

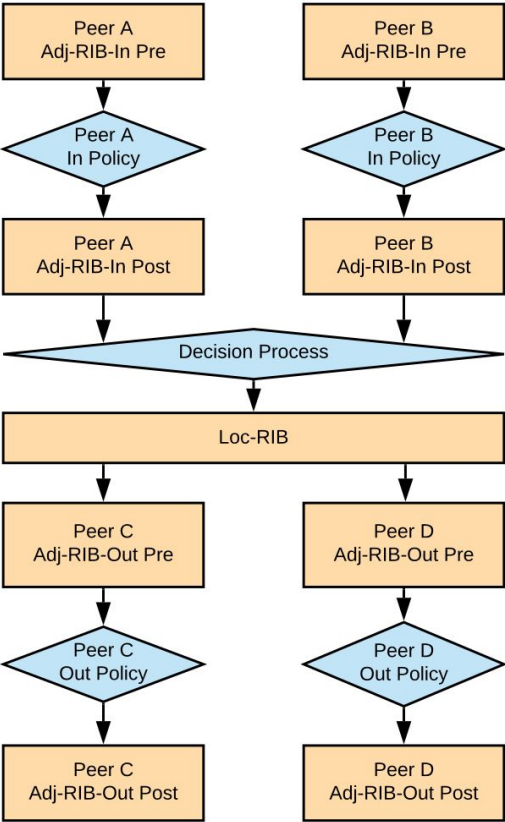
End-to-end Pipeline for BMP Visualization

IETF 109, Livio Sgier

System Goals

- Investigate BMP capabilities in the context of a MPLS VPN L3 lab network
- Build **end-to-end** pipeline
- Correlation on **VPN level** and in **time** between **control** (BMP) and **forwarding** plane (IPFIX)
 - Enable root cause analysis, (real time) performance monitoring

Border Gateway Protocol (BGP)

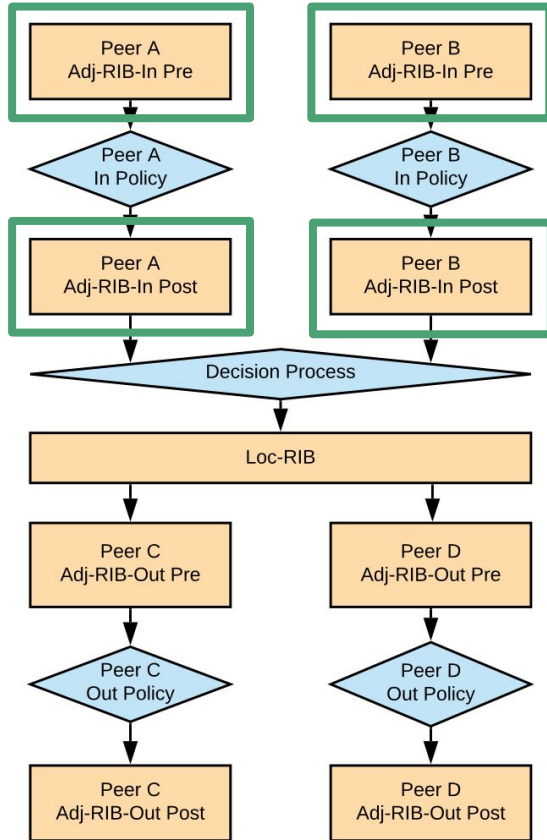


```

Border Gateway Protocol - UPDATE Message
Marker: ffffffffffffffffffffffffffffffffff
Length: 79
Type: UPDATE Message (2)
Withdrawn Routes Length: 0
Total Path Attribute Length: 51
- Path attributes
  > Path Attribute - ORIGIN: IGP
  > Path Attribute - AS_PATH: 65539 65536 65537
  > Path Attribute - NEXT_HOP: 192.0.2.171
  > Path Attribute - COMMUNITIES: 64496:299 64496:1001
- Network Layer Reachability Information (NLRI)
  > 203.0.113.252/31
  
```

RIB Entry: Prefix with attached attributes

BGP Monitoring Protocol (BMP)

