



FINAL DRAFT Amendment

ISO/IEC/IEEE 8802-1Q:2020/ FDAM 35

Telecommunications and exchange between information technology systems — Requirements for local and metropolitan area networks —

Part 1Q: Bridges and bridged networks AMENDMENT 35: Congestion isolation

*Télécommunications et échange entre systèmes informatiques —
Exigences pour les réseaux locaux et métropolitains —*

Partie 1Q: Ponts et réseaux pontés

AMENDEMENT 35

ISO/IEC JTC 1/SC 6

Secretariat: **KATS**

Voting begins on:
2024-05-08

Voting terminates on:
2024-09-25

**Second edition
2020-08**

AMENDMENT 35

This document is circulated as received from the committee secretariat.

FAST TRACK PROCEDURE

Reference number
ISO/IEC/IEEE 8802-1Q:2020/FDAM
35:2024(en)

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

© IEEE 2024

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC/IEEE 8802-1Q:2020/FDAmD 35](https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35)

<https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35>



COPYRIGHT PROTECTED DOCUMENT

© IEEE 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from IEEE at the address below.

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

Email: stds.ipr@ieee.org
Website: www.ieee.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and <https://patents.iec.ch>. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

ISO/IEC/IEEE 8802-1Q:2020/Amd 35 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE Std 802.1Qcz-2023) and drafted in accordance with its editorial rules. It was adopted, under the "fast-track procedure" defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

A list of all parts in the ISO/IEC/IEEE 8802 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Contents

1.	Overview.....	16
1.3	Introduction.....	16
2.	Normative references.....	17
3.	Definitions	18
4.	Abbreviations.....	19
5.	Conformance.....	20
5.4	VLAN Bridge component requirements.....	20
5.4.1	VLAN Bridge component options	20
5.4.7	VLAN Bridge requirements for congestion isolation (optional)	20
5.32	End station requirements for congestion isolation.....	21
6.	Support of the MAC Service	22
6.10	Support of the ISS/EISS by PIPs	22
6.10.1	Data indications	22
8.	Principles of Bridge operation.....	23
8.6	The Forwarding Process	23
8.6.5	Flow classification and metering	23
8.6.6	Queuing frames	26
8.6.8	Transmission selection	26
12.	Bridge management.....	27
12.1	Management functions.....	27
12.1.1	Configuration Management	27
12.2	VLAN Bridge objects	27
12.31	Managed objects for per-stream classification and metering	27
12.31.1	The Stream Parameter Table	27
12.31.2	The Stream Filter Instance Table	28
12.31.3	The Stream Gate Instance Table	29
12.33	Congestion Isolation managed objects	30
12.33.1	CI entity managed object	31
12.33.2	CI Peer Table	31
12.33.3	CI Stream Table	31
12.33.4	CIP entity managed object	32
30.	Principles of congestion notification	33
30.1	Congestion notification design requirements	33
30.3	Congestion Controlled Flow (CCF).....	33
46.	Time-Sensitive Networking (TSN) configuration.....	34
46.2	User/network configuration information	34
46.2.1	Data types	34
46.2.3	Talker	34

