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## **YANG Data Models for requesting Path Computation in Optical Networks**

### **Abstract**

This document provides a mechanism to request path computation in Optical Networks (WSON and Flexi-grid) by augmenting the Remote Procedure Calls (RPCs) defined in RFC YYYY.

[RFC EDITOR NOTE: Please replace RFC YYYY with the RFC number of draft-ietf-teas-yang-path-computation once it has been published.

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## 1. Introduction

[[I-D.ietf-teas-yang-path-computation](#)] describes key use cases, where a client needs to request underlying SDN controllers for path computation. In some of these use cases, the underlying SDN controller can control a single-layer optical technologies, including Optical Transport Network (OTN), Wavelength Switched Optical Networks (WSON), Flexi-grid, and multi-layer Optical network.

This document defines YANG data models, which augment the generic Path Computation RPC defined in [[I-D.ietf-teas-yang-path-computation](#)], with technology-specific augmentations required to request path computation to an underlying Optical SDN controller. These models allow a client to delegate path computation tasks to the underlying Optical SDN controller without having to obtain optical-layer information from the controller and performing feasible path computation itself. This is especially helpful in cases where computing optically-feasible paths require knowledge of physical-layer states, such as optical impairments, which are visible only to the Optical controller.

## 1.1. Terminology and Notations

Refer to [[RFC7446](#)] and [[RFC7581](#)] for the key terms used in this document. The following terms are defined in [[RFC7950](#)] and are not redefined here:

- \*client
- \*server
- \*augment
- \*data model
- \*data node

The following terms are defined in [[RFC6241](#)] and are not redefined here:

- \*configuration data
- \*state data

The terminology for describing YANG data models is found in [[RFC7950](#)].

## 1.2. Tree Diagram

A simplified graphical representation of the data model is used in [Section 3](#) of this document. The meaning of the symbols in these diagrams is defined in [[RFC8340](#)].

## 1.3. Prefix in Data Node Names

In this document, names of data nodes and other data model objects are prefixed using the standard prefix associated with the corresponding YANG imported modules, as shown in [Table 1](#).

Prefix	YANG module	Reference
l0-types	ietf-layer0-types	[ <a href="#">RFCZZZZ</a> ]
te	ietf-te	[ <a href="#">RFCKKKK</a> ]
tepc	ietf-te-path-computation	[ <a href="#">RFCYYYY</a> ]
wson-pc	ietf-wson-path-computation	RFCXXXX
flexg-pc	ietf-flexi-grid-path-computation	RFCXXXX

Table 1: Prefixes and corresponding YANG modules

RFC Editor Note: Please replace XXXX with the RFC number assigned to this document. Please replace ZZZZ with the RFC number assigned to [[I-D.ietf-ccamp-rfc9093-bis](#)]. Please replace KKKK with the RFC number assigned to [[I-D.ietf-teas-yang-te](#)]. Please replace YYYY with the RFC number assigned to [[I-D.ietf-teas-yang-path-computation](#)]. Please remove this note.

## 2. YANG Data Models for Optical Path Computation

### 2.1. YANG Models Overview

The YANG data models for requesting WSON and Flexi-grid path computation are defined as augmentations of the generic Path Computation RPC defined in [[I-D.ietf-teas-yang-path-computation](#)], as shown in [Figure 1](#).

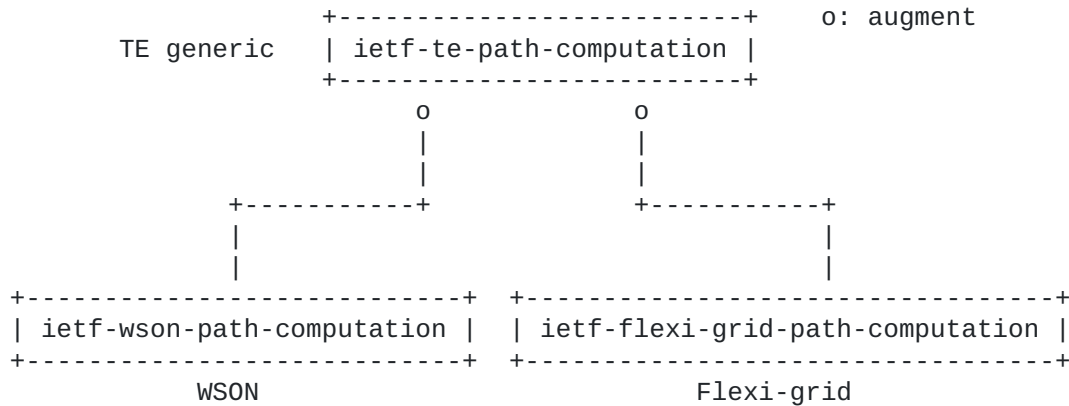


Figure 1: Relationship between WSON, Flexi-grid and TE path computation models

The entities and Traffic Engineering (TE) attributes, such as requested path and tunnel attributes, defined in [[I-D.ietf-teas-yang-path-computation](#)], are still applicable when requesting WSON and Flexi-grid path computation and the models defined in this document only specifies the additional technology-specific attributes/information, using the attributes defined in [[I-D.ietf-ccamp-rfc9093-bis](#)].

