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**A YANG data model for Internet Group Management Protocol (IGMP) and
Multicast Listener Discovery (MLD)
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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) devices.

Table of Contents

1.	Introduction	2
1.1.	Terminology	3
1.2.	Tree Diagrams	3
1.3.	Prefixes in Data Node Names.....	3
2.	Design of Data model.....	4
2.1.	Scope of model	4
2.2.	Optional capabilities.....	4
2.3.	Position of address family in hierarchy.....	5
3.	Module Structure	5
3.1.	IGMP Configuration and Operational state.....	5
3.2.	MLD Configuration and Operational State.....	7
3.3.	IGMP and MLD RPC.....	9
4.	IGMP and MLD YANG Modules.....	10
5.	Security Considerations.....	33
6.	IANA Considerations	35
7.	Acknowledgments	35
8.	Contributing Authors.....	36
9.	References	36
9.1.	Normative References.....	36
9.2.	Informative References.....	38

[1. Introduction](#)

YANG [[RFC6020](#)] [[RFC7950](#)] is a data definition language that was introduced to model the configuration and running state of a device managed using network management protocols such as NETCONF [[RFC6241](#)] or RESTCONF [[RFC8040](#)]. YANG is now also being used as a component of wider management interfaces, such as CLIs.

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) devices. This model will support the core IGMP and MLD protocols, as well as many other features

mentioned in separate IGMP and MLD RFCs. Non-core features are defined as optional in the provided data model.

1.1. Terminology

The terminology for describing YANG data models is found in [\[RFC6020\]](#) [\[RFC7950\]](#).

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

IGMP:

Internet Group Management Protocol [\[RFC3376\]](#).

MLD:

Multicast Listener Discovery [\[RFC3810\]](#).

1.2. Tree Diagrams

Tree diagrams used in this document follow the notation defined in [\[RFC8340\]](#).

1.3. 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

+-----+-----+-----+-----+			
Prefix	YANG module	Reference	
+-----+-----+-----+-----+			
yang	ietf-yang-types	[RFC6991]	
inet	ietf-inet-types	[RFC6991]	
if	ietf-interfaces	[RFC8343]	
ip	ietf-ip	[RFC8344]	
rt	ietf-routing	[RFC8349]	
rt-types	ietf-routing-types	[RFC8294]	

```
| acl          | ietf-access-control-list | [I-D.ietf-acl-yang] |
+-----+-----+-----+-----+
```

Table 1: Prefixes and Corresponding YANG Modules

2. Design of Data model

2.1. Scope of model

The model covers IGMPv1 [[RFC1112](#)], IGMPv2 [[RFC2236](#)], IGMPv3 [[RFC3376](#)] and MLDv1 [[RFC2710](#)], MLDv2 [[RFC3810](#)].

The configuration of IGMP and MLD features, and the operational state fields and RPC definitions are not all included in this document of the data model. This model can be extended, though the structure of what has been written may be taken as representative of the structure of the whole model.

This model does not cover other IGMP and MLD related protocols such as IGMP/MLD Proxy [[RFC4605](#)] or IGMP/MLD Snooping [[RFC4541](#)] etc., these will be specified in separate documents.

2.2. Optional capabilities

This model is designed to represent the capabilities of IGMP and MLD devices with various specifications, including some with basic subsets of the IGMP and MLD protocols. The main design goals of this document are that any major now-existing implementation may be said to support the basic model, and that the configuration of all implementations meeting the specification is easy to express through some combination of the features in the basic model and simple vendor augmentations.

There is also value in widely-supported features being standardized, to save work for individual vendors, and so that mapping between different vendors' configuration is not needlessly complicated. Therefore these modules declare a number of features representing capabilities that not all deployed devices support.

The extensive use of feature declarations should also substantially simplify the capability negotiation process for a vendor's IGMP and MLD implementations.

On the other hand, operational state parameters are not so widely designated as features, as there are many cases where the defaulting of an operational state parameter would not cause any harm to the

system, and it is much more likely that an implementation without native support for a piece of operational state would be able to derive a suitable value for a state variable that is not natively supported.

2.3. Position of address family in hierarchy

The current document contains IGMP and MLD as separate schema branches in the structure. The reason for this is to make it easier for implementations which may optionally choose to support specific address families. And the names of objects may be different between the IPv4 (IGMP) and IPv6 (MLD) address families.

3. Module Structure

3.1. IGMP Configuration and Operational state

The IGMP YANG model conforms to the Network Management Datastore Architecture (NMDA) [[RFC8342](#)]. The operational state data is combined with the associated configuration data in the same hierarchy [[I-D.ietf-netmod-rfc6087bis](#)]. The IGMP module defines in a three-level hierarchy structure as listed below:

Global level: IGMP configuration and operational state attributes for the entire routing system.

