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YANG Data Model for Power-Group Aware TE Topology
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Abstract

This document discusses the notion of a Power-Group construct as an attribute of a Traffic Engineered (TE) Link and defines a YANG data model for representing a Power-Group aware TE topology.

Status of This Memo

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1. Introduction

A Traffic Engineered (TE) topology is a schematic arrangement of TE nodes and TE links. It is the topology on which path computational algorithms are run to compute TE paths. This document introduces a TE link attribute called the Power-Group which can be used by TE path computational algorithms to facilitate Power-Group aware TE Path placement. A Power-Group represents a set of TE links that are terminated on a specific TE node and have a common dependency on a forwarding engine component which when powered down will bring down all the TE links in the set. Each Power-Group has a numerical rating associated with it - the lower the value, the better the rating. The specifics of the algorithms used for computing Power-Group Aware TE paths is outside the scope of this document.

[RFC8795] defines a data model for representing TE topologies and contains technology-agnostic building blocks that can be augmented by other technology-specific TE topology models. The Power-Group Aware TE Topology data model introduced in this document is an augmentation of the TE Topology model defined in [RFC8795].

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

1.2. Terminology

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

The reader is expected to be familiar with the topology modeling terminology specified in [RFC8345], [RFC8776] and [RFC8795].

1.3. Tree Structure

A simplified graphical representation of the data model is presented in Appendix A of this document. The meaning of the symbols in this representation is defined in [RFC8340].

2. Power-Group Aware TE Topology Data Model

2.1. Model Structure

The high-level model structure defined by this document is as shown below:

```
module: ietf-te-topology-pwrgrp
  augment /nw:networks/nw:network/nw:network-types/tet:te-topology:
    +--rw pg!
  augment /nw:networks/nw:network/nw:node/tet:te
            /tet:te-node-attributes:
    +--rw power-groups
       +--rw power-group* [name]
          +  ..........
  augment /nw:networks/nw:network/nt:link/tet:te
            /tet:te-link-attributes:
    + ..........
```

The 'network-types/te-topology' container is augmented to carry the definition of a new TE topology type for Power-Group Aware TE Topology. The 'node/te/te-node-attributes' container is augmented to carry the information about the set of Power-Groups associated with a given TE node. And the 'link/te/te-link-attributes' container is augmented to carry the Power-Group specific information that the TE link is associated with.

2.2. Augmenting TE Node Attributes

The 'power-groups' container carries a list of Power Groups associated with the given TE node. Each power-group entry is identified by a 'name'. It also carries a numerical 'value' leaf that uniquely identifies the Power-Group and a 'cost' leaf that provides a static rating of the Power-Group. A lower 'cost' translates to a better rating. It is to be noted that the identifier of a Power-Group is unique and significant only at the TE node level and not at the TE topology level.

```
augment /nw:networks/nw:network/nw:node/tet:te
          /tet:te-node-attributes:
  +--rw power-groups
     +--rw power-group* [name]
        +--rw name     string
        +--rw value?   uint32
        +--rw cost?    decimal64
```

2.3. Augmenting TE Link Attributes

The augmented 'te-link-attributes' container includes a list of references to the Power-Groups that the TE link is associated with. It also carries information that specifies if the TE link can be placed in 'power-save' mode and the amount of bandwidth that is currently unavailable as a result of the link being in 'power-save' mode. If this bandwidth is zero, then it means that the link is not in 'power-save' mode.

```
augment /nw:networks/nw:network/nt:link/tet:te
          /tet:te-link-attributes:
  +--rw power-groups*           pg-ref
  +--rw power-save-capable?     boolean
  +--rw power-save-bandwidth
     +--rw te-bandwidth
        +--rw (technology)?
           +--:(generic)
              +--rw generic?   te-bandwidth
```

