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P802.1Qca – D0.0 Editor's Notes and Discussion Items

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D0.0

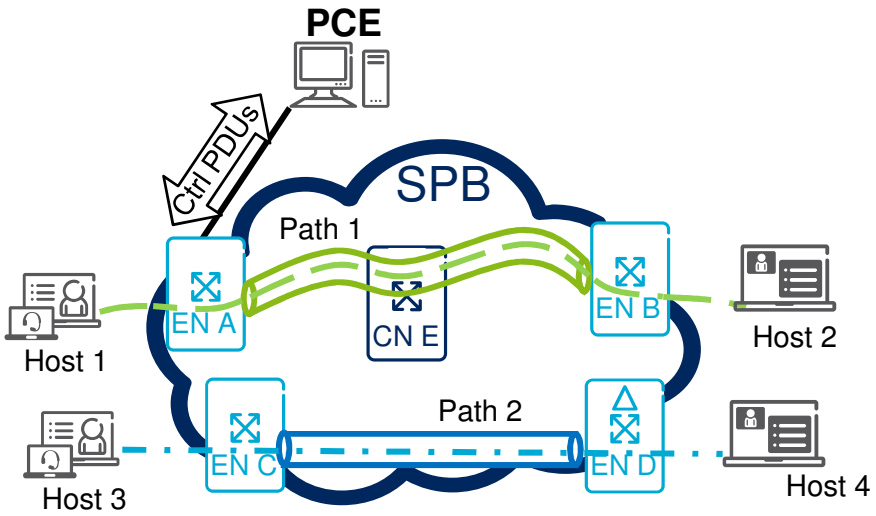
- 45. Path Control and Reservation
  - 45.1 Explicit and constrained paths
    - 45.1.1 Constrained paths
    - 45.1.2 Explicit paths
    - 45.1.3 Point-to-point explicit path
    - 45.1.4 Explicit tree
  - 45.2 Reservation
  - 45.3 Redundant paths
  - 45.4 Distribution of control parameters for time synchronization
  - 45.5 Distribution of control parameters for time scheduling

Model of operation for explicit paths

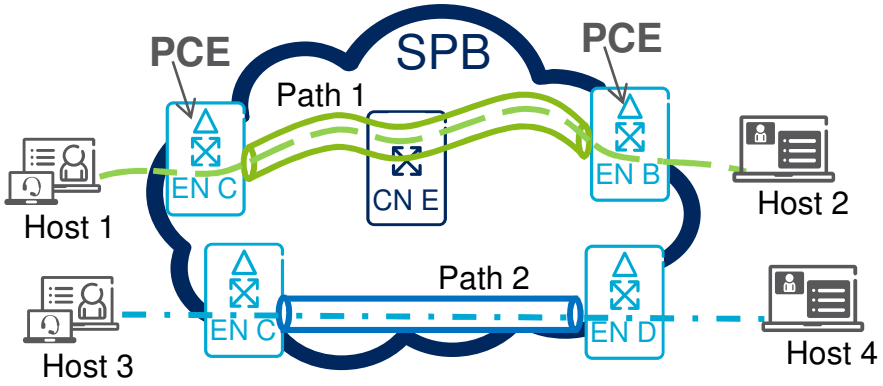
- Explicit path control is selected by assigning a VLAN to the Explicit Path ECT Algorithm (value to be defined)
  - The ECT Algorithm field is the EP ECT Algorithm in the SPB Base VLAN-Identifiers sub-TLV (specified by 802.1aq)
- Explicit Path sub-TLV (Figure 45-3) contains all the VLANs associated with the path
- ISIS-SPB principles are kept
  - The path is available for both V and M mode (V or M mode is selected by Base VID → MSTI allocation)
  - The associations to the Base VID are done by the 802.1aq sub-TLVs, e.g.
    - I-SID → Base VID by the SPBM Service Identifier and Unicast Address sub-TLV
    - SPVID → Base VID by the SPB Instance sub-TLV
      - PCE should not initiate path establishment for SPBV in lack of SPVIDs

Generation and distribution of an explicit path

- Explicit Path (EP) is determined by one or more Path Computation Element(s) (PCE)
  - Constraint Routing (CR) is also performed by PCE(s)
- EP flooded and installed by IS-IS
- Principles described in subclauses:
  - 45.1 Explicit and constrained paths
    - 45.1.1 Constrained paths
    - 45.1.2 Explicit paths



Should we have this type of figures in the spec?