Interface-global: Only including configuration data nodes that IGMP configuration attributes are applicable to all the interfaces whose interface-level corresponding attributes are not existing, with same attributes' value for these interfaces.

Interface-level: IGMP configuration and operational state attributes specific to the given interface.

Where fields are not genuinely essential to protocol operation, they are marked as optional. Some fields will be essential but have a default specified, so that they need not be configured explicitly.

This model augments the core routing data model "ietf-routing" specified in [[RFC8349](#)]. The IGMP model augments "/rt:routing/rt:control-plane-protocols" as opposed to augmenting "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol", as the latter would allow multiple protocol instances, while the IGMP protocol is designed to be enabled or disabled as a single protocol instance on a network instance or a logical network element.

```
augment /rt:routing/rt:control-plane-protocols:
  +-rw igmp {feature-igmp}?
  +-rw global
```



```

|   +--rw enable?          boolean {global-admin-enable}?
|   +--rw max-entries?     uint32 {global-max-entries}?
|   +--rw max-groups?      uint32 {global-max-groups}?
|   +--ro entries-count?   uint32
|   +--ro groups-count?    uint32
|   +--ro statistics
|       +--ro discontinuity-time?  yang:date-and-time
|       +--ro error
|           |   +--ro total?        yang:counter64
|           |   +--ro query?        yang:counter64
|           |   +--ro report?       yang:counter64
|           |   +--ro leave?        yang:counter64
|           |   +--ro checksum?     yang:counter64
|           |   +--ro too-short?    yang:counter64
|       +--ro received
|           |   +--ro total?        yang:counter64
|           |   +--ro query?        yang:counter64
|           |   +--ro report?       yang:counter64
|           |   +--ro leave?        yang:counter64
|       +--ro sent
|           |   +--ro total?        yang:counter64
|           |   +--ro query?        yang:counter64
|           |   +--ro report?       yang:counter64
|           |   +--ro leave?        yang:counter64
+--rw interfaces
    +--rw last-member-query-interval?  uint16
    +--rw query-interval?               uint16
    +--rw query-max-response-time?      uint16
    +--rw require-router-alert?         boolean {intf-require-router-
alert}?
    +--rw robustness-variable?          uint8
    +--rw version?                      uint8
    +--rw max-groups-per-interface?     uint32 {intf-max-groups}?
    +--rw interface* [interface-name]
        +--rw interface-name            if:interface-ref
        +--rw last-member-query-interval?  uint16
        +--rw query-interval?             uint16
        +--rw query-max-response-time?    uint16
        +--rw require-router-alert?       boolean {intf-require-
router-alert}?
        +--rw robustness-variable?        uint8
        +--rw version?                    uint8
        +--rw enable?                     boolean {intf-admin-enable}?
        +--rw group-policy?               -> /acl:acls/acl/name
        +--rw immediate-leave?            empty {intf-immediate-
leave}?
        +--rw max-groups?                  uint32 {intf-max-groups}?
        +--rw max-group-sources?           uint32 {intf-max-group-
sources}?
        +--rw source-policy?              -> /acl:acls/acl/name {intf-
source-policy}?

```

subnet}?	+-rw verify-source-subnet?	empty {intf-verify-source-
tracking}?	+-rw explicit-tracking?	empty {intf-explicit-
	+-rw exclude-lite?	empty {intf-exclude-lite}?

Liu & Guo, etc

Expires April, 2019

[Page 6]

```

      +--rw join-group*                               rt-types:ipv4-multicast-
group-address {_intf-join-group}?
      +--rw ssm-map* [ssm-map-source-addr ssm-map-group-policy] {_intf-
ssm-map}?
      | +--rw ssm-map-source-addr      ssm-map-ipv4-addr-type
      | +--rw ssm-map-group-policy      string
      +--rw static-group* [group-addr source-addr] {_intf-static-
group}?
      | +--rw group-addr      rt-types:ipv4-multicast-group-address
      | +--rw source-addr      rt-types:ipv4-multicast-source-address
      +--ro oper-status        enumeration
      +--ro querier            inet:ipv4-address
      +--ro joined-group*      rt-types:ipv4-multicast-
group-address {_intf-join-group}?
      +--ro group* [group-address]
      +--ro group-address      rt-types:ipv4-multicast-group-address
      +--ro expire             uint32
      +--ro filter-mode        enumeration
      +--ro up-time            uint32
      +--ro last-reporter?     inet:ipv4-address
      +--ro source* [source-address]
      +--ro source-address      inet:ipv4-address
      +--ro expire             uint32
      +--ro up-time            uint32
      +--ro host-count?        uint32 {_intf-explicit-tracking}?
      +--ro last-reporter?     inet:ipv4-address
      +--ro host* [host-address] {_intf-explicit-tracking}?
      +--ro host-address        inet:ipv4-address
      +--ro host-filter-mode    enumeration

