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YANG Data Model for SFC Operations, Administration, and Maintenance (OAM)
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Abstract

This document defines YANG data model for Service Function Chaining (SFC) Operations, Administration, and Maintenance (OAM). It extends from the basic YANG data model for Layer independent OAM Management defined in [I-D.tissa-lime-yang-oam-model] and [I-D.wang-lime-rpc-yang-oam-management] with SFC technology specifics. It includes SFC OAM related configuration, state, and RPC information data.

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1. Introduction

YANG [RFC6020] is a data modeling language used to model configuration and state data manipulated by the Network Configuration Protocol (NETCONF) [RFC6241], NETCONF remote procedure calls (RPC), and NETCONF notifications. This document defines the YANG data model for Service Function Chaining (SFC) [SFCPS] OAM. The SFC OAM YANG module involves the OAM configuration, RPCs and notifications, etc.

Currently, [I-D.tissa-lime-yang-oam-model] and [I-D.wang-lime-rpc-yang-oam-management] propose a basic YANG data model for Layer independent OAM Management that can be applied to various OAM technologies. SFC OAM YANG data model can be defined by directly extending the basic model with SFC technology specifics. It can bring some obvious benefits such as unified format, reusable parts, and correlation of defects, faults, network failure at the specific layer.

In addition, various components in the SFC technology specific YANG data model defined in [SFCYANG] can be directly reused in this draft to define the SFC OAM YANG data model.

Note that SFC OAM mechanisms are not yet defined or standardized although some of the basic concepts and functions (e.g., fault detection, fault localization, performance measurement, etc) may be similar to traditional OAM mechanisms. This draft should get alignment with the latest development SFC OAM mechanisms.

2. Conventions and Terminology

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].

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].

2.1. Terminologies

MP Maintenance Point [8021Q].

MEP Maintenance End Point [8021Q] [RFC6371]

MIP Maintenance Intermediate Point [8021Q] [RFC6371]

MEG Maintenance Entity Group [Y1731] [RFC6371]

ME Maintenance Entity [Y.1731] [RFC6371]

MD Maintenance Domain [8021Q]

OAM Operations, Administration, and Maintenance [RFC6291]

LIME Layer Independent OAM Management [I-D.tissa-lime-yang-oam-model] [I-D.wang-lime-rpc-yang-oam-management]

SF Service Function [SFCYANG]

SFC Service Function Chaining [SFCYANG]

SFF Service Function Forwarder [SFCYANG]

3. Architecture of OAM YANG Model and Relationship to SFC OAM

Layer independent OAM YANG model[I-D.tissa-lime-yang-oam-model] and [I-D.wang-lime-rpc-yang-oam-management] is used as the basis for all the other OAM YANG models. This allows users to span across OAM tools of different technologies through a uniform API. The following Figure depicts the relationship of SFC OAM YANG model to the Layer Independent OAM YANG Model.

```
                        +-+-+-+-+-+
                        |  Layer  |
                        |independent
                        |OAM YANG |
                        +-+-+-+-+-+
                             |
                             O
                             |
    +-----------------------------------------------+
    |               |                   |             |
+-+-+-+-+-+    +-+-+-+-+-+          +-+-+-+-+-+   +-+-+-+-+-+
| TRILL   |    | NVO3    |          | SFC     |. .|  foo    |
|OAM YANG |    |OAM YANG |          |OAM YANG |   |OAM YANG |
+-+-+-+-+-+    +-+-+-+-+-+          +-+-+-+-+-+   +-+-+-+-+-+
      |              |                    |            |
      |              |                    |            |
      |              |                    |            |
    +-----------------------------------------------+
    |             Uniform API                         |
    +-----------------------------------------------+
```

Relationship of SFC OAM YANG model to Layer independent OAM YANG model

4. SFC Extensions to LIME YANG Model

A new Technology parameter of SFC is defined here for the purpose of identifying the SFC specific YANG model extension:

```
identity SFC {

       base goam:technology-types;

       description

         "SFC type";

}
```

SFC identity type

Only when the Technology parameter is set to the "SFC" value, the SFC specific extensions are applied.

