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Multicast YANG Data Model
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Abstract

This document provides a generic multicast YANG data model that shows the relevant technologies or protocols used by multicast flows. It provides a management view for network administrators to obtain information about multicast services.

Status of This Memo

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1. Introduction

Currently, there are many multicast protocol YANG models, such as PIM (Protocol Independent Multicast), MLD (Multicast Listener Discovery), and BIER (Bit Index Explicit Replication) and so on. But all these models are distributed in different working groups as separate files and focus on the protocol itself. Furthermore, they cannot describe a high-level multicast service required by network operators.

This document provides a general and all-round multicast model, which shows the relevant technologies or protocols used by multicast flows. It provides a management view for network administrators to obtain information about multicast services.

This document does not define any specific protocol model, instead, it depends on many existing multicast protocol models and relates several multicast information together to fulfill multicast service.

This document defines one NMDA-compatible [RFC8342] YANG 1.1 [RFC7950] data model for the management of multicast service. This model can be used along with other multicast YANG models such as PIM [RFC9128], which are not covered in this document.

1.1. Terminology

The terminology for describing YANG data models is found in [RFC6020] and [RFC7950], including:

* data model

* data node

* identity

* module

The following abbreviations are used in this document and the defined model:

BIER: Bit Index Explicit Replication [RFC8279].

BIER-TE: Traffic Engineering for Bit Index Explicit Replication [RFC9262].

MLD: Multicast Listener Discovery [I-D.ietf-bier-mld].

MLDP: Label Distribution Protocol Extensions for Point-to-Multipoint and Multipoint-to-Multipoint Label Switched Paths [RFC6388].

MVPN: Multicast in MPLS/BGP IP VPNs [RFC6513].

P2MP-TE: Point-to-Multipoint Traffic Engineering [RFC4875].

PIM: Protocol Independent Multicast [RFC7761].

SR-P2MP: Segment Routing Point-to-Multipoint [I-D.ietf-pim-sr-p2mp-policy].

1.2. Conventions Used in This Document

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] [RFC8174] when, and only when, they appear in all capitals, as shown here.

1.3. Tree Diagrams

Tree diagrams used in this document follow the notation defined in [RFC8340].

1.4. Prefixes in Data Node Names

In this document, names of data nodes, actions, and other data model objects are often used without a prefix, as long as it is clear from the context in which YANG module each name is defined. Otherwise, names are prefixed using the standard prefix associated with the corresponding YANG module, as shown in Table 1.

Prefix	YANG module	Reference
inet	ietf-inet-types	[RFC9911]
rt-types	ietf-routing-types	[RFC8294]
rt	ietf-routing	[RFC8349]
te-types	ietf-te-types	[RFC8776]
bier	ietf-bier	[I-D.ietf-bier-bier-yang]

Table 1

2. Design of the Data Model

2.1. Scope of Model

This model can be used to configure and manage the multicast service. The operational state data can be retrieved by this model. The subscription and push mechanism defined in [RFC8639] and [RFC8641] can be implemented by the user to subscribe to notifications on the data nodes in this model.

The model contains all the basic configuration parameters to configure the multicast service. Depending on the implementation choices, some systems may not allow some of the advanced parameters to be configurable. The occasionally implemented parameters are modeled as optional features in this model. This model can be extended, and it has been structured in a way that such extensions can be conveniently made.

2.1.1. Usage of Multicast Model

This multicast YANG data model is mainly used by the management tools run by the network operators, in order to manage, monitor and debug the network resources that are used to deliver multicast service. This model is used for gathering data from the network as well.

```
                  +------------------------+
                  |    Multicast Model     |
                  +------------------------+
                    |        |          |
                    |        |          |
                    |  +---------+  +----------+
                    |  | EMS/NMS |  |Controller|
                    |  +---------+  +----------+
                    |        |          |
                    |        |          |
           +--------------------------------------------------+
           |                Network Element1.....N            |
           +--------------------------------------------------+
```

Figure 1: Usage of Multicast Model

Figure 1 illustrates example use cases for this multicast model. Network operators can use this model in a controller which is responsible to implement specific multicast flows with specific protocols and work with the corresponding protocols' model to configure the network elements through NETCONF/RESTCONF/CLI. Or network operators can use this model to the EMS (Element Management System)/ NMS (Network Management System) to manage or configure the network elements directly.

On the other hand, when the network elements detect failure or some other changes, the network devices can send the affected multicast flows and the associated signaling/ transport information to the controller. Then the controller/ EMS/NMS can respond immediately due to the failure. Such as the changing of the failure signaling protocol to another one, as well as transport protocol. The controller can distribute new model for the flows to the network nodes. For example, a multicast flow is forwarded by BIER transport, but BIER may no longer be active, and the flow needs to be forwarded via PIM. The controller can send a model with the same multicast flow information and the associated transport protocol (set to PIM) to the ingress node.

Specifically, in section 2, it provides a human readability of the whole multicast network through diagram, which frames different multicast components and correlates them in a readable fashion. Then, based on this diagram, there is instantiated and detailed YANG model in Section 3.

The usage of this model is flexible. The multicast-keys indicate the flow characters. The flow can be L3 multicast flow, or L2 flow which is also called BUM (Broadcast, Unknown unicast, Multicast) flow in EVPN ([RFC7432]) deployment.

The Route Distinguisher, source-address and group-address of L3 multicast flow are the multicast flow keys. For example, when the group-address is set, and the source-address is set to * or a specific value, this is (*,G) or (S,G) analogous. In addition to the source-address and group-address, when vpn-rd is also set, this is MVPN use case.

* When the controller manages all the ingress and egress routers for the flow, the model is sent with flow characters, ingress and egress nodes information to the ingress and egress nodes. Then the ingress and egress nodes can work without any other dynamic signaling protocols.

