SR ISIS Extensions

• Describe new TLVs and SubTLVs advertising Segment Routing capabilities and Segment Routing Identifiers
  – According to Segment Routing architecture described in draft-filsfils-rtgwg-segment-routing-01.txt

• Companion drafts have been submitted in OSPF and PCE working groups
  – draft-psenak-ospf-segment-routing-extensions-03.txt
  – draft-psenak-ospf-segment-routing-ospfv3-extension-00.txt
  – draft-sivabalan-pce-segment-routing-02.txt
**SID/Label SubTLV**

- Contains the Segment Identifier
  - Variable length: 3 or 4 octets
  - 3 octets when SR is used over MPLS dataplane (rightmost 20 bits used as a label)

- The SID/Label SubTLV is present in
  - Prefix-SID SubTLV
  - Adj-SID SubTLV
  - SID/Label Binding TLV

- SID/Label is used as an index when label space is advertised in SR-Capability SubTLV
SID/Index and Label Spaces

- A SID is an index to the label space
- Indexes allow to mix different label spaces in a common SR domain
  - So to cope with MPLS paradigm that specifies the local scope of labels
SID and Label Spaces

- When populating the FIB each node determines the outgoing label value based on advertised label space and SID/indexes.
Prefix-SID SubTLV

• Carries the SID of a prefix
  – Global value

• Optional SubTLV of TLVs: 135, 235, 236, 237

• Flags
  – R-Flag: re-advertisement. Set when prefix comes from either redistribution, propagation or leaking
  – N-Flag: Node-SID Flag. Set when the SID refers to a prefix identifying the node
  – P-Flag: No-PHP flag. If set, the penultimate hop will NOT pop the top label from the stack

• Algorithm
  – Identifies the algorithm associated with this prefix. Only one is defined: SPF (0)

• SID/Index
  – SID/Label SubTLV
Adj-SID SubTLV

- Carries the SID of an adjacency
  - Local value

- Optional SubTLV of TLVs: 22, 222, 23, 141

- Flags
  - F-Flag: Address Family flag. When set it refers to an adjacency with IPv6 encaps. When unset it refers to an adjacency with IPv4 encaps.
  - B-Flag. Backup Flag. When set it refers to an adjacency being protected (FRR or MPLS-FRR)

- Weight: 1 octet for the purpose of lead balancing

- SID/Index
  - SID/Label SubTLV
LAN-Adj-SID SubTLV

- On LAN, each router advertises a single adjacency (to the DIS)
- If SR is used over the LAN each router may need to advertise a SID for each of its neighbors
- If required, the router will use the LAN-Adj-SID Sub TLV in TLV 22/23/222/223
- Each Sub-TLV describes the neighbor System-ID and SID
SID/Label Binding TLV

- **New top level TLV describing a SID/Label binding for different purposes:**
  - non local prefixes: SR Mapping Server functionality
  - TE-LSPs, Forwarding Adjacencies

- **Mapping Server**
  - an SR-ISIS capable node may advertise bindings <prefix, SID/Label> on behalf of non SR-capable nodes
  - encoding of such mappings are optimized through “ranges”

- **TE-LSPs**
  - an SR-ISIS capable node may advertise a TE-LSP associated with a SID/Label and including objects describing the path
    > v4/v6 ERO, backup v4/v6 ERO

```plaintext
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   |     Flags    |   Weight   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Range       | Prefix Length | FEC Prefix   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
// FEC Prefix (continued, variable) //
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| optional subTLVs (variable) |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
SR-Capabilities Sub-TLV

- Part of the Router Capability TLV-242 (RFC4971)
- Multiple occurrences allowed
- Describes SR capabilities
  - Flags
    > I-Flag: IPv4, if set the router is capable of IPv4 on all interfaces
    > V-Flag: IPv6, if set the router is capable of IPv6 on all interfaces
  - Range
    > define label ranges allocated to SR from value defined in SID/Label Sub-TLV
    > When advertised, the SID/Label SubTLV is an index referring to the range
SR-Algorithm Sub-TLV

- Part of the Router Capability TLV-242 (RFC4971)
- Describes SR algorithms supported by the router
  - only one algorithm is specified for now: SPF (value: 0)