Priority Based Flow Control

Group 1: Reception of Valid PFC Frames
Overview: These tests observe the behavior of the DUT when it receives valid PFC frames. In their entirety, these tests verify that a device properly stops transmitting frames for the correct amount of time and handles a variety of valid PFC frames.

Test #36.1.1: Reception of PFC Frames

Purpose: To verify that the DUT inhibits the transmission of MAC client frames when a PFC frame is received.

References:
> [1] PFC – Clause 36

Resource Requirements:
- Testing Station capable of transmitting user defined PFC frames to the DUT.
- Monitor capable of capturing Ethernet traffic.

Last Modification: March 1, 2010.

Discussion: Devices supporting the operation of PFC frames will halt transmission of frames from the specified priority upon reception of a valid PFC frame with a time vector value greater than zero.

Test Setup: *Test Setup 1*. Connect the Testing Station, the DUT and the Monitor as shown. The DUT has been configured to support at least one priority group.

Procedure:

1. The DUT is instructed to transmit a large number of valid frames to the TS.
2. Instruct the TS to issue a valid PFC frame.
3. The activity is captured and observed.
4. Vary the length of time that is indicated in the PFC frames.
5. Repeat each length of time 10 times and record the shortest pause time for each.

Observable Results:

> On the Monitor, verify that the DUT properly halts transmission for at least the specified value of pause_quantum.

Possible Problems: None

Test #36.1.2: Reception of Multiple PFC Frames

Purpose: To verify that the DUT inhibits or begins transmission of MAC client frames when a PFC frame is received after the DUT has already received a valid PFC frame.

References:
> [1] PFC – Clause 36

Resource Requirements:
- Testing Station capable of transmitting user defined PFC frames to the DUT.
- Monitor capable of capturing Ethernet traffic.

Last Modification: March 6, 2009.

Discussion: A device that has already received a valid PFC and receives another valid PFC frame shall restart the timer with the new value provided, or in the case of the time_vector set to zero, the device should begin transmission of frames immediately.

Test Setup: *Test Setup 1.* Connect the Testing Station, the DUT and the Monitor as shown. The DUT has been configured to support at least one priority group.

Procedure:

1. The DUT is instructed to transmit a large number of valid frames to the TS.
2. Instruct the TS to issue a valid PFC frame with a time_vector set to the maximum value of 65535 pause_quanta.
3. At a set time within the pause period, instruct the TS to issue a valid PFC frame with time_vector zero.
4. The activity is captured and observed.
5. Repeat steps 1-4 with other time_vector values such as another maximum value frame and a frame with a small value that is less than the current time.

Observable Results:

> On the Monitor, verify that the DUT properly halts or begins transmission when it receives the second PFC frames.

Possible Problems: None

Test #36.1.5: Reception of Multiple Priority PFC Frames

Purpose: To verify that the DUT properly pauses traffic on multiple priorities.

References:
   [2] PFC – Clause 36

Resource Requirements:
   - Testing Station capable of transmitting user defined PFC frames to the DUT.
   - Monitor capable of capturing Ethernet traffic.

Last Modification: March 9, 2009.

Discussion: A device that receives a PFC frame should pause only those priorities specified with a time_vector greater than 0. A device might share priorities in a single queue in which case, a priority other than the one paused will be blocked.

Test Setup: *Test Setup 1*. Connect the Testing Station, the DUT and the Monitor as shown. The DUT has been configured to support at least one priority for each queue supported by the device.

Procedure:

   1. The DUT is instructed to transmit a large number of valid frames on each priority configured.
   2. Instruct the TS to issue a valid PFC frame that cause the DUT to commence pausing traffic on each configured priority.
   3. The activity is captured and observed.
   4. Repeat steps 1-3 for various combinations of pausing and resuming traffic on each of the priorities configured on the DUT.

Observable Results:

   On the Monitor, verify that when traffic is paused or resumed on one priority it does not affect the traffic on another priority.

Possible Problems: Knowledge of the internal workings of the DUT may be needed in order to establish how many queues are available and what priorities share queues.

Group 4: Proper Handling of PFC Frames With Different VLAN IDs
Overview: These tests observe the behavior of the DUT when it transmits and receives PFC frames based on traffic with different VLAN IDs. In their entirety, these tests verify that a device behaves properly when it receives a PFC frame or sends PFC frames independent of the VLAN ID of the traffic class.

Test #36.4.1: Same Priority in Different VLANs

Purpose: To verify that the DUT properly handles the case when the same priority is configured for two different VLANs.

