

5 **Draft Standard for**  
6 **Local and metropolitan area networks—**

7 **Link Aggregation**

8 **Amendment 1:**  
9 **YANG for Link Aggregation**

10 Prepared by the

11 **Time-Sensitive Networking (TSN) Task Group of IEEE 802.1**

12 Sponsor

13 **LAN/MAN Standards Committee**

14 **of the**

15 **IEEE Computer Society**

16 **This and the following cover pages are not part of the draft.** They provide revision and other information  
17 for IEEE 802.1 Working Group members and will be updated as convenient. **New participants: Please read**  
18 **these cover pages**, they contain information that should help you contribute effectively to this standards  
19 development project. The [Introduction to the current draft](#) should be useful to all readers.

20 The text proper of this draft begins with the [Title page](#).

### Important Notice

This document is an unapproved draft of a proposed IEEE Standard. IEEE hereby grants the named IEEE SA Working Group or Standards Committee Chair permission to distribute this document to participants in the receiving IEEE SA Working Group or Standards Committee, for purposes of review for IEEE standardization activities. No further use, reproduction, or distribution of this document is permitted without the express written permission of IEEE Standards Association (IEEE SA). Prior to any review or use of this draft standard, in part or in whole, by another standards development organization, permission must first be obtained from IEEE SA ([stds-copyright@ieee.org](mailto:stds-copyright@ieee.org)). This page is included as the cover of this draft, and shall not be modified or deleted.

IEEE Standards Association  
445 Hoes Lane  
Piscataway, NJ 08854, USA

## 1 Participation in 802.1 standards development

2 All participants in IEEE 802.1 activities should be aware of the Working Group Policies and Procedures, and  
3 their obligations under the IEEE Patent Policy, the IEEE Standards Association (SA) Copyright Policy, and the  
4 IEEE SA Participation Policy. For information on these policies see [1.ieee802.org/rules/](http://1.ieee802.org/rules/) and the slides  
5 presented at the beginning of each of our Working Group and Task Group meeting.

6 The IEEE SA [PAR \(Project Authorization Request\) and CSD](#) (Criteria for Standards Development established  
7 by IEEE 802) are summarized in these cover pages and links are provided to the full text of both PAR and  
8 CSD. As part of the IEEE 802® process, the text of the PAR and CSD of each project is reviewed regularly to  
9 ensure their continued validity. A vote of "Approve" on this draft is also an affirmation that the PAR and CSD  
10 for this project are still valid.

11 Comments on this draft are encouraged. NOTE: All issues related to IEEE standards presentation style,  
12 formatting, spelling, etc. are routinely handled between the 802.1 Editor and the IEEE Staff Editors prior to  
13 publication, after balloting and the process of achieving agreement on the technical content of the standard is  
14 complete. Readers are urged to devote their valuable time and energy only to comments that materially affect  
15 either the technical content of the document or the clarity of that technical content. Comments should not  
16 simply state what is wrong, but also what might be done to fix the problem.

17 Full participation in the work of IEEE 802.1 requires attendance at IEEE 802 meetings. Information on 802.1  
18 activities, working papers, and email distribution lists etc. can be found on the 802.1 Website:

19 <http://ieee802.org/1/>

20 Use of the email distribution list is not presently restricted to 802.1 members, and the working group has a  
21 policy of considering comments from all who are interested and willing to contribute to the development of the  
22 draft. Individuals not attending meetings have helped to identify sources of misunderstanding and ambiguity  
23 in past projects. The email lists exist primarily to allow the members of the working group to develop  
24 standards, and are not a general forum. All contributors to the work of 802.1 should familiarize themselves  
25 with the IEEE patent policy and anyone using the email distribution list will be assumed to have done so.  
26 Information can be found at <http://standards.ieee.org/db/patents/>

27 Comments on this draft may be sent to the 802.1 email exploder, to the Editors, or to the Chairs of the 802.1  
28 Working Group and Time-Sensitive Networking (TSN) Task Group.

29 Stephen Haddock  
30 Editor, P802.1AXdz  
31 Email: [shaddock@stanfordalumni.org](mailto:shaddock@stanfordalumni.org)

32 Janos Farkas  
33 Chair, 802.1 TSN Task Group  
34  
35 Email: [Janos.Farkas@ericsson.com](mailto:Janos.Farkas@ericsson.com)

Glenn Parsons  
Chair, 802.1 Working Group  
+1 514-379-9037  
Email: [glenn.parsons@ericsson.com](mailto:glenn.parsons@ericsson.com)

36 NOTE: Comments whose distribution is restricted in any way cannot be considered, and may not be  
37 acknowledged.

38 **All participants in IEEE standards development have responsibilities under the IEEE patent policy and**  
39 **should familiarize themselves with that policy, see**  
40 <http://standards.ieee.org/about/sasb/patcom/materials.html>

41 As part of our IEEE 802 process, the text of the PAR and CSD (Criteria for Standards Development, formerly  
42 referred to as the 5 Criteria or 5C's) is reviewed on a regular basis in order to ensure their continued validity.  
43 A vote of "Approve" on this draft is also an affirmation by the balloter that the PAR is still valid.

## 1 **PAR (Project Authorization Request) and CSD**

2 This page is a draft, based on the proposed PAR and CSD as of the close of the May 2023 802.1 Interim  
3 Meeting.

4 Extracts from the PAR, as approved by IEEE NesCom February 15, 2024:

5 <https://development.standards.ieee.org/myproject-web/public/view.html#pardetail/10885>

6 and the CSD (Criteria for Standards Development):

7 <https://mentor.ieee.org/802-ec/dcn/23/ec-23-0238-00-ACSD-p802-1axdz.pdf>

8 follow.

### 9 **Scope of the project:**

10 This amendment specifies YANG modules that allows configuration and status reporting for systems  
11 implementing Link Aggregation, and optionally Distributed Resilient Network Interconnect, based on the  
12 capabilities currently specified in clause 7 (management) and Annex D (Management Information Base  
13 definitions). This amendment also includes technical and editorial corrections in the description of existing  
14 IEEE Std 802.1AX functionality.

### 15 **PAR Need for the Project:**

16 YANG (IETF RFC 7950) is a formalized data modeling language that is widely accepted and can be used to  
17 simplify network configuration. The ability to manage Link Aggregation via YANG modules is needed for  
18 compatibility with modern network management systems.

### 19 **CSD broad market potential [extract]:**

20 The proposed amendment will support the use of YANG, which has broad industry support in networks that  
21 use IEEE Std 802.1AX. Both IEEE Std 802.1AX and YANG are already supported and used by multiple  
22 vendors, network providers, and network users. There is a wide interest in the industry to manage Link  
23 Aggregation via YANG.

### 24 **Economic feasibility [extract]:**

- 25 a) Management using YANG utilizes a balance between end station and infrastructure capabilities; the  
26 balance will be similar to that for existing management methods.
- 27 b) The cost factors will be similar to those of existing management methods.
- 28 c) This project adds YANG capabilities to IEEE Std 802.1AX as a step towards a complete YANG  
29 management solution. This helps to eliminate multiple management platforms, thus reduces  
30 installation cost.
- 31 d) This project adds YANG capabilities to IEEE Std 802.1AX as a step towards a complete YANG  
32 management solution. This helps to eliminate multiple management platforms, thus reduces  
33 operational cost.

## 1 Draft development

2 During the early stages of draft development, 802.1 editors have a responsibility to attempt to craft technically  
3 coherent drafts from the resolutions of ballot comments and from the other discussions that take place in the  
4 working group meetings. Preparation of drafts often exposes inconsistencies in editor's instructions or  
5 exposes the need to make choices between approaches that were not fully apparent in the meeting. Choices  
6 and requests by the editors' for contributions on specific issues will be found in the editors' [Introduction to the](#)  
7 [current draft](#) and at appropriate points in the draft.

8 The ballot comments received on each draft, and the editors' proposed and final disposition of comments on  
9 working group drafts, are part of the audit trail of the development of the standard and are available, along  
10 with all the revisions of the draft on the 802.1 website (for address see above).

11 Records of participants in the development of the standard are added after SA Ballot, as part of  
12 pre-publication editing by IEEE Staff.

## 13 MIB and YANG modules

14 The MIB and YANG modules that are modified or added by this amendment are attached to the draft pdf as  
15 plain text (UTF-8) .mib and .yang files. When a roll up of the current base standard plus this amendment is  
16 made available, all the MIB and YANG modules for the roll up are attached.

## 1 Introduction to the current draft<sup>1</sup>

2 This introduction is not part of the draft, and should not be the subject of ballot comments.

### 3 D1.0

4 Incorporates the resolution of comments received during the Task Group ballot of draft 0.2. Significant  
5 changes resulting from the ballot include:

- 6 — Combining the old figures 10-2 and 10-3 into a single page UML-like diagram for Link Aggregation  
7 (excluding DRNI);
- 8 — Clean up separation of Link Aggregation from the optional DRNI by adding a separate line in the  
9 conformance clause options for DRNI, and moving all DRNI related types from  
10 *ieee802-dot1ax-types.yang* to *ieee802-dot1ax-drni.yang*;
- 11 — Moving the system and system-priority leafs from key-groups to a separate list of aggregation  
12 systems. This allows the system mac address to be provided by the system rather than requiring it to  
13 be explicitly specified in a configuration model.

14 Also changed was adding a base identity choice for the admin-conv-link-map and admin-conv-service-map of  
15 CSCD. This allows a vendor to augment the yang model with an identity statement specifying pre-defined  
16 contents of the table to provide a shorthand for configuration that otherwise could potentially take thousands  
17 of lines of configuration.

### 18 D0.2

19 Incorporates the resolution of comments received during the Task Group ballot of draft 0.1.

### 20 D0.1

21 This is an initial draft and comments are requested on all aspects of the draft. It includes a number of notes  
22 that may be of help to the Editors as well as informing the initial review process.

23 Stephen Haddock, 802.1AXdz Editor

24

---

<sup>1</sup> The whole or parts of the introduction, possibly updated, to past drafts may be retained at the Editor's discretion, with the most recent introduction first. The introduction to each draft may solicit input on specific subjects.

1  
2  
3  
4  
5

6 **Draft Standard for**  
7 **Local and metropolitan area networks—**  
8 **Link Aggregation**  
9 **Amendment 1:**  
10 **YANG for Link Aggregation**

11 Prepared by the  
12 **Time-Sensitive Networking (TSN) Task Group of IEEE 802.1**

13 Sponsor  
14 **LAN/MAN** Standards Committee  
15 **of** the  
16 **IEEE Computer Society**

17 Copyright © 2024 by the IEEE.  
18 Three Park Avenue  
19 New York, New York 10016-5997, USA

20 All rights reserved.

21 This document is an unapproved draft of a proposed IEEE Standard. As such, this document is subject to  
22 change. USE AT YOUR OWN RISK! IEEE copyright statements SHALL NOT BE REMOVED from draft  
23 or approved IEEE standards, or modified in any way. Because this is an unapproved draft, this document  
24 must not be utilized for any conformance/compliance purposes. Permission is hereby granted for officers  
25 from each IEEE Standards Working Group or Committee to reproduce the draft document developed by that  
26 Working Group for purposes of international standardization consideration. IEEE Standards Department  
27 must be informed of the submission for consideration prior to any reproduction for international  
28 standardization consideration ([stds.ipr@ieee.org](mailto:stds.ipr@ieee.org)). Prior to adoption of this document, in whole or in part, by  
29 another standards development organization, permission must first be obtained from the IEEE Standards  
30 Department ([stds.ipr@ieee.org](mailto:stds.ipr@ieee.org)). When requesting permission, IEEE Standards Department will require a  
31 copy of the standard development organization's document highlighting the use of IEEE content. Other  
32 entities seeking permission to reproduce this document, in whole or in part, must also obtain permission  
33 from the IEEE Standards Department.

34 IEEE Standards Department  
35 445 Hoes Lane  
36 Piscataway, NJ 08854, USA

1

2 **Abstract:** This amendment to IEEE Std 802.1AX-2020 specifies a Unified Modeling Language  
3 (UML)-based model and YANG modules for Link Aggregation configuration and status reporting.

4 **Keywords:** Aggregated Link, Aggregator, Distributed Resilient Network Interconnect, DRNI,  
5 interconnect, Link Aggregation, Link Aggregation Group, local area network, management,  
6 Network-Network Interface, NNI, YANG.

7

---

The Institute of Electrical and Electronics Engineers, Inc.  
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2024 by the Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved. Unapproved draft.

OMG®, UML®, and Unified Modeling Language™ are either registered trademarks or trademarks of Object Management Group, Inc. in the United States and/or other countries.  
IEEE and 802 are registered trademarks in the U.S. Patent & Trademark Office, owned by the Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-X-XXX-XXX-X STDXXXXX  
Print: ISBN 978-X-XXX-XXX-X STDPDXXXXX

IEEE prohibits discrimination, harassment, and bullying.

For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

## 1 Important Notices and Disclaimers Concerning IEEE Standards 2 Documents

3 IEEE Standards documents are made available for use subject to important notices and legal disclaimers.  
4 These notices and disclaimers, or a reference to this page (<https://standards.ieee.org/ipr/disclaimers.html>),  
5 appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning  
6 IEEE Standards Documents.”

### 7 Notice and Disclaimer of Liability Concerning the Use of IEEE Standards 8 Documents

9 IEEE Standards documents are developed within IEEE Societies and subcommittees of IEEE Standards  
10 Association (IEEE SA) Board of Governors. IEEE develops its standards through an accredited consensus  
11 development process, which brings together volunteers representing varied viewpoints and interests to  
12 achieve the final product. IEEE Standards are documents developed by volunteers with scientific, academic,  
13 and industry-based expertise in technical working groups. Volunteers are not necessarily members of IEEE  
14 or IEEE SA and participate without compensation from IEEE. While IEEE administers the process and  
15 establishes rules to promote fairness in the consensus development process, IEEE does not independently  
16 evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained  
17 in its standards.

18 IEEE makes no warranties or representations concerning its standards, and expressly disclaims all  
19 warranties, express or implied, concerning this standard, including but not limited to the warranties of  
20 merchantability, fitness for a particular purpose and non-infringement. In addition, IEEE does not warrant or  
21 represent that the use of the material contained in its standards is free from patent infringement. IEEE  
22 standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

23 Use of an IEEE standard is wholly voluntary. The existence of an IEEE Standard does not imply that there  
24 are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to  
25 the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and  
26 issued is subject to change brought about through developments in the state of the art and comments  
27 received from users of the standard.

28 In publishing and making its standards available, IEEE is not suggesting or rendering professional or other  
29 services for, or on behalf of, any person or entity, nor is IEEE undertaking to perform any duty owed by any  
30 other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or  
31 her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate,  
32 seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

33 IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,  
34 EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: THE  
35 NEED TO PROCURE SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR  
36 BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,  
37 WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR  
38 OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON  
39 ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND  
40 REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

### 41 Translations

42 The IEEE consensus development process involves the review of documents in English only. In the event  
43 that an IEEE standard is translated, only the English version published by IEEE is the approved IEEE  
44 standard.



