



**IEEE Standard for**

**Local and metropolitan area networks—**

**Virtual Bridged Local Area Networks**

**Amendment 13: Congestion  
Notification**

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**IEEE Computer Society**

Sponsored by the  
LAN/MAN Standards Committee

IEEE  
3 Park Avenue  
New York, NY 10016-5997, USA

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**IEEE Std 802.1Qau™-2010**  
(Amendment to  
IEEE Std 802.1Q™-2005)

802.1Qau™



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**IEEE Standard for  
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**Virtual Bridged Local Area Networks**

**Amendment 13: Congestion  
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**LAN/MAN Standards Committee  
of the  
IEEE Computer Society**

Approved 25 March 2010

**IEEE-SA Standards Board**

**Abstract:** This amendment specifies protocols, procedures and managed objects that support congestion management of long-lived data flows within network domains of limited bandwidth-delay product. This is achieved by enabling bridges to signal congestion to end stations capable of transmission rate limiting to avoid frame loss.

**Keywords:** congestion, congestion notification, LANs, local area networks, MAC Bridges, transparent bridging, VLANs

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# Introduction

This introduction is not part of IEEE Std 802.1Qau-2010, IEEE Standard for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks—Amendment 13: Congestion Notification.

This standard amends IEEE Std 802.1Q™-2005, providing congestion notification capabilities useful to Virtual Bridged Local Area Networks to support congestion management of long-lived data flows within network domains of limited bandwidth-delay product. Congestion notification mechanisms defined in this standard include the following:

- a) The ability of bridges and end stations to create Congestion Notification Domains for certain priority levels by signaling using the Link Layer Discovery Protocol defined in IEEE Std 802.1AB™-2009.<sup>a</sup>
- b) The ability for bridges to use priority remapping to automatically defend a Congestion Notification Domain against sources that are not aware of congestion notification.
- c) Mechanisms by which bridges detect the congestion state of specified output queues, and send Congestion Notification Messages to the sources of a sampling of the frames in the queue.
- d) Mechanisms by which an end station responds to Congestion Notification Messages by stopping, increasing, decreasing, or disabling control of the rate of output for frames.
- e) A set of managed objects to provide controls for these capabilities in both bridges and end stations.

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

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**Paul Congdon, Vice Chair**

**Norman Finn, Editor**

**Patricia Thaler, Chair, Data Center Bridging Task Group**

Zehavit Alon  
Ting Ao  
Siamack Ayandeh  
Jan Bialkowski  
Jean-Michel Bonnamy  
Paul Bottorff  
Rudolf Brandner  
Craig Carlson  
Weiyang Cheng  
Rao Cherukuri  
Don Connor  
Diego Crupnicoff  
Claudio Desanti  
Zheming Ding  
Linda Dunbar  
Donald Eastlake, III  
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Robert Frazier  
John Fuller  
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Anoop Ghanwani  
Franz Goetz  
Eric Gray  
Craig Gunther  
Mitch Gusat  
Stephen Haddock  
Asif Hazarika  
Charles Hudson

Romain Insler  
Pankaj Jha  
Abhay Karandikar  
Hal Keen  
Yongbum Kim  
Philippe Klein  
Michael Krause  
Vinod Kumar  
Bruce Kwan  
Kari Laihonen  
Ashvin Lakshmikantha  
John Lemon  
Marina Lipshteyn  
Yuanqiu Luo  
Ben Mack-Crane  
Menucher Menuchery  
John Messenger  
Gabriel Montenegro  
John Morris  
Eric Multanen  
Paul Nikolich  
Kevin Nolish  
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Glenn Parsons  
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John Sauer  
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Rakesh Sharma  
Taeshi Shimizu  
Nurit Sprecher  
Kevin Stanton  
Robert Sultan  
Muneyoshi Suzuki  
Michael Johas Teener  
Paul Unbehagen  
Manoj Wadekar  
Yuehua Wei  
Brian Weis  
Martin White  
Bert Wijnen  
Robert Winter  
Chien-Hsien Wu  
Ken Young  
Glen Zorn

