

CCAMP Working Group

Internet Draft

Intended Status: Standard Track

Expires: January 3, 2019

G. Fioccola (Ed.)

Telecom Italia

K. Lee

Korea Telecom

Y. Lee (Ed.)

D. Dhody

Huawei

O. Gonzalez de-Dios

Telefonica

D. Ceccarelli

Ericsson

July 2, 2018

A Yang Data Model for L1 Connectivity Service Model (L1CSM)

[draft-ietf-ccamp-l1csm-yang-05](#)

Abstract

This document provides a YANG data model for Layer 1 Connectivity Service Model (L1CSM).

Status of this Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/1id-abstracts.txt>

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>

This Internet-Draft will expire on January 3, 2019.

Copyright Notice

Copyright (c) 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the [Trust Legal Provisions](#) and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1.	Introduction.....	2
1.1.	Deployment Scenarios.....	3
1.2.	Terminology.....	6
1.3.	Tree diagram.....	6
1.4.	Prefixes in Data Node Names.....	7
2.	Definitions.....	7
3.	L1SM YANG Model (Tree Structure).....	7
4.	L1SM YANG Code.....	8
5.	Security Considerations.....	20
6.	IANA Considerations.....	21
7.	Acknowledgments.....	22
8.	References.....	23
8.1.	Normative References.....	23
8.2.	Informative References.....	23
9.	Contributors.....	24
	Authors' Addresses.....	24

[1. Introduction](#)

This document provides a YANG data model for L1VPN Connectivity Service Model (L1CSM). The intent of this document is to provide a transport service model exploiting Yang data model, which can be utilized by a client network controller to initiate a service request connectivity request as well as retrieving service states toward a transport network controller communicating with the client controller via a NETCONF [[RFC8341](#)] interface.

[RFC4847] provides a framework and service level requirements for Layer 1 Virtual Private Networks (L1VPNs). It classifies service models as management-based service model, signaling-based service

model (Basic Mode) and signaling and routing service model (Enhanced Mode).

In the management-based service model, customer management systems and provider management systems communicate with each other. Customer management systems access provider management systems to request layer 1 connection setup/deletion between a pair of CEs. Customer management systems may obtain additional information, such as resource availability information and monitoring information, from provider management systems. There is no control message exchange between a CE and PE.

In the signaling-based service model (Basic Model), the CE-PE interface's functional repertoire is limited to path setup signaling only. In the Signaling and routing service model (Enhanced Mode), the CE-PE interface provides the signaling capabilities as in the Basic Mode, plus permits limited exchange of information between the control planes of the provider and the customer to help such functions as discovery of customer network routing information (i.e., reachability or TE information in remote customer sites), or parameters of the part of the provider's network dedicated to the customer.

The primary focus of this document is to describe L1CS YANG model required for the instantiation of point-to-point L1VPN service. A L1VPN is a service offered by a core layer 1 network to provide layer 1 connectivity between two or more customer sites where the customer has some control over the establishment and type of the connectivity.

The data model presented in [Section 3](#) is in consistent with [MEF-L1CS]. The data model includes configuration and state data according to the new Network Management Datastore Architecture [[RFC8342](#)].

[1.1. Deployment Scenarios](#)

Figure 1 depicts a deployment scenario of the L1VPN SDN control-based service model for an external customer instantiating L1 point-to-point connectivity to the provider.

