

Fibre Channel Consortium

FC-BB-5
FCoE Initialization Protocol (FIP) Test Suite
Version 1.2

Technical Document



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Modification Record

- April 23, 2010 – Version 1.0 Release – Dustin Schoenbrun: Original Document based off of FC-BB-5 rev 2.00 Standard
- June 21, 2010 – Version 1.1 Release – Added VN_Port tests to VLAN discovery
- August 6, 2012 – Version 1.2 Release – Added multicast Discovery Advertisement tests

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Introduction

Overview

The University of New Hampshire's InterOperability Laboratory (UNH-IOL) is an institution designed to improve the interoperability of standards based products by providing an environment where a product can be tested against other implementations of a standard. These tests are designed to determine if an FCoE product conforms to specifications defined in *Fibre Channel Backbone 5 (FC-BB-5) Rev 2.00 Standard T11/Project 1871-D* (hereafter referred to as "FC-BB-5"). This suite of tests has been developed to help implementers evaluate the functioning of their Fibre Channel over Ethernet-based products. The tests do not determine if a product conforms to the Fibre Channel standard, nor are they purely interoperability tests. Rather, they provide one method to isolate problems within a Fibre Channel device. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other Fibre Channel devices. However, combined with satisfactory operation in the IOL's semi-production environment, these tests provide a reasonable level of confidence that the Device Under Test (DUT) will function well in most multivendor Fibre Channel Environments.

Organization of Tests

The tests contained in this document are organized to simplify the identification of information related to a test and to facilitate in the actual testing process. Each test contains an identification section that describes the test and provides cross-reference information. The discussion section covers background information and specifies why the test is to be performed. Tests are grouped in order to reduce setup time in the lab environment. Each test contains the following information:

Test Number

The Test Number associated with each test follows a simple grouping structure. Listed first is the Clause followed by the Test Group Number followed by the test's number within the group. This allows for the addition of future tests to the appropriate groups of the test suite without requiring the renumbering of the subsequent tests.

Purpose

The purpose is a brief statement outlining what the test attempts to achieve. The test is written at the functional level.

References

This section specifies all reference material *external* to the test suite, including the specific subclauses references for the test in question, and any other references that might be helpful in understanding the test methodology and/or test results. External sources are always referenced by a bracketed number (e.g., [1]) when mentioned in the test description. Any other references in the test description that are not indicated in this manner refer to elements within the test suite document itself (e.g., "Appendix 6.A", or "Table 6.1.1-1")

Resource Requirements

The requirements section specifies the test hardware and/or software needed to perform the test. This is generally expressed in terms of minimum requirements, however in some cases specific equipment manufacturer/model information may be provided.

Last Modification

This specifies the date of the last modification to this test.

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Discussion

The discussion covers the assumptions made in the design or implementation of the test, as well as known limitations. Other items specific to the test are covered here.

Test Setup

The setup section describes in detail the configuration of the test environment and includes a block diagram for clarification as well as information such as the interconnection of devices, what monitoring equipment should capture, what the generation equipment should send, and any other configuration information vital to carrying out the test. Small changes in the configuration should be included in the test procedure.

Procedure

The procedure section of the test description contains the step-by-step instructions for carrying out the test. It provides a cookbook approach to testing, and will often be interspersed with observable results.

Observable Results

The observable results section list observables that can be examined by the tester to verify that the DUT is operating properly. When multiple values are possible for an observable, this section provides a short discussion on how to interpret them. Note that complete delineation between the observables in the **Procedure** and **Observable** is virtually impossible. As such, a careful note should be made of the requirement in both sections. In certain cases, it may be necessary to modify certain steps in the **Procedure** section while doing the actual tests so as to be able to perform the tests. In such cases, the modifications will be noted in the summary report.

Possible Problems

This section provides some troubleshooting procedures in the event that the test does not yield the expected results.

Legend

For reasons of brevity, the following abbreviations are used within this test suite:

DUT	Device Under Test
FCoE	Fibre Channel over Ethernet
FIP	FCoE Initialization Protocol
TS	Testing Station

In the test suite, state transitions have been described using the notations used in the FC-BB-5 document. Any underlined set of transitions implies that the transition is repeated continuously.

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References

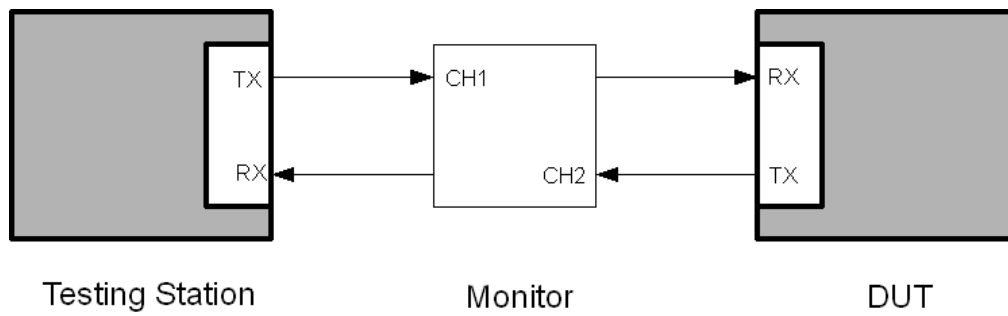
The following documents are referenced in this text:

- ANSI X3T11/Project 1871-D/Rev. 2.00 Fibre Channel Backbone 5 FC-BB-5 (hereafter referred to as “FC-BB-5”)

Test Setup

The following test setup is used in this test suite:

Test Setup 1:



Group 1: VLAN Discovery

Overview: This section tests the capability of the DUT when attempting to discover VLANs on the fabric. These tests are applicable to VN_Ports, VF_Ports, and VE_Ports as they test the capabilities of all.

Test 7.1.1: ALL-FCF-MAC Group Address Listening

Purpose: To verify that the DUT is listening to the All-FCF-MACs group address in the default VLAN and in other VLANs that ENodes or FCFs may use to invoke the protocol.

References:

FC-BB-5 – Clause 7.8.2 – Page 94.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

FCF-MACs shall listen to the All-FCF-MACs group address in the default VLAN and in other VLANs that ENodes or FCFs may use to invoke the protocol.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

Part a: Default FCoE VLAN

1. The testing station is instructed to transmit a protocol-invoking frame to the All-FCF-MACs group address on the default VLAN that the DUT is configured for.
2. Traffic is monitored and captured.