4.1. MEP Address

In SFC, either the SF on service function layer or SF/SFF on SFC forwarding layer can be MEP/MIP. A MEP/MIP cannot be identified without specifying service function path. Therefore the MEP/MIP address can only be identified by SF/SFF address plus service function path id. In [I-D.tissa-lime-yang-oam-model] and [I-D.wang-lime-rpc-yang-oam-management], MEP/MIP address is defined using a combination of choice and case statement. We augment this to include SFC specific SF/SFF address plus service function path id.

```
augment
"/goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:mp-
address" {

   case sf-mep-address {

   description

       "Service function (or service function forwarder) address plus
       service function path id to identify one SFC MEP. A SFC MP can
       be a service function or service function forwarder!"

   leaf sf-mep-ref {

     when "/goam:domains/goam:domain/goam:technology='sfc'";

     type sfc-sf:service-function-ref;
```

```
      }

      leaf sfp-mep-ref {

        when "/goam:domains/goam:domain/goam:technology='sfc'";

        type sfc-sfp:service-function-path-ref;

      }

      }

      case sff-mep-address {

      description

          "Service function forwarder address plus service function path
          id identify one SFC MEP. A SFC MP can be a service function or
          service function forwarder!"

      leaf sff-mep-ref {

        type sfc-sff:service-function-forwarder-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

    }
```

Augment SFC MEP address

4.2. Connectivity-Context

In SFC, connectivity-context is the service function path id. [I-D.tissa-lime-yang-oam-model] and [I-D.wang-lime-rpc-yang-oam-management] defines a placeholder for connectivity-context. This allows other technologies to easily augment that to include technology specific extensions. The snippet below depicts an example of augmenting connectivity-context to include the SFC connectivity-context.

```
augment "/goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:
   connectivity-context" {

      case connectivity-context-sfc {

      leaf connectivity-context-sfp {

        type sfc-sfp:service-function-path-ref;

      }

      }
   }
```

Augment SFC Connectivity-Context

4.3. SFC Layer For RPC - Path Discovery

Path Discovery is used to discover the path that specific service traverses in the network. For SFC, it can be used on both service function layer and SFC forwarding layer depending on what is the desired degree of path information.

```
typedef SFC-layer {
   type enumeration {
   enum "Service function layer" {
     value 0;
   }
   enum "SFC forwarding layer" {
     value 1;
   }
   }
}

augment "/goam-rpc:path-discovery/goam-rpc:input" {
   description
   "Adding SFC specific items on the input";
   leaf path-discovery-layer {
   type SFC-layer;
   description
     "Identifying which SFC layer to run path discovery";
   }
 }
```