```

3.2. MLD Configuration and Operational State

The MLD YANG model uses the same structure as IGMP YANG model. The MLD module also defines in a three-level hierarchy structure as listed below:

```

augment /rt:routing/rt:control-plane-protocols:
  +--rw mld {feature-mld}?
    +--rw global
      | +--rw enable?          boolean {global-admin-enable}?
      | +--rw max-entries?     uint32 {global-max-entries}?
      | +--rw max-groups?      uint32 {global-max-groups}?
      | +--ro entries-count?   uint32
      | +--ro groups-count?    uint32
      | +--ro statistics
      |   +--ro discontinuity-time?  yang:date-and-time
      |   +--ro error
      |     | +--ro total?        yang:counter64
      |     | +--ro query?        yang:counter64
      |     | +--ro report?       yang:counter64

```

		+++ro leave?	yang:counter64
		+++ro checksum?	yang:counter64

```

|         | +--ro too-short?   yang:counter64
|         +--ro received
|         | +--ro total?      yang:counter64
|         | +--ro query?      yang:counter64
|         | +--ro report?     yang:counter64
|         | +--ro leave?      yang:counter64
|         +--ro sent
|             +--ro total?      yang:counter64
|             +--ro query?      yang:counter64
|             +--ro report?     yang:counter64
|             +--ro leave?      yang:counter64
+--rw interfaces
  +--rw last-member-query-interval?  uint16
  +--rw query-interval?               uint16
  +--rw query-max-response-time?      uint16
  +--rw require-router-alert?         boolean {intf-require-router-
alert}?
  +--rw robustness-variable?          uint8
  +--rw version?                      uint8
  +--rw max-groups-per-interface?     uint32 {intf-max-groups}?
  +--rw interface* [interface-name]
    +--rw interface-name              if:interface-ref
    +--rw last-member-query-interval?  uint16
    +--rw query-interval?              uint16
    +--rw query-max-response-time?     uint16
    +--rw require-router-alert?        boolean {intf-require-
router-alert}?
    +--rw robustness-variable?         uint8
    +--rw version?                     uint8
    +--rw enable?                      boolean {intf-admin-enable}?
    +--rw group-policy?                -> /acl:acls/acl/name
    +--rw immediate-leave?             empty {intf-immediate-
leave}?
    +--rw max-groups?                  uint32 {intf-max-groups}?
    +--rw max-group-sources?           uint32 {intf-max-group-
sources}?
    +--rw source-policy?               -> /acl:acls/acl/name {intf-
source-policy}?
    +--rw verify-source-subnet?        empty {intf-verify-source-
subnet}?
    +--rw explicit-tracking?           empty {intf-explicit-
tracking}?
    +--rw exclude-lite?                empty {intf-exclude-lite}?
    +--rw join-group*                  rt-types:ipv6-multicast-
group-address {intf-join-group}?
    +--rw ssm-map* [ssm-map-source-addr ssm-map-group-policy] {intf-
ssm-map}?
      | +--rw ssm-map-source-addr      ssm-map-ipv6-addr-type
      | +--rw ssm-map-group-policy     string
      +--rw static-group* [group-addr source-addr] {intf-static-
group}?

```

```

|   +--rw group-addr      rt-types:ipv6-multicast-group-address
|   +--rw source-addr     rt-types:ipv6-multicast-source-address
+--ro oper-status         enumeration
+--ro querier              inet:ipv6-address
+--ro joined-group*       rt-types:ipv6-multicast-
group-address {intf-join-group}?
+--ro group* [group-address]
  +--ro group-address      rt-types:ipv6-multicast-group-address
  +--ro expire             uint32

```

```

+--ro filter-mode      enumeration
+--ro up-time          uint32
+--ro last-reporter?   inet:ipv6-address
+--ro source* [source-address]
  +--ro source-address  inet:ipv6-address
  +--ro expire          uint32
  +--ro up-time         uint32
  +--ro host-count?     uint32 {_intf-explicit-tracking}?
  +--ro last-reporter?  inet:ipv6-address
  +--ro host* [host-address] {_intf-explicit-tracking}?
    +--ro host-address   inet:ipv6-address
    +--ro host-filter-mode enumeration

```

3.3. IGMP and MLD RPC

IGMP and MLD RPC clears the specified IGMP and MLD group membership.

rpcs:

```

+---x clear-igmp-groups {rpc-clear-groups}?

| +---w input

|   +---w interface-name?  -> /rt:routing/control-plane-
protocols/igmp-mld:igmp/interfaces/interface/interface-name
{feature-igmp}?

|   +---w group-address?    rt-types:ipv4-multicast-group-
address

|   +---w source-address?   rt-types:ipv4-multicast-source-
address

+---x clear-mld-groups {rpc-clear-groups}?

+---w input

+---w interface-name?  -> /rt:routing/control-plane-
protocols/igmp-mld:mld/interfaces/interface/interface-name {feature-
mld}?

+---w group-addrss?     rt-types:ipv6-multicast-group-
address

+---w source-address?   rt-types:ipv6-multicast-source-
address