* When the controller manages the ingress nodes only for the flow, the model is sent with the flow characters to the ingress nodes. The dynamic signaling protocol can be set or not. If the dynamic signaling protocol is set, the nodes use the protocol to signal the flow information with other nodes. If the dynamic signaling protocol is not set, the nodes use the local running dynamic signaling protocol to signal the flow information.

* When the transport protocol is set in the model, the nodes encapsulate the flow according to the transport protocol. When the transport protocol is not set in the model, the nodes use the local configured transport protocol for encapsulation.

* More than one ingress node for a multicast flow can be set in the model. In this situation, two or more ingress nodes are used for a multicast flow forwarding, the ingress routers can be backup for each other. More information can be found in [I-D.ietf-mboned-redundant-ingress-failover].

* The controller can also use this model to get information from the ingress node. When the received information is inconsistent with expectations, for example, a multicast flow should be forwarded through BIER transmission, but the received information shows that the multicast flow is forwarded by PIM, there may be some management inconsistencies.

2.1.1.1. Example

```
                              +------------+
                              |            +---------------------------+
               +--------------+ Controller |                           |
               |              |            +-----------+               |
               |              +------------+           |               |
               |                                       |               |
               |     +-----------------------------+   |               |
               |     |                             |   |               |
               |     |                      +------+---+--+            |
               |     |                      |Egress router+--+ Receiver|
               |     |                      +------+------+            |
           +---+-----+----+                        |                   |
  Source +-|Ingress router|     BIER domain        |                   |
           +---------+----+                        |                   |
                     |                      +------+------+            |
                     |                      |Egress router+--+ Receiver|
                     |                      +------+----+-+            |
                     |                             |    |              |
                     +-----------------------------+    +--------------+
```

Figure 2: Example

The network administrator can use the multicast model and associated models to deploy the multicast service. For example, suppose that the flow for a multicast service is 233.252.0.0/24, the flow should be forwarded by BIER [RFC8279] with MPLS encapsulation [RFC8296].

In this model, the corresponding group-address that is in multicast-keys is set to 233.252.0.0/24, the transport technology is set to BIER. The model is sent to every edge router from the controller. If the BIER transport layer has not been built in the network, the multicast YANG model may work with the BIER YANG model that is defined in [I-D.ietf-bier-bier-yang]. After the BIER transport layer is built, the ingress router encapsulates the multicast flow with BIER header and sends it into the network. Intermediate routers forward the flows to all the egress nodes by BIER forwarding.

Another example for this figure is, the controller can act as the BIER overlay only. The routers in the domain build BIER forwarding plane beforehand. The controller sends the multicast group-address and/or the source-address to the edge routers in BIER domain only, without signaling and transport set in the model. Then the ingres router can encapsulate the multicast flow with BIER encapsulation automatically.

2.2. Specification

This model imports and augments ietf-routing YANG model defined in [RFC8349]. The container "multicast-service" is the top-level container in this data model. The container is expected to enable multicast service functionality.

The YANG data model defined in this document conforms to the Network Management Datastore Architecture (NMDA) [RFC8342]. The operational state data is combined with the associated configuration data in the same hierarchy [RFC8407].

