.";

        leaf host-address {
            type inet:ipv4-address;
            description
                "Multicast membership host address.";
        }
        leaf host-filter-mode {
            type enumeration {
                enum "include" {
                    description
                        "In include mode";
                }
                enum "exclude" {
                    description
                        "In exclude mode.";
                }
            }
            description
                "Filter mode for a multicast membership
                host may be either include or exclude.";
        }
    }

```

```

        } // list host

    } // list source
} // list group

} // instance-state-attributes-igmp-snooping

grouping instance-state-attributes-igmp-ml-d-snooping {

    description
        "State attributes for both IGMP and MLD Snooping of each
VLAN or l2vpn instance or EVPN instance.";

    leaf entries-count {

```

```

        type uint32;
        config false;
        description
            "The number of L2 multicast entries in IGMP and MLD
Snooping.";
    }

    leaf-list bridge-mrouter-interface {

        when "../type = 'bridge'";
        type if:interface-ref;
        config false;
        description " mrouter interface in bridge forwarding";

    }

    leaf-list l2vpn-mrouter-interface-ac {

        when "../type = 'l2vpn'";
        type if:interface-ref;
        config false;
        description " mrouter interface whose type is interface in
l2vpn forwarding";

    }

    leaf-list l2vpn-mrouter-interface-pw {

        when "../type = 'l2vpn'";
        type l2vpn-instance-pw-ref;

```

```

        config false;
        description " mrouter interface whose type is pw in l2vpn
forwarding";
    }

```

```

} // instance-config-attributes-igmp-mld-snooping

```

```

grouping instance-state-attributes-mld-snooping {
    description
        "State attributes for MLD snooping of each VLAN.";

    uses instance-state-attributes-igmp-mld-snooping;

```

```

    list group {

        key "address";

        config false;

```

```

        description "MLD snooping statistics information";

        leaf address {
            type inet:ipv6-address;
            description
                "Multicast group IPV6 address";
        }

        uses instance-state-group-attributes-igmp-mld-snooping;

        leaf last-reporter {
            type inet:ipv6-address;
            description
                "Address of the last host which has sent report to join
the multicast group.";
        }

        list source {
            key "address";
            description "Source IPV6 address for multicast stream";

            leaf address {

```

```

        type inet:ipv6-address;
        description "Source IPV6 address for multicast stream";
    }

    uses instance-state-source-attributes-igmp-mld-snooping;

    leaf last-reporter {
        type inet:ipv6-address;
        description
            "Address of the last host which has sent report to join
the multicast group.";
    }

    list host {
        if-feature explicit-tracking;
        key "host-address";
        description
            "List of multicast membership hosts
            of the specific multicast source-group.";

        leaf host-address {
            type inet:ipv6-address;
            description
                "Multicast membership host address.";
        }
        leaf host-filter-mode {
            type enumeration {
                enum "include" {

```

Zhao & Liu, etc

Expires November 28, 2018

[Page 27]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```

        description
            "In include mode";
    }
    enum "exclude" {
        description
            "In exclude mode.";
    }
}
description
    "Filter mode for a multicast membership
    host may be either include or exclude.";
}
} // list host

} // list source
} // list group

```

```

    } // instance-state-attributes-mld-snooping

    grouping instance-state-source-attributes-igmp-mld-snooping {
        description
            "State attributes for both IGMP and MLD Snooping of each VLAN
or l2vpn instance or EVPN instance.";

        leaf-list bridge-outgoing-interface {
            when "../../type = 'bridge'";
            type if:interface-ref;
            description "Outgoing interface in bridge forwarding";
        }

        leaf-list l2vpn-outgoing-ac {
            when "../../type = 'l2vpn'";
            type l2vpn-instance-ac-ref;
            description "Outgoing AC in L2VPN forwarding";
        }

        leaf-list l2vpn-outgoing-pw {
            when "../../type = 'l2vpn'";
            type l2vpn-instance-pw-ref;
            description "Outgoing PW in L2VPN forwarding";
        }

        leaf up-time {
            type uint32;
            units seconds;
            description "The time elapsed since the device created L2
multicast record";
        }
    }