```


4. IGMP and MLD YANG Modules

```
<CODE BEGINS> file "ietf-igmp-mld@2018-09-15.yang"
module ietf-igmp-mld {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-igmp-mld";
  // replace with IANA namespace when assigned
  prefix igmp-mld;

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

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

  import ietf-routing-types {
    prefix "rt-types";
  }

  import ietf-access-control-list {
    prefix "acl";
  }

  import ietf-routing {
    prefix "rt";
  }

  import ietf-interfaces {
    prefix "if";
  }

  import ietf-ip {
    prefix ip;
  }

  organization
    "IETF PIM Working Group";

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

    WG Chair: Stig Venaas
               <mailto:stig@venaas.com>

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description

"The module defines a collection of YANG definitions common for IGMP and MLD.";

revision 2018-09-15 {

description

"Updated yang data model for default value, address type and repeated leaf definition.";

reference

"RFC XXXX: A YANG Data Model for IGMP and MLD";

}

revision 2018-06-21 {

description

"Updated yang data model for parameter range and description.";

reference

"RFC XXXX: A YANG Data Model for IGMP and MLD";

}

revision 2017-10-20 {

description

"Updated yang data model for adding explicit-tracking and lightweight IGMPv3 and MLDv2 function.";

reference

"RFC XXXX: A YANG Data Model for IGMP and MLD";

}

revision 2017-09-19 {

description

"Updated yang data model for NMDA version and errata.";

reference

"RFC XXXX: A YANG Data Model for IGMP and MLD";

}

/*

* Features


```
*/
feature feature-igmp {
  description
    "Support IGMP protocol for IPv4 group membership record.";
}
feature feature-mlD {
  description
    "Support MLD protocol for IPv6 group membership record.";
}
feature global-admin-enable {
  description
    "Support global configuration to enable or disable protocol.";
}

feature global-interface-config {
  description
    "Support global configuration applied for all interfaces.";
}

feature global-max-entries {
  description
    "Support configuration of global max-entries.";
}

feature global-max-groups {
  description
    "Support configuration of global max-groups.";
}

feature intf-admin-enable {
  description
    "Support configuration of interface administrative enabling.";
}

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

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

feature intf-max-groups {
  description
    "Support configuration of interface max-groups.";
}
```



```
feature intf-max-group-sources {
  description
    "Support configuration of interface max-group-sources.";
}

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

feature intf-source-policy {
  description
    "Support configuration of interface source policy.";
}

feature intf-ssm-map {
  description
    "Support configuration of interface ssm-map.";
}

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

feature intf-verify-source-subnet {
  description
    "Support configuration of interface verify-source-subnet.";
}

feature intf-explicit-tracking {
  description
    "Support configuration of interface explicit-tracking hosts.";
}

feature intf-exclude-lite {
  description
    "Support configuration of interface exclude-lite.";
}

feature per-interface-config {
  description
    "Support per interface configuration.";
}

feature rpc-clear-groups {
  description
    "Support rpc's to clear groups.";
}
```



```
/*
 * Typedefs
 */
typedef ssm-map-ipv4-addr-type {
  type union {
    type enumeration {
      enum 'policy' {
        description
          "Source address is specified in SSM map policy.";
      }
    }
    type inet:ipv4-address;
  }
  description
    "Multicast source IP address type for SSM map.";
} // source-ipv4-addr-type

typedef ssm-map-ipv6-addr-type {
  type union {
    type enumeration {
      enum 'policy' {
        description
          "Source address is specified in SSM map policy.";
      }
    }
    type inet:ipv6-address;
  }
  description
    "Multicast source IP address type for SSM map.";
} // source-ipv6-addr-type

/*
 * Identities
 */

/*
 * Groupings
 */
grouping global-config-attributes {
  description "Global IGMP and MLD configuration.";

  leaf enable {
    if-feature global-admin-enable;
    type boolean;
    default false;
    description
      "true to enable IGMP or MLD in the routing instance;
       false to disable IGMP or MLD in the routing instance.";
  }
}
```



```
    }

    leaf max-entries {
      if-feature global-max-entries;
      type uint32;
      description
        "The maximum number of entries in IGMP or MLD.";
    }
    leaf max-groups {
      if-feature global-max-groups;
      type uint32;
      description
        "The maximum number of groups that IGMP
        or MLD can join.";
    }
  } // global-config-attributes

  grouping global-state-attributes {

    description "Global IGMP and MLD state attributes.";

    leaf entries-count {
      type uint32;
      config false;
      description
        "The number of entries in IGMP or MLD.";
    }
    leaf groups-count {
      type uint32;
      config false;
      description
        "The number of groups that IGMP or MLD can join.";
    }
  }

  container statistics {
    config false;
    description "Global statistics.";

    leaf discontinuity-time {
      type yang:date-and-time;
      description
        "The time on the most recent occasion at which any one
        or more of the statistic counters suffered a
        discontinuity. If no such discontinuities have occurred
        since the last re-initialization of the local
        management subsystem, then this node contains the time
        the local management subsystem re-initialized itself.";
    }
  }
```



