Enhancements to BMP implementation in FRRouting

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Getting Visibility into BGP RIBs with BMP
BGP Monitoring Protocol (BMP)

- Allows to monitor the BGP behaviour of a router
  - Received Paths (BMP Adj-RIB-In) -- RFC 7854
  - Best Path (BMP Loc-RIB) -- RFC 9069
  - Advertised Paths (BMP Adj-RIB-Out) -- RFC8671
  - Statistics
- FRRouting
  - Basic support of BMP
- Project
  - Support all RFC's
  - Support of ongoing GROW WG items
  - Wireshark dissectors
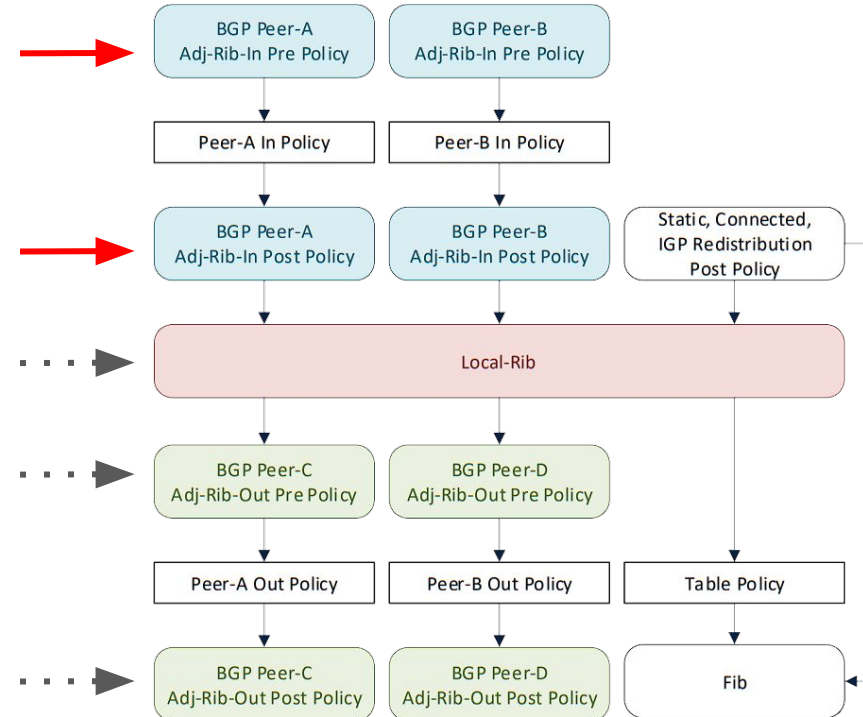
BMP in FRRouting

Initial status

- RFCs
  - Adj-RIB-In
    - No Add-Path Support
  - Loc-RIB
    - No Support
  - Adj-RIB-Out
    - No Support
- Drafts
  - BMPv4
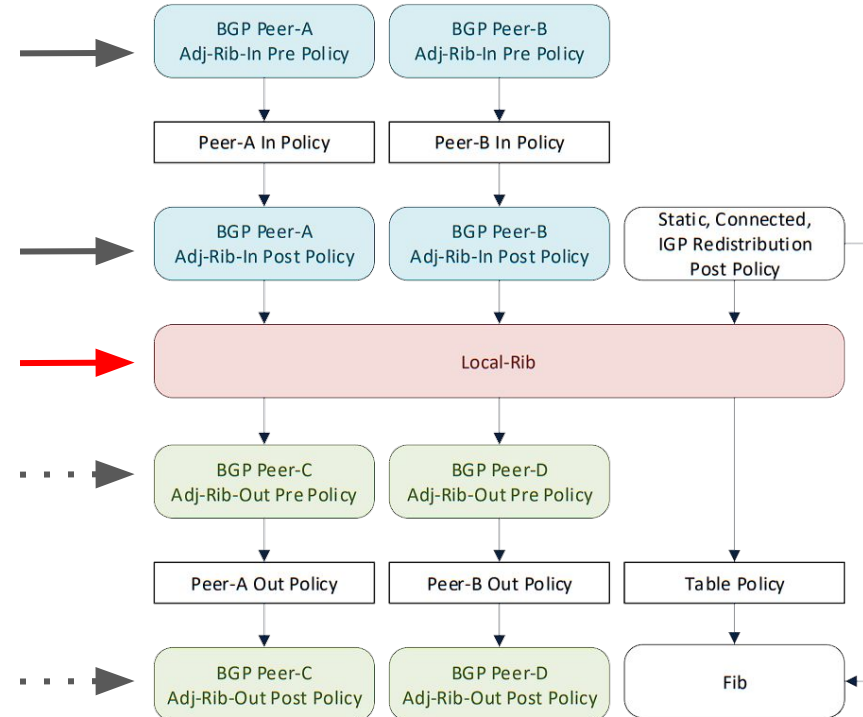   - No Support
  - Path Marking
    - No Support
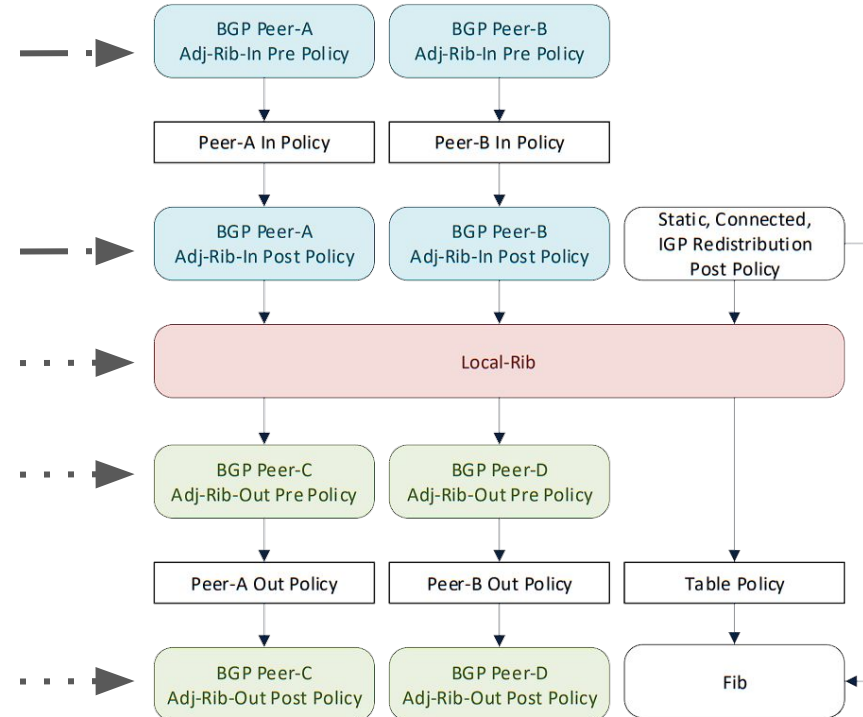
BMP Adj-RIB-In -- RFC 7854