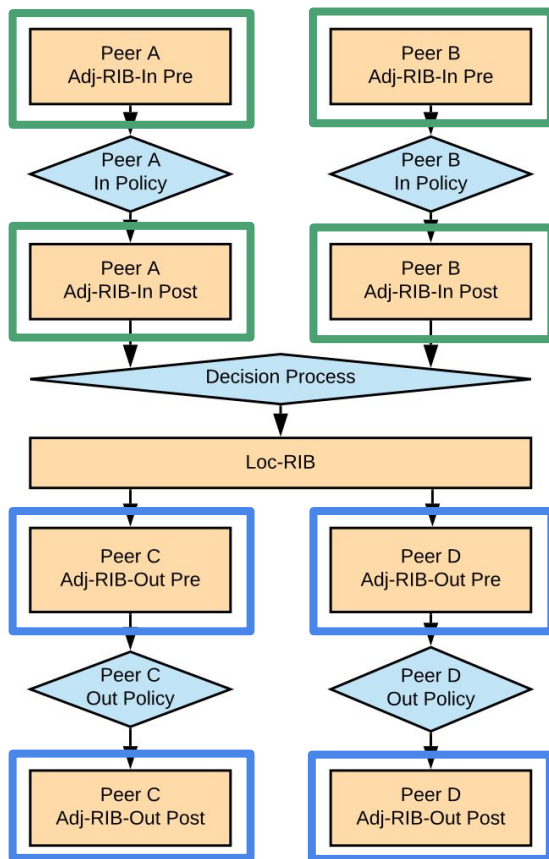


- Access to Adj-RIB-In [RFC 7854]

Enabled use cases:

→ Access to **incoming** BGP updates

BGP Monitoring Protocol (BMP)

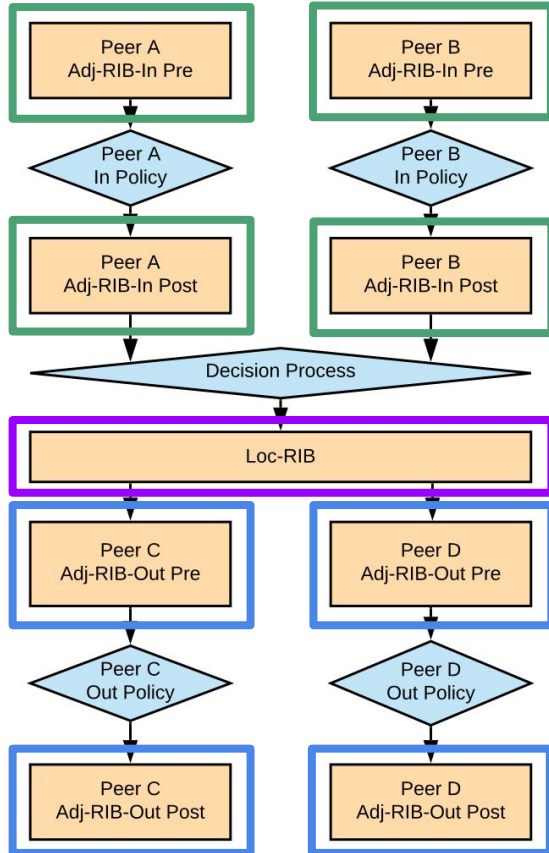


- Access to Adj-RIB-In [RFC 7854]
- Access to Adj-RIB-Out [RFC 8671]

Enabled use cases:

→ Access to **outgoing** BGP updates

BGP Monitoring Protocol (BMP)