```
    container error {
      description "Statistics of errors.";
      uses global-statistics-error;
    }

    container received {
      description "Statistics of received messages.";
      uses global-statistics-sent-received;
    }
    container sent {
      description "Statistics of sent messages.";
      uses global-statistics-sent-received;
    }
  } // statistics
} // global-state-attributes

grouping global-statistics-error {
  description
    "A grouping defining statistics attributes for errors.";
  uses global-statistics-sent-received;
  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.";
  }
} // global-statistics-error

grouping global-statistics-sent-received {
  description
    "A grouping defining statistics attributes.";
  leaf total {
    type yang:counter64;
    description
      "The number of total messages.";
  }
  leaf query {
    type yang:counter64;
    description
      "The number of query messages.";
  }
  leaf report {
    type yang:counter64;
    description
      "The number of report messages.";
```



```
    }
    leaf leave {
      type yang:counter64;
      description
        "The number of leave messages.";
    }
  } // global-statistics-sent-received

  grouping interface-global-config-attributes {
    description
      "Configuration attributes applied to the interface global level
        whose per interface attributes are not existing.";

    leaf max-groups-per-interface {
      if-feature intf-max-groups;
      type uint32;
      description
        "The maximum number of groups that IGMP or MLD can join.";
    }
  } //interface-global-config-attributes

  grouping interface-common-config-attributes {
    description
      "Configuration attributes applied to both the interface global
        level and interface level.";

    leaf last-member-query-interval {
      type uint16 {
        range "1..1023";
      }
      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 {
      range "1..31744";
    }
    units seconds;
    default 125;
    description
      "The Query Interval is the interval between General Queries
        sent by the Querier. In RFC3376, Querier's Query Interval(QQI) is
        represented from the Querier's Query Interval Code in query
        message as follows:
```



```

        If QQIC < 128, QQI = QQIC
        If QQIC >= 128, QQIC represents a floating-point value as follows:
          0 1 2 3 4 5 6 7
          +-+--+--+--+--+
          |1| exp | mant |
          +-+--+--+--+--+
          QQI = (mant | 0x10) << (exp + 3)
          The maximum value of QQI is 31744.";
    reference "RFC3376. Sec. 4.1.7, 8.2, 8.14.2.";
}

leaf query-max-response-time {
    type uint16 {
        range "1..1023";
    }
    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 intf-require-router-alert;
    type boolean;
    default false;
    description
        "Protocol packets should contain router alert IP option.";
}

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.";
}

} // interface-common-config-attributes

grouping interface-common-config-attributes-igmp {
    description
        "Configuration attributes applied to both the interface global
        level and interface level for IGMP.";
    uses interface-common-config-attributes;
}

```



```
    leaf version {
      type uint8 {
        range "1..3";
      }
      default 2;
      description "IGMP version.";
      reference "RFC1112, RFC2236, RFC3376.";
    }
  }

  grouping interface-common-config-attributes-mld {
    description
      "Configuration attributes applied to both the interface global
       level and interface level for MLD.";
    uses interface-common-config-attributes;
    leaf version {
      type uint8 {
        range "1..2";
      }
      default 2;
      description "MLD version.";
      reference "RFC2710, RFC3810.";
    }
  }

  grouping interfaces-config-attributes-igmp {
    description
      "Configuration attributes applied to the interface global
       level for IGMP.";
    uses interface-common-config-attributes-igmp;
    uses interface-global-config-attributes;
  }

  grouping interfaces-config-attributes-mld {
    description
      "Configuration attributes applied to the interface global
       level for MLD.";
    uses interface-common-config-attributes-mld;
    uses interface-global-config-attributes;
  }

  grouping interface-specific-config-attributes {
    description
      "Per interface configuration attributes for both IGMP and MLD
       whose are not existing in interface global level.";

    leaf enable {
      if-feature intf-admin-enable;
      type boolean;
    }
  }
}
```



