Draft YANG Model for IGMP/MLD
draft-guo-pim-igmp-mld-yang-01

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Agenda

• Introduction
• Summary of progress
• Top level structure and critical model design
• Next steps
Introduction

• This draft is still under discussion by the YANG multicast design team

• Archive: http://www.ietf.org/mail-archive/web/yang-multicast/current/maillist.html

• Wiki: http://trac.tools.ietf.org/wg/pim/trac/wiki/yang

• This draft is versioned on github: https://github.com/mcallisterjp/pim-yang/
Summary of Progress

• Scope covers IGMP/MLD protocols and protocol extensions
• High-level structure done
• Configuration attributes done
• Operational state attributes done
• Statistics attributes done
• Still to do:
  – Notifications
  – Further review
Module Position and AF

1. IGMP and MLD module augment options:
   Option A: /rt:routing/rt:routing-instance/rt:routing-protocols:

   Option A chosen.
   Option B would allow multiple protocol instances per VRF, which does not make sense for IGMP and MLD.

2. IGMP and MLD belong to the same module ‘ietf-igmp-mld’
   • Easier to make it consistent for igmp and mld model
Module Position and AF

3. IGMP and MLD share the same structure, but defined as separate schema branches in the structure, so that:
   • implementations may optionally choose to support specific address families
   • the names of objects may be different between ipv4 (igmp) and ipv6 (mld) address families.

++-rw igmp
   |  +-rw ...
+-rw mld
   +--rw ...

4. Same features type defined for both IGMP and MLD to make consistent structure between them. implementations have to support them at the same time

module: ietf-igmp-mld
augment /rt:routing/rt:routing-instance/rt:routing-protocols:
   +-rw igmp
      |  +-rw global
      |     |  +-rw enable? boolean {global-admin-enable}?
      |     |  +-rw max-entries? uint32 {global-max-entries}?
      |     |  +-rw max-groups? uint32 {global-max-groups}?

   +-rw mld
      +--rw global
         |  +-rw enable? boolean {global-admin-enable}?
         |  +-rw max-entries? uint32 {global-max-entries}?
         |  +-rw max-groups? uint32 {global-max-groups}?
Three levels:

- **Global level**: IGMP MLD configuration attributes for the entire routing instance.
- **Interface-global**: IGMP MLD configuration attributes applied to interfaces whose interface level attributes are not existing, with same attributes’ value for those.
- **Interface-level**: IGMP MLD configuration attributes specific to the given interface.

- **Eg.1**: max-groups 100 in **Global level** means 100 groups at most for the entire IGMP instance; Max-groups 100 in **Interface level** means the limitation for each interface is 100, and it may be greater than 100 for the entire IGMP instance.
- **Eg.2**: Max-groups-per-interface 100 in **Interface-global level** defined the group number limitation for interfaces, which donot config max-groups themselves.

```module: ietf-igmp-mld
augment /rt:routing/rt:routing-instance/rt:routing-protocols:
  | -+-rw igmp
  |    | -+-rw global
  |    |     | -+-rw enable?             boolean {global-admin-enable}?
  |    |     | -+-rw max-entries?        uint32 {global-max-entries}?
  |    |     | -+-rw max-groups?         uint32 {global-max-groups}?
  |    |     |     | -+-rw interfaces
  |    |    |     |     | -+-rw max-groups-per-interface?  uint32 {intf-max-groups}?
  |    |    |     |     |     | -+-rw ...
  |    |    |     |     |     |     | -+-rw interface* [interface]
  |    |    |     |     |     |     |     | -+-rw interface if:interface-ref
  |    |    |     |     |     |     |     | -+-rw enable?           boolean {intf-admin-enable}?
  |    |    |     |     |     |     |     | -+-rw max-groups?       uint32 {intf-max-groups}?```
Operational State Structure

Three levels:

- **Global level**: IGMP MLD operational state attributes for the entire routing instance
- **Interface-global**: IGMP MLD interface level operational state attributes applied to interfaces whose interface level attributes do not exist, with same attributes' value for those interfaces
- **Interface-specific**: IGMP MLD operational state attributes specific to the given interface.

module: ietf-igmp-mld

augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:

```plaintext
  +--ro igmp
     | +--ro global
     |    | +--ro enable?  boolean {global-admin-enable}?
     |    | +--ro max-entries?  uint32 {global-max-entries}?
     |    | +--ro max-groups?  uint32 {global-max-groups}?
     |    | +--ro ...
     | +--ro interfaces
     |    +--ro last-member-query-interval?  uint16
     |    +--ro max-groups-per-interface?  uint32 {intf-max-groups}?
     |    +--ro ...
     | +--ro interface*  [interface]
     |    +--ro interface  if:interface-ref
     |    +--ro enable?  boolean {intf-admin-enable}?
     |    +--ro max-groups?  uint32 {intf-max-groups}?
```
Basically two types of definitions: source-addr specified inside policy, or outside policy

**Juniper:**

```conf
policy-statement POLICY-ipv4-example1 {
term 1 {
    from {
        route-filter 232.1.1.1/32 exact;
    }
    then {
        ssm-source [ 10.10.10.4 192.168.43.66 ];
        accept;
    }
}
}
```

**Cisco:**

```conf
!
access-list 10 permit 232.1.2.10
access-list 11 permit 232.1.2.0 0.0.0.255

ip igmp ssm-map enable
ip igmp ssm-map static 10 172.16.8.10
ip igmp ssm-map static 11 172.16.8.11
```
SSM Mapping Config

Using union type to indicate whether source-addr is inside the group-policy module: ietf-igmp-mld

augment /rt:routing/rt:routing-instance/rt:routing-protocols:
  --rw igmp
    |   --rw interfaces
    |     --rw interface* [interface]
    |     |   --rw interface if:interface-ref
    |     |   --rw enable? boolean {intf-admin-enable}?
    |     |   --rw ssm-map* [source-addr group-policy] {intf-ssm-map}?
    |     |     |   --rw source-addr ssm-map-ipv4-addr-type
    |     |     |   |   --rw group-policy string

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
RPC

IGMP and MLD RPC

rpcs:

|------x clear-igmp-groups {rpc-clear-groups}?
|  |------w input
|  |      ------w routing-instance?  rt:route-instance-ref
|  |      ------w interface?         leafref
|  |      ------w group?             inet:ipv4-address

|------x clear-mld-groups {rpc-clear-groups}?
|  |------w input
|  |      ------w routing-instance?  rt:route-instance-ref
|  |      ------w interface?         leafref
|  |      ------w group?             inet:ipv4-address
Next Steps

• Notifications

• Request further review

• Can this draft be adopted as WG draft?
Appendix: Yang Models
Config Global-level

augment /rt:router/rt:router-instance/rt:router-protocols:
  ---rw igmp
  |   ---rw global
  |     |   ---rw enable?  boolean {global-admin-enable}?
  |     |   ---rw max-entries?  uint32 {global-max-entries}?
  |     |   ---rw max-groups?  uint32 {global-max-groups}?
  ---rw mld
  |   ---rw global
  |     |   ---rw enable?  boolean {global-admin-enable}?
  |     |   ---rw max-entries?  uint32 {global-max-entries}?
  |     |   ---rw max-groups?  uint32 {global-max-groups}?
Config Interface-Global

augment /rt:routing/rt:routing-instance/rt:routing-protocols:
  +--rw igmp
  |    +--rw global
  |    +--rw interfaces
  |          +--rw last-member-query-interval?  uint16
  |          +--rw max-groups-per-interface?    uint32 {intf-max-groups}?
  |          +--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 interface*  [interface]
  +--rw mld
     +--rw global
     +--rw interfaces
          +--rw last-member-query-interval?  uint16
          +--rw max-groups-per-interface?    uint32 {intf-max-groups}?
          +--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 interface*  [interface]
Config Interface-Specific(IGMP)

augment /rt:routing/rt:routing-instance/rt:routing-protocols:
  +++rw igmp
  |  +++rw global
  |  +++rw interfaces
  |  |  +++rw interface* [interface]
  |  |  |  +++rw interface
  |  |  |  |  +++rw enable?
  |  |  |  |  |  boolean {intf-admin-enable}?
  |  |  |  |  +++rw group-policy?
  |  |  |  |  |  string
  |  |  |  |  +++rw immediate-leave?
  |  |  |  |  |  empty {intf-immediate-leave}?
  |  |  |  |  +++rw last-member-query-interval?
  |  |  |  |  |  uint16
  |  |  |  |  +++rw max-groups?
  |  |  |  |  |  uint32 {intf-max-groups}?
  |  |  |  |  +++rw max-group-sources?
  |  |  |  |  |  uint32 {intf-max-group-sources}?
  |  |  |  |  +++rw query-interval?
  |  |  |  |  |  uint16
  |  |  |  |  +++rw query-max-response-time?
  |  |  |  |  |  uint16
  |  |  |  |  +++rw require-router-alert?
  |  |  |  |  |  s boolean {intf-require-router-alert}?
  |  |  |  |  +++rw robustness-variable?
  |  |  |  |  |  uint8
