P802.1ASdn/D2.1
May 26, 2024
(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.

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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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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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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™-2024, 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

List of Figures

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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™-2024, 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) is a data modeling language used to model configuration data and state data for remote network management protocols. YANG-based remote network management protocols include the Network Configuration Protocol (NETCONF) [B41] and RESTCONF [B45]. 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 representation similar to the Unified Modeling Language (UML) (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

The YANG framework applies hierarchy in the following areas:

a) The uniform resource name (URN), as specified in IEEE Std 802d–2017.
b) The YANG objects form a hierarchy of configuration and operational data structures that define the YANG model.

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-gptp.yang module imports the ieee1588-ptp-tt module as a whole, augmenting that module as necessary to meet the requirements of this standard.

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-tt.yang) contains the hierarchy (tree) of data sets and their members.

The YANG module of this clause (ieee802-dot1as-gptp.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 [B47] 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. 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 [B48] 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-tt.yang module is shown in white, and Clause 14 data in augments of ieee802-dot1as-gptp.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-tt 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-tt 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-tt 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-tt named scaled-neighbor-rate-ratio (in link-port-ds of Figure 17-4).

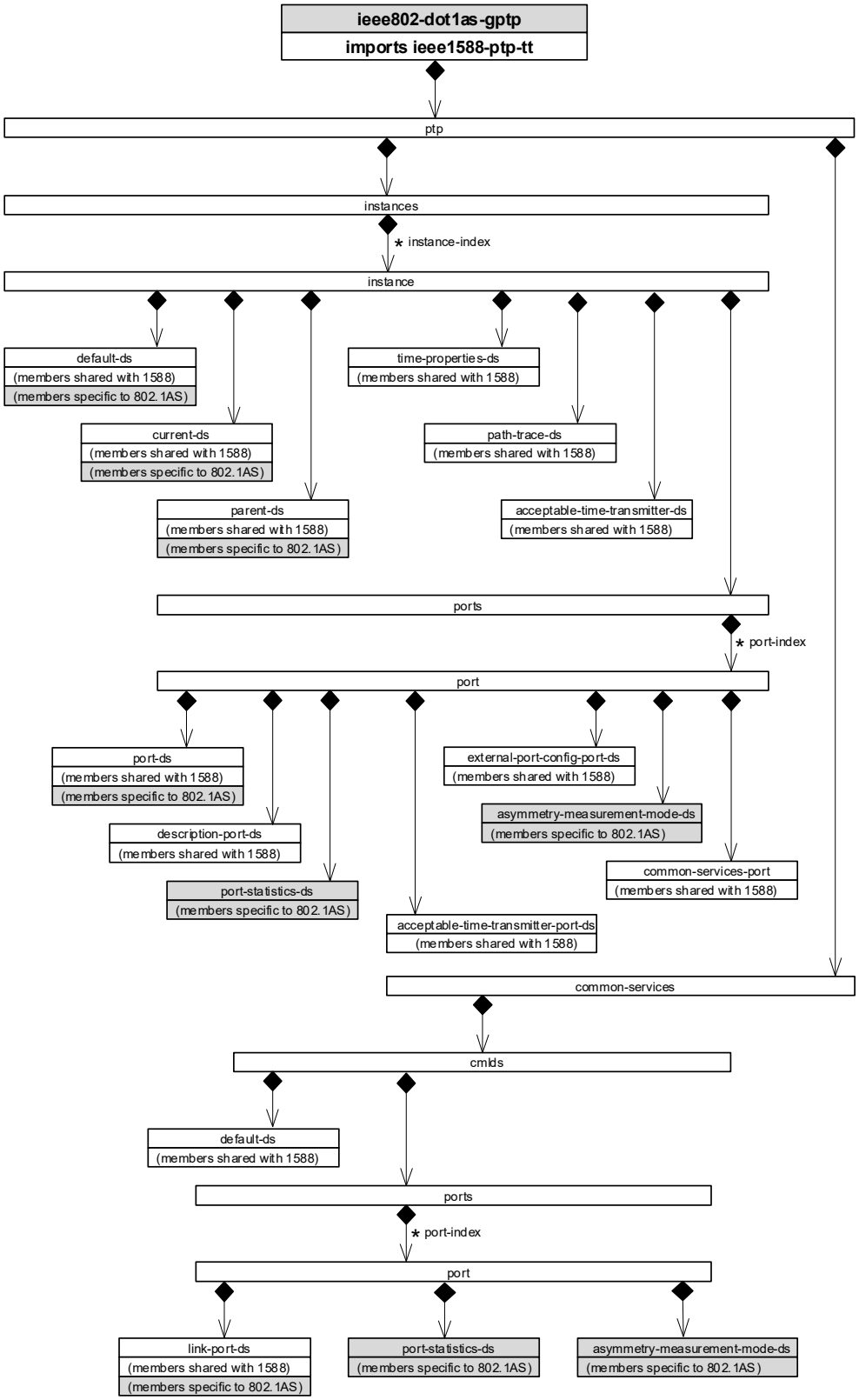

Figure 17-1—Overview of YANG tree

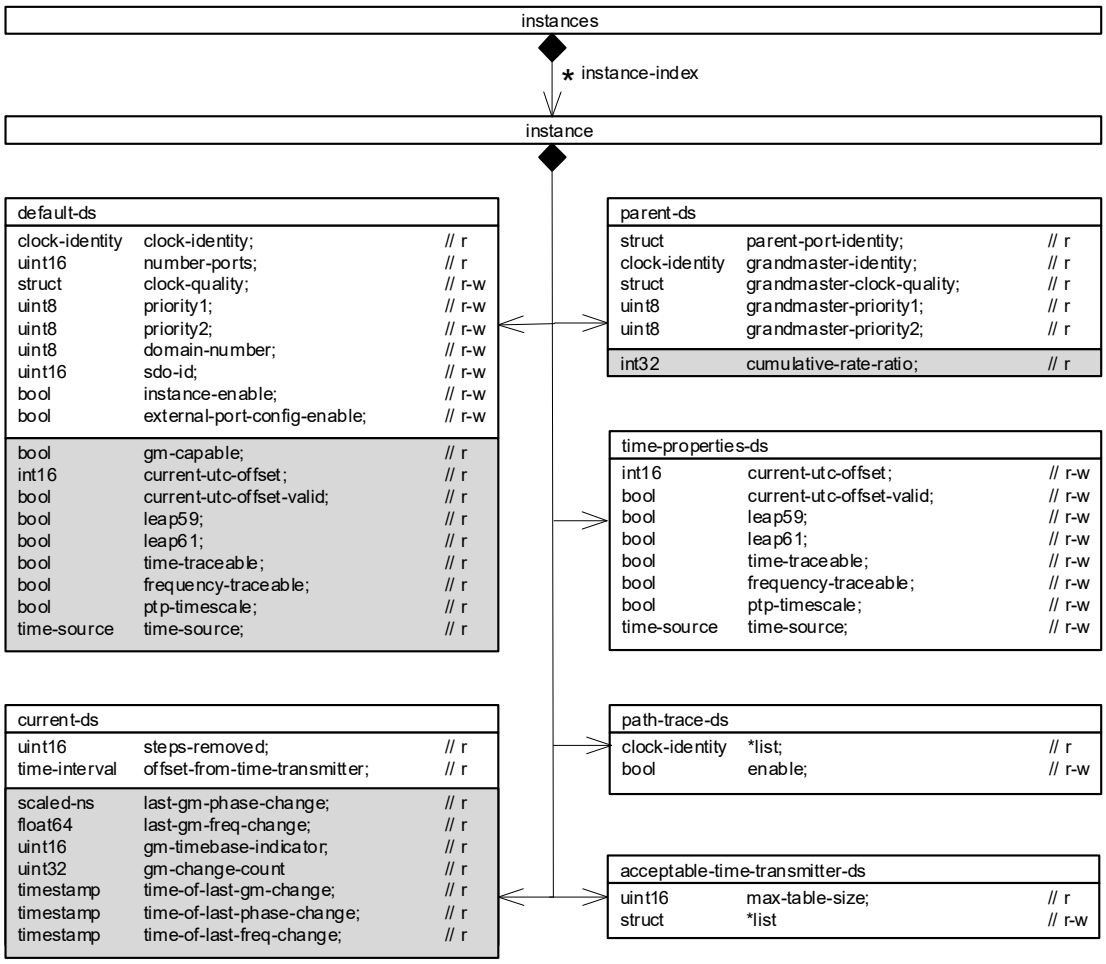

Figure 17-2—PTP Instance detail

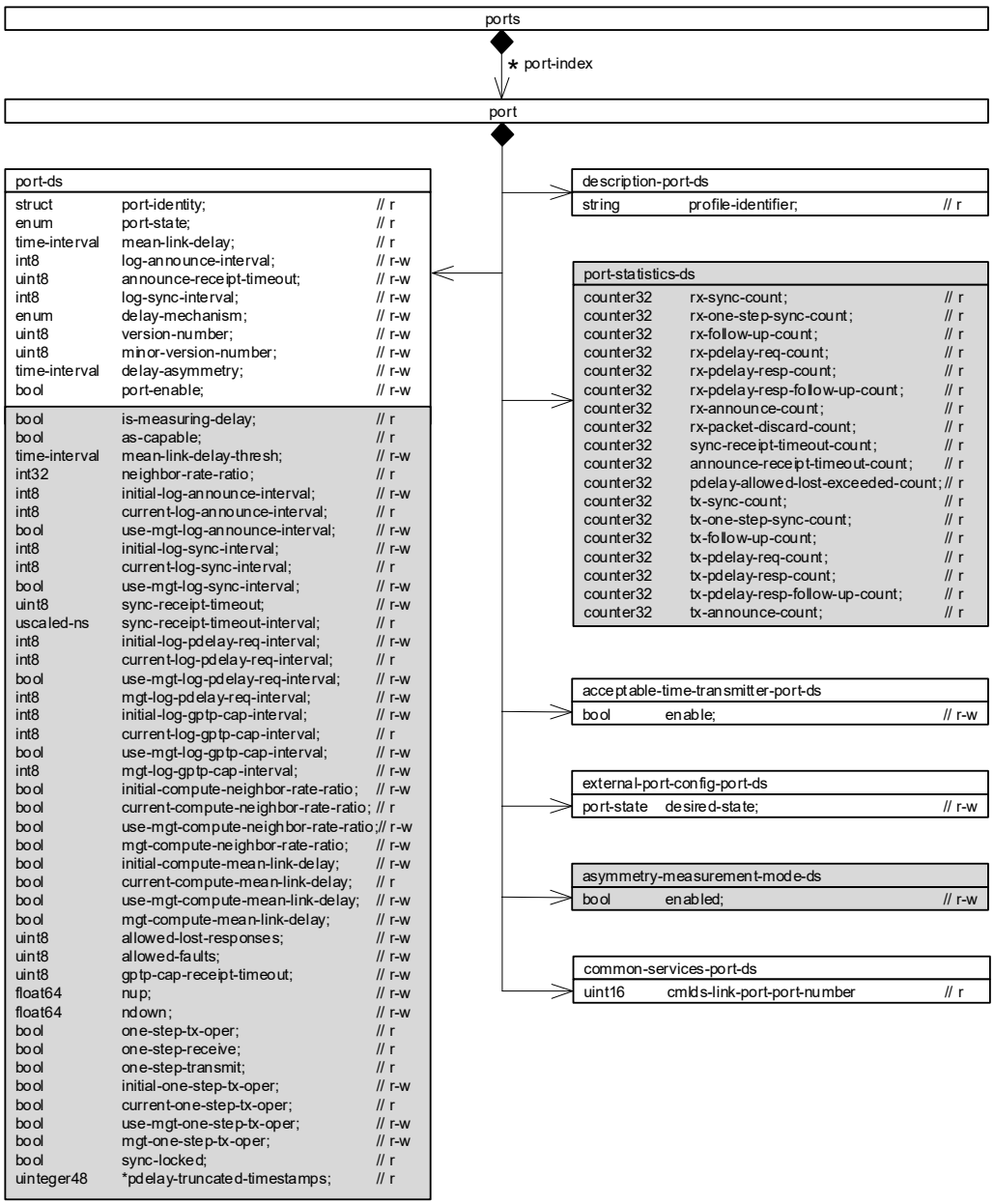

Figure 17-3—PTP Port detail

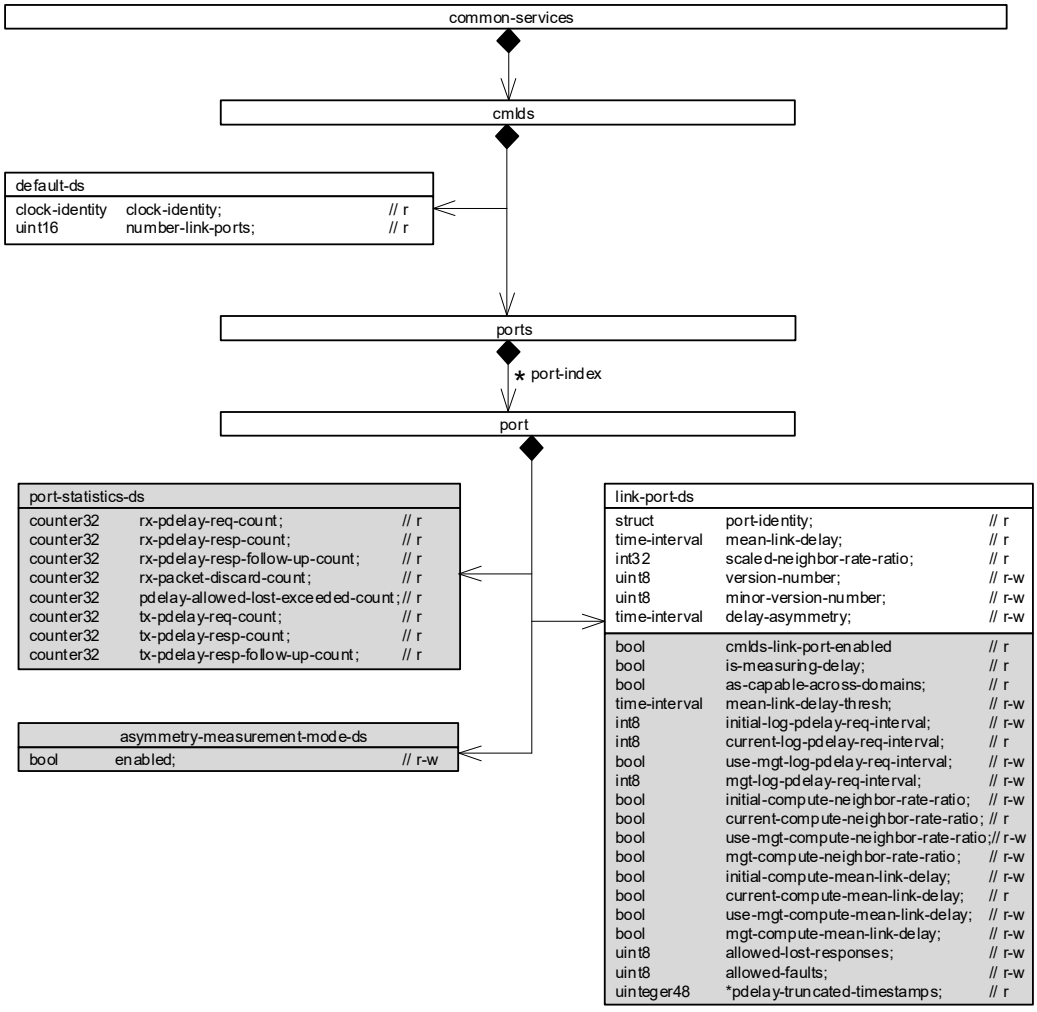

Figure 17-4—Common services detail

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.

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..

