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A Yang Data Model for WSON Optical Networks

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Abstract

This document provides a YANG data model for the routing and wavelength assignment (RWA) TE topology in wavelength switched optical networks (WSONs).

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[1. Introduction](#)

This document provides a YANG data model for the routing and wavelength assignment (RWA) Traffic Engineering (TE) topology in wavelength switched optical networks (WSNs). The YANG model described in this document is a WSON technology-specific Yang model based on the information model developed in [[RFC7446](#)] and the two

encoding documents [RFC7581] and [RFC7579] that developed protocol independent encodings based on [RFC7446]. This document augments the the generic TE topology draft [TE-TOP0].

What is not in scope of this document is both impairment-aware WSON and flex-grid.

This document defines two YANG models: ietf-wson-topology ([Section 3](#)) and ietf-te-wson-types ([Section 4](#)).

2. YANG Model (Tree Structure)

```

module: ietf-wson-topology
  augment /nd:networks/nd:network/nd:network-types/tet:te-topology:
    +--rw wson-topology!
  augment /nd:networks/nd:network/nd:node/tet:te/tet:config/tet:te-node-
attributes/tet:connectivity-matrices/tet:connectivity-matrix:
    +--rw wavelength-availability-range?  te-wson-types:wavelength-range-type
  augment /nd:networks/nd:network/nd:node/tet:te/tet:state/tet:te-node-
attributes/tet:connectivity-matrices/tet:connectivity-matrix:
    +--ro wavelength-availability-range?  te-wson-types:wavelength-range-type
  augment /nd:networks/nd:network/lnk:link/tet:te/tet:config/tet:te-link-
attributes:
    +--rw channel-num?                    int32
    +--rw first-channel-frequency?        decimal64
    +--rw channel-spacing?                decimal64
    +--rw available-wavelength-info* [priority]
      +--rw priority                      uint8
      +--rw wavelength-availability-range?  te-wson-types:wavelength-range-
type
  augment /nd:networks/nd:network/lnk:link/tet:te/tet:state/tet:te-link-
attributes:
    +--ro channel-num?                    int32
    +--ro first-channel-frequency?        decimal64
    +--ro channel-spacing?                decimal64
    +--ro available-wavelength-info* [priority]
      +--ro priority                      uint8
      +--ro wavelength-availability-range?  te-wson-types:wavelength-range-
type
  augment /nd:networks/nd:network/nd:node/tet:te/tet:config/tet:te-node-
attributes:
    +--rw wson-node
      +--rw node-type?  identityref
  augment /nd:networks/nd:network/nd:node/tet:te/tet:state/tet:te-node-
attributes:
    +--ro wson-node
      +--ro node-type?  identityref
  augment /nd:networks/nd:network/nd:node/tet:te/tet:tunnel-termination-
point/tet:config:
    +--rw available-operational-mode*  te-wson-types:operational-mode

```

```
    +--rw operational-mode?          te-wson-types:operational-mode
augment /nd:networks/nd:network/nd:node/tet:te/tet:tunnel-termination-
point/tet:state:
    +--ro available-operational-mode* te-wson-types:operational-mode
```