## 1 Official statements

2 A statement, written or oral, that is not processed in accordance with the IEEE SA Standards Board  
3 Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its  
4 committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE. At lectures,  
5 symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall  
6 make it clear that the presenter's views should be considered the personal views of that individual rather  
7 than the formal position of IEEE, IEEE SA, the Standards Committee, or the Working Group. Statements  
8 made by volunteers may not represent the formal position of their employer(s) or affiliation(s).

## 9 Comments on standards

10 Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of  
11 membership affiliation with IEEE or IEEE SA. However, **IEEE does not provide interpretations,**  
12 **consulting information, or advice pertaining to IEEE Standards documents.**

13 Suggestions for changes in documents should be in the form of a proposed change of text, together with  
14 appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is  
15 important that any responses to comments and questions also receive the concurrence of a balance of interests.  
16 For this reason, IEEE and the members of its Societies and subcommittees of the IEEE SA Board of  
17 Governors are not able to provide an instant response to comments, or questions except in those cases where  
18 the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation  
19 requests. Any person who would like to participate in evaluating comments or in revisions to an IEEE standard  
20 is welcome to join the relevant IEEE working group. You can indicate interest in a working group using the  
21 Interests tab in the Manage Profile & Interests area of the [IEEE SA myProject system](#).<sup>1</sup> An IEEE Account is  
22 needed to access the application.

23 Comments on standards should be submitted using the [Contact Us](#) form.<sup>2</sup>

## 24 Laws and regulations

25 Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the  
26 provisions of any IEEE Standards document does not constitute compliance to any applicable regulatory  
27 requirements. Implementers of the standard are responsible for observing or referring to the applicable  
28 regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not  
29 in compliance with applicable laws, and these documents may not be construed as doing so.

## 30 Data privacy

31 Users of IEEE Standards documents should evaluate the standards for considerations of data privacy and  
32 data ownership in the context of assessing and using the standards in compliance with applicable laws and  
33 regulations.

## 34 Copyrights

35 IEEE draft and approved standards are copyrighted by IEEE under US and international copyright laws.  
36 They are made available by IEEE and are adopted for a wide variety of both public and private uses. These  
37 include both use, by reference, in laws and regulations, and use in private self-regulation, standardization,  
38 and the promotion of engineering practices and methods. By making these documents available for use and  
39 adoption by public authorities and private users, neither IEEE nor its licensors waive any rights in copyright  
40 to the documents.

<sup>1</sup> Available at: <https://development.standards.ieee.org/myproject-web/public/view.html#landing>.

<sup>2</sup> Available at: <https://standards.ieee.org/content/ieee-standards/en/about/contact/index.html>.

## 1 Photocopies

2 Subject to payment of the appropriate licensing fees, IEEE will grant users a limited, non-exclusive license  
3 to photocopy portions of any individual standard for company or organizational internal use or individual,  
4 non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance  
5 Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400;  
6 <https://www.copyright.com/>. Permission to photocopy portions of any individual standard for educational  
7 classroom use can also be obtained through the Copyright Clearance Center.

## 8 Updating of IEEE Standards documents

9 Users of IEEE Standards documents should be aware that these documents may be superseded at any time  
10 by the issuance of new editions or may be amended from time to time through the issuance of amendments,  
11 corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the  
12 document together with any amendments, corrigenda, or errata then in effect.

13 Every IEEE standard is subjected to review at least every 10 years. When a document is more than 10 years  
14 old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of  
15 some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that  
16 they have the latest edition of any IEEE standard.

17 In order to determine whether a given document is the current edition and whether it has been amended  
18 through the issuance of amendments, corrigenda, or errata, visit [IEEE Xplore](#) or [contact IEEE](#).<sup>3</sup> For more  
19 information about the IEEE SA or IEEE's standards development process, visit the IEEE SA Website.

## 20 Errata

21 Errata, if any, for all IEEE standards can be accessed on the [IEEE SA Website](#).<sup>4</sup> Search for standard number  
22 and year of approval to access the web page of the published standard. Errata links are located under the  
23 Additional Resources Details section. Errata are also available in [IEEE Xplore](#). Users are encouraged to  
24 periodically check for errata.

## 25 Patents

26 IEEE Standards are developed in compliance with the [IEEE SA Patent Policy](#).<sup>5</sup>

27 Attention is called to the possibility that implementation of this standard may require use of subject matter  
28 covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the  
29 existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has  
30 filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the  
31 IEEE SA Website at <https://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may  
32 indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without  
33 compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of  
34 any unfair discrimination to applicants desiring to obtain such licenses.

35 Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not  
36 responsible for identifying Essential Patent Claims for which a license may be required, for conducting  
37 inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or  
38 conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing  
39 agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that  
40 determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their  
41 own responsibility. Further information may be obtained from the IEEE Standards Association.

<sup>3</sup> Available at: <https://ieeexplore.ieee.org/browse/standards/collection/ieee>.

<sup>4</sup> Available at: <https://standards.ieee.org/standard/index.html>.

<sup>5</sup> Available at: <https://standards.ieee.org/about/sasb/patcom/materials.html>.

## 1 **IMPORTANT NOTICE**

2 IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure  
3 against interference with or from other devices or networks. IEEE Standards development activities consider  
4 research and information presented to the standards development group in developing any safety  
5 recommendations. Other information about safety practices, changes in technology or technology  
6 implementation, or impact by peripheral systems also may be pertinent to safety considerations during  
7 implementation of the standard. Implementers and users of IEEE Standards documents are responsible for  
8 determining and complying with all appropriate safety, security, environmental, health, and interference  
9 protection practices and all applicable laws and regulations.

## 1 Participants

2 <<The following lists will be updated in the usual way prior to publication>>

3 At the time this standard was submitted to the IEEE-SA Standards Board for approval, the IEEE 802.1  
4 Working Group had the following membership:

5 **Glenn Parsons**, *Chair*  
6 **Jessy V. Rouyer**, *Vice Chair*  
7 **János Farkas**, *Chair, Time-Sensitive Networking Task Group*  
8 **Craig Gunther**, *Vice Chair, Time-Sensitive Networking Task Group*  
9 **Mick Seaman**, *Editor*  
10 **Stephen Haddock**, *Editor*  
11

<<TBA>>

<sup>1</sup> The following members of the individual balloting committee voted on this standard. Balloters may have  
<sup>2</sup> voted for approval, disapproval, or abstention.

<<TBA>>

<sup>3</sup> When the IEEE-SA Standards Board approved this standard on XX Month 20xx, it had the following  
<sup>4</sup> membership:

<sup>5</sup> <<TBA>>

<<TBA>>

<sup>6</sup>  
<sup>7</sup> \*Member Emeritus

<sup>8</sup>  
<sup>9</sup>  
<sup>10</sup>

1 **Introduction**

This introduction is not part of IEEE Std 802.1AXdz™-20XX, IEEE Standard for Local and metropolitan area networks— Link Aggregation—Amendment 1: YANG for Link Aggregation.

2 IEEE Std 802.1AXdz™-202X: YANG for Link Aggregation specifies a Unified Modeling Language  
3 (UML)-based model and YANG modules for Link Aggregation configuration and status reporting

4 This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution.  
5 Revisions are anticipated within the next few years to clarify existing material, to correct possible errors, and  
6 to incorporate new related material. Information on the current revision state of this and other IEEE 802  
7 standards may be obtained from

8	Secretary,	IEEE-SA	Standards	Board
9	445	Hoes		Lane
10	Piscataway,	NJ		08854-4141
11	USA			

# Contents

2.	Normative references .....	18
4.	Acronyms and abbreviations .....	19
5.	Conformance.....	20
10.	YANG Data Model.....	21
10.1	YANG Framework .....	21
10.2	Information Model for Link Aggregation Management.....	21
10.2.1	Link Aggregation model.....	22
10.2.2	DRNI model.....	25
10.3	Structure of the Link Aggregation YANG Model .....	26
10.4	Relationship to other YANG modules.....	26
10.4.1	IEEE 802.1AX Types Module.....	26
10.4.2	IETF YANG Types Module .....	26
10.4.3	IETF Interfaces YANG Module .....	26
10.4.4	IEEE 802 Types Module.....	26
10.5	Security Considerations .....	27
10.5.1	Security considerations of the ieee802-dot1ax YANG modules .....	27
10.6	YANG schema tree definitions.....	28
10.6.1	Schema for the ieee802-dot1ax-linkagg YANG module.....	28
10.6.2	Schema for the ieee802-dot1ax-drni YANG module .....	29
10.7	YANG modules .....	30
10.7.1	The ieee802-dot1ax-types YANG module .....	30
10.7.2	The ieee802-dot1ax-linkagg YANG module.....	37
10.7.3	The ieee802-dot1ax-drni YANG module .....	52
Annex A	.....	63
(normative)	.....	63
Protocol implementation conformance statement (PICS) proforma.....		63
A.2.1	Major capabilities/options .....	63
Annex G	.....	64
(informative)	.....	64
Bibliography	.....	64

**Figures**

Figure 10-1 YANG root hierarchy with Link Aggregation YANG modules..... 22

Figure 10-2 Key Group Configuration and Monitoring Objects ..... 23

Figure 10-4 DRNI Configuration and Monitoring Objects ..... 25



## Tables

Table 10-1	Structure of the YANG modules .....	26
------------	-------------------------------------	----

## <sup>1</sup> 2. Normative references

<sup>2</sup> *Insert the following references into Clause 2 in alphanumeric order:*

<sup>3</sup> IETF RFC 6241, Network Configuration Protocol (NETCONF), June 2011.

<sup>4</sup> IETF RFC 6991, Common YANG Data Types, July 2013

<sup>5</sup> IETF RFC 7950, The YANG 1.1 Data Modeling Language, August 2016.

<sup>6</sup> IETF RFC 8343, A YANG Data Model for Interface Management, March 2018

<sup>7</sup> IETF RFC 8349, A YANG Data Model for Routing Management (NMDA Version), March 2018

## <sup>1</sup> 4. Acronyms and abbreviations

<sup>2</sup> *Insert the following acronyms into Clause 4 in alphabetical order:*

<sup>3</sup> NETCONF   Network Configuration Protocol

<sup>4</sup> UML®   Unified Modeling Language™<sup>1</sup>

---

<sup>1</sup> UML® is a registered trademark of the Object Management Group, Inc., and Unified Modeling Language™ is a trademark of the Object Management Group, Inc.

## 1 5. Conformance

2 *Insert the following text (items j and k) after item i) in the lettered list of 5.3.2*

### 3 5.3.2 Link Aggregation options

- 4 j) Support YANG modules for the management of Link Aggregation capabilities (Clause 10).
- 5 k) Support YANG modules for the management of DRNI capabilities (Clause 10).

1

2 *Insert Clause 10 after Clause 9 as follows:*

## 3 **10. YANG Data Model**

4 This clause specifies the YANG data model comprised of YANG modules that provide control and status  
5 monitoring of systems and system components that implement functionality specified in this standard.

6 This clause:

- 7 a) Introduces the YANG framework that governs the naming and hierarchy of configuration and  
8 operational data structures in the data models, and the modeling of network interfaces (10.1).
- 9 b) Describes the information data model and its relationship to the operational processes and managed  
10 objects specified in the other clauses of this standard, and provides a representation, similar to the  
11 Unified Modeling Language (UML), of relevant objects (10.2).
- 12 c) Describes the structure of the YANG data model, which comprises three YANG modules (10.3).
- 13 d) Includes a relationship description of other modules imported in YANG modules (10.4)
- 14 e) Reviews security considerations applicable to each of the modules, with specific reference to data  
15 nodes in the YANG modules that compose the YANG data model (10.5).
- 16 f) Includes each of the YANG modules and its data schema (10.6).

## 17 **10.1 YANG Framework**

18 The YANG framework applies hierarchy in the following areas:

- 19 a) The uniform resource name (URN), as specified in 802d.
- 20 b) The YANG objects form a hierarchy of configuration and operational data structures that specify the  
21 YANG model.

## 22 **10.2 Information Model for Link Aggregation Management**

23 The YANG objects are based on the managed objects in Clause 7. A UML-like representation of the  
24 management model is provided in the following subclauses.

25 NOTE—OMG® UML2.5<sup>2</sup> [B11] conventions together with C++ language constructs are used in this clause as a  
26 representation to convey model structure and relationships..

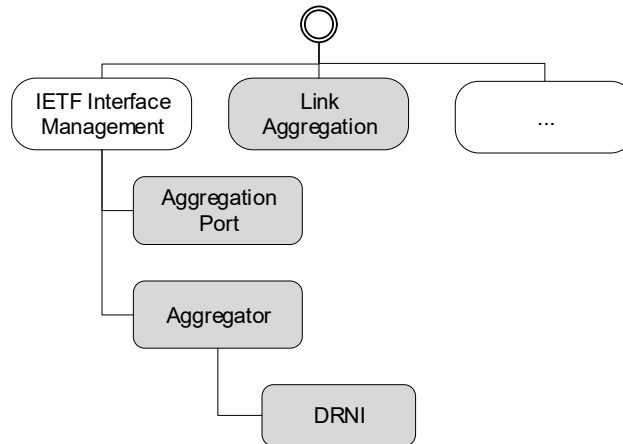
27 The purpose of an UML-like<sup>3</sup> diagram is to express the model design on a single piece of paper. The  
28 structure of the UML-like representation shows the name of the object followed by a list of properties for the  
29 object. The properties indicate its type and accessibility. The UML-like representation is meant to express  
30 simplified semantics for the properties. It is not meant to provide the specific datatype as used to encode the  
31 object in either MIB or YANG. In the UML-like representation, a box with a white background represents  
32 information that comes from sources outside of the IEEE. A box with a gray background represents objects  
33 that are specified by this IEEE Standard.

<sup>2</sup>OMG® is a registered trademark of the Object Management Group, Inc.

<sup>3</sup>A description of the UML-like diagrams used in this clause is provided at <https://1.ieee802.org/uml-like-diagrams>.

1 The YANG hierarchical structure that incorporates the Link Aggregation YANG modules supported by this  
2 standard is represented by Figure 10-1. In the figures in this clause, items that are shaded gray are described  
3 in this document, items with no background shading are specified elsewhere. The YANG data model is  
4 realized in three YANG modules. One module *ieee802-dot1ax-types* provides data types that are needed by  
5 the Link Aggregation configuration and monitoring objects. The *ieee802-dot1ax-linkagg* module provides  
6 the Link Aggregation, Aggregation Port, and Aggregator configuration and monitoring objects. The  
7 *ieee802-dot1ax-drni* module provides the Distribute Resilient Network Interface (DRNI) configuration and  
8 monitoring objects. The Link Aggregation and DRNI capabilities are not only applicable to IEEE Std  
9 802.1Q bridges, but also (for example) end stations, and routers.

10



**Figure 10-1—YANG root hierarchy with Link Aggregation YANG modules**

### 11 10.2.1 Link Aggregation model

12 The Link Aggregation Configuration and Monitoring Objects in Figure 10-2 show the objects that are  
13 applicable on a system supporting link aggregation, and the interfaces supporting link aggregation.

14 The objects on the system consist of a list of aggregation systems, and a list of key groups. A key group  
15 is the set of aggregators and aggregation ports that share the same system priority, system mac address, and  
16 aggregation key, and therefore can potentially form a Link Aggregation Group. Each key group has a unique  
17 combination of actor-admin-key and actor-system, and includes parameters that have the same value for any  
18 aggregator and/or aggregation port that have the same actor-admin-key and actor-system.

