BMP & YANG
GROW and NETCONF WG

IETF 111
July 19-23th, 2021
Virtual Hackathon
BMP Hackathon - Plan

Performance

- Measure CPU and memory consumption of BGP process when BMP Adj-RIB IN, OUT and Local-RIB with path-marking TLV is enabled.
  - [draft-ietf-grow-bmp-local-rib](https://datatracker.ietf.org/doc/draft-ietf-grow-bmp-local-rib/) (BGP Local RIB)
  - [draft-grow-bmp-tlv](https://datatracker.ietf.org/doc/draft-grow-bmp-tlv/) (TLV support for BMP Route Monitoring and Peer Down Messages)
  - [draft-cppy-grow-bmp-path-marking-tlv](https://datatracker.ietf.org/doc/draft-cppy-grow-bmp-path-marking-tlv/) (Path Marking TLV)

- Measure impact of BMP when session is stable, unstable, and when BGP peer is flapping.

- Verify the completeness of information sent by BMP route-monitoring about BGP RIB state when BGP is congested.

- Verify possible BGP route-propagation delay impact when BMP is enabled on a transit node.
Hackathon – Software

Software

- `pmacct` nfacctd for IPFIX and BMP data collection
- Apache `Kafka` as message broker
- Apache `Druid` as timeseries DB
- `Pivot` as user interface
- Wireshark `BMP dissector` for packet analysis
- `ExaBGP` for BGP VPnv4/6 route generation

Tutorial

- [https://imply.io/post/add-bgp-analytics-to-your-imply-netflow-analysis](https://imply.io/post/add-bgp-analytics-to-your-imply-netflow-analysis)
• **VPNv4 1'000'000 path's** route generation with ExaBGP.

• **VPNv4 route-reflector** BMP Adj-RIB IN pre-policy and Adj-RIB Out post-policy, with draft-ietf-grow-bmp-tlv and draft-cpyy-grow-bmp-path-marking-tlv on Huawei VRP V800R013.

• **VPNv4 route-reflector** BMP Adj-RIB Out post-policy on Juniper JunOS 21.1R1.11.

• **MPLS PE** BMP Adj-RIB IN pre-policy on IOS XR 7.4.1 and IOS XE 17.6.1 EFT.
Lab Environment

Achievements

• Test automation contains ExaBGP for sequenced BGP VPNv4 unicast route generation, BMP state initialization, BMP metric and YANG push cpu and memory process usage data collection.
• BMP route-monitoring prefix loss and delay can be automatically measured.
• CPU and memory usage now monitored on BGP process level.
• Comparison between 4 different operating systems.

Next Steps

• Redo same tests with higher scale and Cisco IOS XR being the route-reflector, Cisco IOS XE being the MPLS PE and improved timestamping on Huawei VRP.
BMP Timestamping

- **Huawei VRP**
  - Frame 5: 148 bytes on wire (1184 bits), 148 bytes captured (1184 bits)
  - Ethernet II, Src: Huawei_00:16:17:00:00:00, Dst: VMware_0e:02:1d:24 (00:0c:29:0e:02:1d)
  - Internet Protocol Version 4, Src: 192.0.2.44, Dst: 192.0.2.1
  - BGP Monitoring Protocol, Type Route Monitoring
    - Version: 3
    - Length: 94
      - Type: Route Monitoring (0)
      - Per Peer Header
        - Type: Global Instance Peer (0)
        - 0000 0000 = Flags: 0000
        - Unused: 00000000000000000000000000
        - Address: 198.51.100.52
        - ASN: 65536
        - DGP ID: 192.0.2.52
        - Timestamp (sec): 1614666786
        - Timestamp (usec): 94686
  - Border Gateway Protocol - UPDATE Message

