North-Bound Distribution of Link-State and TE Information using BGP

draft-gredler-idr-ls-distribution-00
(was draft-gredler-bgp-te-01)
Motivation

• Look across the “fence”
  – “Fence” being IGP area/level or AS boundary

• Gain visibility for application(s) which need complete topology data
Use case - Alto Servers: multi-area IGP topology

- ALTO server needs to know all areas topology
- Manually crafting of “IGP peering” topology is tedious and error prone
Use case: Path Computation Element

Note: *No clash* with PCE-WG as no TED sync protocol has been ever been specified, although the PCE architecture permits this.
Major Changes since IETF81

- Support for Node attributes (Overload Bits, Capabilities)
- Support for Multiple protocols sharing a link
  - OSPF/ISIS Migration
  - Level 1,2 intra POP links
- Support for Multi- {Topology, Instance} extensions
- Added support for OSPF/IS-IS Area ID
Transcoding TE Link Info into BGP NLRI

• Carried in
  – MP_REACH_NLRI
  – MP_UNREACH_NLRI

• Two NLRI types
  – Node
  – Link
    • Each NLRI describes a single link anchored by at least a pair of router-IDs
    • Link may be anchored by more than one pair of Router-IDs

• Negotiated between BGP speakers using BGP-MP Capability
Transcoding TE Link Info into BGP NLRI TED (SAFI 1)

Node Anchor TLVs: describes which Protocols Router-IDs will "anchor" the link
Link Descriptor TLVs: uniquely identify a link between a pair of anchor Routers.
Link Attribute TLVs: describe the link properties
TED NLRI TLV Types

“Node Anchor” TLVs
- Local IPv4 Router-ID (4)
- Local IPv6 Router-ID (16)
- Local ISO Node-ID (7)
- Remote IPv4 Router-ID (4)
- Remote IPv6 Router-ID (16)
- Remote ISO Node-ID (7)

NLRI describes “unidirectional link”

“Link Descriptor” TLVs
- IPv4 interface address (4)
- IPv6 interface address (16)
- Local link identifier (4)
- IPv4 neighbor address (4)
- IPv6 neighbor address (16)
- Remote link identifier (4)

“Link Attribute” TLVs
- Admin-group
- Max-link BW
- IGP Metric
- TE-Metric
- SRLG
Transcoding TE Link Info into BGP NLRI TED (SAFI 128)

Route Distinguisher:
Node Anchor TLVs: describes which Protocols Router-IDs will "anchor" the link
Link Descriptor TLVs: uniquely identify a link between a pair of anchor Routers.
Link Attribute TLVs: describe the link properties
Node Anchors

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local Autonomous System</td>
<td>4</td>
</tr>
<tr>
<td>256</td>
<td>Local IPv4 Router-ID</td>
<td>4</td>
</tr>
<tr>
<td>257</td>
<td>Local IPv6 Router-ID</td>
<td>16</td>
</tr>
<tr>
<td>258</td>
<td>Local ISO Node-ID</td>
<td>7</td>
</tr>
<tr>
<td>259</td>
<td>Remote Autonomous System</td>
<td>4</td>
</tr>
<tr>
<td>260</td>
<td>Remote IPv4 Router-ID</td>
<td>4</td>
</tr>
<tr>
<td>261</td>
<td>Remote IPv6 Router-ID</td>
<td>16</td>
</tr>
<tr>
<td>262</td>
<td>Remote ISO Node-ID</td>
<td>7</td>
</tr>
</tbody>
</table>

- **Local IPv4 Router ID**: opaque value (can be an IPv4 address or a 32 Bit router ID)
- **Remote IPv4 Router ID**: opaque value (can be an IPv4 address or 32 Bit router ID)
- **Local IPv6 Router ID**: opaque value (can be an IPv6 address or 128 Bit router ID)
- **Remote IPv6 Router ID**: opaque value (can be an IPv6 address or 128 Bit router ID)
- **Local ISO Node ID**: ISO node-ID (6 octets ISO system-ID plus PSN octet)
- **Remote ISO Node ID**: ISO node-ID (6 octets ISO system-ID plus PSN octet)
- **Local/Remote AS**: used to **disambiguate** Router-IDs allocated from private IP address spaces
## Link Descriptors

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Defined in:</th>
</tr>
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<tbody>
<tr>
<td>4</td>
<td>Link Local/Remote Identifiers</td>
<td>[RFC5307], Section 1.1</td>
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<tr>
<td>6</td>
<td>IPv4 interface address</td>
<td>[RFC5305], Section 3.2</td>
</tr>
<tr>
<td>8</td>
<td>IPv4 neighbor address</td>
<td>[RFC5305], Section 3.3</td>
</tr>
<tr>
<td>12</td>
<td>IPv6 interface address</td>
<td>[RFC6119], Section 4.2</td>
</tr>
<tr>
<td>13</td>
<td>IPv6 neighbor address</td>
<td>[RFC6119], Section 4.3</td>
</tr>
</tbody>
</table>

- Encoding of 'Link Descriptor' TLVs (Type Codepoints, Lengths, Values) same as Extended IS reachability TLV sub-TLVs (defined in RFC5305, RFC5307 & RFC6119)
- Link Descriptor TLVs can carry data sourced either by IS-IS or OSPF.

Node Anchor + Link descriptor form the key in the DB/RIB
Node Attributes

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Length</th>
</tr>
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<tbody>
<tr>
<td>229</td>
<td>Multi Topology</td>
<td>2</td>
</tr>
<tr>
<td>65515</td>
<td>Node Flag Bits</td>
<td>1</td>
</tr>
<tr>
<td>65516</td>
<td>OSPF Specific Node Properties</td>
<td>variable</td>
</tr>
<tr>
<td>65517</td>
<td>IS-IS Specific Node Properties</td>
<td>variable</td>
</tr>
<tr>
<td>65518</td>
<td>Node Area ID</td>
<td>variable</td>
</tr>
</tbody>
</table>

Most important is Node Flags Bits TLV (Overload etc.)
Next steps

• Feedback ?
• Accept as a WG item ?
Router-ID Anchoring Example
ISO Pseudonode

- Broadcast LAN between a pair of routers:
  - “Real” (=non pseudonode) routers have both an IPv4 Router-ID and IS-IS Node-IDs
  - The pseudonode does not have an IPv4 Router-ID.
- Two unidirectional links being generated:
- NRLI #1 for (R1, Pseudonode) encodes:
  - local IPv4 router-ID, local ISO node-ID and remote ISO node-id
- NLRI #2 for (Pseudonode, R2) encodes:
  - local ISO node-ID, remote IPv4 router-ID and remote ISO node-id.