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Internet Draft

Intended status: Standard Track

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Expires: May 12, 2018

November 12, 2017

A Yang Data Model for WSON Optical Networks

[draft-ietf-ccamp-wson-yang-09.txt](#)

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:te-node-
attributes/tet:connectivity-matrices/tet:connectivity-matrix:
    +--rw wavelength-availability-range?  te-wson-types:wavelength-range-type
  augment /nd:networks/nd:network/lnk:link/tet:te/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/nd:node/tet:te/tet:te-node-attributes:
    +--rw wson-node
      +--rw node-type?  identityref
  augment /nd:networks/nd:network/nd:node/tet:te/tet:tunnel-termination-point:
    +--rw available-operational-mode*  te-wson-types:operational-mode
    +--rw operational-mode?            te-wson-types:operational-mode
```

3. IETF-WSON-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.

as
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(<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 "WSON node attributes";
container wson-node {
description "WSON node attributes.";

```

        leaf node-type {
            type identityref {
                base te-wson-types:wson-node-type;
            }
            description "WSON 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 "WSOON 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-WSON-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-DScW-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](#).

8.2. Informative References

[RFC7446] Y. Lee, G. Bernstein, D. Li, W. Imajuku, "Routing and Wavelength Assignment Information Model for Wavelength Switched Optical Networks", [RFC 7446](#), February 2015.

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

[RFC7581] G. Bernstein, Y. Lee, D. Li, W. Imajuku, "Routing and Wavelength Assignment Information Encoding for Wavelength Switched Optical Networks", [RFC 7581](#), June 2015.

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