PCEP extensions for the computation of route offers with price

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Network Service & Business Plane

• NSBP includes all the functions for
  1. service specification and offer creation
  2. product offers publication
  3. e2e offer composition
  4. triggering service provisioning
     (→ std PCE cycle + LSP setup)
  5. manage service operation/monitoring
     (→ OAM)
  6. triggering service deletion
     (→ LSP tear-down)
Service PCE & NSBP

NSBP

- Product Catalogue
- SLA offers Controller + builder

Service PCE

Child-PCE

Domain A

Child-PCE

Domain Z

Route offers can be in the form of sparse multi-domain EROs + cost + price

Route prices computed according to:
- Constraints specified by PCC:
  - end points
  - bw
  - other metrics
  - load balancing
  - ...
- PCE policies (ref. RFC5394)
Route price vs. route cost

Route cost(s)/metric(s) := Traffic Engineering indicators used by the *network administrator* (carrier) to optimize the usage of its network resources

- 1 IGP metric [RFC5440]
- 2 TE metric [RFC5440]
- 3 Hop Counts [RFC5440]
- 4 Aggregate bandwidth consumption [RFC5541]
- 5 Load of the most loaded link [RFC5541]
- 6 Cumulative IGP cost [RFC5541]
- 7 Cumulative TE cost [RFC5541]
- 8 P2MP IGP metric [RFC6006]
- 9 P2MP TE metric [RFC6006]
- 10 P2MP hop count metric [RFC6006]
- ...

Route price := EUR/$$

refers to the *customer-supplier interaction* at the business level for offering, negotiating and, eventually, instantiating a network connectivity service (e.g. a [G]MPLS LSP)

- depends on strategic factors
- depends on the ingress/egress interfaces/PoPs
- influenced by the amount of mobilized network resources (route)
PCEP RP Object extension

• 1 bit in RP object (Price Request bit)
  – PCC to set P-bit in case of route offer computation
  – When P-bit is set, the PCE computes a set of route offers

• A PCEErr message with Error-Type "Capability not supported" sent back to PCC if PCE does not support it
**PRICE-INFO Object**

| 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 |
|---------------------------------|------------------|
| +---------------------------------+------------------|
| priceModel                       | currencyType     |
| +---------------------------------+------------------|
| priceUnitTime                    | priceUnitData    | capUnitTime | capUnitData |
| +---------------------------------+------------------|-------------|-------------|
| priceValue                       | capValue         |

- **priceModel** (8 bits): Pay-as-you-go | Flat
- **currencyType** (24 bits): ISO-4217 currency name (e.g. EUR, USD, etc.)
- **priceUnitTime** (8 bits): time interval for a unitary price value (mins | hours | day | week | month | year )
- **priceUnitData** (8 bits): data volume for a unitary price value (KB|MB|GB|TB)
- **priceValue** (32 bits): value of the price

- **capUnitTime** (8 bits): time unit used to express the Cap Value (same as per priceUnitTime)
- **capUnitData** (8 bits): data volume unit used to express the Cap Value (same as per priceUnitData)
- **capValue** (32 bits): upper bound for this service offer (e.g. max data volume or time length for which the given offer is valid at the specified price)
PRICE-INFO Object

<PCRep Message> ::= <Common Header>
    <response-list>

<response-list>::=<response>[<response-list>]

<response>::= <RP>
    [<NO-PATH>]
    [<attribute-list>]
    [<path-list>]

<path-list>::=<path>[<path-list>]

<path>::= <ERO><attribute-list>

<attribute-list>::= [<price-info-list>]
    [<LSPA>]
    [<BANDWIDTH>]
    [<metric-list>]
    [<IRO>]

<metric-list>::=<METRIC>[<metric-list>]

<price-info-list>::=<PRICE-INFO>[price-info-list]

- For successful route offers computation
  - at least 1 PRICE-INFO object per PCRep msg (if P-bit is set in RP)
  - multiple PRICE-INFO objects when more than one route offer is identified by the PCE for the same service
  - All the PRICE-INFO objects carried in a path refer to the same ERO computed by the PCE
  - In case of unsuccessful route offers computation
    - NO-PATH object is included as for standard path computation procedure
Next steps

• Continue collecting feedbacks
  – this meeting, the mailing list, etc.
  – some just received via email
• Refine the document
  – PRICE_INFO field as TLV?
    • min bits allocated with current format
    • More overhead with TLVs, but a more flexible / extensible object (e.g. express more caps)
  – Discuss any framework convergence with
    • pce-hierarchy-fwk
    • Service-awareness metrics work (delay, jitter, etc.)
    • Stateful PCE
• Find consensus towards progressing to WG I-D