### 2.2. Attributes Augmentation

The common characteristics for layer 0 (WSON and Flexi-grid) tunnels are under definition in [[I-D.ietf-ccamp-rfc9093-bis](#)] and re-used in the `ietf-wson-path-computation` and `ietf-flexi-grid-path-computation` YANG models

### 2.3. Bandwidth Augmentation

As described in Section 4.2 of [[RFC7699](#)], there is some overlap between bandwidth and label in layer0.

The WSON and flexi-grid label resource information described in [Section 2.4](#), is sufficient to describe also the spectrum resources within WSON and flexi-grid networks. Therefore, the model does not define any augmentation for the `te-bandwidth` containers defined in [[I-D.ietf-teas-yang-path-computation](#)].

### 2.4. Label Augmentations

The models augment all the occurrences of the `label-restriction` list with WSON and Flexi-grid technology-specific attributes using the

l0-label-range-info and flexi-grid-label-range-info groupings defined in [[I-D.ietf-ccamp-rfc9093-bis](#)].

Moreover, the models augment all the occurrences of the te-label container with the WSON, Flexi-grid and OTN technology-specific attributes using the wson-label-start-end, wson-label-hop, wson-label-step, flexi-grid-label-start-end, flexi-grid-label-hop and flexi-grid-label-step defined in [[I-D.ietf-ccamp-rfc9093-bis](#)].

### **3. Optical Path Computation Tree Diagrams**

#### **3.1. WSON Path Computation Tree Diagrams**

[Figure 2](#) below shows the tree diagram of the YANG data model defined in module ietf-wson-path-computation.yang.

```

module: ietf-wson-path-computation

augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request:
  +- bit-stuffing?      boolean
  +- wavelength-assignment? identityref
  +- gsnr-margin?      snr
augment /te:tunnels-path-compute/te:output/te:path-compute-result
  /tepc:response/tepc:computed-paths-properties
  /tepc:computed-path-properties/tepc:path-properties:
  +-ro estimated-gsnr?  snr
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:optimizations/tepc:algorithm
  /tepc:metric/tepc:optimization-metric
  /tepc:explicit-route-exclude-objects
  /tepc:route-object-exclude-object/tepc:type:
  +--:(oms-element)
  +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:optimizations/tepc:algorithm
  /tepc:metric/tepc:optimization-metric
  /tepc:explicit-route-include-objects
  /tepc:route-object-include-object/tepc:type:
  +--:(oms-element)
  +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:explicit-route-objects-always
  /tepc:route-object-exclude-always/tepc:type:
  +--:(oms-element)
  +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:explicit-route-objects-always
  /tepc:route-object-include-exclude/tepc:type:
  +--:(oms-element)
  +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:synchronization/tepc:exclude-objects/tepc:excludes
  /tepc:type:
  +--:(oms-element)
  +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:output/te:path-compute-result
  /tepc:response/tepc:computed-paths-properties
  /tepc:computed-path-properties/tepc:path-properties
  /tepc:path-route-objects/tepc:path-route-object
  /tepc:type:
  +--:(oms-element)
  +-ro oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-in-segment
  /tepc:label-restrictions/tepc:label-restriction:
  +- grid-type?      identityref
  +- priority?       uint8
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-out-segment
  /tepc:label-restrictions/tepc:label-restriction:
  +- grid-type?      identityref
  +- priority?       uint8
augment /te:tunnels-path-compute/te:input/te:path-compute-info

