
**Information technology —
Telecommunications and information
exchange between systems — Local
and metropolitan area networks —
Specific requirements —**

**Part 1Q:
Bridges and bridged networks**

**AMENDMENT 2: Application virtual
local area network (VLAN) type, length,
value (TLV)**

*Technologies de l'information — Télécommunications et échange
d'information entre systèmes — Réseaux locaux et métropolitains —
Exigences spécifiques —
Partie 1Q: Ponts et réseaux pontés*

*AMENDEMENT 2: Type, longueur, valeur (TLV) pour applications de
réseaux locaux virtuels (VLAN)*





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IEEE Std 802.1Qcd™-2015

(Amendment to
IEEE Std 802.1Q™-2014)

**IEEE Standard for
Local and metropolitan area networks—**

Bridges and Bridged Networks

**Amendment 23: Application Virtual Local Area
Network (VLAN) Type, Length, Value (TLV)**

Sponsor

**LAN/MAN Standards Committee
of the
IEEE Computer Society**

Approved 16 February 2015

IEEE SA-Standards Board

Abstract: Enhancements to the set of TLVs used by the Data Center Bridging eXchange protocol (DCBX) for the purpose of simplifying the management of networks utilizing Data Center Bridging (DCB) features are defined in this amendment to IEEE Std 802.1Q-2014.

Keywords: Bridged Networks, Data Center Bridging (DCB), Data Center Bridging eXchange protocol (DCBX), IEEE 802[®], IEEE 802.1Q[™], IEEE 802.1Qcd[™], local area networks (LANs), MAC Bridges, metropolitan area networks, Virtual Bridged Networks (virtual LANs), VLAN Bridges

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Introduction

This introduction is not part of IEEE Std 802.1Qcd™-2015, IEEE Standard for Local and metropolitan area networks—Bridges and Bridged Networks—Amendment 23: Application Virtual Local Area Network (VLAN) Type, Length, Value (TLV).

This amendment specifies the protocols, procedures, and management objects for an Application Virtual Local Area Network (VLAN) identifier (ID) Type, Length, Value (TLV) within the Data Center Bridging eXchange protocol (DCBX) defined in IEEE Std 802.1Q. This standard also specifies minor extensions and editorial corrections to the Application Priority TLV.

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 may be obtained from

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IEEE Standard for Local and metropolitan area networks—

Bridges and Bridged Networks

Amendment 23: Application Virtual Local Area Network (VLAN) Type, Length, Value (TLV)

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(This amendment is based on IEEE Std 802.1Q™-2014.)

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.¹

The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~striketrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. 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.

¹Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

2. Normative references

Insert the following reference after IETF RFC 2205 and before IETF RFC 2578 in the list in Clause 2.

IETF RFC 2474, Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers, Nichols, K., Blake, S., Baker, F. and Black, D.

5. Conformance

5.4.1.7 DCBX Bridge requirements

Insert item g) into the lettered list in 5.4.1.7 as follows:

A device supporting DCBX shall

- a) Support Link Layer Discovery Protocol (LLDP) transmit and receive mode (IEEE Std 802.1AB).
- b) Support the DCBX ETS Configuration Type, Length, Value (TLV) (D.2.9).
- c) Support the ETS Recommendation TLV (D.2.10).
- d) Support the Priority-based Flow Control Configuration TLV (D.2.11).
- e) Support the Application Priority TLV (D.2.12).
- f) Support the asymmetric and symmetric DCBX state machines (38.4).
- g) Support the Application VLAN TLV (D.2.15).

38. Data Center Bridging eXchange protocol (DCBX)

Change items e) and f) and insert a new item g), as follows:

38.1 Overview

This clause details DCBX, which is used by DCB devices to exchange configuration information with directly connected peers. The protocol may also be used for misconfiguration detection and for configuration of the peer.

This standard describes the base protocol, which comprises state machines and TLVs for capability exchange. For each feature that is supported by DCBX, the attributes that are to be exchanged specify

- a) The attributes to be exchanged;
- b) How the attributes are used for detecting misconfiguration; and
- c) What action needs to be taken when a misconfiguration is detected.