```
    default false;
    description
      "true to enable IGMP or MLD on the interface;
       false to disable IGMP or MLD on the interface.";
  }
  leaf group-policy {
    type leafref {
      path "/acl:acls/acl:acl/acl:name";
    }
    description
      "Name of the access policy used to filter IGMP or MLD
       membership. A device can restrict the length
       and value of this name, possibly space and special
       characters are not allowed.";
  }
  leaf immediate-leave {
    if-feature intf-immediate-leave;
    type empty;
    description
      "If present, IGMP or MLD perform an immediate leave upon
       receiving an IGMPv2 or MLDv1 leave message.
       If the router is IGMP-enabled or MLD-enabled, it sends an
       IGMP or MLD last member query with a last member query
       response time. However, the router does not wait for
       the response time before it prunes off the group.";
  }
  leaf max-groups {
    if-feature intf-max-groups;
    type uint32;
    description
      "The maximum number of groups that IGMP or MLD can join.";
  }
  leaf max-group-sources {
    if-feature intf-max-group-sources;
    type uint32;
    description
      "The maximum number of group sources.";
  }
  leaf source-policy {
    if-feature intf-source-policy;
    type leafref {
      path "/acl:acls/acl:acl/acl:name";
    }
    description
      "Name of the access policy used to filter sources.
       A device can restrict the length
       and value of this name, possibly space and special
       characters are not allowed.";
```



```
}
leaf verify-source-subnet {
  if-feature intf-verify-source-subnet;
  type empty;
  description
    "If present, the interface accepts packets with matching
    source IP subnet only.";
}
leaf explicit-tracking {
  if-feature intf-explicit-tracking;
  type empty;
  description
    "If present, IGMP/MLD-based explicit membership tracking function
    for multicast routers and IGMP/MLD proxy devices
    supporting IGMPv3/MLDv2. The explicit membership tracking
    function contributes to saving network resources and
    shortening leave latency.";
}
leaf exclude-lite {
  if-feature intf-exclude-lite;
  type empty;
  description
    "If present, lightweight IGMPv3 and MLDv2 protocols will run on the
    which simplify the standard versions of IGMPv3 and MLDv2.";
  reference "RFC5790";
}
} // interface-specific-config-attributes

grouping interface-config-attributes-igmp {
  description
    "Per interface configuration attributes for IGMP.";

  uses interface-common-config-attributes-igmp;
  uses interface-specific-config-attributes;

  leaf-list join-group {
    if-feature intf-join-group;
    type rt-types:ipv4-multicast-group-address;
    description
      "The router joins this multicast group on the interface.";
  }

  list ssm-map {
    if-feature intf-ssm-map;
    key "ssm-map-source-addr ssm-map-group-policy";
    description "The policy for (*,G) mapping to (S,G).";
    leaf ssm-map-source-addr {
      type ssm-map-ipv4-addr-type;
    }
  }
}
```



```
        description
          "Multicast source IPv4 address.";
      }
      leaf ssm-map-group-policy {
        type string;
        description
          "Name of the policy used to define ssm-map rules.
           A device can restrict the length
           and value of this name, possibly space and special
           characters are not allowed. ";
      }
    }
  }

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

    leaf group-addr {
      type rt-types:ipv4-multicast-group-address;
      description
        "Multicast group IPv4 address.";
    }
    leaf source-addr {
      type rt-types:ipv4-multicast-source-address;
      description
        "Multicast source IPv4 address.";
    }
  }
} // interface-config-attributes-igmp


grouping interface-config-attributes-mlld {
  description
    "Per interface configuration attributes for MLD.";

  uses interface-common-config-attributes-mlld;
  uses interface-specific-config-attributes;

  leaf-list join-group {
    if-feature intf-join-group;
    type rt-types:ipv6-multicast-group-address;
    description
      "The router joins this multicast group on the interface.";
  }

  list ssm-map {
```



```
    if-feature intf-ssm-map;
    key "ssm-map-source-addr ssm-map-group-policy";
    description "The policy for (*,G) mapping to (S,G).";
    leaf ssm-map-source-addr {
        type ssm-map-ipv6-addr-type;
        description
            "Multicast source IPv6 address.";
    }
    leaf ssm-map-group-policy {
        type string;
        description
            "Name of the policy used to define ssm-map rules.
            A device can restrict the length
            and value of this name, possibly space and special
            characters are not allowed.";
    }
}

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

    leaf group-addr {
        type rt-types:ipv6-multicast-group-address;
        description
            "Multicast group IPv6 address.";
    }
    leaf source-addr {
        type rt-types:ipv6-multicast-source-address;
        description
            "Multicast source IPv6 address.";
    }
}
} // interface-config-attributes-mlld

grouping interface-state-attributes-igmp-mlld {
    description
        "Per interface state attributes for both IGMP and MLD.";

    leaf oper-status {
        type enumeration {
            enum up {
                description
                    "Ready to pass packets.";
            }
            enum down {
                description
```



```
        "The interface does not pass any packets.";
    }
}
config false;
mandatory true;
description
    "Interface up or down state for IGMP or MLD protocol";
}
} // interface-config-attributes-igmp-mld

grouping interface-state-attributes-igmp {

    description
        "Per interface state attributes for IGMP.";

    uses interface-state-attributes-igmp-mld;

    leaf querier {
        type inet:ipv4-address;
        config false;
        mandatory true;
        description "The querier address in the subnet";
    }
    leaf-list joined-group {
        if-feature intf-join-group;
        type rt-types:ipv4-multicast-group-address;
        config false;
        description
            "The routers that joined this multicast group.";
    }