Augment SFC SFC-layer for Path Discovery

5. SFC OAM YANG Data Hierarchy

The complete data hierarchy related to the SFC OAM YANG model is presented below. The following notations are used within the data tree and carry the meaning as noted below.

```
   Each node is printed as:

   <status> <flags> <name> <opts> <type>

   <status> is one of:
        +  for current
        x  for deprecated
        o  for obsolete


   <flags> is one of:

       rw for configuration data
       ro for non-configuration data
       -x for rpcs
       -n for notifications


   <name> is the name of the node

   If the node is augmented into the tree from another module, its name
   is printed as <prefix>:<name>.

   <opts> is one of:

        ?  for an optional leaf or choice
        !  for a presence container
        *  for a leaf-list or list
        [<keys>] for a list's keys

   <type> is the name of the type for leafs and leaf-lists

    module: sfc-oam

    augment /goam:domains/goam:domain/goam:MAs/goam:MA/goam:
    connectivity-context:

       +--:(connectivity-context-sfc)

          +--rw connectivity-context-sfp?   sfc-sfp:service-function-
    path-ref

    augment /goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:mp-
    address:

       +--:(sf-mep-address)

       |  +--rw sf-mep-ref?   sfc-sf:service-function-ref
```

```
       |  +--rw sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--rw sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--rw sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:
    connectivity-context:

       +--:(connectivity-context-sfc)

          +--rw connectivity-context-sfp?   sfc-sfp:service-function-
    path-ref

    augment
    /goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:session/goa
    m:destination-mep-address/goam:mp-address:

       +--:(sf-mep-address)

       |  +--rw sf-mep-ref?   sfc-sf:service-function-ref

       |  +--rw sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

          +--rw sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--rw sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment
    /goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:session/goa
    m:connectivity-context:

       +--:(connectivity-context-sfc)

          +--rw connectivity-context-sfp?   sfc-sfp:service-function-
    path-ref

    augment /goam-rpc: contiuity-check/goam-rpc:input/goam-
    rpc:source-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref
```

```
       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc: contiuity-check/goam-rpc:input/goam-
    rpc:destination-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref


    augment /goam-rpc: connectity-verification/goam-
    rpc:input/goam-rpc:source-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc: connectity-verification/goam-
    rpc:input/goam-rpc:destination-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref
```

```
       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref


    augment /goam-rpc: path-discovery/goam-rpc:input:

       +--ro:path-discovery-layer SFC-layer

    augment /goam-rpc: path-discovery/goam-rpc:input/goam-
    rpc:source-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc: path-discovery/goam-rpc:input/goam-
    rpc:destination-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc: path-discovery/goam-rpc:output/ goam-
    rpc:response/goam-rpc:destination-mp/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref
```

```
       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref


    augment /goam-rpc:initiated-performance-measurement/goam-
    rpc:input/goam-rpc:source-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc:initiated-performance-measurement/goam-
    rpc:input/goam-rpc:destination-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc:revoke-performance-measurement/goam-
    rpc:input/goam-rpc:source-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref
```

```
       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc:revoke-performance-measurement/goam-
    rpc:input/goam-rpc:destination-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc:initiated-other-function/goam-rpc:input/goam-
    rpc:source-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc:initiated-other-function/goam-rpc:input/goam-
    rpc:destination-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref
```

```
          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc:revoke-other-function/goam-rpc:input/goam-
    rpc:source-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

    augment /goam-rpc:revoke-other-function/goam-rpc:input/goam-
    rpc:destination-mep/goam-rpc:mp-address:

       +--:(sf-mep-address)

       |  +--ro sf-mep-ref?   sfc-sf:service-function-ref

       |  +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref

       +--:(sff-mep-address)

       |  +--ro sff-mep-ref? sfc-sff:service-function-forwarder-ref

          +--ro sfp-mep-ref?   sfc-sfp:service-function-path-ref
```