```

```

    /tepc:path-request/tepc:optimizations/tepc:algorithm
    /tepc:metric/tepc:optimization-metric
    /tepc:explicit-route-exclude-objects
    /tepc:route-object-exclude-object/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
    +--:(dwdm)
      | +-- (single-or-super-channel)?
      |   +--:(single)
      |     | +-- dwdm-n?                l0-types:dwdm-n
      |     +--:(super)
      |       +-- subcarrier-dwdm-n*    l0-types:dwdm-n
    +--:(cwdm)
      +-- cwdm-n?                      l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:optimizations/tepc:algorithm
    /tepc:metric/tepc:optimization-metric
    /tepc:explicit-route-include-objects
    /tepc:route-object-include-object/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
    +--:(dwdm)
      | +-- (single-or-super-channel)?
      |   +--:(single)
      |     | +-- dwdm-n?                l0-types:dwdm-n
      |     +--:(super)
      |       +-- subcarrier-dwdm-n*    l0-types:dwdm-n
    +--:(cwdm)
      +-- cwdm-n?                      l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:explicit-route-objects-always
    /tepc:route-object-exclude-always/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
    +--:(dwdm)
      | +-- (single-or-super-channel)?
      |   +--:(single)
      |     | +-- dwdm-n?                l0-types:dwdm-n
      |     +--:(super)
      |       +-- subcarrier-dwdm-n*    l0-types:dwdm-n
    +--:(cwdm)
      +-- cwdm-n?                      l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:explicit-route-objects-always
    /tepc:route-object-include-exclude/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
    +--:(dwdm)
      | +-- (single-or-super-channel)?
      |   +--:(single)
      |     | +-- dwdm-n?                l0-types:dwdm-n
      |     +--:(super)
      |       +-- subcarrier-dwdm-n*    l0-types:dwdm-n
    +--:(cwdm)

```

```

    +-- cwdm-n?          l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-in-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-start/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
  +--:(dwdm)
  | +-- dwdm-n?    l0-types:dwdm-n
  +--:(cwdm)
  +-- cwdm-n?    l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-in-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-end/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
  +--:(dwdm)
  | +-- dwdm-n?    l0-types:dwdm-n
  +--:(cwdm)
  +-- cwdm-n?    l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-in-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-step/tepc:technology:
+--:(wson)
  +-- (l0-grid-type)?
  +--:(dwdm)
  | +-- wson-dwdm-channel-spacing?  identityref
  +--:(cwdm)
  +-- wson-cwdm-channel-spacing?  identityref
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-out-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-start/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
  +--:(dwdm)
  | +-- dwdm-n?    l0-types:dwdm-n
  +--:(cwdm)
  +-- cwdm-n?    l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-out-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-end/tepc:te-label/tepc:technology:
+--:(wson)
  +-- (grid-type)?
  +--:(dwdm)
  | +-- dwdm-n?    l0-types:dwdm-n
  +--:(cwdm)
  +-- cwdm-n?    l0-types:cwdm-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-out-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-step/tepc:technology:
+--:(wson)
  +-- (l0-grid-type)?
  +--:(dwdm)

```



```

    | +-- wson-dwdm-channel-spacing?  identityref
+--:(cwdm)
    +-- wson-cwdm-channel-spacing?  identityref
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:synchronization/tepc:exclude-objects/tepc:excludes
    /tepc:type/tepc:label/tepc:label-hop/tepc:te-label
    /tepc:technology:
+--:(wson)
    +-- (grid-type)?
        +--:(dwdm)
            | +-- (single-or-super-channel)?
            |   +--:(single)
            |   | +-- dwdm-n?                l0-types:dwdm-n
            |   +--:(super)
            |   | +-- subcarrier-dwdm-n*    l0-types:dwdm-n
            +--:(cwdm)
            | +-- cwdm-n?                    l0-types:cwdm-n
augment /te:tunnels-path-compute/te:output/te:path-compute-result
    /tepc:response/tepc:computed-paths-properties
    /tepc:computed-path-properties/tepc:path-properties
    /tepc:path-route-objects/tepc:path-route-object/tepc:type
    /tepc:label/tepc:label-hop/tepc:te-label/tepc:technology:
+--:(wson)
    +--ro (grid-type)?
        +--:(dwdm)
            | +--ro (single-or-super-channel)?
            |   +--:(single)
            |   | +--ro dwdm-n?                l0-types:dwdm-n
            |   +--:(super)
            |   | +--ro subcarrier-dwdm-n*    l0-types:dwdm-n
            +--:(cwdm)
            | +--ro cwdm-n?                    l0-types:cwdm-n