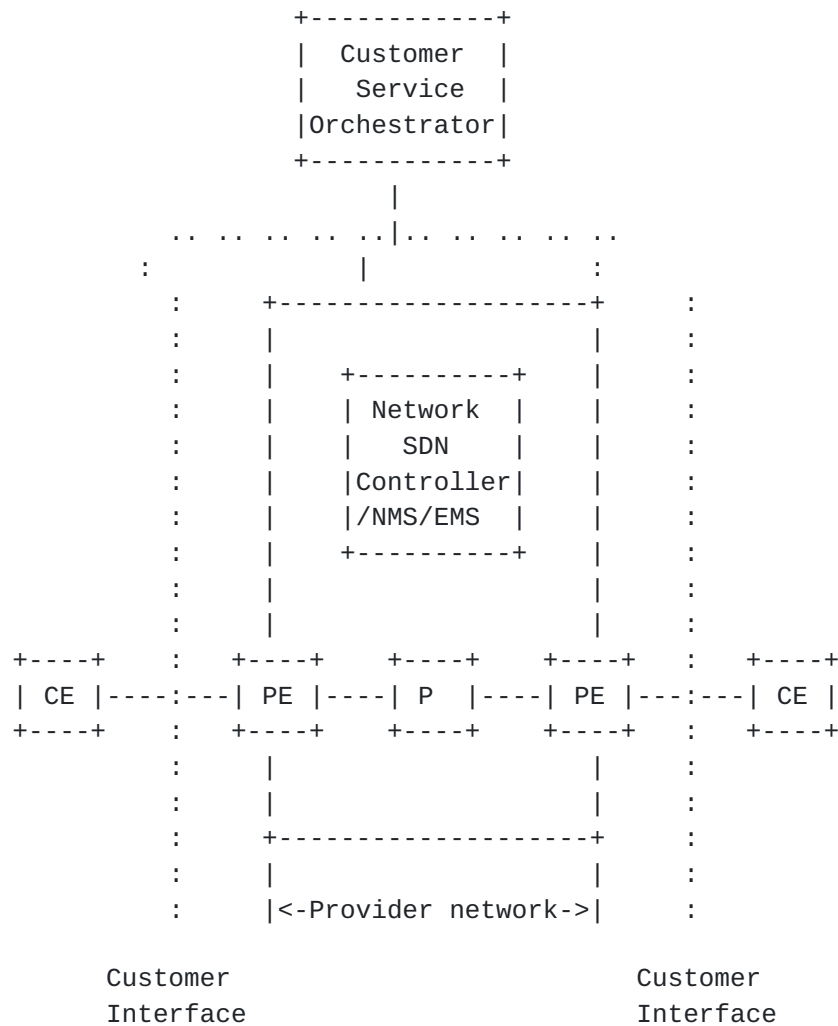


Figure 1: L1VPN SDN Controller/EMS/NMS-Based Service Model: External Customer

With this scenario, the customer service orchestrator interfaces with the network SDN controller of the provider using Customer Service Model as defined in [[Service-Yang](#)].

Figure 2 depicts another deployment scenario for internal customer (e.g., higher-layer service management department(s)) interfacing the layer 1 transport network department. With this scenario, a multi-service backbone is characterized such that each service

department of a provider (e.g., L2/3 services) that receives the same provider's L1VPN service provides a different kind of higher-layer service. The customer receiving the L1VPN service (i.e., each service department) can offer its own services, whose payloads can be any layer (e.g., ATM, IP, TDM). The layer 1 transport network and each service network belong to the same organization, but may be managed separately. The Service SDN Controller is the control/management entity owned by higher-layer service department (e.g., L2/3 VPN) whereas the Network SDN Controller is the control/management entity responsible for Layer 1 connectivity service. The CE's in Figure 2 are L2/3 devices that interface with L1 PE devices.

