IS-IS Spine-Leaf

IETF 104 Prague
LSR

draft-ietf-isis-spine-leaf-ext-01

March, 2019
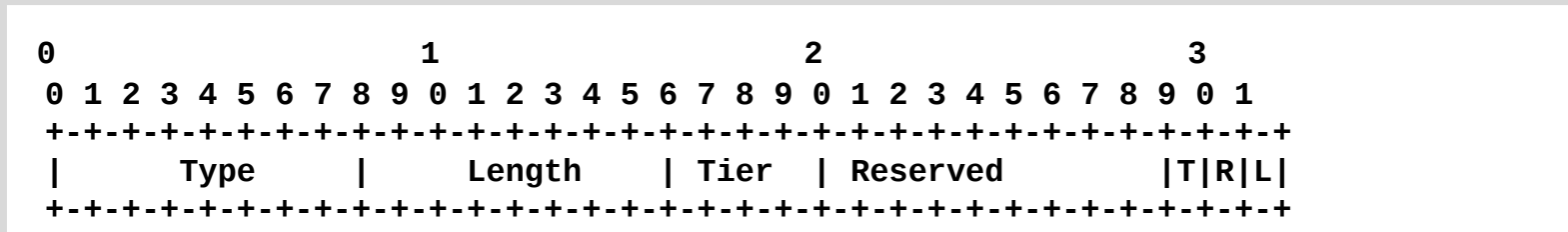
Naiming S., Les G., Sanjay T.

DC IS-IS Spine-Leaf

- Incremental protocol improvement
- Reuses well deployed protocol for DC fabric supporting large number of network routing entries and features
- Supports full routing in small/median DC and serves as a DC fabric for overlay routing
- Supports Auto-tier discovery and protocol configuration for Zero Touch Provisioning
- Minimizes IS-IS LSP flooding to leaf nodes in DC spine-leaf topology
- Handles link/node DOWN events in spine-leaf topology to avoid black holes
- Supports other mechanisms/proposals such as Openfabric and Dynamic Flooding