19 NOTE—See 6.3.5 and 6.3.6 for a description of the identification of Aggregation Ports that can potentially form a Link  
20 Aggregation Group, and Figure 6-15 for examples.

21 Each Aggregation Port is an interface (e.g. of type *ieee8023csmacd*) augmented with an “aggport” presence  
22 container as shown on the right side of Figure 10-2. Each Aggregator is an interface to the entire Link  
23 Aggregation Group (typically using type *ieee8023adlag*) augmented with a “lag” container as shown on the  
24 left side of Figure 10-2. The binding of Aggregation Ports to Aggregators is a dynamic function of the Link  
25 Aggregation Control Protocol. The Aggregation Ports attached to an Aggregator can be read from the *lower-*  
26 *layer-if* attribute of the Aggregator interface. The Aggregator to which an Aggregation Port is attached can  
27 be read through the *higher-layer-if* attribute of the Aggregation Port interface.

28

1

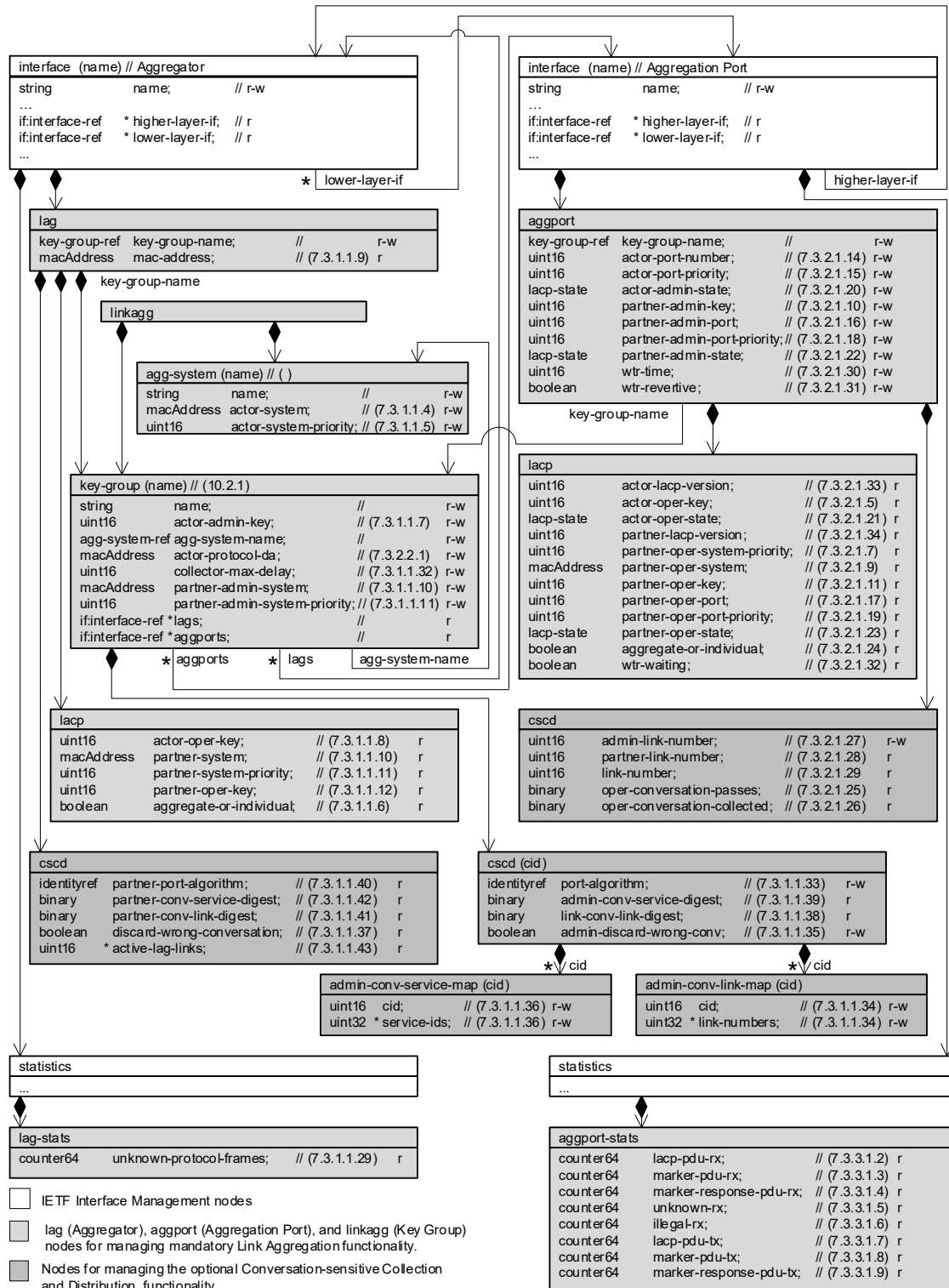


Figure 10-2—Link Aggregation Configuration and Monitoring Objects

## 10.2.2 DRNI model

- The DRNI Configuration and Monitoring Objects in Figure 10-3 show the objects that are applicable to an Aggregator augmented with a “drni” container.

4

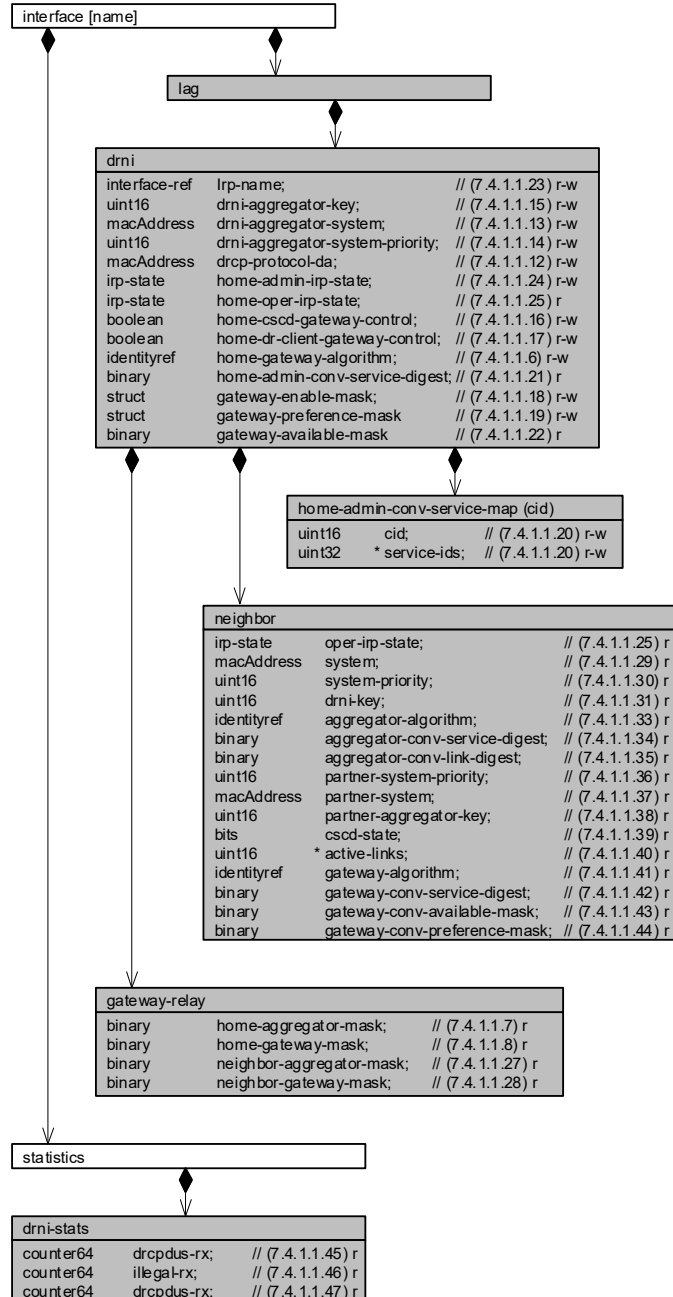


Figure 10-3—DRNI Configuration and Monitoring Objects



## 10.3 Structure of the Link Aggregation YANG Model

The YANG data model specified in this standard is comprised of three YANG modules. A summary of the modules contained in this clause is represented in Table 10-1.

**Table 10-1—Structure of the YANG modules**

Module	Subclause	Notes
ieee802-dot1ax-types	10.7.1	Type definitions used for Link Aggregation YANG.
ieee802-dot1ax-linkagg	10.7.2	Link Aggregation Management
ieee802-dot1z-drni	10.7.3	DRNI Management

In the YANG modules below, if any discrepancy between the DESCRIPTION text and the corresponding specification in any other part of this standard occurs, the specifications outside this clause take precedence.

## 10.4 Relationship to other YANG modules

This clause describes how the *ieee802-dot1ax-linkagg* and *ieee802-dot1ax-drni* YANG modules are related to the YANG modules that are imported.

### 10.4.1 IEEE 802.1AX Types Module

The *ieee802-dot1ax-types* module provides reusable types that are used by the *ieee802-dot1ax-linkagg* and *ieee802-dot1ax-drni* modules.

### 10.4.2 IETF YANG Types Module

The *ietf-yang-types* YANG module (IETF RFC 6991) contains a set of derived YANG types. This document leverages counter64.

### 10.4.3 IETF Interfaces YANG Module

The *ietf-interfaces* YANG module (IETF RFC 8343) contains a set of YANG definitions for managing network interfaces. This document augments an *ietf-interfaces:interface* with aggregation-port or aggregator data nodes..

### 10.4.4 IEEE 802 Types Module

The *ieee802-types* module provides reusable types that are used in IEEE 802 standards.

NOTE—The type for mac-addresses defined in *ieee802-types* has a pattern that allows upper and lower case letters. To avoid issues with string comparison, it is suggested to only use upper case for the letters in the hexadecimal numbers. Implementers using code comparing MAC addresses are advised that there is still an issue with a difference between the IETF mac-address definition and the IEEE mac-address definition.

## 10.5 Security Considerations

The YANG modules specified in this clause are designed to be accessed via a network configuration protocol (e.g., NETCONF protocol). In the case of NETCONF, the lowest NETCONF layer is the secure transport layer and the mandatory to implement secure transport is SSH. The NETCONF access control model provides the means to restrict access for particular NETCONF users to a pre-configured subset of all available NETCONF protocol operations and content.

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 users who 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.

### 10.5.1 Security considerations of the *ieee802-dot1ax* YANG modules

There are several management objects specified in the *ieee802-dot1ax-linkagg* and *ieee802-dot1ax-drni* YANG modules that are configurable (i.e., read-write) and/or operational (i.e., read-only). Such objects could be considered sensitive or vulnerable in some network environments. A network configuration protocol, such as NETCONF (IETF RFC 6241), can support protocol operations that can edit or delete YANG module configuration data (e.g., edit-config, delete-config, copy-config). If this is done in a non-secure environment without proper protection, then negative effects on the network operation are possible.

The following containers, and the objects in these containers, of the *ieee802-dot1ax-linkagg* and *ieee802-dot1ax-drni* YANG modules can be manipulated to interfere with the operation of the Link Aggregation Control Protocol (LACP) or the Distributed Relay Control Protocol (DRCP). This could, for example, cause network instability and result in the loss of service for a large number of end users.

- dot1ax-linkagg/link-aggregation/key-group
- dot1ax-linkagg/link-aggregation/cscd
- dot1ax-linkagg/link-aggregation/cscd/admin-conv-service-map
- dot1ax-linkagg/link-aggregation/cscd/admin-conv-link-map
- dot1ax-linkagg/aggregation-port
- dot1ax-linkagg/aggregation-port/cscd/admin-link-number
- dot1ax-linkagg/aggregator
- dot1ax-drni/aggregator/drni
- dot1ax-drni/aggregator/drni/home-admin-conv-service-map

Some of the readable data in this YANG module could be considered sensitive or vulnerable in some network environments. It is important to control all types of access (e.g., including NETCONF get, get-config operations) to these objects and possibly to even encrypt the values of these objects when sending them over the network. For example the system name and other information about the remote systems could provide information about the configuration and topology of the network and could be considered a privacy threat.

## 10.6 YANG schema tree definitions<sup>4,5</sup>

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in these diagrams is as follows:

- Brackets "[" and "]" enclose list keys.
- Abbreviations before data node names: "rw" means configuration (read-write), and "ro" means state data (read-only).
- Symbols after data node names: "?" means an optional node, "!" means a presence container, and "\*" denotes a list and leaf-list.
- Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- Ellipsis ("...") stand for contents of subtrees that are not shown.

### 10.6.1 Schema for the *ieee802-dot1ax-linkagg* YANG module

```
12 module: ieee802-dot1ax-linkagg
13   +--rw linkagg
14     +--rw agg-system* [name]
15       | +--rw name string
16       | +--rw actor-system? ieee:mac-address
17       | +--rw actor-system-priority? uint16
18     +--rw key-group* [name]
19       +--rw name string
20       +--rw actor-admin-key uint16
21       +--rw agg-system-name agg-system-ref
22       +--rw actor-protocol-da? ieee:mac-address
23       +--rw collector-max-delay? uint16
24       +--rw partner-admin-system? ieee:mac-address
25       +--rw partner-admin-system-priority? uint16
26       +--ro lags* if:interface-ref
27       +--ro aggports* if:interface-ref
28     +--rw cscd {ax:cscd}?
29       +--rw port-algorithm? identityref
30       +--rw admin-conv-service-map {ax:sid-map}?
31         | +--rw (method)?
32         |   +--:(pattern)
33         |   | +--rw pattern? identityref
34         |   +--:(cid-list)
35         |   | +--rw cid-list* [cid]
36         |   |   +--rw cid uint16
37         |   |   +--rw service-ids* uint32
38       +--ro admin-conv-service-digest? binary
39     +--rw admin-conv-link-map
40       | +--rw (method)?
41       |   +--:(pattern)
42       |   | +--rw pattern? identityref
43       |   +--:(cid-list)
44       |   | +--rw cid-list* [cid]
45       |   |   +--rw cid uint16
46       |   |   +--rw link-numbers* uint16
47     +--ro admin-conv-link-digest? binary
48     +--rw admin-discard-wrong-conv? enumeration {ax:dwc}?
49
50   augment /if:interfaces/if:interface:
51     +--rw lag
52       +--rw key-group-name key-group-ref
```

<sup>4</sup>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.

