Abstract

This document proposes a YANG module for BMP (BGP Monitoring Protocol) configuration and monitoring. A complementary RPC triggers a refresh of the session of a BMP station.

Status of This Memo

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1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

Routing Information Bases, peers, monitoring stations are defined in [RFC7854].

2. Introduction

This document specifies a YANG module for configuring and monitoring the BGP Monitoring Protocol (BMP) [RFC7854]. The model provides parameters for defining BMP monitoring stations, the selection of the BGP Routing Information Bases (RIBs), provides operational metrics and enables to reset BMP monitoring sessions.
3. Model summary

The BMP YANG model provides the methods for managing BMP monitoring stations. It includes:

* Connectivity parameters, including station IP address and destination port.

* BMP session parameters, such as defining the BMP initiation message or the interval for statistics messages.

* BGP Data sources. The model requires the explicit configuration of the RIBs and address family to send to each monitoring station. For Adj-RIB-in and Adj-RIB-out, both post and pre policy, the model also requires the peers from which to originate data. In those RIBs, the value "all_peers" can be used if the operators desires to receive data of all peers.

* Per BMP station status and statistics, such as established status, number of route-monitoring messages, number of route-mirroring messages, number of peer-down and peer-up messages, number of initiation messages.

* BMP session reset RPC action.

4. Base ietf-bmp YANG module

4.1. Tree View

The following tree diagram provides an overview of the ietf-bmp.yang data model.

```yang
module: ietf-bmp
  +--rw bmp
    +--rw stations
      +--rw station* [id]
        +--rw id               string
        +--rw connection
        |  +--rw destination-address    inet:ip-address
        |  +--rw local-address?         inet:ip-address
        |  +--rw destination-port?      inet:port-number
        +--rw bmp_session
        |  +--rw initiation-message?    string
        |  +--rw statistics-interval?   uint32
        +--rw bmp_sources
          +--rw adj-rib-in-pre
              +--rw enabled?            boolean
              +--rw address-families
```

Cardona, et al. Expires 22 September 2022
```yang
module bmp-yang-module {
  import yang

  namespace "http://example.com/bmp-yang"

  prefix bmp

  leafrib {
    leafrib-in-post {
      address-families {
        address-family {
          name leafref
          peers union
          enabled boolean
        }
      }
    }
    local-rib {
      address-families {
        address-family {
          name leafref
          peers union
          enabled boolean
        }
      }
    }
    adj-rib-out-pre {
      address-families {
        address-family {
          name leafref
          peers union
          enabled boolean
        }
      }
    }
    adj-rib-out-post {
      address-families {
        address-family {
          name leafref
          peers union
          enabled boolean
        }
      }
    }
    session-stats {
      discontinuity-time yang:date-and-time
      established-session boolean
      total-route-monitoring-messages uint64
      total-statistics-messages uint64
      total-peer-down-messages uint64
      total-peer-up-messages uint64
      total-initiation-messages uint64
      total-route-mirroring-messages uint64
    }
    actions {
      session-reset {
        input {
          station? -> /bmp/stations/station/id
        }
        output {
          (outcome)?
            success empty
            failure string
        }
      }
    }
  }
}
```
4.2. YANG Module

<CODE BEGINS> file "ietf-bmp@2022-01-27.yang"

module ietf-bmp {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-bmp";
  prefix bmp;

  import ietf-yang-types {
    prefix yang;
  }

  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 6991: Common YANG Data Types";
  }

  import ietf-routing {
    prefix rt;
    reference
      "RFC 8349, A YANG Data Model for Routing Management (NMDA Version)";
  }

  import ietf-bgp-types {
    prefix bt;
    reference
      "RFC XXXX: BGP YANG module for Service Provider Network. RFC-EDITOR: please update XXX with the RFC ID assigned to I-D.ietf-1dr-bgp-model";
  }

  import ietf-bgp {
    prefix bgp;
    reference
      "RFC XXXX: BGP YANG module for Service Provider Network. RFC-EDITOR: please update XXX with the RFC ID assigned to I-D.ietf-1dr-bgp-model";
  }

  import ietf-netconf-acm {
    prefix nacm;
    reference
      "RFC 8341: Network Configuration Access Control Model";
  }

  organization

"IETF GROW Working Group";

contact
"WG Web:  <https://datatracker.ietf.org/wg/grow/>
WG List:  <mailto:grow@ietf.org>

Author:  Camilo Cardona
<mailto:camilo@ntt.net>

Author:  Paolo Lucente
<mailto:cpaolo@ntt.net>

Author:  Thomas Graf
<mailto:thomas.graf@swisscom.com>

Author:  Benoit Claise
<mailto:benoit.claise@huawei.com>";

description
"This module specifies a structure for BMP
(BGP Monitoring Protocol) configuration and monitoring.