2.3. Overview

```
module: ietf-multicast
  +--rw multicast-service
     +--rw multicast-flow* [vpn-rd source-address group-address]
        +--rw vpn-rd            rt-types:route-distinguisher
        +--rw source-address    ip-multicast-source-address
        +--rw group-address     rt-types:ip-multicast-group-address
        +--rw upstream
        |  +--rw neighbor* [neighbor-address]
        |     +--rw neighbor-address    inet:ip-address
        |     +--rw vni-type?           identityref
        |     +--rw signaling?          identityref
        |     +--rw (protocol-type)?
        |        +--:(evpn)
        |        +--:(mld)
        |        +--:(mld-snooping)
        |        +--:(mvpn)
        |        +--:(pim)
        +--rw downstream* [signaling transport]
           +--rw signaling                    identityref
           +--rw (protocol-type)?
           |  +--:(evpn)
           |  +--:(mld)
           |  +--:(mld-snooping)
           |  +--:(mvpn)
           |  +--:(pim)
```

```
              +--rw transport                   identityref
              +--rw (transport-tech-type)?
              |  +--:(bier) {bier}?
              |  |  +--rw bier* [sub-domain]
              |  |     +--rw sub-domain         uint16
              |  |     +--rw tad* [mt-id fa-number data-plane]
              |  |     |  +--rw mt-id         uint16
              |  |     |  +--rw fa-number     uint8
              |  |     |  +--rw data-plane    uint8
              |  |     +--rw bitstringlength?   uint16
              |  |     +--rw bier-encap-type?   identityref
              |  +--:(bier-te) {bier-te}?
              |  |  +--rw bitstring* [name]
              |  |     +--rw name           string
              |  |     +--rw bier-te-adj* [adj-id]
              |  |        +--rw adj-id    uint16
              |  +--:(mldp) {mldp}?
              |  |  +--rw mt-id?                uint16
              |  |  +--rw fa-number?            uint8
              |  +--:(rsvp-te-p2mp) {p2mp-te}?
              |  |  +--rw template-name?
              |  |  |       te-types:te-template-name
              |  |  +--rw static-tunnel-name?   string
              |  +--:(pim) {pim}?
              |  |  +--rw source-address?
              |  |  |       ip-multicast-source-address
              |  |  +--rw group-address
              |  |  |       rt-types:ip-multicast-group-address
              |  |  +--rw bidir {bidir}?
              |  |  +--rw tad* [mt-id fa-number data-plane]
              |  |     +--rw mt-id         uint16
              |  |     +--rw fa-number     uint8
              |  |     +--rw data-plane    uint8
              |  +--:(ir-tunnel) {ir-tunnel}?
              |  |  +--rw ir-tunnel-type?       uint8
              |  +--:(sr-p2mp) {sr-p2mp}?
              |  +--:(native)
              +--rw neighbor* [neighbor-address]
                 +--rw neighbor-address    inet:ip-address
                 +--rw vni-type?           identityref

     notifications:
       +---n ingress-egress-event
          +--ro event-type?       identityref
          +--ro multicast-flow* [vpn-rd source-address group-address]
             +--ro vpn-rd            rt-types:route-distinguisher
             +--ro source-address    ip-multicast-source-address
             +--ro group-address     rt-types:ip-multicast-group-address
```

```
             +--ro upstream
             |  +--ro neighbor* [neighbor-address]
             |     +--ro neighbor-address    inet:ip-address
             |     +--ro vni-type?           identityref
             |     +--ro signaling?          identityref
             |     +--ro (protocol-type)?
             |        +--:(evpn)
             |        +--:(mld)
             |        +--:(mld-snooping)
             |        +--:(mvpn)
             |        +--:(pim)
             +--ro downstream* [signaling transport]
                +--ro signaling                   identityref
                +--ro (protocol-type)?
                |  +--:(evpn)
                |  +--:(mld)
                |  +--:(mld-snooping)
                |  +--:(mvpn)
                |  +--:(pim)
                +--ro transport                   identityref
                +--ro (transport-tech-type)?
                |  +--:(bier) {bier}?
                |  |  +--ro bier* [sub-domain]
                |  |     +--ro sub-domain         uint16
                |  |     +--ro tad* [mt-id fa-number data-plane]
                |  |     |  +--ro mt-id         uint16
                |  |     |  +--ro fa-number     uint8
                |  |     |  +--ro data-plane    uint8
                |  |     +--ro bitstringlength?   uint16
                |  |     +--ro bier-encap-type?   identityref
                |  +--:(bier-te) {bier-te}?
                |  |  +--ro bitstring* [name]
                |  |     +--ro name           string
                |  |     +--ro bier-te-adj* [adj-id]
                |  |        +--ro adj-id    uint16
                |  +--:(mldp) {mldp}?
                |  |  +--ro mt-id?                uint16
                |  |  +--ro fa-number?            uint8
                |  +--:(rsvp-te-p2mp) {p2mp-te}?
                |  |  +--ro template-name?
                |  |  |       te-types:te-template-name
                |  |  +--ro static-tunnel-name?   string
                |  +--:(pim) {pim}?
                |  |  +--ro source-address?
                |  |  |       ip-multicast-source-address
                |  |  +--ro group-address
                |  |  |       rt-types:ip-multicast-group-address
                |  |  +--ro bidir {bidir}?
```

```
                |  |  +--ro tad* [mt-id fa-number data-plane]
                |  |     +--ro mt-id         uint16
                |  |     +--ro fa-number     uint8
                |  |     +--ro data-plane    uint8
                |  +--:(ir-tunnel) {ir-tunnel}?
                |  |  +--ro ir-tunnel-type?       uint8
                |  +--:(sr-p2mp) {sr-p2mp}?
                |  +--:(native)
                +--ro neighbor* [neighbor-address]
                   +--ro neighbor-address    inet:ip-address
                   +--ro vni-type?           identityref
```

2.4. Multicast YANG data model Configuration

This model can work with other protocol data models to provide multicast service.

This model includes multicast service keys, the multicast service signaling, the transport layer information. Multicast keys include the features of multicast flow, such as (vpn-rd, multicast source and multicast group) information. In data center network, for fine-grained to gather the nodes belonging to the same virtual network, there may need VNI-related information to assist.

Multicast service signaling defines the multicast flows information, and the nodes (ingress and/or egress) information. If the transport layer is BIER, there may define BIER information including (Subdomain, tad (multi-topology ID, flex algo number, data-plane), encapsulation-type). When the nodes (ingress and/or egress) information are not defined, there may need dynamic multicast signaling technology, such as MLD or MVPN, to collect these nodes information. The model can be sent to the ingress nodes only. For example, regardless of the dynamic signaling protocol used, the ingress node advertises the multicast flow information to all neighbors in the BIER domain. When the ingress node receives the signaling from some egress nodes, the ingress node sends the flow to the signaling egress nodes.

Multicast transport layer defines the type of transport technologies that can be used to forward multicast flow, including BIER forwarding type, MPLS forwarding type, or PIM forwarding type and so on. The multicast YANG data model can be used with the corresponding protocol model to indicate the transport technology used for the multicast flow.

The configuration modeling branch is composed of the keys, upstream (ingress) nodes, downstream (egress) nodes, signaling protocols and transport technologies.

2.5. Multicast YANG data model State

Multicast model states are the same with the configuration. In most cases, network administrators can use this model to obtain multicast flows and related protocol information such as signaling protocols and transport technologies.

2.6. Multicast YANG data model Notification

The defined Notifications include the events of ingress or egress nodes. Like ingress node failure, signaling/ transport module loading/ unloading. And the potential failure about some multicast flows and associated signaling/ transport technologies.

