



IEEE Standard for Local and Metropolitan Area Networks— Timing and Synchronization for Time-Sensitive Applications Amendment 2: YANG Data Model

IEEE Computer Society

Developed by the
LAN/MAN Standards Committee

IEEE Std 802.1ASdn™-2024
(Amendment to IEEE Std 802.1AS™-2020
as amended by IEEE Std 802.1AS™-2020/Cor 1-2021
and IEEE Std 802.1ASdr™-2024)

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**IEEE Standard for
Local and Metropolitan Area Networks—**

**Timing and Synchronization for
Time-Sensitive Applications**

Amendment 2: YANG Data Model

Developed by the
LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 26 September 2024
IEEE SA Standards Board

Abstract: A YANG data model that allows configuration and state reporting for all managed objects of the base standard is specified in this amendment.

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

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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 2: YANG Data Model.

The first edition of IEEE Std 802.1AS was published in 2011. A first corrigendum, IEEE Std 802.1ASTM-2011/Cor 1-2013, provided technical and editorial corrections. A second corrigendum, IEEE Std 802.1ASTM-2011/Cor 2-2015 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 IEEE 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-2024, changed non-inclusive terms, replacing them with 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.

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IEEE Standard for Local and Metropolitan Area Networks—

Timing and Synchronization for Time-Sensitive Applications

Amendment 2: YANG Data Model

(This amendment is based on IEEE Std 802.1AS™-2020 as amended by IEEE Std 802.1AS™-2020/Cor 1-2021 and IEEE Std 802.1 ASdr-2024.)

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 ~~striketrough~~ (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.⁶

⁶ Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

2. Normative references

Insert the following references into Clause 2 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.^{7, 8}

IEEE Std 1588e™-2024, IEEE Standard for Precision Clock Synchronization Protocol for Networked Measurement and Control Systems—Amendment 5: MIB and YANG Modules.

IETF RFC 7950, The YANG 1.1 Data Modeling Language, August 2016.⁹

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⁸ IEEE publications are available from The Institute of Electrical and Electronics Engineers (<https://standards.ieee.org/>).

⁹ IETF RFCs are available from the Internet Engineering Task Force (<https://www.ietf.org/>).

4. Acronyms and abbreviations

Insert the following abbreviations into Clause 4 in alphanumeric order:

NETCONF Network Configuration Protocol

UML[®] Unified Modeling Language[™] ¹⁰

¹⁰ UML[®] is a registered trademark of the Object Management Group, Inc., and Unified Modeling Language[™] is a trademark of the Object Management Group, Inc.

5. Conformance

5.4 PTP Instance requirements and options

5.4.2 PTP Instance options

Insert a new list item k) 4) after k) 3) in the list in 5.4.2, as follows:

- 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 new Clause 17 after Clause 16 as follows:

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) (IETF RFC 6242 [B13a]) and RESTCONF (IETF RFC 8040 [B13e]). 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—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 (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-gtp.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— IETF RFC 8575 [B13g] 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 RFC 8575. Therefore, the YANG module of RFC 8575 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 Figure 17-1 through Figure 17-4. The purpose of the diagrams 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 2.5¹¹ [B24a] 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 are 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-gtp.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).

¹¹ OMG® is a registered trademark of the Object Management Group, Inc.

