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**Support for Adj-RIB-Out in BGP Monitoring Protocol (BMP)
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Abstract

The BGP Monitoring Protocol (BMP) defines access to only the Adj-RIB-In Routing Information Bases (RIBs). This document updates the BGP Monitoring Protocol (BMP) [RFC 7854](#) by adding access to the Adj-RIB-Out RIBs. It adds a new flag to the peer header to distinguish Adj-RIB-In and Adj-RIB-Out.

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1. Introduction

BGP Monitoring Protocol (BMP) defines monitoring of the received (e.g. Adj-RIB-In) Routing Information Bases (RIBs) per peer. The Adj-RIB-In pre-policy conveys to a BMP receiver all RIB data before any policy has been applied. The Adj-RIB-In post-policy conveys to a BMP receiver all RIB data after policy filters and/or modifications have been applied. An example of pre-policy verses post-policy is when an inbound policy applies attribute modification or filters. Pre-policy would contain information prior to the inbound policy changes or filters of data. Post policy would convey the changed data or would not contain the filtered data.

Monitoring the received updates that the router received before any policy has been applied is the primary level of monitoring for most use-cases. Inbound policy validation and auditing is the primary use-case for enabling post-policy monitoring.

In order for a BMP receiver to receive any BGP data, the BMP sender (e.g. router) needs to have an established BGP peering session and actively be receiving updates for an Adj-RIB-In.

Being able to only monitor the Adj-RIB-In puts a restriction on what data is available to BMP receivers via BMP senders (e.g. routers). This is an issue when the receiving end of the BGP peer is not enabled for BMP or when it is not accessible for administrative reasons. For example, a service provider advertises prefixes to a customer, but the service provider cannot see what it advertises via BMP. Asking the customer to enable BMP and monitoring of the Adj-RIB-In is not feasible.

This document updates BGP Monitoring Protocol (BMP) [RFC 7854](#) [[RFC7854](#)] peer header by adding a new flag to distinguish Adj-RIB-In verses Adj-RIB-Out.

Adding Adj-RIB-Out enables the ability for a BMP sender to send to a BMP receiver what it advertises to BGP peers, which can be used for outbound policy validation and to monitor RIBs that were advertised.

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

2. Definitions

- o Adj-RIB-Out: As defined in [[RFC4271](#)], "The Adj-RIBs-Out contains the routes for advertisement to specific peers by means of the local speaker's UPDATE messages."
- o Pre-Policy Adj-RIB-Out: The result before applying the outbound policy to an Adj-RIB-Out. This normally would match what is in the local RIB.
- o Post-Policy Adj-RIB-Out: The result of applying outbound policy to an Adj-RIB-Out. This MUST be what is actually sent to the peer.

3. Per-Peer Header

The per-peer header has the same structure and flags as defined in [section 4.2 \[RFC7854\]](#) with the following 0 flag addition:

```

      0 1 2 3 4 5 6 7
      +---+---+---+---+
      |V|L|A|0| Resv |
      +---+---+---+---+

```

- o The 0 flag indicates Adj-RIB-In if set to 0 and Adj-RIB-Out if set to 1.

The remaining bits are reserved for future use. They MUST be transmitted as 0 and their values MUST be ignored on receipt.

4. Adj-RIB-Out

4.1. Post-Policy

The primary use-case in monitoring Adj-RIB-Out is to monitor the updates transmitted to the BGP peer after outbound policy has been applied. These updates reflect the result after modifications and filters have been applied (e.g. Adj-RIB-Out Post-Policy). The L flag MUST be set to 1 in this case to indicate post-policy.

4.2. Pre-Policy

As with Adj-RIB-In policy validation, there are use-cases that pre-policy Adj-RIB-Out is used to validate and audit outbound policies. For example, a comparison between pre-policy and post-policy can be used to validate the outbound policy. The L flag MUST be set to 0 in

this case to indicate pre-policy.

5. BMP Messages

Many BMP messages have a per-peer header but some are not applicable to Adj-RIB-In or Adj-RIB-Out monitoring. Unless otherwise defined, the 0 flag should be set to 0 in the per-peer header in BMP messages.

5.1. Route Monitoring and Route Mirroring

The 0 flag MUST be set accordingly to indicate if the route monitor or route mirroring message conveys Adj-RIB-In or Adj-RIB-Out.

5.2. Statistics Report

Statistics report message has Stat Type field to indicate the statistic carried in the Stat Data field. Statistics report messages are not specific to Adj-RIB-In or Adj-RIB-Out and MUST have the 0 flag set to zero. The 0 flag SHOULD be ignored by the BMP receiver. The following new statistic types are added:

- o Stat Type = TBD: (64-bit Gauge) Number of routes in Adj-RIBs-Out Pre-Policy.
- o Stat Type = TBD: (64-bit Gauge) Number of routes in Adj-RIBs-Out Post-Policy.
- o Stat Type = TBD: Number of routes in per-AFI/SAFI Adj-RIB-Out Pre-Policy. The value is structured as: 2-byte Address Family Identifier (AFI), 1-byte Subsequent Address Family Identifier (SAFI), followed by a 64-bit Gauge.
- o Stat Type = TBD: Number of routes in per-AFI/SAFI Adj-RIB-Out Post-Policy. The value is structured as: 2-byte Address Family Identifier (AFI), 1-byte Subsequent Address Family Identifier (SAFI), followed by a 64-bit Gauge.

5.3. Peer Down and Up Notifications

PEER UP and DOWN notifications convey BGP peering session state to BMP receivers. The state is independent of whether or not route monitoring or route mirroring messages will be sent for Adj-RIB-In, Adj-RIB-Out, or both. BMP receiver implementations SHOULD ignore the 0 flag in PEER UP and DOWN notifications.

6. Security Considerations

It is not believed that this document adds any additional security considerations.

7. IANA Considerations

This document requests that IANA assign the following BMP new parameters to the BMP parameters name space [1].

7.1. BMP Peer Flags

This document defines a new flag ([Section 3](#)):

- o Flag 3 as 0 flag

7.2. BMP Statistics Types

This document defines four new statistic types for statistics reporting ([Section 4.2](#)):

- o Stat Type = TBD: (64-bit Gauge) Number of routes in Adj-RIBs-Out Pre-Policy.
- o Stat Type = TBD: (64-bit Gauge) Number of routes in Adj-RIBs-Out Post-Policy.
- o Stat Type = TBD: Number of routes in per-AFI/SAFI Adj-RIB-Out Pre-Policy. The value is structured as: 2-byte Address Family Identifier (AFI), 1-byte Subsequent Address Family Identifier (SAFI), followed by a 64-bit Gauge.
- o Stat Type = TBD: Number of routes in per-AFI/SAFI Adj-RIB-Out Post-Policy. The value is structured as: 2-byte Address Family Identifier (AFI), 1-byte Subsequent Address Family Identifier (SAFI), followed by a 64-bit Gauge.

8. References

8.1. URIs

- [1] <https://www.iana.org/assignments/bmp-parameters/bmp-parameters.xhtml>

8.2. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.
- [RFC4271] Rekhter, Y., Ed., Li, T., Ed., and S. Hares, Ed., "A Border Gateway Protocol 4 (BGP-4)", [RFC 4271](#), DOI 10.17487/RFC4271, January 2006, <<http://www.rfc-editor.org/info/rfc4271>>.
- [RFC7854] Scudder, J., Ed., Fernando, R., and S. Stuart, "BGP Monitoring Protocol (BMP)", [RFC 7854](#), DOI 10.17487/RFC7854, June 2016, <<http://www.rfc-editor.org/info/rfc7854>>.

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