- **Cisco IOS XR**
  - Frame 9: 588 bytes on wire (4804 bits), 588 bytes captured (4804 bits)
  - Ethernet II, Src: Cisco_iosxr:02:17:00:00:00:00, Dst: VMware_0e:02:1d:24 (00:0c:29:0e:02:1d)
  - Internet Protocol Version 4, Src: 192.0.2.51, Dst: 192.0.2.1
  - BGP Monitoring Protocol, Type Route Monitoring
    - Version: 3
    - Length: 76
      - Type: Route Monitoring (0)
      - Per Peer Header
        - Type: Global Instance Peer (0)
        - 0000 0000 = Flags: 0000, Post-policy
        - Peer Distinguisher: 0:0
        - Unused: 00000000000000000000000000
        - Address: 192.0.21.161
        - ASN: 65537
        - DGP ID: 192.0.2.61
        - Timestamp (sec): 1685817658
        - Timestamp (usec): 35304
  - Border Gateway Protocol - UPDATE Message

- **Juniper JunOS**
  - Frame 27: 177 bytes on wire (1416 bits), 177 bytes captured (1416 bits)
  - Ethernet II, Src: Juniper Junos:03:32:17:00:00:00:00, Dst: JovNetIP_16187:4d (1c:98:ec:16:78:4d)
  - BGP Monitoring Protocol, Type Route Monitoring
    - Version: 3
    - Length: 123
      - Type: Route Monitoring (0)
      - Per Peer Header
        - Type: RD Instance Peer (0)
        - 0000 0000 = Flags: 0000
        - Peer Distinguisher: 0:00000000000000000000000000000000
        - Unused: 00000000000000000000000000000000
        - Address: 169.254.0.1
        - ASN: 65536
        - DGP ID: 169.254.0.0
        - Timestamp (sec): 1613215686
        - Timestamp (usec): 957699
  - Border Gateway Protocol - UPDATE Message

- **Cisco IOS XE**
  - Frame: (msec in 17.6)
# Device Measurement

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Huawei</th>
<th>IOS XR</th>
<th>IOS XE</th>
<th>JunOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGP process CPU</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
</tr>
<tr>
<td>BGP process memory</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
</tr>
<tr>
<td>RSP CPU</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
</tr>
<tr>
<td>RSP memory</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
<td>every 30 seconds</td>
</tr>
</tbody>
</table>

With `huawei-debug.yang`, "display cpu-usage slot 3 | i BGP" and "display memory-usage slot 3 | i BGP"

With `Cisco-IOS-XR-procmem-oper.yang`, `Cisco-IOS-XR-wdysmon-fd-oper.yang`, "show processes cpu thread pid","show processes memory detail pid"

With `Cisco-IOS-XE-process-cpu-oper.yang` and `Cisco-IOS-XE-process-memory-oper.yang`

With "show system processes extensive | match rpd"
Huawei VPNv4 route-reflector
Impact of BMP on BGP Propagation Delay

1'000'000 BGP VPNv4 unicast paths advertised as fast as possible to 10 peers.
BMP session on/off - Stable vs. Flapped BGP.
Huawei VPNv4 route-reflectors

Impact of BMP on BGP Propagation Delay

1'000'000 BGP VPNv4 unicast paths advertised as fast as possible to 10 peers. Delay comparison between BMP enabled, disabled and BMP session flapping.
1'000'000 BGP VPNv4 unicast paths advertised as fast as possible to 10 peers.
Memory and CPU comparison between BMP enabled and disabled
1,000,000 BGP VPNv4 unicast paths advertised as fast as possible to 10 peers.
Memory and CPU comparison between BMP enabled and disabled on Huawei RR.
1'000'000 BGP VPNv4 unicast paths advertised as fast as possible to 10 peers.
Memory and CPU comparison between BMP enabled and disabled on Huawei RR
What we learned (again)

• Good
  • With the 6th hackathon, we know the drill. Consistency more and more pays off.
  • Good preparation, planning with test automation was gold.

• Bad
  • Testbed getting instable with 4'000'000 routes. Need to increase performance and stability.
  • Yet again, missing beers and cocktails after 😊
Thanks to...

- Alex Huang Feng – INSA
- Pierre Francois – INSA
- Paolo Lucente – NTT
- Marco Tollini - Swisscom
- Matthias Arnold - Swisscom
- Thomas Graf - Swisscom

...Imply for providing us the big data,
Huawei for the network environment and support,
and Cisco for Software and the test cases.