3. Multicast YANG data Model

This module references [RFC4541], [RFC4875], [RFC4915], [RFC5015], [RFC5120], [RFC6388], [RFC6513], [RFC6514], [RFC7348], [RFC7432], [RFC7637], [RFC7716], [RFC7761], [RFC7988], [RFC8174], [RFC8279], [RFC8294], [RFC8296], [RFC8349], [RFC8556], [RFC8776], [RFC8926], [RFC9179], [RFC9262], [RFC9350], [RFC9502], [RFC9524], [RFC9572], [RFC9624], [RFC9658], [RFC9911], [I-D.ietf-bier-bier-yang], [I-D.ietf-bier-mld], [I-D.ietf-bier-bierin6], [I-D.ietf-bier-pim-signaling], [I-D.ietf-bier-te-yang], [I-D.ietf-lsr-flex-soft-dataplane], [I-D.ietf-pim-sr-p2mp-policy], [I-D.xz-pim-flex-algo].

```
<CODE BEGINS> file "ietf-multicast@2026-01-06.yang"
module ietf-multicast {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-multicast";
  prefix ietf-multicast;

  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 9911: Common YANG Data Types";
  }
  import ietf-routing-types {
    prefix rt-types;
    reference
      "RFC 8294: Common YANG Data Types for the Routing Area";
  }
  import ietf-routing {
```

```
       prefix rt;
       reference
         "RFC 8349: A YANG Data Model for Routing Management
                    (NMDA Version)";
     }
     import ietf-te-types {
       prefix te-types;
       reference
         "RFC 8776: Common YANG Data Types for Traffic Engineering";
     }
     import ietf-bier {
       prefix bier;
       reference
         "I-D.ietf-bier-bier-yang: YANG Data Model for BIER Protocol";
     }

     organization
       " IETF MBONED (MBONE Deployment) Working Group";
     contact
       "WG List:  <mailto:mboned@ietf.org>

        Editor:   Zheng Zhang
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        Editor:   Mahesh Sivakumar
                  <mailto:sivakumar.mahesh@gmail.com>
       ";

     // RFC Ed.: replace XXXX with actual RFC number and remove
     // this note

     description
       "The module defines the YANG definitions for multicast service
        management. This model can be used to send multicast flow
        information to or retrieve multicast flow information from
        devices, including upstream and downstream node information,
        possible signaling protocols, and the multicast transmission
        protocol that actually carries the multicast flow.

        Copyright (c) 2026 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
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        This version of this YANG module is part of RFC 9719
        (https://www.rfc-editor.org/info/rfc9719); see the RFC itself
        for full legal notices.

        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 (RFC 2119) (RFC 8174) when, and only when,
        they appear in all capitals, as shown here.";

     revision 2026-01-06 {
       description
         "Initial revision.";
       reference
         "RFC XXXX: A YANG Data Model for multicast service management
          YANG.";
     }

     /*
      *feature
      */

     feature bier {
       description
         "Cooperation with BIER technology.";
       reference
         "RFC 8279: Multicast Using Bit Index Explicit Replication
            (BIER)";
     }

     feature bier-te {
       description
         "Cooperation with BIER-TE technology.";
       reference
         "RFC 9262: Tree Engineering for Bit Index Explicit Replication
            (BIER-TE)";
     }

     feature sr-p2mp {
       description
         "Cooperation with multipoint Segment Routing replication
          technology.";
```

```
       reference
         "RFC 9524: Segment Routing Replication for Multipoint
            Service Delivery";
     }

     feature ir-tunnel {
       description
         "Cooperation with Ingress Replication tunnel technology.";
       reference
         "RFC 7988: Ingress Replication Tunnels in Multicast VPN";
     }

     feature mldp {
       description
         "Cooperation with MLDP technology.";
       reference
         "RFC 6388: Label Distribution Protocol Extensions
            for Point-to-Multipoint and Multipoint-to-Multipoint
            Label Switched Paths";
     }

     feature p2mp-te {
       description
         "Cooperation with RSVP TE P2MP technology.";
       reference
         "RFC 4875: Extensions to Resource Reservation Protocol -
           Traffic Engineering (RSVP-TE) for Point-to-Multipoint TE
           Label Switched Paths (LSPs)";
     }

     feature pim {
       description
         "Cooperation with PIM technology.";
       reference
         "RFC 7761: Protocol Independent Multicast - Sparse Mode
          (PIM-SM): Protocol Specification (Revised)";
     }

     feature bidir {
       description
         "Cooperation with BIDIR-PIM technology.";
       reference
         "RFC 5015: Bidirectional Protocol Independent Multicast
          (BIDIR-PIM)";
     }

     /*
      *typedef
```

```
      */

     typedef ip-multicast-source-address {
       type union {
         type enumeration {
           enum * {
             description
               "Any source address.";
           }
         }
         type inet:ipv4-address;
         type inet:ipv6-address;
       }
       description
         "Multicast source IP address type.";
     }

     /*
      * Identities
      */

     identity multicast-service {
       base rt:control-plane-protocol;
       description
         "Identity for the multicast model.";
     }

     identity dynamic-signaling-type {
       description
         "Base identity for the dynamic signaling type of multicast
          service technology.";
     }

     identity transport-type {
       description
         "Identity for the multicast transport technology.";
     }

     identity tunnel-encap-type {
       description
         "Base identity for the type of multicast flow tunnel
          encapsulation.";
     }

     identity tunnel-encap-vxlan {
       base tunnel-encap-type;
       description
         "The VXLAN encapsulation is used for flow encapsulation.";
```

```
       reference
         "RFC 7348: Virtual eXtensible Local Area Network (VXLAN):
           A Framework for Overlaying Virtualized Layer 2 Networks
           over Layer 3 Networks";
     }

     identity tunnel-encap-nvgre {
       base tunnel-encap-type;
       description
         "The NVGRE encapsulation is used for flow encapsulation.";
       reference
         "RFC 7637: NVGRE: Network Virtualization Using Generic
           Routing Encapsulation";
     }

     identity tunnel-encap-geneve {
       base tunnel-encap-type;
       description
         "The GENEVE encapsulation is used for flow encapsulation.";
       reference
         "RFC 8926: Geneve: Generic Network Virtualization
           Encapsulation";
     }

     identity signaling-pim {
       base dynamic-signaling-type;
       description
         "Using PIM as multicast service signaling technology.";
       reference
         "I-D.ietf-bier-pim-signaling: PIM Signaling Through BIER
           Core";
     }

     identity mld {
       base dynamic-signaling-type;
       description
         "Using MLD as multicast service signaling technology.";
       reference
         "I-D.ietf-bier-mld: BIER Ingress Multicast Flow Overlay
           using Multicast Listener Discovery Protocols";
     }

     identity mld-snooping {
       base dynamic-signaling-type;
       description
         "Using MLD-snooping as multicast service signaling
          technology.";
       reference
```

```
         "RFC 4541: Considerations for Internet Group Management
           Protocol (IGMP) and Multicast Listener
           Discovery (MLD) Snooping Switches";
     }

     identity evpn {
       base dynamic-signaling-type;
       description
         "Using EVPN as multicast service signaling technology.";
       reference
         "RFC 7432: BGP MPLS-Based Ethernet VPN
          RFC 9572: Updates on EVPN BUM Procedures
          RFC 9624: EVPN Broadcast, Unknown Unicast, or Multicast
           (BUM) Using Bit Index Explicit Replication (BIER)";
     }

     identity mvpn {
       base dynamic-signaling-type;
       description
         "Using MVPN as multicast service signaling technology.";
       reference
         "RFC 6513: Multicast in MPLS/BGP IP VPNs
          RFC 7716: Global Table Multicast with BGP Multicast VPN
           (BGP-MVPN) Procedures
          RFC 8556: Multicast VPN Using Bit Index Explicit
           Replication (BIER)";
     }

     identity bier {
       base transport-type;
       description
         "Using BIER as multicast transport technology.";