Part b: Non-Default FCoE-Enabled VLAN

1. The testing station is instructed to transmit a protocol-invoking frame to the All-FCF-MACs group address on a different, FCoE-Enabled VLAN other than the default VLAN enabled on the DUT.
2. Traffic is monitored and captured.

Part c: Non-Default FCoE-Disabled VLAN

1. The testing station is instructed to transmit a protocol-invoking frame to the All-FCF-MACs group address on a different, FCoE-Disabled VLAN other than the default VLAN enabled on the DUT.
2. Traffic is monitored and captured.

Observable Results:

Parts a and b: The DUT should respond to the All-FCF-MACs addressed frame.

Part c: The DUT should not respond to the All-FCF-MACs addressed frame.

Possible Problems: None.

Test 7.1.2: FIP VLAN Request Frame Response

Purpose: To verify that, if the DUT is a VF_Port capable FCF and receives a FIP VLAN request frame, it responds with a unicast FIP VLAN notification frame over the same VLAN.

References:

FC-BB-5 – Clause 7.8.2 – Page 93

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames.
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

An ENode MAC may send a FIP VLAN Request frame to the ALL_FCF_MACs MAC address over an available VLAN (e.g., the port VLAN). VF_Port capable FCF-MACs that receive a FIP VLAN Request frame shall respond with a unicast FIP VLAN Notification frame over the same VLAN. *This test is applicable to VF_Port capable FCF devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station, DUT and the Monitor as shown.

Procedure:

1. The testing station, acting as an ENode, is instructed to transmit a FIP VLAN Request frame to the DUT
2. The exchange between the DUT and the Testing Station is captured and observed.

Observable Results:

On the Monitor, verify that the DUT responds to the FIP VLAN Request with a unicast FIP VLAN Notification frame over the same VLAN.

Possible Problems: None.

Test 7.1.3: Discarding Multicast FIP VLAN Request Frames with Duplicate MAC Addresses

Purpose: To verify that the DUT discards any multicast FIP VLAN request frame that has a source address equal to its FCF-MAC address.

References:

FC-BB-5 – Clause 7.8.2 – Page 93.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

A VF_Port capable FCF-MAC shall discard a multicast FIP VLAN request frame that has a source address equal to its FCF_MAC address, and the FIP VLAN request frame should be reported in a vendor specific way as an indication of a MAC address duplication. *This test is applicable to VF_Port capable FCF devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

1. The testing station is instructed to transmit a multicast FIP VLAN request frame that has a source address equal to the DUT's FCF-MAC address.
2. Traffic is monitored and captured.

Observable Results:

The DUT should discard the frame and potentially report the frame in a vendor specific way.

Possible Problems: None.

Test 7.1.4: VLAN Configuration Change Response

Purpose: To verify that the DUT, if it is VF_Port capable, correctly constructs a FIP VLAN notification frame if it chooses to create one in response to a change in configuration of VLANs on which it supports FC-BB_E services.

References:

FC-BB-5 – Clause 7.8.2 – Page 93.

Resource Requirements:

- A Testing Station capable of changing the settings on a VLAN where the DUT is supporting FC-BB_E services.
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

If the configuration of VLANs on which a VF_Port capable FCF-MAC supports FC-BB_E services changes, that FCF-MAC should send a unicast FIP VLAN notification frame to each ENode MAC address with which that FCF-MAC has established VN_Port to VF_Port virtual links. The unicast FIP VLAN notification frame shall carry the revised list of VLAN IDs over which the originating VF_Port capable FCF-MAC offers FC-BB_E services. *This test is applicable to VF_Port capable FCF devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

1. Set up VLAN 5 on the FCoE switch to be able to handle FCoE traffic.
2. Change the FCoE enabled VLAN on the FCoE switch from 5 to 6.
3. Traffic is monitored and captured.

Observable Results:

If the DUT sent any unicast FIP VLAN notification frames, it should carry the revised list of VLAN IDs over which the DUT supports FC-BB_E services.

Possible Problems: None.

Test 7.1.5: FIP VLAN Request Frame Response

Purpose: To verify that the DUT, if it is VF_Port capable, responds to FIP VLAN request frames with a unicast FIP VLAN notification frame over the same VLAN.

References:

FC-BB-5 – Clause 7.8.2 – Page 93.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

A VE_Port capable FCF-MAC may send a FIP VLAN request frame to the MAC address ALL-FCF-MACs over an available VLAN. VE_Port capable FCF-MACs that receive a FIP VLAN request frame shall respond with a unicast FIP VLAN notification frame over the same VLAN. The FIP VLAN notification frame carries the list of VLAN IDs over which the originating FCF offers FC-BB_E services. The VE_Port capable FCF-MAC that received a FIP VLAN notification frame may enable one or more of these VLANs for subsequent operations. *This test is applicable to VE_Port capable FCF devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

1. The testing station is instructed to transmit a FIP VLAN request frame to the DUT
2. Traffic is monitored and captured.

Observable Results:

The DUT should respond to the FIP VLAN request with a unicast FIP VLAN notification frame over the same VLAN.

Possible Problems: None.

Test 7.1.6: Discarding Multicast VLAN Request Frames with Duplicate MAC Addresses

Purpose: To verify that the DUT discards any multicast VLAN request frame that has a source address equal to its FCF-MAC address.

References:

FC-BB-5 – Clause 7.8.2 – Page 94.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

A VF_Port capable FCF-MAC shall discard a multicast VLAN request frame that has a source address equal to its FCF_MAC address, and the VLAN request frame should be reported in a vendor specific way as an indication of a MAC address duplication. *This test is applicable to VF_Port capable FCF devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

1. The testing station is instructed to transmit a multicast VLAN request frame that has a source address equal to the DUT's FCF-MAC address.
2. Traffic is monitored and captured.

Observable Results:

The DUT should discard the frame and potentially report the frame in a vendor specific way.

Possible Problems: None.

Test 7.1.7: VLAN Configuration Change Response

Purpose: To verify that the DUT, if it is VE_Port capable, correctly constructs a FIP VLAN notification frame if it chooses to create one in response to a change in configuration of VLANs on which it supports FC-BB_E services.

References:

FC-BB-5 – Clause 7.8.2 – Page 93.