- Added Add-Path support
- Add-Path RX ID in Adj-In NLRI
- VRF Identification

Best Path (BMP Loc-RIB) -- RFC 9069

- Now supported
- Supports BGP Multipath
- Supports VRF identification

Best Path (BMP Loc-RIB) -- RFC 9069
Challenges

- ECMP Diff in Local-RIB
  - Comparison of two sets of paths
    in the FRRouting DP code…
- Collection issue
  - Leave Path-ID same as Rx-ID in NLRI
    Ambiguous without draft-francois-grow-bmp-loc-peer
    vs.
    Regenerate Path-ID
    Losing link with Adj-RIB-In

Advertised Paths (BMP Adj-RIB-Out) -- RFC8671

- Now supported
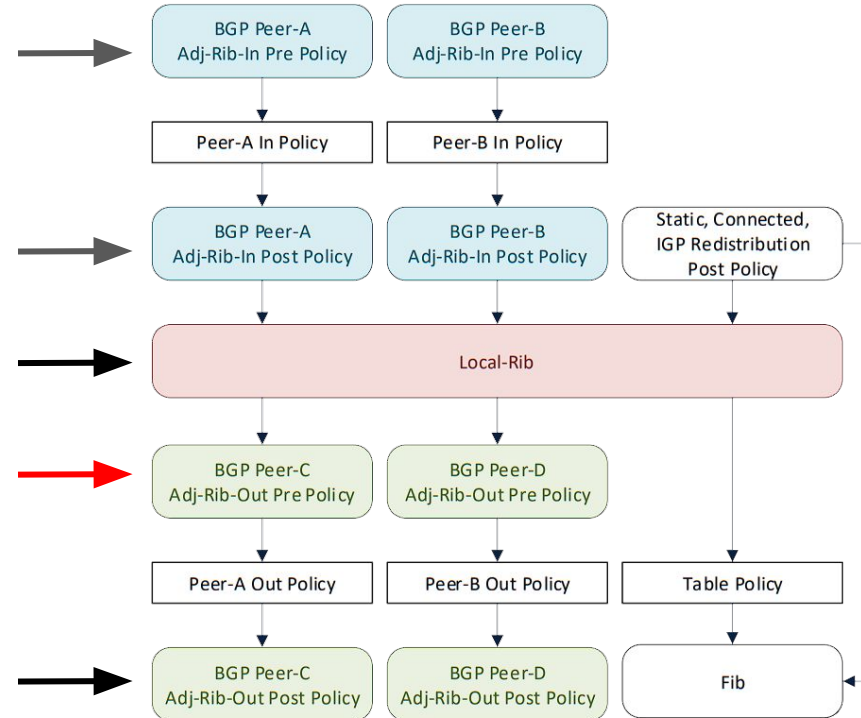 - Supports BGP Add-Path
  - Supports VRF identification
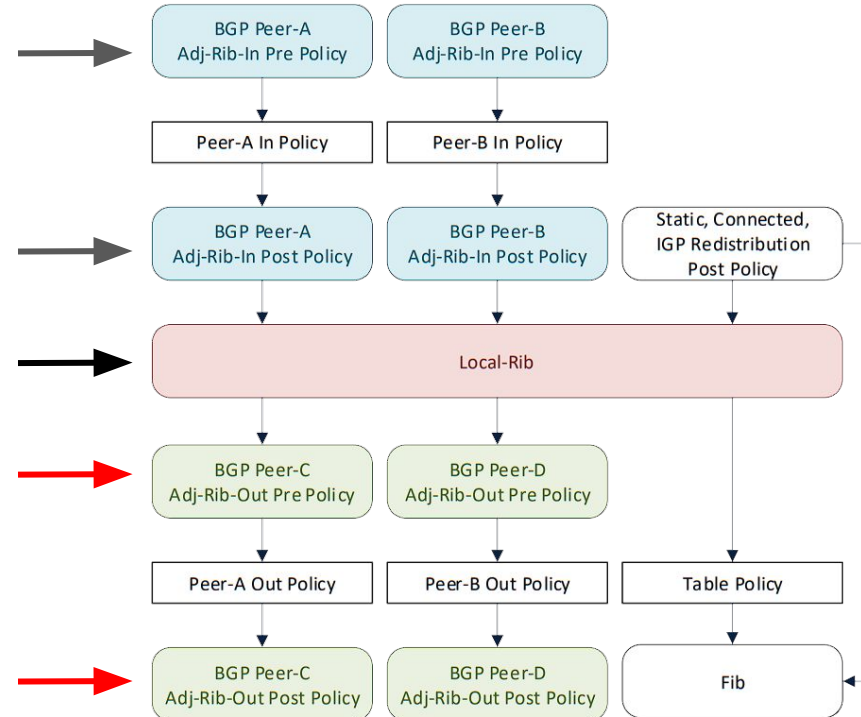
Advertised Paths (BMP Adj-RIB-Out) -- RFC8671