```

```

    leaf expire {
        type uint32;
        units seconds;
        description
            "The time left before multicast group timeout.";
    }

    leaf host-count {

```



```

        if-feature explicit-tracking;
        type uint32;
        description
            "The number of host addresses.";
    }

} // instance-state-source-attributes-igmp-ml-d-snooping

grouping general-statistics-error {
    description
        "A grouping defining statistics attributes for errors.";

    leaf checksum {
        type yang:counter64;
        description
            "The number of checksum errors.";
    }
    leaf too-short {
        type yang:counter64;
        description
            "The number of messages that are too short.";
    }
} // general-statistics-error

grouping general-statistics-sent-received {
    description
        "A grouping defining statistics attributes.";

    leaf query {
        type yang:counter64;
        description
            "The number of query messages.";
    }
    leaf membership-report-v1 {
        type yang:counter64;
        description
            "The number of membership report v1 messages.";
    }
    leaf membership-report-v2 {
        type yang:counter64;
        description
            "The number of membership report v2 messages.";
    }
}

```

```

    }
    leaf membership-report-v3 {

```

```

        type yang:counter64;
        description
            "The number of membership report v3 messages.";
    }
    leaf leave {
        type yang:counter64;
        description
            "The number of leave messages.";
    }
    leaf non-member-leave {
        type yang:counter64;
        description
            "The number of non member leave messages.";
    }
    leaf pim {
        type yang:counter64;
        description
            "The number of pim hello messages.";
    }
} // general-statistics-sent-received

grouping interface-endpoint-attributes-igmp-snooping {
    description "interface attributes for igmp snooping";

    list host {

        if-feature explicit-tracking;

        key "host-address";

        config false;

        description
            "List of multicast membership hosts
            of the specific multicast source-group.";

        leaf host-address {
            type inet:ipv4-address;
            description
                "Multicast membership host address.";
        }
        leaf host-filter-mode {
            type enumeration {
                enum "include" {
                    description
                        "In include mode";
                }
            }
        }
    }
}

```

```
    }
    enum "exclude" {
      description
        "In exclude mode.";
    }
  }
  description
    "Filter mode for a multicast membership
    host may be either include or exclude.";
}
} // list host
} // interface-endpoint-attributes-igmp-snooping

grouping interface-endpoint-attributes-mld-snooping {

  description "interface endpoint attributes mld snooping";

  list host {

    if-feature explicit-tracking;

    key "host-address";

    config false;

    description
      "List of multicast membership hosts
      of the specific multicast source-group.";

    leaf host-address {
      type inet:ipv6-address;
      description
        "Multicast membership host address.";
    }
    leaf host-filter-mode {
      type enumeration {
        enum "include" {
          description
            "In include mode";
        }
        enum "exclude" {
          description
            "In exclude mode.";
        }
      }
      description
        "Filter mode for a multicast membership
```

```

        host may be either include or exclude.";
    }
} // list host
} // interface-endpoint-attributes-mld-snooping

```

```

/*
 * igmp-snooping-instance
 */
container igmp-snooping-instances {
    description
        "igmp-snooping-instance list";

    list igmp-snooping-instance {
        key "name";
        description
            "IGMP Snooping instance to configure the igmp-
snooping.";

        leaf name {
            type string;
            description
                "Name of the igmp-snooping-instance to configure the igmp
snooping.";
        }

        leaf type {
            type enumeration {
                enum "bridge" {
                    description "bridge";
                }
                enum "l2vpn" {
                    description "l2vpn";
                }
            }
            description "The type indicates bridge or l2vpn.";
        }
    }

    uses instance-config-attributes-igmp-snooping {
        if-feature per-instance-config;
    }

    uses instance-state-attributes-igmp-snooping;

```

```
    } //igmp-snooping-instance
  } //igmp-snooping-instances
```

```
    /*
     * mld-snooping-instance
     */
    container mld-snooping-instances {
```

Zhao & Liu, etc

Expires November 28, 2018

[Page 32]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```
    description
      "mld-snooping-instance list";

    list mld-snooping-instance {
      key "name";
      description
        "MLD Snooping instance to configure the mld-snooping.";

      leaf name {
        type string;
        description
          "Name of the mld-snooping-instance to configure the mld
snooping.";
      }

      leaf type {
        type enumeration {
          enum "bridge" {
            description "bridge";
          }
          enum "l2vpn" {
            description "l2vpn";
          }
        }
        description "The type indicates bridge or l2vpn.";
      }
    }

    uses instance-config-attributes-mld-snooping {
      if-feature per-instance-config;
    }
```