Resource Requirements:

- A Testing Station capable of changing the settings on a VLAN where the DUT is supporting FC-BB_E services.
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

If the configuration of VLANs on which a VE_Port capable FCF-MAC supports FC-BB_E services changes, that FCF-MAC should send a unicast FIP VLAN notification frame to each FCF-MAC address with which that FCF-MAC has established VE_Port to VE_Port virtual links. The unicast FIP VLAN notification frame shall carry the revised list of VLAN IDs over which the originating VE_Port capable FCF-MAC offers FC-BB_E services. *This is applicable to VE_Port capable FCF devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

1. Change the settings on a VLAN where the DUT is supporting FC-BB_E services.
2. Traffic is monitored and captured.

Observable Results:

If the DUT sent any unicast FIP VLAN notification frames, it should carry the revised list of VLAN IDs over which the DUT supports FC-BB_E services.

Possible Problems: None.

Test 7.1.8: VN_Port VLAN Discovery Start

Purpose: To verify that the DUT correctly constructs and sends a VLAN Request frame upon becoming operational.

References:

FC-BB-5 – Clause 7.8.2 – Page 93.

Resource Requirements:

- A Testing Station capable of changing the settings on a VLAN where the DUT is supporting FC-BB_E services.
- A Monitor capable of capturing FCoE traffic.

Last Updated: June 21, 2010

Discussion:

When a VN_Port becomes operational it should send a VLAN Request frame to inform the switch that it is operational and ready to receive a VLAN Notification frame. VLAN Discovery is not a mandatory function, but if a device supports VLAN Discovery and does not know what VLAN to use via other means it should send a VLAN Request frame immediately upon becoming operational.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

1. Configure the DUT to use VLAN Discovery and make the link operational.
2. Traffic is monitored and captured.

Observable Results:

Verify that the DUT sends a properly formatted VLAN Request frame to the ALL_FCF_MACs address.

Possible Problems: None.

Test 7.1.9: VN_Port VLAN Discovery Accept VLAN ID

Purpose: To verify that the DUT takes the recommended VLAN ID that the switch provides to it and uses it for FCoE Traffic.

References:

FC-BB-5 – Clause 7.8.2 – Page 93.

Resource Requirements:

- A Testing Station capable of changing the settings on a VLAN where the DUT is supporting FC-BB_E services.
- A Monitor capable of capturing FCoE traffic.

Last Updated: June 21, 2010

Discussion:

After the DUT becomes operational and sends a VLAN Request frame to the ALL_FCF_MACs address, the switch should respond with a VLAN Notification frame to the DUT. In the VLAN Notification frame the switch will provide one or more VLAN IDs that the DUT can transmit FCoE traffic on. The DUT should use one or more of the VLAN IDs for all further FCoE traffic.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

Part a: One VLAN ID

1. Make the link to the DUT operational.
2. When the DUT transmits a VLAN Request frame, instruct the TS to respond with a properly formatted VLAN Notification frame with a single VLAN IDs provided.
3. Traffic is monitored and captured.

Part b: Multiple VLAN ID

1. Make the link to the DUT operational.
2. When the DUT transmits a VLAN Request frame, instruct the TS to respond with a properly formatted VLAN Notification frame with two different VLAN IDs provided.
3. Traffic is monitored and captured.

Observable Results:

In both parts, verify that the DUT immediately begins sourcing all FCoE traffic on a valid VLAN ID provided in the VLAN Notification frames.

Possible Problems: None.

Test 7.1.10: VN_Port VLAN Discovery Change VLAN ID

Purpose: To verify that the DUT properly begins sourcing FCoE traffic on a new VLAN ID when a switch sends a VLAN Notification message with a different VLAN ID.

References:

FC-BB-5 – Clause 7.8.2 – Page 93.

Resource Requirements:

- A Testing Station capable of changing the settings on a VLAN where the DUT is supporting FC-BB_E services.
- A Monitor capable of capturing FCoE traffic.

Last Updated: June 21, 2010

Discussion:

After the DUT becomes operational and sends a VLAN Request frame to the ALL_FCF_MACs address, the switch should respond with a VLAN Notification frame to the DUT. In the VLAN Notification frame the switch will provide one or more VLAN IDs that the DUT can transmit FCoE traffic on. The DUT should use one or more of the VLAN IDs for all further FCoE traffic. During operation, FCoE services may move to another VLAN ID. In this case, the switch will send out a unicast VLAN Notification frame with the new VLAN IDs.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown.

Procedure:

1. Make the link to the DUT operational.
2. When the DUT transmits a VLAN Request frame, instruct the TS to respond with a properly formatted VLAN Notification frame with a single VLAN ID provided.
3. Traffic is monitored to observe that the DUT is sourcing traffic on the correct VLAN ID.
4. Instruct the TS to issues a unicast VLAN Notification frame to the DUT with a different VLAN ID.
5. Traffic is monitored and captured.

Observable Results:

Verify that the DUT immediately begins sourcing all FCoE traffic on a valid VLAN ID provided in the second VLAN Notification frame.

Possible Problems: None.

Group 2: ENode/FCF Discovery

Overview: This section tests the capability of the DUT when attempting to discover other ENodes or FCFs on the fabric. These tests are applicable to both ENodes and FCFs as they test the capabilities of both.

Test #7.2.1: DUT Transmits FIP Discovery Advertisements

Purpose: To verify that the DUT correctly transmits FIP Discovery Advertisements periodically.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 94
Ibid – Clause 7.8.7.3 – Page 116

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames.
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

The FCoE Controller of a VF_Port capable FCF-MAC will periodically send multicast Discovery Advertisements to the All-ENode-MACs (01:10:18:01:00:01) group address every FKA_ADV_PERIOD (250-90000ms +/- 0 to 100ms). *This test is applicable to VF_Port capable FCF devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station, DUT and the Monitor as shown. The DUT has not yet completed the FIP protocol and has not completed login.

Procedure:

1. The DUT is instructed to start initialization using FIP.
2. The testing station is instructed not respond to the DUT for a period of time.
3. The exchange between the DUT and the Testing Station is captured and observed.

Observable Results:

On the Monitor, verify that the DUT sends FIP Discovery Advertisements every FKA_ADV_PERIOD and also verify that the DUT sets the maximum FCoE PDU size value within the Max FCoE Size descriptor that it intends to use for FCoE traffic.

Possible Problems: None.