`+-ro operational-mode?`

`te-wson-types:operational-mode`

3. IETF-WSN-Topology YANG Model

```
<CODE BEGINS> file "ietf-wson-topology@2017-10-09.yang"

module ietf-wson-topology {
//TODO: FIXME
    //yang-version 1.1;

    namespace "urn:ietf:params:xml:ns:yang:ietf-wson-topology";

    prefix "wson";

    import ietf-network {
        prefix "nd";
    }

    import ietf-network-topology {
        prefix "lnk";
    }

    import ietf-inet-types {
        prefix "inet";
    }

    import ietf-te-topology {
        prefix "tet";
    }
}
```

```
import ietf-te-wson-types { //Modified
prefix "te-wson-types";
}

//NOT NEEDED
/*import ietf-transport-types {
prefix "tran-types";
} */

organization
  "IETF CCAMP Working Group";

contact
  "Editor:  Young Lee  <leeyoung@huawei.com>";

description
  "This module contains a collection of YANG definitions
  for
    RWA WSON.

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  as
    authors of the code.  All rights reserved.

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  Legal
    Provisions Relating to IETF Documents
    (http://trustee.ietf.org/license-info).";

revision 2017-10-09 {
  description
    "version 8.";

  reference
    "RFC XXX: A Yang Data Model for WSON Optical
  Networks ";
```

```
}

typedef wson-topology-id {
    type inet:uri;
    description
        "The WSON Topology ID";
}

grouping wson-topology-type {
    description "wson-topology type";
    container wson-topology {
        presence "indicates a topology of wson";
        description
            "Container to identify wson topology type";
    }
}

grouping wson-node-attributes {
    description "WSOON node attributes";
    container wson-node {
        description "WSOON node attributes.";
        leaf node-type {
            type identityref {
                base te-wson-types:wson-node-type;
            }
            description "WSOON node type.";
        }
    }
}

grouping wson-wavelength-availability-range{
    description "wavelength availability range";

    leaf wavelength-availability-range{
        type te-wson-types:wavelength-range-type;
        description
            "range that indicates if a wavelength is
            available or not on each channel at
            specified priority level.";
    }
}
```

```

    grouping wson-link-attributes {
        description "WSON link attributes";
        leaf channel-num {
            type int32;
            description "Number of OCh channels available";
        }
        leaf first-channel-frequency {
            type decimal64 {
                fraction-digits 5;
            }
            units THz;
            description "First channel frequency in the grid";
        }
        leaf channel-spacing {
            type decimal64 {
                fraction-digits 5;
            }
            units GHz;
            description "This is fixed channel spacing for
WSON,
                e.g, 12.5, 25, 50, 100, ..";
        }

        list available-wavelength-info{
            key "priority";
            max-elements "8";

            description
                "List of available wavelength channels on
this link";

            leaf priority {
                type uint8 {
                    range "0..7";
                }
                description "priority";
            }
            uses wson-wavelength-availability-range;
        }
    }

```



```
    grouping wson-tp-attributes {
        description "wson-tp-attributes";

        leaf client-facing {
            type empty;
            description
                "if present, it means this tp is a client-
facing tp.
                adding/dropping client signal flow.";
        }

/*
//can it be fully covered by interface-switching-capability of base
TE model?
        leaf-list supported-client-signals {
            type identityref {
                base tran-types:client-signal;
            }
            description
                "Supported client signals at this TP";
        }
*/
    }

    grouping wson-ttp-attributes {
        description "WSON tunnel termination point (e.g.
tranponder)
        attributes";
        leaf-list available-operational-mode {
            type te-wson-types:operational-mode;
            description "List of all vendor-specific supported
mode identifiers";
        }

        leaf operational-mode {
            type te-wson-types:operational-mode;
            description "Vendor-specific mode identifier";
        }
    }
```

```
/* AUGMENTS */

augment "/nd:networks/nd:network/nd:network-types"
  + "/tet:te-topology" {
    description "wson-topology augmented";
    uses wson-topology-type;
  }

//FIXING NMDA
augment "/nd:networks/nd:network/nd:node/tet:te"
  + "/tet:te-node-attributes/tet:connectivity-matrices"
  + "/tet:connectivity-matrix" {
    when "/nd:networks/nd:network/nd:network-types"
      + "/tet:te-topology/wson:wson-topology" {
      description
        "This augment is only valid for WSON
connectivity
matrix.";
    }
    description "WSON connectivity matrix config
augmentation";
    uses wson-wavelength-availability-range;
  }

//REMOVING
/*
augment "/nd:networks/nd:network/nd:node/tet:te/tet:state"
  + "/tet:te-node-attributes/tet:connectivity-matrices"
  + "/tet:connectivity-matrix" {
    when "/nd:networks/nd:network/nd:network-types"
      + "/tet:te-topology/wson-topology" {
      description
        "This augment is only valid for WSON
connectivity
matrix.";
    }
    description "WSON connectivity matrix state augmentation";
    uses wson-wavelength-availability-range;
  }*/

//FIXING NMDA
```

```
augment "/nd:networks/nd:network/lnk:link/tet:te"
  + "/tet:te-link-attributes" {
  when "/nd:networks/nd:network/nd:network-types"
    +"/tet:te-topology/wson:wson-topology" {
    description
      "This augment is only valid for WSON.";
  }
  description "WSON Link augmentation.";

  uses wson-link-attributes;
}

//REMOVING
/*
augment "/nd:networks/nd:network/lnk:link/tet:te/tet:state"
  + "/tet:te-link-attributes" {
  when "/nd:networks/nd:network/nd:network-types"
    +"/tet:te-topology/wson:wson-topology" {
    description
      "This augment is only valid for WSON.";
  }
  description "WSON Link augmentation.";

  uses wson-link-attributes;
}*/

//FIXING NMDA
augment "/nd:networks/nd:network/nd:node/tet:te"
  + "/tet:te-node-attributes" {
  when "/nd:networks/nd:network/nd:network-types"
    +"/tet:te-topology/wson:wson-topology" {
    description
      "This augment is only valid for WSON.";
  }
  description "WSON Node augmentation.";

  uses wson-node-attributes;
}

//REMOVING
/*
```

```
augment "/nd:networks/nd:network/nd:node/tet:te/tet:state"
  + "/tet:te-node-attributes" {
    when "/nd:networks/nd:network/nd:network-types"
      + "/tet:te-topology/wson:wson-topology" {
      description
        "This augment is only valid for WSON.";
    }
    description "WSON Node augmentation.";

    uses wson-node-attributes;
  }*/

//FIXING NMDA
augment "/nd:networks/nd:network/nd:node/tet:te"
  + "/tet:tunnel-termination-point" {
    when "/nd:networks/nd:network/nd:network-types"
      + "/tet:te-topology/wson:wson-topology" {
      description
        "This augment is only valid for WSON.";
    }
    description "WSON tunnel termination point
augmentation.";

    uses wson-ttp-attributes;
  }

//removing
/*augment "/nd:networks/nd:network/nd:node/tet:te"
  + "/tet:tunnel-termination-point/tet:state" {
    when "/nd:networks/nd:network/nd:network-types"
      + "/tet:te-topology/wson:wson-topology" {
      description
        "This augment is only valid for WSON.";
    }
    description "WSON tunnel termination point
augmentation.";

    uses wson-ttp-attributes;
  }*/
```

```
}  
<CODE ENDS>
```