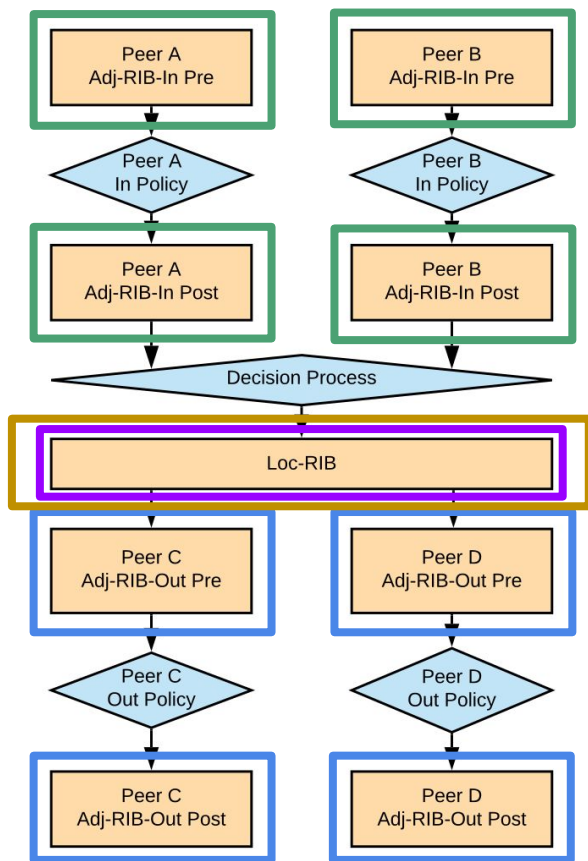


- Access to Adj-RIB-In [RFC 7854]
- Access to Adj-RIB-Out [RFC 8671]
- Access to Loc-RIB [draft]

Enabled use cases:

- Access to BGP updates **installed** in local RIB

BGP Monitoring Protocol (BMP)

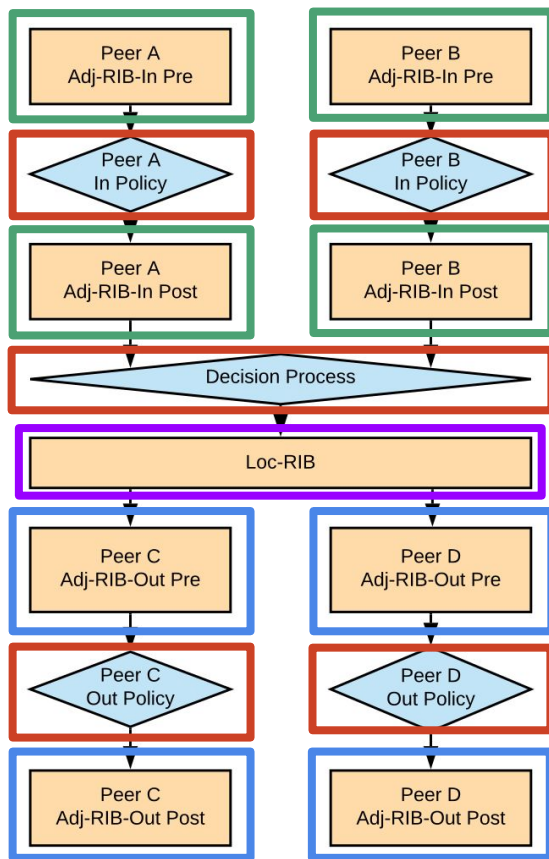


- Access to Adj-RIB-In [RFC 7854]
- Access to Adj-RIB-Out [RFC 8671]
- Access to Loc-RIB [draft]
- Route Monitoring Path Marking [draft]

Enabled use cases:

- Access to **how** BGP updates are installed in the local RIB

BGP Monitoring Protocol (BMP)



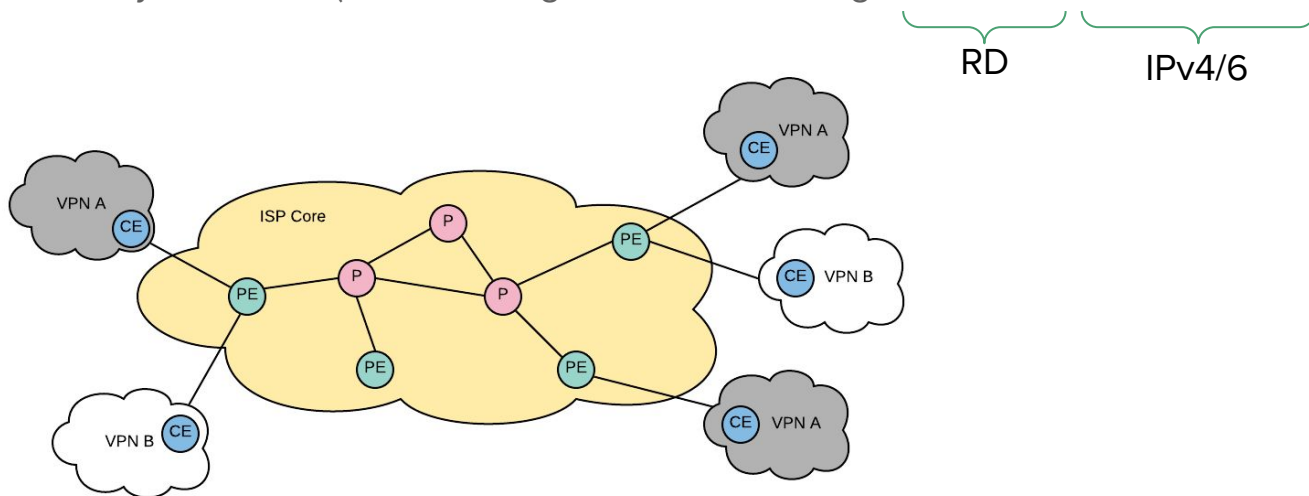
- Access to Adj-RIB-In [RFC 7854]
- Access to Adj-RIB-Out [RFC 8671]
- Access to Loc-RIB [draft]
- Route Monitoring Path Marking [draft]
- Route Policy and Attr. Tracing [draft]