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

        leaf group-address {
            type rt-types:ipv4-multicast-group-address;
            description
                "Multicast group address.";
        }
    }
    uses interface-state-group-attributes-igmp-mld;

    leaf last-reporter {
        type inet:ipv4-address;
        description
            "The last host address which has sent the
```



```
        report to join the multicast group.";
    }
    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 in group record.";
        }
        uses interface-state-source-attributes-igmp-mld;
        leaf last-reporter {
            type inet:ipv4-address;
            description
                "The last host address which has sent the
                report to join the multicast source and group.";
        }
        list host {
            if-feature intf-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.";
            }
            uses interface-state-host-attributes-igmp-mld;
        } // list host
    } // list source
} // list group
} // interface-state-attributes-igmp

grouping interface-state-attributes-mld {

    description
        "Per interface state attributes for MLD.";

    uses interface-state-attributes-igmp-mld;

    leaf querier {
        type inet:ipv6-address;
        config false;
        mandatory true;
    }
}
```



```
    description
      "The querier address in the subnet.";
  }
  leaf-list joined-group {
    if-feature intf-join-group;
    type rt-types:ipv6-multicast-group-address;
    config false;
    description
      "The routers that joined this multicast group.";
  }

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

    leaf group-address {
      type rt-types:ipv6-multicast-group-address;
      description
        "Multicast group address.";
    }
  }
  uses interface-state-group-attributes-igmp-mld;
  leaf last-reporter {
    type inet:ipv6-address;
    description
      "The last host address which has sent the
       report to join the multicast group.";
  }
  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 in group record";
    }
  }
  uses interface-state-source-attributes-igmp-mld;
  leaf last-reporter {
    type inet:ipv6-address;
    description
      "The last host address which has sent the
       report to join the multicast source and group.";
  }
  list host {
```



```
    if-feature intf-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.";
    }
    uses interface-state-host-attributes-igmp-mld;
} // list host
} // list source
} // list group
} // interface-state-attributes-mld

grouping interface-state-group-attributes-igmp-mld {
    description
        "Per interface state attributes for both IGMP and MLD
        groups.";

    leaf expire {
        type uint32;
        units seconds;
        mandatory true;
        description
            "The time left before multicast group state expires.";
    }
    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.";
            }
        }
    }
    mandatory true;
    description
        "Filter mode for a multicast group,
```



```
        may be either include or exclude.";
    }
    leaf up-time {
        type uint32;
        units seconds;
        mandatory true;
        description
            "The elapsed time since the device created multicast group record.";
    }
} // interface-state-group-attributes-igmp-mld

grouping interface-state-source-attributes-igmp-mld {
    description
        "Per interface state attributes for both IGMP and MLD
        source-group records.";

    leaf expire {
        type uint32;
        units seconds;
        mandatory true;
        description
            "The time left before multicast source-group state expires.";
    }
    leaf up-time {
        type uint32;
        units seconds;
        mandatory true;
        description
            "The elapsed time since the device created multicast
            source-group record.";
    }
    leaf host-count {
        if-feature intf-explicit-tracking;
        type uint32;
        description
            "The number of host addresses.";
    }
} // interface-state-source-attributes-igmp-mld

grouping interface-state-host-attributes-igmp-mld {
    description
        "Per interface state attributes for both IGMP and MLD
        hosts of source-group records.";

    leaf host-filter-mode {
        type enumeration {
            enum "include" {
                description
                    "In include mode";
            }
        }
    }
}
```



```
    }
    enum "exclude" {
        description
            "In exclude mode.";
    }
}
mandatory true;
description
    "Filter mode for a multicast membership
    host may be either include or exclude.";
}
} // interface-state-host-attributes-igmp-mld

/*
 * Configuration and Operational state data nodes (NMDA version)
 */
augment "/rt:routing/rt:control-plane-protocols"
{
    description
        "IGMP augmentation to routing control plane protocol
        configuration and state.";

    container igmp {
        if-feature feature-igmp;
        description
            "IGMP configuration and operational state data.";

        container global {
            description
                "Global attributes.";
            uses global-config-attributes;
            uses global-state-attributes;
        }

        container interfaces {
            description
                "Containing a list of interfaces.";

            uses interfaces-config-attributes-igmp {
                if-feature global-interface-config;
            }

            list interface {
                key "interface-name";
                description
                    "List of IGMP interfaces.";
                leaf interface-name {
                    type if:interface-ref;
                    must "/if:interfaces/if:interface[if:name = current()]/"
```