2.4. YANG Module

```
<CODE BEGINS> file "ietf-te-topology-pwrgrp@2026-03-02.yang"
module ietf-te-topology-pwrgrp {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-te-topology-pwrgrp";
  prefix tet-pg;

  import ietf-network {
```

```
      prefix nw;
      reference
        "RFC 8345: A YANG Data Model for Network Topologies";
    }
    import ietf-network-topology {
      prefix nt;
      reference
        "RFC 8345: A YANG Data Model for Network Topologies";
    }
    import ietf-te-topology {
      prefix tet;
      reference
        "RFC 8795: YANG Data Model for Traffic Engineering (TE)
         Topologies";
    }
    import ietf-te-types {
      prefix te-types;
      reference
        "RFC 8776: Common YANG Data Types for Traffic Engineering";
    }

    organization
      "IETF Traffic Engineering Architecture and Signaling (TEAS)
       Working Group.";
    contact
      "WG Web:   <http://tools.ietf.org/wg/teas/>
       WG List:  <mailto:teas@ietf.org>

       Editor:   Colby Barth
                 <mailto:jonathan.barth@hpe.com>

       Editor:   Vishnu Pavan Beeram
                 <mailto:vishnupavan.ietf@gmail.com>";
    description
      "YANG data model for representing Power-Group aware TE
       topology.

       Copyright (c) 2026 IETF Trust and the persons identified as
       authors of the code.  All rights reserved.

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       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
```

```
       (https://www.rfc-editor.org/info/rfcXXXX); see the RFC itself
       for full legal notices.";

     revision 2026-03-02 {
       description
         "Initial revision.";
       reference
         "RFC XXXX: YANG Data Model for Power-Group aware TE Topology";
     }

     /*
      * Typedefs
      */

     typedef pg-ref {
       type leafref {
         path "/nw:networks/nw:network/nw:node/tet:te/"
            + "tet:te-node-attributes/tet-pg:power-groups/"
            + "tet-pg:power-group/tet-pg:name";
       }
       description
         "This type is used to reference a Power-Group on a given node";
     }

     /*
      * Groupings
      */

     grouping pg-topology-type {
       description
         "Identifies the Power-Group aware TE topology type.";
       container pg {
         presence "Indicates that the TE topology is Power-Group
                   aware.";
         description
           "Its presence identifies that the TE topology is Power-Group
            aware.";
       }
     } // pg-topology-type

     grouping pg-node-attributes {
       description
         "Grouping for carrying Power-Group specific node attributes";
       container power-groups {
         description
           "Container for Power-Groups.";
         list power-group {
           key "name";
```

```
          unique "value";
          description
            "List of Power-Groups.";
          leaf name {
            type string;
            description
              "A string that uniquely identifies the Power-Group on a
               given node.";
          }
          leaf value {
            type uint32;
            description
              "An integer that uniquely identifies the Power-Group on
               a given node.";
          }
          leaf cost {
            type decimal64 {
              fraction-digits 2;
            }
            description
              "Rating/Cost of the Power-Group.";
          }
        }
      }
    } // pg-node-attributes

    grouping pg-link-attributes {
      description
        "Grouping for carrying Power-Group specific link attributes";
      leaf-list power-groups {
        type pg-ref;
        description
          "List of associated Power-Groups";
      }
      leaf power-save-capable {
        type boolean;
        description
          "Can the link be placed in power-save mode?";
      }
      container power-save-bandwidth {
        uses te-types:te-bandwidth;
        description
          "Amount of bandwidth that is currently unavailable on this
           link as a result of the link being in power-save mode. If
           the link is not in power-save mode, power-save-bandwidth
           is zero. Units are in bytes per second.";
      }
    } //pg-leaf-attributes
```

```
    /*
     * Augmentations
     */

    augment "/nw:networks/nw:network/nw:network-types/"
          + "tet:te-topology" {
      description
        "Defines the Power-Group aware TE topology type.";
      uses pg-topology-type;
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:te-node-attributes" {
      description
        "Augmentation for Power-Group specific node attributes.";
      uses pg-node-attributes;
    }

    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:te-link-attributes" {
      description
        "Augmentation for Power-Group specific link attributes.";
      uses pg-link-attributes;
    }
  }
  <CODE ENDS>
```

3. IANA Considerations

This document registers the following URI in the IETF XML registry [RFC3688]. Following the format in [RFC3688], the following registration is requested to be made.

