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YANG Data Model for TRILL Operations, Administration, and Maintenance (OAM) Performance Management
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Abstract

This document presents YANG Data model for TRILL OAM PM[TRILL-PM]. It extends the YANG model defined in [GENYANNGOAM] and [TRILLOAMYANG] for TRILL OAM Performance management technology specifics.
1. Introduction

Fault Management for TRILL is defined in [TRILL-FM]. TRILL Fault Management utilizes the [8021Q] CFM model and extends CFM with technology specific details. Those technology specific extensions are flow-entropy for multipath support, MEP addressing on TRILL identifiers, and so on. The extensions are explained in detail in [TRILL-FM].

Performance Management for TRILL is defined in [TRILL-PM]. TRILL Performance Management utilizes the [Y.1731-2013/G.8013] and extends it with Loss Measurement and Delay measurement.

Generic OAM Yang model [GENYANGGOAM] presents Generic Yang data model for all OAM technologies.

In this document we extend the YANG model defined in [GENYANGGOAM] and [TRILLOAMYANG] for TRILL OAM Performance management. Details are provided in section 4 below.
2. 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 RFC-2119 [RFC2119].

2.1. Terminology

ECMP - Equal Cost Multipath
MP - Maintenance Point [8021.Q]
MEP - Maintenance End Point [RFC7174] [8021Q] [RFC6371]
MIP - Maintenance Intermediate Point [RFC7174] [8021.Q] [RFC6371]
MA - Maintenance Association [8021.Q] [RFC7174]
MD - Maintenance Domain [8021.Q]
OAM - Operations, Administration, and Maintenance [RFC6291]
TRILL - Transparent Interconnection of Lots of Links [RFC6325]
DMM - Delay Measurement Message
1SL - One-way Synthetic Loss Measurement message
1DM - One-way Delay Measurement message
DMR - Delay Measurement Reply
OAM - Operations, Administration, and Maintenance
PM - Performance Monitoring
SLM - Synthetic Loss Measurement Message
SLR - Synthetic Loss Measurement Reply
TLV - Type, Length, and Value

3. Architecture of OAM YANG Model and Relationship to TRILL OAM PM
4. YANG Extension

MEP Addressing is defined in Generic OAM YANG model [GENYANGGOAM]. In this draft we augment MEP Configuration with Performance Management configuration and statistics for Delay Measurement and Performance Measurement.

For technology specific we are re-using identify defined in [TRILLOAMYANG] model.

```yang
identity trill {
    base goam:technology-types;
    description "trill type";
}
```

4.1 MEP Address

As defined in TRILL OAM Yang[TRILLOAMYANG] model. TRILL OAM Yang is referenced.

4.1 MEP Configuration Extension

```yml
module: trill-oam-pm
```

augment /goam:domains/goam:domain/goam:MAS/goam:MA/goam:MEP:

4.2 Flow Entropy

As defined in TRILL OAM Yang[TRILLOAMYANG] model.

4.3 Context-id

As defined in TRILL OAM Yang[TRILLOAMYANG] model.

4.4 Grouping Statements loss-measurement-configuration-group, groups
configuration objects for Frame Loss Measurement function defined in
[TRILL-PM].

loss-stats-group, groups statistics object for [TRILL-PM] Loss
measurement section.

measurement-timing-group, groups object used for proactive and on-
demand scheduling of PM measurement sessions.

delay-measurement-configuration-group, groups configuration objects
for Delay measurement function defined in [TRILL-PM]

delay-measurement-stats-group, groups statistics objects for a TRILL
Delay measurement sessions.

4.5 RPC definition

The rpc model facilitates issuing commands to a NETCONF server (in
this case to the device that needs to execute the OAM command) and
obtaining a response.

Grouping Statements loss-measurement-configuration-group,
measurement-timing-group, and delay-measurement-configuration-group
defines input extension for Delay and Loss measurement RPCs.

4.5.1 create-loss-measurement

RPC allows scheduling of one-way or two-way on-demand or proactive
performance monitoring loss measurement session.

4.5.2 abort-loss-measurement

RPC allow aborting of currently running or scheduled loss measurement
session.
4.5.3 create-delay-measurement

RPC allow scheduling of one-way or two-way on-demand or proactive performance monitoring delay measurement session.

4.4.4 abort-delay-measurement RPC allow aborting of currently running or scheduled delay measurement session.