       reference
         "RFC 8279: Multicast Using Bit Index Explicit Replication
           (BIER)";
     }

     identity bier-te {
       base transport-type;
       description
         "Using BIER-TE as multicast transport technology.";
       reference
         "RFC 9262: Traffic Engineering for Bit Index Explicit
           Replication (BIER-TE)";
     }

     identity mldp {
       base transport-type;
```

```
       description
         "Using mLDP as multicast transport technology.";
       reference
         "RFC 6388: Label Distribution Protocol Extensions
           for Point-to-Multipoint and Multipoint-to-Multipoint
           Label Switched Paths";
     }

     identity rsvp-te-p2mp {
       base transport-type;
       description
         "Using P2MP TE as multicast transport technology.";
       reference
         "RFC 4875: Extensions to Resource Reservation Protocol
           - Traffic Engineering (RSVP-TE) for Point-to-Multipoint
           TE Label Switched Paths (LSPs)";
     }

     identity sr-p2mp {
       base transport-type;
       description
         "Using Segment Routing  as multicast transport technology.";
       reference
         "I-D.ietf-pim-sr-p2mp-policy:
            Segment Routing Point-to-Multipoint Policy";
     }

     identity pim {
       base transport-type;
       description
         "Using PIM as multicast transport technology.";
       reference
         "RFC 7761: Protocol Independent Multicast - Sparse Mode
           (PIM-SM): Protocol Specification (Revised)";
     }

     identity bidir {
       base transport-type;
       description
         "Using BIDIR-PIM as multicast transport technology.";
       reference
         "RFC 5015: Bidirectional Protocol Independent Multicast
           (BIDIR-PIM)";
     }

     identity event-type {
       description
         "The events of the multicast service.";
```

```
     }

     identity event-up {
       base event-type;
       description
         "The multicast service works.";
     }

     identity event-down {
       base event-type;
       description
         "There is something wrong with upstream or downstream node,
          and node can’t work properlay.";
     }

     identity protocol-enabled {
       base event-type;
       description
         "The protocol that is used for multicast flows have been
          enabled.";
     }

     identity protocol-disabled {
       base event-type;
       description
         "The protocol that is used by multicast flows have been
          disabled.";
     }

     grouping general-multicast-key {
       description
         "The general multicast keys. They are used to differentiate
          multicast service.";
       leaf vpn-rd {
         type rt-types:route-distinguisher;
         description
           "A Route Distinguisher is used to differentiate
            routes from different MVPNs.";
         reference
           "RFC 8294: Common YANG Data Types for the Routing Area
            RFC 6513: Multicast in MPLS/BGP IP VPNs";
       }
       leaf source-address {
         type ip-multicast-source-address;
         description
           "The IP source address of the multicast flow. The
            value set to * means that the receiver interests
            in all source that relevant to one given group.";
```

```
        }
        leaf group-address {
          type rt-types:ip-multicast-group-address;
          mandatory true;
          description
            "The IP group address of multicast flow. This
             type represents a version-neutral IP multicast group
             address. The format of the textual representation
             implies the IP version.";
          reference
            "RFC 8294: Common YANG Data Types for the Routing Area";
        }
      }

      // multicast-key

      grouping encap-type {
        description
          "The encapsulation type used for flow forwarding.
           This encapsulation acts as the inner encapsulation,
           as compare to the outer multicast-transport encapsulation.";
        choice encap-type {
          case mpls {
            description
              "The BIER forwarding depends on mpls.";
            reference
              "RFC 8296: Encapsulation for Bit Index Explicit
                Replication (BIER) in MPLS and Non-MPLS Networks";
          }
          case eth {
            description
              "The BIER forwarding depends on ethernet.";
            reference
              "RFC 8296: Encapsulation for Bit Index Explicit
                Replication (BIER) in MPLS and Non-MPLS Networks";
          }
          case ipv6 {
            description
              "The BIER forwarding depends on IPv6.";
            reference
              "I-D.ietf-bier-bierin6: BIER in IPv6 (BIERin6)";
          }
          description
            "The encapsulation type in BIER.";
        }
      }

      // encap-type
```

```
     grouping bier-key {
       description
         "The key parameters set for BIER/BIER TE forwarding.";
       reference
         "RFC 8279: Multicast Using Bit Index Explicit Replication
           (BIER).";
       leaf sub-domain {
         type uint16;
         description
           "The subdomain ID that the multicast flow belongs to.";
       }
       list tad {
         key "mt-id fa-number data-plane";
         description
           "The associated Multi-Topology ID, Flex Algo number and
               data plane type.";
         leaf mt-id {
           type uint16;
           description
             "The multi-topology ID that the multicast flow belongs
                 to.";
           reference
             "RFC 4915: Multi-Topology (MT) Routing in OSPF
              RFC 5120: M-ISIS: Multi Topology (MT) Routing in
                Intermediate System to Intermediate Systems (IS-ISs)";
         }
         leaf fa-number {
           type uint8;
           description
             "Flex-algo number, value between 128 and 255 inclusive.";
           reference
             "RFC 9350: IGP Flexible Algorithm";
         }
         leaf data-plane {
           type uint8;
           description
             "Data plane type used for prefix calculation.";
           reference
             "RFC 9502: IGP Flexible Algorithm in IP Networks
              I-D.ietf-lsr-flex-soft-dataplane: IGP Flex Soft
               Dataplane";
         }
       }
       leaf bitstringlength {
         type uint16;
         description
           "The bitstringlength used by BIER forwarding.";
       }
```

```
       leaf bier-encap-type {
         type identityref {
           base bier:bier-encapsulation;
         }
         description
           "The BIER encapsulation that can be used in either MPLS
            networks or non-MPLS networks.";
       }
     }

     grouping transport-tech {
       description
         "The transport technology selected for the multicast service.
          For one specific multicast flow.
          The same multicast flow may be forwarded using multiple
          transport technologies as needed for management purposes.";
       leaf transport {
         type identityref {
           base transport-type;
         }
         description
           "The type of transport technology";
       }
       choice transport-tech-type {
         description
           "The type of transport technology";
         case bier {
           if-feature "bier";
           list bier {
             key "sub-domain";
             description
               "Using BIER as the transport technology.
                The BIER technology is introduced in RFC8279.
                The parameters are consistent with the definition in
                BIER YANG data model.";
             reference
               "RFC 8296: Encapsulation for Bit Index Explicit
                  Replication (BIER) in MPLS and Non-MPLS Networks
                I-D.ietf-bier-bier-yang:
                  YANG Data Model for BIER Protocol";
             uses bier-key;
           }
         }
         case bier-te {
           if-feature "bier-te";
           description
             "Using BIER-TE as the transport technology.
              The BIER-TE technology is introduced in RFC9262.
```

```
              The parameters are consistent with the definition in
              BIER and BIER TE YANG data model.";
           reference
             "RFC 9262: Tree Engineering for Bit Index Explicit
                Replication (BIER-TE)
              I-D.ietf-bier-bier-yang: YANG Data Model for BIER