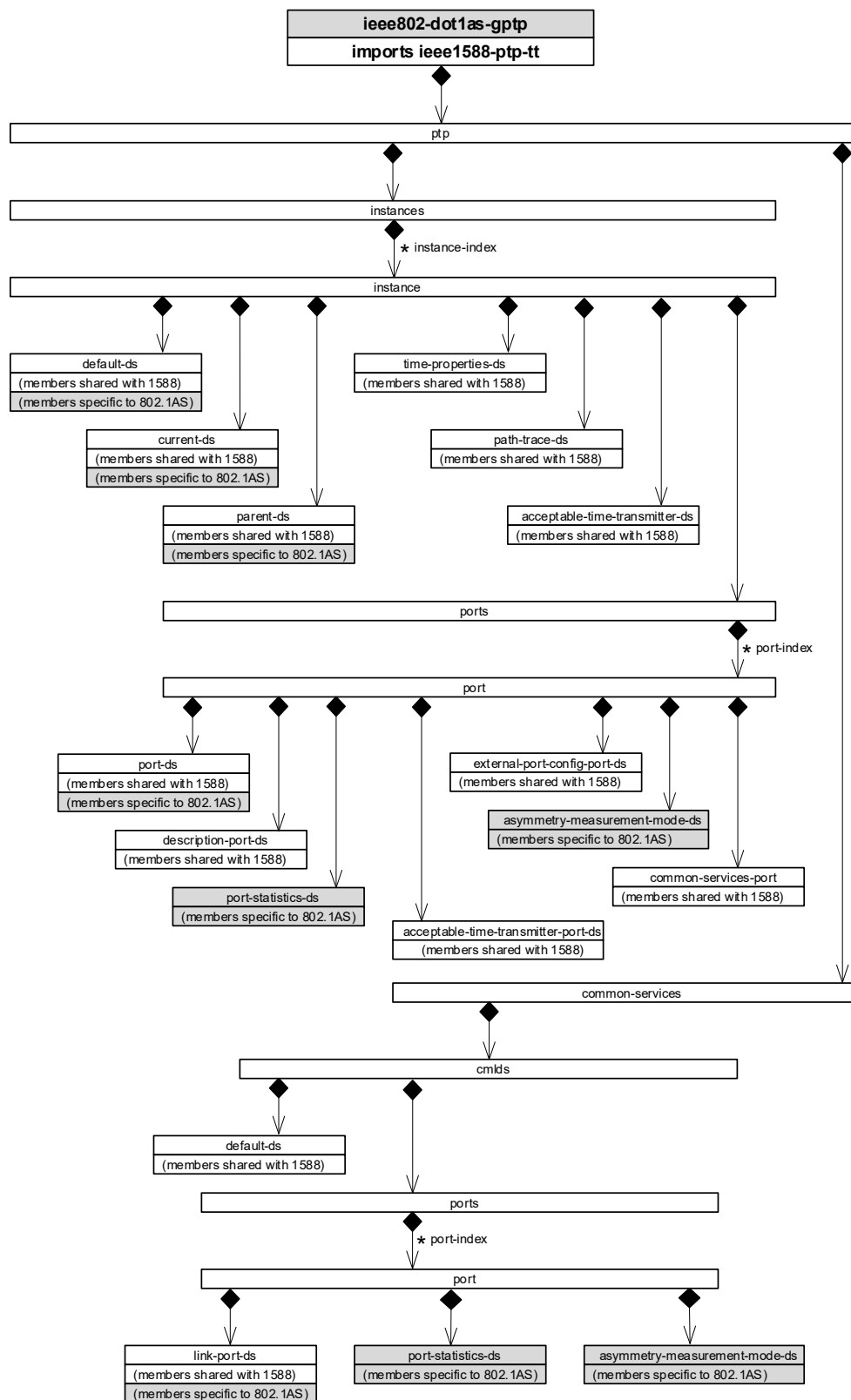


Figure 17-1—Overview of YANG tree

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

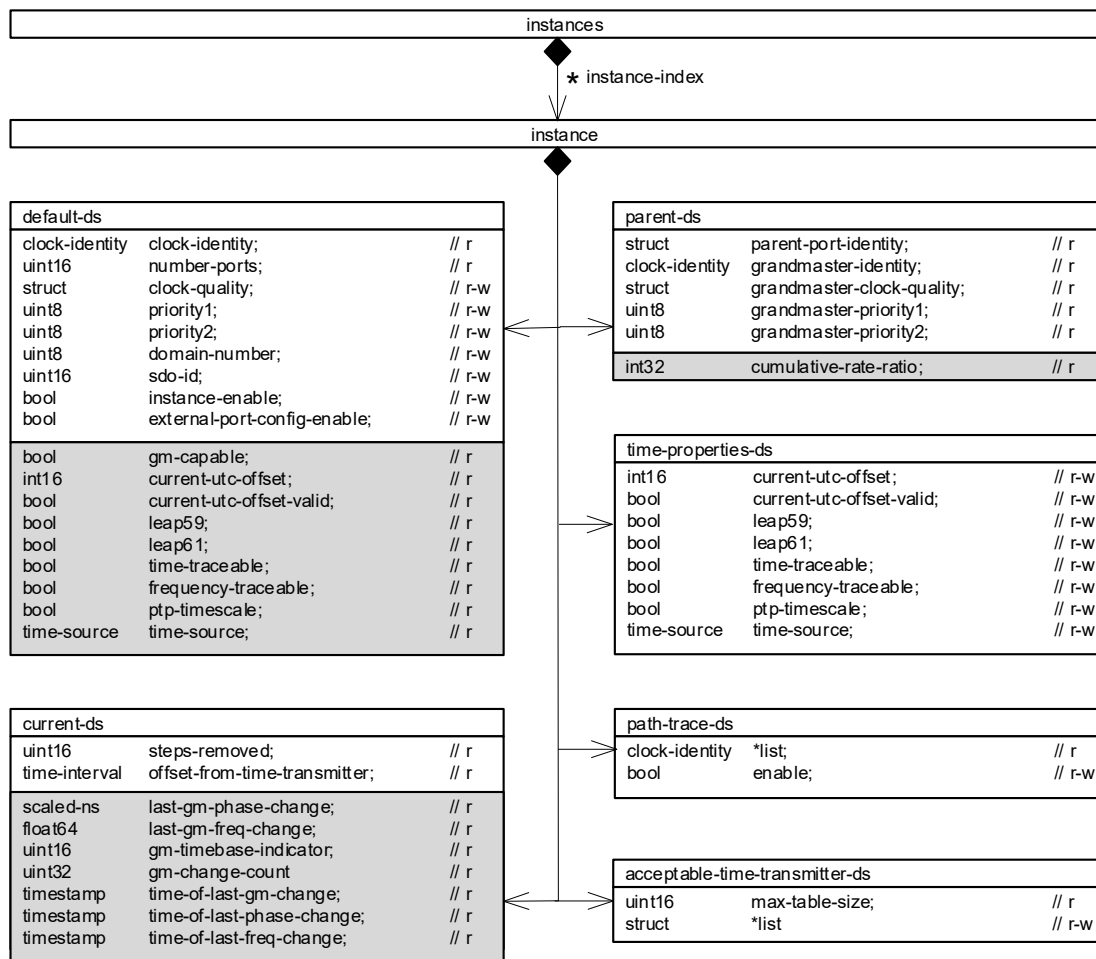


Figure 17-2—PTP Instance detail

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

NOTE 3—Subclause 14.8.4 specifies `ptpPortEnabled` (`ptp-port-enabled`), which is provided in YANG as the semantically equivalent node in `ieee1588-ntp-tt` named `port-enabled` (in `port-ds` of Figure 17-3). Subclause 14.8.15 specifies `mgtSettableLogAnnounceInterval` (`mgt-settable-log-announce-interval`), which is provided in YANG as the semantically equivalent node in `ieee1588-ntp-tt` named `log-announce-interval` (in `port-ds` of Figure 17-3). Subclause 14.8.20 specifies `mgtSettableLogSyncInterval` (`mgt-settable-log-sync-interval`), which is provided in YANG as the semantically equivalent node in `ieee1588-ntp-tt` named `log-sync-interval` (in `port-ds` of Figure 17-3).

