YANG Data Models for TE and RSVP

draft-ietf-teas-yang-te-08

draft-ietf-teas-yang-rsvp-07

draft-ietf-teas-yang-rsvp-te-01

code @ https://github.com/ietf-mpls-yang/te

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Agenda

- Updates to I-Ds (since IETF98)
- Open issues
- Next steps

I-D: draft-ietf-teas-yang-te-08

Summary of Changes

- Credits:
  - Thanks to Sergio Belotti, Italo Busi, Carlo Perocchio, Francesco Lazzeri et. al for their feedback and review comments
  - Thanks to multi-vendor team for the continued discussions during meetings
- High-level model changes:
  - Moved auto-bandwidth properties to te-mpls module
  - Additional path constraints
  - Per LSP oper state and path computed properties
  - In/out segment stitching properties

Update # 1
LSP path operational state

<draft-ietf-teas-yang-te-08 >

```
+--ro lsp*
<snip>
      +--ro operational-state? identityref

 identity lsp-path-computing {
  base lsp-state-type;
  description
   "State path compute in progress";
 }
 identity lsp-path-computation-ok {
  base lsp-state-type;
  description
   "State path compute successful";
 }
 identity lsp-path-computatione-failed {
  base lsp-state-type;
  description
   "State path compute failed";
 }
 identity lsp-state-setting-up {
  base lsp-state-type;
  description
   "State setting up";
 }
```

```
+--ro lsp*
<snip>
      +--ro operational-state? identityref

 identity lsp-state-setup-ok {
  base lsp-state-type;
  description
   "State setup successful";
 }


 identity lsp-state-setup-failed {
  base lsp-state-type;
  description
   "State setup failed";
 }


 identity lsp-state-up {
  base lsp-state-type;
  description "State up";
```

Update # 2 <draft-ietf-teas-yang-te-08 >

TE path computed computed properties state

```
+--ro lsp*
      -ro computed-path-properties
       +--ro path-metric* [metric-type]
       |  +--ro metric-type    -> ../state/metric-type
       |  +--ro state
       |     +--ro metric-type?         identityref
       |     +--ro accumulative-value?   uint64
       +--ro path-affinities
       |  +--ro constraints* [usage]
       |     +--ro usage    -> ../state/usage
       |     +--ro state
       |        +--ro usage?       identityref
       |        +--ro (style)?
       |           +--:(value)
       |           |  +--ro value? te-types:admin-groups
       |           +--:(named)
       |              +--ro affinity-names* [name]
       |                 +--ro name    string
       +--ro path-srlgs
       |  +--ro (style)?
       |     +--:(values)
       |     |  +--ro state
       |     |     +--ro usage?    identityref
       |     |     +--ro values*   te-types:srlg
```

- Models per LSP path state computed properties
  - Accumulative path-metrics
    - TE, IGP, latency, hop-count, average-delay, and other additive metrics
  - Accumulative path affinities
    - presented as bit-map values or names
  - Accumulative path SRLGs
    - presented as bit-map values or names

Update # 3
TE path computed state

<draft-ietf-teas-yang-te-08>

```
-ro path-computed-route-objects
 +--ro path-computed-route-object* [index]
   +--ro index    -> ../state/index
   +--ro state
     +--ro index?          uint32
     +--ro (type)?
       +--:(numbered)
       |  +--ro numbered-hop
       |     +--ro address?    te-types:te-tp-id
       |     +--ro hop-type?   te-hop-type
       +--:(as-number)
       |  +--ro as-number-hop
       |     +--ro as-number?   binary
       |     +--ro hop-type?    te-hop-type
       +--:(unnumbered)
       |  +--ro unnumbered-hop
       |     +--ro node-id?     te-types:te-node-id
       |     +--ro link-tp-id?  te-types:te-tp-id
       |     +--ro hop-type?    te-hop-type
       +--:(label)
       |  +--ro label-hop
       |     +--ro value?   rt-types:generalized-label
       +--:(sid)
          +--ro sid-hop
             +--ro sid?   rt-types:generalized-label
```

- Models per LSP path state computed computed properties:
  - Shows for head-end/ingress LSPs
  - Shows for transit for path expanded tansit LSPs
  - Path computed route/ERO

Update # 4
TE path additional constraints

<draft-ietf-teas-yang-te-08>

```
rw named-path-constraints
+--rw named-path-constraint* [name]
   +--rw name
   +--rw path-metric-bounds
   |  +--rw path-metric-bound* [metric-type]
   |     +--rw metric-type    -> ../config/metric-type
   |     +--rw config
   |     |  +--rw metric-type?   identityref
   |     |  +--rw upper-bound?   uint64
   |     +--ro state
   |        +--ro metric-type?   identityref
   |        +--ro upper-bound?   uint64
```