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Thomas Alexander	Atsushi Ito	Randall Safier
Richard Alfvén	Tony Jeffree	John Santhoff
Butch Anton	Shinkyō Kaku	John Sauer
Khin Mi Mi Aung	Stuart J. Kerry	Bartien Sayogo
Tomo Bogataj	Yongbum Kim	Michael Seaman
Edward Carley	Bruce Kraemer	Gil Shultz
Juan Carreon	Li Li	Amjad Soomro
Keith Chow	William Lumpkins	Matthew Squire
Charles Cook	Elvis Maculuba	Manikantan Srinivasan
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Russell Dietz	Arthur Marris	Thomas Starai
Thomas Dineen	Peter Martini	Walter Struppler
Donald Eastlake, III	Gary Michel	Joseph Tardo
C. Fitzgerald	Jose Morales	William Taylor
Yukihiro Fujimoto	Joseph Moran	Michael Johas Teener
Ilango Ganga	Eric Multanen	Patricia Thaler
Reinhard Gloger	Michael S. Newman	Mark-Rene Uchida
Ron Greenthaler	Nick S. A. Nikjoo	Dmitri Varsanofiev
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Michelle Turner  
*IEEE Standards Program Manager, Document Development*

Kathryn Cush  
*IEEE Standards Program Manager, Technical Program Development*



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# IEEE Standard for Local and metropolitan area networks—

## Virtual Bridged Local Area Networks

### Amendment 13: Congestion Notification

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This amendment specifies changes to the forwarding and queueing functions described in IEEE Std 802.1Q™. Changes are applied to the base text of IEEE Std 802.1Q-2005, as modified by those amendments that had been approved, but not incorporated into the base text of the standard, at the time that this amendment was approved, namely (in chronological order) IEEE Std 802.1ad™, IEEE Std 802.1ak™, IEEE Std 802.1ag™, IEEE Std 802.1ah™, IEEE Std 802.1Q-2005/Cor 1, IEEE Std 802.1ap™, IEEE Std 802.1Qaw™, IEEE Std 802.1Qay™, IEEE Std 802.1aj™, and IEEE Std 802.1Qav™. Text shown in bold italics in this amendment defines the editing instructions necessary to changes to this base text. Three editing instructions are used: **change**, **delete**, and **insert**. **Change** is used to make a change to existing material. The editing instruction specifies the location of the change and describes what is being changed. Changes to existing text may be clarified using ~~strikeout~~ markings to indicate removal of old material, and underline markings to indicate addition of new material. **Delete** removes existing material. **Insert** adds new material without changing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. Editorial notes will not be carried over into future editions of IEEE Std 802.1Q.

## 1. Overview

*Insert the following after the initial paragraphs of Clause 1:*

This standard specifies protocols, procedures, and managed objects that support congestion management of long-lived data flows within network domains with a bandwidth-delay product on the order of 5 Mbits or less. Such flows are typically encountered in data centers, backplane fabrics, computing clusters, and storage networks. This is achieved by enabling bridges to signal congestion to end stations capable of transmission rate limiting to avoid frame loss. This mechanism enables support for higher layer protocols that are highly loss or latency sensitive. VLAN tag encoded priority values are allocated to segregate frames subject to congestion control, allowing simultaneous support of both congestion controlled and other higher layer protocols. This standard does not specify communication or reception of congestion notification information to or from end stations outside the congestion controlled domain or encapsulation of frames from those end stations across the domain.

### 1.1 Scope

*Insert the following at end of 1.1, relettering the bullet points so that they follow in order from those in the existing text.*

This standard specifies protocols, procedures, and managed objects to support congestion notification. These allow a Virtual Bridged Local Area Network or a portion thereof, with a limited bandwidth-delay product, to transfer long-lived data flows with a significantly reduced chance of frame loss compared to a network without congestion notification. To this end, it

- aa) Defines a means for VLAN-aware Bridges that support congestion notification to form Congestion Managed Domains within a Virtual Bridged LAN.
- ab) Defines a means for detecting congested queues in end stations and VLAN-aware Bridges, for signaling such congestion to the end stations sourcing the frames causing the congestion, and for those end stations to control the rate of transmission of those frames.