The information listed above is specified for the following:

- d) ETS;
- e) PFC; ~~and~~
- f) Application Priority Configuration TLV; ~~and~~
- g) Application VLAN TLV.

Annex A

(normative)

PICS proforma—Bridge implementations²

A.35 Data Center Bridging eXchange protocol (DCBX)

Insert the following entry for the Application VLAN TLV at the end of the table in A.35.

Item	Feature	Status	References	Support
DCBX-8	Support the Application VLAN TLV	DCBX:M	D.2.15	Yes []

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Annex B

(normative)

PICS proforma—End station implementations³

B.14 Data Center Bridging eXchange protocol (DCBX)

Insert the following entry for the Application VLAN TLV at the end of the table in B.14.

Item	Feature	Status	References	Support
DCBX-8	Support the Application VLAN TLV	DCBX:M	D.2.15	Yes []

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Annex D

(normative)

IEEE 802.1 Organizationally Specific TLVs

D.1 Requirements of the IEEE 802.1 Organizationally Specific TLV sets

The IEEE 802.1 Organizationally Specific TLVs may be supported in conjunction with any of the destination MAC addresses identified in 7.1 of IEEE Std 802.1AB-2009.

If any IEEE 802.1 Organizationally Specific TLV set is supported, all IEEE 802.1 Organizationally Specific TLVs that are identified as members of that TLV set shall be supported. All IEEE 802.1 Organizationally Specific TLVs shall conform to the LLDPDU bit and octet ordering conventions of 8.1 of IEEE Std 802.1AB-2009.

The currently defined IEEE 802.1 Organizationally Specific TLVs specified in this standard are listed in Table D-1. Other standards can also define IEEE 802.1 Organizationally Specific TLVs. The “TLV set name” column identifies the TLV set to which each TLV belongs. Any additions or changes to these TLVs will be included in this annex.

Insert the following entry for the Application VLAN TLV at the end of Table D-1.

Table D-1— IEEE 802.1 Organizationally Specific TLVs specified in this standard

IEEE 802.1 subtype	TLV name	TLV set name	TLV reference	Feature clause reference
10	Application VLAN TLV	dcbxSet	D.2.15	Clause 38

D.2 Organizationally Specific TLV definitions

Change D.2.12 as follows:

D.2.12 Application Priority TLV

The TLV illustrated in Figure D-12 is encoded into each IEEE Std 802.1AB-2009 LLDP message and may be transmitted by a system in order to indicate the application priority table. This TLV is informational and used to indicate to a peer station the local configuration.

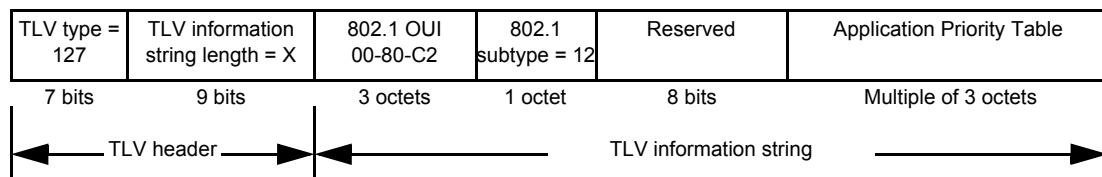


Figure D-12—Application Priority TLV format

D.2.12.1 TLV type

A 7-bit integer value occupying the most-significant bits of the first octet of the TLV. Always contains the value 127.

D.2.12.2 TLV information string length

A 9-bit unsigned integer, occupying the LSB of the first octet of the TLV (the MSB of the TLV information string length) and the entire second octet of the TLV, containing the total number of octets in the TLV information string of the Application Priority TLV. This does not count the TLV type and TLV information string length fields. The length for the Application Priority TLV is variable depending on the number of Application Priorities specified. The length shall be 5 plus a multiple of 3 octets.