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.

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forth in Section 4.c of the IETF Trust’s Legal Provisions
Relating to IETF Documents

This version of this YANG module is part of RFC 9196
(https://www.rfc-editor.org/info/rfc9196); see the RFC itself
for full legal notices."

revision 2022-01-27 {
  description
    "initial version";
  reference
    "RFC YYYY: BMP YANG Module
    RFC-EDITOR: please update YYYY with this RFC ID";
}
typedef bmp-peer-types {
  type enumeration {
    enum all-peers {
      value 10;
      description
        "Selects all peers.";
    }
  }
}

description
  "Enum values for peer selection specific for BMP. The
  all-peers value is an explicit way of defining that the device
  should send the updates from all peers to the station for
  a particular RIB/AFI. The module also allows the selection
  of individual peers (through its remote-address), or use the
  bgp:peer-type to select the type of peers.";
}

grouping bmp-ip-connection {
  description
    "common elements for defining connectivity
    to a bmp station";
  leaf destination-address {
    type inet:ip-address;
    mandatory true;
    description
      "Destination IP address of station";
  }
  leaf local-address {
    type inet:ip-address;
    description
      "Local IP address to source connections";
  }
  leaf destination-port {
    type inet:port-number;
    description
      "Destination port for connections";
  }
}

grouping bmp-peer-ribs-filter {
  description
    "Leaves for configuring RIBs where
    origin/destination peers are well defined.";
  leaf enabled {
    type boolean;
    description
      "Enables the specified RIB";
  }
}
container address-families {
    description
        "container for lists of address-families";
    list address-family {
        key "name";
        description
            "List of address families.
            The name of the address family, as defined
            in the BGP model is used for keying.";
        leaf name {
            type leafref {
                path "/rt:routing/rt:control-plane-protocols/
                 + "rt:control-plane-protocol/bgp:bgp/"
                 + "bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:name";
            }
            description
                "Name of the address family";
        }
        leaf-list peers {
            type union {
                type leafref {
                    path "/rt:routing/rt:control-plane-protocols/
                     + "rt:control-plane-protocol/bgp:bgp/"
                     + "bgp:neighbors/bgp:neighbor/bgp:remote-address";
                }
                type bt:peer-type;
                type bmp-peer-types;
            }
            description
                "Peers can be identified by a remote-address,
                 or by an enum value corresponding to groups of peers.
                 This way an operator can select all external peers,
                 all internal peers, or all peers.";
        }
    }
}

grouping bmp-route-monitoring-sources {
    description
        "";
    container adj-rib-in-pre {
        description
            "Configuration for the adj-rib-in pre-policy";
        reference
            "RFC7854: BGP Monitoring Protocol (BMP), Section 2.";
        uses bmp-peer-ribs-filter;
    }
}
container adj-rib-in-post {
    description
    "Configuration for the adj-rib-in post-policy";
    reference
    "RFC7854: BGP Monitoring Protocol (BMP), Section 2.";
    uses bmp-peer-ribs-filter;
}

container local-rib {
    description
    "Configuration for the local-rib";
    reference
    "RFC9069: Support for Local RIB in the BGP Monitoring Protocol (BMP), Section 3.";
    leaf enabled {
        type boolean;
        description
        "Enables the specified RIB";
    }
    leaf-list address-families {
        type identityref {
            base bt:afi-safi-type;
        }
        description
        "List of address families to enable for local-rib.";
    }
}

container adj-rib-out-pre {
    description
    "Configuration for the adj-rib-out pre-policy";
    uses bmp-peer-ribs-filter;
    reference
    "RFC8671: Support for Adj-RIB-Out in the BGP Monitoring Protocol (BMP), Section 3.";
}