```

Figure 2: WSON path computation tree diagram

### 3.2. Flexi-grid Path Computation Tree Diagrams

[Figure 3](#) below shows the tree diagram of the YANG data model defined in module `ietf-flexi-grid-path-computation.yang`.

```

module: ietf-flexi-grid-path-computation

augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request:
    +- bit-stuffing?          boolean
    +- wavelength-assignment? identityref
    +- gsnr-margin?          snr
augment /te:tunnels-path-compute/te:output/te:path-compute-result
    /tepc:response/tepc:computed-paths-properties
    /tepc:computed-path-properties/tepc:path-properties:
    +-ro estimated-gsnr?    snr
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:optimizations/tepc:algorithm
    /tepc:metric/tepc:optimization-metric
    /tepc:explicit-route-exclude-objects
    /tepc:route-object-exclude-object/tepc:type:
    +--:(oms-element)
        +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:optimizations/tepc:algorithm
    /tepc:metric/tepc:optimization-metric
    /tepc:explicit-route-include-objects
    /tepc:route-object-include-object/tepc:type:
    +--:(oms-element)
        +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:explicit-route-objects-always
    /tepc:route-object-exclude-always/tepc:type:
    +--:(oms-element)
        +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:explicit-route-objects-always
    /tepc:route-object-include-exclude/tepc:type:
    +--:(oms-element)
        +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:synchronization/tepc:exclude-objects/tepc:excludes
    /tepc:type:
    +--:(oms-element)
        +- oms-element-uid?  string
augment /te:tunnels-path-compute/te:output/te:path-compute-result
    /tepc:response/tepc:computed-paths-properties
    /tepc:computed-path-properties/tepc:path-properties
    /tepc:path-route-objects/tepc:path-route-object
    /tepc:type:
    +--:(oms-element)
        +-ro oms-element-uid?  string
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:path-in-segment
    /tepc:label-restrictions/tepc:label-restriction:
    +- grid-type?          identityref
    +- priority?           uint8
    +- flexi-grid
        +- slot-width-granularity?  identityref
        +- min-slot-width-factor?    uint16
        +- max-slot-width-factor?    uint16
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:path-out-segment

```

```

        /tepc:label-restrictions/tepc:label-restriction:
+-- grid-type?      identityref
+-- priority?       uint8
+-- flexi-grid
    +-- slot-width-granularity?  identityref
    +-- min-slot-width-factor?    uint16
    +-- max-slot-width-factor?    uint16
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:optimizations/tepc:algorithm
    /tepc:metric/tepc:optimization-metric
    /tepc:explicit-route-exclude-objects
    /tepc:route-object-exclude-object/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(flexi-grid)
    +-- (single-or-super-channel)?
        +--:(single)
        | +-- flexi-n?                l0-types:flexi-n
        | +-- flexi-m?                l0-types:flexi-m
        +--:(super)
            +-- subcarrier-flexi-n* [flexi-n]
            +-- flexi-n    l0-types:flexi-n
            +-- flexi-m?  l0-types:flexi-m
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:optimizations/tepc:algorithm
    /tepc:metric/tepc:optimization-metric
    /tepc:explicit-route-include-objects
    /tepc:route-object-include-object/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(flexi-grid)
    +-- (single-or-super-channel)?
        +--:(single)
        | +-- flexi-n?                l0-types:flexi-n
        | +-- flexi-m?                l0-types:flexi-m
        +--:(super)
            +-- subcarrier-flexi-n* [flexi-n]
            +-- flexi-n    l0-types:flexi-n
            +-- flexi-m?  l0-types:flexi-m
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:explicit-route-objects-always
    /tepc:route-object-exclude-always/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(flexi-grid)
    +-- (single-or-super-channel)?
        +--:(single)
        | +-- flexi-n?                l0-types:flexi-n
        | +-- flexi-m?                l0-types:flexi-m
        +--:(super)
            +-- subcarrier-flexi-n* [flexi-n]
            +-- flexi-n    l0-types:flexi-n
            +-- flexi-m?  l0-types:flexi-m
augment /te:tunnels-path-compute/te:input/te:path-compute-info
    /tepc:path-request/tepc:explicit-route-objects-always
    /tepc:route-object-include-exclude/tepc:type/tepc:label
    /tepc:label-hop/tepc:te-label/tepc:technology:
+--:(flexi-grid)
    +-- (single-or-super-channel)?
        +--:(single)
        | +-- flexi-n?                l0-types:flexi-n