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-tt	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-gptp	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 ([B45]). 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 [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-tt/instances/instance/default-ds
/ptp-tt/instances/instance/path-trace-ds
/ptp-tt/instances/instance/acceptable-time-transmitter-ds
/ptp-tt/instances/instance/ports/port/port-ds
/ptp-tt/instances/instance/ports/port/acceptable-time-transmitter-port-ds
/ptp-tt/instances/instance/ports/port/external-port-config-port-ds
/ptp-tt/instances/instance/ports/port/asymmetry-measurement-mode-ds
/ptp-tt/common-services/cmlds/ports/port/link-port-ds
/ptp-tt/common-services/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 can 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 [B46]).

17.5.1 Tree diagram for ieee802-dot1as-gptp.yang

```
module: ieee802-dot1as-gptp
  augment /ptp-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt: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-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt: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-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt:parent-ds:
      +--ro cumulative-rate-ratio?   int32
    augment /ptp-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt:ports/ptp-tt:port/
  ptp-tt:port-ds:
      +--ro is-measuring-delay?                    boolean
      +--ro as-capable?                            boolean
      +--rw mean-link-delay-thresh?                ptp-tt: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-neighbor-rate-ratio?   boolean
      +--ro current-compute-neighbor-rate-ratio?   boolean
      +--rw use-mgt-compute-neighbor-rate-ratio?   boolean
      +--rw mgt-compute-neighbor-rate-ratio?       boolean
      +--rw initial-compute-mean-link-delay?       boolean
      +--ro current-compute-mean-link-delay?       boolean
      +--rw use-mgt-compute-mean-link-delay?       boolean
      +--rw mgt-compute-mean-link-delay?           boolean
      +--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?              boolean
      +--ro current-one-step-tx-oper?              boolean
      +--rw use-mgt-one-step-tx-oper?              boolean
      +--rw mgt-one-step-tx-oper?                  boolean
      +--ro sync-locked?                           boolean
      +--ro pdelay-truncated-timestamps*           uinteger48
    augment /ptp-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt:ports/ptp-tt: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-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt:ports/ptp-tt:port:
    +--rw asymmetry-measurement-mode-ds
       +--rw enabled?   boolean
     augment   /ptp-tt:ptp/ptp-tt:common-services/ptp-tt:cmlds/ptp-tt:ports/ptp-
tt:port/ptp-tt: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-tt: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-neighbor-rate-ratio?  boolean
    +--ro current-compute-neighbor-rate-ratio?  boolean
    +--rw use-mgt-compute-neighbor-rate-ratio?  boolean
    +--rw mgt-compute-neighbor-rate-ratio?      boolean
    +--rw initial-compute-mean-link-delay?      boolean
    +--ro current-compute-mean-link-delay?      boolean
    +--rw use-mgt-compute-mean-link-delay?      boolean
    +--rw mgt-compute-mean-link-delay?          boolean
    +--rw allowed-lost-responses?               uint8
    +--rw allowed-faults?                       uint8
    +--ro pdelay-truncated-timestamps*          uinteger48
     augment   /ptp-tt:ptp/ptp-tt:common-services/ptp-tt:cmlds/ptp-tt:ports/ptp-
tt: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-tt:ptp/ptp-tt:common-services/ptp-tt:cmlds/ptp-tt:ports/ptp-
tt:port:
    +--rw asymmetry-measurement-mode-ds
       +--rw enabled?   boolean
```

17.6 YANG module[1] [2]

The YANG module specified by IEEE Std 1588e (ieee1588-ptp-tt.yang) serves as the foundation of the YANG[3] module specified in this clause.

17.6.1 Module ieee802-dot1as-gptp.yang

```
module ieee802-dot1as-gptp {
  yang-version "1.1";
  namespace urn:ieee:std:802.1AS:yang:ieee802-dot1as-gptp;
  prefix dot1as-gptp;
  import ietf-yang-types {
    prefix yang;
  }
  import ieee1588-ptp-tt {
    prefix ptp-tt;
  }
  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.

    Copyright (C) IEEE (2024). This version of this YANG module is part
    of IEEE Std 802.1AS; see the standard itself for full legal notices.";
  revision 2024-05-08 {
    description
      "Published as part of IEEE Std 802.1ASdn-2024. Initial version.";
    reference
      "IEEE Std 802.1AS - Timing and Synchronization for Time-Sensitive
      Applications: IEEE Std 802.1AS-2020, IEEE Std 802.1AS-2020/Cor
      1-2021, IEEE Std 802.1ASdr-2023, IEEE Std 802.1ASdn-2024. IEEE Std
      1588 - IEEE Standard for a Precision Clock Synchronization Protocol
      for Networked Measurement and Control Systems: IEEE Std 1588-2019,
      IEEE Std 1588g-2022, IEEE Std 1588e-2024.";
  }
  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/.

[3]An ASCII version of IEEE Std 1588 can be obtained from https://github.com/YangModels/yang/tree/main/standard/ieee/published/1588.