<sup>5</sup>An ASCII version of the YANG module(s) can be obtained by Web browser from the IEEE 802.1 Website at <https://1.ieee802.org/yang-modules/>.

```

1      +---ro mac-address?          ieee:mac-address
2      +---ro lacp
3      |   +---ro actor-oper-key?          uint16
4      |   +---ro partner-system?          ieee:mac-address
5      |   +---ro partner-system-priority?  uint16
6      |   +---ro partner-oper-key?        uint16
7      |   +---ro aggregate-or-individual?  boolean
8      +---ro cscd {ax:cscd}?
9          +---ro partner-port-algorithm?    identityref
10         +---ro partner-conv-service-digest? binary
11         +---ro partner-conv-link-digest?   binary
12         +---ro discard-wrong-conversation? boolean
13         +---ro active-lag-links*          uint16
14     augment /if:interfaces/if:interface/if:statistics:
15         +---ro lag-stats
16             +---ro unknown-protocol-frames? yang:counter64
17     augment /if:interfaces/if:interface:
18         +---rw aggpport!
19             +---rw key-group-name          key-group-ref
20             +---rw actor-port-number?      uint16
21             +---rw actor-port-priority?    uint16
22             +---rw actor-admin-state?      ax:lacp-state
23             +---rw partner-admin-key?      uint16
24             +---rw partner-admin-port?     uint16
25             +---rw partner-admin-port-priority? uint16
26             +---rw partner-admin-state?    ax:lacp-state
27             +---rw wtr-time?              uint16
28             +---rw wtr-revertive?          boolean
29         +---ro lacp
30         |   +---ro actor-lacp-version?    uint8
31         |   +---ro actor-oper-key?        uint16
32         |   +---ro actor-oper-state?      ax:lacp-state
33         |   +---ro partner-lacp-version?  uint8
34         |   +---ro partner-oper-system-priority? uint16
35         |   +---ro partner-oper-system?   ieee:mac-address
36         |   +---ro partner-oper-key?      uint16
37         |   +---ro partner-oper-port?     uint16
38         |   +---ro partner-oper-port-priority? uint16
39         |   +---ro partner-oper-state?    ax:lacp-state
40         |   +---ro aggregate-or-individual? boolean
41         |   +---ro wtr-waiting?           boolean
42         +---rw cscd {ax:cscd}?
43             +---rw admin-link-number?     uint16
44             +---ro partner-link-number?    uint16
45             +---ro link-number?           uint16
46             +---ro oper-conversation-passes? binary
47             +---ro oper-conversation-collected? binary
48     augment /if:interfaces/if:interface/if:statistics:
49         +---ro aggpport-stats
50             +---ro lacp-pdu-rx?            yang:counter64
51             +---ro marker-pdu-rx?          yang:counter64
52             +---ro marker-response-pdu-rx? yang:counter64
53             +---ro unknown-rx?            yang:counter64
54             +---ro illegal-rx?            yang:counter64
55             +---ro lacp-pdu-tx?           yang:counter64
56             +---ro marker-pdu-tx?         yang:counter64
57             +---ro marker-response-pdu-tx? yang:counter64
58

```

## 10.6.2 Schema for the *ieee802-dot1ax-drni* YANG module

```

60     module: ieee802-dot1ax-drni
61
62     augment /if:interfaces/if:interface/dot1ax:lag:

```

```

1  +--rw drni!
2      +--rw irp-name                               if:interface-ref
3      +--rw drni-aggregator-key?                   uint16
4      +--rw drni-aggregator-system?                ieee:mac-address
5      +--rw drni-aggregator-system-priority?       uint16
6      +--rw drcp-protocol-da?                      ieee:mac-address
7      +--rw home-admin-irp-state?                  irp-state
8      +--ro home-oper-irp-state?                   irp-state
9      +--rw home-cscd-gateway-control?             boolean
10     +--rw home-dr-client-gateway-control?         boolean
11     +--rw home-gateway-algorithm?                 identityref
12     +--rw home-admin-conv-service-map* [cid]
13         | +--rw cid                               uint16
14         | +--rw service-ids*                      uint32
15     +--ro home-admin-conv-service-digest?         binary
16     +--rw gateway-enable-mask
17         | +--rw (method)?
18         | | +--:(pattern)
19         | | | +--rw pattern?                      identityref
20         | | +--:(cid-list)
21         | | | +--rw cid-list*                    uint16
22         | | +--:(mask)
23         | | +--rw mask?                          binary
24         | +--rw invert-list?                      boolean
25     +--rw gateway-preference-mask
26         | +--rw (method)?
27         | | +--:(pattern)
28         | | | +--rw pattern?                      identityref
29         | | +--:(cid-list)
30         | | | +--rw cid-list*                    uint16
31         | | +--:(mask)
32         | | +--rw mask?                          binary
33         | +--rw invert-list?                      boolean
34     +--ro gateway-available-mask?                 binary
35     +--ro neighbor
36         | +--ro oper-irp-state?                   irp-state
37         | +--ro system?                           ieee:mac-address
38         | +--ro system-priority?                  uint16
39         | +--ro drni-key?                         uint16
40         | +--ro aggregator-algorithm?             identityref
41         | +--ro aggregator-conv-service-digest?   binary
42         | +--ro aggregator-conv-link-digest?      binary
43         | +--ro partner-system-priority?          uint16
44         | +--ro partner-system?                   ieee:mac-address
45         | +--ro partner-aggregator-key?           uint16
46         | +--ro cscd-state?                       bits
47         | +--ro active-links*                     uint16
48         | +--ro gateway-algorithm?                identityref
49         | +--ro gateway-conv-service-digest?      binary
50         | +--ro gateway-available-mask?           binary
51         | +--ro gateway-preference-mask?          binary
52     +--ro gateway-relay
53         +--ro home-aggregator-mask?               binary
54         +--ro home-gateway-mask?                 binary
55         +--ro neighbor-aggregator-mask?          binary
56         +--ro neighbor-gateway-mask?             binary
57 augment /if:interfaces/if:interface/if:statistics:
58     +--ro drni-stats
59         +--ro drcpdus-rx?                          yang:counter64
60         +--ro illegal-rx?                          yang:counter64
61         +--ro drcpdus-tx?                          yang:counter64
62

```

## 1 10.7 YANG modules

### 2 10.7.1 The *ieee802-dot1ax-types* YANG module

```
3 module ieee802-dot1ax-types {
4   yang-version 1.1;
5   namespace "urn:ieee:params:xml:ns:yang:ieee802-dot1ax-types";
6   prefix "dot1ax-types";
7
8   import iana-if-type {
9     prefix "ianaif";
10  }
11
12  organization
13    "IEEE 802.1 Working Group";
14
15  contact
16    "WG-URL: http://www.ieee802.org/1/
17    WG-Email: stds-802-1-1@ieee.org
18
19    Contact: IEEE 802.1 Working Group Chair
20    Postal: C/O IEEE 802.1 Working Group
21            IEEE Standards Association
22            45 Hoes Lane
23            Piscataway, NJ 08854
24            USA
25    E-mail: stds-802-1-chairs@ieee.org";
26
27  description
28    "Common types used within 802.1AX Link Aggregation modules.
29
30    Copyright (C) IEEE (2024).
31
32    This version of this YANG module is part of IEEE Std 802.1AX;
33    see the standard itself for full legal notices.";
34
35
36  revision "2024-11-15" {
37    description
38      "Editor's note: this revision statement will be removed prior
39      to publication. It is only present while the project is
40      running in order to make it easier for the reader to see whar
41      changes have been introduced while the project is running.
42
43      For working group ballot on draft 1.0";
44    reference
45      "IEEE 802.1AX-2020, Link Aggregation.";
46  }
47
48  feature csdc {
49    description
50      "Conversation Sensitive Collection and Distribution (CSCD)
51      is supported.";
52    reference
53      "5.3.2, 6.6 of IEEE Std 802.1AX";
54  }
55
56  feature dwc {
```

```
1  description
2    "The Discard Wrong Conversation option in CSCD is
3    supported.";
4  reference
5    "5.3.2, 6.6 of IEEE Std 802.1AX";
6  }
7
8
9  typedef lacp-state {
10   type bits {
11     bit lacp-activity {
12       position 1;
13       description
14         "Provides administrative control over when LACPDUs are
15         transmitted. A value of '1' indicates Active mode where
16         LACPDUs are sent regardless of partner's lacp-activity
17         value. A value of '0' indicates Passive mode where
18         LACPDUs are sent only when the partner's lacp-activity
19         value is '1' (partner is in Active mode).";
20     }
21     bit lacp-timeout {
22       position 2;
23       description
24         "Provides administrative control over the frequency of
25         received LACPDUs. A value of '1' indicates Short Timeout
26         (so partner uses frequent transmission). A value of '0'
27         indicates Long Timeout (so partner can use infrequent
28         transmission).";
29     }
30     bit aggregation {
31       position 3;
32       description
33         "Provides administrative control over whether this
34         Aggregation Port can be in a LAG with more than one
35         member. A value of '1' indicates the port can be
36         aggregated with other ports. A value of '0' indicates
37         the port can only be a solitary link.";
38     }
39     bit synchronization {
40       position 4;
41       description
42         "The Synchronization state of the MUX state machine.";
43     }
44     bit collecting {
45       position 5;
46       description
47         "The Collecting state of the MUX state machine.";
48     }
49     bit distributing {
50       position 6;
51       description
52         "The Distributing state of the MUX state machine.";
53     }
54     bit defaulted {
55       position 7;
56       description
57         "Indicates the port is using the partner-admin values
58         to select an Aggregator.";
59     }
60   }
61 }
```

```
1     bit expired {
2         position 8;
3         description
4             "The Expired state of the Receive state machine.";
5     }
6 }
7 description
8     "LACP state values as transmitted in LACPDUs.
9     Administrative control over the values of lacp-activity,
10    lacp-timeout, aggregation, and (in partner-admin-lacp-state)
11    synchronization is allowed. The remaining bits are read-only.";
12 reference
13     "6.4.1, 6.4.2.3 of IEEE Std 802.1AX";
14 }
15
16 feature sid-map {
17     description
18         "The Service ID to Conversaion ID map is supported for
19         use distribution algorithms.";
20 }
21
22 identity distribution-algorithm {
23     description
24         "Each distribution algorithm is identified by a sequence of
25         4 octets, structured as shown in Figure 8-1. Distribution
26         algorithm identifiers are used by network administrators to
27         select between algorithms and, in Conversation-sensitive
28         LACP and (if supported) Distributed Resilient Network
29         Interconnect (DRNI) operation, to check whether partners
30         and neighbors are using the same algorithm.
31
32         This identity is intended to serve as base identity, not
33         to be directly referenced.
34
35         Vendor specific, combination (ex: multi-layer), and other
36         customized distribution algorithms can be created as
37         their own identities in their own YANG files, derived from
38         this imported base type.";
39     reference
40         "8.1, 8.2 of IEEE Std 802.1AX";
41 }
42 identity unspecified {
43     base distribution-algorithm;
44     description
45         "The 'Unspecified distribution algorithm' identifier has
46         been reserved for use when the algorithm is unknown (or
47         is not advertised).";
48     reference
49         "Table 8-1 of IEEE Std 802.1AX";
50 }
51
52 feature c-vid-dist-alg {
53     description
54         "Supports distribution based on C-VIDs.";
55 }
56 identity c-vids-nomap {
57     base distribution-algorithm;
58     if-feature "c-vid-dist-alg";
59     description
```



```
1      "Distribution based on C-VIDs (8.2.1). No Service ID
2      mapping table is used.";
3      reference
4      "Table 8-1 of IEEE Std 802.1AX";
5  }
6  identity c-vids-map {
7      base distribution-algorithm;
8      if-feature "c-vid-dist-alg and sid-map";
9      description
10     "Distribution based on C-VIDs (8.2.1). A Service ID
11     mapping table is used.";
12     reference
13     "Table 8-1 of IEEE Std 802.1AX";
14 }
15
16 feature s-vid-dist-alg {
17     description
18     "Supports distribution based on S-VIDs.";
19 }
20 identity s-vids-nomap {
21     base distribution-algorithm;
22     if-feature "s-vid-dist-alg";
23     description
24     "Distribution based on S-VIDs (8.2.2). No Service ID
25     mapping table is used.";
26     reference
27     "Table 8-1 of IEEE Std 802.1AX";
28 }
29 identity s-vids-map {
30     base distribution-algorithm;
31     if-feature "s-vid-dist-alg and sid-map";
32     description
33     "Distribution based on S-VIDs (8.2.2). A Service ID
34     mapping table is used.";
35     reference
36     "Table 8-1 of IEEE Std 802.1AX";
37 }
38
39 feature i-sid-dist-alg {
40     description
41     "Supports distribution based on I-SIDs.";
42 }
43 identity i-sids-nomap {
44     base distribution-algorithm;
45     if-feature "i-sid-dist-alg";
46     description
47     "Distribution based on I-SIDs (8.2.3). No Service ID
48     mapping table is used.";
49     reference
50     "Table 8-1 of IEEE Std 802.1AX";
51 }
52 identity i-sids-map {
53     base distribution-algorithm;
54     if-feature "i-sid-dist-alg and sid-map";
55     description
56     "Distribution based on I-SIDs (8.2.3). A Service ID
57     mapping table is used.";
58     reference
59     "Table 8-1 of IEEE Std 802.1AX";
```

```
1  }
2
3  feature te-sid-dist-alg {
4      description
5          "Supports distribution based on TE-SIDs.";
6  }
7  identity te-sids-nomap {
8      base distribution-algorithm;
9      if-feature "te-sid-dist-alg";
10     description
11         "Distribution based on TE-SIDs (8.2.4). No Service ID
12         mapping table is used.";
13     reference
14         "Table 8-1 of IEEE Std 802.1AX";
15 }
16 identity te-sids-map {
17     base distribution-algorithm;
18     if-feature "te-sid-dist-alg and sid-map";
19     description
20         "Distribution based on TE-SIDs (8.2.4). A Service ID
21         mapping table is used.";
22     reference
23         "Table 8-1 of IEEE Std 802.1AX";
24 }
25
26 feature flow-hash-dist-alg {
27     description
28         "Supports distribution based on Flow Hash.";
29 }
30 identity flow-hash-nomap {
31     base distribution-algorithm;
32     if-feature "flow-hash-dist-alg";
33     description
34         "Distribution based on Flow Hash (8.2.5). No Service ID
35         mapping table is used.";
36     reference
37         "Table 8-1 of IEEE Std 802.1AX";
38 }
39 identity flow-hash-map {
40     base distribution-algorithm;
41     if-feature "flow-hash-dist-alg and sid-map";
42     description
43         "Distribution based on Flow Hash (8.2.5). A Service ID
44         mapping table is used.";
45     reference
46         "Table 8-1 of IEEE Std 802.1AX";
47 }
48
49 identity link-map-patterns {
50     description
51         "Base identify for patterns filling the admin-conv-link-map.
52         This identity is intended to serve as base identity, not
53         to be directly referenced. Use of the identity allows vendors
54         to augment the module with vendor specified patterns,";
55 }
56 feature basic-link-maps {
57     description
58         "Pre-defined admin-conv-link-map configurations to distribute
59         packets on either one or two active links, with any
```

```
1     remaining links available as standby.";  
2 }  
3 identity one-plus-n {  
4     base link-map-patterns;  
5     if-feature basic-link-maps;  
6     description  
7         "Provides active/standby behavior with one active link and  
8         up to 63 standby links. All packets are mapped to whichever  
9         link that is active in the aggregation has the lowest link  
10        number. If that link fails, all packets are mapped to the  
11        lowest link number of the remaining links that are active  
12        in the aggregation.  
13        The map consists of an identical entry for each cid, with a  
14        list of numbers from 1 to 64.  
15        Supports any number of links in the aggregation (up to 64)  
16        with link numbers between 1 and 64. Any links in the  
17        aggregation with a link number greater than 64 will never  
18        be used.";  
19 }  
20 identity two-plus-n {  
21     if-feature basic-link-maps;  
22     base link-map-patterns;  
23     description  
24         "Provides basic load-balancing on two active links with up  
25         to 62 standby links. All packets with an even cid value are  
26         mapped to the link with the lowest link number in the  
27         aggregation, and all packets with an odd cid value are  
28         mapped to the link with the highest link number in the  
29         aggregation.  
30         The map consists of an identical entry for each even cid  
31         containing a list of numbers from 1 to 64, and an identical  
32         entry for each odd cid containing a list of numbers from 64  
33         to 1.  
34         Supports any number of links in the aggregation (up to 64)  
35         with link numbers between 1 and 64. Any links in the  
36         aggregation with a link number greater than 64 will never  
37         be used.";  
38 }  
39  
40 identity service-map-patterns {  
41     description  
42         "Base identity for patterns filling the admin-conv-service-map.  
43         This identity is intended to serve as base identity, not  
44         to be directly referenced. Use of the identity allows vendors  
45         to augment the module with vendor specified patterns,";  
46 }  
47 }
```