5. TRILL PM data hierarchy The complete data hierarchy related to the OAM YANG is presented below. The following notations are used within the 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
[key] for a list’s keys

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

module: trill-oam-pm
augment /goam:domains/goam:domain/goam:MAAs/goam:MA/goam:MEP:
+--rw delay-responder? boolean
augment /goam:domains/goam:domain/goam:MA/goam:MA/goam:MEP:
  +--rw delay-measurements
    +--rw delay-measurements* [session-cookie]
      |  +--ro session-cookie  uint32
      |  +--ro id?             string
      |  +--ro status?         boolean
    +--rw measurement-type?  enumeration
    +--rw measurement-enable? bits
    +--rw message-period?    uint32
    +--rw frame-size?        uint32
    +--rw data-pattern?      enumeration
    +--rw measurement-interval? uint32
    +--rw number-intervals-stored? uint32
    +--rw ifdv-selection-offset? uint32
    +--rw session-type?      enumeration
    +--rw start-time
      |  +--rw (start-time)?
      |     |  ++-(immediate)
      |     |     |  +--rw immediate!
      |     |  ++-(absolute)
      |     |     |  +--rw absolute?  yang:date-and-time
    +--rw stop-time
      |  +--rw (stop-time)?
      |     |  ++-(none)
      |     |     |  +--rw none!
      |     |  ++-(absolute)
      |     |     |  +--rw absolute?  yang:date-and-time
    +--rw destination-mep
      |  +--rw (mp-address)?
      |     |  ++-(mac-address)
      |     |     |  +--rw mac-address?  yang:mac-address
      |     |  ++-(ipv4-address)
      |     |     |  +--rw ipv4-address?  inet:ipv4-address
      |     |  ++-(ipv6-address)
      |     |     |  +--rw ipv6-address?  inet:ipv6-address
      |     +--rw mep-id?       toam:tril-rb-nickname
    +--rw frame-delay-two-way?  yang:gauge32
    +--rw frame-delay-forward?  yang:gauge32
    +--rw frame-delay-backward?  yang:gauge32
    +--rw inter-frame-delay-variation-two-way?  yang:gauge32
    +--rw inter-frame-delay-variation-forward?  yang:gauge32
    +--rw inter-frame-delay-variation-backward?  yang:gauge32
    +--rw current-stats
      |  +--rw start-time?     yang:date-and-time
      |  +--rw elapsed-time?    uint32
      |  +--rw suspect-status?  boolean
      |  +--rw frame-delay-two-way-min?  uint32
      |  +--rw frame-delay-two-way-max?  uint32
++--rw frame-delay-two-way-average?  uint32
++--rw frame-delay-forward-min?  uint32
++--rw frame-delay-forward-average?  uint32
++--rw frame-delay-forward-max?  uint32
++--rw frame-delay-backward-min?  uint32
++--rw frame-delay-backward-max?  uint32
++--rw frame-delay-backward-average?  uint32
++--rw frame-delay-variation-backward-min?  uint32
++--rw frame-delay-variation-backward-max?  uint32
++--rw frame-delay-variation-backward-average?  uint32
++--rw frame-delay-variation-forward-min?  uint32
++--rw frame-delay-variation-forward-average?  uint32
++--rw frame-delay-variation-forward-max?  uint32
++--rw frame-delay-variation-two-way-min?  uint32
++--rw frame-delay-variation-two-way-average?  uint32
++--rw frame-delay-variation-two-way-max?  uint32
++--rw history-stats* [id]
  ++--rw id  uint32
  ++--rw start-time?  yang:date-and-time
  ++--rw elapsed-time?  uint32
  ++--rw suspect-status?  boolean
  ++--rw frame-delay-two-way-min?  uint32
  ++--rw frame-delay-two-way-max?  uint32
  ++--rw frame-delay-two-way-average?  uint32
  ++--rw frame-delay-forward-min?  uint32
  ++--rw frame-delay-forward-max?  uint32
  ++--rw frame-delay-forward-average?  uint32
  ++--rw frame-delay-variation-backward-min?  uint32
  ++--rw frame-delay-variation-backward-max?  uint32
  ++--rw frame-delay-variation-backward-average?  uint32
  ++--rw frame-delay-variation-forward-min?  uint32
  ++--rw frame-delay-variation-forward-average?  uint32
  ++--rw frame-delay-variation-forward-max?  uint32
  ++--rw frame-delay-variation-two-way-min?  uint32
  ++--rw frame-delay-variation-two-way-average?  uint32
  ++--rw frame-delay-variation-two-way-max?  uint32
augment /goam:domains/goam:domain/goam:MA/goam:MA/goam:MEP:
  ++--rw loss-measurements
    ++--ro loss-measurements* [session-cookie]
      |  ++--ro session-cookie  uint32
      |  ++--ro id?  string
      |  ++--ro status?  boolean
    ++--rw measurement-type?  enumeration
    ++--rw enabled-counters?  bits
    ++--rw message-period?  uint32