  |  |  |  |  +++rw source-policy?
  |  |  |  |  |  string {intf-source-policy}?
  |  |  |  |  +++rw verify-source-subnet?
  |  |  |  |  |  empty {intf-verify-source-subnet}?
  |  |  |  |  +++rw version?
  |  |  |  |  |  uint8
  |  |  |  |  +++rw join-group*
  |  |  |  |  |  inet:ipv4-address {intf-join-group}?
  |  |  |  |  +++rw ssm-map* [source-addr group-policy] {intf-ssm-map}?
  |  |  |  |  |  |  +++rw source-addr
  |  |  |  |  |  |  string
  |  |  |  |  |  |  +++rw group-policy
  |  |  |  |  |  |  string
  |  |  |  |  |  +++rw static-group* [group source-addr] {intf-static-group}?
  |  |  |  |  |  |  +++rw group
  |  |  |  |  |  |  inet:ipv4-address
  |  |  |  |  |  |  +++rw source-addr
  |  |  |  |  |  |  source-ipv4-addr-type
  +++rw mld
  |  +++rw global
augment /rt:routing/rt:routing-instance/rt:routing-protocols:

    +++-rw mld
    |     +++-rw global
    |     +++-rw interfaces
    |     |     +++-rw interface* [interface]
    |     |     |     +++-rw interface if:interface-ref
    |     |     |     +++-rw enable? boolean {intf-admin-enable}?
    |     |     |     +++-rw group-policy? string
    |     |     |     +++-rw immediate-leave? empty {intf-immediate-leave}?
    |     |     |     +++-rw last-member-query-interval? uint16
    |     |     |     +++-rw max-groups? uint32 {intf-max-groups}?
    |     |     |     +++-rw max-group-sources? uint32 {intf-max-group-sources}?
    |     |     |     +++-rw query-interval? uint16
    |     |     |     +++-rw query-max-response-time? uint16
    |     |     |     +++-rw require-router-alert? boolean {intf-require-router-alert}?
    |     |     |     +++-rw robustness-variable? uint8
    |     |     |     +++-rw source-policy? string {intf-source-policy}?
    |     |     |     +++-rw verify-source-subnet? empty {intf-verify-source-subnet}?
    |     |     |     +++-rw version? uint8
    |     |     |     +++-rw join-group* inet:ipv6-address {intf-join-group}?
    |     |     |     +++-rw ssm-map* [source-addr group-policy] {intf-ssm-map}?
    |     |     |     |     +++-rw source-addr ssm-map-ipv6-addr-type
    |     |     |     |     +++-rw group-policy string
    |     |     |     +++-rw static-group* [group source-addr] {intf-static-group}?
    |     |     |     |     +++-rw group inet:ipv6-address
    |     |     |     |     +++-rw source-addr source-ipv6-addr-type
augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:
   +---ro igmp
      |   +---ro global
      |   |   +---ro enable?    boolean {global-admin-enable}?
      |   |   +---ro max-entries? uint32 {global-max-entries}?
      |   |   +---ro max-groups?  uint32 {global-max-groups}?
      |   |   +---ro entries-count? uint32
      |   |   +---ro groups-count?  Uint32
   +---ro mld
      +---ro global
      |   +---ro enable?    boolean {global-admin-enable}?
      |   +---ro max-entries? uint32 {global-max-entries}?
      |   +---ro max-groups?  uint32 {global-max-groups}?
      |   +---ro entries-count? uint32
      |   +---ro groups-count?  uint32
Operation Global-level(IGMP)

augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:

  +---ro igmp
  |   +---ro global
  |   |   +---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
Operation Global-level(MLD)

augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:
  +++-ro mld
  +++-ro global
    |  +++-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
augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:
   +---ro igmp
    |   +---ro global
    |   +---ro interfaces
    |      +---ro last-member-query-interval? uint16
    |      +---ro max-groups-per-interface? uint32 \{intf-max-groups\}?
    |      +---ro query-interval? uint16
    |      +---ro query-max-response-time? uint16
    |      +---ro require-router-alert? boolean \{intf-require-router-alert\}?
    |      +---ro robustness-variable? uint8
    |      +---ro version? uint8
    |      +---ro interface* [interface]
   +---ro mld
    +---ro global
    +---ro interfaces
     +---ro last-member-query-interval? uint16
     +---ro max-groups-per-interface? uint32 \{intf-max-groups\}?
     +---ro query-interval? uint16
     +---ro query-max-response-time? uint16
     +---ro require-router-alert? boolean \{intf-require-router-alert\}?
     +---ro robustness-variable? uint8
     +---ro version? uint8
     +---ro interface* [interface]
Operation Interface-Specific(IGMP)