Test #7.2.2: DUT Receives FIP Discovery Advertisement

Purpose: To verify that the DUT correctly handles the reception of FIP Discovery Advertisements.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 94
Ibid – Table 27 – Page 104

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

The FCoE Controller of an ENode MAC, upon receiving FIP Discovery Advertisements, shall verify the VN_Port addressing capabilities of the advertising FCF-MAC against its own VN_Port addressing capabilities. If the advertising FCF-MAC is compatible, then the FCoE Controller of an ENode MAC shall create an entry for each such FCF-MAC in an internal FCF List. If the advertising FCF-MAC is incompatible, then the Discovery Advertisement shall be discarded. *This test is applicable to VN_Port capable ENode devices.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

Part a: FIP Discovery Advertisements are Compatible with the DUT

1. The DUT is instructed to start initialization using FIP
2. The Testing Station will send FIP Discovery Advertisements that are compatible with the capabilities of the DUT.

Part b: FIP Discovery Advertisements are NOT Compatible with the DUT

1. The DUT is instructed to start initialization using FIP
2. The Testing Station will send FIP Discovery Advertisements that are NOT compatible with the capabilities of the DUT.

Observable Results:

Part a: The DUT should create an entry for the Testing Station in its internal FCF List

Part b: The DUT should discard the FIP Discovery Advertisements and not add the Testing Station to its internal FCF List.

Possible Problems: None.

Test #7.2.3: DUT Transmits FIP Discovery Solicitation

Purpose: To verify that the DUT correctly transmits FIP Discovery Solicitations after receiving FIP Discovery Advertisements.

References:

- FC-BB-5 – Clause 7.8.3.2 – Page 94
- FC-BB-5 – Clause 7.8.3.2 – Note 18

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: August 6, 2012

Discussion:

An ENode MAC may wait to receive unsolicited multicast Discovery Advertisements and then send unicast Discovery Solicitations to the FCF-MACs selected for login from the FCF Login set. In order to perform a FIP FLOGI with an FCF_MAC in the FCF Login Set with the 'Max FCoE Size Verified' flag set to zero, the FCoE Controller of an ENode MAC shall transmit a unicast Discovery Solicitation to that FCF-MAC address after receiving a Discovery Advertisement. *This is an optional test which may allow a device to be interoperable with an FCF that performs fabric login using multicast FIP Discovery Advertisements.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

Part a: Multicast FIP Discovery Advertisements are Compatible with the DUT

1. The testing station, acting as an FCF that has not yet been seen by the DUT, is instructed to send a multicast Discovery Advertisement to the All-ENode-MACs group address.
2. Traffic is monitored and captured.

Part b: Unicast FIP Discovery Advertisement with Padding

1. The testing station, acting as an FCF that has not yet been seen by the DUT, is instructed to send a multicast Discovery Advertisement to the All-ENode-MACs group address.
2. Upon reception of a unicast FIP Discovery Solicitation from the DUT, transmit a unicast Discovery Advertisement with padding equal to the Max FCoE Size Descriptor of the received Discovery Solicitation.
3. Traffic is monitored and captured.

Part c: Unicast FIP Discovery Advertisement without Padding

1. The testing station, acting as an FCF that has not yet been seen by the DUT, is instructed to send a multicast Discovery Advertisement to the All-ENode-MACs group address.
2. Upon reception of a unicast FIP Discovery Solicitation from the DUT, transmit a unicast Discovery Advertisement with no padding.
3. Traffic is monitored and captured.

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Observable Results:

Part a: The DUT should transmit a unicast FIP Discovery Solicitation to the Testing Station's MAC address.

Part b: The DUT should transmit a FLOGI frame to the Testing Station's MAC address.

Part c: The DUT should not transmit a FLOGI frame to the Testing Station's MAC address.

Possible Problems: The DUT may not respond to the Testing Station transmitting multicast Discovery Advertisements. In this case, the test is Not Applicable.

Test #7.2.4: DUT Transmits FIP Discovery Solicitation upon Becoming Operational

Purpose: To verify that the DUT correctly transmits a multicast FIP Discovery Solicitation to the All-FCF-MACs group address (01:10:18:01:00:02) upon becoming operational.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 95.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the FCoE Controller of an ENode MAC becomes operational it should discover VF_Port capable FCF-MACs with which it may perform FIP FLOGI by transmitting a multicast FIP Discovery Solicitation to the All-FCF-MACs group address (01:10:18:01:00:02).

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has already logged in using FIP and is idle.

Procedure:

1. Disconnect the fiber connecting the DUT and the Testing Station.
2. Reconnect the fiber
3. Monitor and Capture the traffic.

Observable Results:

The DUT should transmit a multicast FIP Discovery Solicitation to the All-FCF-MACs group address upon becoming operational.

Possible Problems: None.

Test #7.2.5: DUT Transmits FIP Discovery Advertisement after Receiving FIP Discovery Solicitation

Purpose: To verify that the DUT, upon receiving a FIP Discovery Solicitation, transmits a solicited unicast FIP Discovery Advertisement to the soliciting ENode MAC.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 95.

Ibid – Table 47 – Page 122.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When a VF_Port capable FCF-MAC receives a FIP Discovery Solicitation from an ENode MAC with which the VN_Port addressing modes are compatible and if it is configured to allow a FIP FLOGI from that ENode, it shall transmit a solicited unicast FIP Discovery Advertisement to that ENode MAC within ADV_TOV (2 seconds) time. *This test is applicable to VF_Port capable FCF devices.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

1. The testing station is instructed to send a FIP Discovery Solicitation to the DUT.
2. Traffic is monitored and captured.

Observable Results:

The DUT should transmit a solicited unicast FIP Discovery Advertisement to the Testing Station within AD_TOV (2 seconds) time.

Possible Problems: None.

Test #7.2.6: Max FCoE Size Descriptor in a FIP Discovery Solicitation

Purpose: To verify that when the DUT transmits a FIP Discovery Solicitation it sets the value of the maximum FCoE PDU Size.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 95.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When either a ENode MAC or a VE_Port capable FCF-MAC transmits a FIP Discovery Solicitation, it shall specify the maximum FCoE PDU size that it intends to use for FCoE traffic within the Max FCoE Size Descriptor

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

1. The testing station is instructed to start initialization using FIP.
2. Traffic is monitored and captured.

Observable Results:

The DUT should transmit a solicited unicast FIP Discovery Solicitation to the Testing Station within AD_TOV (2 seconds) time with the Max FCoE Size Descriptor field filled in with the maximum FCoE PDU size that it intends to use for FCoE traffic.