```

```

    | +-- flexi-m?          l0-types:flexi-m
+--:(super)
  +-- subcarrier-flexi-n* [flexi-n]
    +-- flexi-n          l0-types:flexi-n
    +-- flexi-m?        l0-types:flexi-m
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-in-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-start/tepc:te-label/tepc:technology:
+--:(flexi-grid)
  +-- flexi-n?          l0-types:flexi-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-in-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-end/tepc:te-label/tepc:technology:
+--:(flexi-grid)
  +-- flexi-n?          l0-types:flexi-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-in-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-step/tepc:technology:
+--:(flexi-grid)
  +-- flexi-grid-channel-spacing? identityref
  +-- flexi-n-step?          uint8
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-out-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-start/tepc:te-label/tepc:technology:
+--:(flexi-grid)
  +-- flexi-n?          l0-types:flexi-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-out-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-end/tepc:te-label/tepc:technology:
+--:(flexi-grid)
  +-- flexi-n?          l0-types:flexi-n
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:path-request/tepc:path-out-segment
  /tepc:label-restrictions/tepc:label-restriction
  /tepc:label-step/tepc:technology:
+--:(flexi-grid)
  +-- flexi-grid-channel-spacing? identityref
  +-- flexi-n-step?          uint8
augment /te:tunnels-path-compute/te:input/te:path-compute-info
  /tepc:synchronization/tepc:exclude-objects/tepc:excludes
  /tepc:type/tepc:label/tepc:label-hop/tepc:te-label
  /tepc:technology:
+--:(flexi-grid)
  +-- (single-or-super-channel)?
    +--:(single)
      | +-- flexi-n?          l0-types:flexi-n
      | +-- flexi-m?          l0-types:flexi-m
    +--:(super)
      +-- subcarrier-flexi-n* [flexi-n]
        +-- flexi-n          l0-types:flexi-n
        +-- flexi-m?        l0-types:flexi-m
augment /te:tunnels-path-compute/te:output/te:path-compute-result
  /tepc:response/tepc:computed-paths-properties

```

```
    /tepc:computed-path-properties/tepc:path-properties
    /tepc:path-route-objects/tepc:path-route-object/tepc:type
    /tepc:label/tepc:label-hop/tepc:te-label/tepc:technology:
+--:(flexi-grid)
  +--ro (single-or-super-channel)?
    +--:(single)
      | +--ro flexi-n?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
        +--ro flexi-n    l0-types:flexi-n
        +--ro flexi-m?   l0-types:flexi-m
```

Figure 3: Flexi-grid path computation tree diagram

#### **4. YANG Models for Optical Path Computation**

##### **4.1. YANG Model for WSON Path Computation**

```

<CODE BEGINS> file "ietf-wson-path-computation@2022-09-08.yang"

module ietf-wson-path-computation {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-wson-path-computation";
  prefix "wson-pc";

  import ietf-te-path-computation {
    prefix "tepc";
    revision-date "2021-09-06";
    reference
      "I-D.ietf-teas-yang-path-computation-14: Yang model
       for requesting Path Computation.";
  }

  import ietf-te {
    prefix "te";
    revision-date "2021-02-20";
    reference
      "I-D.ietf-teas-yang-te-19: A YANG Data Model for Traffic
       Engineering Tunnels and Interfaces. ";
  }

  import ietf-layer0-types {
    prefix "l0-types";
    reference
      "I-D.ietf-ccamp-rfc9093-bis: A YANG Data Model for Layer 0
       Types.";
  }

  organization
    "IETF CCAMP Working Group";
  contact
    "WG Web: <http://tools.ietf.org/wg/ccamp/>
     WG List: <mailto:ccamp@ietf.org>

     Editor: Aihua Guo
             <mailto:aihuaguo.ietf@gmail.com>

     Editor: Italo Busi
             <mailto:italo.busi@huawei.com>

     Editor: Sergio Belotti
             <mailto:sergio.belotti@nokia.com>";

  description
    "This module defines a model for requesting
     WSON Path Computation.

     The model fully conforms to the Network Management
     Datastore Architecture (NMDA).

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     identified as authors of the code. All rights reserved.

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```



set forth in Section 4.c of the IETF Trust's Legal Provisions  
Relating to IETF Documents  
(<https://trustee.ietf.org/license-info>).

This version of this YANG module is part of RFC XXXX; see  
the RFC itself for full legal notices.";

```
revision "2022-09-08" {
  description
    "Initial version.";
  reference
    "RFC XXXX: YANG Data Models for requesting Path Computation
    in Optical Networks.";
  // RFC Ed.: replace XXXX with actual RFC number, update date
  // information and remove this note
}

/*
 * Data nodes
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request" {
  description
    "Augment with additional constraints for WSON paths.";
  uses l0-types:l0-tunnel-attributes;
  uses l0-types:l0-path-constraints;
}

augment "/te:tunnels-path-compute/te:output/"
  + "te:path-compute-result/tepc:response/"
  + "tepc:computed-paths-properties/"
  + "tepc:computed-path-properties/tepc:path-properties" {
  description
    "Augment with additional properties for WSON paths.";
  uses l0-types:l0-path-properties;
}

