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A Yang model for I2RS service topology
draft-hares-i2rs-service-topo-dm-06.txt

Abstract

This document defines I2RS protocol-independent service layer virtual topology data model. This data model utilizes the concepts in the generic I2RS topology model of virtual networks (node, links, termination points) and cross-layer topologies. This virtual service topology may be a composite layer created from the combination of protocol-dependent service layers. Protocol-dependent services layers include: L3VPN, L2VPN, EVPN, E-Tree, and others.

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Internet-Draft

I2RS Service Topology

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[1.](#) Introduction

Service topology in [[I-D.ietf-i2rs-yang-network-topo](#)] includes the a virtual topology for a service layer above the L1, L2, and L3 layers. This virtual topology has the generic topology elements of node, link, and terminating point. The virtual service topology is a network-wide topology stored on one routing system which an I2RS agent is connected to.

The virtual service topology is a composite summary of the services available services gathered from the lower layer indications of L3VPN, L2VPN, and EVPN services, E-TREE services, Seamless MPLS topologies within an As and others. This is a "bottoms up" yang module providing composite protocol independent service topology based on these protocol services.

This "bottoms-up" yang model does provide a mechanism to link this bottoms up model to a top-down service model. One example of a top-down service model for L3 VPNs is the L3 Service yang data model [[I-D.ietf-l3sm-l3vpn-service-model](#)]. Although the two models are linked, the top-down service model cannot be derived from the lower layers.

1.1. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119](#) [[RFC2119](#)].

1.2. Base Model: the Service-Topology Component

The following diagram contains an informal graphical depiction of the main elements of the information model:

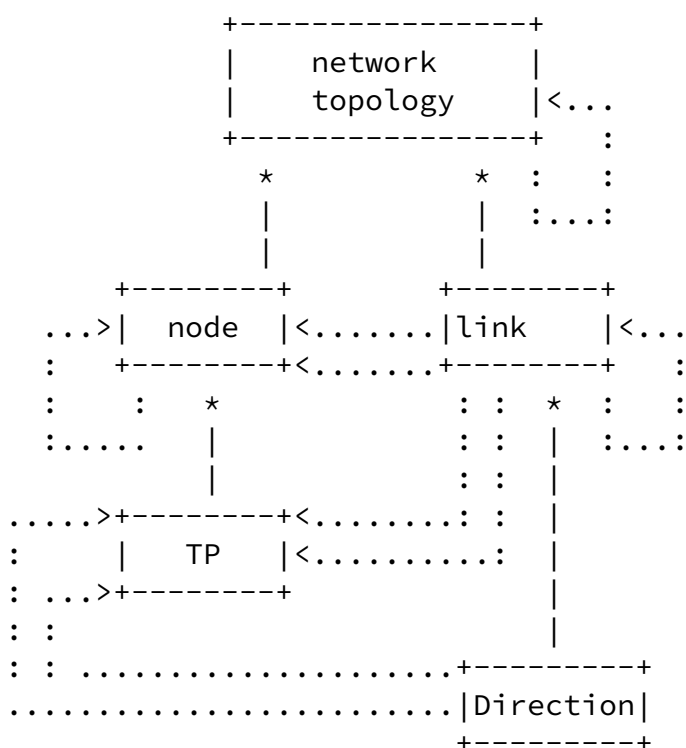


Figure 1

The link between the upper layer and the lower layer occurs by linking the bottoms up service network topologies to Top-down service topologies at certain service nodes to support transport of service across a virtual service link.

An example of the top-down service topology link to the bottoms up composite service topology may help. Suppose a bottoms up topology contains a composite of 3 L3VPN network topologies, 2 L2VPN network

topologies, and 2 EVPN network topologies. Each of these physical networks can support virtual networks on top of the physical network. The service network base bottoms up is formed topology map with all of these topologies.

Suppose an L3SM has three VPN services topologies which support three services over 9 virtual topologies transiting the 2 of the L3VPN networks.