D.2.12.3 Application Priority Table

Table D-8 shows the layout of a 3 octet entry in the Application Priority Table.

Table D-8—Application Priority Table Entry format

Octets:	1						2		3	
	Priority		Reserved		Sel		Protocol ID			
Bits:	<u>8</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>1</u>	<u>8</u>	<u>1</u>	<u>8</u>	<u>1</u>

The priority field is a 3-bit unsigned integer indicating the priority for which the Protocol ID is being used.

The meaning of the Protocol ID field is determined by the Sel field. Allowed values for the Sel field are shown in Table D-9.

Table D-9—Sel field values

Sel Value	Protocol ID value
0	Reserved
1	0: Default <u>application</u> priority. For use when <u>application</u> priority is not otherwise specified. 1–1535: Reserved 1536–65535: An EtherType.
2	Well Known Port number over TCP, or Steam Control Transmission Protocol (SCTP).
3	Well Known Port number over UDP, or Datagram Congestion Control Protocol (DCCP).
4	Well Known Port number over TCP, SCTP, UDP, or DCCP.
5	<u>Differentiated Services Code Point (DSCP) value. The 6-bit DSCP value is stored in bits 1–6 of the low order octet of the Protocol ID field (octet 3 of the Application Priority Table Entry). Bits 7 and 8 and the high order octet of the Protocol ID field are set to zero. (See IETF RFC 2474 for the definition of the DSCP value.)</u>
6–7	Reserved

NOTE—The port numbers shown are for identification (i.e., as assigned by IANA) instead of the actual port numbers being used in a particular deployment.

Insert a new subclause D.2.15 after D.2.14. Renumber subsequent tables and figures appropriately.

D.2.15 Application VLAN TLV

The TLV illustrated in Figure D-15 is encoded into each IEEE Std 802.1AB-2009 LLDP message and may be transmitted by a system in order to indicate the application VLAN table. This TLV is informational and used to indicate to a peer station the local configuration.

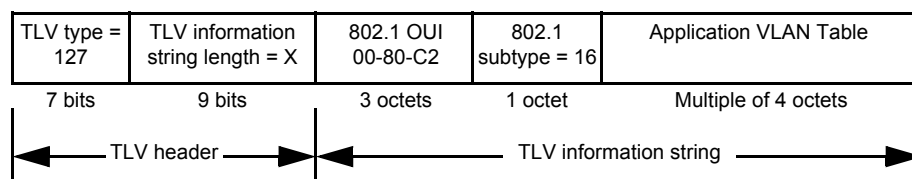


Figure D-15—Application VLAN TLV format

D.2.15.1 TLV type

A 7-bit integer value occupying the most significant bits of the first octet of the TLV. Always contains the value 127.

D.2.15.2 TLV information string length

A 9-bit unsigned integer, occupying the LSB of the first octet of the TLV (the MSB of the TLV information string length) and the entire second octet of the TLV, containing the total number of octets in the TLV information string of the Application VLAN TLV. This does not count the TLV type and TLV information string length fields. The length for the Application VLAN TLV is variable depending on the number of Application VLANs specified. The length shall be 4 plus a multiple of 4 octets.

D.2.15.3 Application VLAN Table

Table D-12 shows the layout of a 4 octet entry in the Application VLAN Table.

Table D-12—Application VLAN Table Entry format

Octets:	1		2				3		4		
Field:	VID				Reserved	Sel	Protocol ID				
Bits:	8	1	8	5	4	3	1	8	1	8	1

The VID field is a 12-bit unsigned integer indicating the VID of the VLAN for which the Protocol ID is being used.

The meaning of the Protocol ID field is determined by the Sel field. Allowed values for the Sel field are shown in Table D-13.

The Application VLAN TLV may be exchanged between EVB station ERs (5.24.1) and EVB Bridges (5.23) with LLDP using the Nearest Customer Bridge address. This allows ERs sharing a LAN using S-channels (40.2) to use different VLANs for the same application.