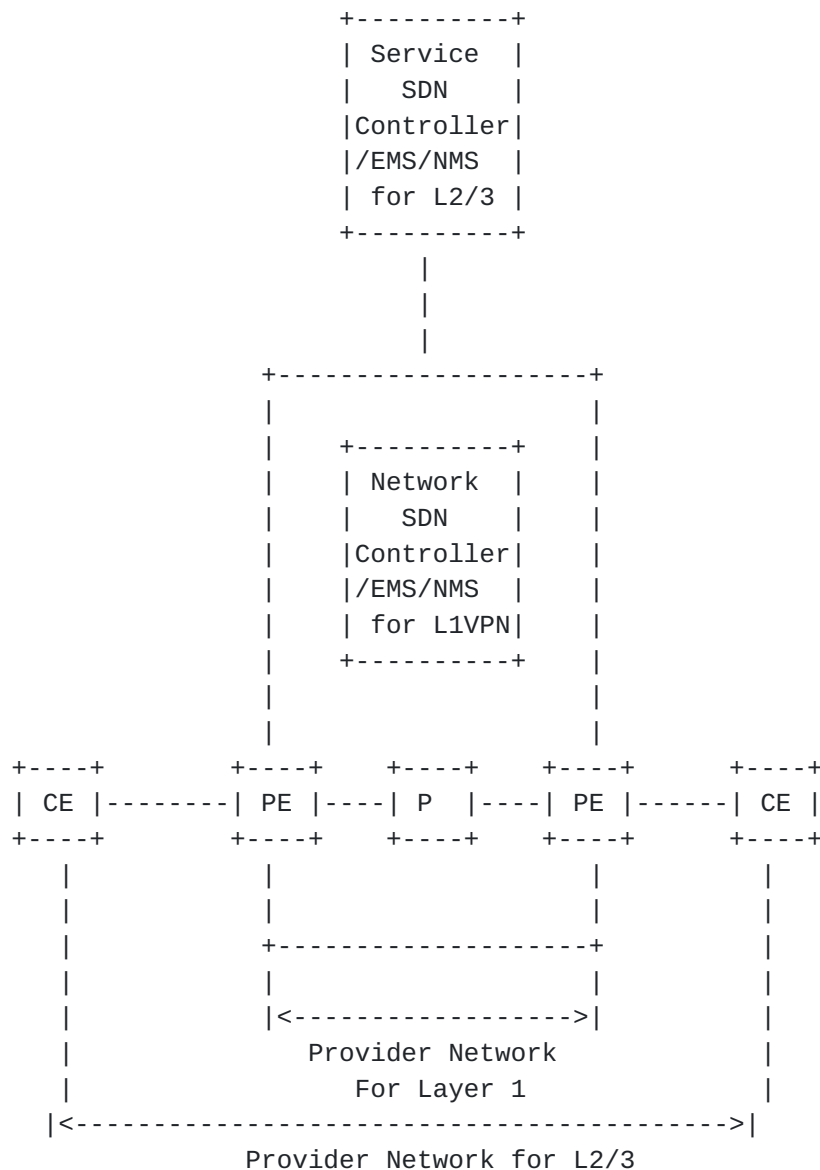


Figure 2: L1VPN SDN Controller/EMS/NMS-Based Service Model: Internal Customer

The benefit is that the same layer 1 transport network resources are shared by multiple services. A large capacity backbone network (data plane) can be built economically by having the resources shared by multiple services usually with flexibility to modify topologies, while separating the control functions for each service department. Thus, each customer can select a specific set of features that are needed to provide their own service [[RFC4847](#)].

1.2. Terminology

Refer to [[RFC4847](#)] and [[RFC5253](#)] for the key terms used in this document.

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

- o client
- o configuration data
- o server
- o state data

The following terms are defined in [[RFC6020](#)] and are not redefined here:

- o augment
- o data model
- o data node

The terminology for describing YANG data models is found in [[RFC6020](#)].

1.3. Tree diagram

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

1.4. Prefixes 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
l1csm	ietf-l1csm	[RFC XXXX]
l1-st	ietf-l1-mef-service-types	[RFC XXXX]
yang	ietf-yang-types	[RFC6991]

Table 1: Prefixes and corresponding YANG modules

Note: The RFC Editor will replace XXXX with the number assigned to the RFC once this draft becomes an RFC.

2. Definitions

L1VC Layer 1 Virtual Connection

SLS Service Level Specification

UNI User Network Interface

PE Provider Edge

CE Customer Edge

EP End Point

P Protocol

C Coding

O Optical Interface

3. L1SM YANG Model (Tree Structure)

```

module: ietf-l1csm
  +-rw l1cs
    +-rw access
      | +-rw uni-list* [UNI-ID]

```

```

|      +--rw UNI-ID                string
|      +--rw protocol?             identityref
|      +--rw coding?               identityref
|      +--rw optical_interface?    identityref
+--rw service
  +--rw service-list* [subscriber-l1vc-id]
  +--rw subscriber-l1vc-id         string
  +--rw service-config
    +--rw subscriber-l1vc-id?       string
    +--rw subscriber-l1vc-ep-id-1?  string
    +--rw subscriber-l1vc-ep-id-2?  string
    +--rw subscriber-l1vc-ep-UNI-1? -> /l1cs/access/uni-list/UNI-
ID
    +--rw subscriber-l1vc-ep-UNI-2? -> /l1cs/access/uni-list/UNI-
ID
    +--rw time-start?              yang:date-and-time
    +--rw time-interval?           int16
    +--rw performance-metric?      Identityref

```

4. L1SM YANG Code

The YANG code is as follows:

```
<CODE BEGINS> file "ietf-l1csm@2018-07-02.yang"
```

```

module ietf-l1csm {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-l1csm";

  prefix "l1csm";
  import ietf-yang-types {
    prefix "yang";
  }

  import ietf-l1-mef-service-types {
    prefix "l1-st";
  }

  organization
    "Internet Engineering Task Force (IETF) CCAMP WG";

  contact
    "Editor: G. Fioccola (giuseppe.fioccola@telecomitalia.it)
    Editor: K. Lee (kwangkoog.lee@kt.com)
    Editor: Y. Lee (leeyoung@huawei.com)
    Editor: D. Dhody (dhruv.ietf@gmail.com)

```

Editor: O. G. de-Dios (oscar.gonzalezdedios@telefonica.com)

Fioccola, et al.