- o VPN-svc 1: supporting hub-spoke flow for Customer 1 with 2 Cloud identifiers (2 topologies) with connecting the customers access at 3 sites

- o VPN-svc 2: supporting hub-spoke flow disjoint for Customer 2 with 2 Cloud identifiers (2 topologies) at 3 sites,
- o VPN-svc 3: supporting any-to-any flow for Customer 3 with 1 Cloud Identifier (5 topologies) at 3 sites.

Let us examine how VPN-svc 1 links to the composite cloud. Let us assume for simplicity of the example that the nodes providing the L3VPN provider equipment (PE) and the customer equipment (CE) at all sites are all unique. The diagram of how the top-down service topology meets the bottom up service topology is shown in figure

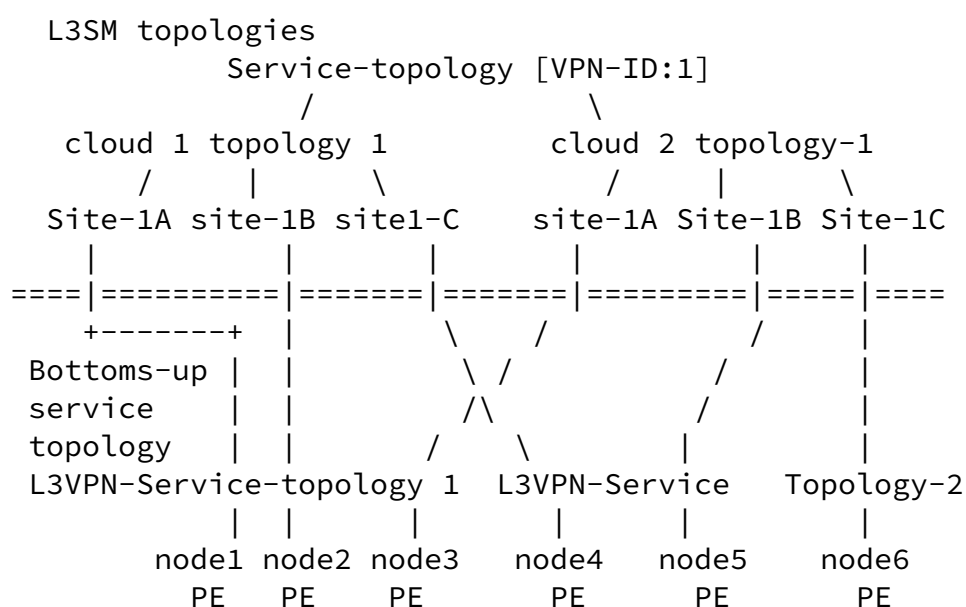




Figure 2

These two layers of service topologies are by two different composite models composite models and different supporting models as follows:

- o Top-Down Provider Services with supporting L3SM model,
- o Bottom-Up I2RS Composite Services with supporting model from L3VPN, L2VPN, EVPN (only L3VPN used). The links between topologies occur at specific nodes.

2. High level Yang architecture

This section describes the Yang High level architecture.

2.1. Network level

The service topology network level defines the following high-level yang architecture:

```

module: i2rs-service-topologies
  augment /nw:network/nw:network-types:
    +--rw service-topologies-types
  augment /nw:network:
    +--rw service-topology-attributes
      +--rw name?    string
      +--rw description? string
      +--rw composite-flag* identity-ref
    +--rw tdsvc-supports-attributes*
      [tdsvc-attr-name]
      +--rw tdsvc-attr-name string
      +--rw tdsvc-supports-attribute* identityref
  
```

Note: Composite flags are bottoms-up flags

Figure 3

The service topology attributes for a network include the following

name - name of the service topology,

description - description of service topology

composite-flags - bit mask with flags of service layer topologies network topology node available to create service topology from. These topologies include: L3VPN, L2VPN, and EVPN services, E-TREE services, Seamless MPLS topologies within an AS and others.

tdsvc-supports-attributes - composite topology supports top-down services topology attributes

tdsvc-supports-attr-name - name of top-down service attribute

tdsvc-supports-attribute - identity ref of service attribute (e.g. L3SM service for any-to-any)