Enabled use cases:

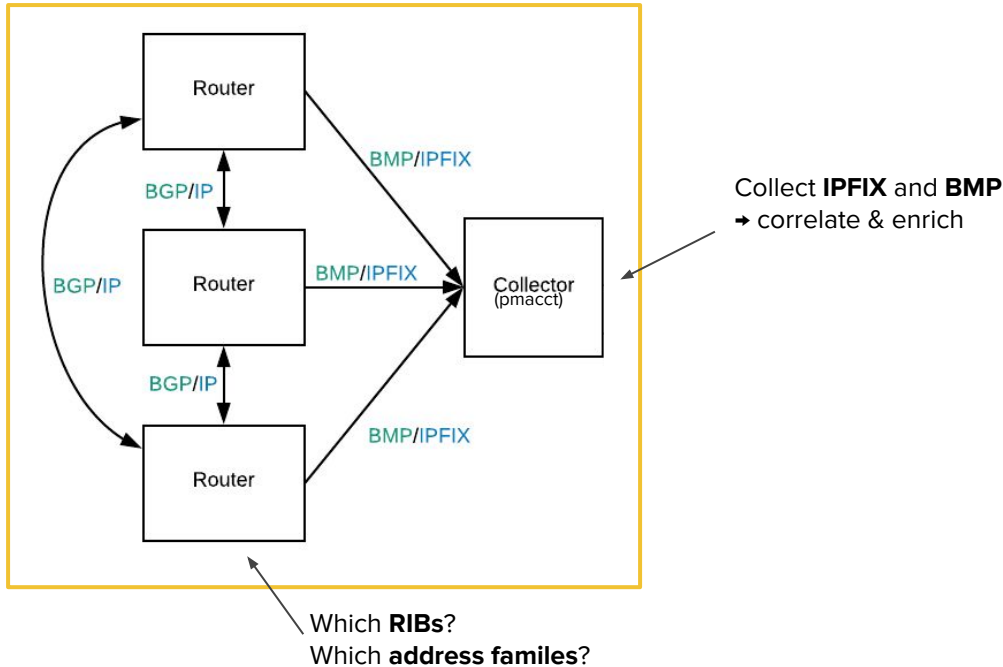
- Information about triggered route policies

