P802.1ASdn/D2.0
December 12, 2023
(Amendment to
IEEE Std 802.1AS™-2020 as modified by IEEE Std 802.1AS™-2020/Cor 1-2021 and IEEE Std 802.1ASdr-2023)

Draft Standard for Local and metropolitan area networks—

Timing and Synchronization for Time-Sensitive Applications

Amendment: YANG Data Model

Sponsor

LAN/MAN Standards Committee
of the
IEEE Computer Society

Time-Sensitive Networking Task Group of IEEE 802.1

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Editors' Foreword

This draft standard is an amendment. The scope of changes to the base standard is thus strictly limited, as detailed in the PAR.

Information on participation in this project, and in the IEEE 802.1 Working Group can be found here.

Participation in 802.1 standards development

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Project Authorization Request, Scope, Purpose, and Criteria for Standards Development (CSD)

The complete amendment PAR, as approved by IEEE NesCom on the 24th of September 2020, can be found at:

https://development.standards.ieee.org/myproject-web/public/view.html#pardetail/8477

The 'Scope of the Proposed changes' and the 'Need for the Project' specify the changes to be made by this amendment (see below).

Scope of the Proposed changes:

This amendment specifies a YANG data model that allows configuring and state reporting for all managed objects of the base standard. This amendment specifies a Unified Modeling Language (UML)-based figure to explain the managed objects and the associated YANG data model.

Need for the Project:

YANG (IETF RFC 7950) is a formalized data modeling language that is widely accepted and can be used to simplify network configuration. The ability to manage timing and synchronization via YANG data models is needed for compatibility with modern network management systems.

Criteria for Standards Development:

The complete Criteria for Standards Development (CSD) can be found at:

https://mentor.ieee.org/802-ec/dcn/20/ec-20-0202-00-ACSD-p802-1asdn.pdf

Draft IEEE Standard for Local and metropolitan area networks—

Timing and Synchronization for Time-Sensitive Applications

Amendment: YANG Data Model

[This amendment is based on IEEE Std 802.1AS™-2020 as modified by IEEE Std 802.1AS™-2020/Cor 1-2021 and IEEE Std 802.1ASdr-2023.]

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.[1]

[1]Notes in text, tables, and figures are given for information only, and do not contain requirements needed to implement the standard.

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Draft IEEE Standard for Local and metropolitan area networks—

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Amendment: YANG Data Model

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Abstract: This amendment to IEEE Std 802.1AS™-2020 specifies a YANG data model that allows configuration and state reporting for all managed objects of the base standard.

Keywords: YANG, data model, network management, managed objects, IEEE 802.1AS™, synchronization, syntonization, time-aware system

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At the time this standard was completed, the IEEE 802.1 working group had the following membership:

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Jessy Rouyer, *Vice Chair*
János Farkas, *TSN Task Group Chair*
Geoffrey Garner, *Editor, IEEE Std 802.1AS*
Johannes Specht, *Editor, P802.1ASdn*

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Introduction

This introduction is not part of IEEE Std 802.1ASdn™-2023, IEEE Standard for Local and metropolitan area networks—Timing and Synchronization for Time-Sensitive Applications—Amendment: YANG Data Model

The first edition of IEEE Std 802.1AS was published in 2011. A first corrigendum, IEEE Std 802.1AS™-2011/Cor1-2013, provided technical and editorial corrections. A second corrigendum, IEEE Std 802.1AS™-2011/Cor2-2015 provided additional technical and editorial corrections.

The second edition, IEEE Std 802.1AS-2020, added support for multiple gPTP domains, Common Mean Link Delay Service, external port configuration, and Fine Timing Measurement for 802.11 transport. Backward compatibility with IEEE Std 802.1AS-2011 was maintained. The corrigendum IEEE 802.1AS-2020/Cor 1-2021 provides technical and editorial corrections. The amendment IEEE Std 802.1ASdr-2023 changes non-inclusive terms, replacing them with their suitable and inclusive terminology wherever possible.

This amendment to IEEE Std 802.1AS™-2020 specifies a YANG data model that allows configuration and state reporting for all managed objects of the base standard.

Contents

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2. Normative references

Insert the following references in alphanumeric order:

IEEE Std 802d™-2017, IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture—Amendment 1: Allocation of Uniform Resource Name (URN) Values in IEEE 802® Standards.

IEEE Std 1588e™-20**xx**, IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems—Amendment: MIB and YANG Data Models.

IETF RFC 7950, The YANG 1.1 Data Modeling Language, August 2016.

4. Acronyms and abbreviations

Insert the following abbreviations in alphanumeric order, renumbering footnotes as necessary:

NETCONF	Network Configuration Protocol
UML®	Unified Modeling Language™

5. Conformance

5.4.2 PTP Instance Options

Insert the following item 5.4.2 k) 4) after 5.4.2 k) 3) (MIB), renumbering as necessary:

4) If YANG is supported with a remote management protocol, support the YANG data model in Clause 17.

Change the title of Clause 15 as follows:

15. ~~Managed object definitions~~Management Information Base (MIB)

Insert the following new Clause 17:

17. YANG Data Model

YANG (IETF RFC 7950 [B45]) is a data modeling language used to model configuration data and state data for remote network management protocols. Examples of YANG-based remote network management protocols include NETCONF (IETF RFC 6241 [B41]) and RESTCONF (IETF RFC 8040 [B46]). Each remote network management protocol uses a specific encoding on-the-wire, such as XML or JSON. A YANG module specifies the organization and rules for the management data, and a mapping from YANG to the specific encoding enables the data to be understood correctly by both client (e.g., network manager) and server (e.g., PTP Instances).

This clause specifies the YANG data model for IEEE Std 802.1AS.

This clause:

a) Introduces the organization of the data models, including the relationship with other standards (17.1)
b) Provides an overview of the hierarchy of the data models using a UML-like representation (17.2)
c) Summarizes the structure of the YANG data model (17.3)
d) Reviews security considerations (17.4)
e) Provides a schema tree as an overview of the YANG module (17.5)
f) Specifies the YANG module (17.6)

17.1 YANG framework

Clause 14 specifies the information model for management of this standard. The data model for a specific management mechanism is derived from the information model. Since YANG-based protocols are an example of a management mechanism, the YANG data model of this clause is derived from Clause 14.

NOTE 1 - The MIB modules specified in Clause 15 were also derived from Clause 14. Consequently, the capabilities and structure of the YANG data models are aligned with those represented by the MIB. However the YANG data model has not been derived from the MIB, and there has been no attempt to include data or modeling constructs that might appear in the MIB but not in the information model.

The information model in Clause 14 is organized as a hierarchy of data sets. Each data set contains one or more related members (items of data that can be read or written). In the context of YANG, each data set is represented as a YANG “container”, and each member is represented as a YANG “leaf”.

17.1.1 Relationship to the IEEE Std 1588 data model

The YANG data models specified in this standard are based on, and augment, those specified in IEEE Std 1588. In particular the ieee802-dot1as-ptp.yang module imports the ieee1588-ptp module as a whole, augmenting that module as necessary to meet the requirements of this standard. This import makes existing and new IEEE Std 1588 YANG capabilities not specifically addressed by the present standard available to its implementors without delay, without the need to revise or amend IEEE Std 802.1AS.

Some of the data sets in Clause 14 (e.g., defaultDS) are derived from IEEE Std 1588, and some of the data sets are unique to IEEE Std 802.1AS (i.e., not derived from IEEE Std 1588). For each data set in Clause 14 that is derived from IEEE Std 1588, a portion of the members are derived from IEEE Std 1588, and the

remaining members are unique to IEEE Std 802.1AS. For the members that are derived from IEEE Std 1588, the specifications in both standards are analogous (i.e., same name, data type, semantics, etc).

The YANG data model for IEEE Std 1588-2019 is published as amendment IEEE Std 1588e. The YANG module of IEEE Std 1588e (ieee1588-ptp.yang) contains the hierarchy (tree) of data sets and their members.

The YANG module of this clause (ieee802-dot1as-ptp.yang) uses the YANG "import" statement to import the YANG module of IEEE Std 1588e. This effectively uses the IEEE Std 1588 YANG tree as the foundation of the IEEE Std 802.1AS YANG tree. By importing the tree and its data set containers, all members from Clause 14 that are derived from IEEE Std 1588 are also imported.

The core of the YANG module for IEEE Std 802.1AS consists of YANG "augment" statements, used to add members to the tree that are unique for IEEE Std 802.1AS.

NOTE 2 - IETF RFC8575 [B48] is the standard YANG data model for IEEE Std 1588-2008. The YANG data model of IEEE Std 1588e is effectively a newer version of RFC8575. Therefore, the YANG module of RFC8575 is not imported by the YANG module of this clause.

17.2 IEEE 802.1AS YANG data model

This clause uses a UML-like representation to provide an overview of the hierarchy of the IEEE Std 802.1AS YANG data model.

A representation of the management model is provided in Figures 17-1 through 17-4. The purpose of the diagram is to express the model design in a concise manner. The structure of the representation shows the name of the object followed by a list of properties for the object. The properties indicate their type and accessibility. It should be noted that the representation is meant to express simplified semantics for the properties. It is not meant to provide the specific datatype used to encode the object in either MIB or YANG. In the representation, a box with a white background represents information that comes from sources outside of this IEEE standard. A box with a gray background represents objects that are defined by this IEEE standard.

NOTE 1 - OMG® UML 2.5 [B49] conventions together with C++ language constructs are used in this clause as a representation to convey model structure and relationships.