Expires January 2019

[Page 8]

Editor: D. Ceccarelli (daniele.ceccarelli@ericsson.com);

description

"this module describes Layer 1 connectivity service model for subscriber Layer 1 Connectivity Services and Attributes. Refer to 'MEF x.y.x Technical Specification Working Draft v0.09 5, December 13, 2017' for all terms and the original references used in the module.

Copyright (c) 2018 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in [Section 4.c](http://trustee.ietf.org/license-info) of the IETF Trust's Legal Provisions Relating to IETF Documents (<http://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 2018-07-02 {

description

"updated version to incorporate MEF comments";
reference "to add the draft name";

}

revision 2018-06-20 {

description

"updated version to incorporate MEF comments";
reference "to add the draft name";

}

revision 2018-04-11 {

description

"Initial revision.";
reference "to add the draft name";

}

grouping protocol-coding-optical_interface {

description

"describes <p,c,o> where p:protocol type; c:coding function; o:optical interface function";

leaf protocol {

type identityref {

base "l1-st:protocol-type";

}


```
        description
            "List of physical layer L1VC clientprotocol";
    }
    leaf coding {
        type identityref {
            base "l1-st:coding-func";
        }
        description "coding function";
    }
    leaf optical_interface {
        type identityref {
            base "l1-st:optical-interface-func";
        }

        description "optical-interface-function";
    }
}

grouping uni-attributes {
    description
        "uni-service-attributes";

    leaf UNI-ID {
        type string;
        description "the UNI id of UNI Service Attributes";
    }

    uses protocol-coding-optical_interface;
}

grouping subscriber-l1vc-sls-service-attribute {
    description
        "The value of the Subscriber L1VC SLS (Service Level
        Specification) Service Attribute expressed in a 3-tuple
        <p,c,o> of the form.";

    leaf time-start {
        type yang:date-and-time;
        description "a time that represent the date and time
            for the start of the SLS";
    }

    leaf time-interval {
        type int16;
        units seconds;
        description "a time interval (e.g., 2,419,200 seconds
            which is 28 days) that is used in
            conjunction wuth time-start to specify a
```

contiguous sequence of time intervals T for

Fioccola, et al.

Expires January 2019

[Page 10]

```
        determining when performance objectives are
        met.";
    }

    leaf performance-metric {
        type identityref {
            base "l1-st:performance-metriclist";
        }
        description "list of performance metric";
    }
}

grouping subscriber-l1vc-service-attributes {
    description
        "subscriber layer 1 connection service service level";

    leaf subscriber-l1vc-id {
        type string;
        description "subscriber L1VC identifier";
    }

    leaf subscriber-l1vc-ep-id-1 {
        type string;
        description "subscriber end point ID of one end";
    }

    leaf subscriber-l1vc-ep-id-2 {
        type string;
        description "subscriber end point ID of the other end";
    }

    leaf subscriber-l1vc-ep-UNI-1 {
        type leafref {
            path "/l1cs/access/uni-list/UNI-ID";
        }
        description "this is one end of subscriber L1VC end point
            ID value = UNI-1";
    }

    leaf subscriber-l1vc-ep-UNI-2 {
        type leafref {
            path "/l1cs/access/uni-list/UNI-ID";
        }
        description "this is the other end of subscriber L1VC end
            point ID value = UNI-2";
    }

    uses subscriber-l1vc-sls-service-attribute;
}
```



```
grouping subscriber-attributes {
  description
    "subscriber attributes";

  uses subscriber-l1vc-service-attributes;
}

container l1cs {
  description
    "serves as a top-level container for a list of layer 1
    connection services (l1cs)";

  container access {
    description "UNI configurations";

    list uni-list {
      key "UNI-ID";
      description "uni identifier";
      uses uni-attributes {
        description "UNI attributes information";
      }
    }
  }

  container service {
    description "L1VC service";
    list service-list {
      key "subscriber-l1vc-id";
      description
        "an unique identifier of a service";

      leaf subscriber-l1vc-id {
        type string;
        description "a unique service identifier for
          L1VC.";
      }
      container service-config {
        description "service-config container";
        uses subscriber-attributes;
      } //end of service-config
    } //end of service list
  } //end of service container
} //service top container
}
```