#### 48 10.7.2 The *ieee802-dot1ax-linkagg* YANG module

```
49 module ieee802-dot1ax-linkagg {  
50     yang-version 1.1;  
51     namespace "urn:ieee:params:xml:ns:yang:ieee802-dot1ax-linkagg";  
52     prefix "dot1ax";  
53  
54     import ieee802-dot1ax-types {  
55         prefix "ax";  
56     }  
57     import ieee802-types {
```

```
1     prefix "ieee";
2 }
3 import ietf-yang-types {
4     prefix "yang";
5 }
6 import ietf-interfaces {
7     prefix "if";
8 }
9 import iana-if-type {
10    prefix "ianaif";
11 }
12
13 organization
14     "IEEE 802.1 Working Group";
15
16 contact
17     "WG-URL: http://www.ieee802.org/1/
18     WG-Email: stds-802-1-1@ieee.org
19
20     Contact: IEEE 802.1 Working Group Chair
21     Postal: C/O IEEE 802.1 Working Group
22             IEEE Standards Association
23             45 Hoes Lane
24             Piscataway, NJ 08854
25             USA
26     E-mail: stds-802-1-chairs@ieee.org";
27
28
29 description
30     "This YANG module describes the configuration model for Link
31     Aggregation, as specified in IEEE Std 802.1AX, including Link
32     Aggregation Control Protocol (LACP) and Conversation Sensitive
33     Collection and Distribution.
34
35     Copyright (C) IEEE (2024).
36
37     This version of this YANG module is part of IEEE Std 802.1AX;
38     see the standard itself for full legal notices.";
39
40
41 revision "2024-11-15" {
42     description
43         "Editor's note: this revision statement will be removed prior
44         to publication. It is only present while the project is
45         running in order to make it easier for the reader to see whar
46         changes have been introduced while the project is running.
47
48         For working group ballot on draft 1.0";
49     reference
50         "IEEE 802.1AX-2020, Link Aggregation.";
51 }
52
53 typedef key-group-ref {
54     type leafref {
55         path "/dotlax:linkagg/dotlax:key-group/dotlax:name";
56     }
57     description
58         "This type is used by aggregators and aggregation ports to
59         reference an entry in the key-group list.";
60 }
61 typedef agg-system-ref {
62     type leafref {
63         path "/dotlax:linkagg/dotlax:agg-system/dotlax:name";
64     }
```

```
1     description
2         "This type is used in the key-group list entries to
3         reference an entry in the agg-system list.";
4     }
5
6
7     container linkagg {
8         description
9             "Link Aggregation System specific configuration nodes.";
10        list agg-system {
11            key name;
12            description
13                "List of aggregation systems.";
14            leaf name {
15                type string;
16                description
17                    "Name for the aggregation system.";
18            }
19            leaf actor-system {
20                type ieee:mac-address;
21                description
22                    "The part of the System Identifier that is a globally
23                    unique MAC address. This leaf provides the ability to
24                    administratively override the initial value provided
25                    by the system.";
26                reference
27                    "7.3.1.1.4, 7.3.2.1.3 of IEEE Std 802.1AX";
28            }
29            leaf actor-system-priority {
30                type uint16;
31                default 0x8000;
32                description
33                    "The part of the System Identifier that is the
34                    priority of the system.";
35                reference
36                    "7.3.1.1.5, 7.3.2.1.2 of IEEE Std 802.1AX";
37            }
38        }
39        list key-group {
40            key name;
41            unique "actor-admin-key";
42            description
43                "List of key groups. A key group is the set of aggregators
44                and aggregation ports that share the same system priority,
45                system identifier, and aggregation key, and therefore can
46                potentially form a Link Aggregation Group. Each entry in
47                the key group list contains the parameters common to all
48                aggregation ports and/or aggregators in the key group.";
49            reference
50                "6.3.5, 6.4.12 of IEEE Std 802.1AX";
51            leaf name {
52                type string;
53                description
54                    "Name for the key group.";
55            }
56            leaf actor-admin-key {
57                type uint16 {
58                    range 1..65535;
59                }
60                mandatory true;
61                description
62                    "The administrative value of the key used by the
63                    Aggregators and Aggregation Ports in this key-group.";
64                reference
```

```
1      "7.3.1.1.7, 7.3.2.1.4 of IEEE Std 802.1AX";
2  }
3  leaf agg-system-name {
4      type agg-system-ref;
5      mandatory true;
6      description
7          "Specifies the aggregation system for this key
8          group.";
9  }
10 leaf actor-protocol-da {
11     type ieee:mac-address;
12     must
13         \. = "01-80-c2-00-00-00" or . = "01-80-C2-00-00-00" or
14         . = "01-80-c2-00-00-02" or . = "01-80-C2-00-00-02" or
15         . = "01-80-c2-00-00-03" or . = "01-80-C2-00-00-03"
16         { error-message "Invalid protocol address"; }
17     default "01-80-c2-00-00-02";
18     description
19         "A 6-octet read-write MAC Address value specifying the DA
20         to be used when sending Link Aggregation Control and
21         Marker PDUs. Valid addresses are the Nearest Customer
22         Bridge, Slow_Protocols_Multicast, and Nearest non-TPMR
23         Bridge group addresses. The default value
24         is the Slow_Protocols_Multicast address.";
25     reference
26         "7.3.2.2.1, 6.2.10.2 of IEEE Std 802.1AX";
27 }
28 leaf collector-max-delay {
29     type uint16;
30     description
31         "Specifies the maximum delay, in tens of microseconds,
32         between receiving a frame from an Aggregator Port, and
33         either delivering the frame to the Aggregator Client or
34         discarding the frame. A value of zero means the delay
35         is less than the minimum increment (< 10us).
36         This leaf provides the ability to administratively
37         override the initial value provided by the system.";
38     reference
39         "7.3.1.1.32, 6.2.3.1.1, B.3 of IEEE Std 802.1AX";
40 }
41 leaf partner-admin-system {
42     type ieee:mac-address;
43     default "00-00-00-00-00-00";
44     description
45         "The administrative value of the MAC address portion of
46         the Partner's System Identifier.
47         The assigned value is used, along with the value of
48         port-partner-admin-system, partner-admin-key,
49         partner-admin-port, and partner-admin-port-priority,
50         to achieve administratively configured Link
51         Aggregation Groups with a partner that does not run
52         LACP.";
53     reference
54         "7.3.2.1.8 of IEEE Std 802.1AX";
55 }
56 leaf partner-admin-system-priority {
57     type uint16;
58     default 0;
59     description
60         "The administrative value of priority portion of the
61         the Partner's System Identifier. The assigned
62         value is used, along with the value of
63         port-partner-admin-system, partner-admin-key,
64         partner-admin-port, and partner-admin-port-priority,
```

```
1         to achieve administratively configured Link
2         Aggregation Groups with a partner that does not run
3         LACP."";
4     reference
5         "7.3.2.1.6 of IEEE Std 802.1AX";
6 }
7 leaf-list lags {
8     type if:interface-ref;
9     config false;
10    description
11        "A list of the if:name of aggregators assigned to this
12        key group."";
13    reference
14        "linkagg:key-group";
15 }
16 leaf-list aggports {
17     type if:interface-ref;
18     config false;
19    description
20        "A list of the if:name of aggregation ports assigned to
21        this key group."";
22    reference
23        "linkagg:key-group";
24 }
25
26 container cscd {
27     if-feature "ax:cscd";
28     description
29         "Contains CSCD parameters that need to be consistent for
30         all aggregation ports and aggregators in the key group."";
31     leaf port-algorithm {
32         type identityref {
33             base ax:distribution-algorithm;
34         }
35         default ax:unspecified;
36         description
37             "Identifies the algorithm used by the Aggregator to
38             assign frames to a Port Conversation ID. Default is
39             the value for an unspecified distribution algorithm."";
40         reference
41             "7.3.1.1.33 of IEEE Std 802.1AX";
42     }
43
44     container admin-conv-service-map {
45         if-feature ax:sid-map;
46         uses service-map;
47         description
48             "Data structure to map service identifiers to
49             conversation identifiers. Each entry consists of a
50             Conversation ID (CID) and a list of zero or more
51             Service Identifiers (SIDs) that map to it. An empty
52             list of SIDs means there are no SIDs that map to this
53             CID, and results in the same behavior as not having an
54             entry for this CID."";
55         reference
56             "7.3.1.1.36, 6.6.3.1 of IEEE Std 802.1AX";
57     }
58     leaf admin-conv-service-digest {
59         type binary;
60         config false;
61         description
62             "The MD5 Digest of the admin-conv-service-map. The
63             value is NULL when the distribution algorithm
64             specified by agg-port-algorithm does not use the
```

```
1      admin-conv-service-map."";
2      reference
3      "7.3.1.1.39, 6.6.3.1 of IEEE Std 802.1AX";
4  }
5  container admin-conv-link-map {
6      uses link-map;
7      description
8      "Data structure to map a Conversation Identifier
9      (CID) to a Link Number. Each entry consists of a CID
10     and a list of link numbers that can potentially be
11     selected for that CID. An empty list of link-numbers
12     means that no links are selected for the CID.";
13     reference
14     "7.3.1.1.34, 6.6.3.1 of IEEE Std 802.1AX";
15 }
16 leaf admin-conv-link-digest {
17     type binary;
18     config false;
19     description
20     "The MD5 Digest of the admin-conv-link-map. The value
21     is NULL when the distribution algorithm specified by
22     agg-port-algorithm does not use the
23     admin-conv-link-map.";
24     reference
25     "7.3.1.1.38, 6.6.3.1 of IEEE Std 802.1AX";
26 }
27
28 leaf admin-discard-wrong-conv {
29     if-feature "ax:dwc";
30     type enumeration {
31         enum force-true {
32             value 1;
33             description
34             "Indicates that an Aggregator discards a
35             frame that is collected from an Aggregation Port
36             that is different from the Aggregation Port to
37             which the Aggregator would distribute a frame
38             with the same Port Conversation ID.";
39         }
40         enum force-false {
41             value 2;
42             description
43             "Indicates that an Aggregator does not discard
44             a frame that is collected from an Aggregation Port
45             that is different from the Aggregation Port to
46             which the Aggregator would distribute a frame with
47             the same Port Conversation ID. This is the behavior
48             of the Aggregator when DWC is not supported";
49         }
50         enum auto {
51             value 3;
52             description
53             "Indicates that the Aggregator behaves as
54             if the value was force-true only when the actor
55             and partner agree on the algorithms (other than
56             unspecified) and mapping tables used to map frames
57             to Aggregation Ports, and behaves as if the value
58             was force-false otherwise.";
59         }
60     }
61     default force-false;
62     description
63     "Indicates whether an Aggregator discards a
64     frame that is collected from an Aggregation Port
```



```
1         that is different from the Aggregation Port to which
2         the Aggregator would distribute a frame with the
3         same Port Conversation ID.";
4     reference
5         "7.3.1.1.35, 6.6 of IEEE Std 802.1AX";
6     }
7 }
8
9 }
10 }
11
12
13 augment "/if:interfaces/if:interface" {
14     when
15         "derived-from-or-self(if:type,'ianaif:ieee8023adLag') or "+
16         "derived-from-or-self(if:type,'ianaif:ieee8021axDrni')" {
17         description
18             "Applies to interfaces representing a LAG or
19             (if supported) DRNI Intra-Relay Port.";
20         }
21     description
22         "Augment Interface with Aggregator parameters.";
23     container lag {
24         description
25             "Contains the configuration and status information that
26             allows an instance of an Aggregator to be managed.";
27         leaf key-group-name {
28             type key-group-ref;
29             mandatory true;
30             description
31                 "Specifies the entry in the link-aggregation key-group
32                 list to which this aggregator is assigned.";
33         }
34         leaf mac-address {
35             type ieee:mac-address;
36             config false;
37             description
38                 "The MAC address assigned to the Aggregator.";
39             reference
40                 "7.3.1.1.9 of IEEE Std 802.1AX";
41         }
42         container lacp {
43             config false;
44             description
45                 "Contains aggregator LACP operational data.";
46             leaf actor-oper-key {
47                 type uint16;
48                 description
49                     "The current operational value of the Key for the
50                     Aggregator. The meaning of particular Key
51                     values is of local significance.";
52                 reference
53                     "7.3.1.1.8 of IEEE Std 802.1AX";
54             }
55             leaf partner-system {
56                 type ieee:mac-address;
57                 description
58                     "The value of the MAC address portion of the
59                     System Identifier for the current
60                     protocol partner of this Aggregator. A value
61                     of zero indicates that there is no known partner.
62                     If the aggregation is manually configured, this
63                     System identifier value is assigned by the
64                     local System.";
```

```
1         reference
2         "7.3.1.1.10 of IEEE Std 802.1AX";
3     }
4     leaf partner-system-priority {
5         type uint16;
6         description
7         "Indicates the priority value portion of the current
8         Partner's System Identifier. If the aggregation is
9         manually configured, this System Priority value is
10        assigned by the local System.";
11        reference
12        "7.3.1.1.11 of IEEE Std 802.1AX";
13    }
14    leaf partner-oper-key {
15        type uint16;
16        description
17        "The current operational value of the Key for the
18        Aggregators current protocol Partner. If the
19        aggregation is manually configured, this Key value
20        is assigned by the local System.";
21        reference
22        "7.3.1.1.12 of IEEE Std 802.1AX";
23    }
24    leaf aggregate-or-individual {
25        type boolean;
26        description
27        "Indicates whether the Aggregator represents an
28        Aggregate (TRUE) or an Individual link (FALSE).";
29        reference
30        "7.3.1.1.6 of IEEE Std 802.1AX";
31    }
32 }
33 container cscd {
34     if-feature "ax:cscd";
35     config false;
36     description
37     "Aggregator parameters obtained by the operation of LACP
38     supporting CSCD.";
39     leaf partner-port-algorithm {
40         type identityref {
41             base ax:distribution-algorithm;
42         }
43         description
44         "Operational value of the distribution algorithm in
45         use by the LACP Partner.";
46         reference
47         "7.3.1.1.40 of IEEE Std 802.1AX";
48     }
49     leaf partner-conv-service-digest {
50         type binary;
51         description
52         "The MD5 Digest of the admin-conv-service-map in use
53         by the LACP Partner.";
54         reference
55         "7.3.1.1.42, 6.6.3.1 of IEEE Std 802.1AX";
56     }
57     leaf partner-conv-link-digest {
58         type binary;
59         description
60         "The MD5 Digest of the admin-conv-link-map in use
61         by the LACP Partner.";
62         reference
63         "7.3.1.1.41, 6.6.3.1 of IEEE Std 802.1AX";
64     }
```

```
1      leaf discard-wrong-conversation {
2          type boolean;
3          description
4              "The operational value that determines whether an
5              Aggregator discards a frame that is collected
6              from an Aggregation Port that is different from the
7              Aggregation Port to which the Aggregator would
8              distribute a frame with the same Port Conversation
9              ID.";
10         reference
11             "7.3.1.1.37, 6.6 of IEEE Std 802.1AX";
12     }
13     leaf-list active-lag-links {
14         type uint16;
15         description
16             "A list, possibly empty, of the operational
17             link-number of each Aggregation Port active
18             (i.e. Collecting) on this Aggregator.";
19         reference
20             "7.3.1.1.43 of IEEE Std 802.1AX";
21     }
22 }
23 }
24 }
25
26 augment "/if:interfaces/if:interface/if:statistics" {
27     when
28         "../dot1ax:lag" {
29             description
30                 "Applies to aggregators.";
31         }
32     description
33         "Augment interface statistics with aggregator statistics.";
34     container lag-stats {
35         config false;
36         description
37             "Contains the set of stats associated with the
38             Aggregator.";
39         leaf unknown-protocol-frames {
40             type yang:counter64;
41             description
42                 "A count of data frames discarded on reception by all
43                 ports that are (or have been) members of the
44                 aggregation, due to the detection of an unknown Slow