```

    uses instance-state-attributes-mld-snooping;

    } //mld-snooping-instance
  } //mld-snooping-instances

  container bridges {
    description
      "Apply igmp-mld-snooping instance in the bridge scenario";

    list bridge {
      key name;

      description
        "bridge list";
    }
  }

```

Zhao & Liu, etc

Expires November 28, 2018

[Page 33]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```

    leaf name {
      type name-type;
      description
        "bridge name";
    }
    leaf igmp-snooping-instance {
      type igmp-snooping-instance-ref;
      description "Configure igmp-snooping instance under the
bridge view";
    }
    leaf mld-snooping-instance {
      type mld-snooping-instance-ref;
      description "Configure mld-snooping instance under the
bridge view";
    }
    list component {
      key "name";
      description
        " ";

      leaf name {
        type string;
        description
          "The name of the Component.";
      }
    }
  }

```

```

        container bridge-vlan {
            description "bridge vlan";
            list vlan {
                key "vid";
                description
                "";

                leaf vid {
                    type vlan-index-type;
                    description
                    "The VLAN identifier to which this entry
applies.";

                }
                leaf igmp-snooping-instance {
                    type igmp-snooping-instance-ref;
                    description "Configure igmp-snooping instance
under the vlan view";
                }
                leaf mld-snooping-instance {
                    type mld-snooping-instance-ref;
                    description "Configure mld-snooping instance
under the vlan view";
                }
            }
        }
    }
}

```

```

        } //vlan
    } //bridge-vlan
} //component
} //bridge
} //bridges

```

```

        container l2vpn-instances {
            description "Apply igmp-mld-snooping instance in the l2vpn
scenario";

```

```

            list l2vpn-instance {
                key "name";
                description "An l2vpn service instance";

                leaf name {
                    type string;

```

```

        description "Name of l2vpn service instance";
    }

    leaf igmp-snooping-instance {
        type igmp-snooping-instance-ref;
        description "Configure igmp-snooping instance under the
l2vpn-instance view";
    }
    leaf mld-snooping-instance {
        type mld-snooping-instance-ref;
        description "Configure mld-snooping instance under the
l2vpn-instance view";
    }

}
}

/* augments */

augment "/if:interfaces/if:interface" {
    description "Augment interface for referencing attributes which
only fit for interface view.";

    container igmp-mld-snooping {
        description
            "igmp-mld-snooping related attributes under interface view";

        leaf enable {
            if-feature admin-enable;
            type boolean;
            default false;
            description

```

```

        "Set the value to true to enable IGMP and MLD Snooping in
the VLAN instance.";
    }

    leaf version {
        type uint8 {
            range "1..3";
        }
        description "IGMP and MLD Snooping version.";
    }

    leaf type {

```



```

    type enumeration {
        enum "bridge" {
            description "bridge";
        }
        enum "l2vpn" {
            description "l2vpn";
        }
    }
    description "The type indicates bridge or l2vpn.";
}

container static-mrouter-interface {
    description
        "Container for choice static-mrouter-interface";

    choice static-mrouter-interface {
        description
            "Configure static multicast router interface under the
interface view";

        case bridge {
            when "../type = 'bridge'" {
                description
                    "Applies to bridge scenario.";
            }
            description
                "Applies to bridge scenario.";

            leaf bridge-name {
                type string;
                description
                    "The name for a bridge. Each interface
belongs to only one bridge.";
            }

            leaf-list vlan-id {
                type uint32;
                description

```

```

        "The vlan ids for bridge. If you don't
specify vlan id here, the interface serves as the mrouter interface for
all the vlans in this bridge.";
    }