[2.2.](#) Node level

```
module: i2rs-service-topologies
....
augment /nw:network/nw:node
  +--rw node-service-attributes
    +--rw c-svc-node-name?   inet:domain-name
    +--rw c-svc-node-flag*   identityref;
    +--rw tdsvc-node-supports-attributes*
      [tdsvc-node-attr-name]
    +--rw tdsvc-node-attr-name string;
    +--rw tdsvc-node-supports-attribute identityref
  // Top down attributes supported
```

The additional fields in the service attributes are the following:

c-svc-node-name - name of network node,

c-svc-node-flag - composite service topology node flag. The service node can be a member of one of the existing topology type (L3VPN, L2VPN, EVPN, E-TREE, Seamless MPLS, MPLS-TE, MPLS node, or I2RS created).

tdsvc-node-supports-attributes - node supports top-down services topology attributes

tdsvc-supports-node-attr-name - name of top-down service attribute

tdsvc-supports-node-attribute - identity ref of service attribute (e.g. L3SM service for any-to-any)

[2.3.](#) Service Link and Termination point

```
augment /nw:network/nt:link:
  +--rw service-link-attributes
    +--rw c-svc-link-name?      string
    +--rw c-svc-link-type identityref
    +--rw c-svc-link-metric?   uint32
      +--rw tdsvc-link-supports-attr* [name]
        +--rw tdsvc-link-attr-name string
        +--rw tdsvc-link-attribute identityref
```

```

augment /nw:network/nw:node/nt:termination-point:
  +--rw service-termination-point-attributes
    +--rw svc-tp-name string
      +--rw svc-tp-type identityref
      +--rw tdsvc-tp-support-attributes
        +--rw tdsvc-tp-attr-name
          +--rw tdsvc-tp-support-attribute

```

The augmentation to the service topology is the service link attributes which include:

c-svc-link-name - name of the link,

c-svc-link-type - the service link type supported by this logical link.

metric - the metric of the service type. This metric allows the composite link to store a svc level metric. 0 = no service metric. 1-n values (1 best, n worse).

svc-attributes - the composite attributes of link

tdsvc-td-support-attributes - link support of Top-down attributes

tdsvc-supports-node-attr-name - name of top-down service attribute

tdsvc-supports-node-attribute - identity ref of service attribute (e.g. L3SM service for any-to-any)

The augmentation to the termination point include the following

svc-tp-name - name of termination point,

tp-type - type of link (L3VPN, L2VPN, combined)

tdsvc-tp-support-attributes - list of top-level domain-name attributes this links supports.


```

<CODE BEGINS> file "ietf-i2rs-service-topology@2016-02-q0.yang"

module ietf-i2rs-service-topology{
  namespace "urn:ietf:params:xml:ns:yang:ietf-i2rs-service-topology";
  prefix i2rs-st;

  import ietf-inet-types {
    prefix inet;
  }

  import ietf-network {
    prefix nw;
  }
  import ietf-network-topology {
    prefix "nt";
  }

  organization "IETF";
    contact
    "email: shares@ndzh.com;
    email: linda.dunbar@huawei.com;
    ";

  description
    "This module defines a model for the service topology.
    This service model imports
    - ietf-network and ietf-network-topology from
      draft-ietf-i2rs-yang-network-topo-02.txt,
    - ietf-routing from draft-ietf-netmod-routing-cfg,
    - ietf-l3vpn-svc from
      draft-ietf-l3sm-l3vpn-service-model.
      (not defined yet )
    ";

  revision 2016-02-12 {
    description
      "Version 1 - initial version;
      Version 2 - yang format fixed
      Version 3 - erro in xml file
      version 4 - remove next-hops attribute.
      version 5- links to top-level attributes.
      version 6 - Remove extra parameters.";

    reference "draft-hares-i2rs-service-topo-dm-05.txt";
  }