45                 Protocols PDU (7.3.3.1.5)";
46             reference
47                 "7.3.1.1.29 of IEEE Std 802.1AX";
48         }
49     }
50 }
51
52
53 augment "/if:interfaces/if:interface" {
54     description
55         "Augment interface model with Aggregation port
56         configuration nodes.";
57     container aggport {
58         presence
59             "When present, this interface supports Link Aggregation";
60         description
61             "Contains Aggregation Port configuration related nodes,
62             which provides the basic management controls necessary
63             to allow an instance of an Aggregation Port to be managed,
64             for the purposes of Link Aggregation.";
```

```
1
2 leaf key-group-name {
3   type key-group-ref;
4   mandatory true;
5   description
6     "Specifies the entry in the link-aggregation key-group
7     list to which this aggregation-port is assigned.";
8 }
9 leaf actor-port-number {
10   type uint16 {
11     range 1..65535;
12   }
13   description
14     "The port number assigned to the Aggregation Port.
15     The port number is communicated in LACPDUs as the
16     Actor_Port.";
17   reference
18     "7.3.2.1.14, 6.4.6 of IEEE Std 802.1AX";
19 }
20 leaf actor-port-priority {
21   type uint16;
22   default 0x8000;
23   description
24     "The priority value assigned to this Aggregation Port.";
25   reference
26     "7.3.2.1.15, 6.4.6 of IEEE Std 802.1AX";
27 }
28 leaf actor-admin-state {
29   type ax:lacp-state {
30     bit lacp-activity {
31       position 1;
32       description
33         "Setting the LACP_Activity state to '0' means that the
34         transmission of LACPDUs is controlled by the value of
35         partner-oper-state.LACP_Activity.";
36     }
37     bit lacp-timeout {
38       position 2;
39       description
40         "Setting the LACP_Timeout to '0' means that actor uses
41         the Long_Timeout value, allowing the partner to transmit
42         LACPDUs at the Slow_Periodic_Time.";
43     }
44     bit aggregation {
45       position 3;
46       description
47         "Setting the Aggregation state to '0' prevents this
48         port from being aggregated with any other ports.";
49     }
50   }
51   default "lacp-activity aggregation";
52   description
53     "Provides administrative control over the values of the
54     LACP_Activity, LACP_Timeout, and Aggregation state.";
55   reference
56     "7.3.2.1.20, 6.4.1, 6.4.2.3, 6.4.6 of IEEE Std 802.1AX";
57 }
58
59 leaf partner-admin-key {
60   type uint16 {
61     range 1..65535;
62   }
63   description
64     "The current administrative value of the Key for the
```

```
1      protocol Partner. The assigned value is used, along
2      with the value of port-partner-admin-system-priority,
3      partner-admin-system, partner-admin-port, and
4      partner-admin-port-priority, in order to achieve
5      manually configured aggregation."";
6  reference
7      "7.3.2.1.10 of IEEE Std 802.1AX";
8  }
9  leaf partner-admin-port {
10     type uint16 {
11         range 1..65535;
12     }
13     description
14         "The current administrative value of the port number for
15         the protocol Partner. The assigned value is used, along
16         with the value of partner-admin-system-priority,
17         partner-admin-system, port-partner-admin-key, and
18         partner-admin-port-priority, in order to achieve
19         manually configured aggregation."";
20     reference
21         "7.3.2.1.16 of IEEE Std 802.1AX";
22 }
23 leaf partner-admin-port-priority {
24     type uint16;
25     default 0;
26     description
27         "The current administrative value of the port priority
28         for the protocol Partner. The assigned value is used,
29         along with the value of partner-admin-system-priority,
30         partner-admin-system, partner-admin-key, and
31         partner-admin-port, in order to achieve manually
32         configured aggregation."";
33     reference
34         "7.3.2.1.18 of IEEE Std 802.1AX";
35 }
36 leaf partner-admin-state {
37     type ax:lacp-state {
38         bit lacp-activity {
39             position 1;
40             description
41                 "When the LACP_Activity state is set to '0', the
42                 transmission of LACPDUs is controlled by the
43                 actor-admin-state.LACP_Activity."";
44         }
45         bit lacp-timeout {
46             position 2;
47             description
48                 "When the LACP_Timeout is set to '0', LACPDUs
49                 are transmitted at the Slow_Periodic_Time."";
50         }
51         bit aggregation {
52             position 3;
53             description
54                 "When the Aggregation state is set to '0', this
55                 port cannot be aggregated with any other port."";
56         }
57         bit synchronization {
58             position 4;
59             description
60                 "When the Synchronization state is set to '0', this
61                 port cannot become active."";
62         }
63     }
64     default "synchronization";
```

```
1      description
2          "Provides administrative control over the partner's
3          LACP_Activity, LACP_Timeout, Aggregation, and
4          Synchronization state when the partner's information is
5          unknown (i.e. no LACPDUs are received from the partner).";
6      reference
7          "7.3.2.1.22, 6.4.1, 6.4.2.3, 6.4.6 of IEEE Std 802.1AX";
8  }
9
10 leaf wtr-time {
11     type uint16 {
12         range 0..32767;
13     }
14     default 0;
15     description
16         "The wait-to-restore (WTR) period, in seconds, that
17         needs to elapse between an Aggregation Port on a LAG
18         coming up (Port_Operational becoming TRUE) and being
19         permitted to become active (transmitting and
20         receiving frames) on the LAG.";
21     reference
22         "7.3.2.1.30 of IEEE Std 802.1AX";
23 }
24 leaf wtr-revertive {
25     type boolean;
26     default true;
27     description
28         "Controls revertive or non-revertive mode of operation.
29         When TRUE, the Aggregation Port can become active as
30         soon as the wait-to-restore timer expires regardless of
31         the state of other links in the LAG.
32         When FALSE, the Aggregation Port cannot become active
33         unless there are no other links that can become active
34         in the LAG. The default value is TRUE.";
35     reference
36         "7.3.2.1.31 of IEEE Std 802.1AX";
37 }
38
39 container lacp {
40     config false;
41     description
42         "Contains Aggregation port LACP operational related
43         nodes.";
44     leaf actor-lacp-version {
45         type uint8;
46         description
47             "The version number transmitted in LACPDUs on this
48             Aggregation Port";
49         reference
50             "7.3.2.1.33 of IEEE Std 802.1AX";
51     }
52     leaf actor-oper-key {
53         type uint16;
54         description
55             "The current operational value of the Key for the
56             Aggregation Port. The meaning of particular Key values
57             is of local significance.";
58         reference
59             "7.3.2.1.5 of IEEE Std 802.1AX";
60     }
61     leaf actor-oper-state {
62         type ax:lacp-state;
63         description
64             "The operational value of the Actor_State as
```

```
1      transmitted in LACPDUs.";  
2      reference  
3      "7.3.2.1.21, 6.4.1, 6.4.2.3, 6.4.6 of IEEE Std 802.1AX";  
4  }  
5  leaf partner-lacp-version {  
6      type uint8;  
7      description  
8          "The version number in the LACPDU most recently  
9          received on this Aggregation Port.";  
10     reference  
11     "7.3.2.1.34 of IEEE Std 802.1AX";  
12 }  
13 leaf partner-oper-system-priority {  
14     type uint16;  
15     description  
16         "Indicates the operational value of priority associated  
17         with the Partners System ID. The value of this  
18         attribute can contain the manually configured value  
19         carried in partner-admin-system-priority if there is  
20         no protocol Partner.";  
21     reference  
22     "7.3.2.1.7 of IEEE Std 802.1AX";  
23 }  
24 leaf partner-oper-system {  
25     type ieee:mac-address;  
26     description  
27         "Represents the MAC address portion of the Aggregation  
28         Port's current protocol partner's System Identifier.  
29         A value of zero indicates that there is no known  
30         protocol Partner.  
31         The value of this attribute can contain the manually  
32         configured value carried in partner-admin-system if  
33         there is no protocol Partner.";  
34     reference  
35     "7.3.2.1.9 of IEEE Std 802.1AX";  
36 }  
37 leaf partner-oper-key {  
38     type uint16;  
39     description  
40         "The current operational value of the Key for the  
41         protocol Partner. The value of this attribute can  
42         contain the manually configured value carried in  
43         partner-admin-key if there is no protocol Partner.";  
44     reference  
45     "7.3.2.1.11 of IEEE Std 802.1AX";  
46 }  
47 leaf partner-oper-port {  
48     type uint16;  
49     description  
50         "The operational port number assigned by the  
51         Aggregation Port's protocol Partner. The value of this  
52         attribute can contain the administratively configured  
53         value carried in partner-admin-port if there is no  
54         protocol Partner.";  
55     reference  
56     "7.3.2.1.17 of IEEE Std 802.1AX";  
57 }  
58 leaf partner-oper-port-priority {  
59     type uint16;  
60     description  
61         "The operational priority value assigned by the  
62         Aggregation Port's protocol Partner. The value of this  
63         attribute can contain the administratively configured  
64         value carried in partner-admin-port-priority if there
```

```
1         is no protocol Partner.";  
2     reference  
3         "7.3.2.1.19 of IEEE Std 802.1AX";  
4 }  
5 leaf partner-oper-state {  
6     type ax:lacp-state;  
7     description  
8         "The operational value of the partner's LACP state  
9         derived from received LACPDUs or, when Defaulted is  
10        true, from the partner-admin-state.";  
11    reference  
12        "7.3.2.1.23, 6.4.1, 6.4.2.3, 6.4.6 of IEEE Std 802.1AX";  
13 }  
14 leaf aggregate-or-individual {  
15     type boolean;  
16     description  
17         "When true indicates the Aggregation Port can join a  
18         LAG consisting of multiple Aggregation Ports.  
19         When false, indicates that the Aggregation Port can  
20         only operate as an Solitary link because the  
21         Aggregation bit is false in either  
22         actor-oper-port-state or partner-oper-port-state.";  
23    reference  
24        "7.3.2.1.24 of IEEE Std 802.1AX";  
25 }  
26 leaf wtr-waiting {  
27     type boolean;  
28     description  
29         "Indicates the Aggregation Port is inhibited from  
30         becoming active for an interval (determined by  
31         wtr-time) after becoming operational or while  
32         non-revertive operation is being enforced by the  
33         Selection Logic.";  
34    reference  
35        "7.3.2.32 of IEEE Std 802.1AX";  
36 }  
37 }  
38  
39 container cscd {  
40     if-feature "ax:cscd";  
41     description  
42         "Aggregation port parameters for support of CSCD.";  
43     leaf admin-link-number {  
44         type uint16;  
45         description  
46             "The Link_Number value for the Aggregation Port,  
47             that is unique among all Aggregation Ports in the same  
48             key group. This leaf provides the ability to  
49             administratively override the initial value provided  
50             by the system. A value of 0 is allowed, but  
51             results in no frames being distributed to this  
52             Aggregation Port.";  
53         reference  
54             "7.3.2.1.27, 6.6.3.2 of IEEE Std 802.1AX";  
55     }  
56     leaf partner-link-number {  
57         type uint16;  
58         config false;  
59         description  
60             "The last received value of the Partner_Link_Number,  
61             or zero if the Aggregation Port is using default  
62             values for the Partner or the Partner LACP Version  
63             is 1.";  
64         reference
```



```
1      "7.3.2.1.29 of IEEE Std 802.1AX";
2    }
3    leaf link-number {
4      type uint16;
5      config false;
6      description
7        "The operational link number for this Aggregation Port.
8        The value is either the same as the admin-link-number,
9        or the corresponding value of the LACP partner.";
10     reference
11       "7.3.2.1.28 of IEEE Std 802.1AX";
12   }
13   leaf oper-conversation-passes {
14     type binary;
15     config false;
16     description
17       "A vector of Boolean values, with one value for each
18       possible Port Conversation ID. A 1 indicates that a
19       frame mapping to this Port Conversation ID is
20       distributed to this Aggregation Port, and a 0
21       indicates that it is not";
22     reference
23       "7.3.2.1.25 of IEEE Std 802.1AX";
24   }
25   leaf oper-conversation-collected {
26     type binary;
27     config false;
28     description
29       "A vector of Boolean values, with one value for each
30       possible Port Conversation ID. A 1 indicates that a
31       frame mapping to this Port Conversation ID can be
32       collected from this Aggregation Port, and a 0
33       indicates that it cannot";
34     reference
35       "7.3.2.1.26 of IEEE Std 802.1AX";
36   }
37 }
38 }
39 }
40
41 augment "/if:interfaces/if:interface/if:statistics" {
42   when
43     "../dot1ax:aggport" {
44       description
45         "Applies to aggregation ports.";
46     }
47   description
48     "Augment interface statistics with aggport statistics.";
49   container aggport-stats {
50     config false;
51     description
52       "Contains stats associated with the Aggregation Port.";
53     leaf lacp-pdu-rx {
54       type yang:counter64;
55       description
56         "The number of valid LACPDUs received on this
57         Aggregation Port.";
58       reference
59         "7.3.3.1.2 of IEEE Std 802.1AX";
60     }
61     leaf marker-pdu-rx {
62       type yang:counter64;
63       description
64         "The number of valid Marker PDUs received on this
```

```
1      Aggregation Port.";  
2      reference  
3      "7.3.3.1.3 of IEEE Std 802.1AX";  
4  }  
5  leaf marker-response-pdu-rx {  
6      type yang:counter64;  
7      description  
8          "The number of valid Marker Response PDUs received on  
9          this Aggregation Port.";  
10     reference  
11     "7.3.3.1.4 of IEEE Std 802.1AX";  
12 }  
13 leaf unknown-rx {  
14     type yang:counter64;  
15     description  
16         "The number of frames received that either:  
17         a) Carry the Slow Protocols Ethernet Type value,  
18         but contain an unknown PDU, or  
19         b) Are addressed to the Slow Protocols group MAC  
20         Address, but do not carry the Slow Protocols  
21         Ethernet Type.";  
22     reference  
23     "7.3.3.1.5 of IEEE Std 802.1AX";  
24 }  
25 leaf illegal-rx {  
26     type yang:counter64;  
27     description  
28         "The number of frames received that carry the Slow  
29         Protocols Ethernet Type value, but contain a badly  
30         formed PDU or an illegal value of Protocol Subtype.";  
31     reference  
32     "7.3.3.1.6 of IEEE Std 802.1AX";  
33 }  
34 leaf lacp-pdu-tx {  
35     type yang:counter64;  
36     description  
37         "The number of LACPDUs transmitted on this  
38         Aggregation Port.";  
39     reference  
40     "7.3.3.1.7 of IEEE Std 802.1AX";  
41 }  
42 leaf marker-pdu-tx {  
43     type yang:counter64;  
44     description  
45         "The number of Marker PDUs transmitted on this  
46         Aggregation Port.";  
47     reference  
48     "7.3.3.1.8 of IEEE Std 802.1AX";  
49 }  
50 leaf marker-response-pdu-tx {  
51     type yang:counter64;  
52     description  
53         "The number of Marker Response PDUs transmitted on  
54         this Aggregation Port.";  
55     reference  
56     "7.3.3.1.9 of IEEE Std 802.1AX";  
57 }  
58 }  
59 }  
60  
61 grouping link-map {  
62     description  
63     "Specifies the contents of the admin-conv-link-map.";  
64     choice method {
```

```
1  default cid-list;
2  description
3    "Provides two ways to specify the map contents.";
4  leaf pattern {
5    type identityref {
6      base ax:link-map-patterns;
7    }
8    description
9      "Use a predefined pattern to fill the map.";
10 }
11 list cid-list {
12   key cid;
13   description
14     "Data structure to map a Conversation Identifier
15     (CID) to a Link Number. Each entry consists of a CID
16     and a list of link numbers that can potentially be
17     selected for that CID. An empty list of link-numbers
18     means that no links are selected for the CID.";
19   leaf cid {
20     type uint16 {
21       range 0..4095;
22     }
23     description
24       "Port Conversation Identifier";
25   }
26   leaf-list link-numbers {
27     type uint16;
28     description
29       "List of zero or more Link Numbers that can
30       potentially be selected for distribution of frames
31       with this CID.";
32   }
33 }
34 }
35 }
36
37 grouping service-map {
38   description
39     "Specifies the contents of the admin-conv-service-map.";
40   choice method {
41     default cid-list;
42     description
43       "Provides two ways to specify the map contents.";
44     leaf pattern {
45       type identityref {
46         base ax:service-map-patterns;
47       }
48       description
49         "Use a predefined pattern to fill the map.";
50     }
51     list cid-list {
52       key cid;
53       description
54         "Data structure to map service identifiers to
55         conversation identifiers. Each entry consists of a
56         Conversation ID (CID) and a list of zero or more
57         Service Identifiers (SIDs) that map to it. An empty
58         list of SIDs means there are no SIDs that map to this
59         CID, and results in the same behavior as not having an
60         entry for this CID.";
61       leaf cid {
62         type uint16 {
63           range 0..4095;
64         }