<CODE ENDS>

<CODE BEGINS> file "ietf-l1-mef-service-types@2018-7-02.yang"


```
module ietf-l1-mef-service-types {
  namespace "urn:ietf:params:xml:ns:yang:ietf-l1-mef-service-types";
  prefix "l1-st";

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

    Editor: G. Fioccola(giuseppe.fioccola@telecomitalia.it)
    Editor: K. Lee (kwangkoog.lee@kt.com)
    Editor: Y. Lee (leeyoung@huawei.com)
    Editor: D. Dhody (dhruv.ietf@gmail.com)
    Editor: O. G. de-Dios(oscar.gonzalezdedios@telefonica.com)
    Editor: D. Ceccarelli(daniele.ceccarelli@ericsson.com)";

  description
    "This module defines L1 service types based on MEF
    subscriber Layer 1 Connectivity Service Attribute. Refer to
    'MEF x.y.x Technical Specification Working Draft v0.09 5,
    December 13, 2017' for all terms and the original references
    used in the module.

    Copyright (c) 2018 IETF Trust and the persons identified as
    authors of the code. All rights reserved.
    Redistribution and use in source and binary forms, with or
    without modification, is permitted pursuant to, and subject
    to the license terms contained in, the Simplified BSD
    License set forth in Section 4.c of the IETF Trust's Legal
    Provisions Relating to IETF Documents
    (http://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 "2018-07-02" {
    description
      "Revision 0.2";
    reference "TBD";
  }

  revision "2018-06-20" {
    description
      "Revision 0.2";
    reference "TBD";
```



```
}

revision "2018-04-11" {
    description
        "Revision 0.1";
    reference "TBD";
}

identity protocol-type {
    description
        "base identity from which client protocol type is derived.";
}

identity aGigE {
    base "protocol-type";
    description
        "GigE protocol type";
}

identity a10GigE_WAN {
    base "protocol-type";
    description
        "10GigE-WAN protocol type";
}

identity a10GigE_LAN {
    base "protocol-type";
    description
        "10GigE-LAN protocol type";
}

identity a40GigE {
    base "protocol-type";
    description
        "40GigE protocol type";
}

identity a100GigE {
    base "protocol-type";
    description
        "100GigE protocol type";
}

identity FC-100 {
    base "protocol-type";
    description
        "Fiber Channel - 100 protocol type";
}
```



```
identity FC-200 {
    base "protocol-type";
    description
        "Fiber Channel - 200 protocol type";
}

identity FC-400 {
    base "protocol-type";
    description
        "Fiber Channel - 400 protocol type";
}

identity FC-800 {
    base "protocol-type";
    description
        "Fiber Channel - 800 protocol type";
}

identity FC-1200 {
    base "protocol-type";
    description
        "Fiber Channel - 1200 protocol type";
}

identity FC-1600 {
    base "protocol-type";
    description
        "Fiber Channel - 1600 protocol type";
}

identity FC-3200 {
    base "protocol-type";
    description
        "Fiber Channel - 3200 protocol type";
}

identity STM-1 {
    base "protocol-type";
    description
        "SDH STM-1 protocol type";
}

identity STM-4 {
    base "protocol-type";
    description
        "SDH STM-4 protocol type";
}

identity STM-16 {
```



```
        base "protocol-type";
        description
            "SDH STM-16 protocol type";
    }

    identity STM-64 {
        base "protocol-type";
        description
            "SDH STM-64 protocol type";
    }

    identity STM-256 {
        base "protocol-type";
        description
            "SDH STM-256 protocol type";
    }

    identity OC-3 {
        base "protocol-type";
        description
            "SONET OC-3 protocol type";
    }

    identity OC-12 {
        base "protocol-type";
        description
            "SONET OC-12 protocol type";
    }

    identity OC-48 {
        base "protocol-type";
        description
            "SONET OC-48 protocol type";
    }

    identity OC-192 {
        base "protocol-type";
        description
            "SONET OC-192 protocol type";
    }

    identity OC-768 {
        base "protocol-type";
        description
            "SONET OC-768 protocol type";
    }

    identity coding-func {
        description
```



```
    "base identity from which coding func is derived.";
}

identity a1000X-PCS-36 {
    base "coding-func";
    description
        "PCS clause 36 coding function that corresponds to 1000BASE-X";
}

identity a10GW-PCS-49-WIS-50 {
    base "coding-func";
    description
        "PCS clause 49 and WIS clause 50 coding func that corresponds to
10GBASE-W (WAN PHY)";
}

identity a10GR-PCS-49 {
    base "coding-func";
    description
        "PCS clause 49 coding function that corresponds to 10GBASE-R
(LAN
PHY)";
}

identity a40GR-PCS-82 {
    base "coding-func";
    description
        "PCS clause 82 coding function that corresponds to 40GBASE-R";
}

identity a100GR-PCS-82 {
    base "coding-func";
    description
        "PCS clause 82 coding function that corresponds to 100GBASE-R";
}

/* coding func needs to expand for Fiber Channel, SONET, SDH */

identity optical-interface-func {
    description
        "base identity from which optical-interface-function is derived.";
}

identity SX-PMD-clause-38 {
    base "optical-interface-func";
    description
        "SX-PMD-clause-38 Optical Interface function for 1000BASE-X
PCS-36";
```