                Protocol
              I-D.ietf-bier-te-yang: A YANG data model for Traffic
                Engineering for Bit Index Explicit Replication
                (BIER-TE)";
           list bitstring {
             key "name";
             leaf name {
               type string;
               description
                 "The name of the bitstring";
             }
             list bier-te-adj {
               key "adj-id";
               leaf adj-id {
                 type uint16;
                 description
                   "The link adjacency ID used for BIER TE
                    forwarding.";
               }
               description
                 "The adjacencies ID used for BIER TE bitstring
                  encapsulation.";
             }
             description
               "The bitstring name and detail used for BIER TE
                forwarding encapsulation. One or more bitstring
                can be used for backup path.";
           }
         }
         case mldp {
           if-feature "mldp";
           description
             "Using MLDP as the transport technology.";
           reference
             "RFC 6388: Label Distribution Protocol Extensions
               for Point-to-Multipoint and Multipoint-to-Multipoint
               Label Switched Paths
              RFC 9658:
               Multipoint LDP Extensions for Multi-Topology Routing";
           leaf mt-id {
             type uint16;
             description
```

```
                "The multi-topology ID that the multicast flow
                 belongs to.";
              reference
                "RFC 4915: Multi-Topology (MT) Routing in OSPF
                 RFC 5120: M-ISIS: Multi Topology (MT) Routing in
                 Intermediate System to Intermediate Systems (IS-ISs)";
            }
            leaf fa-number {
              type uint8;
              description
                "Flex-algo number, value between 128 and 255
                 inclusive.";
              reference
                "RFC 9350: IGP Flexible Algorithm";
            }
          }
          case rsvp-te-p2mp {
            if-feature "p2mp-te";
            description
              "Using RSVP TE P2MP as the transport technology.";
            reference
              "RFC 4875: Extensions to Resource Reservation Protocol -
                 Traffic Engineering (RSVP-TE) for Point-to-Multipoint
                 TE Label Switched Paths (LSPs)
               RFC 8776: Common YANG Data Types for Traffic
                 Engineering";
            leaf template-name {
              type te-types:te-template-name;
              description
                "A type for the name of a TE node template or TE link
                 template.";
            }
            leaf static-tunnel-name {
              type string;
              description
                "Optional for statically specifying the P2MP TE tunnel
                 name.";
            }
          }
          case pim {
            if-feature "pim";
            description
              "Using PIM as the transport technology.
               By setting the corresponding TAD (Multi-Topology ID,
               FA number, and data plane type), constraint-based
               multicast path establishment can be achieved.";
            reference
              "RFC 7761: Protocol Independent Multicast - Sparse Mode
```

```
              (PIM-SM): Protocol Specification (Revised)
              I-D: xz-pim-flex-algo: Multi-Topology in PIM";
           leaf source-address {
             type ip-multicast-source-address;
             description
               "The IP source address of the multicast flow. The
                value set to * means that the receiver interests
                in all source that relevant to one given group.";
           }
           leaf group-address {
             type rt-types:ip-multicast-group-address;
             mandatory true;
             description
               "The IP group address of multicast flow. This
                type represents a version-neutral IP multicast group
                address. The format of the textual representation
                implies the IP version.";
           }
           container bidir {
             if-feature "bidir";
             description
               "Using BIDIR-PIM as the transport technology.
                When using the bidir technique, only the group address
                needs to be considered.";
             reference
               "RFC 5015: Bidirectional Protocol Independent Multicast
                (BIDIR-PIM)";
           }
           list tad {
             key "mt-id fa-number data-plane";
             description
               "The associated Multi-Topology ID, Flex Algo number
                and data plane type.";
             leaf mt-id {
               type uint16;
               description
                 "The multi-topology ID that the multicast flow
                  belongs to.";
               reference
                 "RFC 4915: Multi-Topology (MT) Routing in OSPF
                  RFC 5120: M-ISIS: Multi Topology (MT) Routing in
                    Intermediate System to Intermediate Systems
                    (IS-ISs)";
             }
             leaf fa-number {
               type uint8;
               description
                 "Flex-algo number, value between 128 and 255
```

```
                 inclusive.";
              reference
                "RFC 9350: IGP Flexible Algorithm";
            }
            leaf data-plane {
              type uint8;
              description
                "Data plane type used for prefix calculation.";
              reference
                "RFC 9502: IGP Flexible Algorithm in IP Networks
                 I-D.ietf-lsr-flex-soft-dataplane:
                   IGP Flex Soft Dataplane";
            }
          }
        }
        case ir-tunnel {
          if-feature "ir-tunnel";
          description
            "Using IR (Ingress Replication) P-tunnel for MVPN as the
             transport technology.";
          reference
            "RFC 7988: Ingress Replication Tunnels in Multicast VPN
             RFC 6514: BGP Encodings and Procedures for Multicast
               in MPLS/BGP IP VPNs";
          leaf ir-tunnel-type {
            type uint8;
            description
              "The tunnel type used by MVPN ingress replication.";
          }
        }
        case sr-p2mp {
          if-feature "sr-p2mp";
          description
            "Using SR P2MP as the transport technology.
             The ingress replication and the treesid
             function will not be used at the same time.";
          reference
            "RFC 9524: Segment Routing Replication for Multipoint
               Service Delivery
             I-D.ietf-pim-sr-p2mp-policy: Segment Routing
               Point-to-Multipoint Policy";
        }
        // sr-p2mp
        case native {
          description
            "When this type is set, it indicates that it is a
             normal multicast and no additional transport
             forwarding is required.";
```

```
         }
       }
     }

     // transport
     /*signaling*/

     grouping signaling-tech {
       leaf signaling {
         type identityref {
           base dynamic-signaling-type;
         }
         description
           "The type of signaling technology";
       }
       choice protocol-type {
         description
           "The type of dynamic signaling technology.";
         case evpn {
           description
             "EVPN technology is used for multicast service
              signaling.
              When BIER is used as a transport technology, there is
              specific draft listed below that explain how to
              perform signaling.";
           reference
             "RFC 7432: BGP MPLS-Based Ethernet VPN
              RFC 9624: EVPN Broadcast, Unknown Unicast, or
              Multicast (BUM) Using Bit Index Explicit Replication
              (BIER)";
         }
         case mld {
           description
             "MLD/IGMP can be used as multicast service signaling.
              When BIER is used as a transport technology, there is
              specific draft listed below that explain how to
              perform signaling.";
           reference
             "I-D:ietf-bier-mld: BIER Ingress Multicast Flow Overlay
              using Multicast Listener Discovery Protocols";
         }
         case mld-snooping {
           description