```

```
1         description
2         "Port Conversation Identifier";
3     }
4     leaf-list service-ids {
5         type uint32;
6         description
7             "List of zero or more SIDs that map to the CID.";
8     }
9 }
10 }
11 }
12
13 }
```

### 15 10.7.3 The *ieee802-dot1ax-drni* YANG module

```
16 module ieee802-dot1ax-drni {
17     yang-version 1.1;
18     namespace "urn:ieee:params:xml:ns:yang:ieee802-dot1ax-drni";
19     prefix "dot1ax-drni";
20
21     import ieee802-dot1ax-types {
22         prefix "ax";
23     }
24     import ieee802-dot1ax-linkagg {
25         prefix "dot1ax";
26     }
27     import ieee802-types {
28         prefix "ieee";
29     }
30     import ietf-yang-types {
31         prefix "yang";
32     }
33     import ietf-interfaces {
34         prefix "if";
35     }
36
37     organization
38         "IEEE 802.1 Working Group";
39
40     contact
41         "WG-URL: http://www.ieee802.org/1/
42         WG-Email: stds-802-1-1@ieee.org
43
44         Contact: IEEE 802.1 Working Group Chair
45         Postal: C/O IEEE 802.1 Working Group
46                 IEEE Standards Association
47                 45 Hoes Lane
48                 Piscataway, NJ 08854
49                 USA
50         E-mail: stds-802-1-chairs@ieee.org";
51
52     description
53         "This YANG module describes the configuration model for a
54         Distributed Resilient Network Interface (DRNI) as specified
55         in 802.1AX.
56
57         Copyright (C) IEEE (2024).
58
59         This version of this YANG module is part of IEEE Std 802.1AX;
60         see the standard itself for full legal notices.";
61
62     revision "2024-11-15" {
```

```
1      description
2      "Editor's note: this revision statement will be removed prior
3      to publication. It is only present while the project is
4      running in order to make it easier for the reader to see whar
5      changes have been introduced while the project is running.
6
7      For working group ballot on draft 1.0";
8  reference
9      "IEEE 802.1AX-2020, Link Aggregation.";
10 }
11
12 typedef irp-state {
13     type bits {
14         bit reserved-1 {
15             position 1;
16             description
17                 "Reserved for future use. It is set to 0 on
18                 transmit and ignored on receipt.";
19         }
20         bit reserved-2 {
21             position 2;
22             description
23                 "Reserved for future use. It is set to 0 on
24                 transmit and ignored on receipt.";
25         }
26         bit short-timeout {
27             position 3;
28             description
29                 "The Short_Timeout flag indicates the Timeout control value
30                 in use by the DRCP Receive machine on this IRP. Short Timeout
31                 is encoded as a 1; Long Timeout is encoded as a 0.";
32         }
33         bit synchronization {
34             position 4;
35             description
36                 "When the Sync flag is TRUE (1), the DRCP Receive machine has
37                 determined the Neighbor DRNI System has a compatible
38                 configuration for forming a DRNI.";
39         }
40         bit irc-data {
41             position 5;
42             description
43                 "When the IRC_Data flag is TRUE (1), the transfer of Up
44                 and Down frames is permitted on the IRC.";
45         }
46         bit drni {
47             position 6;
48             description
49                 "The DRNI flag is TRUE (1) when this DRNI System is paired
50                 with another DRNI System (i.e., when DR_Solo is FALSE)
51                 and FALSE (0) otherwise.";
52         }
53         bit defaulted {
54             position 7;
55             description
56                 "When the Defaulted flag is TRUE (1), the DRCP Receive machine
57                 is using default operational Neighbor information.
58                 When FALSE (0), the operational Neighbor information
59                 in use has been received in a DRCPDU.";
60         }
61         bit expired {
62             position 8;
63             description
64                 "When the Expired flag is TRUE (1), the DRCP Receive machine
```

```
1         is in the EXPIRED state."";
2     }
3 }
4 description
5     "IRP state values as transmitted in DRCPDUs.
6     Administrative control over the values of Short_Timeout
7     and IRC_Data is allowed. The remaining bits are read-only.";
8 reference
9     "7.4.1.1.24, 9.6.2.3, Figure 9-13 of IEEE Std 802.1AX";
10 }
11
12 identity drni-mask-patterns {
13     description
14         "Base identify for a 4096 bit mask indexed by CID.
15         This identity is intended to serve as base identity, not
16         to be directly referenced.";
17     reference
18         "9.5.3.5 of IEEE Std 802.1AX";
19 }
20 identity all-ones {
21     base drni-mask-patterns;
22     description
23         "All bits in the mask are set to one.";
24 }
25 identity even-odd {
26     base drni-mask-patterns;
27     description
28         "Pattern of alternating ones and zeroes, beginning with zero
29         for CID zero.";
30 }
31 identity high-low {
32     base drni-mask-patterns;
33     description
34         "Pattern of 2048 zeros followed by 2048 ones.";
35 }
36
37
38 augment "/if:interfaces/if:interface/dot1ax:lag" {
39     description
40         "Augmentation parameters only for Aggregators with
41         DRNI enabled.";
42     container drni {
43         presence
44             "When present, this Aggregator is enabled for DRNI";
45         description
46             "Aggregator parameters to support a Distributed
47             Resilient Network Interface";
48         leaf irp-name {
49             type if:interface-ref;
50             mandatory true;
51             description
52                 "Interface Name (if:name) of the Port supporting the
53                 Intra Relay Port (IRP) of this DRNI Gateway.";
54             reference
55                 "7.4.1.1.23 of IEEE Std 802.1AX";
56         }
57         leaf drni-aggregator-key {
58             type uint16 {
59                 range 0..4095;
60             }
61             description
62                 "The Aggregator Key value to be used by the Aggregator
63                 supporting this DRNI Gateway (and the Aggregation Ports
64                 assigned to this DRNI Gateway) when paired with a
```

```
1      neighbor DRNI System via the IRC. ";
2      reference
3      "7.4.1.1.15 of IEEE Std 802.1AX";
4  }
5  leaf drni-aggregator-system {
6      type ieee:mac-address;
7      default "00-00-00-00-00-00";
8      description
9      "The Aggregator System value to be used by the
10     Aggregator supporting this DRNI Gateway (and the
11     Aggregation Ports assigned to this DRNI Gateway)
12     when paired with a neighbor DRNI System via the
13     Intra-Relay Connection (IRC).";
14     reference
15     "7.4.1.1.13 of IEEE Std 802.1AX";
16 }
17 leaf drni-aggregator-system-priority {
18     type uint16;
19     default 0;
20     description
21     "The Aggregator System Priority value to be used by the
22     Aggregator supporting this DRNI Gateway (and the
23     Aggregation Ports assigned to this DRNI Gateway) when
24     paired with a neighbor DRNI System via the IRC.";
25     reference
26     "7.4.1.1.14 of IEEE Std 802.1AX";
27 }
28 leaf drcp-protocol-da {
29     type ieee:mac-address;
30     must
31     '. = "01-80-c2-00-00-00" or . = "01-80-C2-00-00-00" or
32     . = "01-80-c2-00-00-0e" or . = "01-80-C2-00-00-0E" or
33     . = "01-80-c2-00-00-03" or . = "01-80-C2-00-00-03"' {
34         error-message "Invalid protocol address";
35     }
36     default "01-80-c2-00-00-03";
37     description
38     "A 6-octet read-write MAC Address value specifying the
39     Destination Address for Distributed Relay Control PDUs
40     transmitted on the Intra-Relay Port. Valid addresses are
41     the Nearest Customer Bridge, Nearest Bridge, and
42     Nearest non-TPMR Bridge group addresses. The default
43     value is the Nearest Non-TPMR Bridge group
44     address.";
45     reference
46     "7.4.1.1.12, 9.6.1.1 of IEEE Std 802.1AX";
47 }
48 leaf home-admin-irp-state {
49     type irp-state{
50         bit short-timeout {
51             position 3;
52             description
53             "The Short_Timeout flag indicates the Timeout control value
54             in use by the DRCP Receive machine on this IRP. Short Timeout
55             is encoded as a 1; Long Timeout is encoded as a 0.";
56         }
57         bit irc-data {
58             position 5;
59             description
60             "When the IRC_Data flag is TRUE (1), the transfer of Up
61             and Down frames is permitted on the IRC.";
62         }
63     }
64     default "short-timeout irc-data";
```

```
1      description
2        "Provides administrative control over the values of the
3        Short_Timeout and IRC-Data state.";
4      reference
5        "7.4.1.1.24, 9.6.2.3, Figure 9-13 of IEEE Std 802.1AX";
6    }
7    leaf home-oper-irp-state {
8      type irp-state;
9      config false;
10     description
11       "A string of 8 bits, corresponding to the current
12       operational value of IRP_State as transmitted in
13       DRCPDUs.";
14     reference
15       "7.4.1.1.25, 9.6.2.3, Figure 9-13 of IEEE Std 802.1AX";
16   }
17   leaf home-cscd-gateway-control {
18     type boolean;
19     default true;
20     description
21       "When TRUE, allows the DRNI Gateway Port selection to
22       be based on the CSCD parameters that control the
23       Aggregator Port selection.";
24     reference
25       "7.4.1.1.16 of IEEE Std 802.1AX";
26   }
27   leaf home-dr-client-gateway-control {
28     type boolean;
29     default true;
30     description
31       "When TRUE, allows the Distributed Relay Client to
32       determine whether to forward frames through the DRNI
33       Gateway Port.";
34     reference
35       "7.4.1.1.17 of IEEE Std 802.1AX";
36   }
37   leaf home-gateway-algorithm {
38     type identityref {
39       base ax:distribution-algorithm;
40     }
41     default ax:unspecified;
42     description
43       "Identifies the algorithm used by the DRNI Gateway to
44       assign frames to a Gateway Conversation ID. 8.2 provides
45       the IEEE 802.1 OUI (00-80-C2) Gateway Algorithm
46       encodings. Default is the value for an unspecified
47       distribution algorithm.";
48     reference
49       "7.4.1.1.6 of IEEE Std 802.1AX";
50   }
51
52   list home-admin-conv-service-map {
53     key cid;
54     description
55       "Data structure to map service identifiers to
56       conversation identifiers. Each entry consists of a
57       Conversation ID (CID) and a list of zero or more Service
58       Identifiers (SIDs) that map to it. Frames with Service
59       IDs not contained in the map are not mapped to any
60       Gateway Conversation ID and are discarded.";
61     leaf cid {
62       type uint16 {
63         range 0..4095;
64       }
65     }
66   }
```



```
1      description
2      "Port Conversation Identifier";
3  }
4  leaf-list service-ids {
5      type uint32;
6      description
7          "List of SIDs that are associated with the CID.";
8  }
9  reference
10     "7.4.1.1.20, 6.6.3.1 of IEEE Std 802.1AX";
11 }
12 leaf home-admin-conv-service-digest {
13     type binary;
14     config false;
15     description
16         "The MD5 Digest of the home-admin-conv-service-map. The
17         value is NULL when the distribution algorithm specified
18         by agg-port-algorithm does not use the
19         home-admin-conv-service-map.";
20     reference
21         "7.4.1.1.21 of IEEE Std 802.1AX";
22 }
23 container gateway-enable-mask {
24     uses drni-mask;
25     description
26         "A vector of Boolean values, with one value for each
27         possible Gateway Conversation ID. A 1 indicates that
28         frames associated with that Gateway Conversation ID
29         are allowed to pass through this Gateway Port, and a
30         0 indicates that such frames are not allowed to pass.
31         Default value is all bits set to 1.";
32     reference
33         "7.4.1.1.18, 9.5.3.5, 9.6.5 of IEEE Std 802.1AX";
34 }
35
36 container gateway-preference-mask {
37     uses drni-mask;
38     description
39         "A vector of Boolean values, with one value for each
40         possible Gateway Conversation ID. A 1 indicates that
41         this Gateway Port is the preferred Gateway when both
42         DRNI Gateways have the Gateway Conversation ID enabled
43         in the gateway-available-mask, and a 0 indicates that
44         it is not preferred.
45         Default value is all bits set to 1.";
46     reference
47         "7.4.1.1.19, 9.5.3.5, 9.6.5 of IEEE Std 802.1AX";
48 }
49 leaf gateway-available-mask {
50     type binary;
51     config false;
52     description
53         "A vector of Boolean values, with one value for each
54         possible Gateway Conversation ID. A 1 indicates that
55         this Gateway Port is eligible to be selected to pass
56         that Gateway Conversation ID, and a 0 indicates that
57         it is not eligible.";
58     reference
59         "7.4.1.1.22, 9.5.3.5, 9.6.5 of IEEE Std 802.1AX";
60 }
61
62 container neighbor {
63     config false;
64     description
```

```
1      "Operational values for the DRNI neighbor obtained
2      from DRCPDUs.";
3  leaf oper-irp-state {
4      type irp-state;
5      description
6          "A string of 8 bits, corresponding to the current
7          operational value of IRP_State as transmitted in
8          DRCPDUs.";
9      reference
10         "7.4.1.1.25, 9.6.2.3, Figure 9-13 of IEEE Std 802.1AX";
11  }
12  leaf system {
13      type ieee:mac-address;
14      description
15          "The MAC Address portion of the System Identifier of
16          the Neighbor DRNI System (connected via the
17          Intra-Relay Port). ";
18      reference
19          "7.4.1.1.29 of IEEE Std 802.1AX";
20  }
21  leaf system-priority {
22      type uint16;
23      description
24          "The priority portion of the System Identifier of the
25          Neighbor DRNI System (connected via the Intra-Relay
26          Port).";
27      reference
28          "7.4.1.1.30 of IEEE Std 802.1AX";
29  }
30  leaf drni-key {
31      type uint16;
32      description
33          "The DRNI key value received from the Neighbor DRNI
34          System (connected via the IntraRelay Port).";
35      reference
36          "7.4.1.1.31 of IEEE Std 802.1AX";
37  }
38  leaf aggregator-algorithm {
39      type identityref {
40          base ax:distribution-algorithm;
41      }
42      description
43          "The Port algorithm used by the Neighbor Aggregator to
44          assign frames to Port Conversation IDs.";
45      reference
46          "7.4.1.1.33 of IEEE Std 802.1AX";
47  }
48  leaf aggregator-conv-service-digest {
49      type binary;
50      config false;
51      description
52          "The MD5 Digest of the Neighbor Aggregator's
53          Admin_Conv_Service_Map. Obtained from the Home
54          Aggregator State TLV last received from the Neighbor
55          DRNI System.";
56      reference
57          "7.4.1.1.34 of IEEE Std 802.1AX";
58  }
59  leaf aggregator-conv-link-digest {
60      type binary;
61      config false;
62      description
63          "The MD5 Digest of the Neighbor Aggregator's
64          Admin_Conv_Link_Map. Obtained from the Home Aggregator
```

```
1         State TLV (9.6.2.4) last received from the Neighbor
2         DRNI System."";
3     reference
4         "7.4.1.1.35 of IEEE Std 802.1AX";
5 }
6 leaf partner-system-priority {
7     type uint16;
8     description
9         "The priority portion of the System Identifier of the
10        Neighbor Aggregator's Partner."";
11     reference
12         "7.4.1.1.36 of IEEE Std 802.1AX";
13 }
14 leaf partner-system {
15     type ieee:mac-address;
16     description
17         "The MAC Address portion of the System Identifier of
18        the Neighbor Aggregator's Partner."";
19     reference
20         "7.4.1.1.37 of IEEE Std 802.1AX";
21 }
22 leaf partner-aggregator-key {
23     type uint16;
24     description
25         "The operational key value of the Neighbor
26        Aggregator's Partner."";
27     reference
28         "7.4.1.1.38 of IEEE Std 802.1AX";
29 }
30 leaf cscd-state {
31     type bits {
32         bit reserved-1 {
33             position 0;
34             description
35                 "Bit 1 is reserved for future use. It is set to 0
36                and ignored on receipt."";
37         }
38         bit reserved-2 {
39             position 1;
40             description
41                 "Bit 2 is reserved for future use. It is set to 0
42                and ignored on receipt."";
43         }
44         bit reserved-3 {
45             position 2;
46             description
47                 "Bit 3 is reserved for future use. It is set to 0
48                and ignored on receipt."";
49         }
50         bit cscd_gateway_control {
51             position 3;
52             description
53                 "CSCD_Gateway_Control is encoded in bit 4. When
54                this flag is TRUE, the DRNI Gateway is configured
55                to minimize forwarding data frames on the IRC by
56                selecting the DRNI Gateway and Aggregator Ports
57                for forwarding any given Conversation ID to be in
58                the same DRNI System."";
59         }
60         bit discard_wrong_conversation {
61             position 4;
62             description
63                 "Discard_Wrong_Conversation is encoded in bit 5.
64                The Aggregator's Discard_Wrong_Conversation
```

```
1         value."";
2     }
3     bit differ_conv_link_digests {
4         position 5;
5         description
6             "Differ_Conv_Link_Digests is encoded in bit 6.
7             This flag is TRUE when the Aggregator's
8             Actor_Conv_Link_Digest matches the Aggregator's
9             Partner_Conv_Link_Digest."";
10    }
11    bit differ_conv_service_digests {
12        position 6;
13        description
14            "Differ_Conv_Service_Digests is encoded in bit 7.
15            This flag is TRUE when the Aggregator's
16            Actor_Conv_Service_Digest matches the Aggregator's
17            Partner_Conv_Service_Digest."";
18    }
19    bit differ_port_algorithms {
20        position 7;
21        description
22            "Differ_Port_Algorithms is encoded in bit 8. The
23            Aggregator's differPortAlgorithms flag is TRUE
24            when the Aggregator's Actor_Port_Algorithm matches
25            the Aggregator's Partner_Port_Algorithm."";
26    }
27 }
28 description
29     "8 bits, corresponding to the Aggregator_CSCD_State
30     in the Neighbor_Aggregator_State variable. The first
31     three bits (the least significant bits of CSCD_State)
32     are reserved; the fourth bit corresponds to the
33     Neighbor's value for Home_Admin_CSCD_Gateway_Control;
34     the fifth bit corresponds to the Neighbor Aggregator's
35     operational value for Discard Wrong_Conversation; and
36     the sixth, seventh, and eighth bits correspond to the
37     Neighbor Aggregator's operational value for
38     differConvLinkDigests, differConvServiceDigests, and
39     differPortAlgorithms, respectively, (the most
40     significant bits of CSCD_State).";
41 reference
42     "7.4.1.1.39 of IEEE Std 802.1AX";
43 }
44 leaf-list active-links {
45     type uint16;
46     description
47         "A list of the operational Link_Numbers of Aggregation
48         Ports that are currently active (i.e., collecting) on
49         the Neighbor's Aggregator. An empty list indicates that
50         there are no Aggregation Ports active. Each integer
51         value in the list carries an aAggPortOperLinkNumber
52         attribute value."";
53     reference
54         "7.4.1.1.40 of IEEE Std 802.1AX";
55 }
56 leaf gateway-algorithm {
57     type identityref {
58         base ax:distribution-algorithm;
59     }
60     description
61         "The gateway algorithm used by the Neighbor DRNI
62         Gateway to assign frames to Gateway Conversation IDs."";
63     reference
64         "7.4.1.1.41 of IEEE Std 802.1AX";
```

```
1      }
2  leaf gateway-conv-service-digest {
3      type binary;
4      description
5          "The MD5 Digest of the Neighbor DRNI Gateway's
6          the Home_Admin_Gateway_Conv_Service_Map. Obtained
7          from Gateway_Conv_Service_Digest in the
8          Neighbor_Gateway_State TLV last received from the
9          Neighbor DRNI System.";
10     reference
11         "7.4.1.1.42 of IEEE Std 802.1AX";
12 }
13 leaf gateway-available-mask {
14     type binary;
15     description
16         "A vector of Boolean values, with one value for each
17         possible Gateway Conversation ID. A 1 indicates that
18         the Neighbor DRNI Gateway Port is eligible to be
19         selected to pass that Gateway Conversation ID, and
20         a 0 indicates that it is not eligible.";
21     reference
22         "7.4.1.1.43 of IEEE Std 802.1AX";
23 }
24 leaf gateway-preference-mask {
25     type binary;
26     description
27         "A vector of Boolean values, with one value for each
28         possible Gateway Conversation ID. A 1 indicates that
29         the Neighbor DRNI Gateway Port is the preferred
30         Gateway when both DRNI Gateways have the Gateway
31         Conversation ID enabled in the gateway-available-mask,
32         and a 0 indicates that it is not preferred.";
33     reference
34         "7.4.1.1.44 of IEEE Std 802.1AX";
35 }
36 }
37
38 container gateway-relay {
39     config false;
40     description
41         "The set of masks, indexed by CID that determine the
42         forwarding of frames by the DRNI Gateway Relay.";
43     leaf home-aggregator-mask {
44         type binary;
45         description
46             "A vector of Boolean values, with one value for each
47             possible Port Conversation ID. A 1 indicates that the
48             Port Conversation ID is allowed to be distributed
49             through this DRNI Gateway's Aggregator, and a 0
50             indicates that it cannot";
51         reference
52             "7.4.1.1.7, 9.5.2.2 of IEEE Std 802.1AX";
53     }
54     leaf home-gateway-mask {
55         type binary;
56         description
57             "A vector of Boolean values, with one value for each
58             possible Port Conversation ID. A 1 indicates that the
59             Port Conversation ID is allowed to pass through this
60             DRNI Gateway Port, and a 0 indicates that it cannot";
61         reference
62             "7.4.1.1.8, 9.5.2.2 of IEEE Std 802.1AX";
63     }
64     leaf neighbor-aggregator-mask {
```

```
1      type binary;
2      description
3          "A vector of Boolean values, with one value for each
4              possible Port Conversation ID. A 1 indicates that the
5              Port Conversation ID is allowed to be distributed
6              through the IRP to the Neighbor Aggregator, and a 0
7              indicates that it is not";
8      reference
9          "7.4.1.1.27, 9.5.2.2 of IEEE Std 802.1AX";
10     }
11     leaf neighbor-gateway-mask {
12         type binary;
13         description
14             "A vector of Boolean values, with one value for each
15                 possible Port Conversation ID. A 1 indicates that the
16                 Port Conversation ID is allowed to be passed to the
17                 Neighbor DRNI Gateway Port via the IRP, and a 0
18                 indicates that it is not";
19         reference
20             "7.4.1.1.28, 9.5.2.2 of IEEE Std 802.1AX";
21     }
22 }
23 }
24 }
25
26 augment "/if:interfaces/if:interface/if:statistics" {
27     when
28         "../dotlax:lag/dotlax-drni:drni" {
29
30         description
31             "Applies to aggregators with DRNI present.";
32     }
33     description
34         "Augment interface statistics with DRNI statistics.";
35     container drni-stats {
36         description
37             "Contains DRNI specific statistics.";
38
39         leaf drcpdus-rx {
40             type yang:counter64;
41             config false;
42             description
43                 "The number of valid DRCPDUs received on this
44                     Intra-Relay Port.";
45             reference
46                 "7.4.1.1.45 of IEEE Std 802.1AX";
47         }
48         leaf illegal-rx {
49             type yang:counter64;
50             config false;
51             description
52                 "The number of frames received on this Intra-Relay
53                     Port that carry the DRCP EtherType value,
54                     but contain a badly formed PDU.";
55             reference
56                 "7.4.1.1.46, 9.6.1.4 of IEEE Std 802.1AX";
57         }
58         leaf drcpdus-tx {
59             type yang:counter64;
60             config false;
61             description
62                 "The number of valid DRCPDUs transmitted on this
63                     Intra-Relay Port.";
64             reference
```

```
1      "7.4.1.1.47 of IEEE Std 802.1AX";
2    }
3  }
4 }
5
6 grouping drni-mask {
7   description
8     "Specifies the contents of a bit mask indexed by CID.";
9   choice method {
10    default pattern;
11    description
12      "Provides three ways to specify the mask contents.";
13    leaf pattern {
14      type identityref {
15        base drni-mask-patterns;
16      }
17      default all-ones;
18      // Could not get this default statement to pass yanglint
19      // if grouping was specified in ieee802-dot1ax-types
20      description
21        "Use a predefined pattern to fill the mask.";
22    }
23    leaf-list cid-list {
24      type uint16 {
25        range 0..4095;
26      }
27      description
28        "A list of CIDs whose corresponding bit in the
29        mask is set to one.";
30    }
31    leaf mask {
32      type binary {
33        length 512;
34      }
35      description
36        "Specify an explicit mask for all 4096 CID values.";
37    }
38  }
39  leaf invert-list {
40    type boolean;
41    default false;
42    description
43      "When true the mask derived from one of the options
44      above is inverted: each zero replaced with a one,
45      and each one replaced with a zero.";
46  }
47 }
48 }
49
50
```