4. IETF-TE-WSOY-Types YANG Model

```
<CODE BEGINS> file "ietf-te-wson-types@2017-10-09.yang"  
  module ietf-te-wson-types {  
    namespace "urn:ietf:params:xml:ns:yang:ietf-te-wson-types";  
    prefix "te-wson-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@huawei.com>  
  
      Editor: Young Lee  
        <mailto:leeyoung@huawei.com>";  
  
    description  
      "This module defines WSON types.";   
  
    revision "2017-10-09" {  
      description  
        "Revision 0.1";  
      reference "TBD";  
    }  
  
    typedef operational-mode {  
      type string;  
      description  
        "Vendor-specific mode that guarantees interoperability.  
        It must be an string with the following format:  
        B-DSW-ytz(v) where all these attributes are conformant  
        to the ITU-T recommendation";  
      reference "ITU-T G.698.2 (11/2009) Section 5.3";  
    }  
  }
```

```
identity wson-node-type {
  description
    "WSON node type.";
  reference
    "";
}

identity wson-node-foadm {
  base wson-node-type;
  description
    "Fixed OADM node.";
}

identity wson-node-roadm {
  base wson-node-type;
  description
    "ROADM or OXC node.";
}

identity wson-node-ila {
  base wson-node-type;
  description
    "ILA (In-Line Amplifier) node.";
}

//ADDED
typedef wavelength-range-type {
  type string {
    pattern "([1-9][0-9]{0,3}(-[1-9][0-9]{0,3})?" +
      "(,[1-9][0-9]{0,3}(-[1-9][0-9]{0,3})?)*)";
  }
  description
    "A list of WDM channel numbers (starting at 1)
    in ascending order. For example: 1,12-20,40,50-80";
}

identity wavelength-assignment {
  description "Wavelength selection base";
}
```

```
identity unspecified-wavelength-assignment {
    base wavelength-assignment;
    description "No method specified";
}

identity first-fit-wavelength-assignment {
    base wavelength-assignment;
    description "All the available wavelengths are numbered,
        and this WA method chooses the available wavelength
        with the lowest index.";
}

identity random-wavelength-assignment {
    base wavelength-assignment;
    description "This WA method chooses an available
        wavelength randomly.";
}

identity least-loaded-wavelength-assignment {
    base wavelength-assignment;
    description "This WA method selects the wavelength that
        has the largest residual capacity on the most loaded
        link along the route (in multi-fiber networks).";
}

}
```

<CODE ENDS>

5. Security Considerations

TDB

[6.](#) IANA Considerations

TDB

[7.](#) Acknowledgments

This document was prepared using 2-Word-v2.0.template.dot.

8. References

8.1. Normative References

[TE-TOP0] X. Liu, et al., "YANG Data Model for TE Topologies", work in progress: [draft-ietf-teas-yang-te-topo](#).

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[RFC7579] G. Bernstein, Y. Lee, D. Li, W. Imajuku, "General Network Element Constraint Encoding for GMPLS Controlled Networks", [RFC 7579](#), June 2015.

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9. Contributors

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