```

```

    }
    case l2vpn {
        when "../type = 'l2vpn'" {
            description
                "Applies to l2vpn scenario.";
        }
        description
            "Applies to l2vpn scenario.";

        leaf l2vpn-instance-name {
            type string;
            description
                "The l2vpn instance name applied in the
interface";

        }
    }

} // choice static-mrouter-interface
} // container static-mrouter-interface

container static-l2-multicast-group {
    description
        "Container for static-l2-multicast-group";

    choice static-l2-multicast-group {
        description
            "Configure static l2 multicast group under the
interface view";

        case bridge {
            when "../type = 'bridge'" {
                description
                    "Applies to bridge scenario.";
            }
            description
                "Applies to bridge scenario.";

            leaf bridge-name {
                type string;
                description
                    "bridge name.";
            }

        }
    }
}

```

```
list bridge-group-v4 {

    key "group source-addr";
    description
        "A static multicast route, (*,G) or (S,G).";

    leaf group {
        type inet:ipv4-address;
        description
            "Multicast group IPV4 address";
    }

    leaf source-addr {
        type source-ipv4-addr-type;
        description
            "Multicast source IPV4 address.";
    }

    leaf-list vlan-id {
        type uint32;
        description
            "vlan id.";
    }
}

list bridge-group-v6 {
    key "group source-addr";
    description
        "A static multicast route, (*,G) or (S,G).";

    leaf group {
        type inet:ipv6-address;
        description
            "Multicast group IPV6 address";
    }

    leaf source-addr {
        type source-ipv6-addr-type;
        description
            "Multicast source IPV6 address.";
    }

    leaf-list vlan-id {
        type uint32;
        description
            "vlan id.";
```

```
}
```

```
}
```

```
    }
    case l2vpn {
        when "../type = 'l2vpn'" {
            description
                "Applies to l2vpn scenario.";
        }
        description
            "Applies to l2vpn scenario.";

        list l2vpn-group-v4 {
            key "group source-addr";
            description "A static multicast route, (*,G) or
(S,G).";

            leaf group {
                type inet:ipv4-address;
                description
                    "Multicast group IPV4 address";
            }

            leaf source-addr {
                type source-ipv4-addr-type;
                description
                    "Multicast source IPV4 address.";
            }

            leaf l2vpn-instance-name {
                type string;
                description
                    "The l2vpn instance name applied in the
interface";

            }
        }
        list l2vpn-group-v6 {

            key "group source-addr";

            description
```

```
"A static multicast route, (*,G) or (S,G).";
```

```
leaf group {  
    type inet:ipv6-address;  
    description  
        "Multicast group IPV6 address";  
}
```

```
leaf source-addr {  
    type source-ipv6-addr-type;
```

Zhao & Liu, etc

Expires November 28, 2018

[Page 39]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```
    description  
        "Multicast source IPV6 address.";  
}
```

```
leaf l2vpn-instance-name {  
    type string;  
    description  
        "The l2vpn instance name applied in the
```

```
interface";
```

```
}
```

```
}
```

```
}
```

```
} //choice static-l2-multicast-group
```

```
} // container static-l2-multicast-group
```

```
container statistics {  
    config false;  
    description  
        "A collection of interface-related statistics objects."  
  
    uses general-state-attributes;
```

```
}
```

```
}
```

```
}
```

```
/* RPCs */
```

```
rpc clear-igmp-snooping-groups {  
    if-feature rpc-clear-groups;  
    description  
        "Clears the specified IGMP Snooping cache tables."  
  
    input {  
  
        leaf name {  
            type string;  
            description  
                "Name of the igmp-snooping-instance";  
        }  
  
        leaf group {  
            type inet:ipv4-address;
```

Zhao & Liu, etc

Expires November 28, 2018

[Page 40]

Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

```
        description  
            "Multicast group IPv4 address.  
            If it is not specified, all IGMP snooping group tables  
are  
            cleared."  
    }  
  
    leaf source {  
        type inet:ipv4-address;  
        description  
            "Multicast source IPv4 address.  
            If it is not specified, all IGMP snooping source-group  
tables are  
            cleared."  
    }  
}  
} // rpc clear-igmp-snooping-groups  
  
rpc clear-mld-snooping-groups {  
    if-feature rpc-clear-groups;  
    description  
        "Clears the specified MLD Snooping cache tables."  
  
    input {  
        leaf name {  
            type string;  
            description
```