```
        + "ip:ipv4" {
        description
            "The interface must have IPv4 enabled.";
        }
        description
            "Reference to an entry in the global interface list.";
        }
        uses interface-config-attributes-igmp {
            if-feature per-interface-config;
        }
        uses interface-state-attributes-igmp;
    } // interface
} // interfaces
} // igmp
} // augment

augment "/rt:routing/rt:control-plane-protocols"
{
    description
        "MLD augmentation to routing control plane protocol
        configuration and state.";

    container mld {
        if-feature feature-mld;
        description
            "MLD configuration and operational state data.";

        container global {
            description
                "Global attributes.";
            uses global-config-attributes;
            uses global-state-attributes;
        }

        container interfaces {
            description
                "Containing a list of interfaces.";

            uses interfaces-config-attributes-mld {
                if-feature global-interface-config;
            }

            list interface {
                key "interface-name";
                description
                    "List of MLD interfaces.";
                leaf interface-name {
                    type if:interface-ref;
                    must "/if:interfaces/if:interface[if:name = current()]/"
```



```
        + "ip:ipv6" {
        description
            "The interface must have IPv6 enabled.";
        }
        description
            "Reference to an entry in the global interface list.";
        }
        uses interface-config-attributes-mld {
            if-feature per-interface-config;
        }
        uses interface-state-attributes-mld;
    } // interface
} // interfaces
} // mld
} // augment

/*
 * RPCs
 */
rpc clear-igmp-groups {
    if-feature rpc-clear-groups;
    description
        "Clears the specified IGMP cache entries.";

    input {
        leaf interface-name {
            if-feature feature-igmp;
            type leafref {
                path "/rt:routing/rt:control-plane-protocols/"
                    + "igmp-mld:igmp/igmp-mld:interfaces/"
                    + "igmp-mld:interface/igmp-mld:interface-name";
            }
            description
                "Name of the IGMP interface.
                If it is not specified, groups from all interfaces are
                cleared.";
        }
        leaf group-address {
            type rt-types:ipv4-multicast-group-address;
            description
                "Multicast group IPv4 address.
                If it is not specified, all IGMP group entries are
                cleared.";
        }
        leaf source-address {
            type rt-types:ipv4-multicast-source-address;
            description
                "Multicast source IPv4 address.
                If it is not specified, all IGMP source-group entries are
```



```
        cleared.";
    }
}
} // rpc clear-igmp-groups

rpc clear-mld-groups {
    if-feature rpc-clear-groups;
    description
        "Clears the specified MLD cache entires.";

    input {
        leaf interface-name {
            if-feature feature-mld;
            type leafref {
                path "/rt:routing/rt:control-plane-protocols/"
                    + "igmp-mld:mld/igmp-mld:interfaces/"
                    + "igmp-mld:interface/igmp-mld:interface-name";
            }
            description
                "Name of the MLD interface.
                If it is not specified, groups from all interfaces are
                cleared.";
        }
        leaf group-addrss {
            type rt-types:ipv6-multicast-group-address;
            description
                "Multicast group IPv6 address.
                If it is not specified, all MLD group entries are
                cleared.";
        }
        leaf source-address {
            type rt-types:ipv6-multicast-source-address;
            description
                "Multicast source IPv6 address.
                If it is not specified, all MLD source-group entries are
                cleared.";
        }
    }
} // rpc clear-mld-groups

/*
 * Notifications
 */
}
<CODE ENDS>
```


5. 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:

igmp:global

This subtree specifies the configuration for the IGMP attributes at the global level on a device. Modifying the configuration can cause IGMP membership deleted or reconstructed on all the interfaces of a device.

igmp:interfaces

This subtree specifies the configuration for the IGMP attributes at all of the interfaces level on a device. Modifying the configuration can cause IGMP membership deleted or reconstructed on all the interfaces of a device.

igmp:interfaces/interface

This subtree specifies the configuration for the IGMP attributes at the interface level on a device. Modifying the configuration can cause IGMP membership deleted or reconstructed on a specific interface of a device.

These subtrees are all under

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

mlld:global

This subtree specifies the configuration for the MLD attributes at the global level on a device. Modifying the configuration can cause MLD membership deleted or reconstructed on all the interfaces of a device.

mld:interfaces

This subtree specifies the configuration for the MLD attributes at all of the interfaces level on a device. Modifying the configuration can cause MLD membership deleted or reconstructed on all the interfaces of a device.

mld:interfaces/interface

This subtree specifies the configuration for the MLD attributes at the interface level on a device. Modifying the configuration can cause MLD membership deleted or reconstructed on a specific interface of a device.

These subtrees are all under

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

Unauthorized access to any data node of these subtrees can adversely affect the membership records of multicast routing subsystem on the local device. 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/igmp

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

Unauthorized access to any data node of the above subtree can disclose the operational state information of IGMP or MLD 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. These are the operations and their sensitivity/vulnerability:

clear-igmp-groups

clear-mld-groups

Unauthorized access to any of the above RPC operations can delete the IGMP or MLD membership records on this device.

6. 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

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

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

prefix: igmp-mld

reference: RFC XXXX

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Liu & Guo, etc

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[Page 38]

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