Data hierarchy of SFC OAM

6. SFC OAM YANG Module

```
   <CODE BEGINS> file "xxx.yang"

 <CODE BEGINS> file "xxx.yang"

 module sfc-oam {

     namespace "urn:huawei:params:xml:ns:yang:sfc-oam";

     prefix sfcoam;

     import gen-oam {
```

```
      prefix goam;
    }
    import gen-oam-rpc {
      prefix goam-rpc;
    }

    import service-function  {
      prefix sfc-sf;
    }
    import service-function-path  {
      prefix sfc-sfp;
    }
    import service-function-forwarder  {
      prefix sfc-sff;
    }

    revision 2014-09-04 {
      description
      "Initial revision.";
    }

    identity sfc {
      base goam:technology-types;
      description
```

```
      "sfc type";

    }

    typedef SFC-layer {

      type enumeration {

      enum "Service function layer" {

        value 0;

      }

      enum "SFC forwarding layer" {

        value 1;

      }

      }

    }


   augment
   "/goam:domains/goam:domain/goam:MAs/goam:MA/goam:connectivity-
   context" {

      case connectivity-context-sfc {

      leaf connectivity-context-sfp {

        type sfc-sfp:service-function-path-ref;

      }

      }

   }


    augment
   "/goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:mp-
   address" {
```

```
       case sf-mep-address {

       description

       "Service function (or service function forwarder) address plus
    service function path id to identify one SFC MEP. A SFC MP can be a
    service function or service function forwarder!";

       leaf sf-mep-ref {

         when "/goam:domains/goam:domain/goam:technology='sfc'";

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         when "/goam:domains/goam:domain/goam:technology='sfc'";

         type sfc-sfp:service-function-path-ref;

       }

       }

       case sff-mep-address {

       description

       "Service function address plus service function path id to
    identify one SFC MEP. A SFC MP can be a service function or service
    function forwarder!";

       leaf sff-mep-ref {

         type sfc-sff:service-function-forwarder-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }
```

```
     }

     augment
    "/goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:session/go
    am:destination-mep-address/goam:mp-address" {

       case sf-mep-address {

       leaf sf-mep-ref {

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

       case sff-mep-address {

       leaf sff-mep-ref {

         type sfc-sff:service-function-forwarder-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

     }



     augment
    "/goam:domains/goam:domain/goam:MAs/goam:MA/goam:MEP/goam:session/go
    am:connectivity-context" {

       case connectivity-context-sfc {
```

```
        leaf connectivity-context-sfp {

          type sfc-sfp:service-function-path-ref;

        }

        }

      }





      //SFC extension of contiuity-check part

      augment "/goam-rpc: continuity-check/goam-rpc:input/goam-
     rpc:source-mep/goam-rpc:mp-address" {

        case sf-mep-address {

        leaf sf-mep-ref {

          type sfc-sf:service-function-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

        case sff-mep-address {

        leaf sff-mep-ref {

          type sfc-sff:service-function-forwarder-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;
```

```
      }

      }

    }

    augment "/goam-rpc: continuity-check/goam-rpc:input/goam-
   rpc:destination-mep/goam-rpc:mp-address" {

      case sf-mep-address {

      leaf sf-mep-ref {

        type sfc-sf:service-function-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

      case sff-mep-address {

      leaf sff-mep-ref {

        type sfc-sff:service-function-forwarder-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

    }



    //SFC extension of connectity-verification part
```

```
    augment "/goam-rpc: connectivity-verification/goam-
    rpc:input/goam-rpc:source-mep/goam-rpc:mp-address" {

       case sf-mep-address {

       leaf sf-mep-ref {

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

       case sff-mep-address {

       leaf sff-mep-ref {

         type sfc-sff:service-function-forwarder-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

     }

     augment "/goam-rpc: connectivity-verification/goam-
    rpc:input/goam-rpc:destination-mep/goam-rpc:mp-address" {

       case sf-mep-address {

       leaf sf-mep-ref {



        type sfc-sf:service-function-ref;
```

```
      }
      leaf sfp-mep-ref {
        type sfc-sfp:service-function-path-ref;
      }
      }
      case sff-mep-address {
      leaf sff-mep-ref {
        type sfc-sff:service-function-forwarder-ref;
      }
      leaf sfp-mep-ref {
        type sfc-sfp:service-function-path-ref;
      }
      }
    }



    //SFC extension of path-discovery part
   augment "/goam-rpc: path-discovery/goam-rpc:input" {
      description
      "adds SFC specific items on the input";
      leaf path-discovery-layer {
      type SFC-layer;
      description
        "Identifying which SFC layer to run path discovery";
```

```
      }

    }


    augment "/goam-rpc: path-discovery/goam-rpc:input/goam-
   rpc:source-mep/goam-rpc:mp-address" {

      case sf-mep-address {

      leaf sf-mep-ref {

        type sfc-sf:service-function-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

      case sff-mep-address {

      leaf sff-mep-ref {

        type sfc-sff:service-function-forwarder-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

    }

    augment "/goam-rpc: path-discovery/goam-rpc:input/goam-
   rpc:destination-mep/goam-rpc:mp-address" {