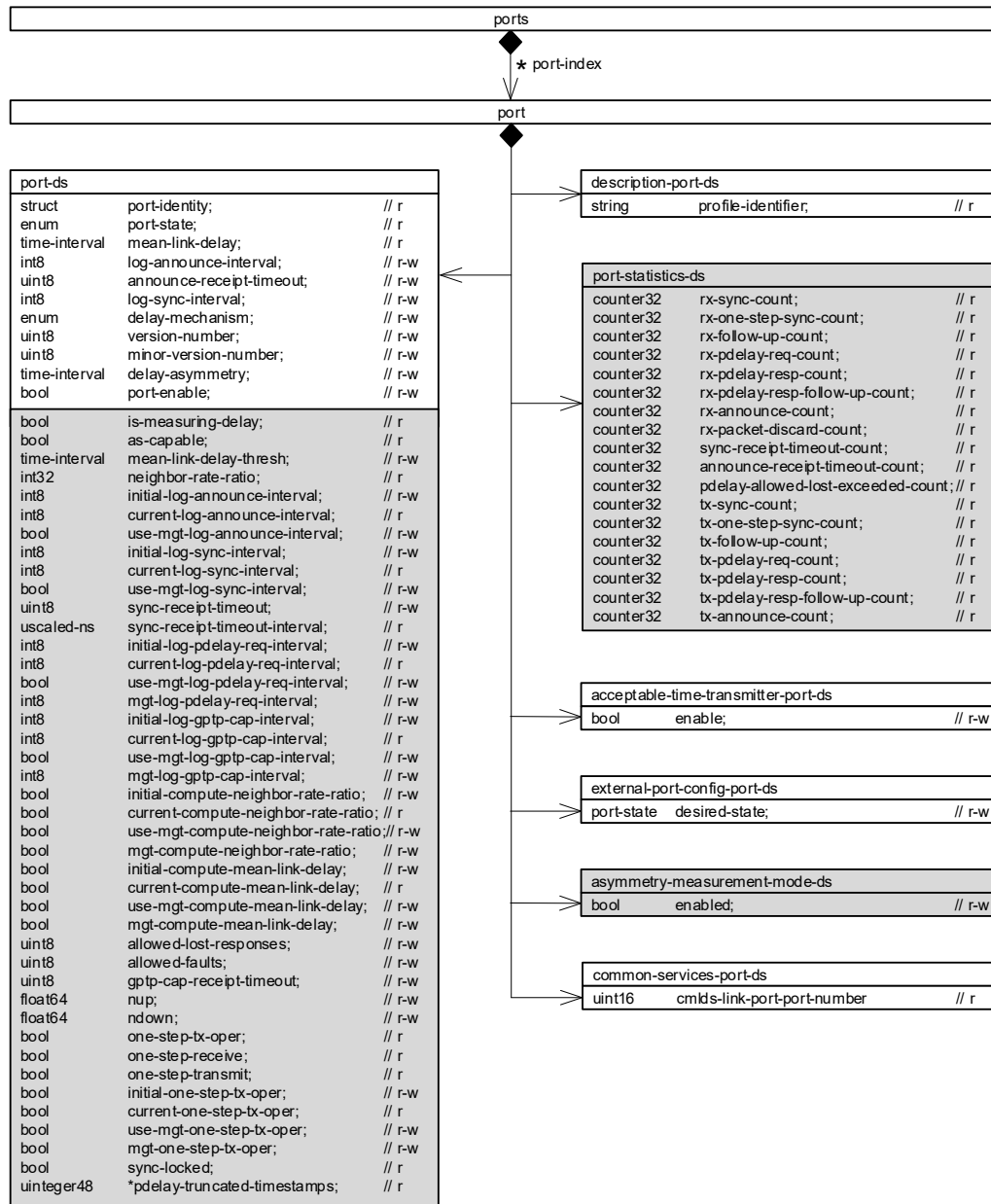


Figure 17-3—PTP Port detail

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

NOTE 4—Subclause 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).

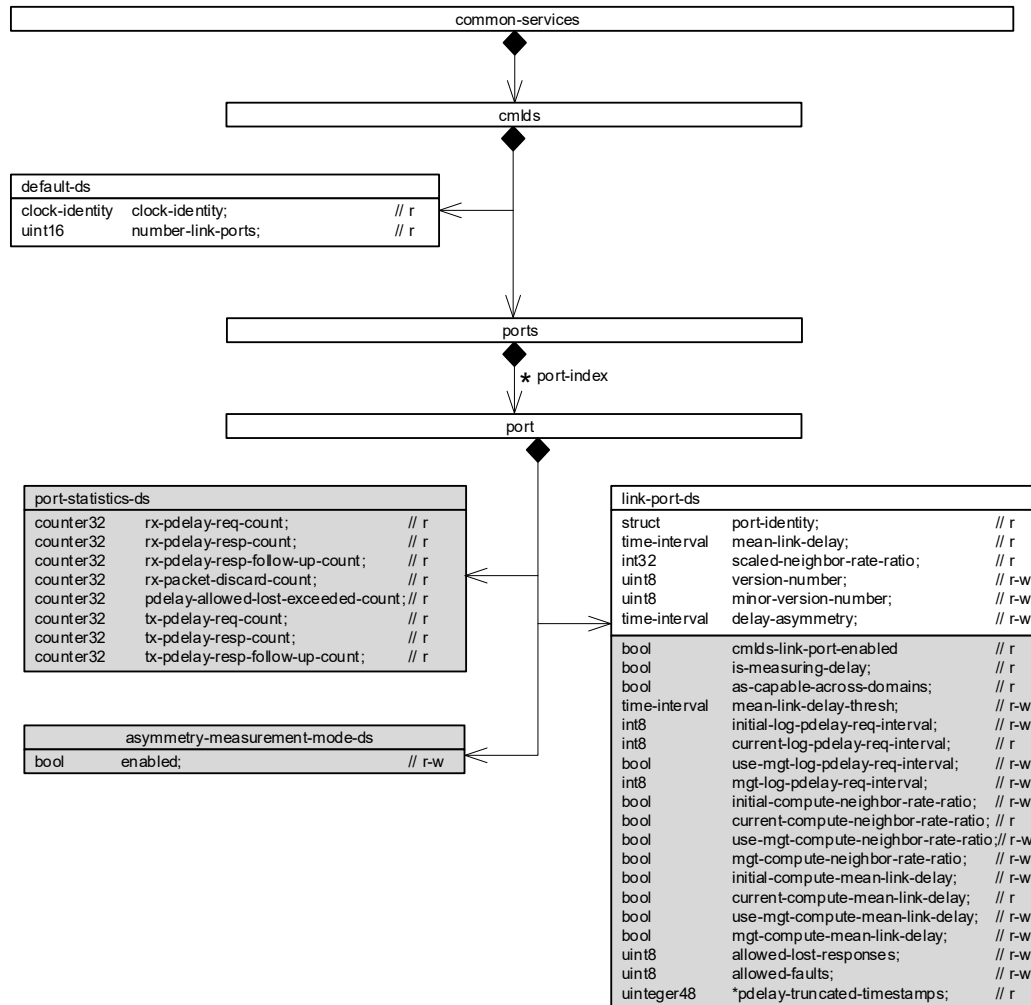


Figure 17-4—Common services detail

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 occurs, the definitions outside this clause (Clause 17) take precedence.