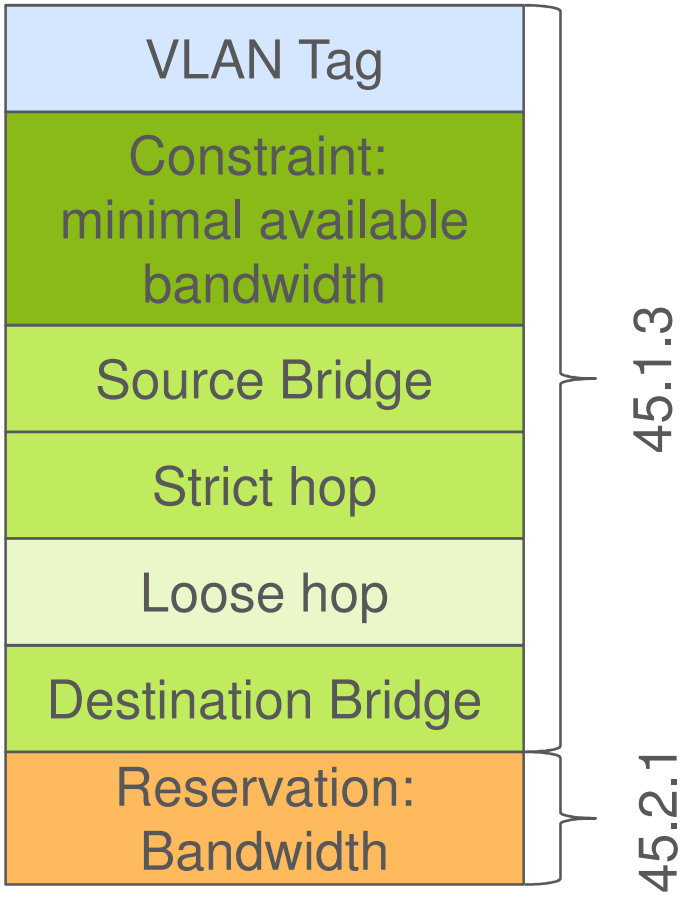
IS-IS sub-TLVs for Constrained Routing

- Described in subclause 45.1.1 Constrained paths
  - These sub-TLVs are distributed by normal IS-IS flooding (without external entity)
- IS-IS TE [RFC 5305] defines
  - a) Administrative group (color, resource class) (sub-TLV type 3)
  - b) Maximum link bandwidth (sub-TLV type 9)
  - c) Maximum reservable link bandwidth (sub-TLV type 10)
  - d) Unreserved bandwidth (sub-TLV type 11)
  - e) Traffic engineering default metric (sub-TLV type 18)
  - **Do time-sensitive networks require further TLVs?**
- Two sub-TLVs copied from draft-previdi-isis-te-metric-extensions-03
  - Link delay
  - Link delay variation
  - **Should we have these sub-TLVs in Qca?**
  - **If yes, then what is the relationship between Qca and the above draft?**
- **Please, provide me input on what sub-TLVs TSN needs exactly**

Point-to-point explicit path

- EP contains VLAN Tag(s)
  - Base VID
  - PCP and DEI
- EP contains the constraint(s) if CR has to be applied for loose hops (instead of shortest path)
- EP may contain strict and loose hops
- EP also contains the reservation parameters if reservation is to be made
  - Can be made for a class based on PCP

- An EP sub-TLV example



HOW MANY EXPLICIT PATHS DO WE EXPECT TO HAVE?

Constraints

- 45.1.3.1 Constraint sub-TLV
- Two types of constraints so far
  - Type 1: Bandwidth (minimum available bandwidth)
  - Type 2: Delay (delay budget for the loose hop)

- **Should we have any other type of constraint?**

Hop

- **Which ID should we use for specifying a hop?**
  - IS-IS System ID? (45.1.3.2 IS-IS System ID hop sub-TLV)
  - Bridge ID? (45.1.3.3 Bridge ID hop sub-TLV)
  - **Anything else?**
  - **Single option or multiple options?**
- Can be strict or loose (L flag)
- Can be constrained or shortest path for loose hops (C flag)
- **Should we support parallel links between adjacent nodes?**
  - P flag
  - Port ID field
- **Should we support Exclude Hop?**

Reservation

- 45.2.1 Reservation sub-TLV
- Bandwidth reservation capability so far
- **Should we provide other type of reservation as well?**

- Conflict resolution planned to be provided similarly to SPVID allocation

- **MSRP Gen2?**
  - **What support/assist MSRP Gen2 expects from Qca?**
  - **Any subTLVs?**

Explicit tree

- Point-to-multipoint and multipoint-to-multipoint is in fact a tree
- **Do we want to go for explicit trees?**

Generic Concerns

- Existing standards, e.g. IETF RFCs, are aimed to be (re-)used as much as possible
  - Hence well established terms are used, e.g. PCE
- Relevant IETF standards are not based on IS-IS
  - IS-IS uses TLVs
  - Relevant IETF standards specify Objects
  - For example
    - IP address vs. IS-IS System ID or Bridge ID
    - Explicit Path sub-TLV vs. Explicit Route Object
- **How much should we follow IETF specifications?**
  - The structure of the sub-TLVs is similar to that of the Objects for now, where possible

TLVs and Objects

Figure 45-3–Explicit Path sub-TLV

		Octet
	Type (???)	1
	Length	2
	Format ID	3
	Number of hops	4
VLAN Tag 1	VLAN Tag	5-6
	...	
VLAN Tag n	VLAN Tag	
sub-TLV 1	sub-TLV	
	...	
sub-TLV n	sub-TLV	

Explicit Route Object [RFC 3209]

```
Class = 20, C_Type = 1

 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
//                        (Subobjects)                         //
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 45-5–IS-IS System ID sub-TLV

	Octet
Type (???)	1
Length (7 or 9)	2
P	3
L	3
C	3
reserved	3
System ID	4-9
Port ID	9-10

IPv4 prefix subobject [RFC 3209]

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|L|    Type     |     Length    | IPv4 address (4 bytes)        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| IPv4 address (continued)      | Prefix Length |      Resvd    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Terminology

- Shortest Path Tree (SPT) Domain / Region / Bridge
- Equal Cost Tree (ECT) Algorithm was introduced for shortest paths