NOTE 1—The Application VLAN TLV allows multiple VLANs to be associated with an application on a port. Issues involved with using multiple VLANs for an application on a port, such as resolving which IP subnetwork corresponds to which VLAN, are beyond the scope of this standard.

NOTE 2—Selection of different IEEE 802.1 paths may use different VLANs, which could be associated with different quality of service levels. This TLV may not apply to deployment cases where the VID is implied by other attributes of the frame, for example, by the IP subnet of the source IP address.

Table D-13—Sel field values

Sel Value	Protocol ID value
0	Reserved
1	0: PVID. For use when an application VLAN is not otherwise specified. 1–1535: Reserved 1536–65535: An EtherType.
2	Well Known Port number over TCP, or SCTP.
3	Well Known Port number over UDP, or DCCP.
4	Well Known Port number over TCP, SCTP, UDP, or DCCP.
5	Differentiated Services Code Point (DSCP) value. The 6-bit DSCP value is stored in bits 1–6 of the low order octet of the Protocol ID field (octet 4 of the Application VLAN Table Entry). Bits 7 and 8 and the high order octet of the Protocol ID field are set to zero. (See IETF RFC 2474 for the definition of the DSCP value.)
6–7	Reserved

D.4 PICS proforma for IEEE 802.1 Organizationally Specific TLV extensions**D.4.3 Major capabilities and options**

Change the dcbxtlv entry in the table in D.4.3 as follows:

Item	Feature	Status	References	Support
dcbxtlv	Is each TLV in the IEEE 802.1 DCBX TLV set implemented?			
	ETS Configuration TLV	dcbxSet:M	D.2.9	Yes []
	ETS Recommendation TLV	dcbxSet:M	D.2.10	Yes []
	Priority-based Flow Control Configuration TLV	dcbxSet:M	D.2.11	Yes []
	Application Priority TLV	dcbxSet:M	D.2.12	Yes []
	<u>Application VLAN TLV</u>	<u>dcbxSet:M</u>	<u>D.2.15</u>	<u>Yes []</u>

D.5 IEEE 802.1/LLDP extension MIB**D.5.2 Structure of the IEEE 802.1/LLDP extension MIB**

Insert the following entry at the end of Table D-14 (renumbered from Table D-12) for the MIB group lldpXdot1dcbxApplicationVlanGroup.

Table D-14—IEEE 802.1 extension MIB object group conformance requirements

MIB group	Rx mode	Tx mode	Tx/Rx mode
<u>lldpXdot1dcbxApplicationVlanGroup</u>	<u>DCBX:M</u>	<u>DCBX:M</u>	<u>DCBX:M</u>

Change Table D-15 (renumbered from Table D-13) by adding the following entries for the Application VLAN TLV MIB objects at the end of each dcbx extension group section as shown. (Only the dcbx extension group sections of the table are shown here.)

Table D-15—IEEE 802.1/LLDP extension MIB object cross reference

MIB table	MIB object	LLDP reference
<i>lldpXdot1dcbxConfig extension group^a</i>		
	lldpXdot1dcbxConfigETSConfigurationEntry	
	lldpXdot1dcbxConfigETSConfigurationTxEnable	D.2.9
	lldpXdot1dcbxConfigETSRecommendationTable	
	lldpXdot1dcbxConfigETSRecommendationTxEnable	D.2.10
	lldpXdot1dcbxConfigPFCTable	
	lldpXdot1dcbxConfigPFCTxEnable	D.2.11
	lldpXdot1dcbxConfigApplicationPriorityTable	

Table D-15—IEEE 802.1/LLDP extension MIB object cross reference (continued)