```

        "Name of the mld-snooping-instance";
    }

    leaf group {
        type inet:ipv6-address;
        description
            "Multicast group IPv6 address.
            If it is not specified, all MLD snooping group tables are
            cleared.";
    }

    leaf source {
        type inet:ipv6-address;
        description
            "Multicast source IPv6 address.
            If it is not specified, all MLD snooping source-group
            tables are
            cleared.";
    }
} // rpc clear-mld-snooping-groups
}
<CODE ENDS>

```

[4. Security Considerations](#)

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF [[RFC6241](#)] or RESTCONF [[RFC8040](#)]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [[RFC6242](#)]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [[RFC5246](#)].

The NETCONF access control model [[RFC6536](#)] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

There are a number of data nodes defined in this YANG module that are writable/creatable/deletable (i.e., config true, which is the default). These data nodes may be considered sensitive or vulnerable

in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:

/ims:igmp-snooping-instances/ims:igmp-snooping-instance

/ims:mld-snooping-instances/ims:mld-snooping-instance

/if:interfaces/if:interface/ims:igmp-mld-snooping

Unauthorized access to any data node of these subtrees can adversely affect the IGMP & MLD Snooping subsystem of both the local device and the network. This may lead to network malfunctions, delivery of packets to inappropriate destinations, and other problems.

Some of the readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via get, get-config, or notification) to these data nodes. These are the subtrees and data nodes and their sensitivity/vulnerability:

/ims:igmp-snooping-instances/ims:igmp-snooping-instance

/ims:mld-snooping-instances/ims:mld-snooping-instance

/if:interfaces/if:interface/ims:igmp-mld-snooping

Unauthorized access to any data node of these subtrees can disclose the operational state information of IGMP & MLD Snooping on this device.

Some of the RPC operations in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control access to these operations. The IGMP & MLD Snooping Yang module support the "clear-igmp-snooping-groups" and "clear-mld-snooping-groups" RPCs. If it meets unauthorized RPC operation invocation, the IGMP and MLD Snooping group tables will be cleared unexpectedly.

[5.](#) IANA Considerations

RFC Ed.: In this section, replace all occurrences of 'XXXX' with the

actual RFC number (and remove this note).

This document registers the following namespace URIs in the IETF XML registry [[RFC3688](#)]:

URI: urn:ietf:params:xml:ns:yang:ietf-igmp-mld-snooping

Registrant Contact: The IESG.

XML: N/A, the requested URI is an XML namespace.

This document registers the following YANG modules in the YANG Module Names registry [[RFC7950](#)]:

name: ietf-igmp-mld-snooping

namespace: urn:ietf:params:xml:ns:yang:ietf-igmp-mld-snooping

prefix: ims

reference: RFC XXXX