NOTE 2 - This standard specifies YANG for Clause 14 of this standard. There are optional features in the YANG module of IEEE Std 1588 that are not specified in Clause 14, and therefore not shown in the figures of this subclause. If optional IEEE Std 1588 YANG features are implemented, conformance is specified by IEEE Std 1588.

For all figures, Clause 14 data that is imported from the ieee1588-ptp.yang module is shown in white, and Clause 14 data in augments of ieee802-dot1as-ptp.yang is shown in gray.

Figure 17-1 provides an overview of the IEEE Std 802.1AS YANG tree. The top level instance-list provides the list of one or more PTP Instances, each with data sets. For each PTP Instance, port-ds-list provides the list of one or more PTP Ports, each with data sets. The common-services apply to all PTP Instances, including the Common Mean Link Delay Service (cmlds).

Figure 17-2 provides detail for the data sets of each PTP Instance, including each data set member.

Figure 17-3 provides detail for the data sets of each PTP Port, including each data set member.

NOTE 2 - 14.8.4 specifies ptpPortEnabled (ptp-port-enabled), which is provided in YANG as the semantically equivalent node in ieee1588-ptp named port-enable (in port-ds of Figure 17-3). 14.8.15 specifies

mgtSettableLogAnnounceInterval (mgt-settable-log-announce-interval), which is provided in YANG as the semantically equivalent node in ieee1588-ptp named log-announce-interval (in port-ds of Figure 17-3). 14.8.20 specifies mgtSettableLogSyncInterval (mgt-settable-log-sync-interval), which is provided in YANG as the semantically equivalent node in ieee1588-ptp named log-sync-interval (in port-ds of Figure 17-3).

Figure 17-4 provides detail for the common services, including each data set member. The Common Mean Link Delay Service (cmlds) has a data sets for the service itself (e.g., default-ds), and data sets for each PTP Link Port.

NOTE 3 - 14.16.9 specifies neighborRateRatio (neighbor-rate-ratio), which is provided in YANG as the semantically equivalent node in ieee1588-ptp named scaled-neighbor-rate-ratio (in link-port-ds of Figure 17-4).

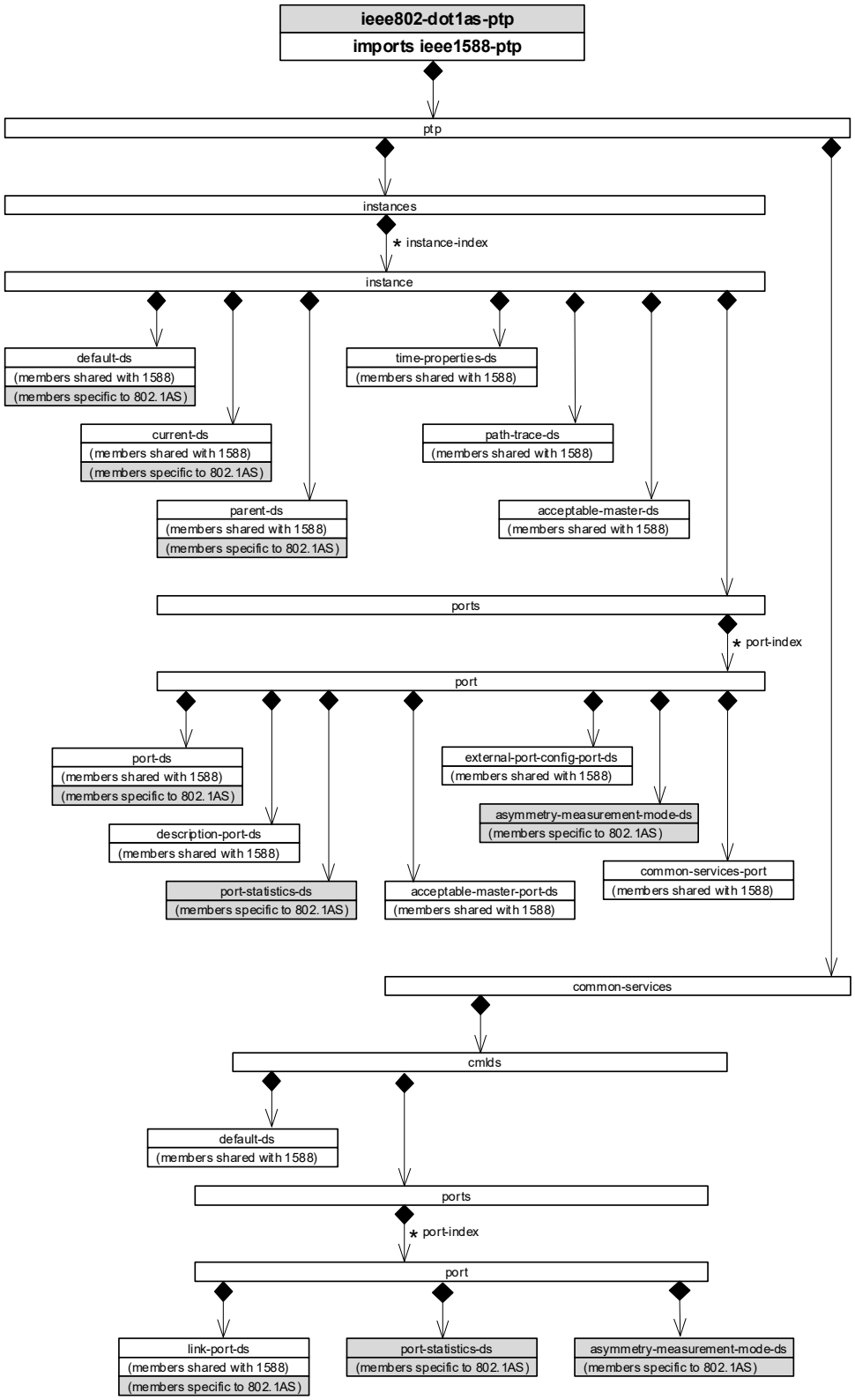

Figure 17-1—Overview of YANG tree

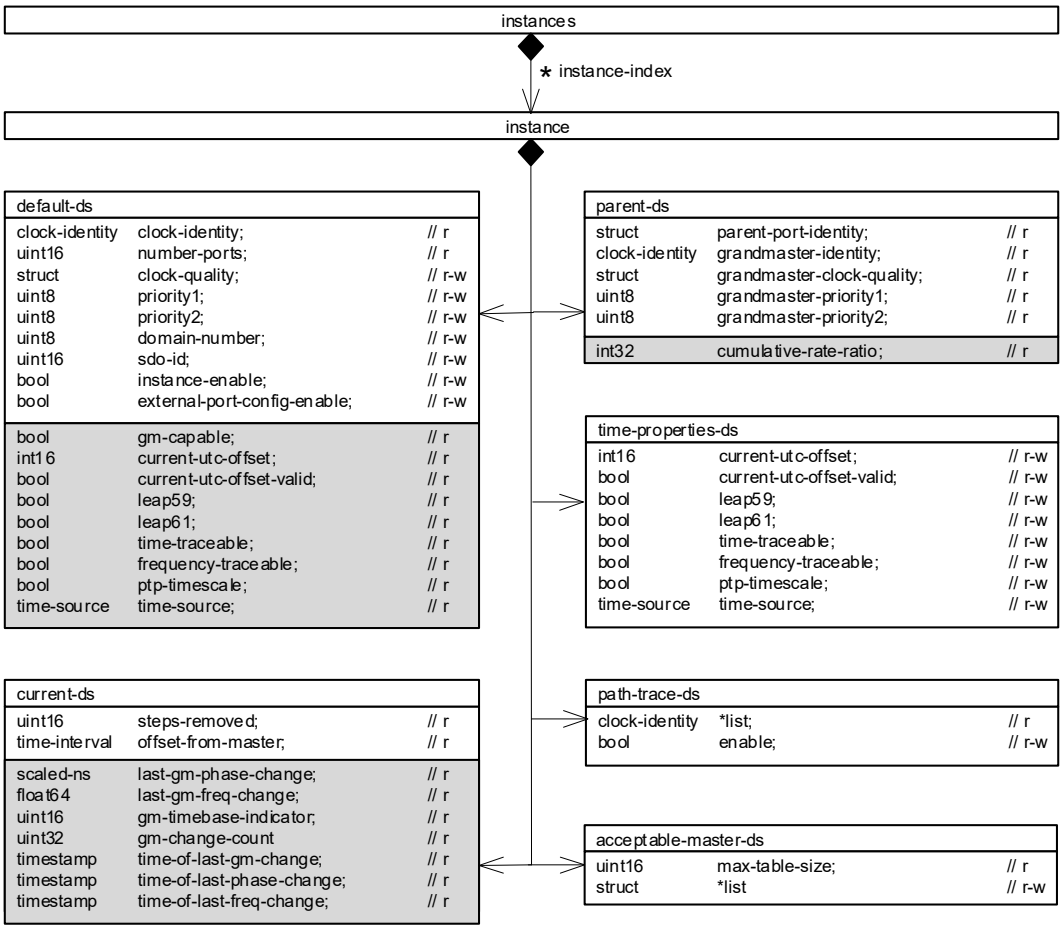

Figure 17-2—PTP Instance detail

NOTE 4 - IEEE Std 1588-2019 uses the original terminology of 'master' and 'slave', and therefore ieee1588-ptp.yang uses that terminology. IEEE Std 802.1ASdr-2023 uses the alternative terminology of 'timeTransmitter' and 'timeReceiver' (from IEEE Std 1588g-2022), and therefore Clause 14 uses that terminology. In the UML-like diagrams, and associated YANG data model, YANG nodes that are imported from ieee1588-ptp.yang use the original terminology, but are equivalent to the corresponding data set members from Clause 14 (using alternate terminology). This includes:
– 1588 acceptable-master-ds is equivalent to 802.1AS acceptable-time-transmitter-ds.
– 1588 acceptable-master-port-ds is equivalent to 802.1AS acceptable-time-transmitter-port- ds.
– 1588 current-ds.offset-from-master is equivalent to 802.1AS current-ds.offset-from-time-transmitter.