URI: urn:ietf:params:xml:ns:yang:ietf-te-topology-pwrgrp
Registrant Contact: The TEAS WG of the IETF.
XML: N/A, the requested URI is an XML namespace.

This document registers a YANG module in the YANG Module Names registry [RFC6020].

name: ietf-te-topology-pwrgrp
namespace: urn:ietf:params:xml:ns:yang:ietf-te-topology-pwrgrp
prefix: tet-pg
reference: RFCXXXX

RFC Editor: Please replace XXXX with the RFC number assigned to this document.

4. Security Considerations

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF [RFC6241] or RESTCONF [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 for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

The data nodes defined in this YANG module that are writable/creatable/deletable (i.e., config true, which is the default) may be considered sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:

* "/nw:networks/nw:network/nw:network-types/tet:te-topology/pg": This subtree specifies the topology type. Modifying the configurations can make the topology type invalid and cause interruption to the specified Power-Group Aware TE topology.

* "/nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes/ power-groups": This subtree specifies the configurations for Power-Groups associated with a TE node. By manipulating these data nodes, a malicious attacker may cause unauthorized and improper behavior to any TE path placement application that is making use of the compromised Power-Groups information.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes": This augmented subtree includes the configurations for Power-Group specific information associated with a TE link. By manipulating these data nodes, a malicious attacker may cause unauthorized and improper behavior to any TE path placement application that is making use of the compromised Power-Groups information.

The readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via get, get-config, or notification) to these data nodes. These are the subtrees and data nodes and their sensitivity/vulnerability:

* "/nw:networks/nw:network/nw:network-types/tet:te-topology/pg": Unauthorized access to this subtree can disclose the Power-Group Aware TE topology type.

* "/nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes/power-groups": Unauthorized access to this subtree can disclose the Power-Groups information associated with a given TE node.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes": Unauthorized access to this augmented subtree can disclose the Power-Group specific information associated with a TE link.

5. References

5.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/rfc/rfc2119>.

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[RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <https://www.rfc-editor.org/rfc/rfc6020>.

[RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", RFC 6241, DOI 10.17487/RFC6241, June 2011, <https://www.rfc-editor.org/rfc/rfc6241>.

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[RFC8446] Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.3", RFC 8446, DOI 10.17487/RFC8446, August 2018, <https://www.rfc-editor.org/rfc/rfc8446>.

[RFC8776] Saad, T., Gandhi, R., Liu, X., Beeram, V., and I. Bryskin, "Common YANG Data Types for Traffic Engineering", RFC 8776, DOI 10.17487/RFC8776, June 2020, <https://www.rfc-editor.org/rfc/rfc8776>.

[RFC8795] Liu, X., Bryskin, I., Beeram, V., Saad, T., Shah, H., and O. Gonzalez de Dios, "YANG Data Model for Traffic Engineering (TE) Topologies", RFC 8795, DOI 10.17487/RFC8795, August 2020, <https://www.rfc-editor.org/rfc/rfc8795>.

5.2. Informative References

[RFC8340] Bjorklund, M. and L. Berger, Ed., "YANG Tree Diagrams", BCP 215, RFC 8340, DOI 10.17487/RFC8340, March 2018, <https://www.rfc-editor.org/rfc/rfc8340>.

Appendix A. Complete Model Tree Structure

```
   module: ietf-te-topology-pwrgrp

     augment /nw:networks/nw:network/nw:network-types/tet:te-topology:
       +--rw pg!
     augment /nw:networks/nw:network/nw:node/tet:te
               /tet:te-node-attributes:
       +--rw power-groups
          +--rw power-group* [name]
             +--rw name     string
             +--rw value?   uint32
             +--rw cost?    decimal64
     augment /nw:networks/nw:network/nt:link/tet:te
               /tet:te-link-attributes:
       +--rw power-groups*           pg-ref
       +--rw power-save-capable?     boolean
       +--rw power-save-bandwidth
          +--rw te-bandwidth
             +--rw (technology)?
                +--:(generic)
                   +--rw generic?   te-bandwidth
```

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