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++rw frame-size?           uint32
++rw data-pattern?        enumeration
++rw measurement-interval? uint32
++rw number-intervals-stored? uint32
++rw session-type?        enumeration
++rw start-time
  |  +++rw (start-time)?
  |  |  +--:(immediate)
  |  |  |  |  ++rw immediate!
  |  |  +--:(absolute)
  |  |  ++rw absolute?    yang:date-and-time
  +++rw stop-time
  |  +++rw (stop-time)?
  |  |  +--:(none)
  |  |  |  +++rw none!
  |  |  +--:(absolute)
  |  |  ++rw absolute?    yang:date-and-time
++rw destination-mep
  |  +++rw (mp-address)?
  |  |  +--:(mac-address)
  |  |  |  ++rw mac-address?    yang:mac-address
  |  |  +--:(ipv4-address)
  |  |  |  ++rw ipv4-address?   inet:ipv4-address
  |  |  +--:(ipv6-address)
  |  |  |  ++rw ipv6-address?   inet:ipv6-address
  |  |  +++rw mep-id?         toam:trill-rb-nickname
++rw measurement-forward-flr?    yang:gauge32
++rw measurement-backward-flr?   yang:gauge32
++rw current-stats
  |  +++rw start-time?       yang:date-and-time
  |  +++rw elapsed-time?      uint32
  |  +++rw suspect-status?    boolean
  |  +++rw backward-transmitted-frames?    yang:gauge32
  |  +++rw backward-received-frames?       yang:gauge32
  |  +++rw backward-min-frame-loss-ration? uint32
  |  +++rw backward-max-frame-loss-ration? uint32
  |  +++rw backward-average-frame-loss-ration? uint32
  |  +++rw forward-transmitted-frames?      yang:gauge32
  |  +++rw forward-received-frames?         yang:gauge32
  |  +++rw forward-min-frame-loss-ration?    uint32
  |  +++rw forward-max-frame-loss-ration?    uint32
  |  +++rw forward-average-frame-loss-ration? uint32
++rw history-stats* [id]
  |  +++rw id                uint32
  |  |  |  +++rw start-time?       yang:date-and-time
  |  |  +++rw elapsed-time?      uint32
  |  |  +++rw suspect-status?    boolean
  |  |  +++rw backward-transmitted-frames?    yang:gauge32
++--rw backward-received-frames?             yang:gauge32
++--rw backward-min-frame-loss-ratoon?       uint32
++--rw backward-max-frame-loss-ratoon?       uint32
++--rw backward-average-frame-loss-ratoon?   uint32
++--rw forward-transmitted-frames?           yang:gauge32
++--rw forward-received-frames?              yang:gauge32
++--rw forward-min-frame-loss-ratoon?        uint32
++--rw forward-max-frame-loss-ratoon?        uint32
++--rw forward-average-frame-loss-ratoon?    uint32