48.	YANG Data Models	35
48.2	IEEE 802.1Q YANG models.....	35
48.2.8	Congestion Isolation (CI) model	35
48.3	Structure of the YANG models	36
48.3.7	Asynchronous Traffic Shaping (ATS) model	36
48.3.8	Congestion Isolation (CI) model	37
48.4	Security considerations	38
48.4.8	Security considerations of the Congestion Isolation model	38
48.5	YANG schema tree definitions.....	39
48.5.11	Schema for the ieee802-dot1q-stream-filters-gates YANG module	39
48.5.12	Schema for the ieee802-dot1q-stream-filters-gates-bridge YANG module	39
48.5.13	Schema for the ieee802-dot1q-ats YANG module	40
48.5.14	Schema for the ieee802-dot1q-ats-bridge YANG module	40
48.5.15	Schema for the ieee802-dot1q-congestion-isolation YANG module	41
48.5.16	Schema for the ieee802-dot1q-congestion-isolation-bridge YANG module	42
48.6	YANG modules	43
48.6.2	The ieee802-dot1q-types YANG module	43
48.6.11	The ieee802-dot1q-stream-filters-gates YANG module	58
48.6.12	The ieee802-dot1q-stream-filters-gates-bridge YANG module	64
48.6.13	The ieee802-dot1q-ats YANG module	65
48.6.14	The ieee802-dot1q-ats-bridge YANG module	70
48.6.15	The ieee802-dot1q-congestion-isolation YANG module	72
48.6.16	The ieee802-dot1q-congestion-isolation-bridge YANG module	80
49.	Congestion Isolation	82
49.1	Congestion isolation objectives	83
49.2	Principles of congestion isolation	84
49.2.1	Congesting flow identification	85
49.2.2	IEEE Std 802.1CB stream identification	85
49.2.3	Flow priority modification	85
49.2.4	Priority-based Flow Control interaction	85
49.2.5	Congestion isolation signaling	86
49.2.6	Congesting to non-congesting status change	86
49.2.7	System topology and port orientation	87
49.2.8	Comparison to Congestion Notification	87
49.3	The Congestion Isolation Aware Forwarding Process	88
49.3.1	CIP Congestion Detection	89
49.3.2	CIP transmission gates	89
49.3.3	CIM Demultiplexer	89
49.3.4	Congesting flow identification	89
49.3.5	CIM Multiplexer	89
49.3.6	CI Peer Table	90
49.3.7	CI Stream Table	90
49.4	Congestion Isolation Protocol.....	90
49.4.1	Variables controlling operation	90
49.4.2	CIP procedures	94
49.4.3	Encoding of the CIM PDU	101
49.4.4	LLDP Congestion Isolation TLV	104
49.5	Topology Recognition	105
49.5.1	TR theory of operation	105
49.5.2	TR variables controlling operation	106
49.5.3	TR procedures	106

Annex A (normative) PICS proforma—Bridge implementations	108
A.5 Major capabilities	108
A.7 Relay and filtering of frames	108
A.14 Bridge management	109
A.47 YANG	110
A.53 Congestion Isolation	111
Annex B (normative) PICS proforma—End station implementations	112
B.5 Major capabilities	112
B.19 Congestion Isolation	112
Annex D (normative) IEEE 802.1 Organizationally Specific TLVs	113
D.1 Requirements of the IEEE 802.1 Organizationally Specific TLV sets	113
D.2 Organizationally Specific TLV definitions	113
D.2.15 Congestion Isolation TLV	113
D.2.16 Topology Recognition TLV	115
D.3 IEEE 802.1 Organizationally Specific TLV management	116
D.3.2 IEEE 802.1 managed objects—TLV variables	116
D.4 PICS proforma for IEEE 802.1 Organizationally Specific TLV extensions	117
D.4.3 Major capabilities and options	117
D.5 IEEE 802.1/LLDP extension MIB	118
D.5.2 Structure of the IEEE 802.1/LLDP extension MIB	118
D.5.4 Security considerations for IEEE 802.1 LLDP extension MIB module	119
D.5.5 IEEE 802.1 LLDP extension MIB module—version 2	121
D.6 IEEE 802.1/LLDP extension YANG	193
D.6.1 YANG framework	193
D.6.2 IEEE 802.1 Organizationally Specific TLV YANG data models	193
D.6.3 Structure of the IEEE 802.1/LLDP extension YANG models	198
D.6.4 Security considerations	199
D.6.5 Definition of the IEEE 802.1/LLDP extension YANG modules	200
D.6.6 IEEE 802.1/LLDP extension YANG modules	204
Annex W (informative) Maintaining frame order with Congestion Isolation	225
W.1 Queue markers for order preservation	227
W.2 Congestion Isolation queuing and Priority-based Flow Control	229
Annex X (informative) Bibliography	232