```
    }
    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. Each of the 12 octets is represented as a pair of
      hexadecimal characters, using uppercase for a letter. Octets are
      separated by a dash character. The most significant octet is first.";
    reference
      "6.4.3.1 of IEEE Std 802.1AS";
  }
  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. Each of the 12 octets is represented as a pair of
      hexadecimal characters, using uppercase for a letter. Octets are
      separated by a dash character. The most significant octet is first.";
    reference
      "6.4.3.2 of IEEE Std 802.1AS";
  }
  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. Each of the 8 octets is represented as a pair of
      hexadecimal characters, using uppercase for a letter. Octets are
      separated by a dash character. The most significant octet is first.";
    reference
      "6.4.2 of IEEE Std 802.1AS";
  }
  typedef uinteger48 {
    type uint64 {
      range "0..281474976710655";
    }
    description
      "48-bit unsigned integer data type.";
    reference
      "6.4.2 of IEEE Std 802.1AS";
  }
  augment
    "/ptp-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt: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";
    }
    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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      leaf time-source {
        type identityref {
          base ptp-tt: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";
      }
    }
    augment
      "/ptp-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt: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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
    }
    augment "/ptp-tt:ptp/ptp-tt:instances/ptp-tt:instance/ptp-tt: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";
    }
  }
  augment
    "/ptp-tt:ptp"+
    "/ptp-tt:instances"+
    "/ptp-tt:instance"+
    "/ptp-tt:ports"+
    "/ptp-tt:port"+
    "/ptp-tt:port-ds" {
    description
      "Augment IEEE Std 1588 portDS.

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

      14.8.15 of IEEE Std 802.1AS specifies
      mgtSettableLogAnnounceInterval (mgt-log-announce-interval), which
      is provided in YANG as the semantically equivalent node in
      ieee1588-ptp-tt 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 specifies mgtSettableLogSyncInterval
      (mgt-log-sync-interval), which is provided in YANG as the
      semantically equivalent node in ieee1588-ptp-tt 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";
    }
    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
```

```
          14.8.7 of IEEE Std 802.1AS";
      }
      leaf mean-link-delay-thresh {
        type ptp-tt: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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
```

```
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      leaf initial-compute-neighbor-rate-ratio {
        type boolean;
        description
          "When use-mgt-compute-neighbor-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";
      }
      leaf current-compute-neighbor-rate-ratio {
        type boolean;
        config false;
        description
          "Current value of computeNeighborRateRatio.";
        reference
          "14.8.32 of IEEE Std 802.1AS";
      }
      leaf use-mgt-compute-neighbor-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-neighbor-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";
      }
      leaf mgt-compute-neighbor-rate-ratio {
        type boolean;
        description
          "Value of computeNeighborRateRatio, used if
          use-mgt-compute-neighbor-rate-ratio is true. This value is not
          used if use-mgt-compute-neighbor-rate-ratio is false.";
        reference
          "14.8.34 of IEEE Std 802.1AS";
      }
      leaf initial-compute-mean-link-delay {
        type boolean;
        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";
      }
      leaf current-compute-mean-link-delay {
        type boolean;
        config false;
        description
          "Current value of computeMeanLinkDelay.";
        reference
          "14.8.36 of IEEE Std 802.1AS";
      }
      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";
      }
      leaf mgt-compute-mean-link-delay {
        type boolean;
        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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      leaf initial-one-step-tx-oper {
        type boolean;
        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";
      }
      leaf current-one-step-tx-oper {
        type boolean;
        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";
      }
      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";
    }
    leaf mgt-one-step-tx-oper {
      type boolean;
      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";
    }
    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";
    }
    leaf-list pdelay-truncated-timestamps {
      type uinteger48;
      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";
    }
  }
  augment
    "/ptp-tt:ptp"+
    "/ptp-tt:instances"+
    "/ptp-tt:instance"+
    "/ptp-tt:ports"+
    "/ptp-tt: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";
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
```