rpcs:
  +++-x create-loss-measurement
     +++-ro input
        | +++-ro measurement-type?          enumeration
        | +++-ro enabled-counters?          bits
        | +++-ro message-period?           uint32
        | +++-ro frame-size?               uint32
        | +++-ro data-pattern?             enumeration
        | +++-ro measurement-interval?     uint32
        | +++-ro number-intervals-stored?  uint32
        | +++-ro session-type?             enumeration
        | +++-ro start-time
        |        | +++-:(immediate)
        |        |        | +++-ro immediate!
        | +++-ro stop-time
        |        | +++-:(none)
        |        |        | +++-ro none!
        |        | +++-:(absolute)
        |        |          | +++-ro absolute?  yang:date-and-time
        | +++-ro destination-mep
        |        | +++-ro (mp-address)?
        |        |        | +++-:(mac-address)
        |        |        |        | +++-ro mac-address?       yang:mac-address
        |        |        | +++-:(ipv4-address)
        |        |        |        | +++-ro ipv4-address?     inet:ipv4-address
        |        |        | +++-:(ipv6-address)
        |        |        |        | +++-ro ipv6-address?     inet:ipv6-address
        |        |        | +++-ro mep-id?         toam:tril-rb-nickname
        |        | +++-ro flow-entropy?               toam:flow-entropy-trill
        |        | +++-ro context-type?                boolean
        |        | +++-ro context-id-vlan?             toam:vlan
        |        | +++-ro context-id-fgl?              toam:fgl
        | +++-ro output
        |        | +++-ro session-id     uint32
  +++-x abort-loss-measurement
| +--ro input
|   +--ro technology     identityref
|   +--ro MD-name-string  MD-name-string
|   +--ro MA-name-string? MA-name-string
|   +--ro destination-mep
|     +--ro (mp-address)?
|       | +--ro mac-address?  yang:mac-address
|       +--:(ipv4-address)
|         | +--ro ipv4-address?  inet:ipv4-address
|         +--:(ipv6-address)
|           | +--ro ipv6-address?  inet:ipv6-address
|           +--ro mep-id?  toam:tril-rb-nickname
|   +--ro session-id     uint32
+---x create-delay-measurement
| +--ro input
|   | +--ro measurement-type?  enumeration
|   | +--ro measurement-enable?  bits
|   | +--ro message-period?     uint32
|   | +--ro frame-size?         uint32
|   | +--ro data-pattern?       enumeration
|   | +--ro measurement-interval?  uint32
|   | +--ro number-intervals-stored?  uint32
|   | +--ro ifdv-selection-offset?  uint32
|   | +--ro session-type?       enumeration
|   | +--ro start-time
|       | +--ro (start-time)?
|       |       | +--:(immediate)
|       |       |       | +--ro immediate!  yang:date-and-time
|       |       | +--:(absolute)
|       |       |       | +--ro absolute?  yang:date-and-time
|   | +--ro stop-time
|       | +--ro (stop-time)?
|       |       | +--:(none)
|       |       |       | +--ro none!  yang:date-and-time
|       |       | +--:(absolute)
|       |       |       | +--ro absolute?  yang:date-and-time
|   | +--ro destination-mep
|       | +--ro (mp-address)?
|       |       | +--ro mac-address?  yang:mac-address
|       |       +--:(ipv4-address)
|       |           | +--ro ipv4-address?  inet:ipv4-address
|       |           +--:(ipv6-address)
|       |           | +--ro ipv6-address?  inet:ipv4-address
|       |           +--ro mep-id?  toam:tril-rb-nickname
|       | +--ro flow-entropy? toam:flow-entropy-trill
|       | +--ro context-type? boolean
module trill-oam-pm {
    namespace "urn:cisco:params:xml:ns:yang:tril-oam-pm";
    prefix trilloampm;

    import gen-oam {
        prefix goam;
    }
    import trill-oam {
        prefix toam;
    }
    import ietf-yang-types {
        prefix yang;
    }
    revision 2015-01-07 {
        description
            "Initial revision.";
    }

    identity trill {

base goam:technology-types;
description  "trill type";
}
grouping context-id-group {
    leaf context-type {
        type boolean;
    }
description  "If context-type is set then it’s context-id-vlan, else it’s context-id-fgl.";
    leaf context-id-vlan {
        type toam:vlan;
    }
    leaf context-id-fgl {
        type toam:fgl;
    }
}
grouping loss-measurement-configuration-group {
    description  "This grouping includes configuration objects for Frame Loss Measurement function defined in TRILL-PM.";
    reference  TRILL-PM;
    leaf measurement-type {
        type enumeration {
            enum slm {
                description  "TRILL PM SLM Frames generated and received SLR responses tracked.";
            }
            enum lsl {
                description  "TRILL PM LSL Frames generated.";
            }
        }
        default slm;
    }
description  "This object specifies what type of Loss Measurement will be performed.";
leaf enabled-counters {
  type bits {
    bit forward-min-flr;
    bit forward-max-flr;
    bit forward-average-flr;
    bit backward-min-flr;
    bit backward-max-flr;
    bit backward-average-flr;
    bit TRILL-PM-pdus-sent;
    bit TRILL-PM-pdus-received;
  }
  default " ";
}

description
"A vector of bits that indicates the type of TRILL-PM loss
measurement counters found in the current-stats and history
that are enabled.

  A present bit enables the specific counter. A not present
  bit disables the specific counter.

  Not all counters are supported for all
  TRILL-PM Loss Measurement types.";
}

leaf message-period {
  type uint32;
  default 1000;

description
"This objects specifies the interval between Loss
Measurement OAM message transmission. Default value is
1 sec.";
}

leaf frame-size {
  type uint32 {
    range "64 .. 9600";
  }
  default 64;
description
"This object specifies the Loss Measurement OAM frame size.
The adjustment of the frame size of the standard frame size is accomplished by addition of a Data TLV as mention in TRILL-PM."

leaf data-pattern {
  type enumeration {
    enum zeroes {
      description "Indicates the Data TLV contains all 0s.";
    } enum ones {
      description "Indicates the Data TLV contains all 1s.";
    }
  }
  default zeroes;
}

description
"This object specifies the LM data pattern included in OAM frame."