References:
   [3] PFC – Clause 36

Resource Requirements:
   • Testing Station capable of transmitting user defined PFC frames to the DUT.
   • Monitor capable of capturing Ethernet traffic.

Last Modification: March 1, 2010.

Discussion: A PFC frame is a MAC control frame that operates on the priority field of the VLAN tag. PFC is intended to work on different priorities regardless of VLAN ID.

Test Setup: *Test Setup 1*. Connect the Testing Station, the DUT and the Monitor as shown. The DUT has been configured to support at least one priority group with two different VLAN IDs.

Procedure:

   1. The DUT is instructed to transmit a large number of valid frames from two different VLAN IDs with the same priority to the TS.
   2. Instruct the TS to issue a valid PFC frame.
   3. The activity is captured and observed.

Observable Results:

   On the Monitor, verify that the DUT properly pauses the traffic in both VLAN IDs with the same priority.

Possible Problems: None.

Test #36.4.2: Different Priority in Different VLANs

Purpose: To verify that the DUT properly handles the case when different priorities are configured for two different VLANs.

References:
> [4] PFC – Clause 36

Resource Requirements:
- Testing Station capable of transmitting user defined PFC frames to the DUT.
- Monitor capable of capturing Ethernet traffic.

Last Modification: March 1, 2010.

Discussion: A PFC frame is a MAC control frame that operates on the priority field of the VLAN tag. PFC is intended to work on different priorities regardless of VLAN ID.

Test Setup: *Test Setup 1.* Connect the Testing Station, the DUT and the Monitor as shown. The DUT has been configured to support at least two priority groups with two different VLAN IDs.

Procedure:

1. The DUT is instructed to transmit a large number of valid frames from one VLAN ID and priority to the TS.
2. Instruct the TS to issue a valid PFC frame to the priority of the VLAN ID NOT being transmitted.
3. The activity is captured and observed.

Observable Results:

> On the Monitor, verify that the DUT does not pause the traffic of the first VLAN ID and priority.

Possible Problems: None.

Enhanced Transmission Selection

Group 1: Traffic Class Mapping

Overview: These tests observe the behavior of the DUT during transmission and reception of frames using ETS. They ensure that the DUT properly transmits frames according to the ETS configurations set before transmission.

Test #37.1.1: Bandwidth Utilization of Two TCs

Purpose: To verify that the DUT properly disperses traffic to within 10% of it's ETS configured settings.

References:
- ETS – Sub-clause 37.3

Resource Requirements:
- A resource for traffic generation.
- Monitor capable of capturing Ethernet traffic.

Last Modification: March 8, 2011.

Discussion: The DUT should have the ability to set the bandwidth allocation for at least three TCs. When all configured TCs consume their share of the available bandwidth, each TC should be within +/-10% of the allocated bandwidth over a period of time as measured by 10,000,000 bit times during transmission of max sized frames without any PFC frames received.

Test Setup: Case 1: *Test Setup 1*. Connect the DUT to a TS. Connect a monitor between the DUT and the TS. Case 2: *Test Setup 2*. Connect two TS Sources and one TS Sink to the DUT. Connect a monitor between the DUT and the TS Sink.

Procedure:

Test Run	TC 1	TC 2
1	50.0%	50.0%
2	15.0%	85.0%
3	85.0%	15.0%

Case 1: The DUT is an End Device

1. Bring the links between the TS and DUT up.
2. Configure the DUT and the TS to have the ETS settings for Test Run 1.
3. Transmit at least 500 max sized frames at 100% utilization from the TS.
4. Capture the results.
5. Repeat for Test Run 2 and 3.

Case 2: The DUT is a Switch

1. Bring the links between the TSs and DUT up.
2. Configure the DUT to have the ETS settings for Test Run 1.
3. Configure each Source to transmit a unique TC from the table above.
4. Transmit at least 500 max sized frames at 100% utilization from Source 1 and 2.
5. Capture the results.
6. Repeat for Test Run 2 and 3.

Observable Results:

On the Monitor, verify that the DUT properly disperses the frames to within 10% of each of the ETS settings.

Possible Problems: none.

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Test #37.1.5: Bandwidth Sharing

Purpose: To verify that the DUT properly shares bandwidth with other TCs when one TC 's bandwidth is not fully allocated.

References:
[1] ETS – Sub-clause 37.3

Resource Requirements:
- A resource for traffic generation.
- Monitor capable of capturing Ethernet traffic.

Last Modification: March 8, 2011.

Discussion: When a TC does not consume all of it's allocated bandwidth the DUT is to disperse the remaining bandwidth amongst the other TCs.