```
        }
        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";
        }
        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";
        }
        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";
        }
        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";
        }
        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";
        }
        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";
        }
        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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
    }
  }
  augment
    "/ptp-tt:ptp"+
    "/ptp-tt:instances"+
    "/ptp-tt:instance"+
    "/ptp-tt:ports"+
    "/ptp-tt: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
          Annex G of IEEE Std 802.1AS";
        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-tt:ptp"+
      "/ptp-tt:common-services"+
      "/ptp-tt:cmlds"+
      "/ptp-tt:ports"+
      "/ptp-tt:port"+
      "/ptp-tt:link-port-ds" {
      description
        "Augment IEEE Std 1588 cmldsLinkPortDS.

        14.16.9 of IEEE Std 802.1AS specifies neighborRateRatio
        (neighbor-rate-ratio), which is provided in YANG as the
        semantically equivalent node in ieee1588-ptp-tt 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
          14.16.3 of IEEE Std 802.1AS";
      }
      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";
      }
      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
          14.16.5 of IEEE Std 802.1AS";
      }
      leaf mean-link-delay-thresh {
```

```
        type ptp-tt: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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      leaf initial-compute-neighbor-rate-ratio {
        type boolean;
        description
          "This leaf is analogous to initial-compute-neighbor-rate-ratio
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.14 of IEEE Std 802.1AS";
      }
      leaf current-compute-neighbor-rate-ratio {
        type boolean;
        config false;
        description
          "This leaf is analogous to current-compute-neighbor-rate-ratio
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.15 of IEEE Std 802.1AS";
      }
      leaf use-mgt-compute-neighbor-rate-ratio {
```

```
        type boolean;
        description
          "This leaf is analogous to use-mgt-compute-neighbor-rate-ratio
          for a PTP Port, but applicable to this Link Port.";
        reference
          "14.16.16 of IEEE Std 802.1AS";
      }
      leaf mgt-compute-neighbor-rate-ratio {
        type boolean;
        description
          "This leaf is analogous to mgt-compute-neighbor-rate-ratio for a
          PTP Port, but applicable to this Link Port.";
        reference
          "14.16.17 of IEEE Std 802.1AS";
      }
      leaf initial-compute-mean-link-delay {
        type boolean;
        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";
      }
      leaf current-compute-mean-link-delay {
        type boolean;
        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";
      }
      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";
      }
      leaf mgt-compute-mean-link-delay {
        type boolean;
        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";
      }
      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";
      }
      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";
    }
    leaf-list pdelay-truncated-timestamps {
      type uinteger48;
      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";
    }
  }
  augment
    "/ptp-tt:ptp"+
    "/ptp-tt:common-services"+
    "/ptp-tt:cmlds"+
    "/ptp-tt:ports"+
    "/ptp-tt: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";
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
      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";
      }
    }
  }
  augment
    "/ptp-tt:ptp"+
    "/ptp-tt:common-services"+
    "/ptp-tt:cmlds"+
    "/ptp-tt:ports"+
    "/ptp-tt: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";
```

```
        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.";
          reference
            "14.13.2 of IEEE Std 802.1AS";
        }
      }
    }
  }
```

Annex A

(normative)

Protocol Implementation Conformance Statement (PICS) proforma[4]

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 [ ]

[4] *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 8040, RESTCONF Protocol, January 2017.

[B46] IETF RFC 8340, YANG Tree Diagrams, March 2018.

[B47] IETF RFC 8575, YANG Data Model for the Precision Time Protocol (PTP).

[B48] OMG Unified Modeling Language (OMG UML), Version 2.5, March 2015.