Figures

Figure 8-13	Flow classification and metering	23
Figure 8-15a	Per-stream classification and assignment for CI.....	24
Figure 48-17	Congestion Isolation model	35
Figure 49-1	Congestion Isolation example operation.....	82
Figure 49-2	Congestion Isolation reference diagram	88
Figure 49-3	Layer-2 CIM encapsulation	102
Figure 49-4	IPv4 layer-3 CIM encapsulation	102
Figure 49-5	IPv6 layer-3 CIM encapsulation	103
Figure 49-6	CIM PDU	103
Figure D-15	Congestion Isolation TLV format.....	113
Figure D-16	Topology Recognition TLV Format.....	115
Figure D-17	YANG hierarchy with IEEE 802.1Q Extension TLV YANG.....	193
Figure D-18	basicSet TLV model	194
Figure D-19	cnSet TLV model.....	195
Figure D-20	dcbxSet TLV model.....	196
Figure D-21	evbSet TLV model.....	197
Figure D-22	ciSet TLV model.....	197
Figure D-23	trSet TLV model	198
Figure W-1	Isolation out-of-order frame example	225
Figure W-2	De-isolation out-of-order frame example	226
Figure W-3	Using queue markers and counters to preserve order when isolating.....	227
Figure W-4	Using queue markers and counters to preserve order when de-isolating	228
Figure W-5	Example Bridge buffering supporting PFC and CI	229
Figure W-6	Example CI initiation by downstream peer	230
Figure W-7	Example CI in process	230
Figure W-8	Example PFC request for congesting queue	231
Figure W-9	Example PFC request to avoid packet loss with CI enabled	231

Tables

Table 12-34	The Stream Parameter Table.....	27
Table 12-35	Stream Filter Instance Table.....	28
Table 12-36	The Stream Gate Instance Table.....	29
Table 12-42	CI entity managed object.....	31
Table 12-43	CI Peer Table entry.....	31
Table 12-45	CIP entity managed object.....	32
Table 12-44	CI Stream Table entry.....	32
Table 48-1	Summary of the YANG modules.....	36
Table 48-7	Stream filters and stream gates model YANG modules.....	36
Table 48-9	CI model YANG modules.....	37
Table 48-8	ATS model YANG modules.....	37
Table 49-1	Congestion Isolation Message EtherType.....	102
Table D-1	IEEE 802.1 Organizationally Specific TLVs.....	113
Table D-13a	Device Type field values.....	115
Table D-13b	Port Orientation field values.....	116
Table D-14	IEEE 802.1 extension MIB object group conformance requirements.....	118
Table D-15	IEEE 802.1/LLDP extension MIB object cross reference.....	118
Table D-16	Summary of the YANG modules.....	198

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC/IEEE 8802-1Q:2020/FDAMd 35](https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35)

<https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35>

IEEE Standard for
Local and Metropolitan Area Networks—

Bridges and Bridged Networks

Amendment 35: Congestion Isolation

(This amendment is based on IEEE Std 802.1Q™-2022.)

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

The editing instructions are shown in ***bold italics***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strike~~ (to remove old material) and under (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this note will not be carried over into future editions because the changes will be incorporated into the base standard.⁶

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

ISO/IEC/IEEE 8802-1Q:2020/FDAM 35:2024(en)

IEEE Std 802.1Qcz-2023
IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks
Amendment 35: Congestion Isolation

1. Overview

1.3 Introduction

Insert new text at the end of 1.3 as follows:

This standard specifies protocols, procedures, and managed objects that support the isolation of congesting data flows within data center environments. This is achieved by enabling systems to individually identify flows creating congestion, isolate those flows to the congesting queue, and signal to neighbors. This mechanism reduces head-of-line blocking for non-congesting flows sharing the same traffic class. Congestion Isolation is used with higher layer protocols that utilize end-to-end congestion control in order to reduce packet loss and latency. To this end, it:

- ct) Defines a means for VLAN-aware Bridges that support congestion isolation to identify flows that are creating congestion.
- cu) Defines a means for adjusting transmission selection for frames of congesting flows.
- cv) Provides a means for discovering peer VLAN-aware Bridges and stations that support congestion isolation.
- cw) Defines a means for signaling congestion isolation to supporting peer Bridges and stations.
- cx) Defines a means for recognizing a system's level and port orientation within the topology relative to the edge.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC/IEEE 8802-1Q:2020/FDAmd 35](https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35)

<https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35>

ISO/IEC/IEEE 8802-1Q:2020/FDAM 35:2024(en)

IEEE Std 802.1Qcz-2023
IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks
Amendment 35: Congestion Isolation

2. Normative references

Insert the following references into Clause 2 in alphanumeric order:

IEEE Std 802.1CSTM, IEEE Standard for Local and Metropolitan Area Networks—Link-local Registration Protocol.^{7, 8}

IETF RFC 768 (STD0006), User Datagram Protocol, August 1980.⁹

IETF RFC 791 (STD0005), Internet Protocol—DARPA Internet Program Protocol Specification, September 1981.