leaf measurement-interval {
  type uint32;
  units minutes;
  default 15;

description
"This object specifies a Measurement Interval in minutes."
}

leaf number-intervals-stored {
  type uint32 {
    range "2..10";
  }
  default 10;

description
"This object specifies the number of completed measurement intervals to store in the history statistics table."
}

leaf session-type {
type enumeration {
    enum proactive {
        description
        "The current session is 'proactive'.";
    }
    enum on-demand {
        description
        "The current session is on-demand.";
    }
}

description
"This object indicates whether the current session is defined
to be proactive or on-demand.";
}

grouping loss-stats-group {
    description
    "This grouping includes statistics object for TRILL PM Loss
    Measurement session.";
    leaf suspect-status {
        type boolean;
        description
        "if bit is set it means measurement
        interval statistics is
        not valid.";
    }

    leaf backward-transmitted-frames {
        type yang:gauge32;
        description
        "This object contains the number of
        frames transmitted in the
        backward direction by this session.
        This is count of TRILL-PM SLM and 1SL frames.";
    }

    leaf backward-received-frames {
        type yang:gauge32;
        description
        "This object contains the number of
        frames received in the
        backward direction by this session.
        This is count of TRILL-PM SLM and 1SL frames.";
    }

    leaf backward-min-frame-loss-ration {
        type uint32 {

range "0..100000";
}
units milli-percent;

description
"This object contains the minimum
one-way frame loss ratio
in the backward direction calculated by this
MEP for the session
in this Measurement Interval.
The FLR value is a ratio that
is expressed as a percent with a value 0
(ratio 0.00) through
100000 (ratio 1.00);"
}
leaf backward-max-frame-loss-ratio {
type uint32 {
  range "0..100000";
}
units milli-percent;

description
"This object contains the maximum
one-way frame loss ratio
in the backward direction calculated by
this MEP for the session
in this Measurement Interval.
The FLR value is a ratio that
is expressed as a percent with a value 0
(ratio 0.00) through
100000 (ratio 1.00);"
}
leaf backward-average-frame-loss-ratio {
type uint32 {
  range "0..100000";
}
units milli-percent;

description
"This object contains the average
one-way frame loss ratio
in the backward direction calculated by this MEP for the session
in this Measurement Interval.
The FLR value is a ratio that
is expressed as a percent with a value 0 (ratio 0.00) through
100000 (ratio 1.00);";
leaf forward-transmitted-frames {
  type yang:gauge32;
  
  description
  "This object contains the number of frames transmitted in the forward direction by this session. This is count of TRILL-PM SLM and 1SL frames.";
}

leaf forward-received-frames {
  type yang:gauge32;
  
  description
  "This object contains the number of frames received in the forward direction by this session. This is count of TRILL-PM SLM and 1SL frames.";
}

leaf forward-min-frame-loss-ration {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;
  
  description
  "This object contains the minimum one-way frame loss ratio in the forward direction calculated by this MEP for the session in this Measurement Interval. The FLR value is a ratio that is expressed as a percent with a value 0 (ratio 0.00) through 100000 (ratio 1.00);"
}

leaf forward-max-frame-loss-ration {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;
  
  description
  "This object contains the maximum one-way frame loss ratio in the forward direction calculated by this MEP for the session"


```
in this Measurement Interval. The FLR value is
a ratio that
is expressed as a percent with a value
0 (ratio 0.00) through
100000 (ratio 1.00)";
}
leaf forward-average-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;
  description
    "This object contains the average one-way
    frame loss ratio
    in the forward direction calculated by this
    MEP for the session
    in this Measurement Interval. The FLR value
    is a ratio that
    is expressed as a percent with a value
    0 (ratio 0.00) through
    100000 (ratio 1.00)";
}

}
grouping measurement-timing-group {
  description
    "This grouping includes objects used for
    proactive and on-demand
    scheduling of PM measurement sessions.";
  container start-time {
    description
      "This container defines the session start time.";
    choice start-time {
      description
        "Measurement sessions tart time can be immediate, relative, or
        absolute.";
      container immediate {
        presence "Start the measurement session immediately.";
      }
      leaf absolute {
        type yang:date-and-time;
        description
```
container stop-time {
    description
    "This container defines the session stop time.";
}

choice stop-time {
    description
    "Measurement session stop time can be none, or absolute.";
}

container none {
    presence "Never end the measurement session.";
}

leaf absolute {
    type yang:date-and-time;

    description
    "This objects specifies the scheduled stop time
    to perform the on-demand monitoring operations.";
}
}