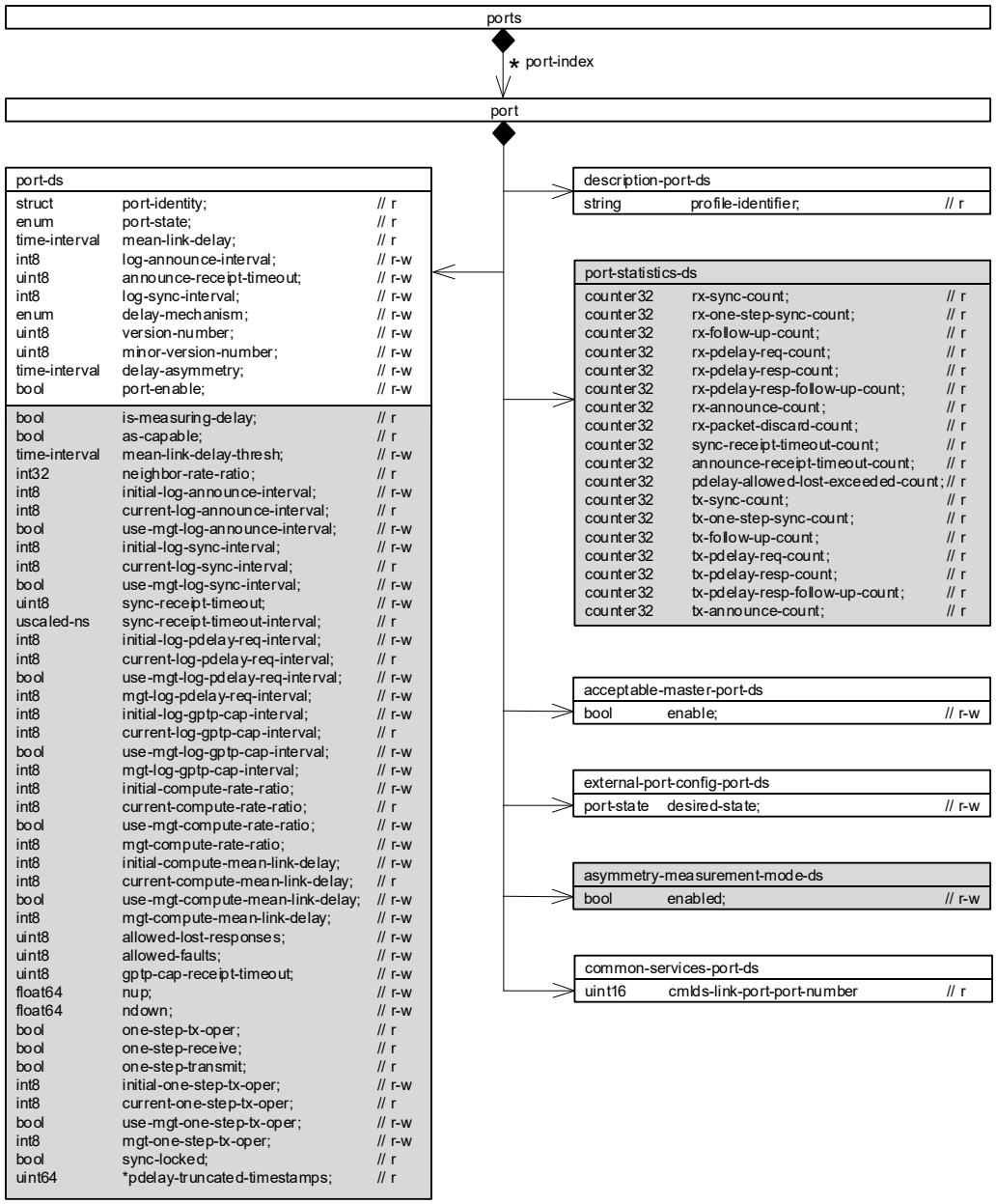

Figure 17-3—PTP Port detail

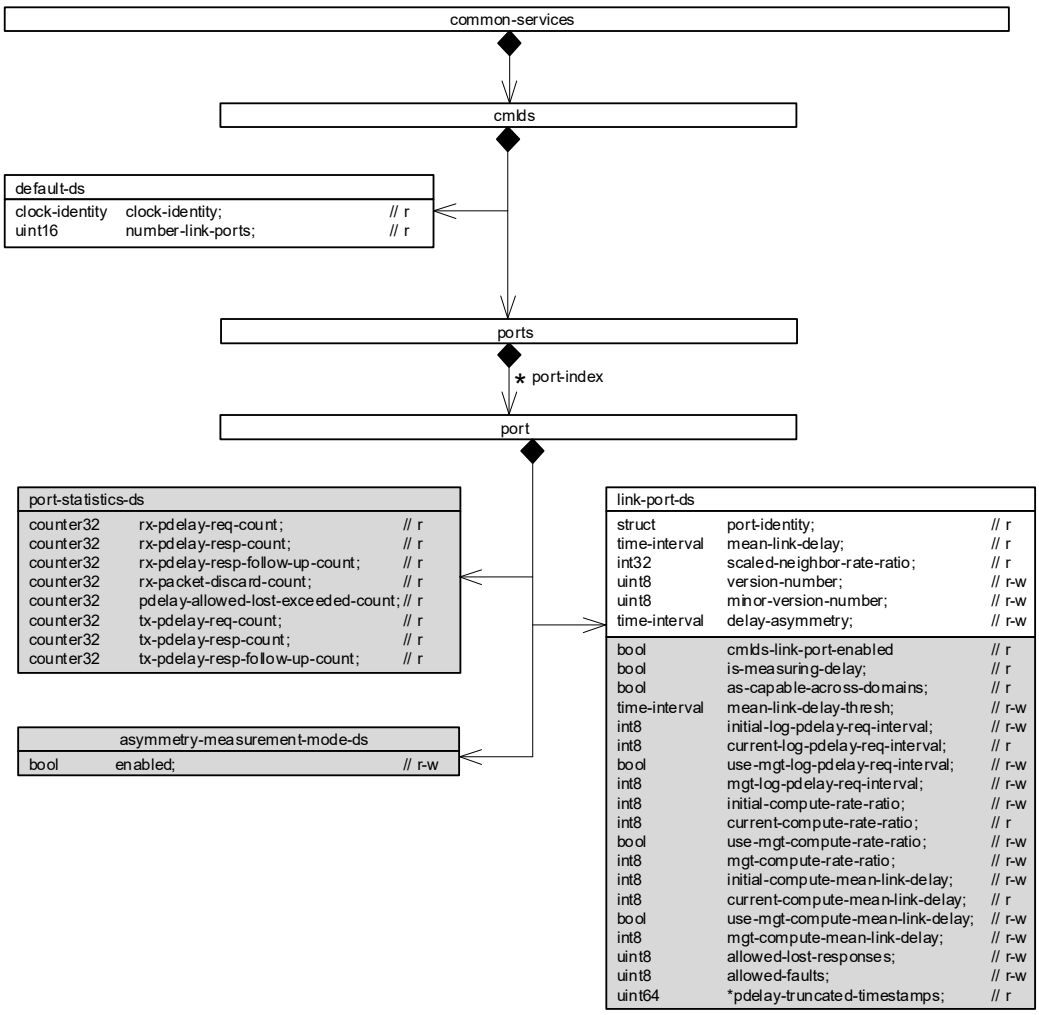

Figure 17-4—Common services detail

17.3 Structure of the YANG data model

The YANG data model specified by this standard uses the YANG modules summarized in Table 17-1.[1]

In the YANG module definitions, if any discrepancy between the “description” text and the corresponding definition in any other part of this standard occur, the definitions outside this clause (Clause 17) take precedence..

[1]An amendment’s designation is often used to refer to functionality in an IEEE standard after the amendment has been incorporated in a revision of the standard, even if the functionality has been revised. The amendment that added each YANG module is identified to help locate the relevant provisions of this standard.

Table 17-1—Summary of the YANG modules

Module	Managed functionality	YANG specification notes
ietf-yang-types	Type definitions	IETF RFC 6991 - Common YANG Data Types.
ieee1588-ptp	Clause 14	IEEE Std 1588e - MIB and YANG Data Models. IEEE Std 802.1ASdn imports this YANG module as its foundational tree, including a subset of members from Clause 14.
ieee802-dot1as-ptp	Clause 14	IEEE Std 802.1ASdn - YANG Data Model. The YANG module of this clause uses YANG augments to add members from Clause 14 that are unique to IEEE Std 802.1AS.

17.4 Security considerations

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF ([B41]) and RESTCONF ([B46]). NETCONF and RESTCONF protocols provide the means to secure communication between client and server, using secure transport layers such as Secure Shell (SSH) ([B42]) and Transport Layer Security (TLS) ([B44]).

It is the responsibility of a system's implementor and administrator to ensure that the protocol entities in the system that support NETCONF, and any other remote configuration protocols that make use of these YANG modules, are properly configured to allow access only to those principals (users) that have legitimate rights to read or write data nodes. This standard does not specify how the credentials of those users are to be stored or validated.