```

```
identity svc-topo-flag-identity {
    description "Base type for svc flags";
}
identity l3vpn-svc-topo {
    base svc-topo-flag-identity;
    description "L3VPN service type";
}
identity l2vpn-svc-topo {
    base svc-topo-flag-identity;
    description "L2VPN service type";
}
identity EVPN-svc-topo {
    base svc-topo-flag-identity;
    description "EVPN service type";
}
identity Seamless-MPLS-svc-topo {
    base svc-topo-flag-identity;
    description "Seamless MPLS service type";
}
identity Etree-svc-topo {
    base svc-topo-flag-identity;
    description "Seamless MPLS service type";
}
identity I2rs-svc-topo {
    base svc-topo-flag-identity;
    description "I2RS create service topo";
}

identity svc-tp-type {
    description "Base type for service
        termination-point type flags";
}
identity svc-tp-type-service {
    base svc-tp-type;
    description "service type";
}
identity svc-tp-type-ip {
    base svc-tp-type;
    description "service IP";
}
identity svc-tp-type-unnum {
    base svc-tp-type;
    description "service unnumbered link";
}
```

```
identity svc-link-type {
    description "Base type for composite
```

```
        service link attribute flags";
    }

    identity svc-link-ip-te {
        base svc-link-type;
        description "service link
        that support IP traffic engineering";
    }

    identity svc-link-ip-multicast {
        base svc-link-type;
        description "service link that
        supports IP multicast.";
    }

    identity tdsvc-support-identity {
        description "Base type for svc flags";
    }

    identity td-L3sm-hub-spoke {
        base tdsvc-support-identity;
        description "Supports L3SM hub-spoke";
    }

    identity td-L3sm-hub-spoke-disjoint {
        base tdsvc-support-identity;
        description "Supports L3SM hub-spoke disjoint";
    }

    identity td-L3sm-any-any {
        base tdsvc-support-identity;
        description "Supports L3SM any-any";
    }

    grouping svc-combo-network-type {
        description "Identify the topology type to be
        composite service topology.";
        container svc-combo-network {
            presence "indicates Service layer Network";
            description
```

```

        "The presence of the container node indicates
        Service layer which combines networks
            L3VPN, L2VPN, and others";
    }
}

```

```

grouping service-topology-attributes {
    leaf name {

```

```

        type string;
        description "name of service
        topology";
    }
    leaf description {
        type string;
        description "description
        of service attribute";
    }
    leaf composite-flag {
        type identityref {
            base svc-topo-flag-identity;
        }
        description "other topologies
        this topology is configured to
        be a composite of
        (L3VPN, L2VPN, I2RS only)";
    }

    list tdsvc-supports-attributes {
        key tdsvc-attr-name;
        leaf tdsvc-attr-name {
            type string;
            description "top-down
            service support attribute name";
        }
        leaf tdsvc-supports-attribute {
            type identityref {
                base tdsvc-support-identity;
            }
            description "top-down service
            attribute this topology supports.";
        }
    }
}

```

```

        }
        description "supporting top-down
service attributes. ";
    }
    description "Group of attributes for
service topology";
}

grouping node-svc-attribute {
    leaf c-svc-node-name{
        type inet:domain-name;
        description "Domain name for node";
    }
}

```

```

leaf c-svc-flag {
    type identityref {
        base svc-topo-flag-identity;
    }
    description "virtual network
node can be composite of the
topologies list
(L3VPN, L2VPN, I2RS only)";
}

list tdsvc-node-supports-attributes {
    key tdsvc-node-attr-name;
    leaf tdsvc-node-attr-name {
        type string;
        description "name of top-down
service attribute ";
    }
    leaf tdsvc-node-supports-attribute {
type identityref {
    base tdsvc-support-identity;
    }
        description "top-down service
attribute this topology supports.";
    }
}

```

```

        description "list of top-down service
        attributes this node supports";
    }

    description
    "grouping of composite flag";
}

grouping service-link-attributes {
leaf c-svc-link-name {
    type string;
    description "name of
    service link";
}
leaf c-svc-link-type {
    type identityref {
        base svc-link-type;
    }
    description "other topologies
    this link is current a
        composite of
    (L3VPN, L2VPN, I2RS only)";
}
}