grouping delay-measurement-configuration-group {
    description
    "This grouping includes configuration objects for Delay
    Measurement function defined in TRILL-PM.";
    reference
    "TRILL-PM.";

    leaf measurement-type {
        type enumeration {
            enum dmm {
                description
                "DMM PDU generated, DMR responses received.";
            }
            enum dm1-transmitted {
                description
                "DM1 Transmitted.";
            }
            enum dm1-accepted {
                description
                "DM1 Accepted.";
            }
            enum link-up {
                description
                "Link Up.";
            }
        }
    }
}
"1DM PDU generated."
} enum dm1-received {
    description
    "1DM PDU received and measurement generated.";
}

leaf measurement-enable {
    type bits {
        bit toam-sent;
        bit toam-received;
        bit frame-delay-two-way-min;
        bit frame-delay-two-way-max;
        bit frame-delay-two-way-average;
        bit frame-delay-forward-min;
        bit frame-delay-forward-max;
        bit frame-delay-forward-average;
        bit frame-delay-backward-min;
        bit frame-delay-backward-max;
        bit frame-delay-backward-average;
        bit inter-frame-delay-variation-forward-min;
        bit inter-frame-delay-variation-forward-max;
        bit inter-frame-delay-variation-forward-average;
        bit inter-frame-delay-variation-backward-min;
        bit inter-frame-delay-variation-backward-max;
        bit inter-frame-delay-variation-backward-average;
        bit inter-frame-delay-variation-two-way-min;
        bit inter-frame-delay-variation-two-way-max;
        bit inter-frame-delay-variation-two-way-average;
    }
    default " ";
    description
    "A vector of bits that indicates the type of DM counters
    that are enabled. A set bit enables the specific DM
    counter. A clear bit disables the specific DM counter.
    Not all DM counters are supported for all DM types.";
}

leaf message-period {
    type uint32;
    default 100;
    description
    "This objects specifies the interval between Delay
    Measurement OAM message transmission. Default value is
    100ms.";
leaf frame-size {
  type uint32 {
    range "64 .. 9600";
  }
  default 64;
  description "This object specifies the Delay Measurement OAM frame size. The adjustment of the frame size of the standard frame size is accomplished by addition of a Data TLV as mention in TRILL-PM.";
}

leaf data-pattern {
  type enumeration {
    enum zeroes {
      description "Indicates the Data TLV contains all 0s.";
    }
    enum ones {
      description "Indicates the Data TLV contains all 1s.";
    }
  }
  default zeroes;
  description "This object specifies the DM data pattern included in OAM frame.";
}

leaf measurement-interval {
  type uint32;
  units minutes;
  default 15;
  description "This object specifies a Measurement Interval in minutes.";
}

leaf number-intervals-stored {
  type uint32 {
    range "2..10";
  }
  default 10;
  description
"This object specifies the number of completed measurement intervals to store in the history statistics table."

leaf ifdv-selection-offset {
  type uint32 {
    range "1..10";
  }
  default 1;
  description "This object specifies the selection offset for Inter Frame Delay variation measurements. If this value is set to n, then the IFDV is calculated by taking the difference in frame delay between frame F and frame (F+n).";
}

leaf session-type {
  type enumeration {
    enum proactive {
      description "The current session is ‘proactive’.";
    }
    enum on-demand {
      description "The current session is on-demand.";
    }
  }
  description "This object indicates whether the current session is defined to be proactive or on-demand.";
}

grouping delay-measurement-stats-group {
  description "This grouping includes statistics objects for a TRILL PM Delay Measurement session."

  leaf suspect-status {
    type boolean;
    description "if bit is set it means measurement interval statistics is not valid.";
  }

  leaf frame-delay-two-way-min {
type uint32;
  units microseconds;
}
leaf frame-delay-two-way-max {
  type uint32;
  units microseconds;
}

leaf frame-delay-two-way-average {
  type uint32;
  units microseconds;
}
leaf frame-delay-forward-min {
  type uint32;
  units microseconds;
}
leaf frame-delay-forward-average {
  type uint32;
  units microseconds;
}
leaf frame-delay-forward-max {
  type uint32;
  units microseconds;
}
leaf frame-delay-backward-min {
  type uint32;
  units microseconds;
}
leaf frame-delay-backward-max {
  type uint32;
  units microseconds;
}
leaf frame-delay-backward-average {
  type uint32;
  units microseconds;
}
leaf frame-delay-variation-backward-min {
  type uint32;
  units microseconds;
}
leaf frame-delay-variation-backward-max {
  type uint32;
  units microseconds;
}
leaf frame-delay-variation-backward-average {
  type uint32;
  units microseconds;
}
leaf frame-delay-variation-forward-min {
  type uint32;
  units microseconds;
}