## <sup>1</sup> Annex A

<sup>2</sup> (normative)

### <sup>3</sup> Protocol implementation conformance statement (PICS) <sup>4</sup> proforma<sup>6</sup>

<sup>5</sup> Insert the following rows at the end of the table in A.2.1

#### A.2.1 Major capabilities/options

Item	Feature	Status	References	Support
<a href="#">YANG</a>	<a href="#">Does the implementation support management operations using YANG modules?</a>	<a href="#">O</a>	<a href="#">10.6</a>	<a href="#">Yes [ ] No [ ]</a>
<a href="#">YANG modules</a>	<a href="#">Is the ieee802-dot1ax-types module supported?</a>	<a href="#">YANG:M</a>	<a href="#">10.7.1</a>	<a href="#">Yes [ ] No [ ]</a>
	<a href="#">Is the ieee802-dot1ax module supported?</a>	<a href="#">YANG:M</a>	<a href="#">10.7.2</a>	<a href="#">Yes [ ] No [ ]</a>
	<a href="#">Is the ieee802-dot1ax-drni module supported?</a>	<a href="#">DRNI</a> <a href="#">AND</a> <a href="#">YANG:M</a>	<a href="#">10.7.3</a>	<a href="#">Yes [ ] No [ ]</a>

<sup>6</sup>

<sup>6</sup> Copyright release for PICS proformas: Users of this standard may freely reproduce the PICS proforma in this subclause so that it can be used for its intended purpose and may further publish the completed PICS.



## <sup>1</sup> **Annex G**

<sup>2</sup> (informative)

## <sup>3</sup> **Bibliography**

<sup>4</sup> *Insert the following two bibliography entries after [B8] in Annex G:*

<sup>5</sup>

<sup>6</sup> [B9] IETF RFC 7803, Changing the Registration Policy for the NETCONF Capability URNs Registry,  
<sup>7</sup> February 2016.

<sup>8</sup> [B10] IETF RFC 8040, RESTCONF Protocol, January 2017.

<sup>9</sup> [B11] OMG Unified Modeling Language (OMG UML), Version 2.5, March 2015.<sup>7</sup>

---

<sup>7</sup> OMG documents are available from the Object Management Group (<https://www.omg.org/>).