



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

**Virtual Bridged Local Area Networks
Amendment 9: Management of Data
Driven and Data Dependent
Connectivity Faults**

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE
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(Amendment to
IEEE Std 802.1Q™-2005)

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

Virtual Bridged Local Area Networks

**Amendment 9: Management of Data
Driven and Data Dependent
Connectivity Faults**

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of the
IEEE Computer Society**

Approved 17 June 2009

IEEE-SA Standards Board

Abstract: This amendment extends the connectivity fault management capabilities introduced in IEEE Std 802.1ag-2007 to include tools to facilitate diagnosis and isolation of faults sensitive to, or caused by, particular data patterns in frames transmitted by a service user.

Keywords: fault management, LANs, local area networks, MAC Bridges, MANs, metropolitan area networks, OAM, transparent bridging, VLANs

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Introduction

This introduction is not part of IEEE Std 802.1Qaw-2009, IEEE Standards for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks—Amendment 9: Management of Data Driven and Data Dependent Connectivity Faults.

IEEE Std 802.1Qaw provides additional capability to Connectivity Fault Management (Clause 18 through Clause 22) to achieve data driven and data dependent connectivity fault management.

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Editorial Note

This amendment specifies changes to be applied to the base text of IEEE Std 802.1Q-2005 as amended by IEEE Std 802.1ad™-2005, IEEE Std 802.1ag™-2007, IEEE802.1ak™-2007, IEEE Std 802.1ah™-2008, and IEEE Std 802.1ap™-2008. 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 underscore 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:

The data driven and data dependent connectivity fault management capabilities include tools to facilitate diagnosis and isolation of faults sensitive to, or caused by, particular data patterns in transmitted frames.

1.1 Scope

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

This standard specifies connectivity fault management protocols, procedures, and managed objects that provide confirmation of successful transmission of frames conveying specified data. This capability supports diagnosis of faults sensitive to, or caused by, particular data patterns, and their isolation to part of the transmission path. Connectivity verification can be carried out from any single point with bridged connectivity to maintenance points on the path, can isolate failures to communicate in a specific direction, and can be carried out while service is being provided to other users of the data path. To this end it

- a) Defines the extensions to connectivity fault management capabilities defined by Clause 18 through Clause 22 to facilitate diagnosis and isolation of faults sensitive to, or caused by, particular data patterns in frames transmitted by a service user;
- b) Describes the protocols and procedures for data driven and data dependent connectivity fault management (DDCFM).

3. Definitions

Insert the following definitions, renumbering to place them in the appropriate collating order.

3.1 data driven and data dependent connectivity fault management (DDCFM): DDCFm comprises capabilities to facilitate detecting and isolating data driven and data dependent faults in Virtual Bridged Local Area Networks.

3.2 data driven and data dependent fault (DDF): A fault that is sensitive to, or caused by, particular data patterns in frames transmitted by a service user.

3.3 Decapsulator Responder (DR): An entity for decapsulating Send Frame Messages and sending the decapsulated frames towards destinations specified by their own destination_address field.

3.4 forward path test (FPT): A test to determine if a data frame that matches the specified filter condition can reach a specific location within a network.

3.5 Reflected Frame Message (RFM): A CFM PDU transmitted by a Reflection Responder in order to perform forward path test.

3.6 Reflection Responder (RR): An entity that encapsulates and reflects selected data frames to a target location and allows a copy of each reflected frame to continue to its destination without encapsulation.

3.7 return path test (RPT): A test to determine if a data frame can be sent without error from a specific location within a network to a station specified by the destination_address field of the data frame.

3.8 Reflected Frame Message (RFM) Receiver: A function on a bridge port, an end station, or a test equipment to receive Reflected Frame Message(s) and pass them to the corresponding, non-standardized, RFM analyzer.

3.9 Send Frame Message (SFM): A CFM PDU destined to a Decapsulator Responder in order to perform return path test.

3.10 Send Frame Message (SFM) Originator: A function on a bridge interface, an end station, or a test equipment to send SFM encapsulated data frames.