container adj-rib-out-post {
    description
    "Configuration for the adj-rib-out post-policy";
    uses bmp-peer-ribs-filter;
    reference
    "RFC8671: Support for Adj-RIB-Out in the BGP Monitoring Protocol (BMP), Section 3.";
}

grouping bmp-session-options {
    description
    "leaves for configuration of the bmp session";
leaf initiation-message {
  type string;
  description
    "User defined message to append to the
     initiation message";
}
leaf statistics-interval {
  type uint32;
  description
    "Default Interval for statistic message.";
}

container bmp {
  description
    "Main level for BMP configuration ";
  container stations {
    description
      "Container for the list of BMP stations";
    list station {
      key "id";
      description
        "Configuration for BMP stations.";
      leaf id {
        type string;
        description
          "Identification string for the station";
      }
      // Connection, missing tcp tuning params
      // like keep-alives, segment sizes, etc.
      container connection {
        description
          "Connection details for the station";
        uses bmp-ip-connection;
      }
      container bmp_session {
        description
          "BMP session options for the station";
        uses bmp-session-options;
      }
      container bmp_sources {
        description
          "Configuration of the data sources for the station";
        uses bmp-route-monitoring-sources;
      }
      container session-stats {
        description
          "stats and operational values for the station";
      }
  }
}
leaf discontinuity-time {
    type yang:date-and-time;
    mandatory true;
    description
        "The time on the most recent occasion at which any one
or more of this station's 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.";
}

leaf established-session {
    type boolean;
    config false;
    description
        "Value indicating if the session is currently
established";
}

leaf total-route-monitoring-messages {
    type uint64;
    config false;
    description
        "Number of route-monitoring messages sent since last
successful connection";
}

leaf total-statistics-messages {
    type uint64;
    config false;
    description
        "Number of statistics messages sent since last
successful connection";
}

leaf total-peer-down-messages {
    type uint64;
    config false;
    description
        "Number of peer-down messages sent since last
successful connection";
}

leaf total-peer-up-messages {
    type uint64;
    config false;
    description
        "Number of peer-up messages sent since last successful
connection";
}
leaf total-initiation-messages {
    type uint64;
    config false;
    description
    "Number of initiation messages sent since last successful connection";
}
leaf total-route-mirroring-messages {
    type uint64;
    config false;
    description
    "Number of route-mirroring messages sent since last successful connection";
}

container actions {
    nacm:default-deny-all;
    description
    "Container with the actions for the BMP operation";
    action session-reset {
        description
        "Resets the session for a station.";
        input {
            leaf station {
                type leafref {
                    path "/bmp/stations/station/id";
                    }
                description
                "Identifies the station to reset";
            }
        }
        output {
            choice outcome {
                description
                "Output of the reset operation. Either a success or failure. For the latter, the reason for the error is provided.";
                leaf success {
                    type empty;
                    description
                    "Reset successful";
                }
                leaf failure {
                    type string;
                    description
                    "Reason for failure";
                }
            }
        }
    }
}
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 [RFC8446]. The NETCONF 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.

BGP data is sensible for security considerations. The model described in this document could be used to send BGP information to malicious BMP stations. Write access to this model should therefore be properly protected.

The session-reset action can demand considerable amount of resources from network elements. It should thus be protected from illegal access.

6. IANA Considerations

6.1. The IETF XML Registry

This document registers a URIs in the IETF XML registry [RFC3688]. Following the format in [RFC3688], the following registrations are requested:

Registrant Contact: The IESG.
XML: N/A, the requested URI is an XML namespace.
6.2. The YANG Module Name Registration

This document registers the following YANG module in the "YANG Module Names" registry [RFC6020]:

Name: ietf-bmp
Prefix: bmp
Reference: [This RFC-to-be]

7. Open Issues

Shall we copy the TCP tuning and security parameters from the BGP specifications?

The security considerations section will have to be aligned with https://trac.ietf.org/trac/ops/wiki/yang-security-guidelines

8. Normative References


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Authors’ Addresses

Camilo Cardona
NTT
164-168, Carrer de Numancia
08029 Barcelona
Spain
Email: camilo@ntt.net