Lab Network Type

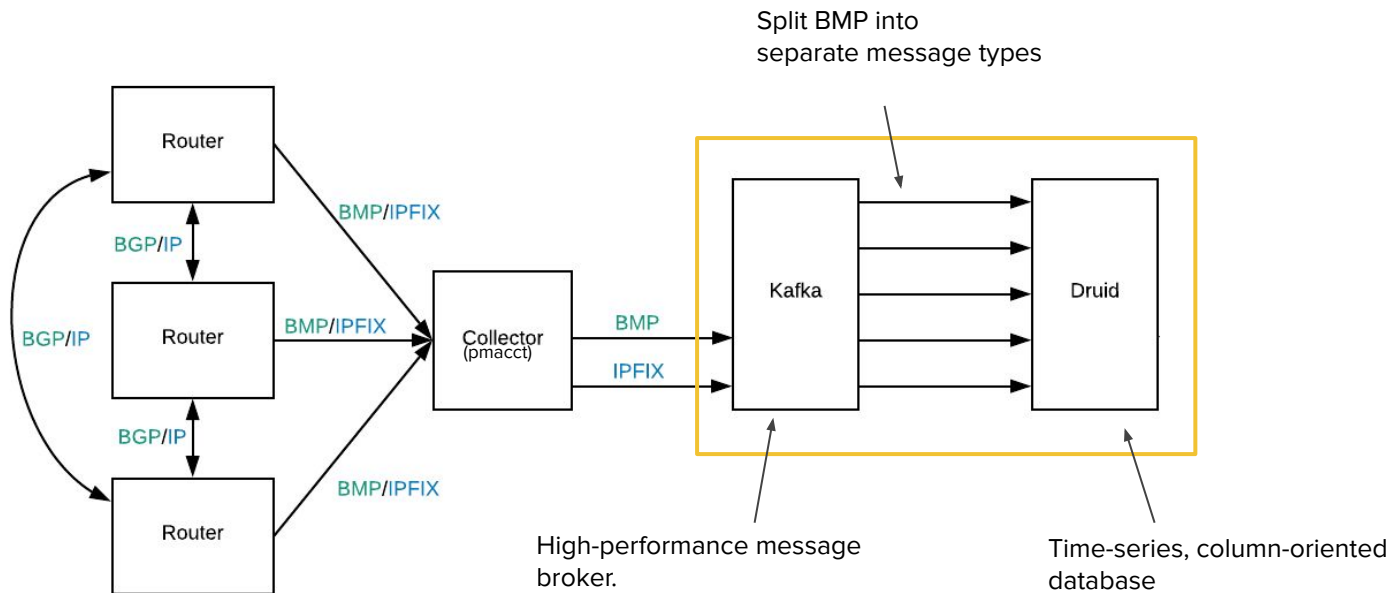
- MPLS/BGP IP Virtual Private Networks [RFC 4364]
- Common architecture for ISPs: Enabling **multiple VPNs** over same physical infrastructure
- Entities: Customer Edge (**CE**), Provider Edge (**PE**), Provider Core (**P**)
- Virtual routing and forwarding (**VRF**) instances per VPN to isolate routing tables
- New address family: **VPNv4/6** (Route Distinguisher + IPv4/6, e.g., 0:64499:6:203.0.113.10/32)



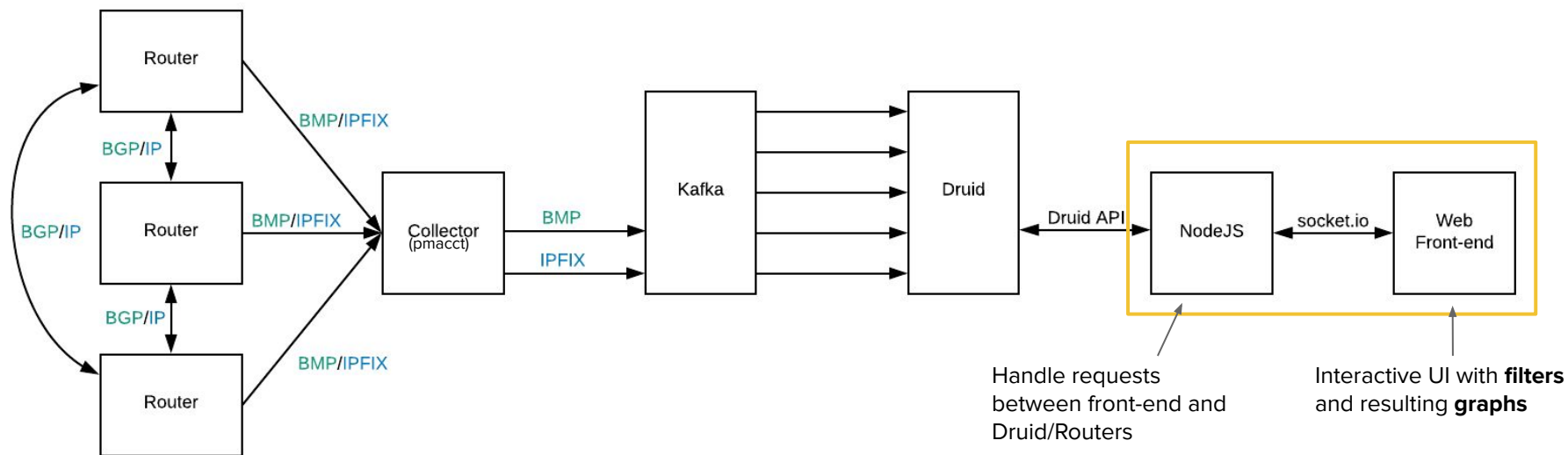
End-to-end Pipeline Design: Export & Collection