leaf frame-delay-variation-forward-average {
  type uint32;
  units microseconds;
}

leaf frame-delay-variation-forward-max {
  type uint32;
  units microseconds;
}

leaf frame-delay-variation-two-way-min {
  type uint32;
  units microseconds;
}

leaf frame-delay-variation-two-way-average {
  type uint32;
  units microseconds;
}

leaf frame-delay-variation-two-way-max {
  type uint32;
  units microseconds;
}

  description
  "This set of data definitions extends the MEP as described in goam";

  leaf delay-responder {
    type boolean;
    default true;
    description
    "This object specifies whether Delay Measurement (DMM) single ended
    Responder is enabled. The value 'false' indicates the Delay measurement
    responder is disabled and received DMM will be discarded.";
  }
}
  description
  "This set of data definitions extends the MEP as described
  in goam, specially with regards to Delay Measurements.";
}

container delay-measurements {
  description
  "This container contains a collection of data definitions
  related to Delay Measurements as defined in TRILL-PM.";

  list delay-measurements {
    key "session-cookie";
    config false;
    description
    "List of Delay Measurement PM Sessions where each
    instance is uniquely identified by an session-cookie
    attribute.";

    leaf session-cookie {
      config false;
      type uint32;
      description
      "cookie to identify Delay Measurement session.";
    }

    leaf id {
      type string;
      description
      "This object uniquely identifies a scheduled measurement
      time.";
    }

    leaf status {
      type boolean;
      config false;
      description
      "This object indicates DM session status, true means
      Active, false means not-active.";
    }
  }
}

uses delay-measurement-configuration-group;
uses measurement-timing-group;
container destination-mep {
  uses goam:mp-address;
  leaf mep-id {
    type toam:tril-rb-nickname;
  }
}
leaf frame-delay-two-way {
  type yang:gauge32;
  units microseconds;
  description
    "This object contains the frame delay calculated by this MEP from the last received TRILL-PM frame. This object is undefined if measurement-type is dm1.";
}

leaf frame-delay-forward {
  type yang:gauge32;
  units microseconds;
  description
    "This object contains the frame delay in the forward direction calculated by this MEP from the last received TRILL-PM frame. One way Delay require sufficiently precise clock Synchronization. This object is undefined if it’s dml-transmitted.";
}

leaf frame-delay-backward {
  type yang:gauge32;
  units microseconds;
  description
    "This object contains the frame delay in the backward direction calculated by this MEP from the last received TRILL-PM frame. One way Delay require sufficiently precise clock Synchronization. This object is undefined if it’s dml-transmitted or dml-received.";
}

leaf inter-frame-delay-variation-two-way {
  type yang:gauge32;
  units microseconds;
  description
    "This object contains the last two-way inter-frame delay interval calculated by this MEP."
leaf inter-frame-delay-variation-forward {
  type yang:gauge32;
  units microseconds;
  description "This object contains the last one-way inter-frame delay in the forward direction calculated by this MEP. The value of this object is undefined when measurement-type is dm1-transmitted.";
}
leaf inter-frame-delay-variation-backward {
  type yang:gauge32;
  units microseconds;
  description "This object contains the last one-way inter-frame delay in the backward direction calculated by this MEP. The value of this object is undefined when measurement-type is dm1-transmitted or dm-received.";
}

container current-stats {
  description "This container contains result of the current Measurement Interval in a TRILL-PM Delay measurement session gathered during the interval indicated by measurement-interval.";
  leaf start-time {
    type yang:date-and-time;
    description "Start time for current measurement interval.";
  }
  leaf elapsed-time {
  }
}
type uint32;

description
"Elapsed time for current measurement
 interval in 0.01
 seconds.";
}
uses delay-measurement-stats-group;
}

list history-stats {
  key id;

description
  "This list contains the result for historic Measurement
  Interval for TRILL-PM session.";

  leaf id {
    type uint32;
  }

  leaf start-time {
    type yang:date-and-time;

description
  "Start time for measurement interval.";
  }

  leaf elapsed-time {
    type uint32;

description
  "Elapsed time for measurement interval in 0.01
  seconds.";
  }

  uses delay-measurement-stats-group;
}


description
"This set of data definitions extends the MEP as described
 in goam, specially with regards to Loss Measurements.";

container loss-measurements {

description
"This container contains a collection of data definitions related to Loss Measurements as defined in TRILL-PM."

