Abstract

This document defines a YANG data model that can be used to configure and manage Internet Group Management Protocol (IGMP) or Multicast Listener Discovery (MLD) proxy devices. The YANG module in this document conforms to Network Management Datastore Architecture (NMDA).

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at http://www.ietf.org/ietf/1id-abstracts.txt
The list of Internet-Draft Shadow Directories can be accessed at http://www.ietf.org/shadow.html

This Internet-Draft will expire on April 27, 2020.

Copyright Notice

Copyright (c) 2019 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust’s Legal Provisions Relating to IETF Documents (http://trustee.ietf.org/license-info) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

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. Augment /rt:routing/rt:control-plane-protocols/rt:control-
       plane-protocol............................................4
3. IGMP/MLD Proxy YANG Module..................................5
4. Security Considerations.......................................13
5. IANA Considerations...........................................14
6. Normative References..........................................15

Authors’ Addresses.............................................17
1. Introduction

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

The YANG module in this document conforms to the Network Management Datastore Architecture defined in [RFC8342]. 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:

- Brackets "[" and "]" enclose list keys.
- Abbreviations before data node names: "rw" means configuration (read-write), and "ro" means state data (read-only).
- Symbols after data node names: "?" means an optional node, "!" means a presence container, and "*" denotes a list and leaf-list.
- Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- 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) / Multicast Listener Discovery (MLD) - Based Multicast Forwarding ("IGMP/MLD Proxying") [RFC4605].
The goal of this document is to define a data model that provides a common user interface to IGMP/MLD proxy. This document provides freedom for vendors to adapt this data model to their product implementations.

2.1. Overview

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

The YANG module augments /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol to enable IGMP/MLD proxy and configure other related parameters.

This YANG module 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. Augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol

The YANG module augments /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol to configure IGMP/MLD proxy. The interface list under igmp-proxy or mld-proxy contains upstream interfaces for IGMP/MLD proxy. There is also a constraint to make sure the upstream interface for IGMP/MLD proxy should not be configured PIM.

To configure a downstream interface for IGMP/MLD proxy, enable IGMP/MLD on that interface. This is defined in the YANG Data Model for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD). In IGMP/MLD proxy model downstream-interface is read-only.

module: ietf-igmp-mld-proxy
  augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol:
    +--rw igmp-proxy {feature-igmp-proxy}?
      +--rw interfaces
        +--rw interface* [interface-name]
          +--rw interface-name if:interface-ref
          +--rw version? uint8
          +--rw enable? boolean
          +--ro group* [group-address]
            +--ro group-address inet:ipv4-address
            +--ro up-time? uint32
3. IGMP/MLD Proxy YANG Module

<CODE BEGINS> file ietf-igmp-mld-proxy@2019-07-03.yang

module ietf-igmp-mld-proxy {
  yang-version 1.1;
  // replace with IANA namespace when assigned
  prefix imp;

  import ietf-inet-types {
    prefix inet;
  }

  import ietf-interfaces {
    prefix if;
  }

  import ietf-routing {
    prefix rt;
  }

Zhao & Liu, etc Expires April 27, 2020 [Page 5]
import ietf-pim-base {
    prefix pim-base;
}

organization
"IETF PIM Working Group";

contact
"WG Web: <http://tools.ietf.org/wg/pim/>
WG List: <mailto:pim@ietf.org>

Editors: Hongji Zhao
<mailto:hongji.zhao@ericsson.com>
Xufeng Liu
<mailto:xufeng.liu.ietf@gmail.com>
Yisong Liu
<mailto:liuyisong@huawei.com>
Mani Panchanathan
<mailto:mapancha@cisco.com>
Mahesh Sivakumar
<mailto:sivakumar.mahesh@gmail.com>
"

description
"The module defines a collection of YANG definitions common for all Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Proxy devices.

Copyright (c) 2019 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in Section 4.c of the IETF Trust’s Legal Provisions Relating to IETF Documents (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 2019-07-03 {
    description
    "Initial revision.";
    reference
Zhao & Liu, etc Expires April 27, 2020 [Page 6]
"RFC XXXX: A YANG Data Model for IGMP and MLD Proxy";
}

/*
 * Features
 */

feature feature-igmp-proxy {
   description
      "Support IGMP Proxy protocol."
   reference
      "RFC 4605";
}

feature feature-mld-proxy {
   description
      "Support MLD Proxy protocol."
   reference
      "RFC 4605";
}

/*
 * Identities
 */

identity igmp-proxy {
   base rt:control-plane-protocol;
   description
      "IGMP Proxy protocol";
}

identity mld-proxy {
   base rt:control-plane-protocol;
   description
      "MLD Proxy protocol";
}

/*
 * Typedefs
 */

/*
 * Groupings
 */

grouping per-interface-config-attributes {
   description "Config attributes under interface view";
}
leaf enable {
  type boolean;
  default false;
  description
    "Set the value to true to enable IGMP/MLD proxy";
}

// per-interface-config-attributes

grouping state-group-attributes {
  description
    "State group attributes";

leaf up-time {
  type uint32;
  units seconds;
  description
    "The elapsed time for (S,G) or (*,G).";
}

leaf filter-mode {
  type enumeration {
    enum "include" {
      description
        "In include mode, reception of packets sent
        to the specified multicast address is requested
        only from those IP source addresses listed in the
        source-list parameter";
    }
    enum "exclude" {
      description
        "In exclude mode, reception of packets sent
        to the given multicast address is requested
        from all IP source addresses except those
        listed in the source-list parameter.";
    }
  }
  description
    "Filter mode for a multicast group,
    may be either include or exclude.";
}