Implementation challenges

- FRRouting does not retain RIB-out Pre-Policy paths

  ⇒

- Unchanged out pre-policy paths may be "updated" after a DP run
- Some statistics are not possible without relevant resource impact

BMP v4 TLV
draft-ietf-grow-bmp-tlv

- Added TLV for BGP PDUs in Route Monitoring Messages

- Added Group TLV code, not leveraged by a feature

- Added Capability TLV code, not leveraged by a feature

```
BGP Monitoring Protocol, Type Route Monitoring
    Version: 4
    Length: 195
    Type: Route Monitoring (0)
  Per Peer Header
  BMPv4 TLV: BGP_PDU
      Type: BGP_PDU (4)
      Length: 122
      Index: 0
    Value: ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff 00 7a 02 00 00 00 63 40 …
      Border Gateway Protocol - UPDATE Message
          Marker: ffffffffffffffffffffffffffffffff
          Length: 122
          Type: UPDATE Message (2)
          Withdrawn Routes Length: 0
          Total Path Attribute Length: 99
        Path attributes
  BMPv4 TLV: VRF_TABLE_NAME
  BMPv4 TLV: BGP_PATH_STATUS
```

BMP Path Marking
Path status and Reason codes

- Added most status and all reason codes

- No e-bit needed for FRR at the moment

- Missing

    - Invalid ROV

    - Backup

    - Best-external


```
▼ BMPv4 TLV: BGP_PATH_STATUS
    Type: BGP_PATH_STATUS (9)
    Length: 4
    Index: 0
  ▼ .... .... .... .... .... 0000 1010 = Status: 0x0a, best, primary
        .... .... ..0 = invalid: Not set
        .... .... .1. = best: Set
        .... .... 0.. = non_selected: Not set
        .... ...1 ... = primary: Set
        .... ..0. ... = backup: Not set
        .... .0.. ... = non_installed: Not set
        .... 0... ... = best_external: Not set
        ...0 .... ... = addpath: Not set
        ..0. .... ... = filtered_in: Not set
        .0.. .... ... = filtered_out: Not set
        0... .... ... = invalid_rov: Not set
```

Wireshark

- BMP v4 TLV https://github.com/network-analytics/wireshark/tree/draft-ietf-grow-bmp-tlv

- BMP Path-Marking

  https://github.com/network-analytics/wireshark/tree/draft-cppy-grow-bmp-path-marking-tlv

References
FRRouting Links

- BMP Local-RIB Pull Request https://github.com/FRRouting/frr/pull/11800

- BMP Adj-RIB-Out https://github.com/mxyns/frr/tree/bmp-riboutmon

- BMP Multi-Path https://github.com/mxyns/frr/tree/bmp-multipath

- BMP v4 TLV https://github.com/mxyns/frr/tree/bmp-draft-tlv

- BMP Path-Marking https://github.com/mxyns/frr/tree/bmp-draft-path-marking

- BMP Loc-RIB Peer https://github.com/mxyns/frr/tree/bmp-draft-francois-grow-bmp-loc-peer

- BMP Fix Per-Peer Header Ports https://github.com/FRRouting/frr/pull/13198

Thanks !

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