Test Setup: Case 1: *Test Setup 1*. Connect the DUT to a TS. Connect a monitor between the DUT and the TS. Case 2: *Test Setup 2*. Connect two TS Sources and one TS Sink to the DUT. Connect a monitor between the DUT and the TS Sink.

Procedure:

Test Run	TC 1	TC 2
1	50.0%	50.0%
2	15.0%	85.0%

Case 1: The DUT is an End Device

1. Bring the links between the TS and DUT up.
2. Configure the DUT to have the ETS settings for Test Run 1.
3. Configure the TS to have the ETS settings for Test Run 2.
4. Transmit at least 500 max sized frames at 100% utilization from the TS.
5. Capture the results.

Case 2: The DUT is a Switch

1. Bring the links between the TSs and DUT up.
2. Configure the DUT to have the ETS settings for Test Run 1.
3. Configure each Source to transmit a unique TC from the table above.
4. Transmit at least 500 max sized frames at the utilization described in Test Run 2 from Source 1 and 2.
5. Capture the results.

Observable Results:

On the Monitor, verify that the DUT properly utilizes the excess bandwidth.

Possible Problems: none.

Test #37.1.6: Lossy vs. Lossless Traffic Priority

Purpose: To verify that when the DUT is overloaded with lossy and lossless traffic, it drops the lossy traffic and properly uses PFC to regulate the rates of incoming lossless traffic.

References:
  • ETS – Sub-clause 37.3

Resource Requirements:
  • A resource for traffic generation.
  • Monitor capable of capturing Ethernet traffic.

Last Modification: March 8, 2011.

Discussion: When lossy and lossless traffic is transmitted to the DUT at faster rates than the DUT can handle, the DUT is required to drop the lossy traffic and use PFC to regulate the rates of the incoming lossless traffic. Regardless of the state of lossy or lossless, the bandwidth allocations should be maintained.

Test Setup: Case 1: *Test Setup 1.* Connect the DUT to a TS. Connect a monitor between the DUT and the TS. Case 2: *Test Setup 2.* Connect two TS Sources and one TS Sink to the DUT. Connect a monitor between the DUT and the TS Sink.

Procedure:

Test Run	TC 1	TC 2
1	50.0%	50.0%
2	15.0%	85.0%
3	85.0%	15.0%

Case 1: The DUT is an End Device

1. Bring the link between the TS and DUT up.
2. Configure the DUT and the TS to have the ETS settings for Test Run 1.
3. Configure TC 1 to be a lossless class and TC 2 to be a lossy class.
4. Transmit at least 500 maxed sized frames at 100% utilization from the TS.
5. Capture the results.
6. Repeat for Test Run 2 and 3.

Case 2: The DUT is a Switch

1. Bring the links between the TSs and DUT up.
2. Configure the DUT to have the ETS settings for Test Run 1.
3. Configure each Source to transmit a unique TC from the table above.
4. Configure TC 1 to be a lossless class and TC 2 to be a lossy class.
5. Transmit at least 500 maxed sized frames at 100% utilization from Source 1 and 2.
6. Capture the results.
7. Repeat for Test Run 2 and 3.

Observable Results:

On the Monitor, verify that the DUT properly disperses the frames to within 10% of each of the ETS settings.

Possible Problems: According to the standard, the observable result can only be measured while PFC is not seen, so a DUT cannot fail this test it is only a recommended behavior.

Data Center Bridging Exchange

Group 5: System Configuration
Overview: These tests observe the behavior of the DUT during various situations not related to a specific TLV. In their entirety, these tests verify that a device properly has DCBX on by default and handles multiple neighbors properly.

Test #38.5.1: DCBX Enabled by Default

Purpose: To verify that the DUT has DCBX enabled by default. The device should also have the ability to disable DCBX in administrator configurations.

References:
[1] DCBX – Sub-clause 38.4

Resource Requirements:
1. Testing Station capable of transmitting user defined DCBX frames to the DUT.
   - Monitor capable of capturing Ethernet traffic.

Last Modification: October 8, 2010.

Discussion: Devices capable of any DCB feature should have DCBX enabled by default. The device should also have the option to administratively disable DCBX.

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

Procedure:
    Part A:
        1. Restart the DUT and observe the DCBX settings.
    Part B:
        1. Disable DCBX on the DUT.
        2. Instruct the TS to transmit valid DCBX frames.
        3. Observe the results.

Observable Results:

    Part A: Verify that the DUT has DCBX enabled by default.
    Part B: After disabling DCBX on the DUT, the DUT should not act upon valid DCBX frame.

Possible Problems: None