// state-group-attributes

/* augments */

augment "/rt:routing/rt:control-plane-protocols"+
  "/rt:control-plane-protocol" {
  description

"IGMP Proxy augmentation to routing control plane protocol configuration and state."

container igmp-proxy {
  when 'derived-from-or-self(../rt:type, "imp:igmp-proxy")' {
    description
      "This container is only valid for IGMP Proxy protocol.";
  }
  if-feature feature-igmp-proxy;
  description "IGMP proxy";
  container interfaces {
    description
      "Containing a list of upstream interfaces.";

    list interface {
      key "interface-name";
      description
        "List of upstream interfaces.";

      leaf interface-name {
        type if:interface-ref;
          description
            "The upstream interface for IGMP proxy should not be configured PIM.";
        }
        description "The upstream interface name.";
      }

      leaf version {
        type uint8 {
          range "1..3";
        }
        default 2;
        description "IGMP version.";
      }

      uses per-interface-config-attributes;

    list group {
      key "group-address";
      config false;
      description
        "Multicast group membership information that joined on the interface.";
      }
    }
  }
}
leaf group-address {
    type inet:ipv4-address;
    description "Multicast group address."
}

uses state-group-attributes;

list source {
    key "source-address";
    description "List of multicast source information of the multicast group.";
    leaf source-address {
        type inet:ipv4-address;
        description "Multicast source address";
    }
}

uses state-group-attributes;

list downstream-interface {
    key "interface-name";
    description "The downstream interfaces list.";
    leaf interface-name {
        type if:interface-ref;
        description "Downstream interfaces for each upstream-interface";
    }
}

leaf filter-mode {
    type enumeration {
        enum "include" {
            description "In include mode, reception of packets sent to the specified multicast address is requested only from those IP source addresses listed in the source-list parameter";
        }
        enum "exclude" {
            description "In exclude mode, reception of packets sent to the given multicast address is requested from all IP source addresses except those listed in the source-list parameter.";
        }
    }
    description "Filter mode for a multicast group, may be either include or exclude.";
}
augment "/rt:routing/rt:control-plane-protocols"+
"/rt:control-plane-protocol" {

description
"MLD Proxy augmentation to routing control plane protocol
configuration and state.";

container mld-proxy {
  when 'derived-from-or-self(../rt:type, "imp:mld-proxy")' {
    description
    "This container is only valid for MLD Proxy protocol.";
  }
  if-feature feature-mld-proxy;
  description "MLD proxy";
  container interfaces {
    description
    "Containing a list of upstream interfaces.";
    list interface {
      key "interface-name";
      description
      "List of upstream interfaces.";
      leaf interface-name {
        type if:interface-ref;
        must "not( current() = /rt:routing"+
        "/rt:control-plane-protocols/pim-base:pim"+
        "/pim-base:interfaces/pim-base:interface"+
        "/pim-base:name )" {
          description
          "The upstream interface for MLD proxy
          should not be configured PIM.";
        }
        description "The upstream interface name.";
      }
      leaf version {
        type uint8 {
          range "1..2";
        }
        default 2;
        description "MLD version.";
      }
    }
  }
}

Zhao & Liu, etc Expires April 27, 2020 [Page 11]
uses per-interface-config-attributes;

list group {
  key "group-address";
  config false;
  description
    "Multicast group membership information
that joined on the interface.";

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

uses state-group-attributes;

list source {
  key "source-address";
  description
    "List of multicast source information
    of the multicast group.";
  leaf source-address {
    type inet:ipv6-address;
    description
      "Multicast source address";
  }
}

uses state-group-attributes;

list downstream-interface {
  key "interface-name";
  description "The downstream interfaces list.";
  leaf interface-name {
    type if:interface-ref;
    description
      "Downstream interfaces for each upstream-interface";
  }
  leaf filter-mode {
    type enumeration {
      enum "include" {
        description
          "In include mode, reception of packets sent
to the specified multicast address is requested
only from those IP source addresses listed in
the
source-list parameter";
      }
      enum "exclude" {

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:

/routing/control-plane-protocols/control-plane-protocol
Unauthorized access to any data node of these subtrees can adversely affect the IGMP/MLD proxy 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:

/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol

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

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]:

---
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-proxy
prefix: imp
---
6. Normative References


Authors’ Addresses

Hongji Zhao
Ericsson (China) Communications Company Ltd.
Ericsson Tower, No. 5 Lize East Street,
Chaoyang District Beijing 100102, P.R. China
Email: hongji.zhao@ericsson.com

Xufeng Liu
Volta Networks
USA
EMail: Xufeng.liu.ietf@gmail.com

Yisong Liu
Huawei Technologies
Huawei Bld., No.156 Beiqing Rd.
Beijing 100095
China
Email: liuyisong@huawei.com

Mani Panchanathan
Cisco
India
Email: mapancha@cisco.com

Mahesh Sivakumar
Juniper Networks
1133 Innovation Way
Sunnyvale, California
USA
EMail: sivakumar.mahesh@gmail.com