```

```

leaf c-svc-link-metric {
    type uint32;
    description "link metric
    for servicest to
        allow TE loading at composite
    service level";
}

list tdsvc-link-supports-attributes {
    key tdsvc-link-attr-name;
    leaf tdsvc-link-attr-name {
        type string;
        description "top-down
        service support attribute name";
    }
    leaf c-svc-link-td-support-attribute {
        type identityref {
            base tdsvc-support-identity;
        }
    }
}

```

```

        description "top-down service
        attribute this link supports.";
    }
    description "list of service level
    link attributes";
}
description "grouping of
service link attribute";
}

grouping service-termination-point-attributes {
    leaf svc-tp-name {
        type string;
        description "name of service
        termination point";
    }
    leaf svc-tp-type {
        type identityref {
            base svc-topo-flag-identity;
        }
        description "other topologies
        this link termination point is
        part of (L3VPN, L2VPN,
        or I2RS only)";
    }
    list tdsvc-tp-support-attributes {
        key tdsvc-tp-attr-name;
        leaf tdsvc-tp-attr-name {
            type string;
            description "top-down

```

```

        service support attribute name";
    }
    leaf tdsvc-tp-support-attribute {
type identityref {
        base tdsvc-support-identity;
    }
        description "top-down service
        attribute this link supports.";
    }
    description "list of service level
    link attributes";

```

```

    }
    description "grouping of
        service link attribute";
}

    augment "/nw:networks/nw:network/nw:network-types" {
uses svc-combo-network-type;
    description
        "augment the network-tpyes with
        the service-topology-types grouping";
    }

    augment "/nw:networks/nw:network" {
when "nw:network-types/svc-combo-network" {
    description
        "Augmentation parameters apply only for
        service network with bottoms up topology";
    }
description
    "Augment with combo service
    topology attributes";
uses service-topology-attributes;
}

augment "/nw:networks/nw:network/nw:node"{
    when "nw:network-types/svc-combo-network" {
description
    "Augmentation parameters apply only for
    service network with bottoms up topology";
    }
uses node-svc-attribute;
    description
        "augment the node with the node-svc-attribute";
    }
}

```

```

augment "/nw:networks/nw:network/nt:link" {
    when "nw:network-types/svc-combo-network" {
description
    "Augmentation parameters apply only for

```



```

        service network with bottoms up topology";
    }
    uses service-link-attributes;
    description
    "augment the link with
    service-link-attributes";
}
augment "/nw:networks/nw:network/nw:node/nt:termination-point"{
    when "nw:network-types/svc-combo-network" {
    description
        "Augmentation parameters apply only for
        service network with bottoms up topology";
    }
    uses service-termination-point-attributes;
    description
    "augment the termination-point with
    service-termination-point-attributes";
}

} // module i2rs-service-topology
} // module i2rs-service-topology

```

<CODE ENDS>

[4.](#) IANA Considerations

TBD

[5.](#) Security Considerations

TBD

[6.](#) References

[6.1.](#) Normative References

[I-D.ietf-i2rs-yang-network-topo]
 Clemm, A., Medved, J., Varga, R., Tkacik, T., Bahadur, N.,
 and H. Ananthakrishnan, "A Data Model for Network
 Topologies", [draft-ietf-i2rs-yang-network-topo-02](#) (work in
 progress), December 2015.

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

[6.2](#). Informative References

[I-D.ietf-i2rs-yang-l3-topology]
Clemm, A., Medved, J., Varga, R., Tkacik, T., Liu, X., Bryskin, I., Guo, A., Ananthakrishnan, H., Bahadur, N., and V. Beeram, "A YANG Data Model for Layer 3 Topologies", [draft-ietf-i2rs-yang-l3-topology-01](#) (work in progress), December 2015.

[I-D.ietf-l3sm-l3vpn-service-model]
Litkowski, S., Shakir, R., Tomotaki, L., and K. D'Souza, "YANG Data Model for L3VPN service delivery", [draft-ietf-l3sm-l3vpn-service-model-02](#) (work in progress), December 2015.

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