Possible Problems: None.

Test #7.2.7: FIP Discovery Advertisement Pad Extension

Purpose: To verify that the DUT, after receiving a FIP Discovery Solicitation, will respond with a FIP Discovery Advertisement with a padded length of the Max FCoE Size specified in the FIP Discovery Solicitation.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 95.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When either a ENode MAC or a VE_Port capable FCF-MAC transmits a FIP Discovery Advertisement in response to a FIP Discovery Solicitation, it shall be padded out to the length specified in the Max FCoE Size descriptor in the FIP Discovery Solicitation.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

1. The testing station is instructed to send a FIP Discovery Solicitation to the DUT with the Max FCoE Size Descriptor value set to 512 bytes.
2. Traffic is monitored and captured.
3. Repeat steps 1 and 2 with the Max FCoE Size Descriptor value set to 1500 bytes and 2500 bytes.

Observable Results:

The DUT should transmit a solicited unicast FIP Discovery Advertisement to the Testing Station within AD_TOV (2 seconds) time with the frame padded out to the value specified in the Testing Station's Max FCoE Size Descriptor.

Possible Problems: None.

Test #7.2.8: DUT Discards Discovery Solicitation – DUT is ENode

Purpose: To verify that the DUT discards any received Discovery Solicitation.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 96.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When an ENode MAC receives any type of Discovery Solicitation, it shall discard it. *This test is only applicable to ENodes.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

1. The testing station is instructed to send a FIP Discovery Solicitation to the DUT.
2. Traffic is monitored and captured.

Observable Results:

The DUT should not respond to the FIP Discovery Solicitation transmitted by the Testing Station.

Possible Problems: None.

Test #7.2.9: DUT Discards Discovery Solicitation – DUT is VF_Port Capable FCF-MAC

Purpose: To verify that the DUT discards any Discovery Solicitation originated by a VE_Port capable FCF-MAC as well as discards any Discovery Solicitation that has a source address equal to its FCF-MAC address.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 96.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When a VF_Port capable FCF-MAC receives a Discovery Solicitation from a VE_Port capable FCF-MAC it shall discard it. Also, when it receives a Discovery Solicitation that has a source address that is equal to its own FCF-MAC address it shall discard it and report it in a vendor specific way. *This test is only applicable to VF_Port Capable FCF-MAC devices.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

Part A:

1. The testing station, acting as a VE_Port capable FCF-MAC, is instructed to transmit a Discovery Solicitation to the DUT.
2. Traffic is monitored and observed.

Part B:

1. The testing station is instructed to transmit a Discovery Solicitation with the source address equal to the FCF-MAC address of the DUT.
2. Traffic is monitored and captured.

Observable Results:

The DUT should not respond to the FIP Discovery Solicitation transmitted by the Testing Station.

Possible Problems: None.

Test #7.2.10: DUT Discards Discovery Advertisement – Identical MAC Addresses

Purpose: To verify that the DUT discards any Discovery Advertisement with a source address equal to its own.

References:

FC-BB-5 – Clause 7.8.3.2 – Page 96.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When an ENode MAC receives an unsolicited multicast Discovery Advertisement that has a source address equal to its ENode MAC address it shall discard it.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT has not completed FIP and has not logged in.

Procedure:

1. The testing station is instructed to send an unsolicited multicast Discovery Advertisement to the DUT.
2. Traffic is monitored and captured.

Observable Results:

The DUT should not respond to the Discovery Advertisement transmitted by the Testing Station.

Possible Problems: None.

Group 3: FCF/FCF Discovery

Overview: The following tests exercise the DUT's ability to discover other FCFs on the network. These tests only apply to devices that act as FCFs.

Test #7.3.1: Periodic Transmission of Multicast Discovery Advertisements

Purpose: To verify that the DUT periodically transmits multicast Discovery Advertisements to the All-FCF-MACs group address.

References:

FC-BB-5 – Clause 7.8.3.3 – Page 96.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

The FCoE Controller of a VF_Port capable FCF-MAC shall periodically transmit multicast Discovery Advertisements to the All-FCF-MACs group address (01:10:18:01:00:02) every FKA_ADV_PERIOD (250-90000 milliseconds, default is 8000).

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and can be in any state.

Procedure:

1. Traffic is monitored and captured.

Observable Results:

The DUT should transmit a multicast Discovery Advertisement to the All-FCF-MACs group address every FKA_ADV_PERIOD.

Possible Problems: None.

Test #7.3.2: Transmission of Unicast Discovery Solicitation

Purpose: To verify that the DUT transmits a unicast Discovery Solicitation to an FCF-MAC that it wishes to perform FIP ELP with.

References:

FC-BB-5 – Clause 7.8.3.3 – Page 96.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

In order to perform FIP ELP with an FCF-MAC in the DUT's FCF list, it must have its "Max FCoE Size Verified" flag set to one. In order to perform FIP ELP with an FCF-MAC with this flag set to zero, the DUT shall transmit a unicast Discovery Solicitation to that FCF-MAC address.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The testing station is instructed to periodically transmit multicast Discovery Advertisements so that the DUT can add it to its internal FCF list.
2. Traffic is monitored and captured.

Observable Results:

The DUT should transmit a unicast Discovery Solicitation to the testing station.

Possible Problems: None.

Test #7.3.3: Transmission of Unicast Discovery Advertisement

Purpose: To verify that the DUT transmits a solicited unicast Discovery Advertisement in response to a unicast Discovery Solicitation.

References:

FC-BB-5 – Clause 7.8.3.3 – Page 97.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

After receiving a unicast Discovery Solicitation from an FCF-MAC that wants to log in to the DUT, the DUT shall transmit a solicited unicast Discovery Advertisement to the FCF-MAC.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

Part A: Unicast Discovery Solicitation

1. The testing station is instructed to transmit a unicast Discovery Solicitation to the DUT.
2. Traffic is monitored and captured.

Part B: Multicast Discovery Solicitation

1. The testing station is instructed to transmit a multicast Discovery Solicitation to the All-FCF-MACs group address.
2. Traffic is monitored and captured.

Observable Results:

Parts A and B: The DUT should transmit a solicited unicast Discovery Advertisement to the FCF-MAC address of the testing station within ADV_TOV (2 seconds).