MIB table	MIB object	LLDP reference
	lldpXdot1dcbxConfigApplicationPriorityTxEnable	
lldpXdot1dcbxConfigApplicationVlanTable		
	lldpXdot1dcbxConfigApplicationVlanTxEnable	D.2.15
<i>lldpXdot1dcbxLocalData extension group^a</i>		
lldpXdot1dcbxLocETSTBasicConfigurationTable		
	lldpXdot1dcbxLocETSTConCreditBasedShaperSupport	D.2.9.4
	lldpXdot1dcbxLocETSTConMaxTC	D.2.9.5
	lldpXdot1dcbxLocETSTConWilling	D.2.9.3
	lldpXdot1dcbxLocETSTConTrafficClassBandwidthTable	D.2.9.7
	lldpXdot1dcbxLocETSTConTrafficSelectionAlgorithmTable	D.2.9.8
lldpXdot1dcbxLocETSTConPriorityAssignmentTable		
	lldpXdot1dcbxLocETSTConPriority	D.2.9.6
	lldpXdot1dcbxLocETSTConTrafficClass	D.2.9.6
lldpXdot1dcbxLocETSTRecommendationTable		
	lldpXdot1dcbxLocETSTRecoTrafficClassBandwidthTable	D.2.10.4
lldpXdot1dcbxLocETSTRecoTrafficSelectionAlgorithmTable		
	lldpXdot1dcbxLocETSTRecoTSAPriority	D.2.10.5
	lldpXdot1dcbxLocETSTRecoTrafficSelectionAlgorithm	D.2.10.5
lldpXdot1dcbxLocPFCBasicTable		
	lldpXdot1dcbxLocPFCWilling	D.2.11.3
	lldpXdot1dcbxLocPFCMBC	D.2.11.4
	lldpXdot1dcbxLocPFCCap	D.2.11.5
lldpXdot1dcbxLocPFCEnableTable		
	lldpXdot1dcbxLocPFCEnablePriority	D.2.11.6
	lldpXdot1dcbxLocPFCEnableEnabled	D.2.11.6
lldpXdot1dcbxLocApplicationPriorityAppTable		
	lldpXdot1dcbxLocApplicationPriorityAESelector	D.2.12.3
	lldpXdot1dcbxLocApplicationPriorityAEProtocol	D.2.12.3
	lldpXdot1dcbxLocApplicationPriorityAEPriority	D.2.12.3
<u>lldpXdot1dcbxLocApplicationVlanAppTable</u>		
	<u>lldpXdot1dcbxLocApplicationVlanAESelector</u>	<u>D.2.15.3</u>
	<u>lldpXdot1dcbxLocApplicationVlanAEProtocol</u>	<u>D.2.15.3</u>

Table D-15—IEEE 802.1/LLDP extension MIB object cross reference (continued)

MIB table	MIB object	LLDP reference
	<u>lldpXdot1dcbxLocApplicationVlanAEVlanId</u>	<u>D.2.15.3</u>
<i>lldpXdot1dcbxRemoteData extension group^a</i>		
	lldpXdot1dcbxRemETSTBasicConfigurationTable	
	lldpXdot1dcbxRemETSTConCreditBasedShaperSupport	D.2.9.4
	lldpXdot1dcbxRemETSTConMaxTC	D.2.9.5
	lldpXdot1dcbxRemETSTConWilling	D.2.9.3
	lldpXdot1dcbxRemETSTConTrafficClassBandwidthTable	D.2.9.7
	lldpXdot1dcbxRemETSTConTrafficSelectionAlgorithm-Table	D.2.9.8
	lldpXdot1dcbxRemETSTConPriorityAssignmentTable	
	lldpXdot1dcbxRemETSTConPriority	D.2.9.6
	lldpXdot1dcbxRemETSTConTrafficClass	D.2.9.6
	lldpXdot1dcbxRemETSTRecommendationTable	
	lldpXdot1dcbxRemETSTRecoTrafficClassBandwidthTable	D.2.10.4
	lldpXdot1dcbxRemETSTRecoTrafficSelectionAlgorithmTable	
	lldpXdot1dcbxRemETSTRecoTSAPriority	D.2.10.5
	lldpXdot1dcbxRemETSTRecoTrafficSelectionAlgorithm	D.2.10.5
	lldpXdot1dcbxRemPFBasicTable	
	lldpXdot1dcbxRemPFCWilling	D.2.11.3
	lldpXdot1dcbxRemPFCMBC	D.2.11.4
	lldpXdot1dcbxRemPFCCap	D.2.11.5
	lldpXdot1dcbxRemPFCEnableTable	
	lldpXdot1dcbxRemPFCEnablePriority	D.2.11.6
	lldpXdot1dcbxRemPFCEnableEnabled	D.2.11.6
	lldpXdot1dcbxRemApplicationPriorityAppTable	
	lldpXdot1dcbxRemApplicationPriorityAESelector	D.2.12.3
	lldpXdot1dcbxRemApplicationPriorityAEProtocol	D.2.12.3
	lldpXdot1dcbxRemApplicationPriorityAEPriority	D.2.12.3
	<u>lldpXdot1dcbxRemApplicationVlanAppTable</u>	
	<u>lldpXdot1dcbxRemApplicationVlanAESelector</u>	<u>D.2.15.3</u>
	<u>lldpXdot1dcbxRemApplicationVlanAEProtocol</u>	<u>D.2.15.3</u>
	<u>lldpXdot1dcbxRemApplicationVlanAEVlanId</u>	<u>D.2.15.3</u>
<i>lldpXdot1dcbxAdminData extension group^a</i>		