End-to-end Pipeline Design: Processing & Storage



End-to-end Pipeline Design: Visualization



Visualization/Web Front End

- Goals

- Support **exploratory** and **real time** queries for **Route Monitoring, Peering, Route Policy**
- **Correlation** on **VPN level** and in **time** between control- and forwarding-plane
 - Make cause and effect visible across planes



Control Plane

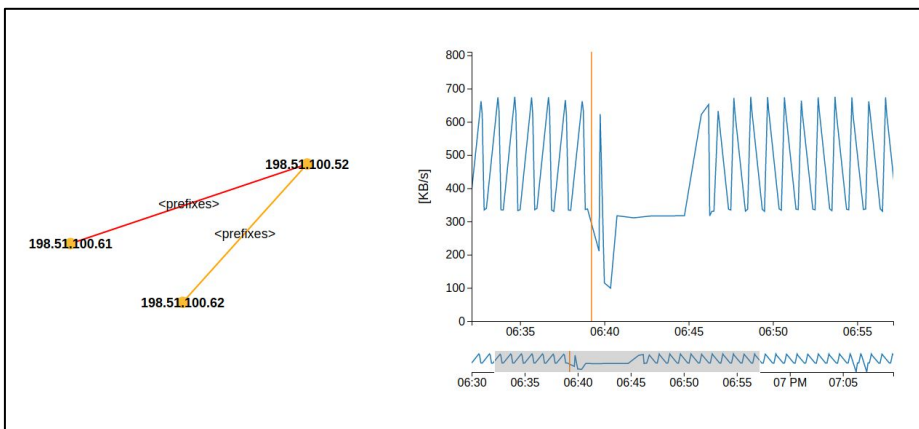
Std. Community: 64497:1 ▾
RIB Selection: Pre-policy Adj-RIB-In ▾
Initialize: 2020-10-25T10:00:00.000Z
Start: 2020-10-25T10:00:00.000Z
End: 2020-10-25T11:00:00.000Z
Confirm > >>

Data Plane

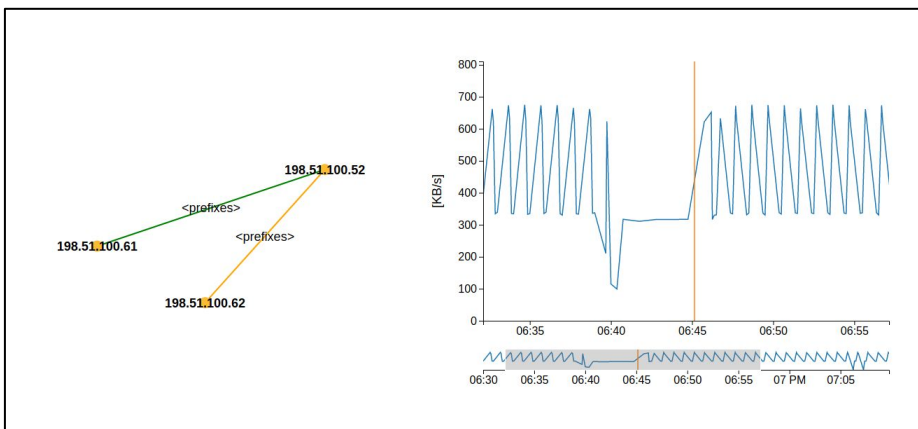
Std. Community: 64497:1 ▾
Peer Src IP: 192.0.2.53 ▾
Start: 2020-10-25T10:00:00.000Z
End: 2020-10-25T11:00:00.000Z
Confirm

Visualization: Example Query (1)

“For **VPN A**, show me the **Adj-RIB-In Pre-Policy** and its **correlation** to the **forwarding plane** before and after enabling an interface on a **VPN level**.”



Removing Interface



Re-enabling Interface

Visualization: Example Query (2)

“For re-enabled **prefix X** on **VPN A**, show a **live view** of **Adj-RIB-Out** and all triggered **route policies**”

