Dynamic Network Probe of Interactive Queries

draft-song-opsawg-dnp4iq-01

Haoyu Song, Jun Gong

Background

- Network visibility is the hot topic and pain point of network and cloud operators
- New trends in network visibility
  - Streaming telemetry
  - Model driven
  - Custom data
  - Machine learning and artificial intelligence for data analytics
- Autonomous Network/self-driving network relies on network visibility

Motivation & Viewpoints

- Due to resource limitation, all-time omni visibility is impossible
  - Alternative: On-demand, real-time, dynamic query and subscription
- Standardized data collection and analytics platform is necessary to realize the vision of fully automated network OAM
- For cost and efficiency reasons, network devices should and be able to actively participate in custom data processing and collection
  - Data plane should be an integral part of the data analytics solution
- Dynamic network probes (DNP) can support dynamic data customization with the direct help from data plane
  - DNP can be realized through runtime programming or configuration
  - Implementation can be jointly done by data plane fast path and slow path
  - Implementation detail is invisible to applications

DNP Concept

- Custom data processing and event monitoring on programmable forwarding chips and device control processor
- Deploy approaches
  - Programming – runtime loadable function module
  - Configuration – existing probe model

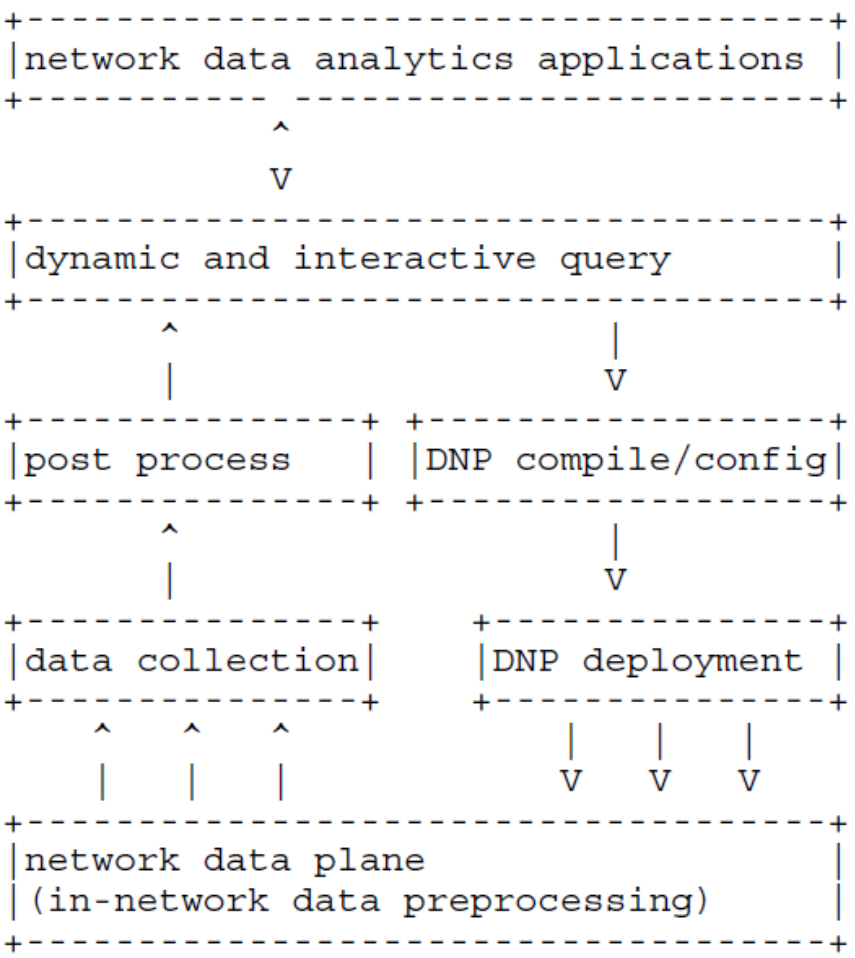
DNP Use Cases

- INT/iOAM
  - Define custom data generating functions
  - Dynamic configure INT/iOAM parameters
- Network congestion monitoring
- Elephant flow identification
- DDoS detection

DNP Types

- Node class
  - Concern the state and status of an individual node in a network
- Path class
  - Concern the state and status of a designate path in a network
- Flow class
  - Concern the state and status of a specific flow in a network

Architecture of Interactive Query



Requirements to Support DNP for Interactive Query

- Programming language and application interface (API)
- Standard south-bound DNP deployment and data collection interface (e.g., gPRC, NETCONF)
- DNP shouldn’t modify the forwarding behavior and lower the forwarding performance
- DNP should support multiple parallel applications and the system can grant, deny, preempt, and revoke DNPs
- Multiple DNP in multiple devices need to cooperate to support network-wide application

Technical Challenges

- Security and safety
- Network wide deployment
- Performance impact
- Device and chip architecture impact

Standard Consideration

- NB API (SQL-like, function call) ;
- SBI (gPRC, NETCONF) ;
- Standard Data Model (YANG)

Thank you!