The Network Configuration Access Control Model (NACM) ([B43]) provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

There are a number of data sets in this YANG module that contain writable data nodes ([B45]), such as:

```
/ptp/instances/instance/default-ds
/ptp/instances/instance/path-trace-ds
/ptp/instances/instance/acceptable-master-ds
/ptp/instances/instance/ports/port/port-ds
/ptp/instances/instance/ports/port/acceptable-master-port-ds
/ptp/instances/instance/ports/port/external-port-config-port-ds
/ptp/instances/instance/ports/port/asymmetry-measurement-mode-ds
/ptp/cmlds/ports/port/link-port-ds
/ptp/cmlds/ports/port/asymmetry-measurement-mode-ds
```

Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. Specifically, an inappropriate configuration of them may adversely impact a PTP synchronization network. For example, loss of synchronization on a clock, accuracy degradation on a set of clocks, or even break down of a whole synchronization network.

17.5 YANG schema tree definitions

The schema tree in this clause is provided as an overview of the YANG module in 17.6. The symbols and their meaning are specified in YANG Tree Diagrams (IETF RFC 8340 [B47]).

17.5.1 Tree diagram for ieee802-dot1as-ptp.yang

```
module: ieee802-dot1as-ptp

  augment /ptp:ptp/ptp:instances/ptp:instance/ptp:default-ds:
    +--ro gm-capable?                boolean
    +--ro current-utc-offset?        int16
    +--ro current-utc-offset-valid?  boolean
    +--ro leap59?                    boolean
    +--ro leap61?                    boolean
    +--ro time-traceable?            boolean
    +--ro frequency-traceable?       boolean
    +--ro ptp-timescale?             boolean
    +--ro time-source?               identityref
  augment /ptp:ptp/ptp:instances/ptp:instance/ptp:current-ds:
    +--ro last-gm-phase-change?       scaled-ns
```

```
      +--ro last-gm-freq-change?         float64
      +--ro gm-timebase-indicator?       uint16
      +--ro gm-change-count?             yang:counter32
      +--ro time-of-last-gm-change?      yang:timestamp
      +--ro time-of-last-phase-change?   yang:timestamp
      +--ro time-of-last-freq-change?    yang:timestamp
    augment /ptp:ptp/ptp:instances/ptp:instance/ptp:parent-ds:
      +--ro cumulative-rate-ratio?   int32
    augment /ptp:ptp/ptp:instances/ptp:instance/ptp:ports/ptp:port/ptp:port-ds:
      +--ro is-measuring-delay?                boolean
      +--ro as-capable?                        boolean
      +--rw mean-link-delay-thresh?            ptp:time-interval
      +--ro neighbor-rate-ratio?               int32
      +--rw initial-log-announce-interval?     int8
      +--ro current-log-announce-interval?     int8
      +--rw use-mgt-log-announce-interval?     boolean
      +--rw initial-log-sync-interval?         int8
      +--ro current-log-sync-interval?         int8
      +--rw use-mgt-log-sync-interval?         boolean
      +--rw sync-receipt-timeout?              uint8
      +--ro sync-receipt-timeout-interval?     uscaled-ns
      +--rw initial-log-pdelay-req-interval?   int8
      +--ro current-log-pdelay-req-interval?   int8
      +--rw use-mgt-log-pdelay-req-interval?   boolean
      +--rw mgt-log-pdelay-req-interval?       int8
      +--rw initial-log-gptp-cap-interval?     int8
      +--ro current-log-gptp-cap-interval?     int8
      +--rw use-mgt-log-gptp-cap-interval?     boolean
      +--rw mgt-log-gptp-cap-interval?         int8
      +--rw initial-compute-rate-ratio?        int8
      +--ro current-compute-rate-ratio?        int8
      +--rw use-mgt-compute-rate-ratio?        boolean
      +--rw mgt-compute-rate-ratio?            int8
      +--rw initial-compute-mean-link-delay?   int8
      +--ro current-compute-mean-link-delay?   int8
      +--rw use-mgt-compute-mean-link-delay?   boolean
      +--rw mgt-compute-mean-link-delay?       int8
      +--rw allowed-lost-responses?            uint8
      +--rw allowed-faults?                    uint8
      +--rw gptp-cap-receipt-timeout?          uint8
      +--rw nup?                               float64
      +--rw ndown?                             float64
      +--ro one-step-tx-oper?                  boolean
      +--ro one-step-receive?                  boolean
      +--ro one-step-transmit?                 boolean
      +--rw initial-one-step-tx-oper?          int8
      +--ro current-one-step-tx-oper?          int8
      +--rw use-mgt-one-step-tx-oper?          boolean
      +--rw mgt-one-step-tx-oper?              int8
      +--ro sync-locked?                       boolean
      +--ro pdelay-truncated-timestamps*       uint64
    augment /ptp:ptp/ptp:instances/ptp:instance/ptp:ports/ptp:port:
      +--rw port-statistics-ds
         +--ro rx-sync-count?                        yang:counter32
         +--ro rx-one-step-sync-count?               yang:counter32
         +--ro rx-follow-up-count?                   yang:counter32
         +--ro rx-pdelay-req-count?                  yang:counter32
         +--ro rx-pdelay-resp-count?                 yang:counter32
         +--ro rx-pdelay-resp-follow-up-count?       yang:counter32
```

```
        +--ro rx-announce-count?                    yang:counter32
        +--ro rx-packet-discard-count?              yang:counter32
        +--ro sync-receipt-timeout-count?           yang:counter32
        +--ro announce-receipt-timeout-count?       yang:counter32
        +--ro pdelay-allowed-lost-exceeded-count?   yang:counter32
        +--ro tx-sync-count?                        yang:counter32
        +--ro tx-one-step-sync-count?               yang:counter32
        +--ro tx-follow-up-count?                   yang:counter32
        +--ro tx-pdelay-req-count?                  yang:counter32
        +--ro tx-pdelay-resp-count?                 yang:counter32
        +--ro tx-pdelay-resp-follow-up-count?       yang:counter32
        +--ro tx-announce-count?                    yang:counter32
    augment /ptp:ptp/ptp:instances/ptp:instance/ptp:ports/ptp:port:
      +--rw asymmetry-measurement-mode-ds
         +--rw enabled?   boolean
      augment  /ptp:ptp/ptp:common-services/ptp:cmlds/ptp:ports/ptp:port/ptp:link-
port-ds:
      +--ro cmlds-link-port-enabled?           boolean
      +--ro is-measuring-delay?                boolean
      +--ro as-capable-across-domains?         boolean
      +--rw mean-link-delay-thresh?            ptp:time-interval
      +--rw initial-log-pdelay-req-interval?   int8
      +--ro current-log-pdelay-req-interval?   int8
      +--rw use-mgt-log-pdelay-req-interval?   boolean
      +--rw mgt-log-pdelay-req-interval?       int8
      +--rw initial-compute-rate-ratio?        int8
      +--ro current-compute-rate-ratio?        int8
      +--rw use-mgt-compute-rate-ratio?        boolean
      +--rw mgt-compute-rate-ratio?            int8
      +--rw initial-compute-mean-link-delay?   int8
      +--ro current-compute-mean-link-delay?   int8
      +--rw use-mgt-compute-mean-link-delay?   boolean
      +--rw mgt-compute-mean-link-delay?       int8
      +--rw allowed-lost-responses?            uint8
      +--rw allowed-faults?                    uint8
      +--ro pdelay-truncated-timestamps*       uint64
    augment /ptp:ptp/ptp:common-services/ptp:cmlds/ptp:ports/ptp:port:
      +--rw port-statistics-ds
         +--ro rx-pdelay-req-count?                  yang:counter32
         +--ro rx-pdelay-resp-count?                 yang:counter32
         +--ro rx-pdelay-resp-follow-up-count?       yang:counter32
         +--ro rx-packet-discard-count?              yang:counter32
         +--ro pdelay-allowed-lost-exceeded-count?   yang:counter32
         +--ro tx-pdelay-req-count?                  yang:counter32
         +--ro tx-pdelay-resp-count?                 yang:counter32
         +--ro tx-pdelay-resp-follow-up-count?       yang:counter32
    augment /ptp:ptp/ptp:common-services/ptp:cmlds/ptp:ports/ptp:port:
      +--rw asymmetry-measurement-mode-ds
         +--rw enabled?   boolean
```

17.6 YANG module[1] [2]

Although not formally specified by this standard, the YANG module specified by IEEE Std 1588e (ieee1588-ptp.yang) serves as the foundation of the YANG module specified in this clause.

17.6.1 Module ieee802-dot1as-ptp.yang

```
module ieee802-dot1as-ptp {
  yang-version 1.1;
  namespace urn:ieee:std:802.1AS:yang:ieee802-dot1as-ptp;
  prefix dot1as-ptp;

  import ietf-yang-types {
    prefix yang;
  }
  import ieee1588-ptp {
    prefix ptp;
  }

  organization
    "IEEE 802.1 Working Group";
  contact
    "WG-URL: http://ieee802.org/1/
     WG-EMail: stds-802-1-l@ieee.org

     Contact: IEEE 802.1 Working Group Chair
              Postal: C/O IEEE 802.1 Working Group
              IEEE Standards Association
              445 Hoes Lane
              Piscataway, NJ 08854
              USA

     E-mail: stds-802-1-chairs@ieee.org";
  description
    "Management objects that control timing and synchronization
    for time sensitive applications, as specified in
    IEEE Std 802.1AS-2020.

    Copyright (C) IEEE (2023).
    This version of this YANG module is part of IEEE Std 802.1AS;
    see the standard itself for full legal notices.";

  revision 2023-04-04 {
    description
      "Published as part of IEEE Std 802.1ASdn-2023.
      Initial version.";
    reference
      "IEEE Std 802.1ASdn-2023 - YANG Data Model";
  }

  typedef scaled-ns {
    type string {
      pattern "[0-9A-F]{2}(-[0-9A-F]{2}){11}";
```

[1] Copyright release for YANG modules: Users of this standard may freely reproduce the YANG modules contained in this subclause so that they can be used for their intended purpose.

