PCEP Extensions for Network Resource Partition (NRP)

draft-dong-pce-pcep-nrp-00

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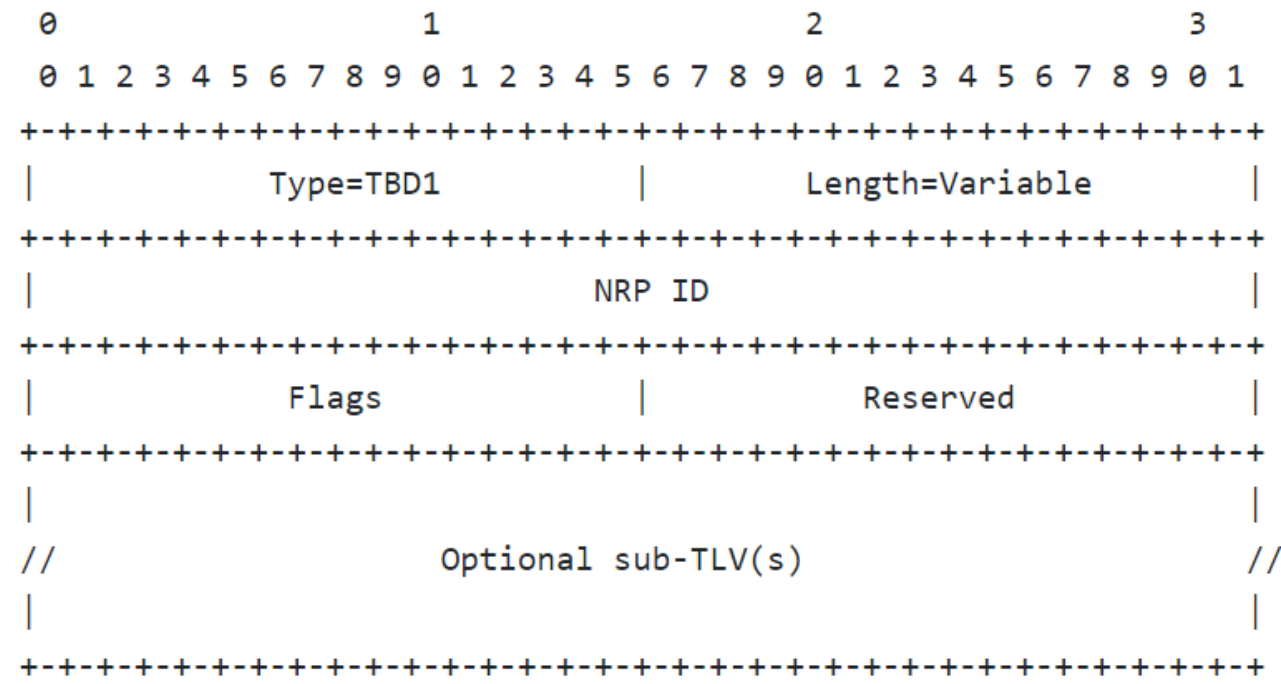PCE WG   IETF 116 Meeting   Mar. 2023

Background

- A Network Resource Partition (NRP) is a subset of the network resources (e.g. buffer/queuing/ scheduling resources) in the underlay network

  - Concept introduced in draft-ietf-teas-ietf-network-slices

  - Can be used as the underlay network construct to support network slice services

- PCE may be requested to compute a TE path within an NRP, and may provide a TE path with NRP-specific information

- This documents describes the PCEP extensions to carry NRP information in PCEP messages

  - To indicate the NRP-specific constraints and information needed in path computation, path update, path status report and path initialization.