4. Abbreviations

Insert the following definitions, placing them in the appropriate collating order (alphabetically):

DDCFM	data driven and data dependent connectivity fault management
DDF	data driven and data dependent fault
DR	Decapsulator Responder
FPT	forward path test
LAG	Link Aggregation Group
RFM	Reflected Frame Message
RPT	return path test
RR	Reflection Responder
SFM	Send Frame Message

5. Conformance

5.4.1.4 Connectivity Fault Management (optional)

In subclause 5.4.1.4, insert the following additional items after current item o) and reletter remaining lettered items:

- p) Support the creation and operation of Reflection Responder and RFM Receiver for the forward path test.
- q) Support the creation and operation of Decapsulator Responder and SFM Originator for the return path test.

12. Bridge management

12.1.1 Configuration management

Insert the following bullet item, relettered if necessary:

- h) The ability to create and delete the functional elements of DDCFM and to control their operations.

12.1.2 Fault management

Insert the following points immediately following point 4) of IEEE Std 802.1ag-2007:

- 5) Determine whether a flow of specified data frames (e.g., frames associated with a service instance or selected data frames with certain destination address) can reach a particular destination.
- 6) Determine whether a flow of data frames can be sent without error from a specific location within a network to a station or stations specified by the DA field of each frame.

12.2 Managed objects

Insert the following bullet item, relettered if necessary after the last item of IEEE Std 802.1ag-2007/IEEE Std 802.1ah-2008/IEEE Std 802.1ap-2008:

- l) The DDCFM Entities (12.18)

Insert a new subclause 12.18 as follows:

12.18 DDCFM entities

The following are the DDCFM managed objects in a Bridge:

- a) DDCFM Stack managed object (12.18.1)
- b) Reflection Responder managed object (12.18.2)
- c) RFM Receiver managed object (12.18.3)
- d) Decapsulator Responder managed object (12.18.4)
- e) SFM Originator managed object (12.18.5)

12.18.1 DDCFM Stack managed object

There is one DDCFM Stack managed object per Bridge. It allows the network administrator to retrieve DDCFM entities configured on a particular Bridge Port or an aggregated IEEE802.3 port within a Bridge Port. The management operation that can be performed is

- a) Read DDCFM Stack managed object (12.18.1.1)

12.18.1.1 Read DDCFM Stack managed object

12.18.1.1.1 Purpose

To retrieve DDCFM entities configured on a particular Bridge Port or an aggregated IEEE802.3 port within a Bridge Port.

12.18.1.1.2 Input

- a) An interface, either a Bridge Port, or an aggregated IEEE802.3 port within a Bridge Port

12.18.1.1.3 Outputs

- a) Operation status. This takes one of the following values:
 - 1) Operation rejected because of invalid reference to an interface;
 - 2) Operation accepted, but there is no DDCFM entity configured on the specified interface; or
 - 3) Operation accepted, there are (is a) DDCFM entities (entity) configured on the specified interface, and
- b) If there are DDCFM entities configured on the specified interface, the following attributes should be returned:
 - 1) An RR is configured, its associated maintenance domain, and the value indicating its direction; and/or
 - 2) An RFM Receiver is configured, its associated maintenance domain; and/or
 - 3) A DR is configured, its associated maintenance domain, and its associated maintenance association; and/or
 - 4) An SFM Originator is configured, its associated maintenance domain, its associated maintenance association, and the value indicating its direction.

12.18.2 Reflection Responder managed object

The management operations that can be performed on the Reflection Responder managed object are as follows:

- a) Create Reflection Responder managed object (12.18.2.1)
- b) Write Reflection Responder managed object's attributes (12.18.2.2)
- c) Read Reflection Responder managed object's attributes (12.18.2.3)
- d) Delete Reflection Responder managed object (12.18.2.4)
- e) Activate Reflection Responder (12.18.2.5)
- f) Deactivate Reflection Responder (12.18.2.6)

12.18.2.1 Create Reflection Responder managed object

12.18.2.1.1 Purpose

To create a Reflection Responder. After the creation, all the writable attributes have their default values unless being configured differently by the Write Reflection Responder managed object operation (12.18.2.2). The Reflection Responder is in the inactive state after the creation and remains so until activated by a subsequent Activate Reflection Responder operation (12.18.2.5).