[2] An ASCII version of the YANG modules are attached to the PDF version of this standard, and can be obtained by Web browser from the IEEE 802.1 Website at https://1.ieee802.org/yang-modules/.

```
    }
    description
      "The IEEE Std 802.1AS ScaledNs type represents
      signed values of time and time interval in units
      of 2^16 ns, as a signed 96-bit integer.
      YANG does not support a signed 96-bit integer.
      Each of the 12 octets is represented in YANG as a pair of
      hexadecimal characters, using uppercase for a letter.
      Each octet in the array is separated by the dash
      character. The most significant octet is first.";
    reference
      "6.4.3.1 of IEEE Std 802.1AS-2020";
  }

  typedef uscaled-ns {
    type string {
      pattern "[0-9A-F]{2}(-[0-9A-F]{2}){11}";
    }
    description
      "The IEEE Std 802.1AS UScaledNs type represents
      unsigned values of time and time interval in units
      of 2^16 ns, as an unsigned 96-bit integer.
      YANG does not support an unsigned 96-bit integer.
      Each of the 12 octets is represented in YANG as a pair of
      hexadecimal characters, using uppercase for a letter.
      Each octet in the array is separated by the dash
      character. The most significant octet is first.";
    reference
      "6.4.3.2 of IEEE Std 802.1AS-2020";
  }

  typedef float64 {
    type string {
      pattern "[0-9A-F]{2}(-[0-9A-F]{2}){7}";
    }
    description
      "The IEEE Std 802.1AS Float64 type represents
      IEEE Std 754 binary64 (64-bit
      double-precision floating-point format).
      YANG does not support floating-point,
      Each of the 8 octets is represented in YANG as a pair of
      hexadecimal characters, using uppercase for a letter.
      Each octet in the array is separated by the dash
      character. The most significant octet is first.";
    reference
      "6.4.2 of IEEE Std 802.1AS-2020";
  }

  augment "/ptp:ptp/ptp:instances/ptp:instance/ptp:default-ds" {
    description
      "Augment IEEE Std 1588 defaultDS.";

    leaf gm-capable {
      type boolean;
      config false;
      description
        "The value is true if the time-aware system is capable
        of being a grandmaster, and false if the time-aware
        system is not capable of being a grandmaster.";
```

```
      reference
        "14.2.7 of IEEE Std 802.1AS-2020";
    }

    leaf current-utc-offset {
      when "../current-utc-offset-valid='true'";
      type int16;
      config false;
      description
        "Offset from UTC (TAI - UTC).
        The offset is in units of seconds.
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
      reference
        "14.2.8 of IEEE Std 802.1AS-2020";
    }

    leaf current-utc-offset-valid {
      type boolean;
      config false;
      description
        "The value of current-utc-offset-valid shall be true
        if the value of current-utc-offset is known to be
        correct, otherwise it shall be false.
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
      reference
        "14.2.9 of IEEE Std 802.1AS-2020";
    }

    leaf leap59 {
      type boolean;
      config false;
      description
        "If the timescale is PTP, a true value for leap59
        shall indicate that the last minute of the
        current UTC day contains 59 seconds.
        If the timescale is not PTP, the value shall be
        false.
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
      reference
        "14.2.10 of IEEE Std 802.1AS-2020";
    }

    leaf leap61 {
      type boolean;
      config false;
      description
        "If the timescale is PTP, a true value for leap61
        shall indicate that the last minute of the
        current UTC day contains 61 seconds.
        If the timescale is not PTP, the value shall be
        false.
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
     reference
       "14.2.11 of IEEE Std 802.1AS-2020";
    }
```

```
    leaf time-traceable {
      type boolean;
      config false;
      description
        "The value of time-traceable shall be true if the
        timescale is traceable to a primary reference;
        otherwise, the value shall be false.
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
      reference
        "14.2.12 of IEEE Std 802.1AS-2020";
    }

    leaf frequency-traceable {
      type boolean;
      config false;
      description
        "The value of frequency-traceable shall be true if
        the frequency determining the timescale is traceable
        to a primary reference; otherwise, the value shall
        be false.
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
     reference
       "14.2.13 of IEEE Std 802.1AS-2020";
    }

    leaf ptp-timescale {
      type boolean;
      config false;
      description
        "If ptp-timescale is true, the timescale of
        the ClockTimeTransmitter entity is PTP, which is
        the elapsed time since the PTP epoch measured
        using the second defined by International Atomic
        Time (TAI).
        If ptp-timescale is false, the timescale of
        the ClockTimeTransmitter entity is ARB, which is
        the elapsed time since an arbitrary epoch.
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
      reference
        "14.2.14 of IEEE Std 802.1AS-2020";
    }

    leaf time-source {
      type identityref {
        base ptp:time-source;
      }
      config false;
      description
        "The source of time used by the Grandmaster Clock
        This leaf applies to the ClockTimeTransmitter entity
        (i.e., local only, unrelated to a remote GM).";
      reference
        "14.2.15 of IEEE Std 802.1AS-2020";
    }
  }
```

```
  augment "/ptp:ptp/ptp:instances/ptp:instance/ptp:current-ds" {
    description
      "Augment IEEE Std 1588 currentDS.";

    leaf last-gm-phase-change {
      type scaled-ns;
      config false;
      description
        "Phase change that occurred on the most recent
        change in either the Grandmaster PTP Instance
        or gm-timebase-indicator leaf.";
      reference
        "14.3.4 of IEEE Std 802.1AS-2020";
    }

    leaf last-gm-freq-change {
      type float64;
      config false;
      description
        "Frequency change that occurred on the most recent
        change in either the Grandmaster PTP Instance
        or gm-timebase-indicator leaf.";
      reference
        "14.3.5 of IEEE Std 802.1AS-2020";
    }

    leaf gm-timebase-indicator {
      type uint16;
      config false;
      description
        "The timeBaseIndicator of the current
        Grandmaster PTP Instance.";
      reference
        "14.3.6 of IEEE Std 802.1AS-2020";
    }

    leaf gm-change-count {
      type yang:counter32;
      config false;
      description
        "This statistics counter tracks the number of times
        the Grandmaster PTP Instance has changed in a
        gPTP domain.";
      reference
        "14.3.7 of IEEE Std 802.1AS-2020";
    }

    leaf time-of-last-gm-change {
      type yang:timestamp;
      config false;
      description
        "System time when the most recent Grandmaster Clock
        change occurred in a gPTP domain.
        This leaf's type is YANG timestamp, which is based
        on system time. System time is an unsigned integer
        in units of 10 milliseconds, using an epoch defined
        by the implementation (typically time of boot-up).";
      reference
```

```
        "14.3.8 of IEEE Std 802.1AS-2020";
    }

    leaf time-of-last-phase-change {
      type yang:timestamp;
      config false;
      description
        "System time when the most recent change in Grandmaster
        Clock phase occurred.
        This leaf's type is YANG timestamp, which is based
        on system time. System time is an unsigned integer
        in units of 10 milliseconds, using an epoch defined
        by the implementation (typically time of boot-up).";
      reference
        "14.3.9 of IEEE Std 802.1AS-2020";
    }

    leaf time-of-last-freq-change {
      type yang:timestamp;
      config false;
      description
        "System time when the most recent change in Grandmaster
        Clock frequency occurred.
        This leaf's type is YANG timestamp, which is based
        on system time. System time is an unsigned integer
        in units of 10 milliseconds, using an epoch defined
        by the implementation (typically time of boot-up).";
      reference
        "14.3.10 of IEEE Std 802.1AS-2020";
    }
  }

  augment "/ptp:ptp/ptp:instances/ptp:instance/ptp:parent-ds" {
    description
      "Augment IEEE Std 1588 parentDS.";

    leaf cumulative-rate-ratio {
      type int32;
      config false;
      description
        "Estimate of the ratio of the frequency of the Grandmaster
        Clock to the frequency of the LocalClock entity of this
        PTP Instance. cumulative-rate-ratio is expressed as
        the fractional frequency offset multiplied by 2^41,
        i.e., the quantity (rateRatio - 1.0)(2^41).";
      reference
        "14.4.3 of IEEE Std 802.1AS-2020";
    }
  }

  augment "/ptp:ptp/ptp:instances/ptp:instance/ptp:ports/ptp:port/ptp:port-ds" {
    description
      "Augment IEEE Std 1588 portDS.

      14.8.4 of IEEE Std 802.1AS-2020 specifies ptpPortEnabled
      (ptp-port-enabled), which is provided in YANG as the
      semantically equivalent node in ieee1588-ptp named
      port-enable (in port-ds).
```

```
        14.8.15 of IEEE Std 802.1AS-2020 specifies
        mgtSettableLogAnnounceInterval
        (mgt-settable-log-announce-interval), which is provided in
        YANG as the semantically equivalent node in ieee1588-ptp named
        log-announce-interval (in port-ds). In the context of
        IEEE Std 802.1AS, log-announce-interval cannot be used
        unless use-mgt-log-announce-interval is true.

        14.8.20 of IEEE Std 802.1AS-2020 specifies
        mgtSettableLogSyncInterval
        (mgt-settable-log-sync-interval), which is provided in YANG
        as the semantically equivalent node in ieee1588-ptp named
        log-sync-interval (in port-ds). In the context of
        IEEE Std 802.1AS, log-sync-interval cannot be used
        unless use-mgt-log-sync-interval is true.";

      leaf is-measuring-delay {
        type boolean;
        config false;
        description
          "Boolean that is true if the port is measuring
          PTP Link propagation delay.";
        reference
          "14.8.6 of IEEE Std 802.1AS-2020";
      }

      leaf as-capable {
        type boolean;
        config false;
        description
          "Boolean that is true if and only if it is determined
          that this PTP Instance and the PTP Instance at the
          other end of the link attached to this port can
          interoperate with each other via the IEEE Std
          802.1AS protocol.";
        reference
          "10.2.5.1 of IEEE Std 802.1AS-2020
          14.8.7 of IEEE Std 802.1AS-2020";
      }

      leaf mean-link-delay-thresh {
        type ptp:time-interval;
        description
          "Propagation time threshold for mean-link-delay,
          above which a port is not considered capable of
          participating in the IEEE Std 802.1AS protocol.";
        reference
          "14.8.9 of IEEE Std 802.1AS-2020";
      }

      leaf neighbor-rate-ratio {
        type int32;
        config false;
        description
          "Estimate of the ratio of the frequency of the LocalClock
          entity of the PTP Instance at the other end of the
          link attached to this PTP Port, to the frequency of the
          LocalClock entity of this PTP Instance.
          neighbor-rate-ratio is expressed as the fractional
```

```
        frequency offset multiplied by 2^41,
        i.e., the quantity (rateRatio - 1.0)(2^41).";
      reference
        "14.8.11 of IEEE Std 802.1AS-2020";
    }

    leaf initial-log-announce-interval {
      type int8;
      description
        "When use-mgt-log-announce-interval is false
        (i.e., change with Signaling message), this is the
        the logarithm to base 2 of the announce
        interval used when the port is initialized.";
      reference
        "14.8.12 of IEEE Std 802.1AS-2020";
    }

    leaf current-log-announce-interval {
      type int8;
      config false;
      description
        "Logarithm to base 2 of the current
        announce interval.";
      reference
        "14.8.13 of IEEE Std 802.1AS-2020";
    }

    leaf use-mgt-log-announce-interval {
      type boolean;
      description
        "Boolean that determines the source of the
        announce interval.
        If the value is true, the announce interval
        (current-log-announce-interval) is set equal to the value
        of mgt-log-announce-interval.
        If the value is false, the announce interval is determined
        by the AnnounceIntervalSetting state machine (i.e., changed
        with Signaling message).";
      reference
        "14.8.14 of IEEE Std 802.1AS-2020";
    }

    leaf initial-log-sync-interval {
      type int8;
      description
        "When use-mgt-log-sync-interval is false
        (i.e., change with Signaling message), this is the
        the logarithm to base 2 of the sync
        interval used when the port is initialized.";
    reference
        "14.8.17 of IEEE Std 802.1AS-2020";
    }

    leaf current-log-sync-interval {
      type int8;
      config false;
      description
        "Logarithm to base 2 of the current sync
        interval.";
```

```
        reference
          "14.8.18 of IEEE Std 802.1AS-2020";
      }

      leaf use-mgt-log-sync-interval {
        type boolean;