/*
 * Augment Route Hop
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-exclude-objects/"
  + "tepc:route-object-exclude-object/tepc:type" {
  description
    "Augment the route hop for the optimization of the explicit
    route objects excluded by the path computation of the requested
    path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
  description

```

```

    "The OMS element route hop type";
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-include-objects/"
  + "tepc:route-object-include-object/tepc:type" {
  description
    "Augment the route hop for the optimization of the explicit
    route objects included by the path computation of the requested
    path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
  description
    "The OMS element route hop type";
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-exclude-always/tepc:type" {
  description
    "Augment the route hop for the explicit route objects always
    excluded by the path computation of the requested path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
  description
    "The OMS element route hop type";
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-include-exclude/tepc:type" {
  description
    "Augment the route hop for the explicit route objects included
    or excluded by the path computation of the requested path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
  description
    "The OMS element route hop type";
}
}

```

```

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:synchronization/tepc:exclude-objects/tepc:excludes/"
  + "tepc:type" {
  description
    "Augment the route hop for the explicit route objects to always
    exclude from synchronized path computation.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
    description
      "The OMS element route hop type";
  }
}

augment "/te:tunnels-path-compute/te:output/"
  + "te:path-compute-result/tepc:response/"
  + "tepc:computed-paths-properties/"
  + "tepc:computed-path-properties/tepc:path-properties/"
  + "tepc:path-route-objects/tepc:path-route-object/"
  + "tepc:type" {
  description
    "Augment the route hop for the route object of the computed
    path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
    description
      "The OMS element route hop type";
  }
}

/*
 * Augment TE label range information
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction" {
  description
    "Augment TE label range information for the ingress segment
    of the requested path.";
  uses l0-types:l0-label-range-info;
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-out-segment/"
  + "tepc:label-restrictions/tepc:label-restriction" {
  description
    "Augment TE label range information for the egress segment
    of the requested path.";
  uses l0-types:l0-label-range-info;
}

```

```

/*
 * Augment TE label.
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-exclude-objects/"
  + "tepc:route-object-exclude-object/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the optimization of the explicit
    route objects excluded by the path computation of the requested
    path.";
  case wson {
    uses l0-types:wson-label-hop;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-include-objects/"
  + "tepc:route-object-include-object/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the optimization of the explicit
    route objects included by the path computation of the requested
    path.";
  case wson {
    uses l0-types:wson-label-hop;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-exclude-always/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the explicit route objects always
    excluded by the path computation of the requested path.";
  case wson {
    uses l0-types:wson-label-hop;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-include-exclude/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the explicit route objects included
    or excluded by the path computation of the requested path.";
  case wson {
    uses l0-types:wson-label-hop;
  }
}

```

```

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-start/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range start for the ingress segment
    of the requested path.";
  case wson {
    uses l0-types:wson-label-start-end;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-end/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range end for the ingress segment
    of the requested path.";
  case wson {
    uses l0-types:wson-label-start-end;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-step/tepc:technology" {
  description
    "Augment TE label range step for the ingress segment
    of the requested path.";
  case wson {
    uses l0-types:wson-label-step;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-out-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-start/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range start for the egress segment
    of the requested path.";
  case wson {
    uses l0-types:wson-label-start-end;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-out-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-end/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range end for the egress segment
    of the requested path.";
  case wson {
    uses l0-types:wson-label-start-end;
  }
}

```

```

    }
  }
  augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
    + "tepc:path-request/tepc:path-out-segment/"
    + "tepc:label-restrictions/tepc:label-restriction/"
    + "tepc:label-step/tepc:technology" {
    description
      "Augment TE label range end for the egress segment
      of the requested path.";
    case wson {
      uses l0-types:wson-label-step;
    }
  }
  augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
    + "tepc:synchronization/tepc:exclude-objects/tepc:excludes/"
    + "tepc:type/tepc:label/tepc:label-hop/"
    + "tepc:te-label/tepc:technology" {
    description
      "Augment TE label hop for the explicit route objects to always
      exclude from synchronized path computation.";
    case wson {
      uses l0-types:wson-label-hop;
    }
  }
  augment "/te:tunnels-path-compute/te:output/"
    + "te:path-compute-result/tepc:response/"
    + "tepc:computed-paths-properties/"
    + "tepc:computed-path-properties/tepc:path-properties/"
    + "tepc:path-route-objects/tepc:path-route-object/"
    + "tepc:type/tepc:label/"
    + "tepc:label-hop/tepc:te-label/tepc:technology" {
    description
      "Augment TE label hop for the route object of the computed
      path.";
    case wson {
      uses l0-types:wson-label-hop;
    }
  }
}
}
<CODE ENDS>

```

Figure 4: WSON path computation YANG module

#### 4.2. YANG Model for Flexi-grid Path Computation

<CODE BEGINS> file "ietf-flexi-grid-path-computation@2022-09-08.yang"