IETF RFC 3168, The Addition of Explicit Congestion Notification (ECN) to IP, September 2001.

IETF RFC 3232, Assigned Numbers: RFC 1700 is Replaced by an On-line Database, January 2002.

IETF RFC 6335, Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry, August 2011.

IETF RFC 8200 (STD0086), Internet Protocol, Version 6 (IPv6) Specification, July 2017.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC/IEEE 8802-1Q:2020/FDAmd 35](https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35)

<https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35>

⁷ The IEEE standards or products referred to in Clause 2 are trademarks owned by The Institute of Electrical and Electronics Engineers, Incorporated.

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

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

3. Definitions

Insert the following definitions in the appropriate collating sequence, renumbering accordingly:

3.1 congesting flow: A sequence of frames the end-to-end congestion controlled higher layer protocol treats as belonging to a single flow that is experiencing congestion within a congestion isolation aware system.

3.2 congestion isolation aware system: A Bridge component conforming to the congestion isolation provisions of this standard.

3.3 Congestion Isolation Message (CIM): A message transmitted by a congestion isolation aware system, conveying congesting flow information used by the upstream peer congestion isolation aware system.

3.4 Congestion Isolation Point (CIP): A Virtual Local Area Network (VLAN) Bridge or end station Port function that monitors a set of queues for congesting flows, isolates congesting flows to a congesting queue, and can generate Congestion Isolation Messages.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC/IEEE 8802-1Q:2020/FDAmD 35](https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35)

<https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35>

4. Abbreviations

Insert the following abbreviations into Clause 4, in the appropriate collating sequence:

CI	Congestion Isolation
CIM	Congestion Isolation Message
CIP	Congestion Isolation Point

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/IEC/IEEE 8802-1Q:2020/FDAmd 35](https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35)

<https://standards.iteh.ai/catalog/standards/iso/3d19413e-fd25-4cf1-81bf-eafa89c8c863/iso-iec-ieee-8802-1q-2020-fdamd-35>

5. Conformance

5.4 VLAN Bridge component requirements

5.4.1 VLAN Bridge component options

Insert new list item ag) at the end of the lettered list in 5.4.1 as follows:

- ag) Support for Congestion Isolation (CI) operation (5.4.7).

5.4.1.6 ETS Bridge requirements

Insert new list item a) at the beginning of the lettered list in 5.4.1.6 as follows, renumbering all subsequent items:

- a) Support the ETS algorithm (8.6.8.3).

Insert 5.4.7 after 5.4.6 as follows:

5.4.7 VLAN Bridge requirements for congestion isolation (optional)

A VLAN-aware Bridge implementation that conforms to the provisions of this standard for congestion isolation in Clause 49 shall:

- a) Support, on one or more Ports, the creation of at least one Congestion Isolation Point (49.3.1).
- b) Support Explicit Congestion Notification (ECN) as defined by IETF RFC 3168 and associated updates along with Active Queue Management (AQM) as described in 49.2.1.
- c) Support per-stream classification and metering for CI as specified in 8.6.5.2.3.
- d) Support, at each Congestion Isolation Point, the variables and procedures of the Congestion Isolation Protocol (49.4).
- e) Support the ability to configure the variables controlling the operation of Congestion Isolation (12.33.1), the CI Peer Table (12.33.2), the CI Stream Table (12.33.3), and each CIP (12.33.4).
- f) Conform to the required capabilities of IEEE Std 802.1AB.
- g) Support the use of the Congestion Isolation TLV in LLDP (D.2.15).

A VLAN Bridge implementation that conforms to the provisions of this standard for congestion isolation may:

- h) Support the monitoring of more than one queue on a Bridge Port (49.4.1.2.5).
- i) Support transmission selection algorithms other than strict priority.
- j) Support the de-isolation of congesting flows by means other than the empty status of a congesting queue (49.2.6).
- k) Support the Congestion Isolation YANG model (48.3.8).
- l) Support Topology Recognition (49.5).