             "MLD/IGMP snooping can be used as multicast service
              signaling.";
           reference
             "RFC 4541:Considerations for Internet Group Management
               Protocol (IGMP) and Multicast Listener Discovery (MLD)
```

```
                Snooping Switches";
          }
          case mvpn {
            description
              "MVPN technology is used for multicast service signaling.
               When BIER is used as a transport technology, there is
               specific draft listed below that explain how to
               perform signaling.";
            reference
              "RFC 6513: Multicast in MPLS/BGP IP VPNs
               RFC 7716: Global Table Multicast with BGP Multicast VPN
                (BGP-MVPN) Procedures
               RFC 8556: Multicast VPN Using Bit Index Explicit
                Replication (BIER)";
          }
          case pim {
            description
              "PIM can be used as multicast service signaling.
               When BIER is used as a transport technology, there is
               specific draft listed below that explain how to
               perform signaling.";
            reference
              "RFC 7761: Protocol Independent Multicast - Sparse Mode
                (PIM-SM): Protocol Specification (Revised)
               I-D.ietf-bier-pim-signaling: PIM Signaling Through BIER
                Core";
          }
        }
        description
          "The dynamic signaling technologies and associated parameter
           that may be set.";
      }

      // signaling-tech

      container multicast-service {
        description
          "Multicast YANG data model. Includes the flow’s key value,
           upstream and downstream neighbors, and related information.";
        list multicast-flow {
          key "vpn-rd source-address group-address";
          description
            "Multicast flow information, including keys, upstream and
             downstream nodes, possible signaling protocols, and
             transport protocols.";
          uses general-multicast-key;
          container upstream {
            description
```

```
             "Upstream node neighbor information and the signaling
              protocol used in the multicast flow.";
           list neighbor {
             key "neighbor-address";
             description
               "The IP address of the upstream node for the multicast
                flow. It can be the ingress node for MVPN, EVPN, and
                BIER.
                In MVPN and EVPN, this is the address of the ingress
                PE; in BIER, it is the BFR prefix of the BFIR.
                To achieve redundant ingress node protection, two or
                more ingress nodes can exist.";
             leaf neighbor-address {
               type inet:ip-address;
               description
                 "The IP address of the neighbor.";
             }
             leaf vni-type {
               type identityref {
                 base tunnel-encap-type;
               }
               description
                 "The encapsulated type for the multicast flow,
                  it is used to carry the virtual network identifier
                  for the multicast service.
                  When this type is set, the associated vni-value
                  MUST be set.";
             }
             uses signaling-tech;
           }
         }
         // upstream
         list downstream {
           key "signaling transport";
           description
             "Downstream node neighbor information, the signaling
              protocol and transport protocol used by the multicast
              flow. For different downstream neighbor, different
              signaling and transport technology may be used.";
           uses signaling-tech;
           uses transport-tech;
           list neighbor {
             key "neighbor-address";
             description
               "The IP address of the downstream node for the multicast
                flow. It can be the egress node for MVPN, EVPN, and
                BIER.
                In MVPN and EVPN, this is the address of the egress PE;
```

```
               in BIER, it is the BFR prefix of the BFER.";
            leaf neighbor-address {
              type inet:ip-address;
              description
                "The IP address of the neighbor.";
            }
            leaf vni-type {
              type identityref {
                base tunnel-encap-type;
              }
              description
                "The encapsulated type for the multicast flow,
                 it is used to carry the virtual network identifier
                 for the multicast service.
                 When this type is set, the associated vni-value
                 MUST be set.";
            }
          }
        }
        // downstream
      }
      // multicast-flow
    }

    /*Notifications*/

    notification ingress-egress-event {
      leaf event-type {
        type identityref {
          base event-type;
        }
        description
          "The event type.";
      }
      list multicast-flow {
        key "vpn-rd source-address group-address";
        description
          "Multicast flow information, including keys, upstream and
           downstream nodes, possible signaling protocols, and
           transport protocols.";
        uses general-multicast-key;
        container upstream {
          description
            "Upstream node neighbor information and the signaling
             protocol used in the multicast flow.";
          list neighbor {
            key "neighbor-address";
            description
```

```
              "The IP address of the upstream node for the multicast
               flow. It can be the ingress node for MVPN, EVPN, and
               BIER.
               In MVPN and EVPN, this is the address of the ingress
               PE; in BIER, it is the BFR prefix of the BFIR.
               To achieve redundant ingress node protection, two or
               more ingress nodes can exist.";
            leaf neighbor-address {
              type inet:ip-address;
              description
                "The IP address of the neighbor.";
            }
            leaf vni-type {
              type identityref {
                base tunnel-encap-type;
              }
              description
                "The encapsulated type for the multicast flow,
                 it is used to carry the virtual network identifier
                 for the multicast service.
                 When this type is set, the associated vni-value
                 MUST be set.";
            }
            uses signaling-tech;
          }
        }
        // upstream
        list downstream {
          key "signaling transport";
          description
            "Downstream node neighbor information, the signaling
             protocol and transport protocol used by the multicast
             flow. For different downstream neighbor, different
             signaling and transport technology may be used.";
          uses signaling-tech;
          uses transport-tech;
          list neighbor {
            key "neighbor-address";
            description
              "The IP address of the downstream node for the multicast
               flow. It can be the egress node for MVPN, EVPN, and
               BIER.
               In MVPN and EVPN, this is the address of the egress PE;
               in BIER, it is the BFR prefix of the BFER.";
            leaf neighbor-address {
              type inet:ip-address;
              description
                "The IP address of the neighbor.";
```

```
             }
             leaf vni-type {
               type identityref {
                 base tunnel-encap-type;
               }
               description
                 "The encapsulated type for the multicast flow,
                  it is used to carry the virtual network identifier
                  for the multicast service.
                  When this type is set, the associated vni-value
                  MUST be set.";
             }
           }
         }
         // downstream
       }
       // multicast-flow
       description
         "Notification events for the upstream or downstream nodes.
          Like node failure, signaling/ transport module
          loading/ unloading. And the potential failure about some
         multicast flows and associated
         signaling/ transport technologies.";
     }
   }
   <CODE ENDS>
```