        description
          "Boolean that determines the source of the
          sync interval.
          If the value is true, the sync interval
          (current-log-sync-interval) is set equal to the value
          of mgt-log-sync-interval.
          If the value is false, the sync interval is determined
          by the SyncIntervalSetting state machine (i.e., changed
          with Signaling message).";
        reference
          "14.8.19 of IEEE Std 802.1AS-2020";
      }

      leaf sync-receipt-timeout {
        type uint8;
        description
          "Number of sync intervals that a timeReceiver port waits
          without receiving synchronization information, before
          assuming that the timeTransmitter is no longer transmitting
          synchronization information and that the BTCA needs to be
          run, if appropriate.";
        reference
          "14.8.21 of IEEE Std 802.1AS-2020";
      }

      leaf sync-receipt-timeout-interval {
        type uscaled-ns;
        config false;
        description
          "Time interval after which sync receipt timeout occurs
          if time-synchronization information has not been
          received during the interval.";
      reference
          "14.8.22 of IEEE Std 802.1AS-2020";
      }

      leaf initial-log-pdelay-req-interval {
        type int8;
        description
          "When use-mgt-log-pdelay-req-interval is false
          (i.e., change with Signaling message), this is the
          the logarithm to base 2 of the Pdelay_Req transmit
          interval used when the port is initialized.";
        reference
          "14.8.23 of IEEE Std 802.1AS-2020";
      }

      leaf current-log-pdelay-req-interval {
        type int8;
        config false;
        description
          "Logarithm to base 2 of the current Pdelay_Req transmit
          interval.";
```

```
        reference
          "14.8.24 of IEEE Std 802.1AS-2020";
      }

      leaf use-mgt-log-pdelay-req-interval {
        type boolean;
        description
          "Boolean that determines the source of the
          Pdelay_Req transmit interval.
          If the value is true, the Pdelay_Req transmit interval
          (current-log-pdelay-req-interval) is set equal to the value
          of mgt-log-pdelay-req-interval.
          If the value is false, the Pdelay_Req transmit interval is
          determined by the LinkDelayIntervalSetting state machine
          (i.e., changed with Signaling message).";
        reference
          "14.8.25 of IEEE Std 802.1AS-2020";
      }

      leaf mgt-log-pdelay-req-interval {
        type int8;
        description
          "Logarithm to base 2 of the Pdelay_Req transmit interval,
          used if use-mgt-log-pdelay-req-interval is true.
          This value is not used if use-mgt-log-pdelay-req-interval
          is false.";
        reference
          "14.8.26 of IEEE Std 802.1AS-2020";
      }

      leaf initial-log-gptp-cap-interval {
        type int8;
        description
          "When use-mgt-log-gptp-cap-interval is false
          (i.e., change with Signaling message), this is the
          the logarithm to base 2 of the gPTP capable message
          interval used when the port is initialized.";
        reference
          "14.8.27 of IEEE Std 802.1AS-2020";
      }

      leaf current-log-gptp-cap-interval {
        type int8;
        config false;
        description
          "Logarithm to base 2 of the current gPTP capable message
          interval.";
        reference
          "14.8.28 of IEEE Std 802.1AS-2020";
      }

      leaf use-mgt-log-gptp-cap-interval {
        type boolean;
        description
          "Boolean that determines the source of the
          gPTP capable message interval.
          If the value is true, the gPTP capable message interval
          (current-log-gptp-cap-interval) is set equal to the value
          of mgt-gptp-cap-req-interval.
```

```
        If the value is false, the gPTP capable message interval is
        determined by the GptpCapableMessageIntervalSetting
        state machine (i.e., changed with Signaling message).";
      reference
        "14.8.29 of IEEE Std 802.1AS-2020";
    }

    leaf mgt-log-gptp-cap-interval {
      type int8;
      description
        "Logarithm to base 2 of the gPTP capable message interval,
        used if use-mgt-log-gptp-cap-interval is true.
        This value is not used if use-mgt-log-pdelay-req-interval
        is false.";
      reference
        "14.8.30 of IEEE Std 802.1AS-2020";
    }

    leaf initial-compute-rate-ratio {
      type int8;
      description
        "When use-mgt-compute-rate-ratio is false
        (i.e., change with Signaling message), this is the
        initial value of computeNeighborRateRatio.";
      reference
        "14.8.31 of IEEE Std 802.1AS-2020";
    }

    leaf current-compute-rate-ratio {
      type int8;
      config false;
      description
        "Current value of computeNeighborRateRatio.";
      reference
        "14.8.32 of IEEE Std 802.1AS-2020";
    }

    leaf use-mgt-compute-rate-ratio {
      type boolean;
      description
        "Boolean that determines the source of
        computeNeighborRateRatio..
        If the value is true, computeNeighborRateRatio
        is set equal to the value of mgt-compute-rate-ratio.
        If the value is false, computeNeighborRateRatio is
        determined by the LinkDelayIntervalSetting
        state machine (i.e., changed with Signaling message).";
      reference
        "14.8.33 of IEEE Std 802.1AS-2020";
    }

    leaf mgt-compute-rate-ratio {
      type int8;
      description
        "Value of computeNeighborRateRatio, used if
        use-mgt-compute-rate-ratio is true.
        This value is not used if use-mgt-compute-rate-ratio
        is false.";
      reference
```

```
        "14.8.34 of IEEE Std 802.1AS-2020";
    }

    leaf initial-compute-mean-link-delay {
      type int8;
      description
        "When use-mgt-compute-mean-link-delay is false
        (i.e., change with Signaling message), this is the
        initial value of computeMeanLinkDelay.";
      reference
        "14.8.35 of IEEE Std 802.1AS-2020";
    }

    leaf current-compute-mean-link-delay {
      type int8;
      config false;
      description
        "Current value of computeMeanLinkDelay.";
      reference
        "14.8.36 of IEEE Std 802.1AS-2020";
    }

    leaf use-mgt-compute-mean-link-delay {
      type boolean;
      description
        "Boolean that determines the source of
        computeMeanLinkDelay.
        If the value is true, computeMeanLinkDelay
        is set equal to the value of mgt-compute-mean-link-delay.
        If the value is false, computeMeanLinkDelay is
        determined by the LinkDelayIntervalSetting
        state machine (i.e., changed with Signaling message).";
      reference
        "14.8.37 of IEEE Std 802.1AS-2020";
    }

    leaf mgt-compute-mean-link-delay {
      type int8;
      description
        "Value of computeMeanLinkDelay, used if
        use-mgt-compute-mean-link-delay is true.
        This value is not used if use-mgt-compute-mean-link-delay
        is false.";
      reference
        "14.8.38 of IEEE Std 802.1AS-2020";
    }

    leaf allowed-lost-responses {
      type uint8;
      description
        "Number of Pdelay_Req messages for which a valid response
        is not received, above which a port is considered to not
        be exchanging peer delay messages with its neighbor.";
      reference
        "14.8.39 of IEEE Std 802.1AS-2020";
    }

    leaf allowed-faults {
      type uint8;
```

```
        description
          "Number of faults above which asCapable is set to false.";
        reference
          "14.8.40 of IEEE Std 802.1AS-2020";
      }

      leaf gptp-cap-receipt-timeout {
        type uint8;
        description
          "Number of transmission intervals that a port waits without
          receiving the gPTP capable TLV, before assuming that the
          neighbor port is no longer invoking the gPTP protocol.";
        reference
          "14.8.41 of IEEE Std 802.1AS-2020";
      }

      leaf nup {
        type float64;
        description
          "For an OLT port of an IEEE Std 802.3 EPON link, this value
          is the effective index of refraction for the EPON
          upstream wavelength light of the optical path";
        reference
          "14.8.43 of IEEE Std 802.1AS-2020";
      }

      leaf ndown {
        type float64;
        description
          "For an OLT port of an IEEE 802.3 EPON link, this value
          is the effective index of refraction for the EPON
          downstream wavelength light of the optical path";
        reference
          "14.8.44 of IEEE Std 802.1AS-2020";
      }

      leaf one-step-tx-oper {
        type boolean;
        config false;
        description
          "This value is true if the port is sending one-step
          Sync messages, and false if the port is sending
          two-step Sync and Follow-Up messages.";
        reference
          "14.8.45 of IEEE Std 802.1AS-2020";
      }

      leaf one-step-receive {
        type boolean;
        config false;
        description
          "This value is true if the port is capable of
          receiving and processing one-step Sync messages.";
        reference
          "14.8.46 of IEEE Std 802.1AS-2020";
      }

      leaf one-step-transmit {
        type boolean;
```

```
        config false;
        description
          "This value is true if the port is capable of
          transmitting one-step Sync messages.";
        reference
          "14.8.47 of IEEE Std 802.1AS-2020";
      }

      leaf initial-one-step-tx-oper {
        type int8;
        description
          "When use-mgt-one-step-tx-oper is false
          (i.e., change with Signaling message), this is the
          initial value of current-one-step-tx-oper.";
        reference
          "14.8.48 of IEEE Std 802.1AS-2020";
      }

      leaf current-one-step-tx-oper {
        type int8;
        config false;
        description
          "This value is true if the port is configured to
          transmit one-step Sync messages, either via management
          (mgt-one-step-tx-oper) or Signaling. If both
          current-one-step-tx-oper and one-step-transmit
          are true, the port transmits one-step Sync messages
          (i.e., one-step-tx-oper true).";
        reference
          "14.8.49 of IEEE Std 802.1AS-2020";
      }

      leaf use-mgt-one-step-tx-oper {
        type boolean;
        description
          "Boolean that determines the source of
          current-one-step-tx-oper.
          If the value is true, current-one-step-tx-oper
          is set equal to the value of mgt-one-step-tx-oper.
          If the value is false, current-one-step-tx-oper is
          determined by the OneStepTxOperSetting
          state machine (i.e., changed with Signaling message).";
        reference
          "14.8.50 of IEEE Std 802.1AS-2020";
      }

      leaf mgt-one-step-tx-oper {
        type int8;
        description
          "If use-mgt-one-step-tx-oper is true,
          current-one-step-tx-oper is set equal to this value.
          This value is not used if use-mgt-one-step-tx-oper
          is false.";
        reference
          "14.8.51 of IEEE Std 802.1AS-2020";
      }

      leaf sync-locked {
        type boolean;
```

```
        config false;
        description
          "This value is true if the port will transmit a Sync as
          soon as possible after the timeReceiver port receives a Sync
          message.";
        reference
          "14.8.52 of IEEE Std 802.1AS-2020";
      }

      leaf-list pdelay-truncated-timestamps {
        type uint64 {
          range "0..281474976710655";
        }
        config false;
        description
          "For full-duplex IEEE Std 802.3 media, and CSN media that use
          the peer-to-peer delay mechanism to measure path delay,
          the values of the four elements of this leaf-list correspond
          to the timestamps t1, t2, t3, and t4, listed in that order.
          Each timestamp is expressed in units of 2^-16 ns (i.e., the
          value of each array element is equal to the remainder obtained
          upon dividing the respective timestamp, expressed in units of
          2^-16 ns, by 2^48). At any given time, the timestamp values
          stored in the array are for the same, and most recently
          completed, peer delay message exchange. For each timestamp,
          only 48-bits are valid (the upper 16-bits are always zero).";
        reference
          "14.8.53 of IEEE Std 802.1AS-2020";
      }
    }

    augment "/ptp:ptp/ptp:instances/ptp:instance/ptp:ports/ptp:port" {
      description
        "Augment to add port-statistics-ds to IEEE Std 1588 PTP Port.";

      container port-statistics-ds {
        description
          "Provides counters associated with the port of the
          PTP Instance.";
        reference
          "14.10 of IEEE Std 802.1AS-2020";

        leaf rx-sync-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time synchronization
            information is received.";
          reference
            "14.10.2 of IEEE Std 802.1AS-2020";
        }

        leaf rx-one-step-sync-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time a one-step Sync
            message is received.";
          reference
```

```
            "14.10.3 of IEEE Std 802.1AS-2020";
        }

        leaf rx-follow-up-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time a Follow_Up
            message is received.";
