Dynamic Network Probe of Interactive Queries

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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

- network data analytics applications
  - dynamic and interactive query
    - post process
    - data collection
      - network data plane
        - (in-network data preprocessing)
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!