Possible Problems: None.

Test #7.3.4: Discarding Invalid Discovery Solicitations

Purpose: To verify that the DUT discards invalid Discovery Solicitations from an FCF.

References:

FC-BB-5 – Clause 7.8.3.3 – Page 97-98.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

After receiving a Discovery Solicitation from an FCF, an FCF-MAC shall perform the following verification checks:

- I. The Name_Identifier field in the Discovery Solicitation shall be different than the Switch_Name of the recipient FCF; and
- II. either
 - A. The FP bit is set to one and the FC-MAP value in the FC-MAP descriptor in the Discovery Solicitation shall be the same as the FC-MAP value of the recipient FCF; or
 - B. The FP bit is set to zero and the SP bit is set to one, and the FC-MAP value in the FC-MAP descriptor in the Discovery Solicitation shall be zero.

If any of the verification checks is false, then that Discovery Solicitation shall be discarded.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

Part A: Name_Identifier Field Value is the Same as the Switch_Name of the DUT

1. The testing station, acting as an FCF, transmits a Discovery Solicitation with the Name_Identifier field equal to the DUT's Switch_Name.
2. Traffic is monitored and captured.

Part B: FP Bit is set to one, FC-MAP value in the FC-MAP descriptor is different than the FC-MAP of the DUT

1. The testing station, acting as an FCF, transmits a Discovery Solicitation with the FP bit set to one and the FC-MAP value in the FC-MAP descriptor in the Discovery Solicitation is different than the FC-MAP value of the DUT.
2. Traffic is monitored and captured.

Part C: FP Bit is set to zero, SP bit is set to one. FC-MAP value in the FC-MAP descriptor is not zero

1. The testing station, acting as an FCF, transmits a Discovery Solicitation with the FP bit set to zero and the SP bit set to one and the FC-MAP value in the FC-MAP descriptor in the Discovery Solicitation is not equal to zero.
2. Traffic is monitored and captured.

Part D: Testing Station as an ENode transmits a Discovery Solicitation (applicable only to VE_Port capable FCF-MACs)

1. The testing station, acting as an ENode, transmits a Discovery Solicitation to the DUT.
2. Traffic is monitored and captured.

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Observable Results:

Parts A, B, C and D: The DUT should discard the Discovery Solicitation transmitted by the testing station.

Possible Problems: None.

Test #7.3.5: Discarding Invalid Discovery Advertisements

Purpose: To verify that the DUT discards invalid Discovery Advertisements from an FCF.

References:

FC-BB-5 – Clause 7.8.3.3 – Page 98.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

After receiving a Discovery Advertisement, an FCF-MAC shall perform the following verification checks:

- I. The Name_Identifier field value in the Discovery Advertisement shall be different than the Switch_Name of the recipient FCF; and
- II. either
 - A. The FP bit is set to one and the FC-MAP value in the Fabric descriptor in the Discovery Advertisement shall be the same as the FC-MAP value of the recipient FCF; or
 - B. The FP bit is set to zero and the SP bit is set to one, and the FC-MAP value in the Fabric descriptor in the Discovery Advertisement shall be zero.

If any of the verification checks is false, then that Discovery Advertisement shall be discarded.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

Part A: Name_Identifier Field Value is the Same as the Switch_Name of the DUT

1. The testing station, acting as an FCF, transmits a Discovery Advertisement with the Name_Identifier field equal to the DUT's Switch_Name.
2. Traffic is monitored and captured.

Part B: FP Bit is set to one, FC-MAP value in the Fabric descriptor is different than the FC-MAP of the DUT

1. The testing station, acting as an FCF, transmits a Discovery Advertisement with the FP bit set to one and the FC-MAP value in the Fabric descriptor in the Discovery Advertisement is different than the FC-MAP value of the DUT.
2. Traffic is monitored and captured.

Part C: FP Bit is set to zero, SP bit is set to one. Fabric value in the FC-MAP descriptor is not zero

1. The testing station, acting as an FCF, transmits a Discovery Advertisement with the FP bit set to zero and the SP bit set to one and the FC-MAP value in the Fabric descriptor in the Discovery Advertisement is not equal to zero.
2. Traffic is monitored and captured.

Observable Results:

Parts A, B, and C: The DUT should discard the Discovery Advertisement transmitted by the testing station.

Possible Problems: None.

Group 4: VN_Port to VF_Port Virtual Link Instantiation

Overview: The following tests exercise the DUT's ability to instantiate VN_Port to VF_Port virtual links. These tests apply to both VN_Port and VF_Port capable devices as these tests examine the capabilities of both.

Test #7.4.1: Fabric Login Using FIP Frames

Purpose: To verify that the DUT during fabric login (i.e. FLOGI, NPIV FDISC) uses FIP frames to do so.

References:

FC-BB-5 – Clause 7.8.4.1 – Page 98.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

Fabric login (i.e. FLOGI, NPIV FDISC) shall be performed using FIP Frames and the associated FIP descriptor type (7 for an FLOGI, 8 for an NPIV FDISC).

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The Testing Station is instructed wait for the DUT to log into it using FIP.
2. The DUT is expected to then proceed into performing Fabric login.
3. Traffic is monitored and captured.

Observable Results:

The DUT should transmit an FLOGI or NPIV FDISC encapsulated within a FIP frame. The FIP frame should also have the FIP Descriptor type set to the appropriate value (7 for an FLOGI, 8 for an NPIV FDISC).

Possible Problems: None.

Test #7.4.2: Indication of Addressing Mode in Fabric Login

Purpose: To verify that the DUT specifies the addressing mode that it intends to use when it transmits a FIP FLOGI or a FIP NPIV FDISC during Fabric login.

References:

FC-BB-5 – Clause 7.8.4.1 – Page 98.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the FCoE Controller of an ENode MAC transmits a FIP FLOGI Request or a FIP NPIV FDISC Request it shall indicate the addressing mode it intends to use. It does this by specifying either the FP bit (for FPMA), the SP bit (for SPMA), or both. *This test is applicable to ENode devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The Testing Station is instructed wait for the DUT to log into it using FIP.
2. The DUT is expected to then proceed into performing Fabric login.
3. Traffic is monitored and captured.

Observable Results:

Within the FLOGI or NPIV FDISC encapsulated frames, verify that either the FP bit is set (for FPMA), the SP bit is set (for SPMA), or both are set.

