draft-xu-idr-neighbour-autodiscovery-09

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Problem Statement

• BGP is used as the only routing protocol in DCs using RFC7938 design

• Operational complexity involved in provisioning of hop-by-hop per link eBGP peering between BGP nodes

• When doing peering using loopbacks (e.g. due to ECMP links or when using IPv6 link-local addresses or unnumbered links) need to also provision static route for reachability
Requirements

• Need a neighbour discovery mechanism that runs on top of IPv4/IPv6
  • Is media independent; works on IPv4, IPv6 and dual stack
  • Needs to support authentication mechanism for security purposes
• Keep it simple and focus on current BGP requirements
  • We have LLDP and BFD widely deployed; leverage them
  • Make mechanism extensible for signalling of information for BGP
• Auto-discovery and bootstrap for BGP TCP Sessions between directly connected nodes
• Separate discovery and liveness for BGP neighbours
  • Discovery and maintenance of adjacency is the core part
  • Use of liveness mechanism is optional; continue to leverage BGP KA, BFD and Fast External Failover features
• Minimal changes for integration with BGP Peer FSM and no changes in BGP protocol operations
What does this draft propose?

• Automated neighbour discovery using UDP Hello Messages on a per link basis for directly connected neighbours only
• Signalling of peering address and ASN so that BGP Peering session can be automatically initiated with discovered neighbour
• BGP session can be setup using loopbacks and reachability established via peering route setup that points over the links over which neighbour is discovered
• Minimal changes to the BGP Peer FSM and no change to BGP route processing
Hello Message Format

- Uses UDP port 179 and sent to link-local multicast address
- Can be used over either IPv4 or IPv6 addresses

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
| Version | Type | Message Length |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
| AS number |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
| BGP Identifier |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
| Adjacency Hold Time | Reserved |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
| TLVs |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
```
Important TLVs

• Peering Address TLV
  • Indicates one or more IPv4 and/or IPv6 peering address(es) to be used
  • Optionally can indicate which AFI/SAFI to be used for which Peering

• Link Attributes TLV
  • Indicates link addresses and link identifiers for describing the link endpoint (so information is learnt for exporting via BGP-LS)
  • Can perform subnet and other policy checking before session setup

• Neighbour TLV
  • Signals discovered neighbours and their adjacency status (1-way, 2-way, reject and established)
  • Used to indicate to neighbour whether the BGP TCP session can be initiated (i.e. when both sides have accepted each other)
Optional TLVs

• Local Prefix TLV
  • Indicates the prefix route to be programmed after neighbour discovery goes to 2-way state to ensure reachability for the neighbour’s peering address
  • Required when peering is to be done using loopback interface; not required when doing peering with interface addresses

• Accepted ASN TLV
  • Indicates the list of ASNs to which peering session would be established – local policy

• Cryptographic Authentication TLV
  • Carries the SA ID and authentication information
Adjacency State Machine

• Initial State
  • Initial state when a neighbour is detected

• 1-way State
  • When router accepts the peer and includes it in its own hello message

• Reject State
  • When router rejects the peer due to detection of some config mismatch or violation of local policy

• 2-way State
  • When router detects itself in the neighbour’s hello; now ready for TCP session establishment step
  • Adds peering route for the neighbour over the link (i.e. when using loopbacks for peering)
  • Creates the BGP Peer State context for discovered peer and triggers the BGP Peer FSM

• Established
  • When the BGP TCP session is established
Session Management

• Once established, session management is performed as per BGP FSM
• Liveness detection via Keepalives & Hold timer
  • BFD and Fast External Failover also works when enabled
• Established BGP session is NOT brought down due to adjacency hold timer expiry by default
  • This may be optionally enabled in cases where required
• Adjacency hold timer expiry used to clean-up BGP Peer state after the session goes down for auto-discovered peer
Peering Route

• Required only when peering is done using loopback interfaces
• Route programmed with higher Admin Distance than normal BGP routes to prevent oscillation (in case the peering route is also learnt via BGP itself)
• When there are multiple links between neighbours then peering route will have ECMP paths over each of them
• BGP NH for the neighbour resolved over this peering route for reachability
• No need for programming static route or running another protocol when doing Peering over loopback addresses
Next Steps …

• WG adoption call ongoing in IDR
• Solicit WG review and comments/inputs/feedback