4. Security Considerations

The "Multicast-service" YANG module defines a data model that is designed to be accessed via YANG-based management protocols, such as NETCONF [RFC6241] or RESTCONF [RFC8040]. These protocols have to use a secure transport layer (e.g., SSH [RFC6242], TLS [RFC8446], and QUIC [RFC9000]) and have to use mutual authentication.

The Network Configuration Access Control Model (NACM) [RFC8341] 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. The following subtrees and data nodes have particular sensitivities/vulnerabilities:

multicast-service

* These data nodes in this model specifies the configuration for the multicast service at the top level. Modifying the configuration can cause multicast service to be deleted or reconstructed.

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:

multicast-service

* Unauthorized access to any data node of the above tree can disclose the operational state information of multicast service on this device.

This YANG module uses groupings from other YANG modules that define nodes that may be considered sensitive or vulnerable in network environments. Refer to the Security Considerations of respective for information as to which nodes may be considered sensitive or vulnerable in network environments.

The YANG module defines a set of identities, types, and groupings. These nodes are intended to be reused by other YANG modules. The module by itself does not expose any data nodes that are writable, data nodes that contain read-only state, or RPCs. As such, there are no additional security issues related to the YANG module that need to be considered.

Modules that use the groupings that are defined in this document should identify the corresponding security considerations. For example, reusing some of these groupings will expose privacy-related information (e.g., 'transport-type').

5. IANA Considerations

RFC Ed.: Please replace all occurrences of 'XXXX' with the actual RFC number (and remove this note).

IANA is requested to register the following URI in the "ns" subregistry within the "IETF XML Registry" [RFC3688]:

URI: urn:ietf:params:xml:ns:yang:ietf-multicast

Registrant Contact: The IESG

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

IANA is requested to register the following YANG module in the "YANG Module Names" subregistry [RFC6020] within the "YANG Parameters" registry.

name: ietf-multicast

Maintained by IANA? N

namespace: urn:ietf:params:xml:ns:yang:ietf-multicast

prefix: ietf-multicast

reference: RFC XXXX

6. Acknowledgements

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7. References

7.1. Normative References

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