Possible Problems: None.

Test #7.4.3: Reception of FLOGI or NPIV FDISC by FCF

Purpose: To verify that the DUT handles the addressing modes specified by the received FLOGI or NPIV FDISC correctly.

References:

FC-BB-5 – Clause 7.8.4.1 – Page 99.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the FCF receives FLOGI or NPIV FDISC frames, it has to determine which addressing mode the link partner wishes to use. These modes can be FPMA (Fabric-Provided MAC Address), SPMA (Server-Provided MAC Address), or both. *This test is applicable to FCFs only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

Part A: SP Bit is set to one, FP Bit is set to zero

1. The testing station is instructed to log into the DUT using FIP.
2. Upon receiving the solicited Discovery Advertisement from the DUT, the testing station is instructed to send an FLOGI with the SP Bit set to one and the FP Bit to zero.
3. Traffic is monitored and captured.

Part B: SP Bit is set to zero, FP Bit is set to one

1. The testing station is instructed to log into the DUT using FIP.
2. Upon receiving the solicited Discovery Advertisement from the DUT, the testing station is instructed to send an FLOGI with the SP Bit set to zero and the FP Bit to one.
3. Traffic is monitored and captured.

Part C: Both SP and FP Bits are set to one

1. The testing station is instructed to log into the DUT using FIP.
2. Upon receiving the solicited Discovery Advertisement from the DUT, the testing station is instructed to send an FLOGI with both the SP and FP Bits set to one.
3. Traffic is monitored and captured.

Observable Results:

Part A: Verify that the DUT returns the MAC address specified in the FLOGI frame in its LS_ACC frame.

Part B: Verify that the DUT returns a properly formed FPMA MAC address in its LS_ACC frame.

Part C: Verify that the DUT selects one of the addressing modes and returns a MAC address for the selected addressing mode.

Possible Problems: None.

Test #7.4.4: Explicit VN_Port to VF_Port Virtual Link De-Instantiation

Purpose: To verify that the DUT when explicitly de-instantiating a VN_Port to VF_Port Virtual Link it transmits a FIP-encapsulated Fabric LOGO frame.

References:

FC-BB-5 – Clause 7.8.4.1 – Page 99.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the DUT wants to explicitly de-instantiate a VN_Port to VF_Port Virtual Link, it shall send a LOGO frame encapsulated within a FIP frame and set the FIP descriptor type field to the correct type (9 for LOGO). *This test is applicable to ENode devices only.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The DUT is instructed to log into the testing station.
2. After receiving the LS_ACC from the testing station, the DUT is instructed to perform a Fabric Logout using a FIP-encapsulated LOGO frame.
3. Traffic is monitored and captured.

Observable Results:

Verify that the LOGO frame is encapsulated within a FIP frame and verify that the FIP descriptor type for the LOGO frame is set to 9.

Possible Problems: None.

Group 5: VE_Port to VE_Port Virtual Link Instantiation

Overview: The following tests exercise the DUT's ability to instantiate VE_Port to VE_Port Virtual Links using FIP. These tests are applicable to VE_Port capable devices only.

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Test #7.5.1: ELP Transmission

Purpose: To verify that when the DUT wants to instantiate a VE_Port to VE_Port virtual link, it sends an ELP Request encapsulated within a FIP frame.

References:

FC-BB-5 – Clause 7.8.4.2 – Page 99.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the DUT wants to instantiate a VE_Port to VE_Port virtual link, it shall send an ELP Request encapsulated within a FIP frame and shall set the FIP descriptor type field to 10.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The DUT is instructed to log into the testing station.
2. After receiving the solicited Discovery Advertisement from the testing station, the DUT is instructed to transmit an ELP Request encapsulated within a FIP frame.
3. Traffic is monitored and captured.

Observable Results:

Verify that the ELP Request is encapsulated within a FIP frame and verify that the FIP descriptor type field is set to 10.

Possible Problems: None.

Group 6: Virtual Link Maintenance

Overview: The following tests exercise the DUT's ability to maintain virtual links. The tests cover dealing with physical layer faults (both local and non-local), keeping the link alive, and other maintenance activities.

Test #7.6.1: Physical Layer Disconnect

Purpose: To verify that when the physical layer of the DUT becomes non-operational it will de-instantiate all of its links.

References:

FC-BB-5 – Clause 7.8.5.2 – Page 99.
Ibid. - Clause 7.8.5.3 – Page 101

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the DUT detects that its physical layer is not operational it shall de-instantiate all its VN_Port to VF_Port virtual links if the DUT is an ENode MAC, or de-instantiate all of its VF_Ports if the DUT is a VF_Port capable FCF-MAC.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The DUT is instructed to log into the testing station and set up a virtual link.
2. The fiber connecting the DUT and the testing station is disconnected.
3. Traffic is monitored and captured.

Observable Results:

Verify that after the fiber is disconnected that the DUT de-instantiated all of its VN_Port to VF_Port virtual links if the DUT is an ENode MAC or that the DUT de-instantiated all of its VF_Ports if DUT is a VF_Port capable FCF-MAC.

Possible Problems: None.

Test #7.6.2: Transmission of FIP Keep Alive

Purpose: To verify that the DUT occasionally transmits FIP Keep Alive frames to keep the virtual link active.

References:

FC-BB-5 – Clause 7.8.5.2 – Page 100.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

The FCoE Controller of an ENode MAC shall occasionally transmit a unicast FIP Keep Alive frame to the VF_Port capable FCF-MAC that it has VN_Ports logged in. It shall transmit the FIP Keep Alive frames every FKA_ADV_PERIOD (default value of 8000 milliseconds) if transmitting on behalf of the ENode MAC (i.e. without a Vx-Port Identification descriptor) or every FKA_VN_PERIOD (90 seconds) if transmitting on behalf of each VN_Port associated with that ENode MAC.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The DUT is instructed to log into the testing station and set up a virtual link.
2. Traffic is monitored and captured for five minutes.

Observable Results:

Verify that the DUT periodically sends FIP Keep Alive frames every FKA_ADV_PERIOD (default value of 8000 milliseconds) if transmitting on behalf of the ENode MAC or every FKA_VN_PERIOD (90 seconds) if transmitting on behalf of each VN_Port associated with that ENode MAC.