12.18.2.1.2 Inputs

- a) A reference to a particular RR managed object, which includes the following:
 - 1) An interface (either a Bridge Port or an aggregated IEEE802.3 port within a Bridge Port) on which the Reflection Responder is defined. The interface identifier could be MAC address or port identifier.
 - 2) A reference to a particular Maintenance Domain managed object (12.14.5).
 - 3) A value indicating the direction in which the RR faces, which can be either Down [Active SAP is further away from the Frame filtering entity (default)], or Up (Active SAP is closer to the Frame filtering entity).

12.18.2.1.3 Outputs

- a) Operation status. This takes one of the following values:
 - 1) Operation rejected because of invalid interface reference or invalid Maintenance Domain level; or

- 2) Operation accepted.

12.18.2.2 Write Reflection Responder managed object

12.18.2.2.1 Purpose

To configure and alter the value of one or more writable attribute(s) of an RR managed object. The attributes of an RR managed object cannot be modified when the RR is active.

12.18.2.2.2 Inputs

- a) Reference to a RR managed object [12.18.2.1.2, item a)].
- b) Writable attributes are as follows:
 - 1) Reference to a Maintenance Association managed object (12.14.6) within the RR's Maintenance Domain. If set to 0, the MA associated with the filtered frame shall be used for the RFM emitted by the RR.
 - 2) Reflection Filter definition(s), which is to specify what data frames are selected to be reflected. Multiple filters can be combined together by "&& (and)", "|| (or)", or "!(negation)" operations with precedence association being determined by "()". DDCFM-capable bridges shall support each of the following filter primitives. Implementers may support additional filters, such as length of data frame being equal, larger or smaller than a particular value.
 - All;
 - VID== vid; This primitive uses SVID if the RR is defined on a S component, and CVID if the RR is defined on a C component. Untagged frame shall not be selected by this filter primitive;
 - DA == xx.xx.xx.xx.xx.xx;
 - SA == xx.xx.xx.xx.xx.xx;
 - The first 2 bytes of the EtherType field ==xx;
 - 3) Sampling Interval (29.2.3.4).
 - 4) Reflection Target Address, which is a MAC address to which the reflected frames are targeted. Only individual address is allowed for the Reflection Target Address. The default is the source_address of the selected data frame being used for Reflection Target Address.
 - 5) Continue option, indicating whether or not the selected data frames are to be continued towards the destination_address specified in the data frame. The default is true to allow data frames to be forwarded to their destinations.
 - 6) Boolean variable indicating if the duration is in seconds or in number of data frames.
 - 7) Duration in seconds for the Reflection Responder to remain active after being activated. Minimum 1 and maximum is implementation dependent.
 - 8) The number data frames for the Reflection Responder to reflect after being activated. Once this frame count is reached, the Reflection Responder shall be de-activated automatically. Default is 0, which means the duration is limited by RR's timer.
 - 9) The priority and drop_eligible parameters to be used in the transmitted encapsulated frames (default value: the highest priority, i.e. that with the highest numerical value, allowed to pass through the Bridge Port for any of the VID. Default value for drop_eligible is false).
 - 10) FloodingEnabled Flag indicating if flooding is allowed or not if Egress port cannot be identified for RFM by the Filtering Database.
 - 11) Truncation flag indicating if the received data frame should be truncated to keep the length of RFM encapsulated frame not exceeding the Maximum Service Data Unit Size (6.5.8). If the Truncation flag is not set and the RFM encapsulated frame exceeds the Maximum Service Data Unit Size (6.5.8), the filtered data frame is fragmented to two smaller frames and encapsulated in two separate RFMs.