list loss-measurements {
  key "session-cookie";
  config false;
  description
  "List of Loss Measurement PM Sessions where each instance is uniquely identified by an session-cookie attribute.";

  leaf session-cookie {
    config false;
    type uint32;
    description
    "cookie to identify Loss Measurement session.";
  }

  leaf id {
    type string;
    description
    "This object uniquely identifies a scheduled measurement time.";
  }

  leaf status {
    type boolean;
    config false;
    description
    "This object indicates DM session status, true means Active, false means not-active.";
  }
}

uses loss-measurement-configuration-group;
uses measurement-timing-group;
container destination-mep {
  uses goam:mp-address;
  leaf mep-id {
    type toam:tril-rb-nickname;
  }
}

leaf measurement-forward-flr {
  type yang:gauge32 {
    range "0..100000";
  }
}
units milli-percent;

description
"This object contains the Frame loss Ratio in forward
direction."
}
leaf measurement-backward-flr {
  type yang:gauge32 {
    range "0..100000";
  }
  units milli-percent;

description
"This object contains the Frame loss Ratio
in backward direction."
}
container current-stats {
  description
  "This container contains result of the
current Measurement
Interval in a TRILL-PM Loss measurement
session gathered
during the interval indicated by
measurement-interval.";

  leaf start-time {
    type yang:date-and-time;

    description
    "Start time for current measurement interval.";
  }

  leaf elapsed-time {
    type uint32;

    description
    "Elapsed time for current measurement
    interval in 0.01 seconds.";
  }

  uses loss-stats-group;
}

list history-stats {
  key id;

  description
  "This list contains the result for
  historic Measurement
Interval for TRILL-PM session.

leaf id {
  type uint32;
}

leaf start-time {
  type yang:date-and-time;
  description
    "Start time for measurement interval.";
}

leaf elapsed-time {
  type uint32;
  description
    "Elapsed time for measurement interval in 0.01 seconds.";
  uses loss-stats-group;
}

//RPCs related to TRILLOAM PM

rpc create-loss-measurement {
  description
    "Schedule a one-way and two-way on-demand or proactive performance monitoring loss measurements on a specific MEP and Flow. A list entry associated with the newly created session will be created in the loss-measurements container and the assigned session identifier will be returned in the output parameter.";
  input {
    uses loss-measurement-configuration-group;
    uses measurement-timing-group;
    container destination-mep {
      uses goam:mp-address;
      leaf mep-id {
        type toam:tril-rb-nickname;
      }
    }
  }
}
leaf flow-entropy {
    type toam:flow-entropy-trill;
}
uses context-id-group;
}
output {
    leaf session-id {
        type uint32;
        mandatory true;
        description
            "The session identifier of the newly
            created loss measurement session."
    }
}
}
	//end of rpc

rpc abort-loss-measurement {
    description
        "Abort a currently running or scheduled
        single-ended on-demand TRILL
        PM function.";
    input {
        uses goam:maintenance-domain-id;
        uses goam:ma-identifier;
        container destination-mep {
            uses goam:mp-address;
            leaf mep-id {
                type toam:tril-rb-nickname;
            }
        }
        leaf session-id {
            type uint32;
            mandatory true;
            description
                "The session Id of the measurement session to
                be aborted.";
        }
    }
}
	//end of RPC

rpc create-delay-measurement {
    description
        "Schedule a one-way and two-way on-demand or proactive
performance
monitoring delay measurements on a specific MEP and Flow.

A list entry associated with the newly created session
will be created in the delay-measurements container
and the assigned
session identifier will be returned in the
output parameter.”;

input {
uses delay-measurement-configuration-group;
uses measurement-timing-group;
container destination-mep {
uses goam:mp-address;
leaf mep-id {
    type toam:tril-rb-nickname;
}
}
leaf flow-entropy {
    type toam:flow-entropy-trill;
}
uses context-id-group;
}
output {
leaf session-id {
    type uint32;
    mandatory true;
    description
        "The session identifier of the newly created
delay measurement session.";
}
}
} //end of rpc

rpc abort-delay-measurement {
    description
        "Abort a currently running or scheduled single-ended
on-demand TRILL PM function.";

    input {
uses goam:maintenance-domain-id;
uses goam:ma-identifier;
container destination-mep {
uses goam:mp-address;
leaf mep-id {
    type toam:tril-rb-nickname;
}

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7. Security Considerations

There are no security considerations relevant to this document.

8. IANA Considerations

No actions are required from IANA as result of the publication of this document.
9. References

9.1. Normative References


9.2. Informative References

[RFC7174] TRILL OAM Framework


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