          reference
            "14.10.4 of IEEE Std 802.1AS-2020";
        }

        leaf rx-pdelay-req-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time a Pdelay_Req
            message is received.";
          reference
            "14.10.5 of IEEE Std 802.1AS-2020";
        }

        leaf rx-pdelay-resp-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time a Pdelay_Resp
            message is received.";
          reference
            "14.10.6 of IEEE Std 802.1AS-2020";
        }

        leaf rx-pdelay-resp-follow-up-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time a Pdelay_Resp_Follow_Up
            message is received.";
          reference
            "14.10.7 of IEEE Std 802.1AS-2020";
        }

        leaf rx-announce-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time an Announce
            message is received.";
          reference
            "14.10.8 of IEEE Std 802.1AS-2020";
        }

        leaf rx-packet-discard-count {
          type yang:counter32;
          config false;
          description
            "Counter that increments every time a PTP message
            of the respective PTP Instance is discarded.";
```

```
        reference
          "14.10.9 of IEEE Std 802.1AS-2020";
      }

      leaf sync-receipt-timeout-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time a sync receipt
          timeout occurs.";
        reference
          "14.10.10 of IEEE Std 802.1AS-2020";
      }

      leaf announce-receipt-timeout-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time an announce receipt
          timeout occurs.";
        reference
          "14.10.11 of IEEE Std 802.1AS-2020";
      }

      leaf pdelay-allowed-lost-exceeded-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time the value of the
          variable lostResponses exceeds the value of the variable
          allowedLostResponses, in the RESET state of the
          MDPdelayReq state machine.";
        reference
          "14.10.12 of IEEE Std 802.1AS-2020";
      }

      leaf tx-sync-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time synchronization
          information is transmitted.";
        reference
          "14.10.13 of IEEE Std 802.1AS-2020";
      }

      leaf tx-one-step-sync-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time a one-step Sync
          message is transmitted.";
        reference
          "14.10.14 of IEEE Std 802.1AS-2020";
      }

      leaf tx-follow-up-count {
        type yang:counter32;
        config false;
```

```
        description
          "Counter that increments every time a Follow_Up
          message is transmitted.";
        reference
          "14.10.15 of IEEE Std 802.1AS-2020";
      }

      leaf tx-pdelay-req-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time a Pdelay_Req
          message is transmitted.";
        reference
          "14.10.16 of IEEE Std 802.1AS-2020";
      }

      leaf tx-pdelay-resp-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time a Pdelay_Resp
          message is transmitted.";
        reference
          "14.10.17 of IEEE Std 802.1AS-202014.10.17";
      }

      leaf tx-pdelay-resp-follow-up-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time a Pdelay_Resp_Follow_Up
          message is transmitted.";
        reference
          "14.10.18 of IEEE Std 802.1AS-2020";
      }

      leaf tx-announce-count {
        type yang:counter32;
        config false;
        description
          "Counter that increments every time an Announce
          message is transmitted.";
        reference
          "14.10.19 of IEEE Std 802.1AS-2020";
      }
    }
  }

  augment "/ptp:ptp/ptp:instances/ptp:instance/ptp:ports/ptp:port" {
    description
      "Augment to add asymmetry-measurement-mode-ds to
      IEEE Std 1588 PTP Port.";

    container asymmetry-measurement-mode-ds {
      description
        "Represents the capability to enable/disable the Asymmetry
        Compensation Measurement Procedure on a PTP Port.
        This data set is used instead of the CMLDS
```

```
          asymmetry-measurement-mode-ds when only a single PTP
          Instance is present (i.e., CMLDS is not used).";
        reference
          "14.13 of IEEE Std 802.1AS-2020
          Annex G of IEEE Std 802.1AS-2020";

        leaf enabled {
          type boolean;
          description
            "For full-duplex IEEE Std 802.3 media, the value is true
             if an asymmetry measurement is being performed for the
             link attached to this PTP Port, and false otherwise.
             For all other media, the value shall be false.";
        }
      }
    }

    augment "/ptp:ptp/ptp:common-services/ptp:cmlds/ptp:ports/ptp:port/ptp:link-
port-ds" {
      description
        "Augment IEEE Std 1588 cmldsLinkPortDS.

        14.16.9 of IEEE Std 802.1AS-2020 specifies neighborRateRatio
        (neighbor-rate-ratio), which is provided in YANG as the
        semantically equivalent node in ieee1588-ptp named
        scaled-neighbor-rate-ratio (in link-port-ds).";

      leaf cmlds-link-port-enabled {
        type boolean;
        config false;
        description
          "Boolean that is true if both delay-mechanism is common-p2p
          and the value of ptp-port-enabled is true, for at least one
          PTP Port that uses the CMLDS; otherwise, the value is false.";
        reference
          "11.2.18.1 of IEEE Std 802.1AS-2020
          14.16.3 of IEEE Std 802.1AS-2020";
      }

      leaf is-measuring-delay {
        type boolean;
        config false;
        description
          "This leaf is analogous to is-measuring-delay
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.4 of IEEE Std 802.1AS-2020";
      }

      leaf as-capable-across-domains {
        type boolean;
        config false;
        description
          "This leaf is true when all PTP Instances (domains)
          for this Link Port detect proper exchange of Pdelay
          messages.";
        reference
          "11.2.2 of IEEE Std 802.1AS-2020
          14.16.5 of IEEE Std 802.1AS-2020";
```

```
    }

    leaf mean-link-delay-thresh {
      type ptp:time-interval;
      description
        "Propagation time threshold for mean-link-delay,
        above which a Link Port is not considered capable of
        participating in the IEEE Std 802.1AS protocol.";
      reference
        "14.16.7 of IEEE Std 802.1AS-2020";
    }

    leaf initial-log-pdelay-req-interval {
      type int8;
      description
        "This leaf is analogous to initial-log-pdelay-req-interval
        for a PTP Port, but applicable to this Link Port.";
      reference
        "14.16.10 of IEEE Std 802.1AS-2020";
    }

    leaf current-log-pdelay-req-interval {
      type int8;
      config false;
      description
        "This leaf is analogous to current-log-pdelay-req-interval
        for a PTP Port, but applicable to this Link Port.";
      reference
        "14.16.11 of IEEE Std 802.1AS-2020";
    }

    leaf use-mgt-log-pdelay-req-interval {
      type boolean;
      description
        "This leaf is analogous to use-mgt-log-pdelay-req-interval
        for a PTP Port, but applicable to this Link Port.";
      reference
        "14.16.12 of IEEE Std 802.1AS-2020";
    }

    leaf mgt-log-pdelay-req-interval {
      type int8;
      description
        "This leaf is analogous to mgt-log-pdelay-req-interval
        for a PTP Port, but applicable to this Link Port.";
      reference
        "14.16.13 of IEEE Std 802.1AS-2020";
    }

    leaf initial-compute-rate-ratio {
      type int8;
      description
        "This leaf is analogous to initial-compute-rate-ratio
        for a PTP Port, but applicable to this Link Port.";
      reference
        "14.16.14 of IEEE Std 802.1AS-2020";
    }

    leaf current-compute-rate-ratio {
```

```
        type int8;
        config false;
        description
          "This leaf is analogous to current-compute-rate-ratio
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.15 of IEEE Std 802.1AS-2020";
      }

      leaf use-mgt-compute-rate-ratio {
        type boolean;
        description
          "This leaf is analogous to use-mgt-compute-rate-ratio
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.16 of IEEE Std 802.1AS-2020";
      }

      leaf mgt-compute-rate-ratio {
        type int8;
        description
          "This leaf is analogous to mgt-compute-rate-ratio
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.17 of IEEE Std 802.1AS-2020";
      }

      leaf initial-compute-mean-link-delay {
        type int8;
        description
          "This leaf is analogous to initial-compute-mean-link-delay
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.18 of IEEE Std 802.1AS-2020";
      }

      leaf current-compute-mean-link-delay {
        type int8;
        config false;
        description
          "This leaf is analogous to current-compute-mean-link-delay
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.19 of IEEE Std 802.1AS-2020";
      }

      leaf use-mgt-compute-mean-link-delay {
        type boolean;
        description
          "This leaf is analogous to use-mgt-compute-mean-link-delay
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.20 of IEEE Std 802.1AS-2020";
      }

      leaf mgt-compute-mean-link-delay {
        type int8;
        description
          "This leaf is analogous to mgt-compute-mean-link-delay
```

```
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.21 of IEEE Std 802.1AS-2020";
      }

      leaf allowed-lost-responses {
        type uint8;
        description
          "This leaf is analogous to allowed-lost-responses
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.22 of IEEE Std 802.1AS-2020";
      }

      leaf allowed-faults {
        type uint8;
        description
          "This leaf is analogous to allowed-faults
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.23 of IEEE Std 802.1AS-2020";
      }

      leaf-list pdelay-truncated-timestamps {
        type uint64 {
          range "0..281474976710655";
        }
        config false;
        description
          "This leaf is analogous to pdelay-truncated-timestamps
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.25 of IEEE Std 802.1AS-2020";
      }
    }

    augment "/ptp:ptp/ptp:common-services/ptp:cmlds/ptp:ports/ptp:port" {
      description
        "Augment to add port-statistics-ds to IEEE Std 1588 Link Port.";

      container port-statistics-ds {
        description
          "This container is analogous to port-statistics-ds
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.17 of IEEE Std 802.1AS-2020";

        leaf rx-pdelay-req-count {
          type yang:counter32;
          config false;
          description
            "This leaf is analogous to rx-pdelay-req-count
            for a PTP Port, but applicable to this Link Port.";
          reference
            "14.17.2 of IEEE Std 802.1AS-2020";
        }

        leaf rx-pdelay-resp-count {
          type yang:counter32;
```

```
        config false;
        description
          "This leaf is analogous to rx-pdelay-resp-count
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.17.3 of IEEE Std 802.1AS-2020";
      }

      leaf rx-pdelay-resp-follow-up-count {
        type yang:counter32;
        config false;
        description
          "This leaf is analogous to rx-pdelay-resp-follow-up-count
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.17.4 of IEEE Std 802.1AS-2020";
      }

      leaf rx-packet-discard-count {
        type yang:counter32;
        config false;
        description
          "This leaf is analogous to rx-packet-discard-count
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.17.5 of IEEE Std 802.1AS-2020";
      }

      leaf pdelay-allowed-lost-exceeded-count {
        type yang:counter32;
        config false;
        description
          "This leaf is analogous to
          pdelay-allowed-lost-exceeded-count
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.17.6 of IEEE Std 802.1AS-2020";
      }

      leaf tx-pdelay-req-count {
        type yang:counter32;
        config false;
        description
          "This leaf is analogous to tx-pdelay-req-count
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.17.7 of IEEE Std 802.1AS-2020";
      }

      leaf tx-pdelay-resp-count {
        type yang:counter32;
        config false;
        description
          "This leaf is analogous to tx-pdelay-resp-count
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.17.8 of IEEE Std 802.1AS-2020";
      }
```

```
        leaf tx-pdelay-resp-follow-up-count {
          type yang:counter32;
          config false;
          description
            "This leaf is analogous to tx-pdelay-resp-follow-up-count
            for a PTP Port, but applicable to this Link Port.";
          reference
            "14.17.9 of IEEE Std 802.1AS-2020";
        }
      }
    }

    augment "/ptp:ptp/ptp:common-services/ptp:cmlds/ptp:ports/ptp:port" {
      description
        "Augment to add asymmetry-measurement-mode-ds to
        IEEE Std 1588 Link Port.";

      container asymmetry-measurement-mode-ds {
        description
          "This container is analogous to asymmetry-measurement-mode-ds
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.18 of IEEE Std 802.1AS-2020";

        leaf enabled {
          type boolean;
          description
            "This leaf is analogous to
            asymmetry-measurement-mode-ds.enabled
            for a PTP Port, but applicable to this Link Port.";
        }
      }
    }
  }
```