Table D-15—IEEE 802.1/LLDP extension MIB object cross reference (continued)

MIB table	MIB object	LLDP reference
lldpXdot1dcbxAdminETSTBasicConfigurationTable		
	lldpXdot1dcbxAdminETSTConCreditBasedShaperSupport	D.2.9.4
	lldpXdot1dcbxAdminETSTConMaxTC	D.2.9.5
	lldpXdot1dcbxAdminETSTConWilling	D.2.9.3
	lldpXdot1dcbxAdminETSTConTrafficClassBandwidthTable	D.2.9.7
	lldpXdot1dcbxAdminETSTConTrafficSelectionAlgorithm-Table	D.2.9.8
lldpXdot1dcbxAdminETSTConPriorityAssignmentTable		
	lldpXdot1dcbxAdminETSTConPriority	D.2.9.6
	lldpXdot1dcbxAdminETSTConTrafficClass	D.2.9.6
lldpXdot1dcbxAdminETSTRecommendationTable		
	lldpXdot1dcbxAdminETSTRecoTrafficClassBandwidth-Table	D.2.10.4
lldpXdot1dcbxAdminETSTRecoTrafficSelectionAlgorithmTable		
	lldpXdot1dcbxAdminETSTRecoTSAPriority	D.2.10.5
	lldpXdot1dcbxAdminETSTRecoTrafficSelectionAlgorithm	D.2.10.5
lldpXdot1dcbxAdminPFCBasicTable		
	lldpXdot1dcbxAdminPFCWilling	D.2.11.3
	lldpXdot1dcbxAdminPFCMBC	D.2.11.4
	lldpXdot1dcbxAdminPFCCap	D.2.11.5
lldpXdot1dcbxAdminPFCEnableTable		
	lldpXdot1dcbxAdminPFCEnablePriority	D.2.11.6
	lldpXdot1dcbxAdminPFCEnableEnabled	D.2.11.6
lldpXdot1dcbxAdminApplicationPriorityAppTable		
	lldpXdot1dcbxAdminApplicationPriorityAESelector	D.2.12.3
	lldpXdot1dcbxAdminApplicationPriorityAEProtocol	D.2.12.3
	lldpXdot1dcbxAdminApplicationPriorityAEPriority	D.2.12.3
<u>lldpXdot1dcbxAdminApplicationVlanAppTable</u>		
	<u>lldpXdot1dcbxAdminApplicationVlanAESelector</u>	<u>D.2.15.3</u>
	<u>lldpXdot1dcbxAdminApplicationVlanAEProtocol</u>	<u>D.2.15.3</u>
	<u>lldpXdot1dcbxAdminApplicationVlanAEVlanId</u>	<u>D.2.15.3</u>

^aThe term Extension Group is used here to be consistent with LLDP (see IEEE Std 802.1AB).