```
module ietf-flexi-grid-path-computation {
  yang-version 1.1;
  namespace
    "urn:ietf:params:xml:ns:yang:ietf-flexi-grid-path-computation";
  prefix "flexg-pc";

  import ietf-te-path-computation {
    prefix "tepc";
    revision-date "2021-09-06";
    reference
      "I-D.ietf-teas-yang-path-computation-14: Yang model
      for requesting Path Computation.";
  }

  import ietf-te {
    prefix "te";
    revision-date "2021-02-20";
    reference
      "I-D.ietf-teas-yang-te-19: A YANG Data Model for Traffic
      Engineering Tunnels and Interfaces.";
  }

  import ietf-layer0-types {
    prefix "l0-types";
    reference
      "I-D.ietf-ccamp-rfc9093-bis: A YANG Data Model for Layer 0
      Types.";
  }

  organization
    "IETF CCAMP Working Group";
  contact
    "WG Web: <http://tools.ietf.org/wg/ccamp/>
    WG List: <mailto:ccamp@ietf.org>

    Editor: Aihua Guo
    <mailto:aihuaguo.ietf@gmail.com>

    Editor: Italo Busi
    <mailto:italo.busi@huawei.com>

    Editor: Sergio Belotti
    <mailto:sergio.belotti@nokia.com>";

  description
    "This module defines a model for requesting
    Flexi-grid Path Computation.

    The model fully conforms to the Network Management
    Datastore Architecture (NMDA).

    Copyright (c) 2022 IETF Trust and the persons
    identified as authors of the code. All rights reserved.

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    without modification, is permitted pursuant to, and subject
```

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This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.";

```
revision "2022-09-08" {
  description
    "Initial version.";
  reference
    "RFC XXXX: YANG Data Models for requesting Path Computation
    in Optical Networks.";
  // RFC Ed.: replace XXXX with actual RFC number, update date
  // information and remove this note
}

/*
 * Data nodes
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request" {
  description
    "Augment with additional constraints flexi-grid
    media channel.";
  uses l0-types:l0-tunnel-attributes;
  uses l0-types:l0-path-constraints;
}

augment "/te:tunnels-path-compute/te:output/"
  + "te:path-compute-result/tepc:response/"
  + "tepc:computed-paths-properties/"
  + "tepc:computed-path-properties/tepc:path-properties" {
  description
    "Augment with additional properties for Flexi-grid paths.";
  uses l0-types:l0-path-properties;
}

/*
 * Augment Route Hop
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-exclude-objects/"
  + "tepc:route-object-exclude-object/tepc:type" {
  description
    "Augment the route hop for the optimization of the explicit
    route objects excluded by the path computation of the requested
    path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
}
```



```

    }
    description
      "The OMS element route hop type";
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-include-objects/"
  + "tepc:route-object-include-object/tepc:type" {
  description
    "Augment the route hop for the optimization of the explicit
    route objects included by the path computation of the requested
    path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
  description
    "The OMS element route hop type";
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-exclude-always/tepc:type" {
  description
    "Augment the route hop for the explicit route objects always
    excluded by the path computation of the requested path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
  description
    "The OMS element route hop type";
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-include-exclude/tepc:type" {
  description
    "Augment the route hop for the explicit route objects included
    or excluded by the path computation of the requested path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
  }
  description
    "The OMS element route hop type";
}

```

```

}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:synchronization/tepc:exclude-objects/tepc:excludes/"
  + "tepc:type" {
  description
    "Augment the route hop for the explicit route objects to always
    exclude from synchronized path computation.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
    description
      "The OMS element route hop type";
  }
}

augment "/te:tunnels-path-compute/te:output/"
  + "te:path-compute-result/tepc:response/"
  + "tepc:computed-paths-properties/"
  + "tepc:computed-path-properties/tepc:path-properties/"
  + "tepc:path-route-objects/tepc:path-route-object/"
  + "tepc:type" {
  description
    "Augment the route hop for the route object of the computed
    path.";
  case oms-element {
    leaf oms-element-uid {
      type string;
      description
        "The unique id of the OMS element.";
    }
    description
      "The OMS element route hop type";
  }
}