[6](#). Normative References

- [RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", [RFC 6020](#), October 2010.

- [RFC6021] Schoenwaelder, J., Ed., "Common YANG Data Types", [RFC 6021](#), October 2010.
- [RFC4541] M. Christensen, K. Kimball, F. Solensky, "Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches", [RFC 4541](#), May 2006.
- [RFC2236] Fenner, W., "Internet Group Management Protocol, Version 2", [RFC 2236](#), November 1997.
- [RFC2710] Deering, S., Fenner, W., and B. Haberman, "Multicast Listener Discovery (MLD) for IPv6", [RFC 2710](#), October 1999.
- [RFC3376] Cain, B., Deering, S., Kouvelas, I., Fenner, B., and A. Thyagarajan, "Internet Group Management Protocol, Version 3", [RFC 3376](#), October 2002.
- [RFC3810] Vida, R. and L. Costa, "Multicast Listener Discovery Version 2 (MLDv2) for IPv6", [RFC 3810](#), June 2004.
- [RFC4604] Holbrook, H., Cain, B., and B. Haberman, "Using InternetGroup Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast", [RFC 4604](#), August 2006.
- [RFC4607] Holbrook, H. and B. Cain, "Source-Specific Multicast for IP", [RFC 4607](#), August 2006.
- [[draft-ietf-pim-igmp-mld-yang-01](#)] X. Liu, F. Guo, M. Sivakumar, P. McAllister, A. Peter, "A YANG data model for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD)", [draft-ietf-pim-igmp-mld-yang-01](#), October 28, 2016.
- [[draft-ietf-pim-igmp-mld-yang-03](#)] X. Liu, F. Guo, M. Sivakumar, P. McAllister, A. Peter, "A YANG data model for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD)", [draft-ietf-pim-igmp-mld-yang-03](#), March 13, 2017.
- [[draft-dsdt-nmda-guidelines-01](#)] M. Bjorklund, J. Schoenwaelder, P. Shafer, K. Watsen, R. Wilton, "Guidelines for YANG Module Authors (NMDA)", [draft-dsdt-nmda-guidelines-01](#), May 2017

[[draft-bjorklund-netmod-rfc7223bis-00](#)] M. Bjorklund, "A YANG Data Model for Interface Management", [draft-bjorklund-netmod-rfc7223bis-00](#), August 21, 2017

[[draft-bjorklund-netmod-rfc7277bis-00](#)] M. Bjorklund, "A YANG Data Model for IP Management", [draft-bjorklund-netmod-rfc7277bis-00](#), August 21, 2017

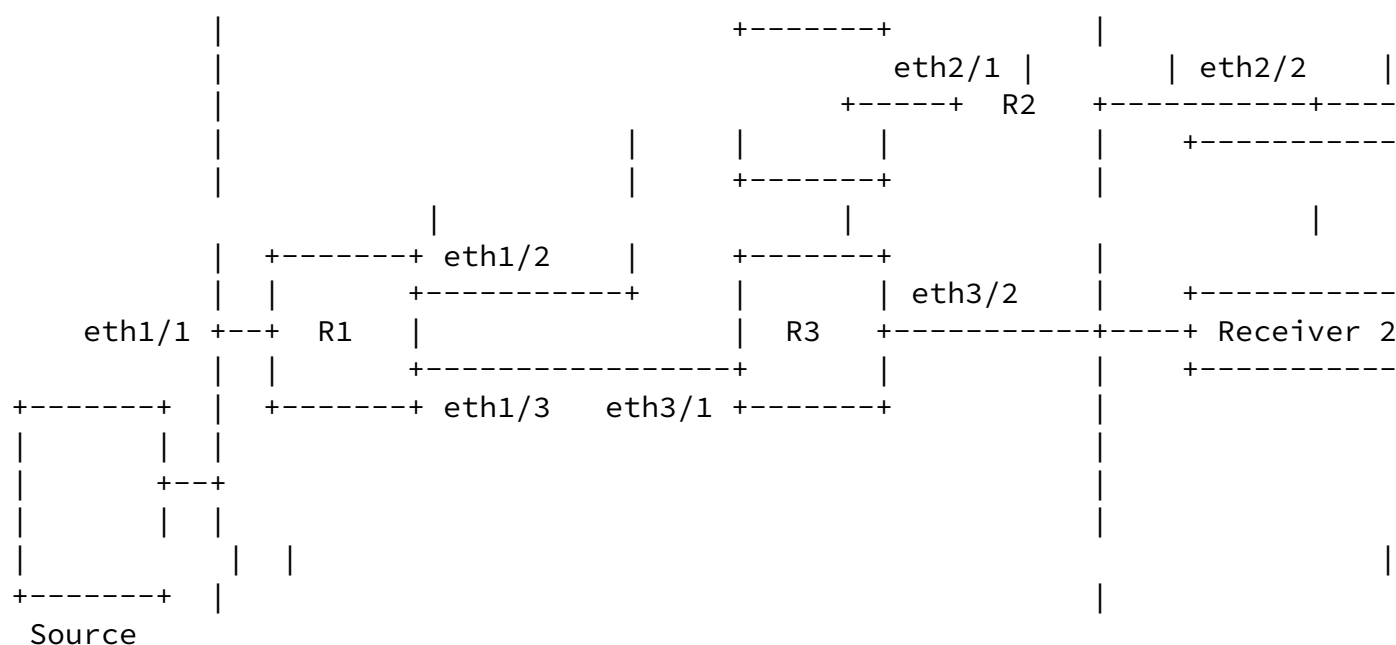
[[draft-ietf-netmod-revised-datastores-03](#)] M. Bjorklund, J. Schoenwaelder, P. Shafer, K. Watsen, R. Wilton, "Network Management Datastore Architecture", [draft-ietf-netmod-revised-datastores-03](#), July 3, 2017

[[draft-ietf-bess-evpn-yang-02](#)] P. Brissette, A. Sajassi, H. Shah, Z. Li, H. Chen, K. Tiruveedhula, I. Hussain, J. Rabadan, "Yang Data Model for EVPN", [draft-ietf-bess-evpn-yang-02](#), March 13, 2017

[[draft-ietf-bess-l2vpn-yang-06](#)] H. Shah, P. Brissette, I. Chen, I. Hussain, B. Wen, K. Tiruveedhula, "YANG Data Model for MPLS-based L2VPN", [draft-ietf-bess-l2vpn-yang-06.txt](#), June 30, 2017

[Appendix A](#). Data Tree Example

This section contains an example of an instance data tree in the JSON encoding [[RFC7951](#)], containing both configuration and state data.



Internet-Draft

IGMP & MLD Snooping Yang Model

May 29, 2018

The configuration instance data tree for R1 in the above figure could be as follows:

```
{
  "ietf-igmp-ml-d-snooping:igmp-snooping-instances": {
    "igmp-snooping-instance": [
      {
        "name": "ins101",
        "type": "bridge",
        "enable": true
      }
    ]
  },
  "ietf-igmp-ml-d-snooping:mld-snooping-instances": {
    "mld-snooping-instance": [
      {
        "name": "ins102",
        "type": "bridge",
        "enable": true
      }
    ]
  },
  "ietf-igmp-ml-d-snooping:bridges": {
    "bridge": [
      {
        "name": "isp",
        "component": [
          {
            "name": "comp1",
            "bridge-vlan": {
              "vlan": [
                {
                  "vid": 101,
                  "igmp-snooping-instance": "ins101"
                },
                {
                  "vid": 102,
                  "mld-snooping-instance": "ins102"
                }
              ]
            }
          }
        ]
      }
    ]
  }
}
```

```

    }
  ]
}
}
}

```

The corresponding operational state data for R1 could be as follows:

```

{
  "ietf-interfaces:interfaces": {
    "interface": [
      {
        "name": "1/1",
        "type": "iana-if-type:ethernetCsmacd",
        "admin-status": "up",
        "if-index": 214748,
        "oper-status": "up",
        "statistics": {
          "discontinuity-time": "2018-05-23T12:34:56-05:00"
        }
      },
      {
        "name": "1/2",
        "type": "iana-if-type:ethernetCsmacd",
        "admin-status": "up",
        "if-index": 214749,
        "oper-status": "up",
        "statistics": {
          "discontinuity-time": "2018-05-23T12:35:06-05:02"
        }
      }
    ]
  },
  "ietf-igmp-mlld-snooping:igmp-snooping-instances": {
    "igmp-snooping-instance": [
      {
        "name": "ins101",
        "type": "bridge",

```

```

"enable": true,
  "forwarding-mode": "ip",
  "explicit-tracking": false,
  "exclude-lite": false,
  "send-query": true,
  "immediate-leave": [null],
  "last-member-query-interval": 1,
  "query-interval": 125,
  "query-max-response-time": 10,
  "require-router-alert": false,
  "robustness-variable": 2,
  "entries-count": 1,
  "bridge-mrouter-interface": ["1/1"],
  "group": [
    {
      "address": "223.0.0.1",
      "mac-address": "01:00:5e:00:00:01",
      "expire": 120,
      "up-time": 180,

```

```

      "last-reporter": "100.0.0.1",
      "source": [
        {
          "address": "192.168.0.1",
          "bridge-outgoing-interface": ["1/2"],
          "up-time": 180,
          "expire": 120,
          "last-reporter": "100.0.0.1"
        }
      ]
    }
  ]
},
"ietf-igmp-mld-snooping:mld-snooping-instances": {
  "mld-snooping-instance": [
    {
      "name": "ins102",
      "type": "bridge",
      "enable": true,
      "forwarding-mode": "ip",
      "explicit-tracking": false,
      "exclude-lite": false,
      "send-query": true,

```


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