```
augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:
  +--ro igmp
  |    +--ro global
  |    +--ro interfaces
  |    |    +--ro interface* [interface]
  |    |    |    +--ro interface if:interface-ref
  |    |    |    +--ro enable? boolean {intf-admin-enable}?
  |    |    |    +--ro group-policy? string
  |    |    |    +--ro immediate-leave? empty {intf-immediate-leave}?
  |    |    |    +--ro last-member-query-interval? uint16
  |    |    |    +--ro max-groups? uint32 {intf-max-groups}?
  |    |    |    +--ro max-group-sources? uint32 {intf-max-group-sources}?
  |    |    |    +--ro query-interval? uint16
  |    |    |    +--ro query-max-response-time? uint16
  |    |    |    +--ro require-router-alert? boolean {intf-require-router-alert}?
  |    |    |    +--ro robustness-variable? uint8
  |    |    |    +--ro source-policy? string {intf-source-policy}?
  |    |    |    +--ro verify-source-subnet? empty {intf-verify-source-subnet}?
  |    |    |    +--ro version? uint8
  |    |    |    +--ro join-group* inet:ipv4-address {intf-join-group}?
  |    |    |    +--ro ssm-map* [source-addr group-policy] {intf-ssm-map}?
  |    |    |    |    +--ro source-addr ssm-map-ipv4-addr-type
  |    |    |    |    +--ro group-policy string
```
Operation Interface-Specific(IGMP)

augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:

  +++-ro igmp
  |  +++-ro global
  |  +++-ro interfaces
  |     +++-ro interface* [interface]
  |     |  +++-ro interface if:interface-ref
  |     |  +++-ro static-group* [group source-addr] {intf-static-group}?
  |     |     |  +++-ro group inet:ipv4-address
  |     |     |  +++-ro source-addr source-ipv4-addr-type
  |     |     +++-ro oper-status? enumeration
  |     |     +++-ro dr? inet:ipv4-address
  |     |     +++-ro querier? inet:ipv4-address
  |     |     +++-ro joined-group* inet:ipv4-address {intf-join-group}?
  |     |     +++-ro group* [address]
  |     |     |  +++-ro address inet:ipv4-address
  |     |     |  +++-ro expire? uint32
  |     |     |  +++-ro filter-mode? enumeration
  |     |     |  +++-ro host-count? uint32
  |     |     |  +++-ro up-time? uint32
  |     |     |  +++-ro host* inet:ipv4-address
  |     |     |  +++-ro last-reporter? inet:ipv4-address
  |     |     |     +++-ro source* [address]
  |     |     |     |  +++-ro address inet:ipv4-address
  |     |     |     |  +++-ro expire? uint32
  |     |     |     |  +++-ro up-time? uint32
augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:
  +++-ro mld
    +++-ro global
    +++-ro interfaces
      +++-ro interface* [interface]
        ---ro interface
        ---ro enable?
        ---ro group-policy?
        ---ro immediate-leave?
        ---ro last-member-query-interval?
        ---ro max-groups?
        ---ro max-group-sources?
        ---ro query-interval?
        ---ro query-max-response-time?
        ---ro require-router-alert?
        ---ro robustness-variable?
        ---ro source-policy?
        ---ro verify-source-subnet?
        ---ro version?
        ---ro join-group*
          ---ro ssm-map* [source-addr group-policy] {intf-ssm-map}?
            | ---ro source-addr         ssm-map-ipv6-addr-type
            | ---ro group-policy        string
augment /rt:routing-state/rt:routing-instance/rt:routing-protocols:
   +--ro mld
   +--ro global
   +--ro interfaces
      +--ro interface* [interface]
         +--ro static-group* [group source-addr] {intf-static-group}?
            |    +--ro group       inet:ipv6-address
            |    +--ro source-addr source-ipv6-addr-type
         +--ro oper-status?   enumeration
         +--ro querier?       inet:ipv6-address
         +--ro joined-group*  inet:ipv6-address {intf-join-group}?

         +--ro group* [address]
            +--ro address       inet:ipv6-address
            +--ro expire?       uint32
            +--ro filter-mode?  enumeration
            +--ro host-count?   uint32
            +--ro up-time?       uint32
            +--ro host*          inet:ipv6-address
            +--ro last-reporter? inet:ipv6-address

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