      case sf-mep-address {
```

```
       leaf sf-mep-ref {

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

       case sff-mep-address {

       leaf sff-mep-ref {

         type sfc-sff:service-function-forwarder-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

     }


    augment "/goam-rpc: path-discovery/goam-rpc:output/goam-
    rpc:response/goam-rpc:destination-mp/goam-rpc:mp-address" {

       case sf-mep-address {

       leaf sf-mep-ref {

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;
```

```
      }

      }

      case sff-mep-address {

      leaf sff-mep-ref {

        type sfc-sff:service-function-forwarder-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

    }




    //SFC extension of performance-measurement part

   augment "/goam-rpc:initiated-performance-measurement/goam-
   rpc:input/goam-rpc:source-mep/goam-rpc:mp-address" {

      case sf-mep-address {

      leaf sf-mep-ref {

        type sfc-sf:service-function-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

      case sff-mep-address {
```

```
        leaf sff-mep-ref {

          type sfc-sff:service-function-forwarder-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

      }

      augment "/goam-rpc:initiated-performance-measurement/goam-
     rpc:input/goam-rpc:destination-mep/goam-rpc:mp-address" {

        case sf-mep-address {

        leaf sf-mep-ref {

          type sfc-sf:service-function-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

        case sff-mep-address {

        leaf sff-mep-ref {

          type sfc-sff:service-function-forwarder-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }
```

```
      }

    }


     augment "/goam-rpc:revoke-performance-measurement/goam-
   rpc:input/goam-rpc:source-mep/goam-rpc:mp-address" {

      case sf-mep-address {

      leaf sf-mep-ref {

        type sfc-sf:service-function-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

      case sff-mep-address {

      leaf sff-mep-ref {

        type sfc-sff:service-function-forwarder-ref;

      }

      leaf sfp-mep-ref {

        type sfc-sfp:service-function-path-ref;

      }

      }

    }

    augment "/goam-rpc:revoke-performance-measurement/goam-
   rpc:input/goam-rpc:destination-mep/goam-rpc:mp-address" {

      case sf-mep-address {
```

```
       leaf sf-mep-ref {

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

       case sff-mep-address {

       leaf sff-mep-ref {

         type sfc-sff:service-function-forwarder-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

     }

    //SFC extension of other-function part

    augment "/goam-rpc:initiated-other-function/goam-rpc:input/goam-
    rpc:source-mep/goam-rpc:mp-address" {

       case sf-mep-address {

       leaf sf-mep-ref {

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;
```

```
        }

        }

        case sff-mep-address {

        leaf sff-mep-ref {

          type sfc-sff:service-function-forwarder-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

      }

      augment "/goam-rpc:initiated-other-function/goam-rpc:input/goam-
     rpc:destination-mep/goam-rpc:mp-address" {

        case sf-mep-address {

        leaf sf-mep-ref {

          type sfc-sf:service-function-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

        case sff-mep-address {

        leaf sff-mep-ref {

          type sfc-sff:service-function-forwarder-ref;

        }
```

```
        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

      }



       augment "/goam-rpc:revoke-other-function/goam-rpc:input/goam-
     rpc:source-mep/goam-rpc:mp-address" {

        case sf-mep-address {

        leaf sf-mep-ref {

          type sfc-sf:service-function-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

        case sff-mep-address {

        leaf sff-mep-ref {

          type sfc-sff:service-function-forwarder-ref;

        }

        leaf sfp-mep-ref {

          type sfc-sfp:service-function-path-ref;

        }

        }

      }
```

```
     augment "/goam-rpc:revoke-other-function/goam-rpc:input/goam-
    rpc:destination-mep/goam-rpc:mp-address" {

       case sf-mep-address {

       leaf sf-mep-ref {

         type sfc-sf:service-function-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

       case sff-mep-address {

       leaf sff-mep-ref {

         type sfc-sff:service-function-forwarder-ref;

       }

       leaf sfp-mep-ref {

         type sfc-sfp:service-function-path-ref;

       }

       }

     }

     }
    <CODE ENDS>
```

7. Security Considerations

TBD.

8. IANA Considerations

TBD.

9. References

9.1. Normative References

[IEEE.802.1Q-2011]
Institute of Electrical and Electronics Engineers, "Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks", IEEE Standard 802.1Q, August 2011.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", March 1997.

[RFC2234] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", RFC 2234, November 1997.

9.2. Informative References

[I-D.penno-sfc-yang]
Penno, R., Quinn, P., Zhou, D., and J. Li, "Yang Data Model for Service Function Chaining", draft-penno-sfc-yang-13 (work in progress), March 2015.

[I-D.wang-lime-rpc-yang-oam-management]
Wang, Z. and Q. Wu, "Additional RPC definitions to Generic YANG Data Model for layer Independent OAM Management", draft-wang-lime-rpc-yang-oam-management-00 (work in progress), October 2014.

[Y.1731] "OAM functions and mechanisms for Ethernet based networks", ITU G.8013/Y.1731, July 2011.

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