Changes From draft-shen-isis-spine-leaf-ext-07

- Became WG document
- Spine-Leaf TLV simplified and limited to hellos
- New TLV (Leaf-Set TLV) introduced for Circuit Scope LSPs
- (re)introduced limited support for leaf-leaf connections
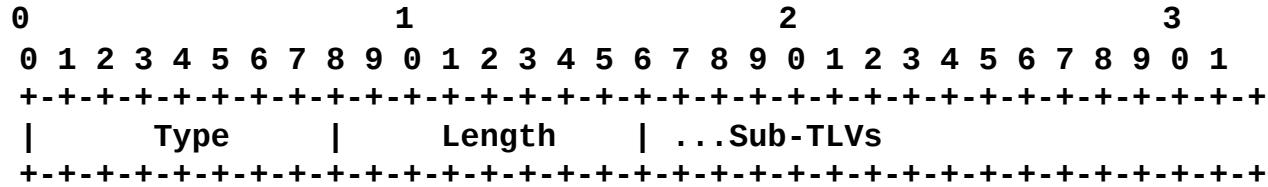
Spine-Leaf TLV in Hello

```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Type     |     Length    | Tier  | Reserved        |T|R|L|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- T bit: Tier field is valid
- L: Leaf mode bit – enables reduced flooding
- R: Default Route Gateway bit

blue: sent by leaf nodes
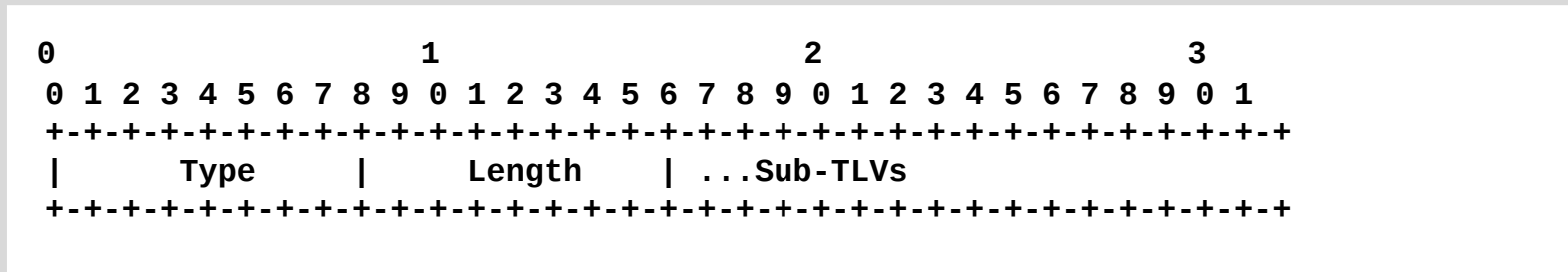*green: sent by spine nodes*

Leaf-Set TLV (CS-LSPs)

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Type      |      Length     | ...Sub-TLVs
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Leaf-Neighbors sub-TLV

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Type      |     Length     | ...System IDs of Leaf Node Neighbors
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
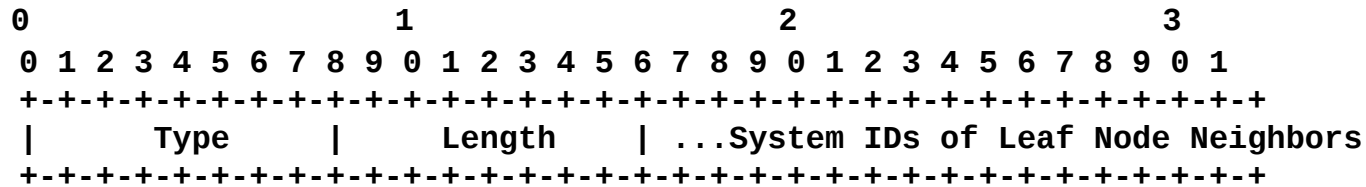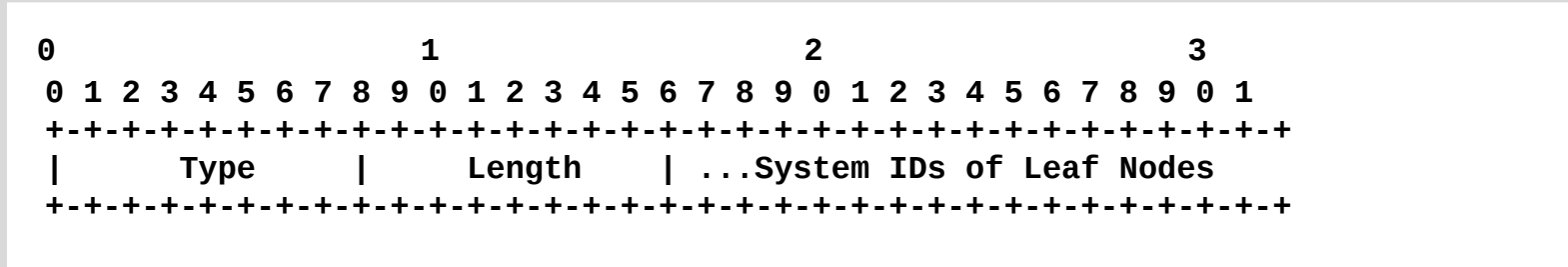
- Sent by Spine Nodes
- Used by Leaf Nodes to detect spine nodes w incomplete reachability to leaf nodes
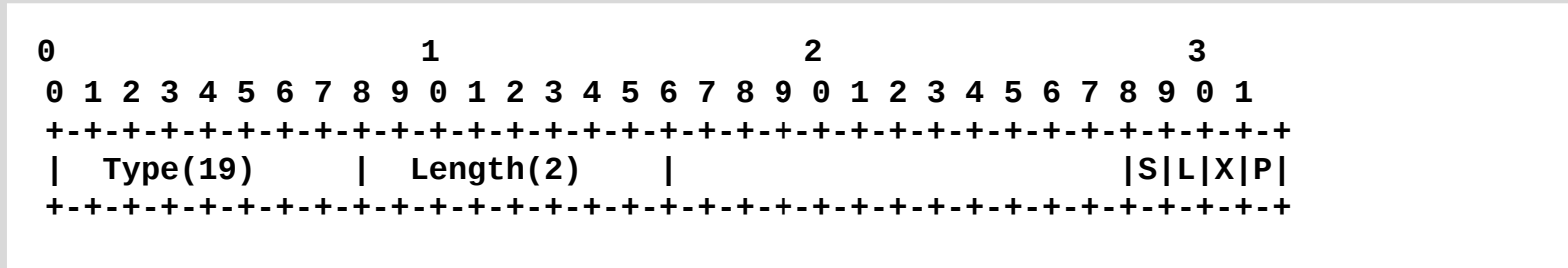
Leaf-Set TLV (CS-LSPs) (s)

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Type       |     Length      | ...Sub-TLVs
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Reachability-Req sub-TLV

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Type       |     Length      | ...System IDs of Leaf Nodes
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- Sent by Leaf Nodes
- Requests Spine Node to send prefix reachability for the specified Leaf Nodes
- Spine Node then sends prefix reachability (TLVs 135/236) in CS-LSPs to the requesting leaf-node

Advertising Connections Between RF Leaf Nodes and Spine Nodes

Link Attribute sub-TLV (RFC 5029)

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Type(19)     |  Length(2)    |                       |S|L|X|P|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- Local Protection Available(P) (RFC 5029)
- Excluded from Local Protection(X) (RFC 5029)
- Connect to RF Leaf Node(L) – sent by Spines
  - Signals leaf node can be excluded from flooding
- Connect to RF Spine(S) – sent by Leaf Nodes
  - Signals Link is to a Spine Node – possible alternate default path

Use of Leaf-Leaf Connections
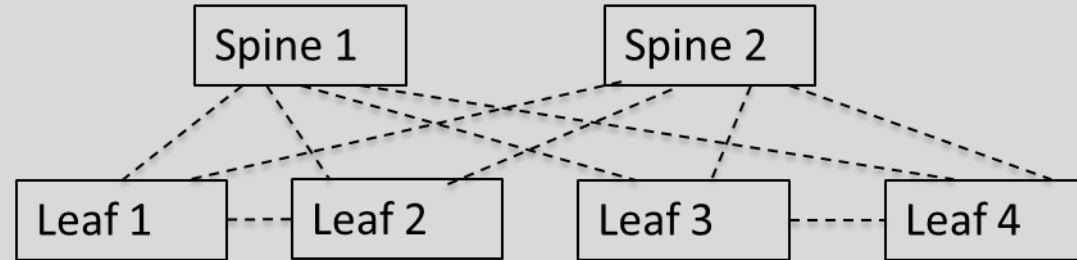
- Limited to one leaf neighbor
- Normal flooding
  - ➢ Leaf Node LSPs are exchanged as normal and flooded to Spine Nodes
  - ➢ Local (to each leaf) Reachability is known
- Local Traffic Only
  - ➢ Leaf Node Sets OL bit so spine nodes cannot use the Link for transit
- Transit Traffic Allowed
  - ➢ OL bit NOT set
  - ➢ High Metric ($2^{24}-2$)
  - ➢ Link of last resort – spine nodes can use the link to reach a leaf node which has been disconnected from all spine nodes

Next Steps

Comments welcomed