- Path metric bounds, covers bounds on metric types
  - TE, IGP, latency, hop-count, average-delay, and other additive metrics
- Added hop-type for strict/loose (applies to all route-hop-types)
- Added sid-hop to covers segment-routing hop

Update # 5
Optimization criteria

<draft-ietf-teas-yang-te-08>

```
rw named-path-constraints
+--rw named-path-constraint* [name]
  +--rw name
    +--rw optimizations
    |  +--rw optimization-metric* [metric-type]
    |     +--rw metric-type    -> ../config/metric-type
    |     +--rw config
    |     |  +--rw metric-type?   identityref
    |     |  +--rw weight?        uint8
    |     +--ro state
    |        +--ro metric-type?   identityref
    |        +--ro weight?        uint8
    +--rw path-objective-function
    |  +--rw config
    |  |  +--rw objective-function-type?   identityref
    |  +--ro state
    |     +--ro objective-function-type?   identityref
    +--rw tiebreakers
    |  +--rw tiebreaker* [tiebreaker-type]
    |     +--rw tiebreaker-type    -> ../config/tiebreaker-type
    |     +--rw config
    |     |  +--rw tiebreaker-type?   identityref
    |     +--ro state
    |        +--ro tiebreaker-type?   identityref
```

- Optimization criteria
  - Optimize using standard objective function (RFC5541)
  - Optimize for a metric, or list of metrics by weight
- In case of ECMP, apply tiebreaker list criteria
  - in list order top to bottom

Update # 6 <draft-ietf-teas-yang-te-08>

Updated resource affinity constraints

```
rw named-path-constraints
+--rw named-path-constraint* [name]
  +--rw name
+--rw path-affinities
|  +--rw constraints* [usage]
|     +--rw usage     -> ../config/usage
|     +--rw config
|     |  +--rw usage?          identityref
|     |  +--rw (style)?
|     |     +--:(value)
|     |     |  +--rw value?          te-types:admin-groups
|     |     +--:(named)
|     |        +--rw affinity-names* [name]
|     |           +--rw name    string
|     +--ro state
|        +--ro usage?          identityref
|        +--ro (style)?
|           +--:(value)
|           |  +--ro value?          te-types:admin-groups
|           +--:(named)
|              +--ro affinity-names* [name]
|                 +--ro name    string
```

- Per RFC3209, added usage parameter to cover checks for 3 additional bit-maps :
  1. Exclude-any
  2. Include-any
  3. Include-all

Update # 7
Segment stitching constraints

<draft-ietf-teas-yang-te-08>

```
rw named-path-constraints
+--rw named-path-constraint* [name]
  +--rw name
  +--rw in-segment!
  |  +--rw forward
  |  |  +--rw config
  |  |  |  +--rw label-set* [inclusive-exclusive label-start]
  |  |  |     +--rw inclusive-exclusive    enumeration
  |  |  |     +--rw label-start          rt-types:generalized-label
  |  |  |     +--rw label-end?           rt-types:generalized-label
  |  |  |     +--rw range-bitmap?        binary
  |  +--rw reverse
  |     +--rw config
  |     |  +--rw label-set* [inclusive-exclusive label-start]
  |     |     +--rw inclusive-exclusive    enumeration
  |     |     +--rw label-start          rt-types:generalized-label
  |     |     +--rw label-end?           rt-types:generalized-label
  |     |     +--rw range-bitmap?        binary
  +--rw out-segment!
  |  +--rw forward
  |  |  +--rw config
  |  |  |  +--rw label-set* [inclusive-exclusive label-start]
  |  |  |     +--rw inclusive-exclusive    enumeration
  |  |  |     +--rw label-start          rt-types:generalized-label
  |  |  |     +--rw label-end?           rt-types:generalized-label
  |  |  |     +--rw range-bitmap?        binary
```

- In/out segment stitching
  - candidate labels on in/out interface of tunnel termination points
- forward and reverse for bidirectional segments

I-D: draft-ietf-teas-yang-rsvp-07

I-D: draft-ietf-teas-yang-rsvp-te-01

Summary of Changes

- No change to draft-ietf-teas-yang-rsvp
- Changes to draft-ietf-teas-yang-rsvp-te are mostly editorial to align with augmented TE model

Open Issue:

Migration to NMDA style

- Impact on-going existing implementation
- Impact on augmenting modules (defined in out-of-scope documents)
- Impact on state created tunnels, e.g.:
  - PCE instantiated tunnels
  - auto-created primary or bypass tunnels
  - Currently, such tunnel properties accessible under “state” branches at last level
  - NMDA proposes a having those under a state branch at the top

Next Steps

- Close on NMDA or OC-style for model
- Continue work on defining tunnel RPCs
- RSVP base/extended in I-D is stable and ready for WGLC
- Request further review and comments on other models

Thank You

TE/RSVP and MPLS YANG Modules

Structure and Relationship