An Architecture of Central Controlled Border Gateway Protocol (BGP)

draft-li-idr-cc-bgp-arch-00

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Introduction

• As the Software Defined Networks (SDN) solution develops, BGP is extended to support central control.
• This document introduces an architecture of using BGP for central control.
• Some use cases under this new framework are also discussed. For specific use cases, making necessary extensions in BGP are required.
Architecture -- Reference Model

- BGP Controller controls all the BGP Clients within its administrative domain by communicating with them.
- BGP sessions are also set up between multiple BGP controllers.

Figure 1: An Architecture of Central Controlled BGP
Architecture -- Deployment Mode

- BGP Controller and BGP Client can run on a general-purpose server or a network device.
- It is more meaningful to decouple control plane and forwarding functionality on BGP Client because this manner enables network devices focusing on forwarding functionality.
Architecture -- Protocol Extensions

• **Building Connectivity:**
  – Connectivity between BGP Controller and BGP Clients in an AS can be built by extending IGP protocol.
  – In order to simplify network operations, such connectivity SHOULD be automatically established.

• **Roles Auto-Discovery:**
  – BGP Controller and BGP Client roles can be auto-discovered by extending IGP protocol to flooding the role information within an AS.
  – When IGP has finished the flooding process of role information, BGP Controller and BGP Client can establish a BGP session on demand.

• **Capability Negotiation:**
  – In order for BGP Controller and BGP Client to support BGP-based Central Controlled framework in a friendly way, this document suggests to defines a new BGP Central Control Capability.

• **High Availability:**
  – To void one-point-failure of BGP Controller, it is possible to run redundant BGP Controllers for high availability.

• **Security**
Use Cases

In BGP-based Central Controlled framework, new use cases are emerging:

• Network Topology Acquisition
  – BGP has been extended to distribute link-state and traffic engineering information.

• Simplifying Network Operation and Maintenance
  – By using I2RS APIs, it would allow network operator to setup BGP policy configuration and apply route policy easily from an central point.
  – In the new Central Controlled framework, VPN Service can be deployed rapidly according to business requirements. More detailed description could be found in [draft-li-l3vpn-instant-vpn-arch-00].
Use Cases (Cont.)

• **MPLS Global Label Allocation**
  – MPLS Global Label should be allocated in a central point to guarantee all distributed network nodes can understand meaning of a specific global label in same.
  – The new BGP-based Central Controlled framework is particularly suitable to allocate MPLS Global Label for services deployed on the network edge nodes.
  – [draft-li-mpls-global-label-usecases-00] proposes the use cases:
    1) Identification of MVPN/VPLS,
    2) Local Protection of PE Node,
    3) Segment-Based EVPN, etc.

• **RR-Based Traffic Steering**
  – RR-based Traffic Steering (RRTS) defined in [draft-chen-idr-rr-based-traffic-steering-usecase-00], is an idea that leverages the BGP route reflection mechanism to realize traffic steering in the network.
  – Therefore the operators can conduct specific traffic to traverse specific path, domains and/or planes as demand.
Use Cases (Cont.)

- **Inter-Controller Applications**
  - The service set up between the nodes is proxied by the BGP Controllers.
  - More detailed description could be found in [draft-li-l2vpn-ccvpn-arch-00].

![Diagram](image-url)  
*Figure 3: Removing BGP Session between Controller and NODE*
Next Steps

• Solicit more comments & feedbacks
• Revise the draft