History

- There were two similar documents on the this topic:

  - draft-dong-pce-pcep-vtn

  - draft-xiong-pce-nrp-id

- As suggested by the WG chairs, the authors of both documents had some discussion, and agreed to produce a merged document
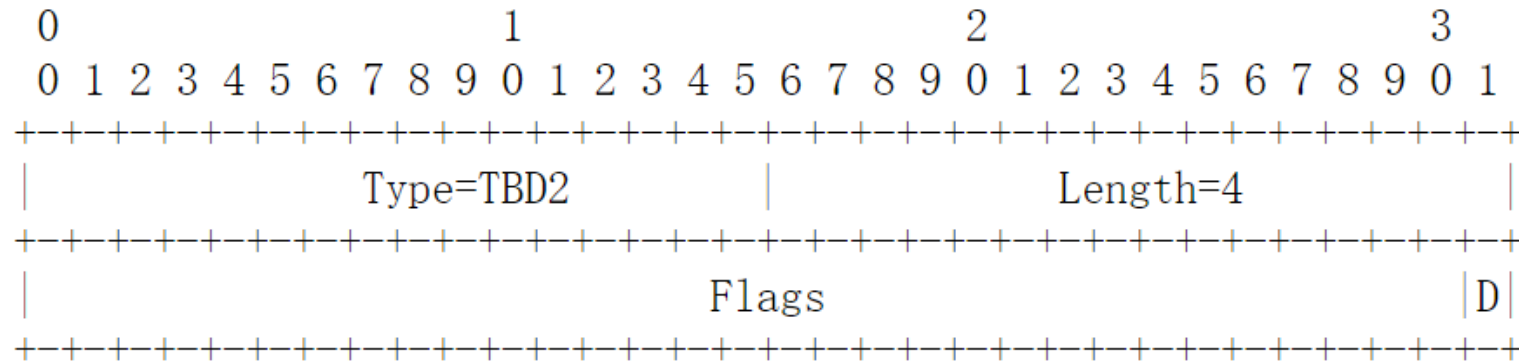
PCEP Extensions

- A new "NRP TLV" in the LSPA Object

```
 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=TBD1           |        Length=Variable        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            NRP ID                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Flags             |           Reserved            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
//                     Optional sub-TLV(s)                     //
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- NRP ID: Network-wide unique 32-bit identifier
- Flags field: All the flags are reserved for future use
- Optional sub-TLVs: Can be used to carry additional NRP specific constraints

PCEP Extensions (Cont.)

- A new PCEP capability called "NRP-CAPABILITY"

```
 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=TBD2         |             Length=4        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            Flags                            |D|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- One bit called "D bit" is defined in the Flags field:

  - When set to 1 by PCC, it indicates that the PCC supports the encapsulation of data plane NRP ID in data packet

  - When set to 1 by PCE, it indicates that the PCE supports to provide path computation result with the data plane NRP ID

NRP-aware Path Computation

- The NRP TLV SHOULD be carried in the LSPA Object of the PCReq message to indicate the NRP as the constraint for path computation

- PCE SHOULD use the network resource and topology attributes associated with the NRP as the parameters in path computation

- In case of path computation failure, the PCRep message may carry the NRP TLV to indicate the computation in the specified NRP was not successful

NRP-specific Path Update and Report

- PCE MAY include the NRP TLV in PCUpd message to indicate the NRP in which the TE path needs to be updated

- On successful update of a TE path of an NRP, PCC SHOULD include the NRP TLV in PCRpt message to indicate the NRP in which the TE path is updated

- If the NRP ID in PCUpd message does not match with the NRP ID of the existing TE path, PCC MUST keep the LSP state unchanged, and include an LSP Error code "NRP Mismatch" in the PCRpt message

NRP-specific Path Initiation

- PCE MAY include the NRP TLV in PCInitiate message to indicate the NRP in which the path needs to be initiated

- Depends on the D flag in the NRP-Capability, PCC SHOULD use either NRP-specific resources-aware SIDs or data plane NRP ID in constructing the TE path

- If the PCC determines the LSP parameters in the PCInitiate message are unacceptable, it MUST send a PCErr message with Error-type "PCE instantiation error" and Error-value "Unacceptable instantiation Parameters"

Next Steps

- Solicit feedbacks on the merged document

- The content of document has been stable

- Consider WG adoption?

Thank You