}

Fioccola, et al.

Expires January 2019

[Page 17]

```
    identity LX-PMD-clause-38 {
      base "optical-interface-func";
      description
        "LX-PMD-clause-38 Optical Interface function for 1000BASE-X
PCS-36";
    }

    identity LX10-PMD-clause-59 {
      base "optical-interface-func";
      description
        "LX10-PMD-clause-59 Optical Interface function for 1000BASE-X
PCS-
36";
    }

    identity BX10-PMD-clause-59 {
      base "optical-interface-func";
      description
        "BX10-PMD-clause-59 Optical Interface function for 1000BASE-X
PCS-
36";
    }

    identity LW-PMD-clause-52 {
      base "optical-interface-func";
      description
        "LW-PMD-clause-52 Optical Interface function for 10GBASE-W
PCS-49-
WIS-50";
    }

    identity EW-PMD-clause-52 {
      base "optical-interface-func";
      description
        "EW-PMD-clause-52 Optical Interface function for 10GBASE-W
PCS-49-
WIS-50";
    }

    identity LR-PMD-clause-52 {
      base "optical-interface-func";
      description
        "LR-PMD-clause-52 Optical Interface function for 10GBASE-R
PCS-49";
    }

    identity ER-PMD-clause-52 {
      base "optical-interface-func";
```

```
        description
            "ER-PMD-clause-52 Optical Interface function for 10GBASE-R
PCS-49";
    }

    identity LR4-PMD-clause-87 {
        base "optical-interface-func";
        description
```

```
        "LR4-PMD-clause-87 Optical Interface function for 40GBASE-R
PCS-82";
    }

    identity ER4-PMD-clause-87 {
        base "optical-interface-func";
        description
            "ER4-PMD-clause-87 Optical Interface function for 40GBASE-R
PCS-82";
    }

    identity FR-PMD-clause-89 {
        base "optical-interface-func";
        description
            "FR-PMD-clause-89 Optical Interface function for 40GBASE-R
PCS-82";
    }

    identity LR4-PMD-clause-88 {
        base "optical-interface-func";
        description
            "LR4-PMD-clause-88 Optical Interface function for 100GBASE-R
PCS-
82";
    }

    identity ER4-PMD-clause-88 {
        base "optical-interface-func";
        description
            "ER4-PMD-clause-88 Optical Interface function for 100GBASE-R
PCS-
82";
    }

    /* optical interface func needs to expand for Fiber Channel, SONET and SDH
*/

    identity performance-metriclist {
        description "list of performance metric";
    }

    identity One-way-Delay {
        base "performance-metriclist";
        description "one-way-delay";
    }

    identity One-way-Errored-Second {
        base "performance-metriclist";
```

```
        description "one-way-errored-second";
    }

    identity One-way-Severely-Errored-Second {
        base "performance-metriclist";
        description "one-way-severely-errored-second";
    }
}
```

```
    }

    identity One-way-Unavailable-Second {
        base "performance-metriclist";
        description "one-way-unavailable-second";
    }

    identity One-way-Availability {
        base "performance-metriclist";
        description "one-way-availability";
    }

}

<CODE ENDS>
```

5. Security Considerations

The configuration, state, and action data defined in this document are designed to be accessed via a management protocol with a secure transport layer, 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 [[RFC5246](#)].