/*
 * Augment TE label range information
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction" {
  description
    "Augment TE label range information for the ingress segment
    of the requested path.";
  uses l0-types:flexi-grid-label-range-info;
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-out-segment/"
  + "tepc:label-restrictions/tepc:label-restriction" {
  description
    "Augment TE label range information for the egress segment
    of the requested path.";
}

```

```

    uses l0-types:flexi-grid-label-range-info;
}

/*
 * Augment TE label.
 */

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-exclude-objects/"
  + "tepc:route-object-exclude-object/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the optimization of the explicit
    route objects excluded by the path computation of the requested
    path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:optimizations/tepc:algorithm/"
  + "tepc:metric/tepc:optimization-metric/"
  + "tepc:explicit-route-include-objects/"
  + "tepc:route-object-include-object/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the optimization of the explicit
    route objects included by the path computation of the requested
    path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-exclude-always/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the explicit route objects always
    excluded by the path computation of the requested path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:explicit-route-objects-always/"
  + "tepc:route-object-include-exclude/tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the explicit route objects included
    or excluded by the path computation of the requested path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

```

```

    }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-start/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range start for the ingress segment
    of the requested path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-end/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range end for the ingress segment
    of the requested path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-in-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-step/tepc:technology" {
  description
    "Augment TE label range step for the ingress segment
    of the requested path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-step;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-out-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-start/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range start for the egress segment
    of the requested path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-out-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-end/tepc:te-label/tepc:technology" {
  description
    "Augment TE label range end for the egress segment
    of the requested path.";
}

```

```

    case flexi-grid {
      uses l0-types:flexi-grid-label-start-end;
    }
  }

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:path-request/tepc:path-out-segment/"
  + "tepc:label-restrictions/tepc:label-restriction/"
  + "tepc:label-step/tepc:technology" {
  description
    "Augment TE label range end for the egress segment
    of the requested path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-step;
  }
}

augment "/te:tunnels-path-compute/te:input/te:path-compute-info/"
  + "tepc:synchronization/tepc:exclude-objects/tepc:excludes/"
  + "tepc:type/tepc:label/tepc:label-hop/"
  + "tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the explicit route objects to always
    exclude from synchronized path computation.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

augment "/te:tunnels-path-compute/te:output/"
  + "te:path-compute-result/tepc:response/"
  + "tepc:computed-paths-properties/"
  + "tepc:computed-path-properties/tepc:path-properties/"
  + "tepc:path-route-objects/tepc:path-route-object/"
  + "tepc:type/tepc:label/"
  + "tepc:label-hop/tepc:te-label/tepc:technology" {
  description
    "Augment TE label hop for the route object of the computed
    path.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}
}

<CODE ENDS>

```

Figure 5: Flexi-grid path computation YANG module

## 5. Manageability Considerations

This document provides a method for requesting path computations for WSON and Flexi-Grid tunnels. Consideration of mechanisms to gather and collate information required for the path computations will be necessary. Furthermore, storing path computation requests and responses and triggering actions will also need to be carefully managed and secured.

Future versions of this document will contain additional information.

## 6. Security Considerations

The YANG module defined in this document will be accessed via the NETCONF protocol [[RFC6241](#)] or RESTCONF protocol [[RFC8040](#)]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [[RFC6242](#)]. The lowest RESTCONF layer is HTTPS and the mandatory-to-implement secure transport is TLS [[RFC8446](#)].

The Network Configuration Access Control Model (NACM) [[RFC8341](#)] provides the means to restrict access to particular NETCONF or RESTCONF users to a pre-configured subset of all available NETCONF or RESTCONF protocol operations and content.

Some of the RPC operations defined in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus essential to control access to these operations.

Operations defined in this document, and their sensitivities and possible vulnerabilities, will be discussed further in future versions of this document.

## 7. IANA Considerations

This document registers the following URIs in the "ns" subregistry within the "IETF XML registry" [[RFC3688](#)].

URI: urn:ietf:params:xml:ns:yang:ietf-wson-path-computation  
Registrant Contact: The IESG.  
XML: N/A, the requested URI is an XML namespace.

URI: urn:ietf:params:xml:ns:yang:ietf-flexi-grid-path-computation  
Registrant Contact: The IESG.  
XML: N/A, the requested URI is an XML namespace.

This document registers the following YANG module in the "YANG Module Names" registry [[RFC7950](#)].

name: ietf-wson-path-computation  
namespace: urn:ietf:params:xml:ns:yang:ietf-wson-path-computation  
prefix: wson-pc  
reference: this document

name: ietf-flexi-grid-path-computation  
namespace: ietf:params:xml:ns:yang:ietf-flexi-grid-path-computation  
prefix: flexg-pc  
reference: this document

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