Possible Problems: It is possible that this behavior can be administratively disabled on the DUT. If this is the case, the DUT will not transmit FIP Keep Alive frames.

Test #7.6.3: Transmission of Discovery Advertisement

Purpose: To verify that the DUT occasionally transmits unsolicited multicast Discovery Advertisements to keep the virtual link active.

References:

FC-BB-5 – Clause 7.8.5.2 – Page 100.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

The FCoE controller of an ENode MAC monitors the status of a VF_Port with which it has VN_Ports logged in by verifying reception of unsolicited multicast Discovery Advertisements from that VF_Port. As a result, to keep the virtual link active, the VF_Port shall transmit an unsolicited multicast Discovery Advertisement every FKA_ADV_PERIOD (default value of 8000 milliseconds).

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has not logged in.

Procedure:

1. The DUT is instructed to log into the testing station and set up a virtual link.
2. Traffic is monitored and captured for five minutes.

Observable Results:

Verify that the DUT periodically sends unsolicited multicast Discovery Advertisements every FKA_ADV_PERIOD (default value of 8000 milliseconds).

Possible Problems: None

Test #7.6.4: Reception of a FIP Clear Virtual Links Frame

Purpose: To verify that the DUT correctly handles the reception of a FIP Clear Virtual Links frame.

References:

FC-BB-5 – Clause 7.8.5.2 – Page 100.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When an ENode MAC receives a FIP Clear Virtual Link frame, it shall de-instantiate the VN_Ports listed within the frame.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has logged in.

Procedure:

1. The Testing Station is instructed to send a FIP Clear Virtual Link frame specifying a VN_Ports to be de-instantiated.
2. Traffic is monitored and captured.

Observable Results:

Verify that the DUT de-instantiates the specified VN_Port upon the reception of the FIP Clear Virtual Link frame.

Possible Problems: None

Test #7.6.5: Transmission of FIP Clear Virtual Links Frame

Purpose: To verify that the DUT correctly transmits FIP Clear Virtual Links Frames at the appropriate times.

References:

FC-BB-5 – Clause 7.8.5.2 – Page 101.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the FCoE Controller of a VF_Port capable FCF-MAC receives a VN_Port FIP Keep Alive from a VN_Port that is not logged in it shall send a FIP Clear Virtual Links frame listing that VN_Port. In addition, the FIP Clear Virtual Links frame shall not exceed the standard Ethernet MAC Client Data size (1500 bytes for basic frames, 1504 bytes for Q-tagged frames). If the list of VN_Ports to be removed does not fit in one FIP frame, multiple FIP frames should be used to convey the entire list.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has logged in.

Procedure:

Part A: FIP Keep Alive from a VN_Port that is not Logged In

1. The Testing Station is instructed to send a FIP Keep Alive claiming to be from a ENode that is not logged into the DUT.
2. The DUT should send a FIP Clear Virtual Links frame specifying the ENode that the Testing Station used.
3. Traffic is monitored and captured.

Part B: FIP Keep Alive from an ENode that is not Logged In

1. The Testing Station is instructed to send a FIP Keep Alive claiming to be from an ENode that is not logged into the DUT.
2. The DUT should send a FIP Clear Virtual Links frame listing no VN_Ports.
3. Traffic is monitored and captured.

Observable Results:

Verify that the DUT transmits a FIP Clear Virtual Links frame to both the VN_Port and the ENode that were listed by the Testing Station and that the FIP Clear Virtual Links frame does not exceed Ethernet frame size limits.

Possible Problems: None

Test #7.6.6: Locally Modified FKA_ADV_PERIOD Value

Purpose: To verify that the DUT correctly handles changes to the FKA_ADV_PERIOD value locally.

References:

FC-BB-5 – Clause 7.8.5.2 – Page 101.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

When the FKA_ADV_PERIOD value is decreased, a VF_Port capable FCF-MAC shall transmit unsolicited multicast Discovery Advertisements at the interval specified value, but shall not use the new value for detection of missing ENode FIP Keep Alives until five times the old value has elapsed since the first updated unsolicited multicast Discovery Advertisement. When the FKA_ADV_PERIOD value is increased, a VF_Port capable FCF-MAC shall transmit unsolicited multicast Discovery Advertisements at the interval specified by the old value until five times the old value has elapsed since the first updated Discovery Advertisement was transmitted. *This test is applicable to devices that can change the FKA_ADV_PERIOD value.*

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has logged in.

Procedure:

Part A: FKA_ADV_PERIOD Decreased

1. The FKA_ADV_PERIOD value on the DUT is decreased from its current value.
2. Traffic is monitored and captured for at least five times the previous FKA_ADV_PERIOD value.

Part B: FKA_ADV_PERIOD Increased

1. The FKA_ADV_PERIOD value on the DUT is increased from its current value.
2. Traffic is monitored and captured for at least five times the previous FKA_ADV_PERIOD value.

Observable Results:

Verify that after five times the old FKA_ADV_PERIOD the device starts using the new value for FKA_ADV_PERIOD. Also verify that the updated value is shown in the subsequent Discovery Advertisements.

Possible Problems: None

Test #7.6.7: Remotely Modified FKA_ADV_PERIOD Value

Purpose: To verify that the DUT correctly handles changes to the FKA_ADV_PERIOD value remotely.

References:

FC-BB-5 – Clause 7.8.5.2 – Page 101.

Resource Requirements:

- A Testing Station capable of transmitting user-defined FCoE Frames
- A Monitor capable of capturing FCoE traffic.

Last Updated: April 23, 2010

Discussion:

On detecting an updated FKA_ADV_PERIOD value, an ENode shall transmit ENode FIP Keep Alive frames at the updated FKA_ADV_PERIOD value as well as use this value to detect missing Discovery Advertisements.

Test Setup: *Test Setup 1.* Connect the Testing Station and DUT as shown. The DUT is powered on and has logged in.

Procedure:

1. The testing station is instructed to change its FKA_ADV_PERIOD value and send out an unsolicited multicast Discovery Advertisement with the new value.
2. The testing station is instructed to stop sending periodic unsolicited multicast Discovery Advertisements so that the link will time out.
3. Traffic is monitored and captured.

Observable Results:

Verify that the DUT sends its FIP Keep Alive frames at the new interval specified by the testing station. Also verify that the DUT uses the new value to detect the lack of unsolicited multicast Discovery Advertisements.

Possible Problems: None