The NETCONF access control model [[RFC8341](#)] provides the means to restrict access for particular NETCONF users to a preconfigured subset of all available NETCONF protocol operations and content.

A number of configuration data nodes defined in this document are writable/deletable (i.e., "config true") These data nodes may be considered sensitive or vulnerable in some network environments.

These are the subtrees and data nodes and their sensitivity/vulnerability:

Service-Config:

- subscriber-l1vc-id
- subscriber-l1vc-ep-id-1
- subscriber-l1vc-ep-id-2
- subscriber-l1vc-ep-UNI-1
- subscriber-l1vc-ep-UNI-2

- time-start
- time-interval
- performance-metric

6. IANA Considerations

This document registers the following namespace URIs in the IETF XML registry [[RFC3688](#)]:

```
-----  
URI: urn:ietf:params:xml:ns:yang:ietf-l1csm  
Registrant Contact: The IESG.  
XML: N/A, the requested URI is an XML namespace.  
-----
```

```
-----  
URI: urn:ietf:params:xml:ns:yang:ietf-l1-mef-service-types  
Registrant Contact: The IESG.  
XML: N/A, the requested URI is an XML namespace.  
-----
```

This document registers the following YANG modules in the YANG Module

Names registry [[RFC7950](#)]:

```
-----  
name:          ietf-l1csm  
namespace:     urn:ietf:params:xml:ns:yang:ietf-l1csm  
reference:     RFC XXXX (TDB)  
-----
```

```
-----  
name:          ietf-l1-mef-service-types  
namespace:     urn:ietf:params:xml:ns:yang:ietf-l1-mef-service-types  
reference:     RFC XXXX (TDB)  
-----
```

7. Acknowledgments

The authors would like to thank Tom Petch and Italo Busi for their helpful comments and valuable contributions.

8. References

8.1. Normative References

- [MEF-L1CS] "Subscriber Layer 1 Connectivity Service Attributes", Working Draft (WD) v0.09 December 13, 2017.
- [RFC5246] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.2", [RFC 5246](#), August 2008.
- [RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", [RFC 6020](#), October 2010.
- [RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", [RFC 6241](#), June 2011.
- [RFC6242] Wasserman, M., "Using the NETCONF Protocol over Secure Shell (SSH)", [RFC 6242](#), June 2011.
- [RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", [RFC 7950](#), August 2016.
- [RFC8040] Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", [RFC 8040](#), January 2017.
- [RFC8341] Bierman, A. and M. Bjorklund, "Network Configuration Access Control Model", [RFC 8341](#), March 2018.

8.2. Informative References

- [RFC4847] T. Takeda (Editor), "Framework and Requirements for Layer 1 Virtual Private Networks", [RFC 4847](#), April 2007.
- [RFC5253] T. Takeda, "Applicability Statement for Layer 1 Virtual Private Network (L1VPN) Basic Mode", [RFC 5253](#), July 2008.
- [Service-Yang] Q. Wu, et al, "Service Models Explained", [draft-wu-opsawg-service-model-explained](#), Work in progress.
- [RFC8342] Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "Network Management Datastore Architecture (NMDA)", [RFC 8342](#), March 2018,

[RFC6991] J. Schoenwaelder, Ed., "Common YANG Data Types", [RFC 6991](#), July 2013.

9. Contributors

Contributor's Addresses

I. Busi
Huawei
Email: Italo.Busi@huawei.com

Authors' Addresses

G. Fioccola (Editor)
Telecom Italia
Email: giuseppe.fioccola@telecomitalia.it

K. Lee
KT
Email: kwangkoog.lee@kt.com

Y. Lee (Editor)
Huawei
Email: leeyoung@huawei.com

D. Dhody
Huawei
Email: dhruv.ietf@gmail.com

O. Gonzalez de Dios
Telefonica
Email: oscar.gonzalezdedios@telefonica.com

D. Ceccarelli
Ericsson
Email: daniele.ceccarelli@ericsson.com