Annex A

(normative)

Protocol Implementation Conformance Statement (PICS) proforma[3]

A.19 Remote management

Insert the following row at the end of the table in A.19:

Item	Feature	Status	References	Support
RMGT-4	If a remote management protocol that supports YANG is listed in RMGT-2, is the YANG data model of Clause 17 supported?	RMGT:O	item k) 4) of 5.4.2, Clause 17	Yes [ ] No [ ]

[3] *Copyright release for PICS proformas:* Users of this standard may freely reproduce the PICS proforma in this annex so that it can be used for its intended purpose and may further publish the completed PICS.

Annex F

(informative)

PTP profile included in this standard

F.4 PTP options

Change F.4 c) as follows:

c) The management mechanism is the mechanism specified in Clause 14 ~~and~~, Clause 15, and Clause 17.

Annex H

(informative)

Bibliography

Insert the following bibliography references in alphanumeric order:

[B40] IETF RFC 6087, Guidelines for Authors and Reviewers of YANG Data Model Documents, January 2011.

[B41] IETF RFC 6241, Network Configuration Protocol (NETCONF), June 2011.

[B42] IETF RFC 6242, Using the NETCONF Protocol over Secure Shell (SSH), June 2011.

[B43] IETF RFC 8341, Network Configuration Access Control Model, March 2018.

[B44] IETF RFC 7589, Using the NETCONF Protocol over Transport Layer Security (TLS) with Mutual X.509 Authentication, June 2015.

[B45] IETF RFC 7950, The YANG 1.1 Data Modeling Language, August 2016.

[B46] IETF RFC 8040, RESTCONF Protocol, January 2017.

[B47] IETF RFC 8340, YANG Tree Diagrams, March 2018.

[B48] IETF RFC 8575, YANG Data Model for the Precision Time Protocol (PTP).

[B49] OMG Unified Modeling Language (OMG UML), Version 2.5, March 2015.